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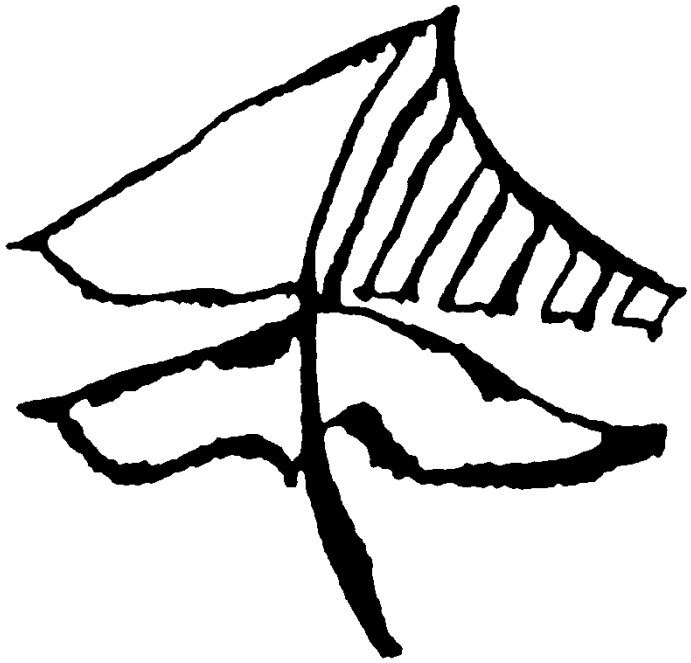

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WSTĘP

25 zeszyt Rocznika „*Intercathedra 2009*" jest rezultatem współpracy naukowej Katedr zajmujących się zagadnieniami ekonomiki, organizacji, zarządzania i marketingu, zwłaszcza, choć nie tylko, w drzewnictwie – z Poznania, Zwolenia, Warszawy, Krakowa, Tarnowa, Trnawy, Zlina, Żyliny, Koszyc, Zagrzebia, Brna, Presova, Jihlavy oraz innych ośrodków naukowych polskich i zagranicznych.

Zasadniczą zawartość zeszytu stanowią artykuły naukowe przekazane Komitetowi Redakcyjnemu w 2009 r. zakwalifikowane do druku po pozytywnych opiniach recenzentów. Część z nich będzie przedmiotem rozważań i dyskusji podczas organizowanej w obecnym, 2009 roku przez Katedrę międzynarodowej konferencji naukowej: FORUM EKONOMICZNE 2009 - Problemy energetyczne i ich wpływ na sektor leśno-drzewny w Polsce, Unii Europejskiej i Europie - Energy problems and their impact on the forestry and wood sector in Poland, the European Union and Europe (Laski 15-17.09.2009).

Konferencja FORUM EKONOMICZNE zorganizowana jest przez **Katedrę Ekonomiki i Organizacji Drzewnictwa** przy współpracy:

1. IATM - ***INTERNATIONAL ASSOCIATION FOR TECHNOLOGY MANAGEMENT***,
2. Leśnym Zakładem Doświadczalnym w Siemianicach,
3. Sekcją Drzewną Stowarzyszenia Inżynierów i Techników Leśnictwa i Drzewnictwa w Warszawie,
4. Instytutem Technologii Drewna w Poznaniu.

Konferencja FORUM EKONOMICZNE 2009 jest XXV międzynarodowym spotkaniem naukowym pracowników katedr prowadzących prace badawcze w zakresie ekonomiki, zarządzania, organizacji, marketingu w przemyśle drzewnym - z Krajów Europy Środkowej. Konferencja zorganizowana została między innymi przy współudziale IATM - ***INTERNATIONAL ASSOCIATION FOR TECHNOLOGY MANAGEMENT*** – międzynarodowej organizacji naukowej, zrzeszającej liczne katedry prowadzące badania naukowe w zakresie ekonomiki i organizacji w przemyśle, drzewnictwie i leśnictwie głównie w krajach Europy Środkowej.

Część opracowań i artykułów naukowych prezentowanych w kolejnym, 25. numerze Rocznika „***Intercathedra 2009***" jest wynikiem wspólnych badań pracowników naukowych katedr z Poznania, Zwolenia, Koszyc i Zagrzebia nad realizowanym w ramach współpracy międzynarodowej tematem: „Implementation of the project logistic management in wood enterprises" (Implementacja zarządzania przedsięwzięciami logistycznymi w przedsiębiorstwach drzewnych).

Rocznik niniejszy wydany jest pod auspicjami IATM, a członkowie tej organizacji honorowo opracowali recenzje, materiały do druku i przygotowali konferencje naukowe, za co składam im serdeczne podziękowania.

Wojciech Lis

SPIS TREŚCI

Rafał Baum, Karol Wajszczuk, Witold Wielicki[1]

A MODEL OF LOGISTICS SYSTEM FOR LOCAL BIOMASS MARKET[2]

Abstract: The paper presents a concept for a digital platform model for the biomass logistics network for local communities. This concept refers to the strategy for the development of renewable power engineering in Poland to the year 2020, adopted by the Polish government. The status and prospects for biomass production are presented, from which it results that plant production for energy purposes may in the nearest future constitute an important alternative to food production. In turn, main problems connected with the organization of biomass market at the local and regional levels are also discussed. In the proposed model the digital platform would be available on the Internet for all links of the logistics chain, starting from producers and ending with buyers (processors) of biomass. Primary benefits of the implementation of such a system include the development of local energy biomass markets and maintenance of their effective operation; comprehensive utilization of local energy biomass resources for the production of green energy; initiation of an appropriate development of biomass power engineering as an element of sustainable rural development.
Key words: sustainable development, renewable energy sources, biomass logistics network

INTRODUCTION

The strategy for the development of the sector of renewable energy production in Poland, approved by the Council of Ministers in 2005, assumed that in 2010 a total of 7.5% and in 2020 14% produced energy will come from renewable sources (Ciechomski, 2005). The goals of the European Union concerning the energy sector up to 2020 are even more ambitious – within the 3 × 20% priority up to the year 2020 the following goals have been planned (Graczyk 2009):

- 20% share of renewable energy in the primary energy balance,
- 20% reduction of energy consumption,
- 20% reduction of greenhouse gas emissions.

For this reason it seems justified to conduct analyses on the production and utilization of biomass. Preliminary investigations indicate that increased interest in energy crop cultivation and biomass production results in the development of technologies of biomass production, logistics, storage and processing for various energy products. It may be expected that in the nearest years demand for biomass will considerably increase on the part of petrochemical, energy plants and heat and power plants, which will result in the necessity to develop efficient systems (networks), which will participate in the collection (transport and harvesting), preliminary processing and storage of biomass.

Systems of this type should concentrate around an integrator(-s) and - depending on the scale of demand for the technological charge (different forms of biomass as the raw material) - they may vary in their scale and range of impact – from regional (e.g. power plants) – to commune (e.g. local boiler plants - schools, commune office buildings, clinics, etc.). These networks presented in the interactive form and available on the Internet need to supply information to all parties interested in the production, processing and utilization of biomass. It is assumed that when developing the system criteria concerning the type and quantity of biomass and products connected with its pre-processing should be taken into consideration. This would facilitate the development of cooperation between individual entities and a more complementary adaptation of their facilities and expectations. The producer would gain information on who may harvest, transport, pre-process or store their biomass, the end buyer would know where to get their technological charge from (who collects bigger batches of the raw material), while companies involved in the logistics services between the producer and the end buyer would know who to cooperate with.

When utilizing renewable energy sources from biomass the primary factor determining the success of the whole enterprise is to provide adequate amounts and quality of required biomass.

Introduce some problems in the biomass market in Poland and an attempt to show a possibility solution - an interactive system of the biomass logistics network were the aims of the study. Creation a system connected producers and biomass processing enterprises and creation such logistics models are needed.

PROBLEMS IN THE BIOMASS MARKET

In further considerations over the problems with biomass the following issues - possibly hindering the development of the biomass market - need to be taken into account (Grzybek, 2007, Zawistowski, 2007):

- a lack of forecasts concerning the share of biomass from forests (wood), which may be potentially used for energy up to the year 2020. Simulations performed by Płotkowski (2007) following three scenarios indicate that the volume of wood biomass, which may be used for energy, ranges from 11 to almost 16 million m3. However, calculated values are theoretical in character and after the so-called processability is taken into consideration, they are reduced to 3 - 5 million m3.
- local and difficult to assess utilization of waste products from wood processing, solid industrial wastes e.g. from paper and furniture industries, as well as recycled wood. Thus 6 -10 million m^3 need to be added (reported values should be treated as theoretical and highly arbitrary).

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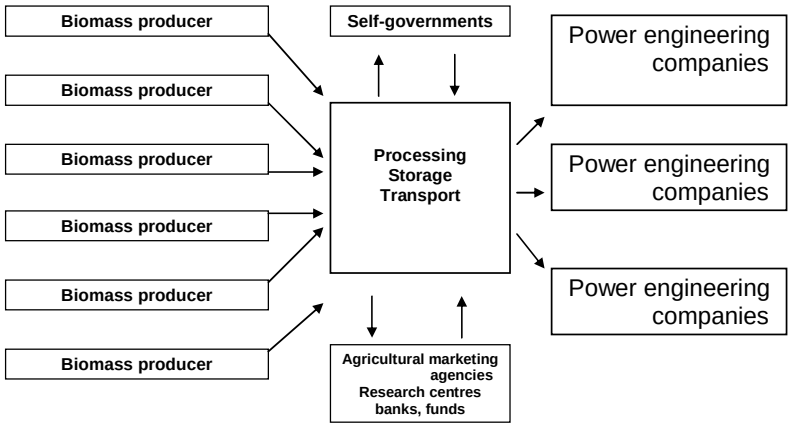
- a scattering of other potential biomass sources such as orchard wood, agricultural products and organic wastes. A lack of the market for agricultural biomass at an adequate scale and at present a lack of producers willing to offer larger batches of the raw material at one time practically eliminates this type of biomass from the commercial scale commodity turnover;
- a lack of competitive edge and instability of the cultivation area of agricultural biomass; resources of this type of biomass are dependent on the size of the production area (yields of biomass) and the ratio of prices for staple crops for human consumption and for animal feeds (sugar beets, rape, wheat). In a situation when production costs of biofuels are generally higher than prices for fossil fuels, increasing the share of biofuels may be achieved thanks to an active fiscal policy promoting biomass use;
- considerable technological and organizational risk connected with the wider-scale introduction of biomass to power and heat supply engineering as well as the production of liquid fuels. The basic problems include complicated supply and logistics, changing legal regulations, weak support on the part of administrative bodies, technological problems (the location of installations, graining and other physical properties of biomass, corrosion, erosion and deteriorating efficiency of boilers, unstable fuel composition);

As far as biomass for solid fuels is concerned (i.e. mainly used for combustion), at present biomass is utilized locally (at the site of processing) on a limited scale. Biomass power engineering is developing in high-capacity heat and power generating plants, and not in case of scattered generation, which hinders the formation of local biomass markets and does not promote investments in energy crops (the necessary transport of biomass at long distances). Cogeneration in high-capacity plants, developing dynamically, is based primarily on the utilization of forest biomass. This results in the absorption of biomass from local markets and an increase in biomass prices, at the simultaneous drop in the value of certificate of origin property rights, which in turn bring about reduced profitability of investments in new biomass power plants of small and medium capacity. The overall instability is also the effect of poor and delayed implementation of mechanisms generating the market for energy crops (Stryjecki, 2007).

Conditions discussed above justify the need to perform analyses on the balance of energy biomass presented on a local scale potential demand and the likely supply. The initiation of studies on the logistics model for the biomass market should be a tool ensuring reliable biomass supply to combustion plants and guaranteeing collection of biomass from producers; at the same time it should facilitate long-term investment decisions, both on the part of power plants (modernization, purchase of new technologies), and on the part of biomass producers.

A MODEL OF A DIGITAL PLATFORM FOR THE BIOMASS LOGISTICS NETWORK

It is assumed that the digital platform is to be the primary tool in the communication between the biomass producer and buyer on the local market. The territorial range of the so-called primary biomass market is expected to be the area of a given commune. Primary commune biomass markets would form county markets and these in turn would be combined into provincial markets. The platform includes also active participation of local self-governments and different types of entities and supporting institutions (research centres, agencies, associations, banks, funds). The diagram of the existing relationships is presented in Graph 1.



Graph 1. A diagram of relationships in the local biomass logistics system
Source: Stryjecki, 2007

Taking into consideration the power supply potential of communes within the scope of the logistics system (apart from forest biomass and wastes from wood processing industry (approx. 3.2 to 5 million ton wood, which is the equivalent – in terms of the calorific value – of 1.6 – 2.5 million ton coal) these include first of all:

- surplus production of crops for household consumption and fodder crops (cereals, potatoes, maize, hay, straw, etc.); this surplus will be gradually diminishing with an increased interest in the typical energy crops,
- purposeful production of plants for energy; cereals, potatoes, sugar and fodder beets, maize, rape (jointly over 4 million ton staple product + approx. 2 million ton straw)

- energy crops for the local heat and electric power supply (common osier, Virginia fanpetals, poplar, Jerusalem artichoke, Miscanthus). According to Jasiulewicz (2007), the area used for cultivation may cover (with some limitations) approx. 50% poor quality soils, which will yield 30 million t d.m. (3 million ha x 10 t d.m.). Some species of energy crops may also be grown on fallow and degraded lands (1 million ha), which at the average yield of 10 t d.m. would give approx. 10 million t d.m. Thus, the equivalent of approx. 20 - 30 million t coal could be produced.

Summing up, in the year 2020 and beyond as much as 50 million ton biomass charge will be harvested, transported, stored and supplied annually.

Thus, in order to avoid transporting large batches of biomass over long distances it is justified to create local biomass markets, balancing the supply and demand, as well as develop electronic logistics systems minimizing costs connected with harvesting, transport and storage of biomass. An additional advantage of the development of the digital platform may be the creation of local power supply centres, i.e. the utilization of the existing heating infrastructure in small towns (heat and power generating plants using biomass – the so-called cogeneration) or the application of biomass (either raw or naturally dried) in local power engineering systems (up to 30 km). In the optimal scenario, thanks to such a system, communes self-sufficient in energy could be formed and exist, which - promoting this solution and investing in such facilities - could use fully their land potential (poor quality soils, fallow land, degraded meadows, etc.) for the production of biomass. These communes would profit from such enterprises thanks to (Jasiulewicz, 2007):

- more effective utilization of labour force resources in the commune,
- increased income from agriculture,
- turnover and capital remaining in the commune,
- improved ecological conditions in the commune – the state of the atmosphere, land, waters (tourist value),
- utilization and development of infrastructure.

It is assumed that the development of the Internet logistics system should facilitate the realization of the primary goal as well as 2 auxiliary goals. The primary goal is to be an intermediate (through all elements of the logistics chain) on the local biomass market – on the one hand, to guarantee the collection of their product to biomass producers based on long-term contracts or direct purchase, and on the other hand, to guarantee the supplies of good quality fuel to power engineering companies over a longer time scale. Moreover, at the further stage of the project realization (complementary goals) the system is to facilitate cooperation of biomass suppliers and buyers with agricultural marketing agencies, ecological funds, banks, research centres, economic self-government bodies and local and regional self-governments, together with extension services offered to producers, self-governments and power engineering enterprises.

It is assumed that the electronic system, available on the Internet, in its primary part would be directed to the following recipients (individual elements of the logistics chain):

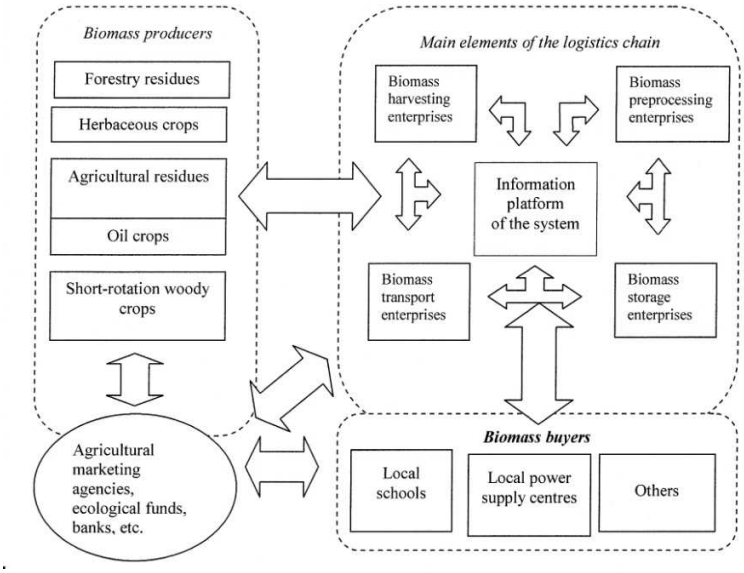
- biomass producers,
- entities dealing with biomass harvesting,
- entities dealing with transport of biomass,
- entities dealing with preliminary processing of biomass,
- entities dealing with biomass warehousing,
- final processors (consumers) of biomass.

After a recipient is identified the system would deliver complete information on the other participants of the chain. Each entity within the system could obtain information on the 5 other ones (see graph 2).

BENEFITS OF THE PROJECT

Practical implementation of the concept of the digital platform for the biomass logistics network should bring about many benefits, both in the macro (nationally, regionally) and micro scale (locally). The most important benefits of this project include such effects as (Pomorski, 2007; Żmuda, 2007; Stryjenki, 2007):

- the implementation of international obligations,
- improved energy security of Poland,
- improved quality of the natural environment – elimination of the so-called low emission – CO2, SO2 , NOx , (utilization of biofuel in ecological combustion systems replacing existing coal-fired boiler plants),
- implementation of the agricultural policy of EU and Poland – stabilization of agricultural production by the change of crops and yields for energy purposes,
- meeting social and economic expectations,
- ensuring coherence of energy management with the local economic development program (activation of the agricultural sector by the creation of new plantations of energy crops, management of idle lands, management of excess agricultural lands, prevention of population migration from rural communities, stimulation of demand for agricultural production means),
- a transformation of public awareness of the local community on the ecological fuel combustion,
- reduction of unemployment – creation of new workplaces,
- increased share of small and medium-sized enterprises in the local and regional economy (higher economic and social cohesion of the commune/province).



Graph 2. An interactive system of the biomass logistics network
Source: Authors' study.

CONCLUDING REMARKS

At present non-renewable fossil energy carriers have the highest share in the total energy consumption (e.g. 85%), but within the next several decades their role will decrease in favour of nuclear power and renewable energy sources. It is assumed that around the year 2060 the latter will constitute over 50% consumed energy resources (Bocheński, 2007).

Renewable energy sources in Poland have gained in importance especially in the last 3-4 years, when their share practically doubled and is currently almost 6%. Emphasis on the production of energy from renewable sources results from the previously mentioned Strategy for the development of renewable power engineering adopted by the Polish Parliament and from the EU directive no. 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport (an increase in the share of biocomponents – biodiesel and bioethanol – in the market of fuels used in transport from 2% in 2005 to 5.75% in 2010 and further to 10% in 2020). Moreover, it results from these documents that the primary source of renewable energy in Poland in the medium-range forecasts will be biomass. Its utilization in the production of liquid biofuels as well as solid fuels requires a considerable increase in biomass resources. Apart from the traditional sources of biomass such as wood and wood waste, the role of energy crop plants and agricultural products as well as organic wastes of agricultural origin is expected to increase significantly.

The project of a model logistics solution meets the expectations concerning the evolution of the energy supply system of Poland. The attempted more comprehensive utilization of RES in Poland in the future will be realized first of all thanks to the increased role of biomass as an energy fuel. The implementation of the presented proposal for the interactive logistics system will provide:

- the development of local markets for energy biomass and ensure their effective operation;
- full utilization of local resources of energy biomass for the production of green energy;
- initiation of a proper development of biomass power supply system as an element of sustainable development of rural areas.

In terms of specific goals, to be fulfilled by the digital platform of the biomass logistics network, the following processes are going to be facilitated:

- purchase of energy biomass from producers,
- processing of biomass for energy fuels and their storage,
- supplies of biomass fuels to interested power engineering enterprises,
- balancing of biomass resources and demand for biofuels within a region,
- initiation of educational activities aiming at the utilization of biomass for energy,
- search for investors in the sector and encouragement of investment projects in the region,
- aiding the search for financing of investments required for the establishment of energy crop plantations,
- cooperation with research centres in the promotion of good farming practice, effective growing and cultivation methods for energy crops, new cultivars of energy crops, technologies of processing biomass into fuels and energy production from biomass.

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***Justyna Biernacka*[3]**

COMPETITIVENESS ASSESSMENT OF SELECTED STOCK-LISTED WOOD COMPANIES IN THE DECONIUNCTURE

Summary: The objective of this paper is to evaluate competitiveness of stock-listed wood companies in the condition of economic crisis. It appears, that the economic situation can successfully identify the competitive position of companies in the market. Evaluation of the economic situation by using well-known early warning methods is particularly important for investors, especially for long-term decision-making on the stock market.
Keywords: wood industry, economic condition, competitiveness.

INTRODUCTION

Among many factors affecting the companies competitiveness in the market there are technical and organizational indicators, as well as economic. The technical and organizational factors include mainly: tide of the market, the level of technique and technology, research and development and management. The economic factors are mainly: the value of exports, changes in the prices of exports and imports and exchange rates.

It is well known that any decisions taken at management level are reflected in the economic results. Therefore a direct test of how the company effecting on the market is its economic condition, which can be assessed using several methods. Especially in the case of investments on the stock market during the global economic crisis, reliable indicators of actual economic situation of enterprises are wanted.

In addition to fundamental analysis, technical analysis and indicator analysis, some methods of early-warning bankruptcy prediction can be mentioned. These models have mostly a polynomial structure. The early-warning models allow to classify companies to the one of two to three groups, namely:

a) bankruptcy hazard,
b) no bankruptcy hazard,
c) uncertain classification (uncertain group)

As a result of the classification, early-warning methods are also referred as "discriminant models".

Among many of early-warning methods a particular attention deserve: Altman's models (the Altman's 68 and Altman's 83 models), and the Mączyńska and Zawadzki's method. As previous author's studies shown, these methods have great usefulness in the economic condition of wood industry stock-listed companies analysis.

RESULTS

In this paper Polish early-warning model – Mączyńska and Zawadzki's model were used and the results of economic condition of Forte SA, Paged SA and Grajewo SA were tested. The input data from quarterly financial reports were analysed: from 1st quarter 2008 to 1st quarter 2009.

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The results of the companies condition analysis made using Mączyńska and Zawadzki's method are shown in table 1 and diagram 1.

Table 1. Values of the Mączyńska and Zawadzki's polynomial for Forte SA, Paged SA and Grajewo SA

Quarter	Forte SA	Paged SA	Grajewo SA
	Z_{MZ} function values		
1st quarter 2008	1,501	1,457	0,686
2nd quarter 2008	1,874	1,171	0,445
3rd quarter 2008	2,430	1,356	0,789
4th quarter 2008	2,234	-0,535	0,749
1st quarter 2009	2,062	-0,790	0,203

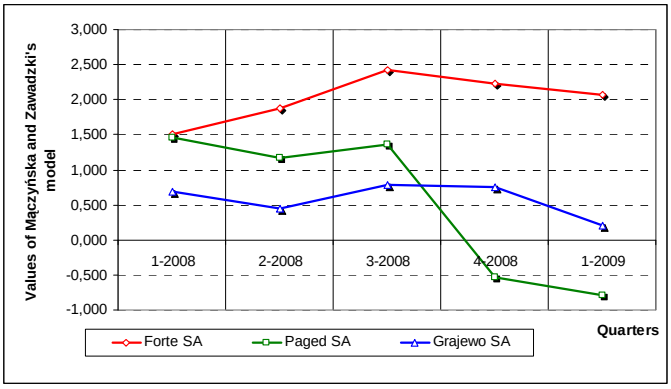

Diagram 1. Values of the Mączyńska and Zawadzki's model for Forte SA, Paged SA and Grajewo SA

The Mączyńska and Zawadzki's polynomial values analysis shows, that in the two initial quarters of analysis the Forte's SA economic condition had improved. Since 3rd quarter 2008 values of Z_{MZ} polynomial are decreasing, and in the last analysed quarter Z_{MZ} function reaches 2,062 (see table 1).

The economic condition of company does not, however, appear to be a threat - the model indicates a high risk of bankruptcy only for the ZMZ value level below zero. Forte SA recorded similar values of the gross profit in the last two analyzed quarters - the highest value of profit can be observed in 3rd quarter 2008, while the lowest in 1st quarter 2008. Forte SA achieved in 1st quarter 2009 quite high revenues from sales, despite the difficult market conditions, (an increase over the same period of previous year by over 14%), which causes an increase in gross profit of the company (compared to 1st quarter 2008 approximately 33,5%). Unfortunately, in the same period, long-term liabilities increased (about 6% compared to 1st quarter 2008) and the short-term liabilities increased (up to 46% compared to 1st quarter 2009).

A similar situation can be observed for Grajewo SA. Despite the positive values of the ZMZ function in analysed period, from 3rd quarter 2008 this values are beginning to reduce and in 1st quarter 2009 achieved level of 0,203. Financial reports analysis allow to admit a significant increase in long-term commitments in relation to the previous quarter (26%), and also in relation to the 1st quarter 2008 (13%) and the negative financial results in the last two quarters are observed.

A difficult situation in the market seems to confirm the analysis of Paged SA management results. As early as 4th quarter 2008 there is a significant fall in the Mączyńska and Zawadzki's values model compared to the previous quarter (of the value of 1,356 in 3rd quarter 2008 to the value of -0,535 in the next quarter). Financial reports analysis allow to admit, that while in 3rd quarter the company noted the positive financial result, in the next quarter it was negative. In this period can be noted almost two-fold increase in current liabilities.

The difficulties of Polish wood industry can be seen in their stock quotes. During entire period of analysis a significant decreases of stock-market listings are observed (see figure 2).

Economic condition of the wood industry is largely affected by changes in exchange rates. Most noteably, exchange rates affect companies, which mainly export their goods.. Table 2 compares the average annual values of exchange rates in the period 2000-2008.

Causes of weakening of the economic results of enterprises can be found in the consolidation of the PLN. Analysis of the data of table 1 allows to determine, that the lowest value of USD/PLN were observed in 2000. In subsequent years the value of the dollar weakened as a result of the United States economic situation deterioration. In the analysed period EUR/PLN rised to (jw). Nevertheless, difficult situation on the EU market and the problems of each economies led to the situation, where price competitive goods from Poland found buyers abroad.

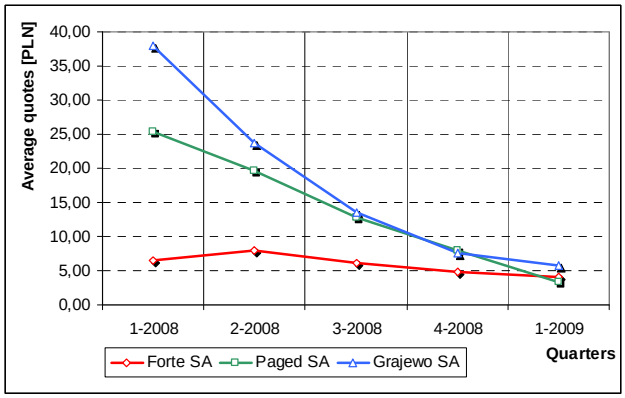

Diagram 2. Average quarterly quotes of Forte SA, Paged SA and Grajewo SA

Table 2. Average annual values of Exchange rates (2000-2008)

Currency	Year								
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
USD/PLN	4,3464	4,0939	4,0795	3,8889	3,6540	3,2348	3,1025	2,7667	2,4092
Dynamics (2000=100)	100	94,19	99,65	95,33	93,96	88,53	95,91	63,65	55,43
EUR/PLN	4,0110	3,6685	3,8557	4,3978	4,5340	4,0254	3,8951	3,7829	3,5166
Dynamics (2000=100)	100	91,46	96,13	109,64	113,04	100,36	97,11	94,31	87,67

Source: author's own calculation based on NBP data (National Bank of Poland)

It seems that a good economic indicator of Polish companies is the electricity consumption. The values of the electricity supply are shown in table 3.

Table 3. Electricity, gas and water supply in Poland (2001-2009)

Year	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**		
	Previous year=100								1995=100	2000=100
Electricity, gas and water supply	111,6	107	104,7	101,9	103,8	106,3	104,0	108,4	264,4	157,9
	January 2009	**February 2009**	**March 2009**	**April 2009**						
	Previous month=100			XII 2008=100	IV 2008=100					
Electricity, gas and water supply	109,8	102,1	99,6	100,3	112	120,1				

Source: author's own calculations based on GUS data (Central Statistical Office)

CONCLUSIONS

As a result of the global crisis and economic problems likely scenario is to decrease energy consumption by companies as a result of costs limiting decisions. In the first months of 2009 a gradual decrease in the electricity consumption is observed, but further observations will answer whether this is a long-term trend or just a reduction in consumption caused by the end of the heating period. However, the difficult situation of enterprises may be confirmed limiting of employment - the lowest rate of unemployment was recorded in September 2008 (8,8%), and in January 2009 it reached a 10,5%.

According to the Council of Europe, in the 1st quarter 2009 Polish companies announced a reduction of employment of about 39 thousand workers, in the 2nd quarter they announced only 11,2 thousand reduction in employment. It seems, that this is a significant decrease in employment reduction, however, Poland is in the forefront of this classification in the European Union (only three countries are worse).

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THE RISK OF FINANCING ENERGY INNOVATIONS IN POLAND - LEGISLATIVE PROPOSAL FOR THE ELIMINATION OF SEVERAL BARRIERS

Abstract: Financing implementation in the modern economy of power engineering based on renewable sources of energy, particularly susceptible to liquidation fluctuations, payment blockage or exchange rate fluctuations, is still classified as high risk in Poland. When the market lacks clear rules of action, with accompanying red tape, legal inconsistency and speculation, many good initiatives become threatened. Noticing the serious barrier in financing innovations, including investments in the scope of energy efficiency, scientific publications should be aimed at restoring equality of entities under the law, and the suggested legislative changes should eliminate the existing pathology.
Key words: energy innovations; financing; speculation; foreign exchange options; Forex; bank enforcement order; legislative proposal.

INTRODUCTION

Real investment capital seems to be one of the main criteria determining the success of innovative projects. Financing implementation in the modern economy of power engineering based on renewable sources of energy, particularly susceptible to liquidation fluctuations, payment blockage or exchange rate fluctuations, is still classified as high risk in Poland. Success is conditioned by an array of key factors: coherent project, clear execution rules (legal, organisational and financial rules), stable source of financing (own or external), professional staff. Unfortunately, even the best project can encounter unpredictable difficulties. When the market lacks clear rules of action, with accompanying red tape, legal inconsistency and speculation, many good initiatives become threatened. Moreover, some regulations originating in the system of centrally controlled economy have survived until today. Various aspects of such barriers, together with the proposal of legislative changes, have been presented in this article.

POTENTIAL SOURCES OF FINANCING: FUNDS AND OPERATIONAL PROGRAMMES

Possessing 100% of own resources for an investment happens rarely in Poland. Therefore, credits and external funds, especially the ones offered by the European Union, are an alternative source of financing. For example, the Infrastructure and Environment Operational Programme has €352.06 million for investments. Measure 9.4 "Generation of energy from renewable sources", whose main aim is to increase production of electrical and thermal energy from renewable sources, has been included within the framework of Priority 9 "Environment-friendly energy infrastructure and energy efficiency" [3]. Potential beneficiaries of the Programme include:

- entrepreneurs,
- territorial self-government units as well as unions and associations thereof,
- entities providing public services under agreements concluded with territorial self-government units, in which a majority of shares are held by the territorial self-government,
- entities selected under a procedure carried out pursuant to the public procurement law, providing public services under agreements concluded with territorial self-government units,
- and finally, churches, church legal persons and associations thereof, as well as other religious communities.

When selecting a potential fund, it is necessary to pay attention to its restrictions concerning:

a) minimum value of the project:
   - the investment projects involving generation of electricity from biomass or biogas, as well as construction or reconstruction of small water power plants - PLN 10 million;
   - remaining investment projects - PLN 20 million.

b) maximum support from EU resources amounting to 20% of costs eligible for support (regional public aid) or of project value (public aid for environment protection);

c) allocation of resources for a given, strictly specified aim, as in the described case:
   - construction of a wind farm,
   - construction of a water power plant up to 10 MW,
   - construction of a power plant using biomass or biogas,
   - construction of a geothermal heating plant,
   - installation of solar collectors;

d) legal consequences connected with public aid.

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The "Order of the Minister of Economy on granting public aid for investments in the scope of construction and extension of units generating electrical energy or heat from renewable energy sources" [7] as well as "Guidelines concerning eligibility of costs within the framework of the Infrastructure and Environment Operational Programme" [11] constitute the legal basis for beneficiary's operations.

Examples of energy efficiency investitive risk on American Council for an Energy-Efficient Economy have been presented in table no. 1.

Table no. 1. Examples of energy efficiency investitive risk on ACEEE.

Investitive activity	Annual percentage rate mean (%)	Risk of investment (%)
government stocks	4,2	5
longs	6,3	11
ordinary shares	10,1	21
small business stock	16,7	32
energy efficiency	**25,2**	**8**

Source: Own elaboration based on ACEEE, 2008

Obviously, financial requirements, most often offset with a promise of a credit, need to be fulfilled too. Unfortunately, financial institutions classify majority of investment projects, including the ones connected with energy efficiency, as venture capital. In practice, such a barrier is critical for a Polish investor. Credit guarantee funds, insurance policy commitments and other guarantee instruments of such kind have so far played a marginal role.

The restriction resulting from the rules of granting funds is one thing. Accounting for the funds that have been granted is another problem. Earlier investment of own resources, which are reimbursed in a contractual amount after project completion, is necessary. Another important detail must not be overlooked; in Poland, subsidies are generally granted in euros, whereas expenses are incurred in Polish zlotys. Therefore, exchange rate fluctuations are of great importance. Such a situation can either bring extraordinary profits or end in a financial catastrophe.

MANAGEMENT "STRATEGY" SPECULATION

When analysing the phenomenon of making profit on price differences, commonly known as "speculation", one may come across radically different opinions of experts. American financier Bernard M. Baruch (1870-1965) described a speculator as a person who was able to observe the future and take correct actions at a proper moment.[5]

However, Baruch, who made a fortune on sugar price speculations, formulated only one aspect of this phenomenon, i.e. the ability of predicting price changes. By analysing price development, speculators play an important role in market economy - they ensure liquidity of assets, which they use to speculate, and at the same time take a risk connected with exchange rate fluctuations [5].

In practice, speculation means not only foreseeing the future, but also its active shaping. The founder of Ford Motor Company, Henry Ford, presented a completely dissimilar approach to speculation from the one proposed by Baruch. [2] He claimed that a speculator did not deal with earning money on delivering goods and providing services, but made profit on prices manipulation; and this is the second aspect of speculation, which consists in sending signals (untrue, that is obvious) concerning supply, demand or price. That is how prices are deformed. From this perspective, speculation is used to create the future.

Taking the above into account, the projects which support financing of renewable energy development in Poland must - in order to be successful - demonstrate innovative "intuition":

- clearly specify strong and weak points;
- predict risk categories and potential sources of profits from project implementation;
- execute the strategy of "small steps" - financing in short stages; then, the exchange rate risk and tendency for speculation are reduced,
- implement each of the stages without delay, thereby increasing project's credibility;
- make use of the "trust no one" rule in relations with the financing institutions and supporting partners; in business practice, only precisely and well secured contracts are a guarantee for minimisation of potential losses.

Majority of projects in the field of energy efficiency will be threatened by a direct risk of foreign exchange speculation until the monetary system in Poland is standardised (i.e. until euro is accepted as official currency).

EXCHANGE RATE SPECULATION THREATS

In the conditions of global economy, currency speculation is conducted on the so-called Over-the-Counter market (OTC). That is how a system of trading bulk amounts of currencies and financial instruments, implemented by financial and credit institutions, is called. As compared to the foreign exchange market (FX, Forex), it is worth paying attention to foreign exchange options (FX Options), which caused a lot of commotion in Poland in the second half of 2008. [9] These instruments were used to speculate on the Forex market. In principle, foreign exchange options were supposed to secure the exchange rate risk of exporters, which - to a certain extent - concerned beneficiaries of European Union structural funds as well.

So far, the scale of Polish enterprises' actual debt towards banks in connection with the so-called option contracts has been unknown. Experts estimate that it totals from PLN 15 to 40 billion. The National Chamber of Commerce claims that the debt may even amount to PLN 200 billion, out of which more than PLN 1 billion concerns companies belonging to the State

Treasury. Companies from the wood and furniture industry have a considerable share in the indebtedness. For example, losses on foreign exchange option contracts recorded by the PAGED SA group were estimated to total PLN 54 million at the end of 2008. Claiming that only enterprises and companies have this problem, and that management boards take full responsibility for such a situation, does not include the following consequences and side effects - increase of unemployment and reduction of territorial self-governments' budgets.

Additionally, we should not forget about the losses resulting from the so-called "toxic foreign exchange options", which have been know for a while now. The most spectacular losses caused by derivatives took place in the period from 1993 to 1998. [9] Examples have been presented in table no. 2.

Table no. 2. Examples of losses on derivatives and currency options in the world.

Enterprise (Organisation)	**Date**	**Foreign Instruments**	**Losses** (million USD)
Orange County, USA	December 1994	reverse repo	1810
Showa Shell Sekiyu, Japan	February 1993	foreign option contracts	1580
Kashima Oil, Japan	April 1994	foreign option contracts	1450
Metallgesellschaft, Germany	January 1994	petroleum futures contracts	1340
Barings, UK	February 1995	foreign stock index futures contracts	1330
Ashariti, Ghana	Oktober, 1999	exotic foreign options	570
Yakult Honsha, Japan	March 1998	foreign stock index futures contracts	523
Codelco, Chile	January 1994	copper futures contracts	200
Procter & Gamble	April 1994	currency swaps	157
NatWest, UK	February 1997	currency swaps and options	127
PAGED SA, Poland	December 2008	foreign exchange options	27

Source: Own elaboration based on ACEEE - American Council for an Energy-Efficient Economy, Washington

BANK ENFORCEMENT ORDER AS A BARRIER FOR INNOVATIVE CONTRACTS

Executive managers of many companies soon realised that entering into currency option contracts with banks was a risky solution. First signals about the Polish problem with options reached the public opinion when banks demanded payments from the companies that had decided on options. No wonder if a bank is entitled to use an absolute legal instrument against its client – a bank enforcement order (BEO).[10] It allows for quick enforcement of amounts due from the debtor's assets. Such enforcement is possible thanks to a clause, present in almost every bank agreement, allowing for execution based on a BEO. Instead of pursuing their rights in a court of law, entrepreneurs often decided on recovery proceedings or insolvency. [8] Taking the procedures of Polish courts into consideration, even if a debtor appeals to a court and wins, their company will probably not survive until a decision is taken.

Being aware of such an important barrier, it is hard to expect Polish enterprises to be innovative and courageous enough to make investments, especially in terms of venture capital. It is commonly known that implementing new technologies, including the ones based on renewable energy sources, can be foredoomed to failure if the projects are deprived of stable financing. In the current situation, large regional projects are able to revive the energy sector by means of innovation and new investments, and at the same bring consumed energy savings.

In order to support innovative projects in this field, including energy investments, it seems justified that the security of contracts signed between entrepreneurs and banks should be increased. The situation is as follows:

- if we compare the status of a bank and an entrepreneur in the present legal status, lack of equality of entities under the law is clearly visible;
- the different position of a bank and of an entrepreneur is largely influenced by the bank's ability to issue the so-called bank enforcement order, which - according to the law in force - leads to immediate execution;
- although a bank enforcement order is a private document, is has a status of an official document resulting from the law;
- according to the provisions of contracts signed in such a way and based on the current legal regulations in force, an entrepreneur, in a separate court trial, is entitled to file for making a bank enforcement order unenforceable, and a proper court can suspend enforcement proceedings for the time of the proceedings; however, in practice, this tool is not efficient.

In the current situation, it seems justified to reintroduce real control over contracts entered into by banks to common courts. Taking a legislative initiative as regards mainly changing articles 96-98 of the Bank law act [1] as well as amending article 95 of the same act with simultaneous repeal of bank documents' privileged status of official documents is necessary.

The path towards improving the present situation should lead to:

- immediate passing of the Bank law act amendment, including introduction of a procedure, which would allow entrepreneurs to appeal to a court without paying registration fees and at the same time suspend existing enforcement proceedings until a legally-binding decision is taken,
- passing a new act, which would give courts control over already issued bank enforcement orders.

Such a change will definitely not deteriorate the situation of banks, which already have many sufficient means of securing their agreements (e.g. mortgage, registered pledge, transfer of ownership, etc.). It is worth remembering that even though there are various scientific publications that show lack of justification for the existence of a bank enforcement order, this regulation is still in force.[8] In the presence of a powerful bank lobby, the proposed legislative initiative would require strong support if we wanted it to be successful.

SUMMARY

The investors intending to carry out their innovative projects in the scope of energy efficiency in Poland should be aware of the existing barriers and risks. Propagating the idea of knowledge management economy, organisational, legislative and administrative actions should all lead to the formation of environment that is friendly towards innovative projects. The selected examples of opportunities and barriers have been presented bearing the above in mind. If passed, the presented proposal for bank law changes allows for impartial assessment and evaluation of agreements by independent courts. The changes do not make any of the parties more privileged (as compared to the privileged position of banks at the moment) or foredoomed to failure (as is in the case of enterprises threatened by immediate enforcement). A bank enforcement order - relic of the communist times - cannot be found in any other civilised country. Being an instrument which allegedly promotes safe credits for entrepreneurs, it was supposed to help and support economic growth. In the meantime, it is only used by the bank sector, which directly contradicts the idea of a market economy.

Noticing the serious barrier in financing innovations, including investments in the scope of energy efficiency, scientific publications should be aimed at restoring equality of entities under the law, and the suggested legislative changes should eliminate the existing pathology. Investing in renewable energy sources in Poland requires stable economic and legal environment, as well as credible and stable sources of financing. Repealing the regulations, which originated in the epoch of a centrally controlled economy aimed mainly at protecting national banks, seems just and necessary today. What is more, it has a chance of becoming a project that will lead to the improvement of energy efficiency in Poland and successful introduction of innovations.

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BEZPEČNOSTNÝ INFORMAČNÝ SYSTÉM ÚRADU ODHAĽOVANIA DAŇOVÝCH TRESTNÝCH ČINOV

Abstract: Nowadays, terms like information, information flow and information system are very frequently used within a mangement. Basic premise for the most effective utilization of information is the neccesity of appropriate information system. Each particular information system is highly specific according to its input and output data. Very topic problem of present time seems to be security and protection of information systems and relevant information in databases. So, it must be question for competent IS/IT employees how to protect important data against leakage, lost or devaluation. Protected and secured information system plays an important role for adequate managerial decision-making process within a company.
Keywords: information, securing information system, analysis of IS/IT protection, planning and development of IS/IT protection.

ÚVOD

Každý, či už jednotlivec alebo spoločnosť sa snaží držať krok s nasadeným tempom rozvoja informačných technológií a požaduje čo najrýchlejší, najjednoduchší prístup k informáciám. Tieto sa následne snaží spracovať, vyhodnocovať a pretransformovať pre svoje potreby, resp. snaží sa ich zúročiť.

V dnešnej dobe sa na každom kroku stretávame s pojmami ako informácia, informačný tok, alebo systém. Tieto sa stále viac a viac stávajú súčasťou nášho každodenného života, či už súkromného alebo profesionálneho. V rebríčku hodnôt podnikateľských subjektov sú informácie vo väčšine prípadov na popredných priečkach. Preto niet divu, že oblasť informačných technológií je najrýchlejšie napredujúcou oblasťou technického sveta.

Základným kameňom pre čo najlepšie narábanie s informáciami je potreba kvalitného informačného systému. Každý takýto systém je svojim spôsobom špecifický, čo závisí hlavne od jeho účelu a charakteru vstupných a výstupných dát s ktorými pracuje.

Stále viac sa do popredia dostáva problematika bezpečnosti takýchto systémov, resp. bezpečnosti dát a informácií, ktoré sa v systéme nachádzajú. Hodnota tých správnych informácií, na tom správnom mieste má „cenu zlata“. A práve preto je veľmi dôležité, ako je systém proti úniku, strate, znehodnoteniu svojich najcennejších dát zabezpečený. Dobre zabezpečený informačný systém je pre svojho užívateľa hlavným pilierom pri tvorbe rozhodnutí, či už v sfére podnikateľskej alebo osobnej. Výstupy, ktoré vychádzajú z nezabezpečeného systému, nemôžu byť nikdy považované za smerodajné, resp. ako podklady pre ďalšie spracovanie.

INFORMAČNÝ SYSTÉM V ŠTÁTNYCH INŠTITÚCIÁCH

Informácie a informačné systémy sú stále významnejšie aj štátne inštitúcie. Medzi najdôležitejšie súčasti štátneho informačného systému vo vyspelých štátoch patria popri špecializovaných armádnych a policajných informačných systémoch i informačné systémy centrálneho registra pobytu obyvateľov, obchodný register fyzických a právnických osôb, trestný register, informačný systém sociálneho zabezpečenia, colný informačný systém a daňový informačný systém. Rozsah previazanosti týchto informačných systémov je obmedzená zákonmi (Zákon o ochrane osobných údajov), ale ich rozumná úroveň prepojenia by bola užitočná i pre občana.

ÚRAD ODHAĽOVANIA DAŇOVÝCH TRESTNÝCH ČINOV (ÚODTČ)

Vznikol na základe Zákona č. 182/2002 Z. z., ktorým sa mení a dopĺňa Zákon č. 150/2001 Z. z. o daňových orgánoch, a ktorým sa mení a dopĺňa Zákon č. 440/2000 Z. z. o správach finančnej kontroly. Ukladá mu hlavne povinnosť odhaľovať trestnú činnosť v súvislosti s porušovaním daňových predpisov a zisťovať ich páchateľov.

Úrad bol zriadený pre územné obvody všetkých daňových úradov a jeho sídlo je v Banskej Bystrici. Vnútorne sa člení na Pracoviská Bratislava, Banská Bystrica a Prešov, kde sa člení na Odbor odhaľovania daňových trestných činov a Odbor informatiky. Táto štruktúra nie je konečná a je predpokladaná jej zmena vyplývajúca z návrhu Novely zákona 511/1992 Zb. o správe daní a poplatkov a o zmenách v sústave územných finančných orgánov, a ktorým sa menia a dopĺňajú niektoré ďalšie zákony.

Úrad má za povinnosť vytvárať, udržiavať a prevádzkovať informačný systém, v ktorom zhromažďuje, spracováva, uchováva a ochraňuje informácie o skutočnostiach a osobách, ktoré spáchali alebo je dôvodné podozrenie, že páchajú trestné činy v súvislosti s porušovaním daňových zákonov a takéto informácie je Úrad oprávnený využívať a vyraďovať. Je ďalej oprávnený a povinný spolupracovať v oblasti odhaľovania trestných činov spáchaných v súvislosti s porušením daňových zákonov v prípade, že tak ustanovuje medzinárodná zmluva alebo osobitný predpis.

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BEZPEČNOSTNÉ PRINCÍPY PRE IS ÚODTČ

Správny a bezpečný chod vnútorných procesov ÚODTČ vo veľkej miere závisí na správnom, bezporuchovom a bezpečnom chode IS. Ochrana IS, ním poskytovaných služieb a spracovávaných dát predstavuje jednu z najvyšších priorít ÚODTČ. Správny a bezpečný chod IS je však podmienený zaistením ochrany spracovávaných a uložených dát, ako aj komponentov tvoriacich IS pred úmyselnými, či neúmyselnými negatívnymi aktivitami a dôsledkami pôsobenia vyššej moci.

Cieľom aktivít smerujúcich k zaisteniu bezpečnosti IS ÚODTČ je vytvorenie a prevádzkovanie systému bezpečnostných opatrení, ktorých úlohou je:

- chrániť údaje spracúvané v IS ÚODTČ tak, aby nedošlo k úniku týchto údajov mimo osoby, ktoré sú oprávnené k nim pristupovať a nedošlo k strate ich úplnosti, aktuálnosti, pravdivosti;
- zaistiť poskytovanie služieb IS ÚODTČ užívateľom v stanovenej kvalite a rozsahu aj pri neštandardných (havarijných) stavoch IS.

Opatrenia na zaistenie informačnej bezpečnosti musia predovšetkým pokrývať:

- časti a moduly IS ÚODTČ, ktoré využívajú resp. budú využívať jednotlivé organizačné zložky ÚODTČ (ústredie aj pracoviská) a dáta nimi spracovávané;
- počítačovú sieť a jej prvky na úrovni LAN/WAN a Internet v kompetencii ÚODTČ.

ZÁKLADNÉ OKRUHY AKTÍV IS ÚODTČ

Aktíva IS ÚODTČ predstavujú entity, dáta a informácie, ktoré majú z hľadiska Úradu hodnotu. Je potrebné ich chrániť, a z tohto dôvodu sú na ne smerované bezpečnostné opatrenia. Základné aktíva IS ÚODTČ sú:

- Budovaný IS a jeho komponenty.
- Pracovné stanice užívateľov a príslušné softvérové vybavenie.
- Údaje spracúvane v IS ÚODTČ.
- Služby IS poskytované zamestnancom ÚODTČ.
- Ľudský faktor – užívatelia a správcovia IS.
- Plnenie legislatívnych a iných úloh ÚODTČ prostredníctvom IS.

DEFINOVANIE JEDNOTLIVÝCH AKTÍV V JEDNOTLIVÝCH OBLASTIACH IS:

Koncepcia bezpečnosti IS

V tejto oblasti boli z hľadiska informačnej bezpečnosti identifikované nasledovné aktíva:

- bezpečnostná politika,
- plán informačnej bezpečnosti,
- koncepcia/stratégia rozvoja IS,
- aplikovateľná legislatíva (zákony a podzákonné normy).

Plánovanie a vývoj IS

V tejto oblasti boli z hľadiska informačnej bezpečnosti identifikované nasledovné aktíva:

- projekty nasadzovania nových aplikácií,
- projekty sprístupňovania nových služieb IS,
- testovacie procedúry,
- proces nasadzovania aplikácií,
- dokumentácia.

Údajová základňa IS

V tejto oblasti boli z hľadiska informačnej bezpečnosti identifikované nasledovné aktíva:

- údaje aplikácií uložené na serveroch IS ÚODTČ,
- údaje aplikácií APV DIS uložené na serveroch daňovej správy SR,
- lokálne uložené údaje aplikácií,
- elektronická korešpondencia,
- konfiguračné údaje,
- údaje o užívateľoch (užívateľské účty, mená užívateľov, ďalšie ich identifikačné údaje),
- autentifikačné údaje užívateľov (napr. heslá),
- auditové údaje o činnosti užívateľov (napr. dátum a miesto prihlásenia, prístup k údajom, vykonanie aplikačných funkcií).

Technické a programové vybavenie IS

V tejto oblasti boli z hľadiska informačnej bezpečnosti identifikované nasledovné aktíva:

- hardvér serverov,
- hardvér pracovných staníc,
- notebooky,
- operačný systém na serveroch,
- operačný systém na pracovných staniciach,
- služby hardvéru a softvéru poskytované servermi,

– služby hardvéru a softvéru poskytované pracovnými stanicami,
– databázové prostredie,
– aplikácie IS ÚODTČ,
– služby aplikácií IS ÚODTČ,
– médiá používané na uloženie a prenos údajov,
– periférne zariadenia serverov,
– jednotky UPS,
– tlačiarne,
– disketové jednotky,
– CD mechaniky,
– periférne zariadenia pracovných staníc,
– tlačiarne,
– disketové jednotky,
– CD mechaniky.

Počítačové siete a sieťová komunikácia v IS

V tejto oblasti boli z hľadiska informačnej bezpečnosti identifikované nasledovné aktíva:
– aktívne prvky,
– kabeláž LAN,
– komunikačné trasy (WAN),
– komunikačné trasy (Internet),
– využívanie služieb Internetu,
– prostriedky pre mobilný prístup.

Prevádzka a správa IS

V tejto oblasti boli z hľadiska informačnej bezpečnosti identifikované nasledovné aktíva:
– administrátorské procedúry,
– servisné zásahy,
– postupy pre riešenie bezpečnostných incidentov.

Fyzická a režimová ochrana IS

V tejto oblasti boli z hľadiska informačnej bezpečnosti identifikované nasledovné aktíva:
– budovy,
– miestnosti,
– systémy elektronického zabezpečenia – EZS,
– systémy požiarnej signalizácie – EPS,
– mechanické zábranné systémy,
– kľúče a systémy pre riadenie vstupu osôb,
– plechové skrine a trezory,
– skartovacie stroje.

Zálohovanie, archivácia a likvidácia údajov IS

V tejto oblasti boli z hľadiska informačnej bezpečnosti identifikované nasledovné aktíva:
– médiá,
– zálohové,
– inštalačné,
– dokumentácia,
– zálohovacie postupy,
– zálohovacie zariadenia – hardvér a softvér.

Havarijné plány a plánovanie obnovy IS

V tejto oblasti boli z hľadiska informačnej bezpečnosti identifikované nasledovné aktíva:
– havarijné plány
– plány obnovy.

Organizačná a personálna bezpečnosť IS

V tejto oblasti boli z hľadiska informačnej bezpečnosti identifikované nasledovné aktíva:
– bezpečnostný správca,
– užívatelia,
– správcovia a administrátori IS.

Systém vnútornej kontroly IS

V tejto oblasti boli z hľadiska informačnej bezpečnosti identifikované nasledovné aktíva:
– plán kontrolnej činnosti v oblasti IS,

– kontrolné postupy,
– reakcie na kontrolné zistenia.

ZÁKLADNÉ OKRUHY BEZPEČNOSTNÝCH HROZIEB

Pri riadení bezpečnosti aktív IS ÚODTČ sa prihliada predovšetkým na nasledovné hrozby:
– nefunkčnosť LAN siete,
– nefunkčnosť WAN siete,
– zlyhanie alebo nesprávny chod programového vybavenia,
– zlyhanie alebo nesprávny chod hardvérového vybavenia,
– poškodenie, zneužitie alebo únik údajov mimo IS ÚODTČ,
– zlyhanie ľudského faktoru,
– vedomé zneužitie pridelených oprávnení zamestnancami ÚODTČ,
– bezpečnostný incident (prítomnosť vírusu, prienik do siete a pod.),
– unik informácií elektronickým kanálom (počítačovou sieťou, disketou, CD a pod.).

Pri riešení bezpečnosti IS ÚODTČ je potrebné venovať pozornosť predovšetkým osobným údajom, údajom účtovného charakteru, utajovaným skutočnostiam a údajom súvisiacim s činnosťami a úlohami ÚODTČ.

RIZIKÁ OHROZUJÚCE IS ÚODTČ

ÚODTČ si je vedomý rizík, ktoré v súčasnej dobe môžu ohrozovať budovaný IS ÚODTČ a majú zásadný vplyv na zabezpečenie dôvernosti, integrity, dostupnosti a auditovateľnosti informácií a kontinuálnej činnosti všetkých systémov, pomocou ktorých sú tieto informácie spracovávané, prenášané a uchovávané. Za hlavné potencionálne hrozby pre svoj IS ÚODTČ považuje:
– zneužitie IS zamestnancami ÚODTČ,
– stratu alebo nedostupnosť prvkov IS (údajov, technických a programových prostriedkov ako aj osôb zabezpečujúcich vývoj a prevádzku IS), ktoré sú dôležité z hľadiska zaistenia kontinuálnej činnosti a plnenia úloh ÚODTČ,
– prieniky do IS zo strany vonkajších subjektov s cieľom modifikovať údaje, zvlášť s ohľadom na presun aktivít organizovaného zločinu do oblasti počítačovej kriminality,
– únik informácií, ktoré vznikajú pri plnení úloh ÚODTČ, neoprávnené manipulácie s týmito informáciami, alebo ich zneužitie,
– neúplnosť alebo nevhodnosť procedúr, ktoré stanovujú postupy pre prípad havarijných a núdzových situácií a ich nedostatočné testovanie,
– neauditovateľnosť a nekontrolovateľnosť integrity informácií a údajov dôležitých pre ÚODTČ,
– neprimerane vysokú závislosť ÚODTČ na externých dodávateľoch technických a programových prostriedkov.

Zvyšovanie informačnej bezpečnosti je na ÚODTČ chápané ako trvalý proces, ktorý priebežne umožní identifikovať a klasifikovať:
– zraniteľné miesta IS ÚODTČ,
– hrozby, potencionálne ohrozujúce IS ÚODTČ,
– riziká, vyplývajúce z týchto hrozieb nielen pre IS ÚODTČ, ale pre ÚODTČ ako celok.

Súčasťou tohto procesu musí byť aj následne prijímanie opatrení na odstránenie rizík alebo ich zníženie na akceptovateľnú úroveň. Do procesu identifikácie zraniteľných miest IS a hrozieb pre bezpečnosť IS sú povinní zapájať sa všetci zamestnanci ÚODTČ.

ZÁKLADNÉ POŽIADAVKY NA RIEŠENIE BEZPEČNOSTI IS ÚODTČ

Postup riešenia bezpečnosti IS ÚODTČ musí zohľadňovať fakt, že na primeranú úroveň zabezpečenia IS nepostačuje zameranie sa na technické bezpečnostné prostriedky, ale treba brať do úvahy aj:
– vhodnosť a adekvátnosť výberu bezpečnostných prostriedkov z hľadiska reálnych bezpečnostných potrieb,
– kvalitu realizovanej ochrany, t.j. či zodpovedá kritériám a prevádzkovým bezpečnostným nárokom,
– bezpečnostné prvky sú využívané predpísaným spôsobom a v predpísanom rozsahu,
– či bezpečnostné prvky vzájomne nekolidujú resp. nesťažujú prácu užívateľom na neakceptovateľnú úroveň.

Riešenie konkrétnych okruhov bezpečnosti IS ÚODTČ musí byť súčasťou všetkých IT projektov na ÚODTČ.

V praxi sa musia uplatňovať nasledovné princípy:
– bezpečnosť IS ÚODTČ je kombináciou technických a programových prostriedkov, postupov a procedúr, legislatívy, administratívnych, kontrolných a personálnych opatrení,
– riešenie bezpečnosti IS je dlhodobý a kontinuálny proces rešpektujúci vývoj a zmeny IS ÚODTČ ako aj organizačné a legislatívne zmeny,
– Investície do bezpečnostných opatrení korešpondujú s rizikami a potenciálnymi škodami v dôsledku vedomých či nevedomých narušení bezpečnostných zásad a dôsledkami vyššej moci,
– špecifikácia prvkov bezpečnosti vo forme konkrétnych opatrení, spôsobu ich nasadenia a využívania musí byť súčasťou každého IT projektu. Pre jednotlivé bezpečnostné opatrenia sa musia uplatňovať zásady,

– musia byť zamerané tak na ochranu pre internými a externými útokmi ako aj pred chybami, omylmi alebo zneužitím legálnych právomocí a prístupových práv,
– musia tvoriť harmonický systém, kde neexistuje triviálne dosiahnuteľná situácia, ktorej dôsledkom je nefunkčnosť celého systému bezpečnostných opatrení,
– Sú koncipované odstupňovane tak, aby chránili jednotlivé aktíva podľa ich hodnoty pre ÚODTČ.

ZÁVER

Každý z nás potrebuje pre svoje rozhodovanie informácie, či už v súkromnom, alebo profesionálnom živote. Informácie a ich bezpečnosť sa stávajú nutnosťou nášho života, s ktorou sa stretávame každý deň. Je len na nás, aké hodnoty informáciám pridelíme, a akú úroveň bezpečnosti budeme pre túto informáciu vyžadovať. Preto pri realizácii rizika je nutné zaoberať sa riadením bezpečnosti informácií a aj celého informačného systému. Cieľom prezentovaného príspevku je poukázať na dôležitosť bezpečnosti IS a informácií, definovanie základných bezpečnostných rizík a hrozieb, a tiež stanoviť požiadavky na riešenie bezpečnosti IS.

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Vojtech Demoč, Patrik Aláč

CONTENT AND METHODS OF PRODUCTION PLANNING

Abstract: Transformation process is the most effective when it runs under optimal costs, under optimal amount of consumed inputs and by spending optimal time. It must be chosen suitable decision making, monitoring and calculating methods which allow to quantify and to compare particular alternatives and to choose the best one . All these above mentioned is very topical just now, in the time of financial and economic crisis.
Keywords: Production, decision making, process of planning, quantitative and qualitative tools

I. PRODUCTION AS A PROCESS

Production can be characterised as a system with inputs and outputs. In the system, there are transformed inputs into outputs by the application of suitable technology, organizational and managerial processes. Feedback represents possible corrections in outputs, technology, managerial decisions and inputs choice. It is a reaction on customers complaints and demand and it must result in appropriate solutions and decisions made (see Figure 1).

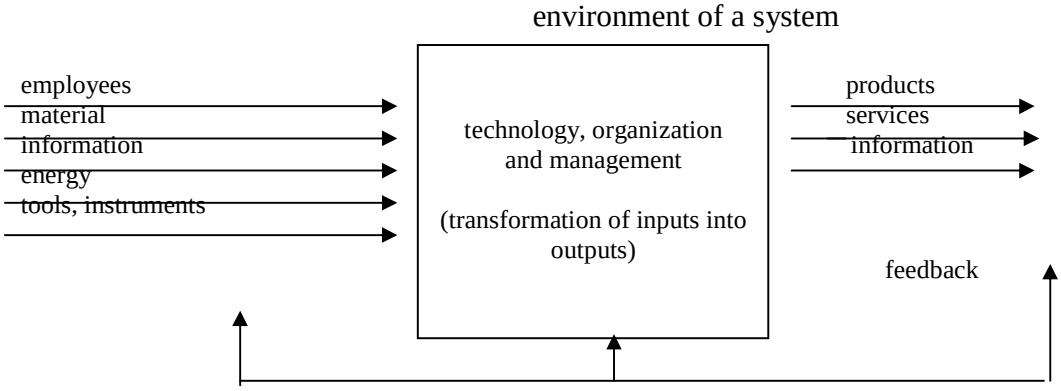

Figure 1. Production as a system

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A goal of production is not whatever product or service but only such one which will be sucessfully realised in the market, which satisfies customer´s demands and which brings adequate (optimal) profit and market share. Transformation process should be the most effective as it runs under optimal costs and under optimal consumption of inputs.

Each component must be precisely specified and characterised in order to choose the most suitable for particular type of production and for determined goals.

What impacts production?

There are several criterions which have decisive impact on each production process.

For the specification of production type it is necessary to evaluate:

- universal character of machinery
- amount of producing products for particular time period
- number of products types
- demands for employees´ qualification
- time of production cycle (process)
- character of labour division etc.

II. PLANNING AS A MANAGERIAL ACTIVITY

Planning can be considered as one of the oldest human activities and mentioned as one of the basic and the most important managerial activity which allows to define company´s goals and activities leading to meet these goals.

According to company´s departments we can speak about: production planning (or planns), personal planning, investment planning, R&D planning, marketing planning, financial planning etc. Figure 2 describes basic functions of management by classics – Taylor and Fayol.

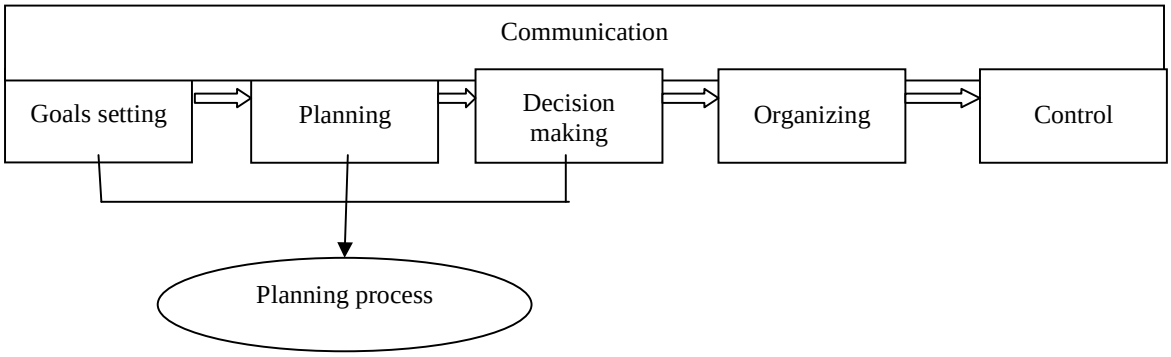

Figure 2. Managerial functions and specification of planning process

The planning includes goals definition and determining appropriate methods to achieve specified goals. The necessity of planning follows from the nature of organizations as goal-seeking subjects.

Some interesting ideas about planning:

- planning is not a description of that what will happen but that what we want to happen,
- those who do not plan never will know where they failed,
- probability of accidental events is higher when planning process is only general and not concrete,but at the same time.when the planning is too detailed and exact, impact of accidental events is less expected,
- planning process should be only such detailed as it is necessary and not as it is possible.

Content of planning process relates not only on departments where the planning is done but also on specified goals which must be met. Each activity, each process should run under optimal costs, it should be finished on demanded time and desired quality must be reached. So, plans should follow some particular managerial objectives:

1. Customer satisfaction: profits and growth depend on meeting customer´s demands. Product must be built according to customers specification, taking into account qualitative standards, it must be delivered to him at promised time and in agreed price.
2. Continual material flow: costs and time of production rise if planned production schedules are interrupted for lack of materials, employees or for any other reason.
3. Optimum inventory levels: the minimum inventory levels to assure continuous material flow may not be the most economic levels. When purchased order quantities increase (demand factors and lead times remaining unchanged), ordering costs are decreased but inventory cost are increased. When ordering costs decrease more than inventory costs increase, optimum inventory level will rise.
4. Increased productivity: working process must be so planned and controlled that production time and costs will be held at or below predetermined limits (levels). Productivity can be increased by shortening production times or by increased volumes of semi-products.

8 STEPS OF PLANNING PROCESS

Generally and very briefly we can say that planning process estimates - what should be done, in what sequence and under which costs. Depth and details of planning depend on concrete planned situation, on its complexity and scale. But each planning process should contain 8 basic steps:

1st step – what is a goal of planning process?; what, why and how should be reached?

- Precisely definied goals and strategy leading to its reaching are two basic steps which determine success of each planning process. If responsible managers or employees do not find relevant and adequate answers on the above mentioned questions (what, why, how?) it is necessary to revaluate assessed goals and strategy.

2nd step – what must be done?

- In this step must be identified and specified (characterized) all activities (for example by brainstorming method). Then these activities must be arranged in logical sequence – e.g. according to technology line or material flow. Last but not least, it must be taken into account relationship among activities.

3rd step – who will perform (realise) given activities?

- This step contains planning and definition of functions, description of job tasks for particular employees. Each activity must be bound with an employee (or technology device) who will be responsible for its performance.

4th step – who and for what will be responsible?

- Each employee should be competent and responsible for his/her performance. These competences and responsibilities can be transparently presented in so called matrix of responsibility.

5th step – when will particular activities be realized?

- In this phase of planning process all activities should be arranged according to logic sequence and relationships. It is also assigned time required for its performance and then it is elaborated time plan.

6th step – which costs and resources are demanded?

- For each activity it should be planned appropriate costs and resources. Amounts of costs and resources can come from past periods, could be forecasted by various analysis or calculation methods. Resources and working time can be estimated and planned from standards of consumed materials and standards of consumed work performance.

7th step – how to control?

- It must be assessed how often and by what method will be activities monitored and controlled. In this phase it is also necessary to specify communication channels (meetings, e-mail) for effective information gathering, transfer and evaluation.

8th step – what will happen if...?

- Planning process should take into account also possible alternatives of consequences arised by accepted decisions. Therefore it is necessary to analyse external and internal environment in order to prevent negative impacts. This final step can be considered as a feedback within the planning process.

III. PRODUCTION PLANNING AND MANAGERIAL TOOLS

It should be recognized that in any individual company, the functions and responsibilities of Production Planning may be divided between various departments or individuals and will not necessarily be organized into a Production Planning division. Centralization of the planning function into a Production Planning division improves and facilitates a co-ordinated and properly executed planning operations.

The functional duties of Production Planning will generally include:

1. Sales forecasting or active participation in sales forecasting
2. The determination of production requirements (specification and quantification of raw materials, other inputs, machinery in order to effectively utilize capacities in a company and to meet sales forecast)
3. Inventory management (both input and output stock optimization)
4. Labour requirements (criterions for the choice of most suitable employees and necessary amount of employees)

Every day, managers must make decisions without knowing precisely what will happen in the future. Decision making requires making forecasts about the future, so managers must often rely on their subjective feelings and best forecasts as they plan. The more accurate these feelings, the better prepared managers will be. Experience tends to improve managers´ judgments and ability to forecast events. Several quantitative methods are available to help managers forecast events. The best managers combine intuition and quantitative tools.

Basic quantitative tools:

- Break - even analysis
- Time series analysis
- Causal modeling (regression analysis)

Qualitative tools of forecasting help generate the information, ideas and judgements that managers need for planning and decision making. Whereas quantitative techniques are focused on selecting the most desirable from a set of options, qualitative tools focus most heavily on identifying options. The following is a list of some qualitative tools:

- Decision trees
- Brainstorming

- Delphi technique
- Nominal group technique

CONCLUSIONS

Production planning has a great impact on the company´s flexibility to meet the market demands. And it is not only planning and forecasting of final products but also to deal with production capacities and technology assemblies. All production factors must be spent in the supply chain under optimal costs and time and this is the task of planning. It is dynamic process which must highly take into account economic cycles.

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Josef Drábek, Martina Merková[9]

EVALUATION OF THE REAL BENEFITS IN SUPPORT OF INVESTMENT PROJECTS IN SMALL AND MIDDLE ENTERPRISES OF EU FUNDS

Abstract: Each enterprise for optimalisation of the financial resources for financing the investment seeks such resources, which are primarily available as well as having the lowest costs - the cost of capital. One of the sources of financing the investment are non-refundable financial contributions (NRFC), obtained from sources in the EU under the corresponding operational program. What is their contribution is the content of our work.

Key words: investment, return on resources, evaluation of investments, resources from EU funds for financing investment

INTRODUCTION

The successful economic development of Slovakia, the development of small and middle enterprises (SMEs) has considerable importance because it significantly contributes to the gross domestic product (GDP). Similarly, the SME sector is also important for job creation, as well as balanced regional development. Small and middle enterprises is also sensitive to changes in the market place, and therefore the government should systematically improve the business environment.

The events of 2008, particularly the impact of global financial and economic crisis has shown once again to a greater mobilization of the benefits of SMEs for the development of regions, country. For effective as well as long term development of the business entity is necessary investment activity, which in whole fulfill the objectives of investment, while respecting the effects of direct and indirect business.

Each company (whether small, medium, large company) before making any investment would **develop an investment project**, which will help evaluate the success of this activity. The investment project is not currently designed for the enterprise, for its successful management, but also for presentation to various investors. Each investor demands that the project was developed under the methodology, it shows that the investment project completes the contents of the challenge, ei efficiency and targeting of spent resources. Of course, the methodology has to demonstrate the controllability of the project, its transparency, within the term of its sustainability, respectively.

Each accepted project, the analysis shows their return, the enterprise moves forward, it makes it stronger and more competitive.

For the positive development of each economy, it is necessary to support an industrial production, which increases the finalization of products, thereby increasing the added value as an important indicator of its performance.

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For the development of SMEs particularly in the wood industry (WI) as well as the furniture industry (FI) is required to use EU funds. However, these sources of business can not be considered as dominant. These non-refundable financial contributions (NRFC), however, have to increase the attractiveness of investment and thus support the priorities, which are supported by corresponding challenge in operational program. What are the real benefits of EU funds support, we present in concrete project in the field of building carpentry in our work.

1. POSSIBILITIES IN EVALUATION OF THE EFFICIENCY OF INVESTMENT FROM EU

As is well known not only in theory but also its application in practice for valuation of investment are used the various methods, indicators, criteria (Drabek, Polách 2008). Of the presented indicators always see some assessment objective, which should then be translated into measurable benefits. Most projects are now valuated not only at the level of enterprises, banking institutions as well as projects financed from EU funds use for evaluation of investment effectiveness the dynamic methods - especially the method of net present value (NPV) and Internal rate of return method (IRR). Mentioned used methods basically show the effectiveness, viability of the project, ie return on capital. To evaluate the effectiveness of investment by the EU funds are important some measurable criteria, indicators, which have clearly declared the usefulness of embedded resources, for example, labor productivity growth, saving material, energy costs, projecting growth in the added value of the company.

If we can evaluate the effectiveness of projects using EU funds, it is necessary that the processor (investor) to correctly valuate total actually incurred expenses for the acquisition of resources and not just disposable money, but also the money used in a period of implementation, as well as the time of the monitoring period. For that, quite often that not every processor (enterprise) can correctly valuate the total actual expenses for the preparation – implementation – monitoring, and thus their comparison with the actual amount of eligible expenses, amount of NRFC, respectively. The amount of NRFC is always clearly declared by particular challenge of operational program.

It therefore follows that to evaluate the project by indicators NET CASH FLOW is not a problem, also requires each investor. However, obtained NRFC is necessary to cleanse from the other expenses that are related with this form of financing. It is therefore the identification of the following expenses:

A. The expenses incurred for the "Preparation of the project“

- The expenses of preparing the project (except for eligible expenditures, eg. for the project documentation, expenses for preparing the application and project description
- Travel expenses related for example with the purchase of technology,
- Expenses for stamp mark, check solemn declaration, form,
- The expenses for the preparation of the loan - refinancing the project, including interest on funds provided by
- Additional expenses for labor and services associated with the signing of the project - legal, economic charges

B. The expenses incurred for the "Implementation of the project“

- The amount of interest on the bridging loan (for the period of reimbursement of NRFC)
- Staff costs for the project management in the realisation period if they are not eligible
- Costs of publicity and monitoring of project
- Premiums, fees associated with insurance of acquired assets from sources of the EU
- Fees for the verification of documents relating to the reimbursement of individual claims for payment
- Travel expenses - consulting with the managing authority, with realising subject etc.

C. The expenses incurred for the "Monitoring of the project“

- Fees for the creation of evaluation reports on the fulfillment of the project indicators (5 years)
- Other fees associated with the project, for example fees for expert reports for the provider of resources
- Travel expenses - consultation with the managing authority

As follows from the above, certain expenses, the fees can be accurately quantified in advance, but the real costs we can determine after completion of whole implementation and utilization process of the project. Therefore, on the basis of that we quantify on a concrete project the estimated costs and their impact on the overall efficiency of investment, we attempt to assess the costs and holding their share of total NRFC, respectively. In the analysis, the calculations should show clearly the advantage – disadvantage of using the resources from the EU for promoting enterprise activities in the particular branch, in the present market environment.

2. EVALUATION OF THE GLOBAL EFFECTIVENESS OF INVESTMENT PROJECT

2.1. Basic description of the investment project

The investment project is realised by the company which is engaged in the production of building joinery products – stairs and railings, related accessories, respectively. This is a project to modernize the technology of the process – the purchase of 5-axis CNC machine + application software for the construction and management of the production of wooden stairs in the total value of € 609 827.00, with the possibility of obtaining non-reimbursable financial contribution NRFC of € 200 000.00. That technology allows the production of technically demanding construction and wooden stairs under the specific requirements of customers (not just wood, but a combination wood-metal, wood-glass, ...). The project aim is to increase productivity, increase revenues, the number of newly created jobs – assembly workers, as well as increase the value added. On the basis of existing marketing strategies, production capacity, the projected revenues and costs were quantified basic economic parameters of the investment project.

2.2. Basic economic parameters of the investment project

Capital expenses: 609 827 €

Expected returns:

Their quantification performed on the basis of actual revenues and expenses in the impact of the realized investment project in period of 6 years, cash flow as follows:

CF1 ..... 191 794 €
CF2 ..... 264 555 €
CF3 ..... 302 662 €
CF4 ..... 361 216 €
CF5 ..... 340 171 €
CF6 ..... 344 221 €

Capital cost discount rate: 10%

The lifetime of the project: T= 6 years

2.3. Evaluation of project effectiveness by indicators NET CASH FLOW

As the above Table 1, considered project of modernization of manufacturing process technology in the company is in accordance with the required criteria in valuation of the investment effectiveness, as well as fully meeting the objectives of the challenge. The project is viable and hence enables the realization of the objectives in the company.

Table 1. Evaluation of the project effectiveness by indicators NET CASH FLOW

No.	Indicator	Required value	Value in the project	Note
1.	Net present value – NPV	NPV>0	469 196 €	Invest
2.	Profitability index – PI	PI>1	1,58	Invest
3.	Internal rate of return – IRR	IRR>r; r = 10%	33,71%	Invest
4.	Discounted payback period – DPP	DPP<T; T = 6 years	3 years a 9 months	Invest

2.4. The required amount of non-refundable financial contribution NRFC

As is apparent from the challenges of the operational program "Competitiveness and Economic Growth", the company in accordance with the challenge requests a maximum of NRFC and the amount of 200 000 €, ie aid intensity of 39.027% (the maximum for the corresponding region is 40%).

2.5. Quantification of expenses on the project

Under the proposal presented in section 1 we can quantify the expenses associated with the preparation, implementation, monitoring framework as follows:

A. Preparation of the project
Expenses of processing of the project ..... 5 975 €
(% of the price fixed NRFC, the requirements of companies 0-5% of NRFC)
Travel expenses ..... 830 €
Expenditure for the stamp marks ..... 100 €
The loan and its total cost ..... 14 937 €
(loan amount 200 000 €; i = 7%, 1 year loan period; + fees for the loan agreement, statement, account)
Other unexpected expenses ..... 332 €

A. Total of ..... 22 174 €

B. Implementation of the project
Personnel expenses for project management ..... 3 319 €
Publicity, monitoring the project ..... 1 992 €
Premiums, fees for the fixed assets ..... 8 298 €
Fees for the verification of documents ..... 166 €
Travel expenses ..... 498 €

B. Total of ..... 14 273 €

C. Monitoring of the project
Fees for processing of the monitoring reports ..... 830 €
Other charges ..... 664 €
Travel expenses ..... 332 €

C. Total of ..... 1 826 €

Total predicted expenses (A+B+C) ..... 38 273 €

2.6. Evaluation of the real benefits of the project for the company

(+) Amount of the expected contribution	200 000 €
(–) 3% of ineligible expenses (settlement)	6 000 €
(–) Costs incurred with the preparation - implementation - using of the project	38 273 €
= Total benefit to the enterprise	155 727 €

As seen from the presented budgets the company must pay a total of approximately 38 273 € extra cost to obtain the NRFC, which practically represents a reduction of contribution of 19.13%. It is clear that is a considerable amount of money, which increase / decrease depends on several factors including:

–fees for processing project,

–the fees for the loan,

–other charges.

If the company fully respects the approved budget, not the cuts approved by the contribution due to the settlement, so the amount actually awarded is below the approximately 19.13%, which is not negligible value, which could certainly venture to invest efficiently. From the calculations shows subsequent conclusion:

Obtained resources for the modernization of manufacturing process technology from the EU Structural Funds under the Operational Program "Competitiveness and Economic Growth“ are beneficial for the company. Posts budgets - NET CASH FLOW project analysis as well as other global budgets document viability of the project, cost-effectiveness of resources - achieving the objectives of the investment.

CONCLUSIONS AND SPECIFIC RECOMMENDATIONS

On the basis of the investment project under the Operational Program "Competitiveness and economic growth" we can formulate some conclusions, recommendations:

1. For the development of SMEs in the wood industry is necessary to use all available resources, which enable the overall development of the enterprise.
2. Even if is the minimum and the maximum amount of NRFC from the perspective of the firm, complexity of processing is necessary to exploit the maximum amount for the NFP.
3. As documented by the budgets of financial-economic analysis of the project, given amount of NRFC increases the effectiveness of the project as a whole, as illustrated by the analysis of indicators NET CASH FLOW
4. The project, namely preparation - implementation - monitoring requires from the processors to have quality information, as well as qualifications in the field of EU projects, use a specialized consulting firm respectively.
5. Posts budgets confirmed the fact that EU funds have also cost of capital, ie acquisition is not free. The real amount of the fee depends on the analyzed actual expenses, this amount a company can first quantify as framework, and after the realization of the project can quantify the actual amount of fees.
6. One of the serious problems which still hampered by a larger number of companies that can apply for the NRFC is a lengthy process of obtaining the NRFC (since the date of the challenge, until after the final audit will expire more than 1 year, which may cause problems in the company: marketing, economic, financial, and others.)
7. A significant number of companies discourages low success in obtaining the NRFC, and not just because of the decommissioning project of formal shortcomings, the errors in the procurement process, breaches of the limits - the structure of the project budget, but also from the errors on the part of the agency (misunderstanding technologies and reduce the eligibility of expenses). Reducing NRFC then has a negative effect on the loan burden on business.
8. As is apparent not only from the application, but also a description of the project within a particular challenge, it is necessary to complete the investment project in accordance with the methodology presented in the professional literature and to present the project in a banking institution in obtaining loan resources. Naturally, from this processed project is no problem to handle the request and a description of the project in accordance with the instructions for particular operating program.
9. It should be noted also on the quality of both the application and description of the project as well as a wide range of attachments, which are a prerequisite for assessing of eligibility for obtaining the NRFC. Their failure in this form is considered as incomplete project, lack of formality, which can reject the very promising, viable project.
10. For the enterprise management is also important the fact that the company may extend the project for themselves, supplemented by other indicators, the criteria not only for the implementation process, so by the particular approach to fulfill the objectives of enterprise investment, overall.

CONCLUSION

Development of each enterprise is not possible without investment. Of course, such investment, as in both the short and long-term period fulfils the particular economic objectives of the enterprise.

For the development of SMEs in the wood industry in relation to its comparative advantage implies the fact that it is advantageous in full accordance with the challenge to use EU funds to improve the efficiency of the business as a whole. From the presented results show that the funds – the acquisition is not easy, but it is economically viable. Declared budgets confirmed the fact that EU funds also have a price (the price of capital, capital cost), which companies must respect. Although the process

of acquiring resources is also time consuming, reducing the need for own resources, reduce the loan burden on the enterprise level, respectively.

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***Eva Drličková, Vladislav Kaputa*[10]**

CONSUMERS' ATTITUDES TOWARDS ECO-PRODUCTS

Abstract: The paper presents selected results of research which has been realized in the year 2009 in selected regions of the central Slovakia. Sample size was 300 respondents which were surveyed by questionnaires. The aim of the research was to evaluate consumers' attitudes towards eco-products using the semantic differential method. According to the results, respondents have positive attitudes towards eco-products and such products are the most often occurred within the products of the food industry and agriculture.

Key words: eco-product, research, semantic differential, questioning

INTRODUCTION

Environmental conscious behaviour of companies needs environmental conscious consumers. This phrase could be a label of recent decades when environmental marketing proved in environmental certification and labelling of products has received worldwide attention. Companies which can prove that they are environmentally responsible by being certified will benefit by differentiating their products and increasing their products and increasing their share in the marketplace (Kaputa, 2008). The differentiating is more often realize by labelling the product with the label or text/declaration which inform consumers about "a level of greenness". Such a product is usually called as the eco-product.

OBJECTIVE AND METHODOLOGY OF THE RESEARCH

Consumer's behaviour change permanently. Reasons could be in the needs, requirements values and attitudes of consumers. Research objective is to evaluate consumers' attitudes towards eco-products. Following methodology was set up to reach the objective of the research:

a) time schedule: The research realized in months from January until May 2009.
b) questionnaire construction and questioning: Questioning was chosen as the main method for data capturing. Respondents were asked to answer personally or via e-mail. The structure of questionnaire was as follows: accost of respondents, instruction to fulfil the questionnaire, demographic data of respondent (age, education, income and sex), evaluation of eco-products by semantic differential, consumers' knowledge of eco-products within specific product's categories. The methods of semantic differential were chosen intentionally since the respondents could answer through verbal as well as numeric expression. Semantic differential contains 13 pairs of opposite adjectives (designed by researchers) which are expressed by the 10-points scale. Terminology has been explained to the respondents.
c) target group of the research: The target group are respondents resident in the central Slovakia. Three-hundred respondents in three districts of central Slovakia region were randomly surveyed (one hundred in each district).
d) methods of evaluation: Data were processed using frequency analysis (absolute and relative frequencies) as well as using arithmetic averages. First, whole data file was analysed and further answers divided into subgroups. Subgroups were created on base of demographic factors as: sex, achieved education, age and district of respondents.

SELECTED RESULTS OF THE RESEARCH

Comparative analysis of the data from three surveyed districts was done. Arithmetic mean of the answers on question "Did you ever meet with label eco-product within following product's categories?" shows Graph 1.

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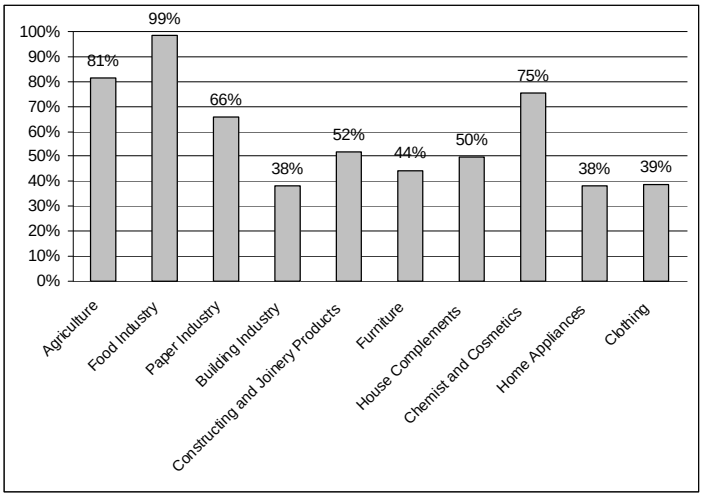
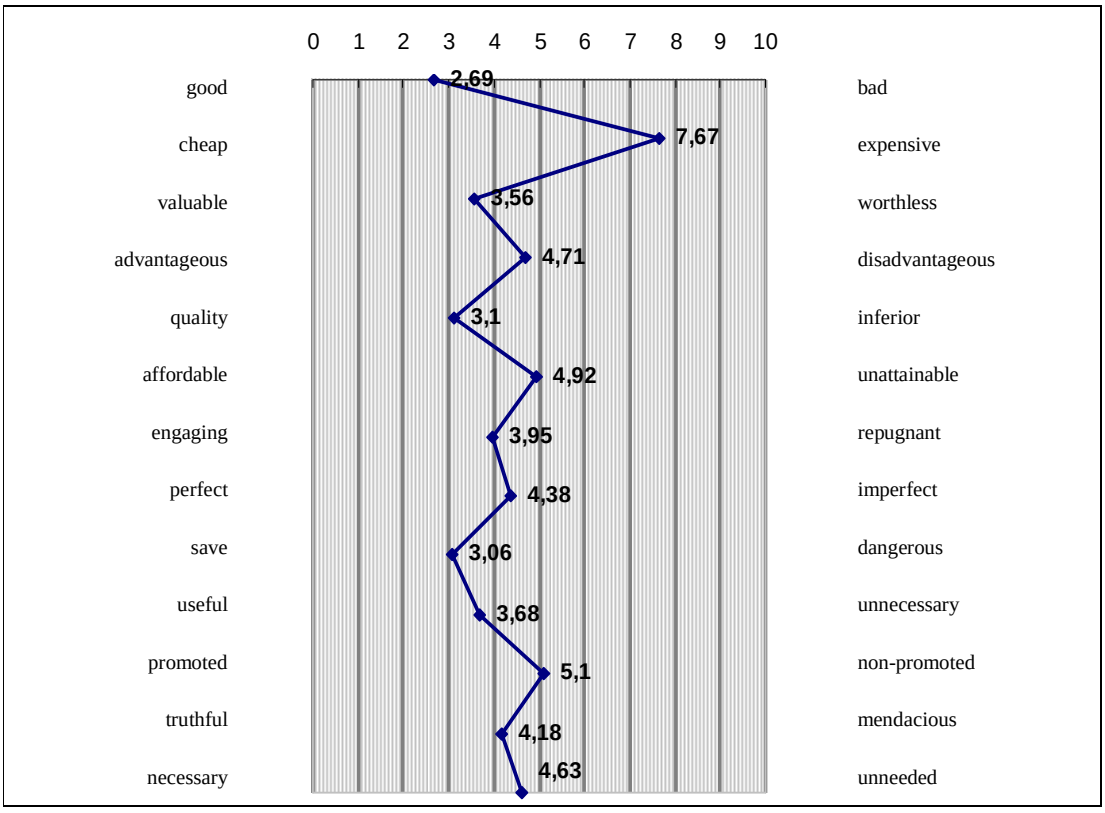


Graph 1. The percentage of consumers who already met with eco-product within product's categories

According to the answers are eco-products more often occurred within products of food industry – 99 % of the respondents already met such a labelled product. Further, eco-products are known within the agriculture (81 % of the respondents met already) products following by the chemist and cosmetics products (75 % of the respondents met already) as well as paper products (66 % of the respondents met already). Since those products are daily or very often used usually, the high percentages are logical. The lowest percentages (around 38 %) of the respondents have met eco-products within clothing, home appliance and building industry.

The results of consumers' attitudes analysis using semantic differential shows Graph 2.



Graph 2. Attitudes towards eco-products expressed by semantic differential

Respondents' attitudes towards eco-products are interpreted mostly by positive adjectives as they consider them for good, save, quality, valuable and useful. The worst evaluated attribute of eco-products is their price, since consumers perceive them as expensive. It is probably connected with the fact that almost 50 % of respondents consider them for unattainable. Weakness of the eco-products seems to be promotion, because only 50 % of respondents marked them as promoted.

CONCLUSION

Consumers usually met eco-products within products which are daily or very often used. The label "eco" or "the green declaration" has more often products which have direct impact (or the production process has direct impact) on the health of consumers or to the environment (in this case companies strive to present their responsible – environmentally conscious – behaviour towards environment). Respondents of our sample consider eco-products rather for good products although their price is perceived negatively by most of respondents (eco-products mostly marked as expensive). It is probably the most restrictive criterion to achieve higher market share.

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***Roman Dudík*[11]**

PREREQUISITES PERTAINING TO THE DEVELOPMENT OF FOREST MANAGEMENT AND WOOD-WORKING INDUSTRY IN THE CZECH REPUBLIC

Abstract: The economic crisis of the advanced world economies is further reflected in all national economic sectors of each country. Economic development that will affect the forestry and woodworking complex is formulated according to a development analysis of selected world indices and indicators. The analysis is chiefly concerned with the following indices and indicators: Dow Jones Industrial Average Index, S&P Homebuilders Index, Chicago Mercantile Exchange random length lumber contract prices, and prices of selected assortments of rough timber in the Czech Republic. The paper further touches on selected aspects of the global context of the defined prerequisites for the development of forest management and woodworking industry.

Keywords: forest management, woodworking industry, economic crisis, Chicago Mercantile Exchange

INTRODUCTION

If we talked about a crisis in the wood-working industry chiefly in the sphere of primary timber processing last year, it now follows out from the macroeconomic data that this year the economic distress has spread into other associated spheres, such as constructional joinery or furniture making.

Other industrial sectors fare no better and we are all too often overloaded by "guaranteed" predictions of foremost domestic and foreign experts concerning the future development of the macroeconomic situation in the CR and abroad. This is nothing special since each economy passes through cycles. We are nevertheless still left with the topical question of whether or not the global economy has already reached its bottom; whether the crisis that we are currently experiencing is already ending and several years of economic growth lie ahead of us, or whether we are to experience similar scenario to what our ancestors went through in the 1930s.

To date, we only witness economic forecasts, which claim that the reversal of the current trend shall occur within more or less six months signifying the end of the crisis. The problem rests in the fact that such forecasts have been circulating for around two years now. This is also confirmed by the macroeconomic predictions for the development of the Czech national economy with regard to the creation of the state budget of the CR for the year 2009 the prospects of which changed several times for the worse.

GLOBAL MACROECONOMIC SITUATION

Although it is useful to analyse historic experience to grasp the present situation and to predict the future development, we will not address this topic here since it is already described elsewhere, e.g. Dudík, 2008. Without any doubt, global macroeconomic impacts have left their traces on the Czech economy. This means that the future state of local economies can be judged on the grounds of a correct prediction of the global development. The problematic issue is however the "correct" prediction.

The prediction specified below is thus based on the actual situation: On the publicly available facts and information. With respect to the activities of multinational woodworking enterprises in the Czech Republic, we need to search for connections also in the international context. In this context, the position of the United States as the leader of global economic growth is of

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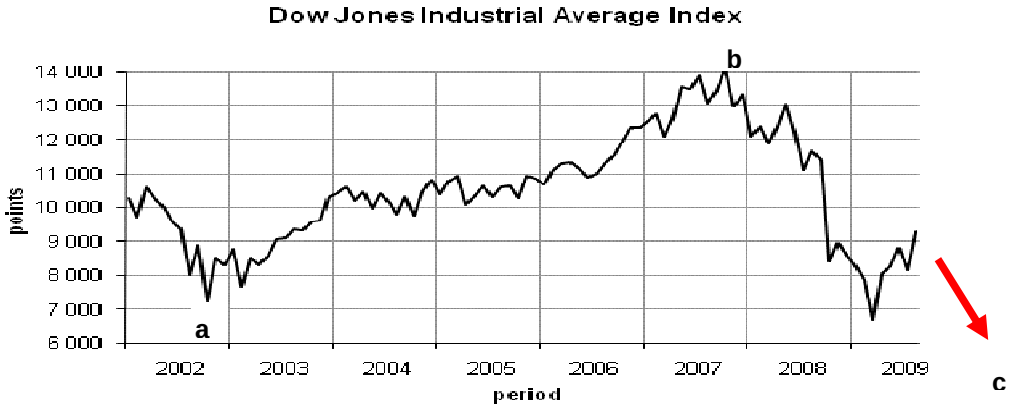
great significance despite the fact that in terms of GDP percentage growth they have been for example surpassed by China. In spite of this, the USA is still considered the indicator of global economic health; a benchmark to which nearly the entire world relates. In essence, between 2003 and mid- 2007, the USA was characterized by strong economic growth, which eventually also corresponds to the growth of money and capital markets. This can be clearly seen in Graph 1 (Finance Google, 2009) showing values of the American stock market Dow Jones Industrial Average Index (DJIAI) from 2003 until the present.



Graph 1. DJIAI performance between 2003 and 2009
Source: Finance.google.com, Hochberg, 2008. Modification: Dudík, 2009

In the graph showing the DJIAI performance, a considerable growth of the stock market index can be noticed starting from March 2009. At first sight, this upturn is of a rather different nature as opposed to the short-term upswings in the course of 2008, which were in fact corrections to the long-term index's downturn in the period between mid-2007 and March of 2009. It also follows out from the graph that since the March bottom, the index has grown by 40 percent. We still need to ask whether the March value was only a local bottom within the framework of a long lasting downturn or if we can soon anticipate a long-term economic growth.

To formulate the future predicted DJIAI performance for at least one year, we use Eliott waves principle, one of the prediction methods for capital markets development. In Graph 1, the types of the individual waves of the highest order in the monitored period are marked (Hochberg, 2008); the marking of the waves is governed by specific principles and it is based on the previous development.

Once knowing the rules for marking the individual waves, we can derive the presumed future index's performance. The truth is that the longer the predicted time period, i.e. in the order of months or years, the more successful the prediction. The same procedure was used for the prediction of future DJIAI performance in August of 2008 (Dudík, 2008) which assumed further downturn of the index at a moment when experts and the media talked about a reversal of the falling trend. The analysis of the previous DJIAI performance together with the current economic information show that the growth of the index from March 2009 is merely a correction to the significant downturn of the index which commenced at the end of 2007. This means that we can expect other remarkable decrease in the index's value corresponding to the worsening global economic situation.

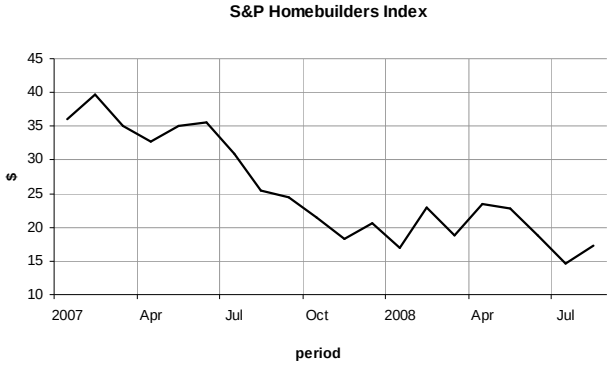
Although the talk is about better performance or at least improvement of performance of the national economies, I am not an optimist in this respect. I attribute the current improvement of macroeconomic indicators performance e.g. in the USA to the massive non-systemic financial aid of the government that mostly financially rehabilitates older problems. No unambiguous government support is in place in the sphere of investments, innovations, and systemic aid to consumption. The so-called “car-scrapping bonus” cannot be conceived of as a systemic measure to increase the population's consumption and to stimulate the economy.

When we talk about a boost to increase the population's consumption as one of the prerequisites to stimulate the economy's recovery, it is necessary to look at information from this field, too. Žabža (2009) states that the amount of debt on credit cards in the United States according to the March 2009 data totals roughly USD 939.6 billion. The Federal Reserve informs that 6.5 % of this debt is minimum 30 days overdue, which is the highest value since 1991 when the FED started monitoring it. In line with the internal rules, the credit companies are obliged to report the debt, which is more than 6 months overdue in their ledgers with the zero value. If the client does not pay by this time, the chances on any other instalment are minimal.

Current data published by MEDIAFAX (2009) state that in the Czech Republic the volume of underpaid consumer loans in the banks will reach the 10.5 % level. This corresponds to CZK 20 billion. If the macroeconomic situation further deteriorates, according to the Moody's rating agency, the delinquent consumer loans may reach the 20 % limit. In Europe, the proportion of underpaid consumer loans shall probably reach 7 %. The heaviest load will be carried by Great Britain, the Europe's largest creditor. The number will rise with more unemployed people. In all, USD 2.5 trillion are loaned in Europe, so the delinquent loans would reach the amount of USD 175 billion. According to MEDIAFAX, the situation is even worse in the United States where the delinquency rate of the household credit totals 14 %.

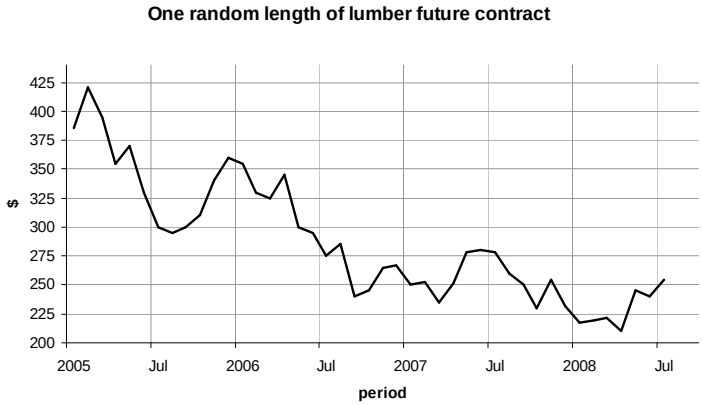
SITUATION IN WOODWORKING INDUSTRY AND ASSOCIATED BRANCHES

The decreasing purchasing power of the population also leads to a shrinking demand for new flats and houses that in turn leads to their lower construction. This is then reflected in the entire segment. Economic situation of the American enterprises listed in the S&P Homebuilders Index (S&PHI) is shown in Graph 2 (Finance Yahoo, 2009). Businesses included in this index belong to the so-called "Housing Segment". The graph clearly demonstrates the falling market value of the companies in the index, which in fact confirms the worsening economic situation of the segment in question.



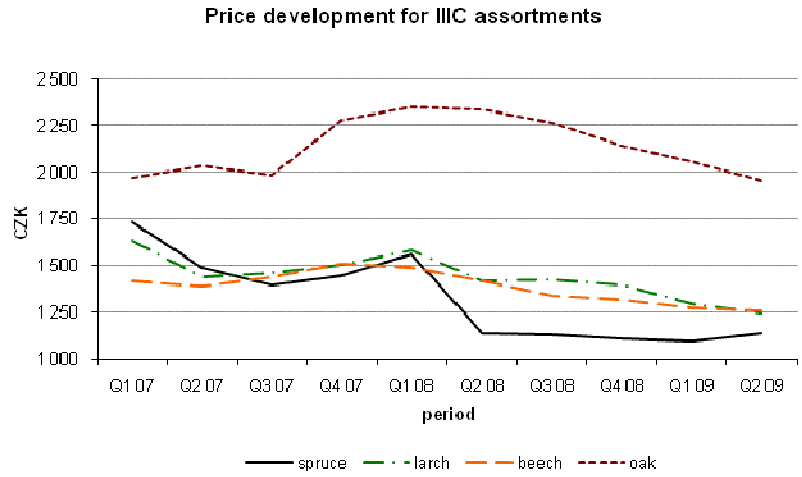
Graph 2. S&P Homebuilders index performance since 2007
Source: Finance.yahoo.com

In the sphere of primary timber processing economy, the development of the sawn timber price can serve as an indicator of the situation. Here we can use the data from the Chicago Mercantile Exchange (hereinafter "CME") where sawn timber contracts are traded the price of which affects sawn timber prices also in other countries' markets. In order to obtain a longer term perspective of the sawn timber price course in CME, Graph 3 shows the price development for one random length lumber futures contract since 2005 (CME, 2009). It needs be stated that trading (similarly to presenting their development) with futures contracts generally entails certain specifics, which shall not be addressed in this paper.

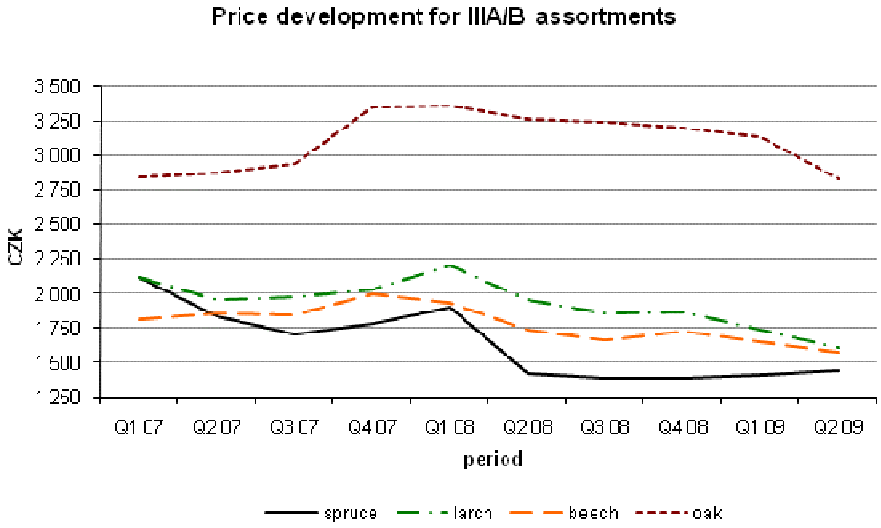


Graph 3: Development of the price of one future sawn timber contract of random duration since 2005
Source: www.cmegroup.com

Neither the S&PHI performance nor sawn timber contract prices prove any clear reversal of long duration downturn trend of both indicators. In the past months, we could rather notice a stagnation of the current situation. A slightly worse situation can be observed in the assortment prices of raw timber in the CR, which is shown in Graphs 4 and 5 for the period of 2007 to mid-2009. It is still characterized by a downward trend of prices of the monitored assortments. Graphs 4 and 5 compare the quarterly level of prices for one cubic metre for the most represented assortments in the IIIA/B and III/C quality classes, respectively, for spruce, larch, beech, and oak woody species. The prices of these assortments are monitored by the Czech Statistical Office (hereinafter "CSO").



Graph 4: IIIA/B assortment price development for selected woody species in the CR since 2007
Source: www.czso.cz



Graph 5: III/C assortment price development for selected woody species in the CR since 2007
Source: www.czso.cz

Prerequisites pertaining to the development of forestry and woodworking industry

Before the possible alternatives of development of the above stated fields will be outlined, we need to be aware of certain facts and relationships:

- It is very likely that neither the Czech Republic nor the important world economies have yet reached the bottom of the economic recession,
- optimistic prognoses talk about the period of minimum two years before it will be unambiguously possible to prove a change in the current negative trend of the global economic development, while majority of the largest economies have already exhausted macroeconomic tools to solve the present crisis,
- these optimistic forecasts do not take into account the bursting of the so-called “bond bubble” which slowly starts to emerge in a number of countries trying to address the current situation by pouring money into their national economies on a massive scale whether these resources are to serve as the rehabilitation of the financial institutions, to fund recovery plans of big businesses (in the upshot, it in fact equals their nationalization), or to initiate growth stimulating programmes; e.g. in the USA the funds run into the order of hundreds of billions of dollars,
- in the context of the Czech Republic, the forestry sector has not been perceived as significant; this will undoubtedly show on the rank of importance of our sector among the fields for which the government will prioritize aid,
- disunion and opinion fragmentation of the sector also due to a relatively large number of professional organizations which often come out against each other are further multiplied by the perception of the sector as marginal and “problematic”,
- if the present sector's contribution to the GDP (and potentially its share in the total number of employees) is considered, no direct financial support to the individual enterprises can be unfortunately expected from the side of the state.

What could then be the functional measures that would alleviate the impacts of economic recession on our sector? A crucial step is undoubtedly support to consumption of the wood raw material and wood products with the focus being on aid that would lead to higher consumption of quality – chiefly sawmill – assortments. Although this activity has been the topic of discussion for some time, its results provide space for further improvement. At the same time, increase in consumption of wood products would be a way out for all entities: i.e. forest estates, forest companies, and woodworking firms. In theory, the simplest way of accomplishing it would be the reduction of the VAT rate of wood products so that the products price would become more interesting for the end customer. One reason for reducing the VAT rate can be the support to bigger exploitation of a renewable raw material. Even though this solution may seem simple at first sight, it can be assumed that the government will be against it since the VAT, as an indirect tax, forms a significant source of income for the state budget. The VAT rate reduction would moreover have to be authorized at the level of competent EU bodies.

Another possible state encroachment to better the present situation could be the depreciation of long-term assets, which equally requires a defence of the question why particularly for forest and woodworking companies.

Yet another solution is for example larger assistance to construction of structures from wood. The assistance should be directed towards the end customers, not the producers. This aid would however most likely be countered by the producers of other construction materials who would feel handicapped.

One of the big issues faced by the entities in the forest and woodworking sector is surely the relation between the Forests of the Czech Republic, state enterprise, and the business entities. The current state indicates other weaknesses in the functioning of the present system of acquiring public contracts from a state enterprise. The situation is further complicated by the fact that companies in the sector of forestry and woodworking industry dispose of no possibility to acquire capital for securing their operational needs, which is the result of a growing unwillingness of commercial banks to grant loans to companies in this sector.

CONCLUSION

Almost everybody would like to know the answer to the question regarding the future economic development. If we take into account the fundamental information on the performance of the principal world economies and combine it with the analysis of the development of selected economic indicators, the conclusion that suggests itself is a further economic downturn. This downturn, or deepening of the crisis, will also negatively reflect in the economic performance of the companies in the forestry and woodworking complex. With respect to the significance of the complex in question, either from the perspective of its share in the gross domestic product or its participation in the number of employees, no big financial or other governmental assistance to these two branches of industry can be expected.

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IMPLEMENTATIONS OF QUALITY MANAGEMENT SYSTEMS INTO SMALL AND MIDDLE SIZE WOODS ENTERPRISES IN SLOVAKIA

Abstract: The article deals about the implementation of Quality management systems into small and middle size enterprises in word-processing industry in Slovak republic and describes the chance, risk and condition of flawless implementation. Simultaneously describes advantages and disadvantages of implementation of quality management systems into small and middle size woods enterprises.
Key words: Small and middle size woods enterprises, quality management system, implementations of quality management system

INTRODUCTION

Small and middle size enterprises, competitiveness, productivity, efficiency are the terms which are dominated in conversation of statesman's, managers and many people in all countries of the world. Small and middle size enterprises have extraordinary intent for national economy. These companies created new jobs in villages, cities and regions, created healthy entrepreneurially atmosphere, increased markets and absorbed labour force which are released from big companies by structurally changes.

Development of small and middle size enterprises are regarded on the main factor of economic development and therefore is in focus of European Union (EU) because they want to be dynamic a competitiveness economy in the world.

1. FUNDAMENTAL CHARACTERISTICS OF SMALL AND MIDDLE SIZE ENTERPRISES

From 1st January 2005 is valid for countries of European Union new definition of small and middle size enterprises. Small and middle size enterprises are in European union countries like a backbone of national economics because they are flexile to market atmosphere, they create new jobs, contribute the healthy competitiveness atmosphere, they have impact on economic improvement and sustain business equilibrium in global work markets.

In European Union exist approximately 18 millions small and middle size enterprises, it is 99,8 % of all companies in EU. Small and middle size enterprises make 55 % of money return of all companies and they make 66 % [5] of aggregate employment. In comparison with big companies small and middle size enterprises employ more woman's like mans, young people. The level of education, training of employees and total stability of small and middle size enterprises is on lower level. Table 1 describes the basic differences of type companies.

Table 1. Basic characteristic of companies according to statute 364/2004

Size of company	Number of employees	Money return in mil. EUR
Micro companies	10	2
Small companies	50	10
Middle size companies	250	50
Big companies	more than 250	-
Corporation	more than 10 000	-

Strong points of small companies:

- moderate negative subsequence of structural changes,
- make like subcontractor of bid companies,
- create conditions for development a implementation new Technologies,
- promptly react to demand of market,
- fill up fringe part of market which are not so attractive for big companies,
- decentralize business activities and can help of development of regions, small villages and cities.

Weak points of small companies:

- small economic power compared with big companies,
- low capital power, limited financing of development activities,
- complicated access to education,
- ignoble competitiveness from big companies, dump prices,
- weak position in competition of public commission,
- big administrative charge. [3]

Quality management systems into small and middle size enterprises is that part of management system which can guaranteed highest customers satisfaction on effectiveness way. This system must fill these functions:

- assign the supply of quality products for external customers,
- create surroundings for continual improvement,
- realize this functions with optimal costs.

For small companies have the implementations of quality management systems some advantages:

- increase company confidences by external customers and other stakeholders,
- increase level of managerial and main processes,

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– decrease errors in company divisions and number of employee complaints,
– clearly defined responsibility in organization functions,
– reduce total costs and losses which are caused by not fill requirements,
– increase competitiveness of company. [4]

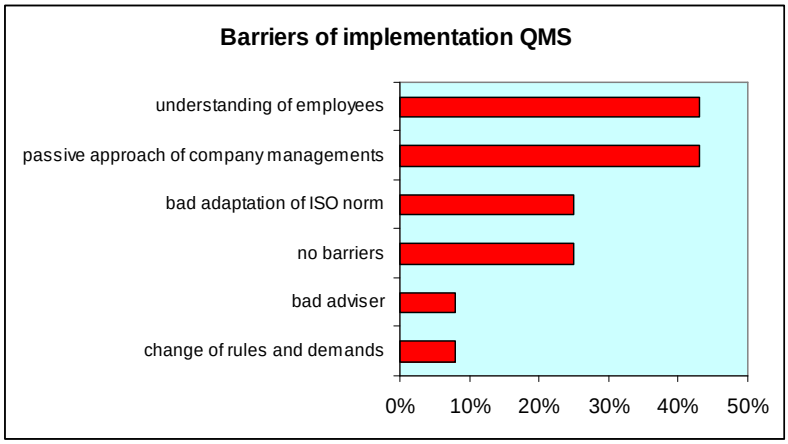
On the other side exist objective and subjective barrier which defended of effectiveness implementation of quality management system into small companies:

– don't exist strategy of development small companies,
– limited financial sources for creating quality management systems,
– exigent understanding meaning of ISO 9000 for employees in small companies,
– insufficient level basic knowledge's, principles of company managements in small companies,
– negative references about the same effort in other companies,
– effort to take a certificate of quality management systems without implementations the basic principles of quality management system. [2]

2. BASIC ATTRIBUTES OF THE IMPLEMENTATION OF QUALITY MANAGEMENT SYSTEMS INTO SMALL AND MIDDLE SIZE WOODS ENTERPRISES IN SLOVAK REPUBLIC

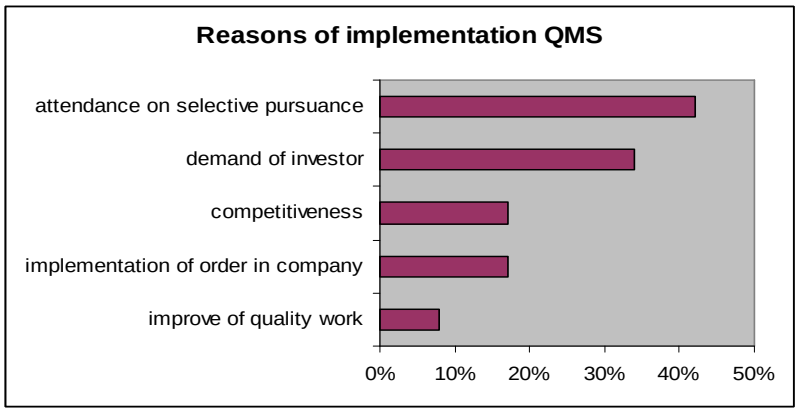
In this part of this article are basic characteristics of implementations quality management systems into small and middle size woods enterprises with characteristics of risk, affairs, advantages and disadvantages of successful implementation.

The first problem is barriers of successful implementation (graph 1).



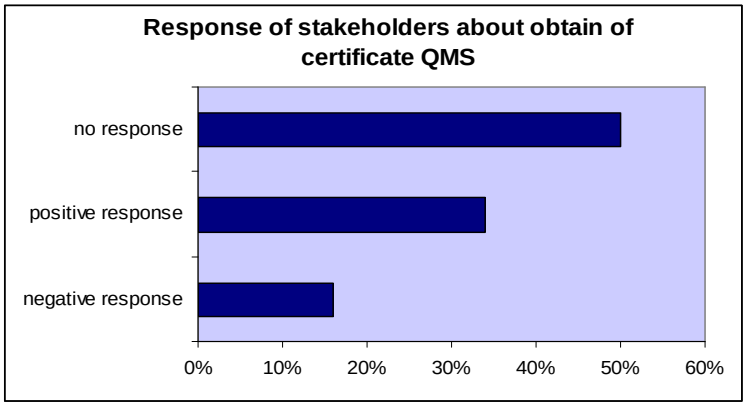
Graph 1. Barriers of implementation QMS into small and middle size enterprises.

The second factor which was monitored was reasons of implementations quality management systems into small and middle size enterprises. The most important reasons describe graph 2.



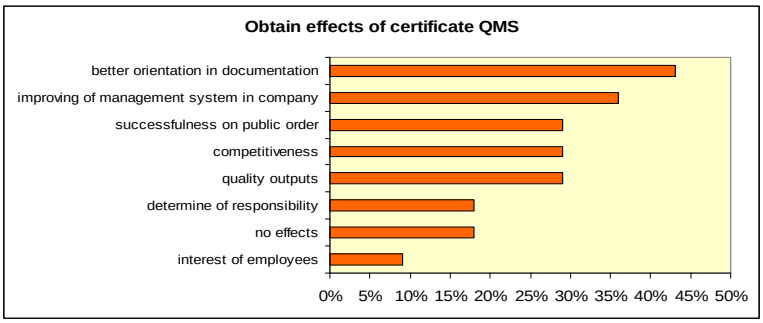
Graph 2. The most important reasons of implementation QMS into small and middle size enterprises.

The next factor which was monitored was response of stakeholders about obtain of certificate QMS of small and middle size enterprises (graph 3).



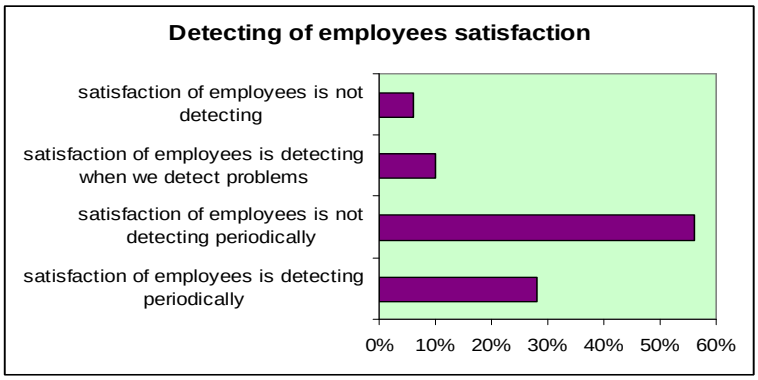
Graph 3. Response of stakeholders about obtain of certificate QMS of small and idle size enterprises

The fourth factor was obtain effects of certificate QMS from side of small and middle size enterprises (graph 4).



Graph 4. Obtain effects of certificate QMS

The last problem which was monitored was detecting of employees satisfaction into small and middle size enterprises. Situation is illustrated on graph 5.



Graph 5. - Detecting of employees satisfaction

CONCLUSION

Small and middle size enterprises are at present exposed of strong competitiveness but they have many new chances too. If they make stronger their productivity they can be on level of successful big company. All piece of knowledge's, proposals, solutions, continual development of employees and other factor can be effectively apply in management of all types of companies but we must find appropriate strategy. About success of any company decided individual ability of company employees. [1]

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EFFECTIVENESS OF COMPLEX PROCESSING OF BEECH WOOD

Summary: The paper presents results of investigations on the effectiveness of the primary and secondary conversion of beech wood into semi-finished products in conditions of the ZPD Kolacz Sawmill which belongs to one of the companies of the KPPD S.A. Holding with the headquarters in Szczecinek. As a result of conducted experiments, quality and dimensional characteristics of lumber converted at the plant were determined. Dimensional groups of representative logs were selected, experimental conversions were performed, suitability of lumber of different quality grades and provenance was evaluated, based on cross stem section, for the production of customized half-finished production. Moreover, efficiency of production was determined for sawn products and customized products.
Key words: effectiveness, beech, sawn timber, semi-finished products

INTRODUCTION

Timber is an extremely valuable natural raw material for humans. Although it is a regenerative raw material, it should be used very reasonably and effectively throughout the production process – from its obtention from the forest to the stage of the final product and then its use and utilization.

In the last years of economy transformation there are many new economic enterprises arose, dealing with sawn wood and various wood products manufacturing. Those enterprises as small and medium firms generally reach in current activity for economic tools (instruments). Near production on the country market, wood products and processed sawn wood are exported, what is the main economic activity direction for many sawmills. Production of sawn wood and simple wood products in 60-80% is connected with costs (value) of used raw material [1, 3, 4]. It is found, that in this range, the basic meaning for appropriate assessment of wood processing has establishment of the optimal parameters of raw material processing, what influences on material effectiveness indicators and economic effects of produced products [2, 3, 4].

According to available data, approx. 3,000 companies deal with sawing in Poland, as many as a half of these being small private companies processing less than 1 thous. m3 annually. As few as 37 (1.2%) companies exceeded the sawing volume of 25,000 m3. The above data points to a large scatter of the timber processing plants in Poland. Recently, however, the concentration and increase of production have been enhanced [5].

This article will deal with the effectiveness of the production of sawn timber and beech wood products resulting from its secondary processing. The article is aimed at an analysis of technological efficiency in the aspect of the most optimum use of timber, which is the main carrier of costs in the sawmilling industry.

TECHNOLOGICAL EFFICIENCY OF BEECHWOOD PROCESSING IN ZPD KOLACZ

The target of work is defining productivity of elementary and secondary breakdown beech wood in Industrial Wood Plant in Kołacz. The company is a part of KPPD S.A. Holding and deals with the complex processing of sawmill timber. Annually approx. 25 thous. m3 of coniferous, mainly beech and oak, logs are sawn.

To reach the best possible relationships between the incomes from the sale of products and the costs of their production, apart from the company's indispensable infrastructure, appropriate machines and equipment and employees' skills, the knowledge of profitability of the production of relevant products is necessary.

The studies of this issue, carried out at the level of various sawmills by the Department of Mechanical Technology of Wood, University of Life in Poznań, demonstrate that of essential importance in this respect is the technological effectiveness of timber processing. The universal macro index of technological efficiency of the sawmill raw material processing into sawn timber and sawmill products (Eps-w) is the index defined as the total of commercial value (the main sawn timber, accompanying sawn timber, and sawmill products) obtained from a given raw material, related to the costs of the purchase of the raw material necessary for their production, described by the following rule:

$$Ep_{s-w} = \frac{\sum V_w^q * C_w^q}{\sum V_s^q * (C_s^q + T_r)}; \quad \text{[zł/zł] * 100 [\%]}$$

where:

$\mathbf{V_w^q}$ – volume of products of a specific class
$\mathbf{C_w^q}$ – market prices of products
$\mathbf{V_s^q}$ – volume of the raw material in classes
$\mathbf{C_s^q}$ – price of raw materials in classes
$\mathbf{T_r}$ – cost of transport of the raw material

The list of the results of the tests of this index, including the material capacity of selected is presented in the figures below.

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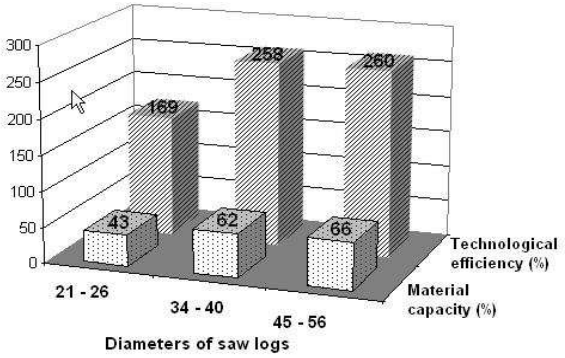

Fig. 1. Indices of investigations of the primary beech timber conversion

Shown effects of total material capacity include the range 43 – 169 %, while efficiency of includes the range 169 – 260 %. Presented results confirm the rule, that the most important material efficiency indicators are obtained by processing of logs with bigger diameters, then by production of saw wood with the biggest size of thickness and wideness [2, 3, 4].

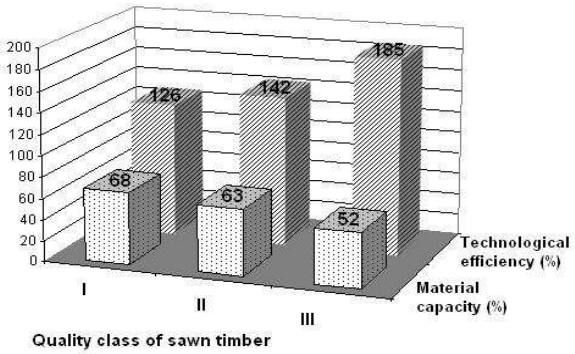

Fig. 2. Indices of investigations of the secondary beech sawn timber conversion

Productivity of secondary breakdown appointed compareing component stock value and batch of lumber value also take in the consideration recived monofacture value and prices of component stock in Industrial Wood Plant.

SUMMING UP

The profitability of timber industry plants depends on many complex factors, such as: technical and technological infrastructure, staff training and skills, innovation, raw materials, location of the plant, financial resources, foreign exchange rates and many other.

Yet, the knowledge of interrelationships within technological efficiency between individual products and their groups allows to take optimum decisions related to the establishment of prices and developmental trends of production. This index is relatively simple and easy to obtain, and once it is known and correctly interpreted, it will allow to react fast to the processes going on in the company within its economic results. Therefore regular studies of this issue are recommended.

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ALTERNATIVE SOURCES OF COMPANY INVESTMENTS FINANCING

Abstract: the article deals with long term bank loans financing of company investments. Processes of acquisition of long term financial sources by bond issue, bank loan, project financing and finance lease are characterized in terms of their advantages and disadvantages, mutual comparison and application in company operation.
Key words: investment, finance sources, bonds, finance bank loans, project financing, leasing

INTRODUCTION

Investment decision has long-time effects and significantly interferes into company process evaluation. It affects conditions of manufacturing, sale possibilities and coheres with many company functional areas. For these reasons it cannot be performed isolate, to not have joint disproportion between company functional parts. As an inevitable condition for decision making and consequently realization of investment project is need of potential projects evaluation. After the process of searching and choosing of suitable investment should follow company financial ability appraisal. Finances need balance, identifying self and foreign resources for financing and possibilities of gaining resources from these resources are also its part.

It is obvious, that realization of investments projects mostly requires big volume of financial resources, which many times exceeds possibilities of own company resources production. For this reason it is needed to assure investment projects financial coverage through the use of foreign resources. For the area of company investments financing are used mainly long-term financial resources as bonds, financial loans and leasing. Lately, project financing is getting into companies awareness. Every mentioned alternative sources has its specifications, advantages and disadvantages, which partly influence the choice of appropriate financial source for specific investment.

1. INVESTMENT FINANCING BY BONDS EMISSION

One of the ways how to gain long-term financial resources to finance company investments is company bonds emission. By emission the company commits that in specified period pays to bond creditor nominal value of the bond and the interest in agreed terms. The emission of company bonds is regulated by state and can be realized as a private or public. When deciding about bonds emission financial managers must take into concern interest rate from the bond, lifetime and way of bond repayment, company credit, bonds guarantee, limiting creditors conditions for company and bonds rate.

The advantages of this financing consist of that, the interest from bonds is tax appreciated cost and on a developed capital market is lower than profits from common shares; by emission the company can gain big financial sums, because bonds on the capital market are placed between more creditors. Also, bonds enable achieve higher flexibility in company capital structure, because some types of bonds can be paid-up prematurely.

On the other hand method of gaining capital with bonds emission is connected with some disadvantages for the emitting company. Disadvantages are: administrational fastidiousness of bonds emission; financial risk growth, which is elicited by increasing the debt part on total capital; fixed interest instalments from bond mainly at company profit drop; high emission costs, which increase capital costs and other limiting conditions proposed by creditors.

From mentioned facts we can see, that only for big companies, with perspective of stability or profit growth, or companies which do not exceed recommended debt equity ratio in their branch of business, it is possible to gain long-term capital by the form of emission. Small and newly formed companies should focus onto other forms of long-term financing.

Bonds are mostly used in USA and their term of expiration is in the range of 20-30 years [5]. In Slovakia, this form of investment is low, same situation is in most countries of EU.

2. INVESTMENT FINANCING BY FINANCIAL LOANS

Most frequent way of company investments financing is through financial loans. They are mainly in the form of term loans, in smaller measure in form of mortgage loans. Those are provided mostly for purchase, build-up, reconstruction and estates maintenance.

When deciding about specific loan source the financial manager has to go from loan price, which is determined by conditions and value categories set in loan contract.

To finance development needs of the company, mainly term loans are designed for. Resources for their repayment should be created from credited objects profits.

As an advantage of this type of financing can be considered ownership of obtained long-term property, possibility to freely dispose with it, of course if it is not encumbered with right of lien in favour of the bank and possibility to add into tax appreciated costs long-term property write-offs as interests from loan.

Concerning the risk of this loan, creditors generally before its grant demand from the company: covering by property guarantee or other subject guarantee; certain share of own company sources on project financing, because creditors usually provide loan only at 50 to70% from needed financial volume; the shortest possible maturity date, where maturity date has to be always shorter than lifetime of loaned project and also detailed analysis of financial and economic company situation, including estimated project profits evaluation. Interest rate is either fix or flowing. The longer is the loan term of expiration, the more is flowing interest rate used.

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Financial loans differ from bonds by that, they have one creditor; are administratively less difficult – they do not need permission and registration from state organs; they are not tradable on capital market and no emission costs are connected with them. Credit interests are usually higher than bond interests because the risk of individual creditor is higher.

Financial loans find wide application in EU countries and in Japan. They are accessible for middle-sized companies.

3. PROJECT INVESTMENT FINANCING

System of project financing is used for financing large, capital-intensive investment projects. It is characteristic by separating financing of the project from other company activities. This fact is gained by founding of project company, where all financial sources for expected project are allocated. Protection of creditors is realized by form of specific guarantees in the phase of build-up (compensational guarantee – guarantee for delay, construction companies guarantees and so on) and it the phase of investment duration (delivery contracts and so on). Instalments of long-term loans are specified in a way that they fit the project possibilities to create financial funds the best to pay the instalments. Other participants of project financing, besides project company, are project sponsors, construction company, operator and bank consortium.

Making of project study is a base for project realization. It is common, that project study is made by sponsor, as project proposer, but also a bank, which decides about its involvement in project financing following project and loan risk examination.

Main advantages of project financing are, that big part of risk is transferred to banks and company debts towards banks are not in the balance sheet. Disadvantages are: time fastidiousness for project preparation, negotiation between partners and higher cost fastidiousness for this investment type.

Basic difference of project financing from classic financing rests in the fact, that bank as a creditor of loan has no or only limited possibilities of sponsor sanctions. It is caused limited or none responsibility of sponsors for loan repayment and also by that, sponsors are not direct loan receiver from the bank, because there is a specially founded project company for that, for whose liabilities sponsors guarantee to a limit or neither. [2]

Project financing is augmented mainly at advanced industrialized economics, regarding investments focused on mineral mining and processing, energetic, water and rail transport.

4. INVESTMENT FINANCING BY FINANTIAL LEASING

To finance renewing and developing investments financial leasing is often used. By financial leasing we understand long-term rent of long-term property with negotiated right of purchase of leased object. That means, that after ending of rent era property rights to leasing subject move from renter (leasing company) to tenant (company) for symbolic surrender value. For using the subject during the leasing relation, the tenant pays to renter predetermined leasing instalments. Regarding the financial leasing, the renter transfers the responsibility to take cake about leasing subject (repairs and maintenance, insurance and so on) to tenant and during the stipulated term no one can repudiate the agreement.

Preferring the financial leasing when financing company investments is conditioned by several advantages [3]:

- Quick way of leasing subject attendance. Leasing companies are more flexible and faster than banks when approving and closing agreement.
- Less administrative fastidiousness. Leasing companies demand less documents from possible tenants as banks.
- Acceptation of higher risk. Leasing companies are less aversive to risk in regard with banks, they often provide leasing to companies, which demands were rejected.
- Use of tax shield. The tenant in line with the law about income tax amortizes the subject of the leasing during the lease duration up to 100% of purchase price founded at renter.
- Better leasing subject insurance. Leasing companies often have better insurance rates than insurance companies.
- As disadvantages of financial leasing we may consider:
- Property is de jure ownership of renter, therefore it is not possible to sale it, or impawn in favour of third parties as a guarantee.
- In case of financial problems or leasing company concurs, leasing tenant can loose rent property.

Leasing as a source of long-term financing began to utilize in the beginning of 50's in USA. Today it is spread in all modern market economics. The reason of leasing favour is the reality, that enables the investor effectively apply newest knowledge into practice and directly connect investment activity with consequential production and sales development. The most common leasing subjects are cars and commercial motor vehicles; trucks; tractors, semi-trailers and trailers; machines, devices and technologic machinery; secretarial and computing technology.

CONCLUSION

The task of top management is to choose appropriate approach to allocation of financial funds. The choice of approach depends from company state, way of its management, organizational development and company culture. Approaches to resources allocation on company level differ and depend from its size. Big company keeps at disposition large financial resources, or can obtain them quickly. Small company has considering its size and financial possibilities essentially taper manoeuvring area.

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FOREST MANAGEMENT PLAN AS AN INTANGIBLE FIXED ASSET AND PRIMARY BASIS FOR DISPOSAL OF ENERGY DENDROMASS

Abstract: Forest management plan (FMP) is an instrument of forest owner that leads to goalseeking forestry. It is the final work of forest forming (layout) and it is usually drawn up for the time of ten years. From the property view forest management plan is intangible fixed asset regarding its character and also value (price).
The paper essentially deals with task and predicative value of FMP in the conditions of forestry and timber industry in the Czech Republic. Forest management plan is conceived as intangible fixed asset and as primary basis for the assessment of dispositions of biomass for energy.
Key words: forestry, forest management plan, intangible fixed asset, timber felling, energy dendromass

INTRODUCTION

Forestry is system (organized) arrangement of basic production factors (where dominant part is forest), production processes and trading activities. It is sector of material (market) and also nonmaterial (nonmarket) production within the frame of national economy and part of so called forestry and timber industry. Besides forest production the forestry includes also next specific activities, e.g. forest economic forming (layout), administration of water flows, building activities (building for realization of forest functions).

Specialities of forestry follow from specific historical evolution. If the wood production was only extractive process in the past then the impending lack of wood compelled more purposeful activities and formation of forestry as independent sector of social production. During the evolution the silvicultural wood production on the bole occupied the primary position. In the connection with ensuring principle of permanency it created also correspondent layout of forests. Accruing importance of forests and forestry within a state and national economy also led to formation of state forest policy. Basic interests of state were embedded into statutory rules; the state forest administration inspects their observance. [3]

Economic forest layout is set of activities. The most important activity is forest economic planning that seeks to do attain permanent and balanced using of forest as renewable nature resource. Forest planning has several levels – the highest is regional forest plan, let us say regional plan of forest development. It is worked up for particular nature forest territories. The next level is forest management plan worked up for forest properties or their whole parts (forest economic complexes). Also so-called forest economic synopses belong to this level. They are worked up for small forest properties (area up to 50 hectares). Economic forest formation has in the Czech Republic great historical background and experiences. Back in 1852 was passed an Austrian forest law – Imperial patent No. 250/1852 of imperial code of law. It was very progressive in that era. Among others it assessed duty to forestry according to economic plans and together with it supervised observance of these plans and supervised total forestry. The matter of interest is fact that this low in principle hold for more than 100 years and it was fully replaced as late as by law No. 166/1960 Sb. about forests and forestry [2].

Forest management plan is non-substitutable instrument for forestry and from the view of value it is important long-term intangible asset. From the view of renewable energy resources it is the primary basis for assessment of dispositions of energy biomass in conditions of forestry and timber industry in the Czech Republic.

METHODOLOGY

In methodological light the forest management plan was primarily analysed from the legislative point. Among others the important determination is setting of obligatory indicators of forest management plan that define disposable quantity of energetically utilisable dendromass. In the next step there the forest management plan was identified as intangible fixed asset, especially from the view of generally true legislation. Financial and value concretization was done in the University forest enterprise "Masarykův les" in Křtiny owned by Mendel University of Agriculture and Forestry in Brno, but especially in state enterprise Forests of the Czech Republic in the period 2004 – 2007. The basic source of data were year-end reports of the Forests of the Czech Republic – above all data contained in enclosures to final accounts according to public notice 500/2002 Sb. Own identification of relevant data of forest management plan represents the third step. Data are needed for determination of disposable volume of energetically utilisable dendromass in forest property.

RESULTS

1. Legislative aspects of forest management plan

Forest management plan legislatively set by the law No. 289/1995 Sb., about forests and about change and completing of some laws (forest law) and by the Public notice of Ministry of agriculture of the Czech Republic No. 84/1996 Sb. about forest management planning. Important legislative determinations are obligatory clauses of forest management plan (vice §

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24 of forest law) – especially maximum total level of felling; for state forests and forests in ownership of municipalities are important also minimum area of tending actions into forest stand younger 40 years. Person who has a licence for this activity in accordance with forest law (§ 41 – 45) must work out forest management plan. The owner pays costs incurred by purchase of forest management plan. Working out of forest management plan is usually public contract (order) because of claim for subsidy.

To legislative aspects of forest management plan belong its approval and permit of changes by local competent organs of state forest administration (§ 27 of forest law) – they are regional authority (office) or municipal office with extended competency.

2 Forest management plan as intangible fixed asset

Today there are about 50 modules of measurement of intangible asset. By Čada is possible to classify into these approaches to qualitative and quantitative. [1]

Qualitative evaluation uses points system based on subjective evaluation by author. It analyzes a quality of asset from many views by the help of:

- points methods of evaluation that is used especially in the cases of trade marks and protection marks,
- information method of evaluation of patents
- econometric methods based on the analysis of share market
- spider graph draws up e.g. relationship with suppliers, management synergy, process quality, ability to learn and focus on the customer into cobweb scheme
- intellectual potential of added value – it defines result of work of knowledge workers according to created added value per worker.

Quantitative evaluation results from basic approaches to setting of value of assets: cost approach, market approach and revenue approach. These basic approaches are intended for recording of adequate economic, physical and comparative characteristic of asset.

Application of cost approach is connected with abstraction of many factors that influence result value. That is why it is recommended only as subsidiary approach to market and revenue approaches. But mostly the result of application of this approach is so small that it overreaches differentiation ability of methods used for prizing of intangible asset. Cost approaches results mainly from historically originated costs or from reproduction price.

Market approach insists on comparison characteristics of intangible assets. For application of this approach are necessary conditions as follows: existence of market that records comparable kind of intellectual capital, sufficient number of transactions realized in the past (in the case of comparable intangible assets), access to information about prices of intangible assets.

This method is practically usable only hardly because of lack of precedents and absence of legal source for significant data and facts.

Revenue approach is in theory recommended as best suited above all to pricing of industrial rights and other know-how (intellectual property). Basic variants are:

- licence analogy that results from presumption that the value of intangible asset corresponds with the price paid on the market for agreement with using the same or similar resolution. This method follows from long-time intangible assets trade and it is preferred to other revenue methods. The using right follows from providing of licence or similar contract. It is paid for this right and it depends on the real production value (or sale value). Licence fee is set by percentage of net sale price.
- increment of revenue – we can apply this method in cases we can prove that the products calculate higher profit in comparison with the competitive product. This method is very difficult to practise and so it is taken only for theoretic method.
- supposed loss of revenue – method shows reciprocal effect of the previous method. It results from presumption of loss of right to use intangible property. This fact would cause the loss of revenue.
- residual revenue method is possible to apply when intangible asset represents the dominant part of property. This method is based on calculation of difference between total revenue and revenue connected with tangible asset. The result amount is possible to allocate to intangible asset.

Complex (mixed) evaluation is used in extreme, unusual situations – usually within the scope of great portfolio of unstructured intellectual capital. It uses model of gradual increases in number of entry conditions that are connected with limiting factors of uncertainty projection (Rule of Tumb, methods Balanced Scorecard, Skandia Navigátor, Monitoring of intangible assets, Value Chain Scorecard etc.).

From the property view forest management plan is intangible fixed asset – according to Czech accounting standards for accounting entities that account according to public notice No. 500/2002 Sb., subsequently amended (Czech accounting standards for enterpriser) – namely Czech accounting standards No. 013 Intangible and tangible fixed asset. In principle it is depreciated asset. There are accounting depreciations – according to technical usable life (10 years), and from the view of income tax there are tax depreciations – 72 months (The law No. 586/1992 Sb., about income taxes, § 32a Depreciations of intangible assets). [2] Purchase price (of drawing up) of forest management plan is about 400 CZK per 1 hectare of forest. For example the purchase price of forest management plan for the University forest enterprise “Masarykův les” in Křtiny costs more than 4 millions CZK. Masarykův les is and the area of woodlands is 10625 hectares.

The next case is state enterprise Forest of the Czech Republic. It paid for creation of forest management plan in 2007 in total 46 369 594 CZK (net of VAT). It is 385 CZK per 1 hectare. Forests of the Czech Republic asked for state subsidy for creation forest management plan in digital form in 2007, the amount was 41 690 250 CZK. Current values of forest management plan as of intangible fixed asset of the Forests of the Czech Republic are almost 200 million CZK in purchase

price and more than 60 million CZK in depreciated prices. The table No. 1 illustrates situation and its development in years of 2004 – 2007.

Table 1 Intangible fixed asset – forest management plans of the Forests of the Czech Republic

Forest management plan (in thousand CZK)	Purchase price	Depreciation	Depreciated price
2004	160 810	116 684	44 126
2005	176 533	127 535	48 998
2006	195 900	135 951	59 949
2007	198 328	137 820	60 508

Source: Forests of the Czech Republic, year-end report

As mentioned above, the Ministry of agriculture of the Czech Republic provides subsidies for creation forest management plan in digital form to forests owners. This program shall motivate forests owners to draw forest management plan in digital form. It should ensure all information on Czech forests will be provided for needs of organs of state forests administration and will be saved into data warehouse of Department of forestry layout in Brandýs nad Labem.

Ministry of agriculture declares this program. Applications for subsidy are given in relevant mailing office that is set depending on location of land, which is subsidy requested for. In the case of common land the application is given in relevant regional office. In the case of lands in national parks and in their zones the application must be given in Ministry of environment. If the lands are important for defence of the state, the application is given in Ministry of defence.

Conditions of awarding of subsidy are:

- validity period of forest management plan is not shorter 10 years
- delivery of forest management plan to approving authority of state forest administration.

The subsidy is given by tariff rate per hectare – it is usually 300 CZK per hectare. Maximum total subsidy is not set.

3 Forest management plan as basis for determination of volume of energy biomass

Forest management plan has three parts: text part, economic book and forests maps.

The text part of forest management plan includes especially general data, it means identification of forest owner, data on author of forest management plan, plan validity, forest map, data on nature conditions, evaluation of forest state and previous operating. It also contains owner's goals, frame directives of forestry and recommendations for forestry. Important part is also highness and reasons of obligatory measures. Final tables of summary data include e.g.:

- basic data in accordance to forest category, age stage and silvicultural rotation,
- stand area according to wood and age stage.

The economic book describes particular forest stands (stand groups) in table form. The description has two parts: the left one provides data on forest state and the right one includes concept of economic measures.

Data on forest state include size of stand groups and forest type, age and crop density; in the case of timber species there are shown their measurational index – e.g. representation, mean height, mean thickness, quality, stand reserve. Concept of measures includes amount and location of principal felling and area of urgent and repeated stand tending actions into forest stand younger 40 years.

Maximum size of principal felling is set according to indicators: felling percentage and normal glade. It relates to commercial forests and special-purposes forests (except forests of first zones of national parks and protected landscape area where maximum felling is set in the plan of forest tending). The value is presented in m3 timber crust less.

Volume of felling mustn't be higher than 10 % above indicator of felling percentage if the forest area is over 50 hectares. In area larger than 500 hectares there the felling mustn't be higher that 20 % above the indicator of normal glade.

Maximum intermediate felling is done as sum of intermediate felling in particular stands. It is possible to increase the intermediate felling about expected share of unregulated felling – it is maximum 20 %.

Minimum area of tending actions into forests stand younger 40 years (cleaning and thinning) is the sum of areas of stand groups younger 40 years where urgent and repeated stand tending actions are planned (by working plan). Urgent actions are tending actions that are important because of increase in forest stands immunity and forming of their species composition.

Approximate estimations of resources of felling residues are most often derived from total amount of timber felling crust less or from the forestland area. By Johansson & Wernius (1974) e.g. follows from the classic allocation of produced dendromass that the top of tree and limbs including bark and tree verdure (it is leaves and needles) represents 15 – 25% of tree volume. Residues quantity of forestry is possible to estimate by the share of felling in this way:

- principal felling conifers – 8 %
- principal felling broadleaved – 12 %
- intermediate felling coniferous and also broadleaved – 20 %
- cleaning - 3 m^3 per 1 hectare.

But it is necessary to concretize the quantity of real potential on the basis of concrete forest management plan and to revise it especially regarding forest categorization, forestry way, orographical conditions, truck-hauling distance and concentration of wood residues. [4] Problem of determination processes of disposable dendromass for energy purposes overreaches scope of this paper.

CONCLUSION

Forest management plan is intangible fixed asset of relatively high values. Primarily it is not substitutable instrument of forest owner that leads to goalseeking forestry. Further the owner faces to relatively high purchase price but on the other side there is an interest of the state as of granter of subsidy from public budget. Not least forest management plan has high value as primary basis for the determination of dispositions of biomass for energy in conditions of timber and forestry industry in the Czech Republic.

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BUSINESS CONTINUITY MANAGEMENT

Abstract: The contribution deals with business continuity .management as managerial approach to an enterprise concerning mainly on risks and their consequences. There are described principles and steps of business continuity management in the paper. The attention is put on business continuity planning.

Key words: risk, crisis, business continuity management, crisis management, risk management

INTRODUCTION

The environment is now becoming increasingly complex, enterprises are becoming more dependent on information technologies, dependence on the chain increases, as well as responsibilities and obligations. Are constantly emerging new types of risk and decreasing tolerance for interruption of service, because many companies reconsider their ability to respond to crises and reduce their risks for the future. Companies want to protect their employees and understand that their ability to secure and satisfy customers is an essential factor to their advantage against competitors.

1 BUSINESS CONTINUITY MANAGEMENT

One task manager for the security company is undertaking systematic training to handle emergency conditions and unforeseen situations. The enterprise must be absolutely prepared such situations, given that even short-term discontinuity in business activity may cause losses.

Managing business continuity is a business management approach that identifies potential impacts of threats to enterprise and provides a framework for effective response and recovery, so that protected the interests of owners and others, the brand name and activities that make up the enterprise value. [1] works with the idea that the response of management to enterprise-threatening event can not be reduced solely to technical aspects of the problem, but the preparation and management capacity to manage and respond to possible threats. Therefore, part of business continuity management is undertaking a number of areas which must be paid to managers (Fig. 1).

The basic principles of management continuity are:

- BCM and crisis management are integral to the management and corporate governance.
- Activity goals and BCM and crisis management must address the mission and business objectives.
- The creation and maintenance of BCM and crisis management should be seen as a process that enhances the enterprise value added presented to customers. BCM increases the competitive ability of the enterprise, as the company prepares presence and work with business risks.
- Strategies and Solutions BCM and crisis management should be based on key activities, risk assessment and the adopted strategy.
- BCM and crisis management reflects the dynamism of entrepreneurship and the dynamics of internal and external business relationships. For this reason, BCM and crisis management requires constant updating of processed documents, their testing and training competent.

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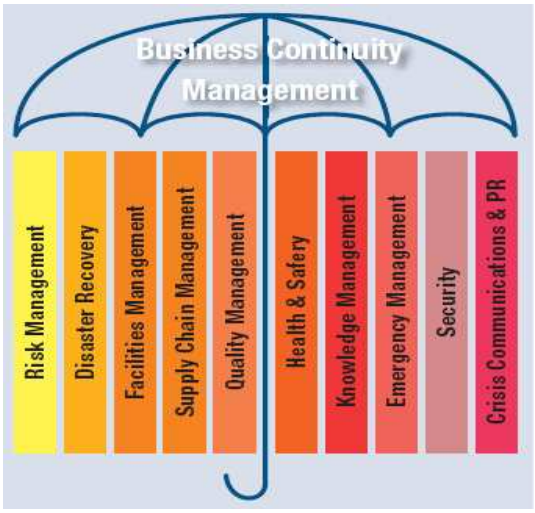

Fig. 1 Specialization business continuity management [6]

Business Continuity Management respectively. Recovery planning is a complex process of bringing answers to the following questions:

- Which threats are sufficiently protected by the enterprise and to whom not?
- How important are the individual business information systems?
- What damage can cause failure?
- By what time it is necessary to restore the operating system?
- How to ensure processes and IT operations against losses?
- Other.

Development of reconstruction requires knowledge and experience to effectively manage the process of analysis, making their testing and maintenance of their information systems.

2 PLANNING BUSINESS CONTINUITY MANAGEMENT

Management plans for business continuity management company are approved by the agreed set of preventive measures and appropriate procedures designed to respond to disasters. Direct links to:

- business strategy;
- emergency plans;
- plans for human resource development;
- other relevant business plans.

Documents prepared for business continuity management covers three sectors of activity:

- **Prevention** involves risk analysis and the necessary technical and organizational measures against the occurrence of emergency situations and to ensure the reconstruction of their occurrence.
- **Responding** to the emergency situation where there is a procedure of how to keep emergency and create organizational structures to cope.
- **Renewal** of current status, which consists of developing procedures for rehabilitation so that the company achieved a standard operation in the minimum time and with minimum losses.

For the purposes of business continuity planning, business is usually drawn up special documents to:

- promoting continuity of critical business activities,
- minimizing damage and losses associated with the emergency,
- developing organization management emergencies and reconstruction operations,
- effective management and coordination processes of reconstruction operations,
- minimizing the risk of failure of information technology and achieve their rehabilitation in the shortest time possible.

The process of business continuity planning business is a very wide area of activities and can be divided into several phases, which content is described below:

2.1 Analysis of functional effects

The first phase of business continuity planning is the transfer function analysis of impacts on business (BIA - Business Impact Analysis). Includes presentation of risk analysis to identify and assess threats, leading to adverse events, identify current processes and their dependencies, and identify resources to support existing processes. Phase analysis includes quantification of the impact of poverty on business processes and determine the time interval (RTO - Recovery Time Objectives) by which the processes should be restored. Business Impact Analysis is a critical component of business continuity planning, resulting in a BIA report, which provides important information for further planning phase. BIA is the best starting point for creating strategies, plans and definition of roles and teams. The result is a picture of the enterprise in terms of vulnerabilities, impacts on business issues and rehabilitation. Basic steps in the first phase of business continuity planning business are:

- Completion of risk analysis,
- Identifying critical functions,

- Determination of the required restoration time,
- Definition of emergency.

2.2 Renewal Strategy

Based on the analysis of functional effects resulting from rehabilitation strategy critical processes for each of the identified critical incidents, which must reflect the evidence in the analysis, and how to respond to crisis events, so that the effective operation of the enterprise. The selection of the optimal strategy, which is developing the investment costs in its implementation. The strategies reflect a basic form of business continuity solutions, and defining key objectives. Mostly on the determination of optimal arrangements for ensuring continuity of critical business activities. The strategy must clearly define how it will lead to restoration of all critical processes. The basic types of recovery strategies are:

- **Strategies "Worst Case Scenario,"** which the crisis event selected worst scenario or disruption of the process. sites, but is not essential why distortion occurs.
- **Strategies for selected types of disturbances**, which are selected those types of disturbances that may arise with the highest qualifications. For instance, fire, flood or power outage and infected networks and use them to create a strategy for rehabilitation and recovery plans.

2.3 Development of Recovery

After defining recovery strategies should be developed recovery plans. Structure plans for business continuity management company is as follows:

- **recovery plan of critical functions including:**
  - description of functions,
  - compilation teams,
  - tracing plan,
  - assign team tasks,
  - allocation of resources to functions,
  - draft form output.
- **design of measures to ensure the baseline include:**
  - technical measures,
  - measure organizational nature.

2. 4 Testing and updating plans

To manage the program management continuity is necessary existence of procedures and processes for testing the continuity of management plans, incident simulation and means for their management. Only tested and approved the plan can be considered a suitable plan for deployment in an emergency. Testing allows the effectiveness and feasibility of plans and identifies their weaknesses. Testing also serves as a practical practice of staff responsible for various tasks in the plans. In addition, testing should be performed by regular updating of plans to respond to changes not only in business but also to changes in the external environment. It is necessary to periodically carry out a thorough review of the plans to ensure that some significant changes have not escaped attention. [9]

CONCLUSION

Managing business continuity is a business management tool that recently used by many businesses to increase their efficiency and ensure competitiveness. It is a way to prepare for any adverse situation in the company, which may occur due to both internal as well as effects due to changes in external environment.

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ANALYSIS OF RISK MANAGEMENT IMPLEMENTATION DEGREE IN COMPANIES

Abstract: The contribution is aimed on analysis of risk management implementation in companies. Risk management is important part of managerial tasks. The risk is influenced the survival of companies, their effectiveness and successfulness.

Key words: risk, risk management, identification of risk, management of risk.

INTRODUCTION

Companies often get into situations involving threats to their future development and prosperity. Risk is an integral part of every business. The company can not be successful long term, if not bear the same degree of business risk. Despite awareness of existing risks, managers pay insufficient attention to their identification and subsequent management.

Managers are often subject to the illusion that decision, provided security, thereby threatening the prosperity of business. Excessively confident forecasting and unwarranted optimism reflected in the implementation of a business plan when not prepared to consider and a possible underlying problems. The owner should take the belief that the risk to their investment decision is undergoing is due to return on capital acceptable.

1 RISK MANAGEMENT

Risk management must be integrated into the corporate system, and respected by all subsystems can not operate in isolation, detached from corporate events. Risk management is the systematic integration of risk into key management decisions. This is a rational procedure in risk situations to protect themselves and increase current and future assets of the company. [6] Enterprise Risk Management is the process of determining and quantifying the risk from all sources, which may jeopardize the company's strategic objectives. In addition, identify risks that can be used as opportunities to enhance the benefits of competitive enterprise.

Focus risk management must be involved in detecting risk assets, financial situation and earning enterprise, establishment of the discretion, as well as ensuring long-term potential of building a sustainable business growth. Risks, to which enterprises are exposed to a considerable extent by their achievements and management of market value. In this respect, it is necessary to build risk management as a subsystem of corporate governance, ensuring a rational and systematic approach to risk by using various methods and instruments. The introduction of risk management system helps maintain or increase business value for its owners. This leads to higher quality of strategic management, greater stability, and faster response to changing market conditions to reduce the likelihood of errors and fraud.

Basic phases of risk management can be summarized into four steps. Each stage is characterized by issues which it identified (Figure 1).

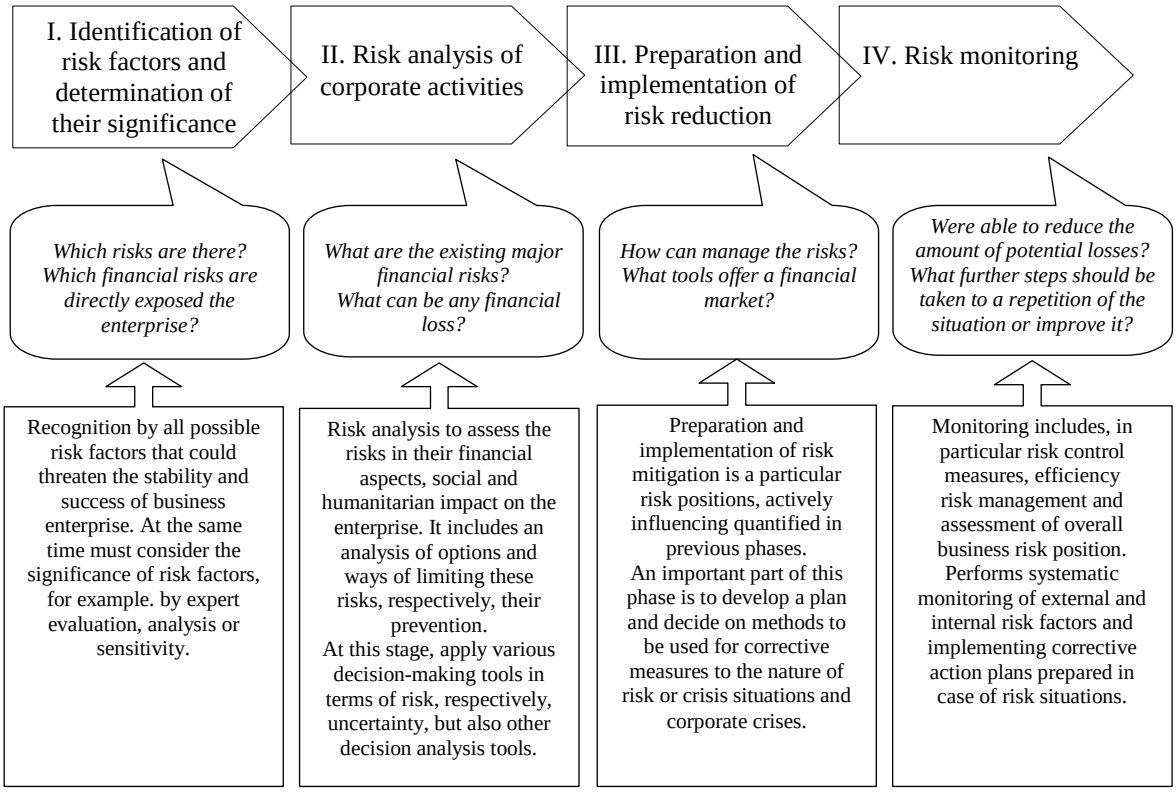

Fig. 1. Risk Management Process, Source: own processing according to [2], [7]

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For effective risk management is essential to creating an integrated risk management across the whole enterprise. Risk management as a process that includes all activities, ensuring a systemic approach to risk - identifying, analyzing, managing and monitoring risks and at the same time monitor the effectiveness and appropriateness of action taken. Securing long-term effectiveness requires that the process of continuous risk management functions in accordance with all business processes.

The most important phase of the risk management process is the identification of targets based on top management company. The identification of risks is to identify significant risks, respectively. risk areas affecting the achievement of corporate strategy. An important part of this phase is to identify critical sources of cash flow and assess them in terms of risk.

After the identification of critical risks must be decided which of the identified risk require detailed analysis. Risk analysis is usually understood as a process of defining the threats, the likelihood of their implementation and impact on assets, determination of risks and their severity. Risk analysis generally includes:

- **Risk definition** - characteristics considered undertaking a description of assets owns.
- **Determine the value of assets** - determination of asset values and their importance for the enterprise assess the potential impact of their loss, alteration or damage to the existence or conduct business.
- **Identification of threats and vulnerabilities** - determining the types of events that may affect the value of assets, determining vulnerabilities company, which may enable interaction threats.
- **Determine the seriousness of threats and vulnerabilities level** - determining the likelihood of threat and degree of vulnerability to the threat of business. [2]

Risk management is a process in which management seeks to limit the impact of existing and future risks and proposes solutions to help eliminate the adverse effect of impact and contrast the opportunities to enjoy the action of positive effects. After considering all factors, management risk management develops, analyzes and compares the possible preventive and control measures. Then they selected those that minimize the existing risks. The final result of each stage is a risk management decision. Most of the output of multiple variants. Unacceptable level of risk requires the cessation of an ongoing process and measures to reduce it.

The last stage of the process of risk management is monitoring and evaluating overall business risk position with an emphasis on operational effectiveness of control measures and analysis of deviations from the plan reality. Function plays an important internal control to ensure effective corporate governance and achieving the objectives of scrutiny and evaluation of business flows, analysis and management reporting bias and the benefit of management executives.

2 ANALYSIS OF PERCEPTION AND RISK MANAGEMENT BUSINESS

In recent years took place several surveys of perception and risk management in enterprises. The analysis is based on the results of the survey firm Marsh, which focused on businesses in Central and Eastern Europe and especially in Slovakia and the Czech survey companies that made the Czech Savings Bank Consulting.

The need for analysis of perception and risk management in the Slovak companies were divided into four risk groups according to separate individual business parameters:

- **The risk of growth** presents risks or issues that could substantially reduce or increase the ability of business to ensure its planned growth. Failure to comply with business objectives due to lack of accurate information to help you respond to competition, unstable market, globalization, meeting with new customer acquisition / retention of staff and provision of new investment, or customers.
- **Risk of efficiency** presents risks or opportunities arising from the plans and site maintenance plant and equipment, new technologies, improvement of business processes, reduction of administrative operations, increase priced capital / finance volume or increasing profitability.
- **Risk of regulatory compliance** represents risks associated with failing to comply with EU directives and local regulations relating to consumer protection, safety and occupational health, environmental protection, corporate governance, ensuring compliance with financial reports, etc.
- **The risk of protection** is a risk associated with natural disasters, the damage to property and disruption of continuity in carrying out business in the event of disruption, with negative effects for the task: avian flu, climate change, tough economic conditions, terrorism, stress, planning crisis and response, fire, flood, etc. [4]

The survey can be found that nearly 60% of Slovak enterprises surveyed, perceived risk and increase efficiency as a threat to their business, though only 20 to 30% companies take measures to prevent or mitigate these risks. Favorable situation in the risk management of risks and compliance are the companies best manage them.

The Slovak enterprises are most responsible for risk management CEO, CFO followed in 29% and only 8% of businesses have a risk manager full time. Although these may have an impact on the enterprise management perceives risk, can identify the main risk factors, but measures to manage risks are no longer commensurate with the seriousness of risk, which expresses the following Figure 3.

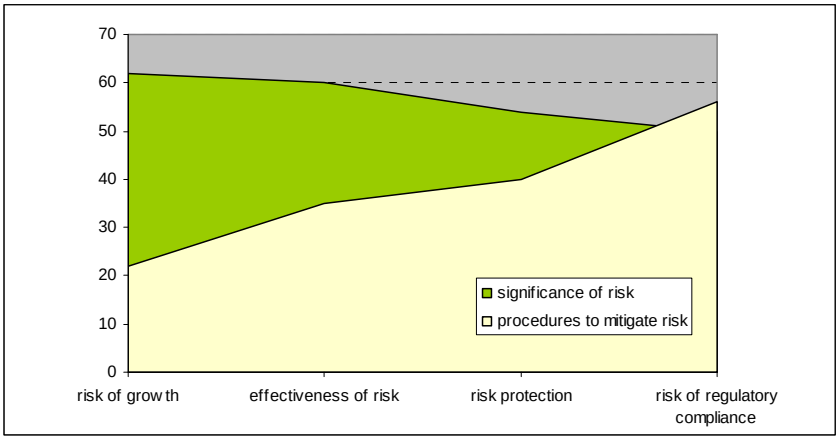

Fig. 2. Risk management in business in the Slovak Republic Source: own processing according to [4]

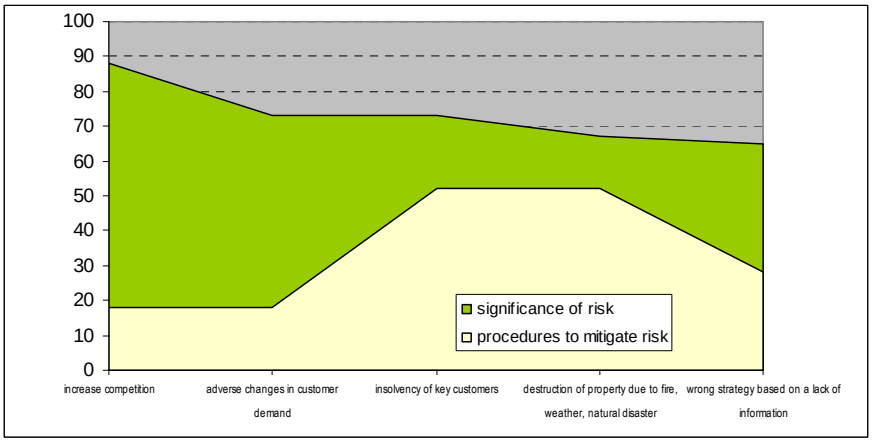

Fig. 3. Analysis of the perception and management of five major risks in Slovak enterprises Source: own processing according to [4]

Same situation with the perception and risk management as the Slovak companies are generally in companies in Central and Eastern Europe (Figure 4). Differences are identified specific high-risk factors and perceptions of individual risk and severity level of their management.

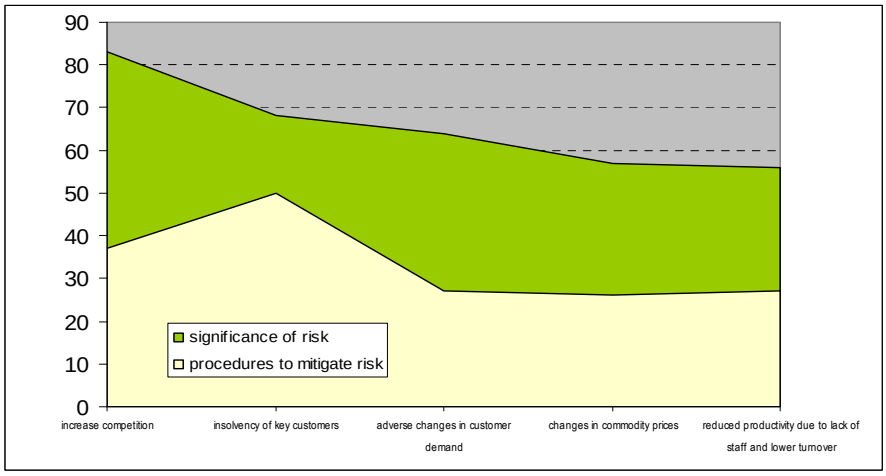

Fig. 4. Analysis of the perception and management of five major risks in enterprises in Central and Eastern Europe Source: own processing according to [4]

The greatest risk of enterprises considers the risk of growth of competition in which there is a mismatch between its greatest impacts on businesses and enterprises the ability to handle it. It is crucial to customers who expressed a degree of uncertainty in the behavior and economic uncertainty.

The companies in Central and Eastern Europe is the leading person responsible for risk management (33%) Executive Director. Second place (25%) belongs to the owner, CEO and CFO. The total number of professionals specializing in risk and insurance is low (14% in insurance and 6% at risk), although their number of financial institutions in the transport sector increased to 25% and utilities sector at 31%, reflecting a complex system these organizations and the potential for serious consequences of unmanaged risks.

The risk analysis in the Czech companies has identified the most serious risk and risk from the most eagerly awaited by businesses. It was analyzed approach to risk management.

Graph in Figure 5, which was created based on the results of the survey in the Czech Republic showed that risk management is becoming part of corporate management, although some companies do weaknesses in the management, organizational and methodological nature. Their removal is a prerequisite for participation in the formulation of risk management in enterprise value, which is a prerequisite for the existence of future business.

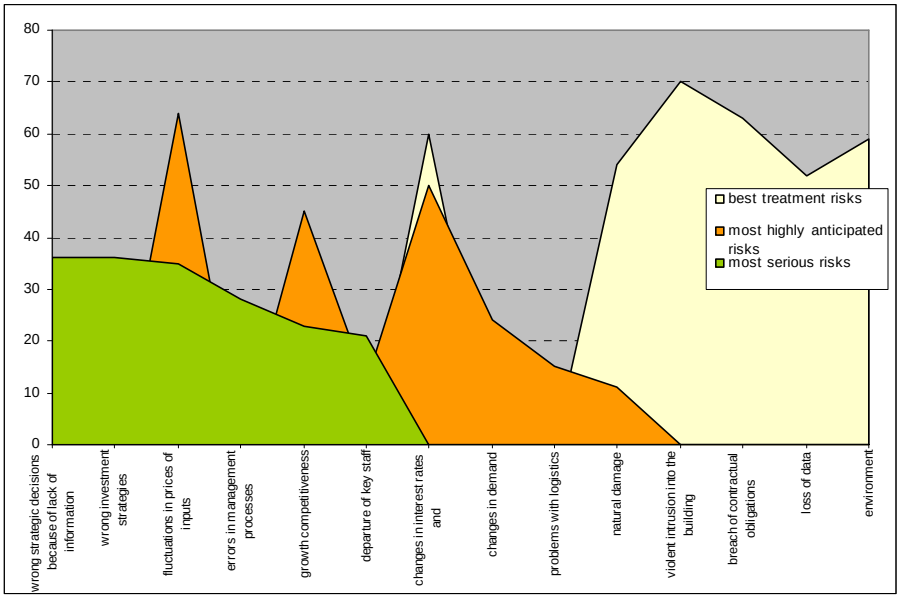

Fig. 5. Risk management in business in the Czech Republic Source: own processing according to [6]

CONCLUSION

In business there is a discrepancy between perceptions of risks and their management. Less than half of businesses are adequately prepared to deal with risks. Companies can identify potential risks, although there are companies in managing minor risks or security vulnerabilities most serious risks. Businesses that are supported by extensive risk management system to recover from the crisis much faster than their competitors and can provide more efficient implementation of customer requirements.

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Art is the result of partial solutions to the grant AV 4/0005/07 Using role of logistics networks in the restructuring of business processes in small and medium-sized industrial firms.

***Mária Kotlínová, Ľubica Simanová*[20]**

OPTIMUM STOCKS, COMPETITIVE ADVANTAGE BUSINESS TIME DEPRESSION

Abstract: The article is concerned with characteristics of regulating stocks in provisions uncertainty and it describes some modern methods of theory stocks. The theoretical knowledge are verified on actual system of supply in the factory Stavomontáže Kovo Sklo Ltd. The cardinal part of project is engaged in the optimalisation of stock and the calculation of the reserve stock for chosen kind of materials. Also we present results of research for the given factory in the supply´s sphere - comparison amount of calculated reserve stock with actual stock level and the suggestion of measures. By this suggestion of measures we started from the given calculation.

Key Words: Methods of regulating stock, complete stock, , uncertainty in supplies, optimal level reserve stock.

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INTRODUCTION

Currently, there are in all major markets competitiveness, businesses are asked to high demand, fully exhibiting effects of the global economic crisis. An enterprise has survived in this environment, it must gain a competitive advantage over others. One of the competitive advantages can also become a well-designed system for the management of stocks, because stocks in the company ensure the smooth running of production and in particular provide great leeway for management.

If the inventory glut, unduly bind many funds, it would be used otherwise. On the other hand, if the stock shortage, causing difficulties in manufacturing. As a result of lack of stock may be to halt production, unnecessary rebuilding of machines, which further leads to the enterprise not only financial, but also a time of loss, loss of reputation, built positions in the market, the loss of competitiveness in the market. In this case it is possible to avoid the detailed planning and tracking inventory.

1. MANAGEMENT OF STOCKS UNDER CONDITIONS OF UNCERTAINTY

The aim of the management and inventory is to increase profitability, predicting the impact of business strategies on the status of stocks and minimize overall costs associated with inventory, while satisfying the requirements for customer service. Management must have detailed information in real time on the cost of maintaining inventory in order to competently and responsibly decide on the level of customer service, inventory levels, mode of transportation and size of batch. The enterprise is the basic unit in the system of national economy. It is influenced by economic conditions, activities of competitors, changes in government regulations, market shifts or changes in consumer buying patterns to a large extent and reliability of suppliers.

Preparation of orders can sometimes include more, sometimes less time. Total length of restocking material may vary depending on the delivery skills to equip the order of the periodicity of the supply cycle, from the size of the required supplies. It may be that the supplier will not be able to respond to changes in demand. These are the circumstances that managers must take into account when building a system of supply under conditions of uncertainty, because they rarely can be accurately predicted, as can occur with a supplier in the market, and what they can expect demand for their products.

Supplying both is among one of the most important business assets. It provides enterprise tangible and intangible factors of production, necessary for its activities. For undertaking an inventory and the positive negative value, as indicated Drahotský and Reznicek: "Negative lies in the fact that the related capital and labor consuming and entail a risk of deterioration and impracticability or unmarketability . On the other hand, the stock settled time, local, and assortment capacitance mismatch between production and consumption, ensuring a smoother production process, and cover various unforeseen fluctuations. (Drahotský, J., Reznicek, B: Logistics, Operations, and their management. Brno, 2003, pp. 16).

For the operational management of inventory is important classification according to their functional components. From this perspective, stocks are divided into normal (turnover) stocks, buffer stocks, technical, seasonal and emergency stock. In terms of signaling the state of stocks and capacity calculations for the design and management of data warehousing are the main values of the state minimum and maximum stock. The inventory management is still important so-called. unused stocks, which usually consist of unnecessary, useless and overnormative (surplus) stocks.

2. MODERN MANAGEMENT STOCKS

The recently reported rapid development of supply logistics, building new, more sophisticated systems, which are directly adapted to the conditions of the undertaking.

GLOBAL SYSTEM

It is one of the newer views on stocks, global (financial) management of stocks. It assesses the overall development, structure and basic characteristics of stocks in an organized breakdown (eg. by factories, warehouses, workers in the supply and the like). It performs the planning, control and incentive function, is an instrument of interest in the domestic economic management.

How it works is that the departments are responsible for a portion of stocks, which is evaluated through mandatory administrative chosen indicators. The effectiveness of this system is a set of quality indicators and tangible incentives, which] [they follow. 6

FREE MODE RESUPPLY

This system, often referred to as the Q-system is one of the oldest system of inventory management. It is suitable for small businesses with simple, standard range, so its significance is currently declining. The basic level of control system is standard ordering stock (point of order). For each item are allocated in two parts inventories. The first covers consumption from the time of delivery of material after a period of exposure to new orders. The second part covers the use of material from the moment the order is issued to supply the material.

FIXED MODE RESUPPLY

The system sometimes called the P-system or the so-called. mini-maxi is also quite old. The key is to establish the correct standard range maximum and minimum stock. Reducing the tolerance signalling increases sensitivity, but the result too often is signaling increases disproportionately agenda. While the previous system in order to manage the majority point of order in this system is issued periodically, usually according to the requirements of the particular production program and under the basic conditions of supply.

COMBINED

It is called a system of P-Q. In this system, for each type of material determined by a number of stocks, especially the size of deliveries, ordering stock standard, standard and maximum stock standard insurance stocks. All previous schemes can be applied only if consumption is relatively uniform. If these conditions are not created, the system reduces the sensitivity and signaling is ineffective.

MANAGEMENT OF STOCKS WITH USING INFORMATION

There are several programs that are comprehensive and can manage both inventory and logistics, but also other areas. On the market there are several types of programs:

SAP Business∪ One - provides immediate and comprehensive overview not only of logistics, but also on finances, personnel, customers and other business areas. The SAP∪ Best Practices Baseline Package - allows to implement a complete ERP solution in a pre-defined scope, providing a complete solution to manage logistics, customer relations and analysis, supports user administration, configuration, central management of data with a link to a Web service. System Accellos WMS (Warehouse Management Software) - provides a comprehensive and user friendly management of all storage and distribution operations, linking stores with the rest of society.

System WCS (Warehouse Control System) - is working∪ closely with WMS systems, determining the best path through all the material flow automation systems, on-line re-optimization of the management of orders for changing business conditions.

3. STOCKS IN THE COMPANY STAVOMONTÁŽE KOVO-GLASS, LTD.

To optimize the supply system must be satisfied the following conditions, which detail the particular firm. In our case, the theoretical hypothesis was verified in a particular enterprise STAVOMONTÁŽE KOVO-GLASS, Ltd. Conditions for optimization supply system are as follows:

- stores should continue to be used for 75-90%,
- management system - should be efficient and simple,
- individual materials should have sufficient stock to cover the minimum needs,
- in the stock should be tied less funding than at present.

The first step was to address the problem of classifying the input materials through ABC analysis. The result is a solution the following sort of materials:

Group A - rich material (85.50% turnover, 20% of stocks)
Group B - connecting material (9% turnover, 40% of stocks)
Group C - welding material (5.5% turnover, 40% of stocks)

The requirement of the enterprise was given the only Group A - rich material. When calculating the premium to be used commonly known, relationships. (Tomek, G., Tomek, J. Nákupní marketing. Vydavatelství: Grada Publishing, Prague, 1996. 175 p., ISBN 80-85623-96X)

$$Z_{pi} = R\sqrt{t_N (\sigma_{mi}^2 + \sigma_{DI}^2)}$$

$$\sigma_{mi} = \sqrt{\frac{1}{n}\sum_{1}^{n}(m - \overline{m_i})^2}$$

$$\sigma_{DI} = \sqrt{\frac{1}{n}\sum_{1}^{n}(D_i - \overline{D_i})_j^2}$$

where:

R - insurance agent,
σmi - standard deviation in the consumption of the i-th material,
σDI - standard deviation in the supply of the i-th material,
m - consumption.

Table 1. Data required to calculate the insurance stocks for metallurgical materials

		Monthly consumption (D)	The average monthly consumption $(\overline{D})$	$(D_i - \overline{D_i})$	$(D_i - \overline{D_i})^2$	Daily consumption (m)	Average daily consumption $(\overline{m})$	$(m_i - \overline{m_i})$	$(m_i - \overline{m_i})^2$
Monthly turnover (in Sk)	I.	357 485	710 815	-353 330	124 842 206 677	17 874	35 541	-17 667	312 105 517
	II.	441 638		-269 177	72 456 347 055	22 082		-13 459	181 140 868
	III.	375 239		-335 576	112 611 363 635	18 762		-16 779	281 528 409
	IV.	889 287		178 472	31 852 195 293	44 464		8 924	79 630 488
	V.	603 744		-107 071	11 464 234 731	30 187		-5 354	28 660 587
	VI.	2 129 535		1 418 720	2 012 765 965 493	106 477		70 936	5 031 914 914
	VII.	1 461 941		751 126	564 190 017 501	73 097		37 556	1 410 475 044
	VIII.	0		-710 815	505 258 201 163	0		-35 541	1 263 145 503
	IX.	1 264 005		553 190	306 018 991 703	63 200		27 659	765 047 479
	X.	252 061		-458 754	210 455 385 434	12 603		-22 938	526 138 464
	XI.	663 538		-47 277	2 235 130 488	33 177		-2 364	5 587 826
	XII.	91 309		-619 506	383 787 890 538	4 565		-30 975	959 469 726
Spolu		8 529 782			4 337 937 929 712	426 489			10 844 844 824

Source: Master's thesis Robert Sečkár

σ_{mi}^{2} = 903 737 069

σ_{di}^{2} = 361 494 827 476

Table 2. Calculation of the premium factor R for strong material

INDICATOR	POINTS
1. Nature of supply from a supplier 1. 1. Cyclicality of production (imports) by the manufacturer	
- every month	1
1. 2. Interval supply from the supplier (delivery cycle)	
- monthly	2
2. Alternative security 2. 1. Suppliers and other customers	
- more suppliers and more customers	3
2.2. Substitutability with other products	
- The product is hardly replaceable 5	5
3. The technological nature of the product	
- used in production for several products	9
Total	**20**
+ base rate	**50**
Overall	**70**

Source: Master's thesis Robert Sečkár

Own calculation is given in Table 1, calculate the premium factor R for strong material is given in Table 2 Obtained data were used in the formula, and then calculated buffer stocks for metallurgical materials.

$$Z_{pi} = R\sqrt{t_N\left(\sigma_{mi}^2 + \sigma_{Di}^2\right)}$$

$$Z_{pi} = 0{,}525\sqrt{21(903737069 + 361494827476)}$$

$$Z_{pi} = 1\ 448\ 312\ Sk \quad (48\ 075{,}15\ EUR)$$

The optimum amount of buffer stocks for the rich material is 1 448 312 Sk, the actual cash value in STAVOMONTÁŽE KOVO glass, Ltd. in 2008 was at 1 114 170,47 Sk. It follows that on the basis of our calculations it is necessary to increase buffer stocks of 301 260 Sk per year.

This increase significantly affect the current level of costs incurred for the logistics company, the capacity of the company stores are sufficient and ready to spatially adjust to this change. Warehouse personnel would also not have a problem with the increase in insurance stocks, as well as the transport is ready to accept the increased volume of stock and put into operational practice. On the other hand, the company will be able to easily adapt to today's turbulent environment, flexible to respond to market demands, and thereby also reduce the risk of loss of business opportunities and improving the overall reputation of the company. The company already plans to set up calculations put into practice by means of computer technology.

CONCLUSION

The problem right choice model to specific conditions is often less complex than ensuring the input data and use the results achieved. Mathematical theory of stock overhaul created a series of modifications to be many real cases. It should be noted that differences between models, theories arising mainly from stocks, as predicted consumption is expressed, such other information - indicators we characterize it further as it is expressed in terms of risk, such probability models described delivery cycle, and as indicated physical units, etc..

From this perspective also based on the specific solutions for the Company STAVOMONTÁŽE KOVO glass, Ltd., which helped to improve the still-functioning supply system in this company.

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Leszek Kozioł, Zenon Muszyński[21]

MANAGEMENT IN COMPANIES WHO'S EMPLOYEES MAY BE EXPOSED TO HARMFUL NOISE INFLUENCE

Abstract: In particular branches of the wood industry the threat of pernicious influence of noise can be noticed. In selected aspects of managing human resources, special attention was drawn to the limitation of its harmful effects on employees' health. The basic rights and duties of the employer and the employees exposed to negative noise influence were also discussed.
Human resources management in the wood industry should take into consideration, if possible, elimination or maximum limitation of the number of works which carry the possibility of health hazards.
Key words: management, noise, hazard level, hearing protection devices

INTRODUCTION

In 2009 the tenth annual European Week for Safety and Health at Work took place, with its main aim at drawing attention to health hazard caused by noise in the work environment. This was prompted by the fact that hearing damages caused by noise were recognized as the most common irreversible occupational diseases in Europe. It was also stated that in Europe the estimated 30% of the employees are exposed to noise regarded as detrimental to health, for about 25% of their working time. Furthermore, assessments show that 40 million employees, for 50% of their working time, are forced to raise their voice above the level of an average conversation in order to communicate more effectively. It was concluded that noise may increase the number of accidents, as well as the level of stress, which, together with other occupational hazards may considerably influence health deterioration [3,6].

It is a common fact that work in different branches of the wood industry is numbered among those strenuous as well as injurious and threatened with noise.

In wood industry companies, especially in mechanical woodworking ones, most of the employees are at risk of temporary, or at times even continuous, influence of noise and mechanical vibrations.

BASIC RIGHTS AND DUTIES OF THE EMPLOYERS AND EMPLOYEES

Among the elementary binding regulations, one should first of all consider the article 66, paragraph 1 of the Constitution of Republic of Poland which ensures that every citizen has a right to safe and hygienic working conditions as well as the article 24 which unequivocally declares that the state is responsible for supervising it. The foregoing deed raises the importance of legal regulations considering occupational health protection. It is amplified further in the Labour Code of 1974, and its subsequent changes, as well as in numerous decrees and administrative acts [4].

In accordance with article 204 of the Labour Code, the employer is obliged to protect the employees' health and life by providing them with safe and hygienic working conditions, making the most of the achievements of technology and science. Thus, the employer is the one responsible for the state of occupational health and safety in the working place and the most effective way to ensure it is by proper management of working process. The employer is obliged to inform the employees about occupational risk involved as well as about the rules for protection from the threat of, among others, high noise levels. The employer should aim at elimination, or at least considerable limitation of noise on particular posts of mechanical woodworking where permissible noise levels are exceeded. For it should be noticed that according to estimations, a significant number of employees in the wood industry is exposed to pernicious influence of noise [5-7].

The basic duties of the employee include obeying the health and safety rules as well as , in particular cases, using means of individual protection. If the working conditions do not meet proper occupational health and safety regulations and cause direct threat to life and health, the employee has a right to refrain from performing the job, immediately informing his or her superior of such a decision [4].

NOXIOUSNESS OF NOISE

Noxious effect of noise on human depends not only on its volume, but also on its frequency, the duration of exposure, as well as whether the noise is continuous or pulsating and so on. Solutions for limiting occupational noise are not only expensive, but also they cannot always guarantee expected effectiveness.

A mild damage to hearing occurs with the noise level of 20 to 40 dB, a mild one - from 40 to 70 dB, a severe one - 70 to 90 dB, and a profound one when the noise level exceeds 90 dB.

According to binding regulations, the noise level in administration rooms, which very often adjoin production halls, especially in small wood industry firms, should not exceed 55dB. However, in rooms meant for mental work requiring particular concentration, admissible noise level cannot exceed 35 dB and in rooms where no internal noise source is foreseen – 40 dB.

The noise of about 45 to 70 dB causes among others a feeling of untimely tiredness and general exhaustion as well as lowers perceptiveness, work efficiency and intellectual skills. It also increases accident threat and frequency of suffering from headaches and giddiness. In many cases it may cause a feeling of anxiety and irritation. Finally, noise hinders physical and psychical relaxation and may lead to insomnia.

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Noise hampers especially mental work as well as all the other works which burden sense organs and central nervous system. For example, an operator of remote control machines may have difficulties with reception of signals and thus be incapable of making proper decisions.

Noise which exceeds 80 dB not only causes difficult to treat hearing damage, but also affects nervous and circulatory system [2,5,7]. Particularly harmful is transient, unexpected pulsing noise over 90 dB of frequencies beyond 4000Hz.

Intense noise may injure eardrum. Percussive noise of high acoustic pressure, which occurs unexpectedly startling humans psychical system, causes very often permanent hearing damage, which is qualified as permanent occupational deafness. It should be noticed that most of the workers employed in wood industry are exposed to noise which exceeds the admissible 85 dB [1,3,5].

CONCLUSIONS

- Noise is included among the most important factors which perniciously affect human psychophysical state, causing most of all hypertension, nervous disorders and stress as well as lower work efficiency.
- Providing safe and hygienic working conditions is the employers duty, whereas the employee is obliged to obey health and safety regulations , including proper usage of hearing protection devices.
- On particular working posts, where admissible noise levels are exceeded, time of working and its length, as well as frequency of breaks should be adjusted to noise levels and individual psychophysical possibilities of the employee.
- If there is no possibility of reducing noise levels, when working in zones exposed to the noise, employees should be equipped with attested hearing protection devices, adequate for the noise level and suitable for each individual worker.
- Work performed in environment which exposes an employee to pernicious influence of inadmissible noise levels should be included among those particularly strenuous and harmful to health, as it carries the threat of permanent hearing loss of various degrees and possibility of development of occupational diseases.

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MAINTENANCE MANAGEMENT AS A FACTOR OF EFFECTIVENESS

Abstract: By increasing demand on company effectiveness in the strong competitive market environment the importance of maintaining machines and equipment increases as well. This causes the change of dimensions in maintenance especially in building the system of safety at work, the system of quality, in decreasing costs and increasing productivity. The document deals with significance and main aims of maintenance as well as with chosen conceptions of managing maintenance activities.

Key words: maintenance management, effectiveness, maintenance systems.

INTRODUCTION

If the companies want to become competitive and in future achieve the position of manufacturers of sought-after products with the lowest costs, they must quickly apply suitable procedures and methods also in the field of maintenance processes. Costs on maintenance of production equipments represent 12-15% of gross domestic product in industrially developed countries. Annual costs on maintenance of machinery represent 5-10 % of the companies‘ turnover.

IMPORTANCE AND OBJECTIVES OF MAINTENANCE

Importance of maintenance especially the field of industry rises with the companies‘ effort to reduce costs in relation to competitive environment, as well as pressure by customers, concentrated on suppliers, accepting requirements imposed on quality, environment, and safety.

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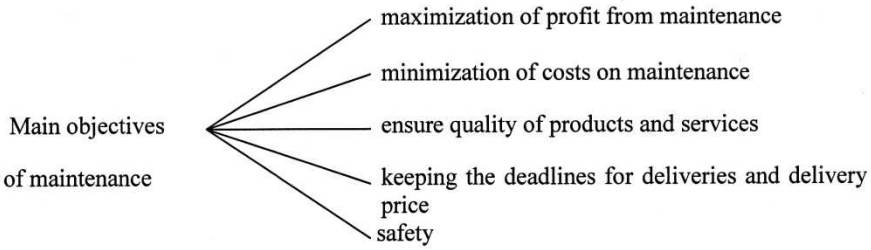
Main tasks within the maintenance are for example [1]:
- pay enough attention to maintenance in the planning and ordering process,
- prepare suitable production and maintenance instructions and procedures,
- develop effective system of spare parts ordering,
- determine responsible organization for maintenance management,
- create sequences for planning, monitoring, and analysis,
- define method of information processing and evaluation,
- determine motivation and education aspects,
- constantly work on the improvement procedure.

Maintenance objective is global minimization of costs in production and maximization of profit while maintaining the Q-D-P-R (Quality-Deadline-Price-Reliability) considering the fact that long-term assets represent the property which has a market value that does not change. Maintenance is supposed to keep particularly this market value. Objective of the maintenance system has many criteria and is reflected into a company's costs and profit.



Management of maintenance of long-term assets is thus a procedure used by the companies to achieve the maximum output with the lowest production costs, while keeping ecological safety and safety at work. The key factors that follow from the construction, maintenance, and operation, force the companies to the optimal output by the means of management of maintenance of long-term assets.

Transformation of management of maintenance of long-term assets into a competitive advantage and understanding of all aspects affecting a company efficiency, from individual components up to complex systems, is enabled by the AEO concept (Asset Efficiency Optimisation). To achieve optimal efficiency of the long-term assets, a company has to implement the process which effectively uses information on technical equipments. The key component of a successful program of maintenance management is obtaining and thorough recording of information from the operational and historical point of view. These data enable a company to achieve the maximum output with the minimum number of maintenance interventions and reach thus the objectives determined for the field of costs and production.

Servicemen's task is to „heal" machines and equipments with optimally used means, as effectively as possible. Knowledge and diagnostic skills of these workers are the result of their longstanding experience.

Problems arising at present in the field of maintenance and their solution that can contribute to reduction of costs and increase in efficiency are above all related to:
- frequent change of organization systems of maintenance management,
- reduction of maintenance costs without objective measurement of their impact on the company's output,
- reduction of number of servicemen
- shifting the maintenance down to the last position,
- neglecting the issues of rewarding and motivation.

In search for costs saving, organization structures were intervened most frequently in the process of transformation, with the aim to reduce and rationalize the work force. Functionality and relation to already created maintenance systems was very rarely considered. Each change of organization structures causes the loss of part of information in the field of maintenance of machinery and equipments. And where significant personal changes in maintenance management took place, it happens that practical knowledge and experience gained in this field in the past periods vanish.

METHODS OF MAINTENANCE MANAGEMENT

Methods of maintenance management in industrial companies can have a form of [4]:
1. *Centralized maintenance* – servicemen are grouped in single-profession or multi-profession groups and can work anywhere in the company. They are not limited to a specific area. They are characterised with working in production units.
2. *Decentralized maintenance* – servicemen are close to production units in small workshops divided according to their professions, they are managed from individual production units mainly by one person who organizes complex repairs.
3. *Combined repair* – part of a shift maintenance is decentralized in production units and part is centrally managed. For this type of organization, centralized technical preparation of maintenance is suitable.

Advantages and disadvantages of individual methods of maintenance organization are listed in Table 1.

Tab. 1 Advantages and disadvantages of individual methods of maintenance organization

Method of maintenance organization	Advantages	Disadvantages
Centralized maintenance	Servicemen: - are managed from one centre - carry out technical preparation of repairs - keep records on machines and equipments - carry out construction of spare parts - ensure complex repairs - have suitable conditions for identification and analysis of defect causes	- transport of tools and spare parts to production units - problematic communication - time of repair is longer
Decentralized maintenance	- maintenance is located near the production unit, is more operative - communication and transport of material and spare parts does not stagnate - workers are better rewarded	- professionalism vanishes - professional development of servicemen is neglected - servicemen cannot be effectively used in a different production unit - number of servicemen grows
Combined maintenance	- daily operative interventions and prevention maintenance is carried out by the shift maintenance - repairs of higher type are carried out by centralized groups by professions, usually managed by one head	- there are information faults between centralized and decentralized maintenance

Another way how a company can carry out the maintenance process is an external form, carried out by a supplying company. In production companies, this type of maintenance is rare and bears high risk as for repairs and responsibility for technical condition. External maintenance is responsible only for the service carried out.

Procedures of production equipment maintenance

In maintenance practice there are three basic spheres of maintenance impact on production equipments [2:

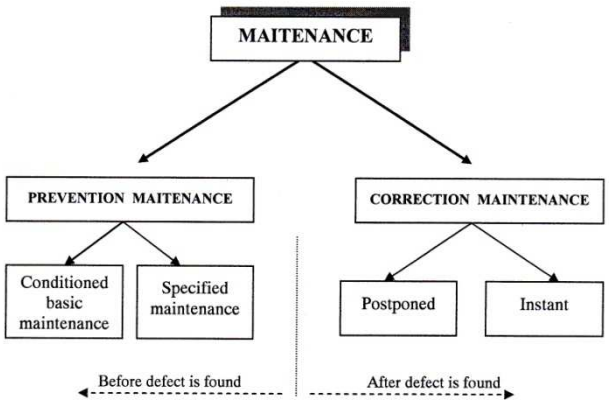
Inspection – measures to ensure and assess real condition of machines, equipments, or structure components.

Maintaining – measures to maintain the required condition of production equipment. It is above all cleaning, lubrication, preservation, refilling and replacement of operational substances, adjustment and arrangement of machines and equipments.

Repairs – measures to reconstruct, i.e. renew, the technical condition of production aggregates to ensure quality production.

Maintenance planning is based on the principle of division into prevention maintenance and correction maintenance - Pict. 1, modified according to [5]. This principle is supported by transparent tools that enable to define main types of repair works and determine necessary period for prevention repairs. There is a simple way how to determine necessary volume of works on the basis of standards for maintenance work difficulty, volume of material costs and minimization of production equipment stoppage.

Companies that rely on correction maintenance have only a little control over their long-term assets. Development of maintenance procedures and strategies is thus very important if the company wants to achieve optimal efficiency of technological equipment and resulting effects on operation and output. To meet the common objectives in the field of company's output it is necessary to define properly balanced requirements for individual equipments. In preparation of the plan it is necessary to consider the company's strategy and analysis of the whole system and carry out a shift from mainly response-based maintenance to a suitable combination of planned maintenance, proactive, predictive and response-based. A shift to a new system must be permanent and should bring fast results and economic return.



Pict. 1. Division of maintenance

The newest stages in the development of maintenance systems in the world are the Total Productive Maintenance – (TPM) and the Reliability Centred Maintenance (RCM).

TPM – Total Productive Maitenance

One of the most suitable strategies of maintenance management which is aimed to increase performance of equipments in relation to increase in efficiency of the production process is the TPM. It puts an emphasis on increase in awareness and knowledge level of operators and service staff, while suitably applying motivation tools to increase the feeling of joint responsibility in all involved persons.

In practice, this system is based on the principle of early detection of abnormalities occurring accidentally due to machine performance, and professional elimination of those abnormalities. Method implementation itself is based on the team work and change of the staff's way of thinking. Shift in the way of thinking must be made especially in optimization of the „man-machine" relation, when the operator's task in not only to operate the machine but also to cooperate actively in the maintenance thereof.

TPM is thus a set of activities covering all units of the company with the aim to [4]:

- create such a company structure that ensures the maximum efficiency of the production system,
- eliminate defects, faults, and all other losses on the equipments,
- gradually increase efficiency of the equipment,
- improve the company's profit,
- create suitable working conditions,
- motivate and engage all workers and all units in the improvement process,
- achieve the zero loss through the team cooperation.

RCM - Reliability Centred Maitenance

Maintenance management includes also methods of its evaluation with the aim of constant improvement. In order to evaluate performance of maintenance, the RCM (newer RCMCost) as an example, uses the indicator of costs efficiency which considers also possible loss in the fault incidence.

Maintenance concentrated on the failure-free state represents a systematic approach of identification of effective activities of maintenance of the equipment and its components following specific procedures and on the basis of intervals defined for execution of individual activities.

This production policy accepts current requirements for maintenance for each equipment component and its performance, while integrating requirements for safety and efficiency of maintenance costs.

Consequences of defects are divided into four areas [4]:

- consequences caused mainly by latent faults, which increase the risk of incidence of recurrent faults (dependent faults),
- consequences influencing safety and environment,
- operational consequences, which influence direct costs due to repair of equipments, affect the production and thus represent the loss,
- indirect consequences, which influence only amount of total costs.

Analysis, evaluation, and subsequent formulation of maintenance interventions including arrangement of material and capacity sources, organization itself, realization and subsequent evaluation of attendance to production equipments is possible only with significant assistance of information technology.

Software tool determined for maintenance management not only in industrial companies but also in other economy branches is for example the Profylax program. It is characteristic with very pleasant user environment that common users manage after very short training. A lot of companies in Slovakia appreciate great benefit brought by this tool and its fast economic return. Implementation of the system ensures management of the maintenance procedures for the ISO quality certificate system. It is a register of machinery and technology, register of prevention actions and planning of prevention maintenance and repairs. Profylax also ensures the register of requirements for repairs of equipments with the required register of actions. [6

CONCLUSION

By implementation of the maintenance management, the companies are able to make utilization of sources more effective – specifically sources of material, technical sources, human sources, and to ensure thus maintenance costs saving and also readiness of machinery and equipment always in the right time. This shall increase efficiency of utilization of long-term assets, as well as human sources.

Through the change in the field of strategies, possibility to purchase complex services, or assigning the responsibility to other organization, the company is offered to use new approaches in the field of maintenance. Every company solves the maintenance and repair issues in dependence of the type and the scope of their production, with regard to internal and external sources, position on the market, competitive environment, etc.

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MARKET OF LACQUER PRODUCTS FOR WOODWORKING INDUSTRY ON THE EXAMPLE OF ITALIAN PRODUCERS

Abstract: On the basis of literature data and informations from producers of lacquer products applied in woodworking industry, considered the problem of emission of volatile organic compounds (VOC) and the negative influence it has on the environment. Largest lacquer producers in this branch located on the second place on european market is Italy. In article some selected products from italian producers, cost relations and marking of technologies operations were presented.
Key words: woodworking industry, lacquer product, market, Italian producer, cost, technological graphic mark, ecology, VOC

1. INTRODUCTION

On the Polish market works many producers, and also distributors of lacquer products intended to finishing of surface of wood and wood based materials in various directions of woodworking industry. On dominating positions in this regard place producers from foreign countries, in this first of all from Germany, Italy and Scandinavian countries. In last, especially several years, especially expansive entered on the Polish market producers and it differents deliverer of lacquer products from Italy, who in respect of size of the general sale imported on our market of products occupy the second position, retiring still enough to clearly prevailing for many years to firms from Germany.

In the article were made the general characterization representatives Italian producers and importers of lacquer products with the regard of chosen assortment segments offered for various directions of woodworking industry in our country. In this context were accent for selected products example relations of price, and thematics of graphic markings in the aspect of recommended technological operations in using processes. In the retrospective seizure were introduced also chosen matters from the range of ecological lacquer products.

2. PRODUCERS OF LACQUER PRODUCTS

The Italian industry of the production of paints and lacquers for different directions occupied approx. 900 firms, at the general employment on the level 16 thousand of workers. From among these firms, five greatest producers covers approx. 25% applications of the Italian market on lacquer products, instead approx. 40% assures first 10 from the ranking list. It is proper to add, that at this fragmentation of the productive potential, no Italian firm is not found leading places in rankings most counting in the world of producers of paints and lacquers. The very significant position in the quantitative structure of producers of lacquer products occupy especially small, specialized firms, offering often within the framework of of cooperative connections of the different kind components from the group of aids. Officially till approx. 40% from among all working firms she employs only to 5 stable workers [5, 6, 15].

The most of producers of paints and lacquers concentrated is in the north-west part Italian, especially in Lombardy, Ligurii, Piedmont and Val d′Aosta. This region delivers over 70% of the Italian industry of lacquer products. Following 18% happens on the centre-piece Italian, stayed, while the part is situated in the south part Italian [5].

Greatest importers of lacquer products from Italy of marked out for various directions of the woodworking industry in our country are specified below firms [9, 10, 15]:

- ICA (INDUSTRIA CHEMICA ADRIATICA S.p.A. Zona Ind.Ie B – Via G. Cattolica, 18 – 62013 CIVITANOVA MARCHE – MC – Italia www.icaspa.com)
- MILESI - ’red’’ (Vernici Egidio Milesi S.p.A., 20017 Rho (MI) Italy - Via Olona, 37 www.milesimilan.it)
- MILESI SPA – ’’gelb’’(Milesi spa – Via Varese, 2 – 20010 Bareggio - Milano, Italia www.milesi.com-milesi@milesi.com)
- ROVEA (Industrie chimiche ROVEA Srl, Via Lombardia 2/4 – 20060 Vignate – Mi - www.rovea.it – info@rovea.it).

These firms across network distributional system and specialized technical sales agents offer services together with the widely technical support.

3. LACQUER PRODUCTS

Italian producers of lacquer products designed for various directions of woodworking industry offer the wide assortment scale of products, on the basis of different homo- and heteropolymers (hybrid systems) as coating systems, in the engage of conventional products and from the HS group, in solvent and waterborne versions, in solutions one- (1K) and two-component (2K). The leading position in the quantitative engage with reference to finishings of top working surfaces e.g. furniture, equipments of interiors and the wood building industry, so of lacquer coatings about high quality, both aesthetic-decorative, as and utylity properties occupied polyurethane (PUR) and waterborne (WB) products. Unfortunately WB products in spite generally very profitable ecological characterizations, not always however fulfil expectations of users

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in respect of the price, and also first of all functional features and resistance of some factors of obtained lacquer coatings. More and more intensely drop-down is also the offer of lacquer products intended for the hardening with UV radiation [14]. These products, demand however in processes of their applications, specialistic, and at this of very expensive technological equipments. In the relevancy instead to finishings of the wood and wood based materials surfaces about the character of coatings, about functions racily preservative, the still leading position in the assortment of the sale occupy nitrocellulose (NC) lacquer products. In the term of recession and the economic stagnation a not as usual important matter within the range collections of the decision about the purchase of the given article of lacquer product stays his price, which speaks behind these last. In the Table 1 was taken down in the relative system, with reference to NC lacquer products current relations of price of products offered by chosen importers from Italy.

Table 1. Relative relations of price of basic lacquer products offered by Italian importers for various directions in the woodworking industry [9, 10]

Firms name	Kind of lacquer product		
	NC	PUR	Waterborne
ICA	**1.00**	1.81	1.87
MILESI SPA	1.02	1.93	2.77
MILESI	1.05	1.69	2.53

At the treat of the decision in relation the buying of the given lacquer products were ought of course in the structure of costs to take into account bounded matters in the first instance from: with the efficiency, consumption, prices of equipments to application, drying and the hardening, energy-consuming and widely understood costs within the range the exploitation, inclusive with charges in the interest of the environmental protection, the utilization of industrial waste material etc.

The analysis of reasons of the inadequate quality of obtained lacquer finishings proved, that one is of prior the inobservance of recommended rules of the usage. Were acknowledged, so that it belonged even if impromptu racily signally to inspire the user to the acquaintance with the most basic information in this regard. Having therefore on the attention the ease of the attainment through buyers to the fundamental information integrally bounded with the technology of using of given article, more and more often on wrappings and in cards of technical products are placed suitable data in the form of markings graphic. Makes easy this users the correct preparation of mixtures of finishings, the leadership of the operation of the application, desiccations and the hardening and delivers the information within the range numbers of applied layers and the interoperating sanding. Every from Italian firms accepted the own system of symbols. In the Table 2 were taken down chosen markings the graphic delivering information from the range of the using technology.

A very important problem stays the matter of ecological lacquer products, especially with reference to threats consequential from the volatile organic compounds (VOC) emission.

4. ECOLOGICAL OF LACQUER PRODUCTS

In each range of finishing of surface of wood and wood based materials with lacquer products, from many already years were undertakes multidirectional undertakings aiming first of all to the prominent stint of bounded threats with VOC. The VOC problems from lacquer products is considered both in the total sphere, in the aspect of the degradation of the environment, bounded first of all with perturbations within the range the ozone balance, as and influences with reference to the matter of health of people.

In the European Union in the 1992÷1996 years taken action within the framework of ecologicalization of lacquer products bore fruit among other things with the rising "eco-sign" of consisting in to the favouritism of products fulfilling suitable criteria within the range environmental protections. Such symbol is admitted first of all on the procedure of life cycle analysis (LCA) for each lacquer product. Competition for the acknowledgement of the certificate is completely voluntary, by the way eco-sign can be argument in strategy of sales managment [7, 8, 11].

The approach of rule of European states to the VOC problem from lacquer products was very diverse - from states in which the problem was not perceived, to such in which were obligatory very restrictive regulations. Chosen maxims consequential from obligatory in chosen countries EU in the year 1998 were took down in the Table 3 [1, 2, 3, 4].

Table 2. Marking of chosen technological operations in finishing processes of surface of wood and wood based materials [9, 10]

Symbol	Description	Symbol	Description
Kinds of applying of lacquer products			
	With brush		Distributing plate
	Cylinder		Dose method from the the applicator nozzle
	Plate distributing notched (with the comb)		With tampons
Making of lacquer mixtures			
	1K product		Lacquer: hardener 1 : 1
	Lacquer: hardener 1 : 2		Lacquer: hardener 2 : 1
Technological aspects			
	Interlayer sanding		7º drying time
	Gloss (in degrees)		Time between spreading of primer and top layer

Table 3. Detailed orders within the range of limitations of VOC emission in chosen EU countries [1, 2]

Country	Chosen maxims within the range of VOC emission
Austria	Required installations clearer detersive take-off gases to the level of the 100 mg/m^3 emission for lacquer factory using up over 2000 kg of solvents in year.
Belgium	Lack of equal regulations. In the Flemish region the limit of the 100 mg/m^3 emision, in the Walloon region limits were obligatory only in some cities.
Denmark	Installations (above 3000 Mg/year) using lacquer products (average VOC over 6 kg/h) must be confirmed by local authorities. Exists the sequence of guidelines of the environmental protection which is universally complied, although are not legally obligatory.
France	Limit of the emission to 150 mg/m^3 for installations using over 2 kg of solvents/h. The agreement between the Department of Environmental Protection and with French Producers′ association of Paints about the limitation of the VOC content in lacquer products about 25% within 5 years.
Italy	Decrees about VOC limits within the range values 0.1÷600.0 mg/m^3, depending on numerous conditions.
Great Britain	Limits of the VOC content in lacquer products: 750 g/dm^3 for grounds, 240 g/dm^3 for primers and 420 g/dm^3 for top products.

An aim of then proposed changes by EU commitee was the reduction of the level of the VOC emission in different scopes of the economy about 1.4 Tg/year. Accordingly to passed analyses costs of the conformability to submitted proposals one valued on level 80 milliards ECU. Were founded, that generality in the first stage modernized would have to become above 400 000 installations, where at 90% from among them represented small- and average enterprises, employing in sum about 10 millions of workers. Below one gave costs which would belong to carry in the case for example firms, employing of 10 workers at the foundation of the reduction of the VOC values about 5 Mg/year from the chosen finishing installation:

- Cost of the limitation of the issue 11 250 ECU/Mg/year
- Total cost of the adaptation 56 250 ECU/year
- Cost in the count on one worker 5 625 ECU/year
- The lowest earnings of the worker 18 000 ECU/year [1, 2].

For many firms execution of such changes and carrying relative costs would be extremely difficult cashable.

For the unification of the legislation within the range VOC in EU countries, in the year 1999 were resolved the instruction (SED 1999/13/EC), amended then in the year 2004 (2004/42/EC), sanctioning initiated successively to the

economic practice of the limitation within the range levels of the VOC value [13]. Introducing the remembered instruction the participation of the VOC emission from lacquer products with reference to the general balance of these compounds TVOC (T-total), was for leading EU countries diverse enough and was shaped in the light of published given within the range values 1.6÷10.2% (Table 4). Where at it is proper to underline, that already then Italian industry of paints and lacquers belonged to distinctiving himself in this regard, retiring only to Scandinavian countries and Spain.

Table 4. Participation of the VOC emission from lacquer products in the general balance TVOC in high fully developed EU countries [1, 2]

Country	VOC emission in the general balance TVOC [%]	Country	VOC emission in the general balance TVOC [%]
Austria	10.2	Ireland	4.3
Holland	7.8	Italy	4.1
Denmark	7.7	Norway	3.6
France	6.2	Spain	2.6
Great Britain	6.1	Sweden	2.1
Belgium	5.4	Finland	1.6

Italian importers of lacquer products still with the due diligence and the consequence impromptu permanent dissolve problems from widely understood ecology. Of course still greatest threats appear in case of the usage of NC lacquer products, clearly smaller for PUR, and on the leading position place products intended to the UV hardening. In relevance to waterborne lacquer products it is proper to mark, that also appears in them the problem of the VOC emission. For each products of the VOC value are shaped within the range 3÷15%. Due they are an occurrence in composition of these products coalescents and some auxiliary agents.

5. RECAPITULATION

Since the year 2003 dates on the Polish market the distinct expansion of Italian producers of paints and lacquers intended to finishing of wood and wood based materials surfaces. For different spheres woodworking industry to the obtainment of decorative coatings on working surfaces are offered first of all PUR, waterborne and cured with UV radiation lacquer products. To finishings about the character of preservative coatings still practical are used more and more smaller scale nitrocellulose products. Lacquer products provided for our receivers fulfil legislative requirements within the range the VOC emission. Each producers of lacquer products introduce systems of the informatory graphics, which in a manner arranges matters from the range of their application.

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EKONOMIC-TECHNOLOGICAL CONDITIONING IN THE RANGE OF APPLIED OF HM ADHESIVES IN FURNITURE INDUSTRY

Abstract: On the basis of literature data and practicse informations of hot melt (HM) adhesives, the problem of economic-technological aspects of applied of HM adhesives in furniture industry was presented. HM adhesives on the various polymers basis on APAO, EVA with- and without fillers, PA, reactive POR and PUR were characterized. Relation of costs of using of these adhesives in woodworking industry comparison with other products were presented. Taking into account relations of costs of HM adhesives, in respect of the polymer base, can it draw up as follows (from expensive to most cheaper): PUR (POR) > APAO > PA > EVA without fillers > EVA filled.

Key words: furniture industry, HM adhesive, polymer basis, filler, technology, economic relation, cost

1. INTRODUCTION

In various directions of furniture industry and equipment of interiors find used finishing materials basing on synthetic polymers, practical in the main degree to finishing of wide- and edges surfaces of fiberboards (HDF, MDF) and particleboards in veneering technologies in versions soft-, postforming and profile-wrapping technology. The leading part among these materials occupy thermoplastic polymers in the form of foils and edges on the basis first of all the following materials: ABS (acrylonitrile-butadiene-styrene), PA (polyamide), PMMA (polymethylmethacrylate), PS (polystyrene) and PVC (polyvinyl chloride) for gluing of which are practical used hot melt adhesives (HM), basing on of ethylene-vinyl copolymers EVA (in versions with fillers or without their participation), atactic polyolefines (APAO), polyamide (PA), and reactive polyolefines (POR) and polyurethanes (PUR). They are characterized with many advantages among others with the ability of the wetting of substrates with the various polarity, with the good initial adherence, short open assembly time, speed of bonding, high resistance of glue lines on tearing off and with profitable features from the point of view of the environmental protection, what predestines it to numberous applied in woodworking industry [2, 3, 7 - 9, 13].

From adhesives used in veneering processes of board elements first of all the very good adhesion and obtainment of transparent and thin glue line is required. In this context more and more spread first of all were endeavours to using of HM adhesives withoutof filler and reactive PUR and POR, assuring the obtainment of glue lines about raised strength and thermoresistance [2, 4, 5, 10].

Tendencies within the range of consumption of HM adhesives (basing on APAO, EVA in version without- and with filler, PA and PUR) with reference to dispersive adhesives applied in German furniture industry were took down in Table 1.

Table 1. Consumption of HM adhesives with relevancy to PVAC adhesives in furniture industry [6]

Adhesives	Year				
	2004	2005	2006	2007	2008 (estimatively)
	Consumption [Gg]				
PVAC dispersions	12.123	12.595	12.877	16.482	19.240
E/VA copolymers	1.482	1.807	1.548	3.052	2.996
HM (EVA, PO, PA, PUR):	**13.313**	**14.052**	**16.156**	**16.501**	**17.369**
EVA with fillers	7.981	8.140	9.731	9.374	9.540
EVA without fillers	2.936	3.123	3.232	3.711	3.852
APAO / PA	1.410	1.507	1.564	1.462	1.488
PUR reactive	0.986	1.282	1.628	1.954	2.488
Total	**26.918**	**28.454**	**30.581**	**36.035**	**39.605**

From data given in Table 1 results states, that in last years appear crescentic tendencies in the scope of the production of reactive HM adhesives.

For the fact, that it is relatively insignificant published works from the range of the properties and usage of HM adhesives the new generation, basing itself on the different kind thermoplastic polymers were undertook work, whose an aim was the performance of economic-technological conditions of the usage of these adhesives in furniture industry.

2. HM ADHESIVES WITHOUT FILLERS

Aiming to the growth of the effectivity of production process, effectiveness and obtainment of final products about high resistance parameters of glue lines it applied in furniture industry HM adhesives without fillers.

In the last years the participation of HM adhesives without fillers used in veneering processes of edges surfaces is significant. Their high performance is a result of the low density not exceeding usually 0.95 g/cm3, and with relation to standard adhesives containing fillers to approx. 1.5 g/cm3.

The obtainment by supportance of glue lines from HM adhesives about the near thickness, is possible at approx. 40÷50% smaller spreading of without fillers product. Simultaneously allow this on veneering about approx. 65% the longer edges. In Table 2 costs components of HM EVA adhesives in versions without- and with filler were compared.

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Table 2. Comparison of chosen components costs of HM EVA adhesives without- and with filler [2]

Kind of adhesive	Density [g/cm^3]	Amount of adhesive [g/cm^2]	Consumption on mb of the edge at the width 25 mm [m/kg]	Relation of the consumption on mb of filled/ without fillers adhesives	Relation costs	Cost comparison [%]
EVA filled	1.35	250	160	1.00	1.0	100
EVA without fillers	0.90	150	260	1.65	1.5	90

Thanks this, higher unit price of not filled adhesives is compensated by their relatively low consumption, while the practice shows, that is possible the decrease of costs of used adhesives about 10%.

Glue lines of HM adhesives produced without fillers are transparent and at gluing of edges about different tints of the colouring comparatively little visible. Thanks to this, exists the possibility of the gluing of edges at the use of universal one-coloured adhesives, without necessaries of change of colours depending on adhesives colours and increase of effectiveness of work across elimination of the troublesome and time-consuming operation of the cleaning melting maschines [2, 3].

Laboratory results prove, that not filled HM adhesives let on achievement of considerably longer, and at this of the more intensive thermal tack, what given possibilities of the range of optimum gluing. This feature assures to not filled HM adhesives the decidedness greater application possibilities and lets on the replacement of several kinds of products without fillers [2, 4].

3. REACTIVE HM ADHESIVES

These adhesives are used in furniture industry in 2 versions as PUR and POR. To their advantages belong among others:

- short bonding time, enlargement of production capacities
- very high resistance on the wide range of temperatures, humidity, acids, plasticisers and solvents
- wide range of the usage (to joining of wood based materials, plastics, metals)
- lower from standard HM adhesives application temperature, allowing on joining of sensitive materials on the temperature [10, 11].

HM POR adhesives, basing on atactic polyolefines (PE and PP) with Si(OR)3 groups, being characterized with the high adhesion to different substrates. In the first stage of the gluing process they bonded at once after the cooling as classical binding agents from the thermoplastic group, while during several following days (7÷14) take place in them complicated chemical reactions as result of which they pass into the form of hardened duroplastics.

For advantages of reactive adhesives find use in many directions of the furniture industry, among others production of kitchen-table tops, veneering boards used in kitchens and bathrooms, joining of HDF elements.

With the essential matter for the industrial practice, can be also problems about the economic character. And so for the obtainment of the high quality of joints, so of very good parameters of strengths and resistances on various factors, were ought to use extremely specialistic and very expensive adhesives, exacting often advanced technological solutions in their application. Alternative meriting the attention solution is the suitable preparation of the substrate for gluing across the use of adhesion promoters, and then conducting of the veneering process with the use of conventional binding agents for the lower prices. In Table 3 were taken down example data to estimation of costs of this products.

Table 3. Influence of adhesion promoters on the structure of costs at veneering of the board elements surfaces with foils and edges by means of chosen HM adhesives [12]

Costs	Adhesion promoter		HM adhesives		
	Solvent	Waterborne	POR	PUR	EVA without fillers
Units [zl/kg]	20		50	60	25
Spreading [g/m^2]	10÷15	20÷25	150		
Materials [zl/m^2]	0.20÷0.30	0.40÷0.50	7.50 [1)]	9.00 [1)]	3.95÷4.25 [2)]

[1)] costs without taken into account adhesion promoters
[2)] dependent from used adhesion promoters

In the comment for data given in Table 3 were ought to add that in case of the foils and edges surfaces about the limited gluability can be used among other reactive HM adhesives in POR or PUR version, whose the unit cost carries out properly 50÷60 zl/kg, what at founded usually quantities of the amount of adhesives approx. 150 g/m2, without the use of the adhesion promoter, determines the cost on the level 7.50÷9.00 zl/m2.

Usually the price of monosilane adhesion promoters does not exceed the level 20 zl/kg, what at recommended to their appling properly for solvent medium in the quantity 10÷15 g/m2, while waterborne 20÷25 g/m2 generates costs within the range 0.20÷0.50 zl/m2. The use of proadhesive agents makes possible the use of not filled HM adhesives, basing on EVA copolymers, not exceded price 25 zl/kg, appling in quantity 150 g/m2, what determines together with the costs of adhesion promoters 3.95÷4.25 zl/m2 and makes possible the obtainment of glue joints about comparable properties to remembered above HM binding agents in the POR or PUR version.

4. COSTS OF HM ADHESIVES

The unit price of HM adhesives influences not only of the kind of the polymer, where based each products, and also composition, content of modification agents, range of the application temperature and the final strength and resistance of obtained glue lines.

In Table 4, basing on given of literature data [1], were compared economic-technological relations of the using of HM adhesives in the furniture industry, presenting chosen application matters (temp. of using and melting of adhesives, direction of application) and relative costs with reference to adhesives containing fillers.

On the base of data given in Table 4 can be stated, that HM reactive adhesives in the PUR version belong to expensive in the using, however promise the highest strength and the resistance of glue lines and can be use in case of bonding of limit gluability materials. Recapitulate, taking into account relations of costs of HM adhesives, in respect of the polymer base, can it draw up as follows (from expensive to most cheaper):

PUR (POR) > APAO > PA > EVA without fillers > EVA filled.

Table 4. Some economic-technological relations of application of HM adhesives in furniture industry [1]

Kind of adhesive – colour	Polymer basis	Application									**Relative costs [-]**
		Primered ABS, PVC, PP	Veneer	CPL or HPL laminate	Composite from massive wood	Softforming	CNC	Manual edgeb.	Melting temp. [°C]	Temp. processing [°C]	
1-transparent	EVA unfilled	XX *)	XX	XX	XX	XX	XX	XX	90	180-200	**1.85**
2-transparent		XX	XX	XX	XX	XX	X	-	100	190-210	**1.85**
3-natural	EVA filled	X	X	XX	-	X	-	X	80	130-150	**1.50**
4-transparent		XX	XX	XX	XX	XX	-	XX	85		**1.85**
5-natural		X	XX	XX	-	X	-	-	90	190-210	**1.00**
6-natural		XX	XX	XX	XX	XX	-	XX	95		**1.50**
7-white		X	XX	XX	-	-	-	-	85		**1.10**
8-brown		X	XX	XX	-	-	-	-			**1.19**
9-black	APAO	X	XX	XX	-	-	-	-			**2.50**
10-natural	PA	XX	XX	XX	-	X	-	-			**2.00**
11-natural	PUR (POR)	XX	XX	X	X	XX	XX	-	-	120-140	**7.00**

*) *XX very applicable, X applicable, - unsuitable*

5. RECAPITULATION

The growth of the effectivity of production of HM adhesives without fillers, and reactive form effectiveness and high resistance parameters of glue lines applied in furniture industry Taking into account relations of costs of HM adhesives, in respect of the polymer base, can it draw up as follows (from expensive to most cheaper): PUR (POR) > APAO > PA > EVA without fillers > EVA filled.

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DENDROMASS POTENTIAL FOR ENERGY IN THE CONDITIONS OF FOREST-TIMBER BRANCH OF THE CZECH REPUBLIC

Abstract: There is an interest in using of forest biomass and wood residues of wood processing recently. It is caused by support of energy obtaining form the renewable resources. Besides international documents there is also known a number of supporting conceptions and legislative documents in the Czech Republic. But on the other hand there are a lot of difficulties here – matter-of-fact, technological and economic. The paper is focused on mentioned problems, it means on dendromass for energy in the conditions of forestry and timber industry of the Czech Republic.
Key words: forestry, wood technology, forestry and timber industry of the Czech Republic, timber felling, wood processing, energy dendromass

INTRODUCTION

Exploitation and maximum upgrading of domestic raw materials are characteristic traits of advanced economies. Basic raw materials also comprise timber, which is considered to be one of the most prospective raw stocks and stimulating materials in the future. [4] In connection with energy obtaining form the renewable resources there also powers on the interest in energy using of dendromass recently. It is concerned especially felling residues (so-called forest biomass) and wood residues from the wood processing. The energy utilization is especially conceived as heat production and also electric energy production.

The Czech Republic professed within the frame of EU to increase share of energy from renewable resources till the year 2010. Share of electric energy should increase form 3 % to 8 % (40 % produced from biomass of it) and share of energy form renewable resources should increase to 6,8 % from the total quantity of primary energy resources (47% biomass of it). Forestry and timber industry will have obviously a significant role.

Forestry and timber industry in the Czech Republic includes three groups of subjects. The first one are forests owners, the second one are forest entrepreneurial entities and the third one are wood processing companies. They create together the complex, where are close relationships. The group of great forest owners includes, no doubt, Forests of the Czech Republic, state enterprise (LČR) that is dominant and so also the strongest part of the whole complex. There are further forests of towns and villages and forests of individuals (private forests). The group of forest entrepreneurial entities includes trading companies and enterpriser (personal entity). They tender their services to forest owners. Trading companies present especially subjects that originated in transform process and privatization of previous companies of state forests. The third group is represented by wood processing subjects – primarily companies of wood-processing industry.

In the Czech Republic there is using of energy forest biomass starting and this biomass usually rises from felling residues after principal felling (tree tops, branches with assimilative apparatuses) in standard forestry. Slightly better the situation is in wood residues using (sawdust, shavings, chips). It relates to own self-supply by energies and also to distribution of collected mass and steady flow to consumers.

The next possibilities of biomass obtaining are targeted growing of energy wood plants (especially on farm unused lands) or residual wood mass produced by cellulose production and bio fuels produced from residual wood mass.

In conditions of forestry and timber industry the complication of this problems lies especially in long-term and balanced dispositions of biomass resources in regional connection, further in resolution of logistic-distributive flows. But also technological and economic snags are important.

METHODOLOGY

To this problems there were primarily analysed legislative and conceptual assumptions of biomass using.

Disposition of energy forest biomass appears basically from timber felling volume. The next step is determination of biomass share that is suitable to energy processing. These methodological processes were verified on the example of Moravia-Silesian region.

Data on Czech forestry are based on statistic inquiries guaranteed by Czech Statistic Office; further the Ministry of Agriculture of the Czech Republic provides some data (e.g. by means of annual income statements). A complex but in fact the only official set of data on forestry is represented by regular reports on the situation of forests and forestry in the Czech Republic for relevant year (systematically since 1996) – so called "green reports". From the database of these reports are drawn basic analysed characteristics: timber felling (total felling, of it conifers, broadleaved, felling intensity per 1 hectare of forest) and increment characteristics: in this case the total average increment (CPP). CPP relates to the main and also dominated (thinning) stand. It is calculated as a sum of average increment of main stand and average thinning (it means rate of all thinning sum and relevant age). It is possible to formulize the CPP by relation:

$$CPP = \frac{V_u + \sum_{0}^{u} T_{prob}}{u} \qquad (1)$$

Symbols:

V_u = volume of the main stand at the end of rotation period $\underline{u}$,

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$\sum_{0}^{u} T_{prob}$ = sum of thinning during the whole rotation period *u*.

Resources of felling residues from forestry are most often educed from total felling volume of timber crust less or from the forestland area. By Johansson & Wernius (1974) e.g. follows from the classic allocation of produced dendromass that the top of tree and limbs including bark and tree verdure (it is leaves and needles) represents 15-25% of tree volume.

Residues quantity of forestry is possible to estimate by the share of felling in this way: principal felling conifers – 8 %, principal felling broadleaved – 12 %, intermediate felling coniferous and also broadleaved – 20 %, cleaning - 3 m3 per 1 hectare. But it is necessary to concretize the quantity of real potential on the basis of concrete conditions forestry complex and forest economic plan, and to revise it especially regarding forest categorization, forestry way, orographical conditions, truck-hauling distance and concentration of wood residues.

Quantity of residues from timber processing industry is possible to estimate according to sawed wood mass – from 1 m3 of sawed wood mass arise 13-18 % sawdust, 12-15% shavings, 2-4 % dust. [1]

Basic economic calculations go from usability and recalculation of energy using of biomass, they usually lead up to basic question: How much is 1 GJ (177,7 kWh) produced from the biomass? It goes from the fact that heating value of 1 ton of dry biomass is about 15 GJ. If the price of 1 ton of dry dendromass in the Czech Republic is about 1000,- CZK the price of produced 1 GJ is about 70,- CZK (presumption is combustion in wood-gasifying technologies with effectivity higher than 80 %). [8]

RESULTS

1 Legislative and conceptual assumptions of biomass using

In November 2007 in Warsaw there was held the 5th Ministerial Conference on the Protection of European Forests (MCPFE), with the motto "Forests for a quality of life". Representatives from 46 European countries and representatives of European Commission signed ministerial declaration and two resolutions: "Forests, wood and energy" and "Forests and water". An increase in the share of energy obtained from renewable resources is emphasized already in the ministerial declaration. The resolution "Forests, wood and energy" directly deals with forests as a resource of renewable raw material. Wood can substitute fossil fuels and so can contribute to ensuring of energy supply as well as to decrease emissions of greenhouse gases. Forests areas in Europe and sustainable forestry lead to increasing availability of forest resources. But nevertheless energy using of forest biomass should not lead to disturbance of wood market and of competition among different end users of this raw material. [6]

Energy using of biomass in the Czech Republic is essentially supported as well as using of another kinds of renewable resources, on the basis of the law No. 180/2005 Sb., about support of using renewable resources.

In the year 2009 the government of the Czech Republic accepted the Action plan for biomass for the period of 2009 – 2011. This plan results from the Action plan for biomass of EU (COM (2005) 628) and from the recommendation of the European commission to member countries to work up the national action plan.

The support of using of renewable energy resources is one of the preferences of Country development program of the Czech Republic for the period 2007 – 2013. For example the Axis I.1.2 Investment in forests includes support on purchase and modernization of technologies for processing and using of residual biomass for energy purposes. In this Axis there is also support on purchase of machine equipment for disposal and processing of brushwood/lop and top. Total annual subsidy makes more than 300 millions CZK.

Not least, in October 2008 there was newly accepted by government decree the National forest program of the Czech Republic for the period till 2013. It contains 4 aims ("pillars"), 17 key actions and 123 measures. Already in the Aim I. Improvement of long-term competitiveness (economic pillar) there is included the Key action 4: Promote and support using of forest biomass for energy production. This key action further includes e.g.:

- Process the analysis of possibilities and in agreement with its results to support using of forest biomass and biomass of fast-growing woods for energy purposes.
- Consider impacts of using of forest biomass for energy purposes on availability of input raw material for timber processing and paper industry.

2 Basic product characteristics of forestry and timber industry of the Czech Republic

Forestry is in the Czech Republic ranked in the sector of the Ministry of Agriculture (MZe ČR). According to the status ranking of industries and their economic activities (OKEČ27) it belongs in Section A Agriculture, game management, forestry; Sub-section 02 – Forestry and related activities. The timber industry is ranked in the sector of the Ministry of industry and trade of the Czech Republic as a part of processing industries – Section D incorporated in the following subsections: 20 – Timber-processing industry, 21 – Pulp and paper industry, 36 – Manufacture of furniture and other processing industries.

Primary production indicators of forestry are level and development of timber supplies and increments, and consequently regeneration felling including tending interferences (lopping and thinning).

The species composition of Czech forests is dominated by conifers – 76.6 % (of this Norway spruce 52.8 %, pine 17.0 %) and by broadleaved species having a share of 23.4 % (of this oak 6.7 % and beech 6.9 %). The current categorization of Czech forests is as follows: commercial forests – 75.4%, protection forests – 2.7 %, special-purpose

[27] *International Standard Industrial Classification of all economic activities (ISIC) and Nomenclature generale des Activitées économique dans les Communautés Européennes (NACE) were used as a standard for the new status ranking of industries and their economic activities (OKEČ) used since November 1991. OKEČ have been replaced by classification CZ-NACE since 2008 (for statistic purposes actual for finding of year 2008).*

forests – 21.9 %. Total timber supplies[28] amount is approximately 673 millions m³ with the average standing volume[29] being about 250 m³/ha. Total mean increment (CPP) is about 17 millions m³ per year, which answers to 6.8 m³/ha.

In the entire post-war period, annual timber felling in the forestry of Czech Republic exhibited an increasing trend until the mid-1980s (14 mil. m³ in 1985). During the restitution of forest properties in 1991-1992 it recorded a temporary decrease but since 1993 the felling volumes have been constantly increasing and recently exceeded 18 millions m³ (the influence of accidental felling after hurricane Kyrill and Ema). The share of coniferous timber ranges more than 90% (of this spruce ca. 75%). Figures of timber felling, felling intensity and total mean increment per 1 ha forest stand area (CPP) are presented in Tab. 1 with the development of timber felling being illustrated in Diagram 1.

Table 1. Timber felling and total average increment

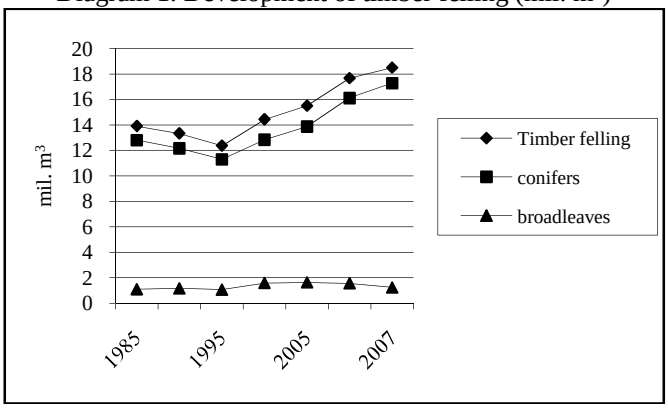
Indicator	Unit	1985	1990	1995	2000	2005	2006	2007
Total timber felling	mil. m^3	13,91	13,33	12,37	14,44	15,51	17,68	18,51
- conifers	mil. m^3	12,82	12,17	11,31	12,85	13,88	16,12	17,28
- broadleaves	mil. m^3	1,09	1,16	1,06	1,59	1,63	1,56	1,23
Felling intensity	m^3/ha forest	5,29	5,07	4,70	5,48	5,86	6,67	6,98
CPP	m^3/ha forest	6,2	6,3	6,4	6,5	6,6	6,7	6,8

Source: Ministry of agriculture of the Czech Republic

The composition of extracted timber is dominated by roundwood assortments (ca. 10 mil. m³) and pulpwood (ca. 6 mil. m³). Remaining supplies consist of other utility timber products including chips and fuel wood. The decisive assortment with an essential influence on the development of timber prices in the Czech Republic is roundwood.

From the view of renewable energy resources is estimated remained 1.6 – 2.3 mil. m3 of unwrought mass on forest area in the Czech Republic (it means branches, tops and other small/top wood). Using of these felling remains should concentrate mainly on commercial forests and under certain condition also some special-purpose forests, e.g. some military forests. [7]

Diagram 1. Development of timber felling (mil. m^3)



In the timber industry of the Czech Republic there the timber processing industry has the largest importance in light of renewable energy resources. In the timber processing industry there is further the most important OKEČ 20100 Sawmill production. Sawmill production is a typical representative of processing in primary production with the highest consumption of wood mass. Main product is sawn timber; shavings, chips, sawdust, etc. are secondary product. In the indicator of revenues from sales of products and services the sawmill production's share in total timber processing industry is about 30 %. [4] Summary of logs sawing and sawn wood production in the Czech Republic is shown in the table 2.

Table 2. Sawing of logs and sawn wood production (thousand of m^3)

Indicator	2000	2004	2005	2006	2007
Sawing of logs	7 170	6 800	6 900	8 650	8 700
Sawn wood production	4 106	3 940	4 003	5 080	5 454
Yield (%)	57,7	57,9	58,0	58,7	62,6

The yield is about 60 % in the case of processing of conifers logs for sawn wood. Chips (the yield 30 %) is suitable for cellulose and chipboards production, sawdust (the yield 10 %) are usable to chipboards production or to energy purposes. Hammer-milled bark is also utilizable for composting or mulching.

3 Utilization and calculation of energetically utilisable biomass in the Moravia-Silesian region

In the year 2007 the Department of forest and wood products economics and policy, from Faculty of forestry and wood technology of Mendel University of agriculture and forestry Brno, worked out Regional forest program for the territory of Moravia-Silesian region. Within this program was also worked up analysis of residues resources from forestry and timber processing industry, including their using for energy purposes. Also Territorial energy conception of the Moravia-Silesian region for the period 2007 – 2013 deals with the problems of renewable energy resources. Based on this conception there is expected decrease of consumption of black coal by 21 %, brown coal by 55 %, coke by 26 %, heating oils by 33 %, natural gas by 10 % and increase of biomass consumption by 61 %. Supposed structure of renewable energy resources shows table 3.

[28] *Timber volumes are reported as the mass of timber to the top of 7 cm outside bark, i.e. at a minimum diameter of 7 cm*
[29] *Average standing volume per forest stand area without clear cuts.*

Table 3. Percent composition of renewable energy resources in the Moravia-Silesian region in 2002

Kind of renewable energy resources	GJ.year^{-1}	Share in %
Solar energy	1 000 000	9
Water energy	300 000	2
Biomass	**8 127 820**	**70**
Biogas	1 593 195	14
Energy of environment	6 300	5

Source: Territorial energy conception

Area of forest stand in total in the Czech Republic is 2592 thousand hectares; of it the territory of Moravia-Silesian region represents 186 thousand hectares. Tables 4.1 and 4.2 enter into detail the forests area according to type of ownership in hectares of stand area.

Table 4.1. State forests in the Moravia-Silesian region and the Czech Republic

State forests	Forests of the Czech Republic	Military forests	Forests of national parks	Regional forests	Other state forests
Moravia-Silesian region	141 325	3 866	0	0	18
Czech Republic	1 233 041	124 904	95 739	3 836	22 728

Source: [5]

Table 4.2. Private forests in the Moravia-Silesian region and the Czech Republic

Private forests	Forests of legal entities	Communal, urban forests	Ecclesiastic forests *	Forests of cooperatives	Forests of individuals
Moravia-Silesian region	980	18 782	76	741	20 003
Czech Republic	56 835	396 946	2 096	32 892	473 538

*Source: [5], * restitution of ecclesiastic forests in the Czech Republic haven't been accomplished yet*

In the Moravia-Silesian region there is total annual timber felling 1472 thousand m3 and annual potential of dendromass from aboveground parts was so established in the amount of 310 thousand tons. It corresponds to energy potential 4030 TJ. But with regard to orographical conditions, truck-hauling distance, concentration of wood residues etc. the real potential was established on 50 %. Summary of energy potential of dendromass in the Moravia-Silesian region according to particular districts are indicated in table 5.

Table 5. Summary of energy potential of dendromass in the Moravia-Silesian region

District	Wood residues and fuel wood (tons.year^{-1})	Energy potential (GJ.rok^{-1})	Real energy potential (GJ.rok^{-1})
Bruntál	116 937	1 517 525	758 763
Frýdek - Místek	99 306	1 288 718	644 359
Karviná	7 625	98 949	49 474
Nový Jičín	32 819	425 905	212 953
Opava	50 441	54 590	327 295
Ostrava - city	3 690	47 884	23 942
Total	310 818	4 033 572	2 016 786

Source: Territorial energy conception

Dalkia, a.s. in Krnov uses biomass as raw material to electric energy production within the Moravia-Silesian region (since 2003). The total power is 100 MW with possibility to burn up to 25 % biomass in the fuel.

Heat energy from biomass is today used for individual heating (most often are burned logs in family houses). Timber factories, blocks of flats and office buildings use biomass fired boiler house. Heating plant Karviná (248 MW) is one of the large plants that burn mix of coal and biomass (20 % biomass).

Biocel Paskov, a.s. is the example of company of timber processing industry in the Moravia-Silesian region that product electric energy. It manufactures about 1.4 million m3 of raw material (1 million m3 of pulp, 400 thousand m3 of chips) and by its technology of bark burning supplies fully own heat demand and 60 % of electric energy need. Similar situation is in the sawmill production of the company Mayer-Melnhof Holz Paskov, s.r.o. The processing capacity is 1 million m3 and within non-waste production the bark is used for energy purposes and sawdust into pellets. Elimination of transport costs in direct chips supplying and common purchase of logs develop competitiveness of both companies.

DISCUSSION

Usually only 60-65 % of produced dendromass volume comes from forests as a stem-wood with bark. Further, forestry evidence encompasses only felling wood without bark. The bark share in tree mass is c. 10%, it means the wood transported from forest represents only a few more than 50 % of produced volume of dendromass. If the timber felling without bark is e.g. 15 million m3 in the Czech Republic then next 15 million m3 dendromass remains theoretically as reserve. Of course, the total quantity is not and never will be usable because of technical, economic and also ecological reasons. There is an estimation that circa 1/3 of this quantity can be usable; it represents more than 5 million m3 dendromass per year. In forests there remain, except felling residues, also mass after cleanings (c. 600 thousand m3 yearly) and mass from first thinnings (c. 825 thousand m3 yearly). But limitation of utilization (max 1/3 volume) is true also of these cases.

Basic costs relations in pricing processes of technologies of forest biomass production are in conditions of the Czech Republic as follows: yarding (mustering) 30 – 35 %, chipping 35 – 40 %, overhead 10 – 15 %, transport 20 – 25 %. It is obvious the most cost-intensive phase of production is the chipping. Situation of energy yields is similar (especially in recalculation of consumption of hydrocarbon fuels – generally diesel). Some authors even refer that balance of energy input

and GJ in output is balanced in the case of forest biomass. Elimination of chipping phase would expressively contribute to effectiveness increase, but it faces burn technologies that are usually installed for bulk material. Eventual modification of heating chamber (e.g. for burning of whole brushwood packs) encounters insufficient guarantee of long-term and balanced supplies (in the case of calculation of energy investments there is usually used 15 year as time of technical and economic utilization).

Cost calculation per effectively gain able 1 GJ heat must be connected with the presumption that every fuel can be burned in different heating chambers of different efficiency. This fact has great impact on final costs per effectively gain able 1 GJ.

CONCLUSION

Using of biomass in member countries of EU differs above all in dependence on biomass occurrence, population density, level of energy development, efficiency of support and other. Energy using of biomass in the Czech Republic is in principle supported. The situation in energy using of dendromass in the Czech Republic in 2006 shows table 6.

Table 6. Energy using of dendromass in the Czech Republic in 2006 (in tons)

Dendromass	For production of electricity	For production of heat	Total
Wood residues, chips and particles	250 150	881 457	1 131 607
Fuel wood	-	54 102	54 102
Briquettes and Pellets	15 519	8 134	23 653
Black liquor	184 619	883 578	1 068 197
Total	450 288	1 827 271	2 277 559
Estimation of wood consumption in households			3 087 549
Export of biomass suitable for energy purposes			516 455
Total of biomass used for energy or exported			5 881 563

Source: [7]

Expanding of forest area and using of wood, both in connection with considerate forestry and reasonable nature protection, gives possibilities how to reduce impacts of global climatic changes and to ensure for society long-term source of ecological and renewable raw material. In decline of interest in agriculture production in less fertile lands (territories) the using of wood for energy purposes gives business opportunity for farmers and forest owners as well as processors of this raw material and also for producers of different heat-power generating equipment.

Efficient and well-considered projects for production and processing of biomass can bring also any more energy to municipalities and country – it is energy of human go-aheadness and surely also prosperities in near future.

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RESEARCH OF INFLUENCE OF CHOSEN TOOLS OF MARKETING MIX ON BEHAVIOUR OF CUSTOMER WHEN CHOOSING THE FURNITURE

Abstract: New market surrounding, that is the result of the transforming society, the knowledge and information allowing understanding the purchasing decision-making and mental processes of this decision-making, are inevitable for producers and salesmen of the furniture commodities and their future development. Only the knowledge of their customers and their expectations will help the producers and sellers to react elastically on their needs and wants in constantly changing surroundings that brings plenty of opportunities. Only those entrepreneurs achieve prosperity who try to get the most complex information about the market, customers and through the own supply they help them to obtain the needful product, in right time, on right place ad for the right price. The success of the marketing program depends on the understanding and knowledge the consumer, his attitudes and values and finding the new ways of consumers' orientation.
Key words: marketing mix, marketing tools, purchasing behaviour, customer, research.

INTRODUCTION

In marketing one of the most discussed question is: „How consumers react on different marketing stimuli which can be used by a firm?" Consumer decision making is conducted with the assistance of various factors that influence final decision. The company that can understand how consumers will react to different variations of product, price and advertising appeals can obtain a great competitive advantage. Only through knowledge of their customers and their expectations producers and traders are able to react flexibly to their needs, wishes in an environment of constantly changing market, which offers many opportunities. Prosperity of the market will be reached by those businesses that try to obtain the most complex information about the market, customers and by their supply they try to help customers to obtain the required product, at the right time, in the right place and right price. According to mentioned ideas the main purpose of the article is to identify the most important tools of marketing mix, which significantly influence the purchasing behaviour of consumers in the market with furniture. In the new market environment, which is a consequence of transforming society, the information and outputs become determinants for understanding the decision-making and mental processes that accompany this decision, as well as for manufacturers of furniture, sellers of commodities and their further development.

RESEARCH OF PURCHASING BEHAVIOUR

The term „purchasing behaviour" can be definied as behaviour, that consumers present when seeking, purchasing, using, evaluating, disposing with products, services and ideas that are expected to satisfy their needs. (Kulčáková, Richterová, 1997)

Consumer behaviour is necessary to examine in the individual stages of purchasing decision-making, as well as in relation to components of marketing mix. We can gain information about customers by several ways (from internal company sources, from market research, etc).

The results, which are presented in the paper, are the output from marketing research, realized in the period October 2007 - March 2008 through questioning. The questionnaire consisted of 9 questions, respondents were asked to answer in writing.

Mostly closed questions were used in the questionnaire. The sample consisted of 750 respondents. For the evaluation we received replies from 696 respondents, representing a 93% return of questionnaires. Elements of the population for research of purchasing behaviour were all inhabitants of the Slovak Republic in the age from 18 years above. Dependent variables in research were gender, age, completed education, economic activity, geographical location and whether they live in a flat or a family house.

Because of determined space we present only chosen results obtained by evaluating the data through cluster analysis, which represents a set of mathematical and statistical techniques used to identify groups of observations, so-called clusters. Cluster analysis deals with how the objects should be included in a group to keep the greatest similarity within the groups and the greatest disparity among groups. It is also used in the market segmentation while classification of consumers is based on a combination of several variables. Variables or segmentation criteria can be: sex, age, education, lifestyle, religion, experience with the product, the size of consumption, frequency of consumption and so on.

RESULTS OF MARKETING RESEARCH

Within the first question the respondents evaluate which factors (material, quality, design, price, availability of a shop and staff in the shop) are decisive when choosing the furniture. The data evaluated by methods of one-sized statistics show that the quality, design and price respondents rate as the most important factors, material as a very significant factor and the availability of store/shop and its staff as moderately important factor.

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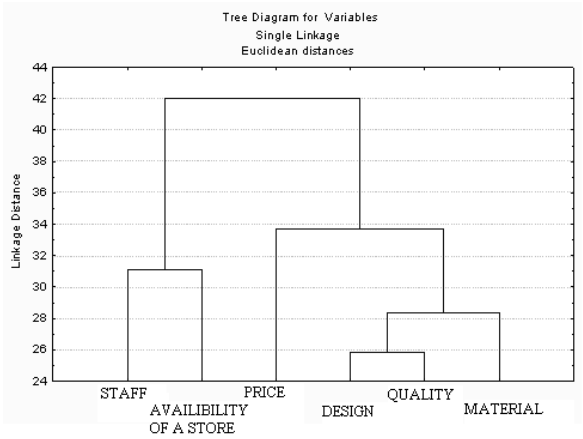
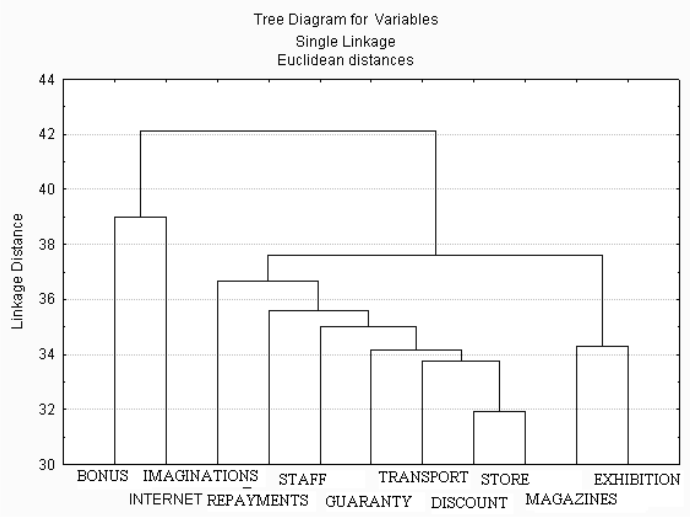


Graph 1. Evaluation of factors influencing the selection of furniture

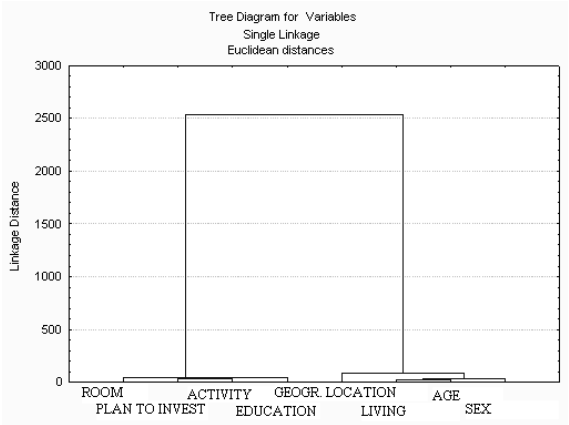
The Graph 1 shows that a separate and as well a very important attribute of the furniture is price. Furniture design, quality and material of which it is made, are a group of properties that affect the customer in accordance with the price. Availability of furniture stores and sales personnel are "outside" decisive factors influencing the customer's concrete decision, although they have their importance.

Therefore the customer in the first place is decided by the character of the furniture, but in case he is determined to buy a product, he is willing to travel in order to purchase it or to overlook the inappropriate behaviour of staff shops, if such a situation occurred.

According to the Graph 2 we can allege that it is important for an educated person to choose the place where he can buy the furniture as well as to get inspiration before buying it. Respondent's economic activity is reflected in choice of specific distribution channel (e.g. pensioners are more likely to buy furniture in hypermarket where they can provide the other purchases as well, businessmen ,except of traditionally furniture specialized shops or markets, like to use more time saving way of buying furniture as catalogue or internet ordering).



Graf 2. Cluster analysis of demographic variables in relation to the distribution and form of communication policy



Graf 3. Cluster analysis of demographic data – intention to invest to new furniture

The influence of other independent variables (geographical location, sex, age of respondent and living standard) which create "cluster of demographic characteristics" has not markedly expressed during selection of the source of inspiration and specific distribution channel but we surely cannot consider it insignificant.

We have got two basic clusters from the comparison of chosen independent variables (age, sex, geographical location, education, living standard and economic activity of respondent) with the plan of investment to specific room furnishing during the next two years. First cluster can be considered as the cluster of respondent's demographic data (geographical location, living standard, sex and age of respondent). Second cluster is the cluster of respondent characteristics that array data including education, his/her economic activity, his/her plan to buy new furniture in the near future and to furnishing of what room is he/her able to invest the most.

According to the mentioned above we can say that the furniture producer should pay attention to who is his /her customer, his/her education, economic activity and based on these information optimize the market supply.

Based on these results as well as the investigation gained by the methods of one-size and multi-size statistics we can deduce following statements:

- Quality, design and price of product are the rated as the most important by the consumer so that it is necessary to pay more attention to the production and distribution of the furniture in the market.
- It is more convenient to publish the furniture offer in the catalogues and furniture exhibitions that was, according to the respondent's opinions, the most appreciated way of advertising eventually the powerful source of inspiration.
- Producers as well as the furniture sales person should try to get the attention of the customer by providing the"extra" services as for example furniture home delivery and its assembly, longer than 2 years (law guaranteed period) guaranty period, discounts, willingness and staff proficiency as well as the ability to pay for the furniture with instalments or take a loan.
- It is necessary to realize that possible customer usually has specific idea and requirements for the furniture before he visits the furniture shop. At the moment of his entrance, staff and the atmosphere in the shop play an important role. The facts mentioned below results to the recommendation especially for the furniture seller to make sure that his /her staff deliver the goods in proper way, it is proficient, knows the furniture that sells to the customer and satisfies the requirements which are in well-developed countries the matter of course but not in Slovak conditions.
- Customer's economic activity reflects on the choice of specific distribution channel so that the producers should consider whose their customers are and according to that place the offer. Except of usual selling way should the producers consider the possibility of catalogue or internet furniture ordering for busy customers forasmuch as it saves the precious time. The other customer group appreciates the possibility of buying the furniture at the places of wider range of goods where they can at the same time make another purchase of different goods.

CONCLUSION

Orientation of marketing on the consumer plays a key role. The success of the marketing program depends on the knowledge and understanding of consumer, his attitudes and values and knowledge of new consumer orientation. The path to the consumer is increasingly difficult. The market segmentation deepens, consumer preferences are changing and they become a broadly diversified when satisfying them. The value orientation of consumers is changing, too. Their application on the market requires better information about consumers, their wishes, changing lifestyles. Creating a marketing program and a combination of marketing mix for each target group presents one of the most serious decisions, in which the marketing staff must rely on knowledge of research and consumer behavior.

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LOW ENERGY CONSUMING OF HARDENING OF LACQUER COATINGS BY MEANS OF UV-LED RADIATORS

Abstract: In the article UV lacquer products were presented, general rules of their hardening, mercury (Hg), gallium (Ga) and UV-LED radiators were characterized, accenting among other things energy matters determining important positions in the structure of costs of presented technology. UV LED radiators with reference to conventional systems need considerably higher investment costs. However thanks to the longer life time, the low application on the energy, to the safety for health of workers overlooking work of equipments and requirements from the range of the environmental protection merit the

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wide promotion and the successive initiation to the industrial practice in different scopes of woodworking industry. In comparison to existing solutions with the use of conventional UV radiators obtained lacquer coatings are characterized the decidedness with higher parameters within the range especially resistances on various factors.
Key words: lacquer product, UV hardening, conventional UV system, UV LED radiator, low energy consuming, cost

1. INTRODUCTION

Finishing of the surface of wood and wood based materials with lacquer products, decides both about displaying of aesthetic-decorative features of produced products, as and give them functional charcteristics, so of the resistance on abiotic factors (climatic, mechanic, thermal and chemical) and biotic, and also the suitable durability. Undertaken over the recent years innovative activities in the field of lacquer products contained a few directions, aiming in the first instance to the improvement of the quality of obtained coatings, in the connection with enlarging of the effectiveness of processing's, at prominent eliminating of unfavourable influences on the environment, so reduce emission of volatile organic compounds (VOC) and industrial waste materials, and also to the assurance of safe working conditions [5, 9, 10]. To all these undertakings integrally actuate also matters concerning of suitable relations of costs, both in the sphere of lacquer products, as and the technology of their applications. From among most intensively drop-down systems the prominent place occupy lacquer products intended to the hardening with radiation methods, with particular reference to techniques using the range of the UV radiation. It was value, that at present in some spheres of the industry, in this also of wood approx. 90% obtained lacquer coatings (e.g. in the production of wooden flooring materials, in technologies of the conventional finishings and printing too) come into being with the using of techniques of the UV radiation [7]. The essential part in the technology of the UV hardening of lacquer products fulfils properly well-chosen radiators (popularly called lamps). Conventional solutions in this regard are characterized very high with energy consuming. Lately were elaborated UV radiators of the new generation in low-energetic solutions with the use of the LED system (Light Emission Diode), proceed simultaneously to the widely conceived program of initiating in the industrial scale. Herein the article UV lacquer products were presented, general rules of their hardening, mercury (Hg), gallium (Ga) and UV-LED radiators were characterized, accenting among other things energy-matters determining important positions in the structure of costs of presented technology.

2. CHARACTERISTICS OF TECHNICAL-ECONOMIC CONDITIONS OF THE USING OF UV LACQUER PRODUCTS

Perspectives of the development of the technology of radiation hardening of lacquer coatings in the significant measure are determined an initiation in EU countries rigorous regulations within the range environmental protections, consequential particularly from reductions of VOC emissions, what an example about the strategic character was the EU SE Directive 1999/13/EC [8]. The qualitative composition of lacquer products cured with the UV radiation differs imprompted of principle from traditional products, first of all in consideration of the specificity of the hardening processes. This process takes place as result of free radical copolymerization reaction, initialized photochemically with the energy of UV radiation at the definite wavelength within the range UVC<280 nm, UVB 280-315 nm and UVA 315÷400 nm. UV lacquer products in the conventional version contained approx. 100% coatings substances, and their commercial viscosity, mostly adapted to techniques of the applying with cylinders is simultaneously a working parameter. UV lacquer products are practical in particulary directions of industrial technological solutions in „on line" version, at velocity crossing already even values 40 m/min. In character the coatings substances are practical usually mixtures of oligomers e.g. on the basis of acrylic polymers or unsaturated polyester resins nad various hybrid systems too, in the arrangement with properly well chosen photoinitiators, and reactive monomers fulfilling simultaneously functions of solvents products the suitable viscosity. Interesting solution introduced in the last years in a great way are waterborne UV lacquer products. They create possibilities of the applying of lacquer products with others various techniques. However their usage is the resoluteness more complicated, because after applying of the lacquer layer, one should from her in relatively mild conditions (temp. <50°C), possibly as soon as possible to vaporize water, what is performed in drying tunnels, in the first stage of the drying-up as result of the heat exchange in the convection process, and then across radiators of the infra-red (IR) radiation within the range MIR-NIR or MOS (Microwave Operating System) systems. Only after the total removal water from painting, were approach the hardening with the UV radiation. Are offered also UV lacquer products with the certain participation of solvents, which before the accession to the hardening one ought also to vaporize from paintings. Generally production of lacquer products cured UV in Europe is estimated on level crossing 30 Gg/r., whereof what one ought to underline greatest quantities are used up by the wood- (approx. 44%) and printing industry (Fig. 1).

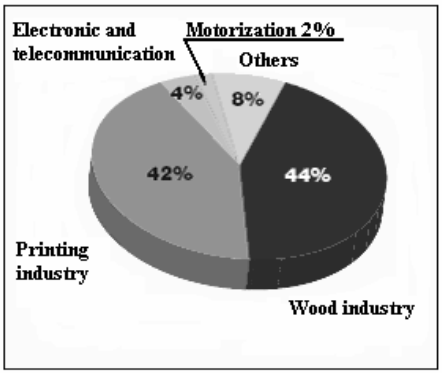

Fig. 1. Structure of the consumption of lacquer products cured with the UV radiation in different directions of industry [7]

Dynamic development of the technology of the UV hardening in different directions of woodworking industry appear not only from legislative requirements connected with the environmental protection, but also with the decidedness better properties of obtained lacquer coatings, and also with consideration of the economic nature. For example the cost of finishing of veneered wood based board surfaces with UV lacquers offered for different technological solutions, can be lower even about above 50% in reference to other conventional products. In the Table 1 example did not take into account costs connected with the VOC emission from NC lacquer products, which determines the more and more greater participation in the general account. Analysing data from Table 1 it is proper to pay attention, that the unit cost of UV lacquer products is relatively significant, however this the whole of technological conditionings decides about the final economic effect. UV lacquer products in comparison with other products affirm little hardening time (Fig. 2), at the resoluteness lower consumption energy (Table 2).

Table 1. Comparison of finishing costs of surfaces with NC and UV lacquer products [1, 2]

Specification			Kind of lacquer products			
			Nitrocellulose (NC)		UV acrylic	
			Producer 1	Producer 2	Producer 1	Producer 2
Solid content		[%]	20	20	100	100
Amount of applying of 2 layers		[g/m^2]	100+100	200+200	30+10	40+10
Position of costs	Lacquer products	[€/kg]	2.50	1.75	6.00	4.25
		[€/m^2]	0.50	0.70	0.24	0.22
	Production surfaces	[€/m^2]	0.03	0.03	0.01	0.01
	Energy		0.06	0.06	0.03	0.03
	Equipment		0.06	0.06	0.03	0.03
	Total		**0.65**	**0.85**	**0.31**	**0.29**
Relative cost		[%]	100	100	48	34

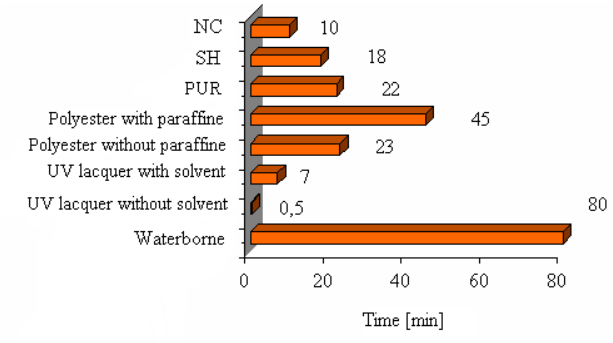

Fig. 2. Comparison of dryings time of coatings from selected lacquer products [6]

Table 2. Comparison of the average consumption of energy for obtainment of coatings from various kinds of lacquer products [6]

Lacquer products	Energy [MJ/m^2]	Relative value
UV lacquers	0.046	1.0
UV putties and enamels	0.160	3.5
Solvent	0.510	11.2
Waterborne	0.760	16.5
Thermosetting	1.100	23.9

farby

3. CONVENTIONAL UV RADIATORS

In technologies of hardening of UV lacquer products in most directions of woodworking industry dominate high compression Hg radiators. Making the selection the given radiator is to requisite the precise dosage the radiation energy, across the suitable selection the power the lamp (60÷120 W/cm lengths of the lamp), what adapted must be adapted in the first sequence to the oligomer-monomer system in the given product, participation (kind-quantity) of the photoinitiator in composition, layered system (substrate, top), transparency (putties, lacquers, enamels), thickness of hardened layer, required properties of coatings and velocity of the conveyer in the technological line. Besides belongs to take into account the spectral characterization of radiant, they're positioning aiming to effective curing of lacquer coating. At this takes part also to make allowance for influence of emitted by lamps of unnecessary in this process IR radiation, both with reference to substrate, as and the course of hardening process. In case of hardening of pigmented products, in form putties and enamels bearing in mind the absorption of energy of UV radiation by some pigments, belongs properly to choose definite wavelengths in spectre of the radiation. In this context producers of lamps properly generate spectrum rate of emission into the required range of the wavelength, thanks to doped of electrodes by means of halides of metals, e.g. Ga, iron (Fe) or wolfram (W).

At present in technologies of the hardening of UV lacquer products in woodworking industry use as basic two kinds of UV radiators, namely Hg and Ga radiators. Depending on construction of radiators, and especially materials from which they became performed they differ with the spectre emission rate. Generally a construction they are nearing to the classical fluorescent lamp, but work within the range other wavelengths and at a lot higher energies. Hg lamps emited the radiation in length of waves 280÷400 nm, and their effective working period carries out usually 1000÷2000 h. Practical they are use to hardening processes of transparent products. In turn lamps Ga were characterized with the higher power and other spectre rate of emission, toward longer waves (within the VIS range), to adapt to the absorption of pigments in this mostly

the titanium dioxide. These radiators were obtains as already were added by the enrichment of classical Hg lamps pair atoms of Ga, Fe and others, which emits waves in length 400÷450 nm [8]. Cycle of their exploitation maximally carries out approx. 3000 h. Practical they are use to hardening of pigmented products applied usually in greater quantities (20÷25 g/m²), what is conditioned this, that pigments show both abilities to the selective absorption of UV radiation energy, as and her reflexions. After the outflow of radiators life time were ought to exchange, what means, that what 3-4 months must be invested over 1000 € on buying of new radiator.

An important part in radiators system is ventilating operations, which not only cool UV lamps, influencing consequently on their long live, but also remove damaining for health, ozone ascendant during the work of radiators. The standard-length of the radiator carries out 130 cm, what for example at the established power 120 W/cm qualifies the demand for energy in values 15.6 kW/lamp, and the plus additionally approx. 40-50% on this quantity absorbs cooling system, what generality demands approx. 22÷23 kW/lamp. So indispensable is work at threats of high tensions and the installation directly next door to of the line of technological different specialistic transformers. With reference to cured coatings this are the dose of the energy on level approx. 4 W/cm². Over lamps places search lights concentrating UV rays on the narrow band of cured surface, what lets on delivering of the suitable dose of the necessary energy operable of hardening process of coatings. Exists also the possibility of regulation of height of lamp position over cured surface, what permits more strongly to concentrate or to disperse the radiation.

Participation of UV radiation of essential from the technical point of view is diverse, because parallel lamps emit the IR radiation, which in this method is completely superfluous. The UV radiation determines in Hg radiator only just approx. 30% spectral part of emitted spectrum [3, 4].

Generally it accepts, that to correct curing of paintings is necessary the definite UV radiation dose. Accordingly is given minimal amount of the required energy (mJ/cm2) to curing of coatings. Depending on kind of lacquer product, amount of spread product, and also the following layer and speed of transporter, dose of photochemical UV energy is shaped usually within the range values 250÷750 mJ/cm2 [8], where at for some products, as e.g. on the base oils this level carries out approx. 1200 mJ/cm2. In this case, if does not obtain minimum-values, one ought to decelerate the conveyer, what automatically lengthens the hardening time.

For improve of effectivity of hardening processes were undertakes activities aiming to prominent limitation of emitted heat. Because is installed dichronic mirrors (so called cold mirrors), which lets pass approx. 85% IR radiations and simultaneously reflect approx. 90% UV radiations, whose parallel bunch is steered on cured painted. Besides constructors of UV lamps perfect shapes of bowl and reflectors. Conventional UV radiators in consideration of connected threats with the occurrence of such metals as Hg and Ga, and also with ozone emission, with the presence of radiation with NIR and a noise of devices are embraced an requirements of RoHS (Restriction of Hazardous Substances), what produces also definite positions of costs within the range their exploitation and the utilization.

4. UV-LED RADIATORS

In last year are initiated to the industrial practice radiators in the version UV LED. Offered solutions are characterized in the relative system with reference to conventional radiators with numerous advantages, in this first of all with the spectral homogeneity, what ties in transfer of the definite photochemical (Fig. 3) energy. Depending on the construction of diodes in form of solid-state matrices, exist in this regard gigantic technical possibilities. Usually on the length of the lamp 130 cm, one places 5 modules (1 module 300 LEDs is installed on the surface 25x25 mm), what permits to obtain the power approx. 140 W/cm lengths of the conventional lamp, at the conscription of energy on the level 50%. In account on the surface of cured coatings are attained doses of the energy on level of value approx. 8 W/cm². An advantage of UV LED radiators is their very universal character. It can carry hardening processes with different intensity, inclusive of with the effect full cure, and also with the deep hardening with elimination of connections threats with the issue of monomers and photosensitizers. UV LED radiators create wide possibilities within the range their locations in technological lines, with the possibility of installation in the coordinate X/Y system, with creation of systems mobile or of cascade. From the point of view of the properties of coatings is profitable similarly anyway as in case of conventional radiants leadership of hardening process in the atmosphere CO2. In some technical solutions between the UV LED radiator and cured coating are installed special helping gas-framings in form of special filters being full screens with transfluent nitrogen. At conveyor velocity 25 m/min, application on N2 is estimated on level 70 dm3/min. In Table 3 were taken down chosen characteristic parameters for conventional radiators, and in the UV LED version.

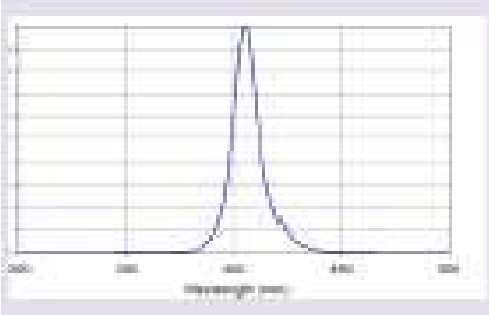

Fig. 3. Example- spectral decomposition in the UV LED radiator [4]

Table 3. Comparison of chosen characteristics for conventional UV- and UV LED radiators [4]

Specification	Kind of UV radiator	
	Conventional	UV LED
Energy cost [%]	100	< 50
Ventilation system	Required	Not required
Life time of radiators [h]	2000÷3000	> 50.000 (to 100.000)
Required necessary time for the correct work of the radiator	From several to tens [min]	[ms]
Possibilities within the range of visual hermetic of the radiator [%]	30 (10) bis 100	0÷100
Mass/measurements of the construction	High/threedimensional	Low/small
Safety/Danger		
→ fire hazard	Yes	No
→ high tension of the power supply	Yes	No
→ environment	Obligatory definite instructions	Friendly (no threats)
→ amount of delivered CO_2 [%]	100	< 50
→ presence of metals (Hg, Ga)	Yes	No
→ ozone and UVB and UVC radiator emission	Yes	No
→ rigours of the RoHS directive	Yes	No

The UV technology based on LED systems with compare to conventional lamps is better also both from economic, as and from the ecological point of view. She is characterized with the clearly lower level of the electrical energy to the power supply, with the entire elimination of superfluous in hardening process of warm and with very long life time. UV-LED systems show the life time averagely from 40 000 to 100 000 h, what determines with reference to this last value approx. 14 years of the continuous activity 24 h/day. In guaranteed exploitation time of UV LED lamps, does not follow any, which fall of their power. UV LED lamps can be engaged or switched off even on several seconds, without no matter which technical perturbations. Is not because the need of warming of lamps, and during work follows formation of only minimum-quantities of warm. In turn for the correct functionate of conventional UV lamp takes part every time to intend at least several minutes. No matter which pause among each technological operations causing the disconnection of the conventional lamp, shortens her life time on the average about approx. 2 h. The operating temperature of the UV-LED system carries out usually below 35°C, while in case of traditional UV lamps this is about 500°C. In case of UV LED lamps exists the technical possibility within the range their cooling with the affected circulation of water. At the use of UV-LED radiators unnecessary become so systems of cooling lamps and ventilations of rooms and installation of dichronic mirrors. Besides the UV-LED technology is friendly to the environment, because there is no ozone emissions, and radiators are not embraced legislative adjustments within the range RoHS instructions [1-4].

5. RECAPITULATION

UV LED radiators with reference to conventional systems need considerably higher investment costs. However thanks to the longer life time, to the low application on the energy, to the safety for health of workers overlooking work of equipments and requirements from the range of the environmental protection merit the wide promotion and the successive initiation to the industrial practice in different scopes of woodworking industry. In comparison to existing solutions with the use of conventional UV radiators obtained lacquer coatings are characterized the decidedness with higher parameters within the range especially resistances on various factors.

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Wojciech Lis[32]

ANALYSIS OF ENERGY USAGE FOR HEATING A DETACHED HOUSE

Abstract: On average 61% of consumed energy is being allotted for central heating and preparation of hot water, which are usually done using the same energy carrier. The analysis of annual energy consumption in the year by an individual household has been carried out.
Key words: energy, heating, seasonal usage

INTRODUCTION

Energy consumed by households in Poland constitutes about 27% of total national energy usage, that is the second largest share right after industry using 29% of its supplies and before transport using around 20% of its resources (in accordance with the data published by Central Statistical Office). An average Polish household uses the largest share of energy - 53% for heating (car uses 31%, hot water and electric appliances use 8% each) [Bankier 2009].

The most important for energy balance as well as home budget is using energy for heating rooms. It depends mainly on the building insulation: in an old residential quarter – about 220 kWh/m^2 is used, in traditional building possessing a better thermal standard only 120 kWh/m^2 is used, while energy-saving building consumes only around 70 kWh/m^2. Additional building insulation and limiting loss of central heating is the main form of energy saving, being also the most important source of lowering heating costs.

In the paper the analysis of annual energy consumption by an individual household has been carried out on the example of energy used by a detached house heated by nitrogen-rich gas GZ-35 at the same time using the carrier for heating water and cooking. The analysis does not account for energy used by a car and electric appliances.

LOSS OF HEAT IN A BUILDING VERSUS CLIMATE

Usage of energy carriers for central heating to a large extend depends on energy loss. Energy is lost via: ventilation (30-40%), outer walls (20-30%), windows (15-25%), roof (10-25%) and basement (3-6)%. Natural heat loss via windows is the result of their arrangement in a building. The biggest loss goes through windows located on the side facing North then facing West, next facing East and the smallest loss goes through the southern side additionally compensated on sunny days by greenhouse effect, which in summer season may be very troublesome or even demanding cooling rooms [Bartosik 2008].

Loss via windows apart from natural loss being the result of their position in relation to the directions of the world, is to a large extend created due to their technical condition, degree of exploitation, inadequate maintenance or lack of cleanness. It mainly concerns old, rarely painted, badly maintained or not renovated wooden windows.

The fastest to deteriorate and to be degraded by atmospheric conditions are windows located on the southern side that is the ones exposed to the sun for the longest period of time and put at risk of the largest daily temperature variations. The vicinity of Poznan, which has been the subject of that research, ranks among the sunnier regions of Poland, and its growing season lasts 210 - 220 days. On average the growing season in Poland lasts about 200 days [Atlas 2005]

Also the windows facing West deteriorate rather intensively, mainly due to wind and rain (western and in the summer north-west winds predominate in Poland). In the vicinity of Poznan an average wind speed ranks among the fastest in Poland and reaches on average 4-5 m/s, which equals 3°B (degrees on Beaufort scale – scale used for measuring wind speed; 3°B – is the speed in the range between 3,4 - 5,4 m/s, it describes mild wind, which is characterized by constant movement of leaves and twigs while the wind unfurls light flags [Retallack 1991]. Whereas the impact of rainfall on windows deterioration is for domestic conditions rather moderate as Wielkopolska water balance belongs to the worst in the whole of Poland and the shortage of precipitation is the biggest, the rainfall in the area of Poznan does not exceed 500 mm per year while an average total rainfall for the whole of Poland is 700 mm.

The third in row to be the most exposed to atmospheric conditions are eastern windows, especially degraded in winter as eastern winds predominate during that season. However in winter diurnal range of temperature which is of key importance is significantly lower than in summer.

The windows located on the northern side of a building are the least worn out by atmospheric conditions as this side is favoured by the most stable conditions and the impact of sun, wind, rainfall and differences in temperature is relatively the smallest.

Energy balance of detached houses is mainly conditioned by basic features of Polish climate: big variety and changeability of weather by the day, irregularity of the course and occurrence of 6 seasons: early spring (it starts at the end of February and the beginning of March lasting for about a month with and average diurnal range of temperature between 0°C and 5°), spring (it starts at the end of March and the beginning of April, lasting for about 60 days with an average diurnal range of temperature between 5°C and 15°C), summer (it starts in May and lasts for about 4 months with the temperature of over 20°C), autumn (it starts at the end of August and the beginning of September, the temperature varies from 15°C to even 5°C; not every year yet almost always around mid-September it gets warm, sunny and the beautiful Indian summer comes, it is the time of a so called Polish golden autumn while the end of autumn brings rain and foul weather, early winter (leaves fell from the trees already, days become shorter, temperature drops below 5°C, it lasts for about six weeks), winter (lasting from 2 months by the sea and in the west up to 3-4 months in northeast) [Atlas 2005].

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Within the range of seasons and temperatures various abnormal weather conditions often occur (for example in January 1982 in 24 hours the temperature in Włocławek dropped from 8°C to -20°C, that is the diurnal range of temperature amounted to 28°C) [Atlas 2005]. This significant changeability makes an important feature of Polish climate. It is especially true for early spring (it may so happen that the season starts at the beginning of February) and spring. In our country one talks about spring months: ,,ne'er cast a clout till May be out", or: ,,March comes in like a lion and goes out like a lamb".

Climate and weather are mainly conditioned by air masses coming over our country. Those are mainly masses of polar and sea air coming from the West for on average 60% of days each year, bringing clouds and rainfall in summer, late autumn and early spring. Masses of polar and continental air come from the East for 30% of days per year bringing sunny weather (frosty or hot) in winter and spring. Of smaller impact are masses of arctic air coming from the North for 5% of days each year, bringing the drop of temperature and heavy snowfall mainly in January and February as well as masses of tropical air coming from the South also for 5% of the days each year bringing beautiful sunny weather in autumn (Polish golden autumn) [Atlas 2005].

SEASONAL USAGE OF ENERGY CARRIERS

Due to a structure of energy carriers usage (53% used for heating and 61% including hot water) – the biggest consumption takes place in winter season embracing early winter, winter and early spring. In Table 2 - it is 86,53%, as it is calculated excluding the energy used for a car and electric appliances. Household energy consumption is especially large during the coldest in our climate winter months: December, January (the coldest month in Poland) and in February. In table 1 - 38,64% of annual gas usage falls in winter. The lowest temperature in Poznan recorded on 14.01.1987 reached -28,5°C (in Poland – record temperature of -41,0°C was noted in Siedlce, on 11.01.1940).

The lowest energy usage takes place in summer months: June, July, August (Table 1 - 3,10%). The highest temperature in Poznan was noted on 29.07.1921 and amounted to+38,7°C (10.08.1992 +37,0°C; In Poland +40,2°C was recorded on 29.07.1921 in Prószków 10 km south of Opole) [Atlas 2005].

Table 1. Usage of nitrogen-rich gas Ls (GZ-35) throughout the year in accounting periods (seasons)

Period	winter **1**				in year %	early spring **2**				in year %	spring **3**				in year %
Year	15.12 m³	days	m³/day	15.02 zł		15.02 m³	days	m³/ day	15.04 zł		15.04 m³	days	m³/ day	15.06 zł	
2003	2747	82	33,5	1744,63	54,22	865	42	20,6	575,94	17,07	284	58	4,897	215,15	5,61
2004	1408	61	23,08	930,89	38,18	1040	57	18,25	698,24	28,20	270	58	4,655	211,44	7,32
2005	1237	63	19,63	840,52	34,27	1120	58	19,31	776,14	31,02	298	61	4,885	236,42	8,25
2006	1690	63	26,83	1341,72	45,24	952	55	17,31	803,64	25,48	270	66	4,091	277,48	7,23
2007	1301	67	19,42	1208,35	37,34	872	64	13,63	841,40	25,03	85	63	1,349	124,08	2,44
2008	1451	57	25,46	1369,14	37,95	1013	70	14,47	976,53	26,50	128	57	2,246	212,45	3,35
2009	1881	64	29,39	2156,73		500	49	10,20	581,82		243	66	3,682	349,04	
razem	7087	311	-	5690,62	35,54	4997	304	-	4095,95	24,14	1051	305	-	1061,87	2,63
średnio	1417	62	22,79	1138,1	**38,64**	999,4	61	16,44	819,19	27,24	210,2	61	3,446	212,37	5,73
Period	summer **4**				in year %	autumn **5**				in year %	early winter **6**				in year %
Year	15.06 m³	days	m³/day	15.08 zł		15.08 m³	days	m³/day	15.10 zł		15.10 m³	days	m³/day	15.12 zł	
2003	144	64	2,25	128,22	2,84	133	63	2,111	122,58	2,63	893	61	14,64	605,31	17,63
2004	152	63	2,413	136,84	4,12	156	67	2,328	139,37	4,23	662	56	11,82	459,27	17,95
2005	116	60	1,933	119,61	3,21	111	68	1,632	118,03	3,07	728	62	11,74	571,87	20,17
2006	103	61	1,689	134,68	2,76	134	62	2,161	161,19	3,59	587	55	10,67	548,55	15,71
2007	106	66	1,606	143,22	3,04	203	57	3,561	231,63	5,83	917	62	14,79	882,41	26,32
2008	92	62	1,484	176,37	2,41	304	61	4,984	388,82	7,95	835	64	13,05	980,50	21,84
Together	569	312	-	710,72		908	315	-	1039,04	1,85	3729	299	-	3442,60	17,23
Middle	113,8	62	1,824	142,14	**3,10**	181,6	63	2,883	207,808	4,95	745,8	60	12,47	688,52	20,33

Source: Self research

Table 2. Usage of nitrogen-rich gas Ls (GZ-35) throughout the all year and in the winter seasons – years 2004-2008

Period	Accounting year (calendar year)						Winter season (early winter previous calendar year, winter and early spring analysing year)						In the year
Year	15.12. m³	zł	days	zł/m³	m³/day	15.12. zł/day	15.10. m³	zł	days	zł/m³	m³/day	15.04. zł/day	%
2003	5066	3392	370	0,670	13,69	9,17							
2004	3688	2576	362	0,698	10,19	7,12	3341	2234	179	0,669	18,66	12,48	90,59
2005	3610	2663	372	0,738	9,70	7,16	3019	2076	177	0,688	17,06	11,73	83,63
2006	3736	3267	362	0,874	10,32	9,02	3370	2717	180	0,806	18,72	15,09	90,20
2007	3484	3431	379	0,985	9,19	9,05	2760	2598	186	0,941	14,84	13,97	79,22
2008	3823	4104	371	1,074	10,30	11,06	3381	3228	189	0,955	17,89	17,08	88,44
2009							3216	3719	177	1,156	18,17	21,01	
Together	18341	16041	1846	0,87	9,94	8,69	15871	12853	911	0,70	17,42	14,11	77,23+4,48=**81,71**
Middle	3668	3208	369				3174	2571	182				**86,53**

Source: Self research

Average annual temperature in Wielkopolska Lowland reaches 8-10°C, while in the centre of Wielkopolska Region it is 8°C; average annual temperatures in Poland amount to 7-8,5°C.

Cost of heating a building becomes for the owners ever more important parameter especially that Municipal Councils issue decisions concerning development of new houses built within town borders, where they specify that heating a building may be carried out using only so called environment-friendly fuels. Among those fuels there are: gas, electricity, fuel oil and renewable energy sources. In such areas it is not allowed to heat using coal. It also concerns the area where the analysed detached house is located.

Natural gas is the most popular acceptable energy carrier in city centres. In Polish gas tariffs there are two kinds of natural gas:

- nitrogen-rich gas (GZ-25, GZ-30, GZ-35, GZ-41,5) – comes from domestic sources and
- high-methane gas (GZ-50) – mainly imported from Russia and from domestic resources located in the southern part of Poland.

So called tariff heat of combustion for the most popular types of gas supplied to individual clients amounts to 26,0 MJ/m3 for nitrogen-rich gas and 38,147 MJ/m3 for high-methane gas. Combustion heat of representative high-methane gas is almost 47% higher and high-methane gas: GZ-50 is more cost-efficient than nitrogen-rich gas: GZ-35.

In the analysis carried out in the article price changes for the third tariff group have been defined. It is so called tariff: Z-3 – allocated for individual recipients connected to distribution network, annually using about 4 200 m3 of natural gas for heating, warming water as well as the preparation of meals. In total, there are 12 tariffs in Poland from Z-1 to Z-12 for nitrogen-rich gas and from W-1 to W-12 for high-methane gas.

ANALYSIS OF ENERGY USAGE THROUGHOUT THE YEAR

Table 1 contains a detailed analysis of energy carriers being used throughout the year on the example of a detached house heated using nitrogen-rich gas Ls (GZ-35) in the period of 5 years (between 2004 and 2008).

In accordance with the rules of reading gas meters by fuel suppliers – year is divided into 6 accounting periods beginning on the 15th day of even months (February, April, June, August, October, December). Those periods correspond to some extend with the previously described seasons: early winter, winter, early spring, spring, summer and autumn accounting for an earlier signalled abnormalities and significant changeability of Polish climate.

The highest gas consumption takes place between 15th December and 15th February that is in winter. For the house analysed in Table 1 it amounts to, on average, 38,64% of total annual usage out of which 35,54% is used for heating purposes. Next is the period between 15th February and 15th of April, which is traditionally an early spring in Poland. An average gas consumption then amounts to 27,24%, out of which 24,14% goes for heating. Additionally, the period between 15th October and 15th December has been defined as winter season always belonging to the previous calendar year to keep the continuity of winter season. Then gas usage amounts to, on average, 20,33%, where 17,23% of that fuel is used for heating.

In the whole winter season, in the analysed house 86,53% of gas is consumed out of which 77,23% is used for heating purposes (Table 2). Gas usage for heating amounts to 81,71% annually. In the season traditionally called summer (from 15th April till 15th October) 4,48% of gas is used for heating. Out of which 2,63%, in spring (traditionally from 15th April till 15th June) and 1,85% in autumn (traditionally from 15th August till 15th October)

Average gas usage in the middle of the summer (from 15th June till 15th August) is rather small because then gas is used exclusively for heating water and preparation of meals. Summer combustion amounts to 3,10% of total annual gas usage. To calculate the amount of gas being used for heating rooms only, in each of the remaining 5 accounting periods (from 15th August till 15th June of the following year) this amount (3,10%) has been deducted from the total gas combustion. The calculation of gas used solely for heating purposes in the analysed period was carried out diminishing total usage in the given time by deducting an average summer consumption (3,10%).

The cost of gas fuel was also calculated in Tables 1 and 2. It has been taken into account that gas price for a client is determined by 4 elements, stipulated on the bills by gas providers:

- amount due for gas fuel- in the researched period prices changed: from 0,3075 zł/m^3 on 05.12.2002 to 0,5966 zł/m^3 on 26.06.2009, that is 194%. It is the only element which price at the time slightly decreased. Namely on 01.06.2009 the price dropped from 0,6474 zł/m^3, that is over 8,5%. Before June decrease the increase in price for gas fuel amounted to almost 211%.
- amount due for licence – increase from 5,9 zł/month on 05.12.2002 to 7,1 zł/month on 26.06.2009, that is 120%.
- gas mains fixed charge – increase from 10 zł/month on 05.12.2002 to 27,4 zł/month on 26.06.2009, that is 274%.
- gas mains variable charge – increase in unit price from 0,2015 zł/m^3 on 05.12.2002 to 0,2687 zł/m^3 on 26.06.2009, that is 133%.

The biggest increase has been noted in gas mains fixed charge (274%), what is the least advantageous for small recipients using little gas as the fixed costs are then spread over a small number of gas units (cubic meters). It is not a seasonal figure being charged regardless of the period of the year.

Unit prices of all those elements have been changing systematically – always growing in the analysed period (between 2003 and 2008) – giving an average unit price of nitrogen-rich gas in the household under the research from, on average, 0,67 zł/m3 to 1,074 zł/m3. In the analysed period the increase amounted to over 160%. In winter seasons the growth was even higher. In the seasons from 2004 till 2009 it amounted to almost 173% from on average 0,669 zł/m3 in winter season beginning on 15th October 2003 to 1,156 zł/m3 in winter season ending 15th April 2009 (Table 2).

The cost of gas consumption by the owners of the detached house under the research between 2004 and 2008 reached, on average, 3208 zł (in current annual prices that is excluding inflation), at an average annual nitrogen-rich gas Ls (GZ-35) usage of 3668 m3 which is equal to: 0,87 zł/m3, 9,94 m3/day and 8,69 zł/day. In winter season an average gas cost reached 2571 zł and an average usage came to 3174 m3; which is equal to: 0,70 zł/m3, 17,42 m3/day and 14,11 zł/day (Table 2).

In August the analysed recipient was switched by the supplier to high-methane gas GZ-50 and was given tariff W-3 – allocated for individual clients connected to distribution network using annually about 3 500 m3 of natural gas – for heating, warming water and meals preparation.

SUMMARY AND CONCLUSIONS

Households use the majority of energy carriers for heating rooms. In the analysed conditions it was almost 82% of annually consumed energy excluding a car and electric appliances. Usage in winter season constitutes almost 87%, out of which over 77% of annual consumption is allotted for heating purposes. Rapidly growing prices of all types of energy (for example the analysed gas in the last five calendar years became 160% more expensive and 173% more expensive over the last 6 winter seasons) make the search for other than traditional energy carriers very profitable.

However for Polish households energy balance of the highest significance might be only those energy carriers which can be exploited from 15th October till 15th April of the following year that is in early winter, winter and early spring – the periods commonly however traditionally regarded as winter season. Therefore, of smaller significance are so called green energy sources such as solar energy which usage in that period, taking into consideration the contemporary engineering development and technology, is rather limited. Of bigger significance might be wind energy (it is however necessary to possess alternative sources satisfying 100% of peak demand) as well as conversion of biomass including wood waste and the products obtained from its processing – briquettes and pellet.

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THE APPLICATION OF RENEWABLE ENERGY SOURCES IN HOUSING DEVELOPMENT

Abstract: The issues of implementing renewable sources can be examined both globally as well as in terms of particular branches of the indsutry and fields of life. Renewable energy sources are successfully implemented in, for example, housing development. For some time now, they have been applied in modern and environment-friendly single-family housing development. It is increasingly visible that developers, who are in charge of building residential estates, pay careful attention to not only the technology and costs of construction, but also maintenance costs.
Key words: energy sources, renewable energy, housing development

INTRODUCTION

The 90s of the previous century were a period of increased interest in alternative sources of energy. They have been generally divided into two categories: renewable and non-renewable. The non-renewable energy includes mineral fossil fuel (hard coal and brown coal, crude oil and gas), whose intensive exploitation leads to systematic exhaustion. Meanwhile, the main advantage of renewable energy sources (RES), also called alternative, is that they never use up in the process of exploitation, whereas their application does not deplete future generation of energy resources

In Poland, renewable energy sources were formally defined in the Energy Law act of April 1997. In compliance with article 3 point 20 of the act, "renewable energy source - a source, which during processing, makes use of the energy of wind, solar radiation, geothermal energy, waves, currents and sea tides, river drop as well as energy generated from biomass, municipal solid waste biogas and gas produced in the process of carrying away or treating sewage, or decomposition of vegetable and animal remains."[6].

RENEWABLE ENERGY SOURCES

Renewable energy sources include primarily:

- sources, in which turbines are propelled by water (water power plants making use of altitude differences, i.e. drop of water, and water wheels propelled by the energy of sea currents, tides and waves);
- sources making use of the power of wind (windmills – wind turbines);
- sources making use of solar energy (photovoltaic energy conversion – photovoltaic cells, also called solar cells, used for direct conversion of solar radiation energy into electrical energy, and photothermal conversion, which consists in transforming solar energy into thermal energy);
- geothermal energy (geothermal energy, which consists in making use of thermal energy located inside Earth; heat pumps based on the same model of circulation as in the case of cooling circulation, which enables generation of heat to warm and cool rooms, or produce warm municipal water. A heat pump is one of the least expensive sources of energy, which requires no maintenance. It uses energy from the environment (air, water, ground) to heat buildings);
- biogas, which is produced in the process of oxygen-free fermentation of organic waste; organic substances are decomposed by bacteria into simple compounds;
- biomass – heat, which can be either used directly or processed into other forms of energy, e.g. electrical energy, is generated through combustion of biomass or products of biomass decomposition.

Energy consumers have been interested in renewable sources for a long time. The energy crisis of 1973 was the critical moment, which enabled decisions connected with energy diversification. That year, due to rocketing prices of crude oil, its consumption restrictions and savings started to be introduced [8].

In the field of renewable energy sources, Poland has quite a potential, although the sources are exploited only to a small extent. Such a situation is caused by a series of barriers hindering the application of renewable energy. Besides financial matters, they also include technical, organisational and legal issues. The share of renewable energy sources in the global fuel and energy balance amounted to approx. 18% at the end of last year; in the European Union it was 6%, whereas in Poland merely 2.5% [5].

THE IMPORTANCE OF RENEWABLE ENERGY

Becoming independent from conventional energy sources and increasing energy security are some of the elements of the European Union's energy policy. The main idea of the policy is to create and develop trans-European networks. Such networks include both power as well as gas grids. The main aim of the project, besides increased energy security, is to improve the effectiveness of the internal market as far as power engineering and increased competitiveness are concerned. This aspect is particularly important if we take into account the fact that 57% of the delivered energy material comes from one supplier only, i.e. Russia [1].

Most definitely, improved effectiveness of energy resources exploitation as well as better environment parameters (thanks to the reduction of pollutants released to the atmosphere, underground water or constituting post-production waste) are some of the factors that weigh in favour of renewable energy sources. Rational utilisation of local renewable sources is also influenced by changes in the energy balance.

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Environment-friendly solutions in building development have been used all over the world for many years. In Poland, they became increasingly popular when EU funds were made available. Therefore, the direction determined by economically developed countries is also possible for Poland. It is of utmost importance to learn about all the opportunities connected with the utilisation of environment-friendly energy in housing development, as well as seek new and cost-effective solutions.

Figure 1 presents the predicted share of various sources energy within the space of years 1900 - 2050.

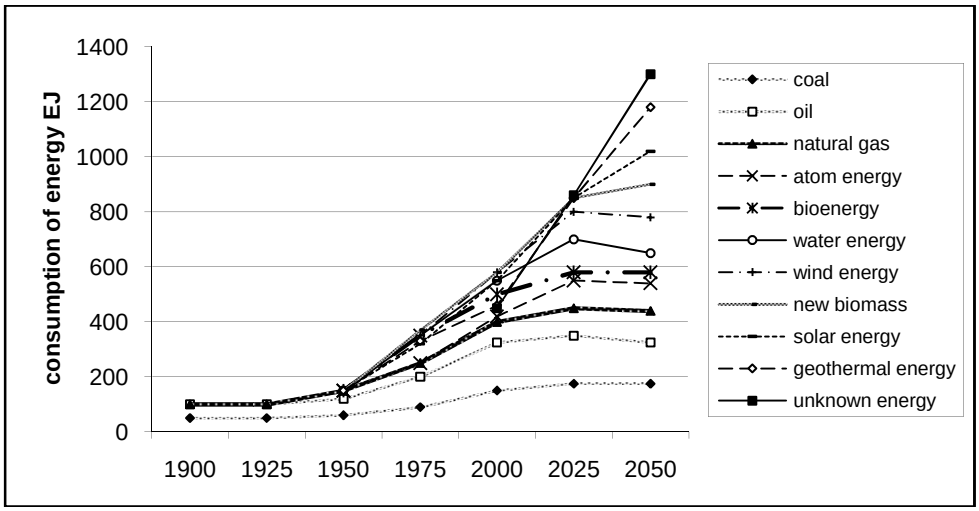

Fig. 1. Share of various energy sources within the space of years 1900 – 2050.
Source: Own study based on [9]

Based on the above figure, systematic increase of demand for all types of energy is forecast in the coming decades. However, within the next several dozen years, experts predict distinct increase of renewable energy consumption, especially geothermal, solar and wind energy. Because of the fact that the issues connected with utilisation of various types of renewable energy are extensive, this article focuses only on the use of solar energy.

THE APPLICATION OF SOLAR ENERGY IN HOUSEHOLDS

Potentially, the housing industry, characterised by fairly extensive demand for energy, may be one of the largest recipients of energy generated from renewable sources. According to a project concerning the use of renewable energy, which is carried out by the German government at the moment, almost one third of the energy consumed in Germany is used by households. Therefore, it has been established that, in prospect, about 14% of the energy assigned for heating buildings is supposed to come from renewable sources [11].

There are cities where "solar estates" have already been constructed, for example Solar City Amorbach in Neckarsulm, Germany, or Drake Landing Solar Community in Okotoks in the province of Alberta, near Calgary, Canada. In the Amorbach estate, built for approximately 2,000 residents, half of the energy used to heat houses, schools and a shopping centre will be produced by solar collectors with a total area of 12,000 m2, which in turn will allow reducing CO2 emission by 80% [12]. In Okotoks, the energy generated by solar collectors for 52 houses is gathered and collected during the summer in special seasonal storehouses, which provide 90% of heating energy and 60% of energy necessary to supply hot water [10]. The scheme of thermal energy delivery from solar collectors and energy storage is presented in figure 2, whereas energy consumption to heat rooms and warm up water is presented in figure 3.

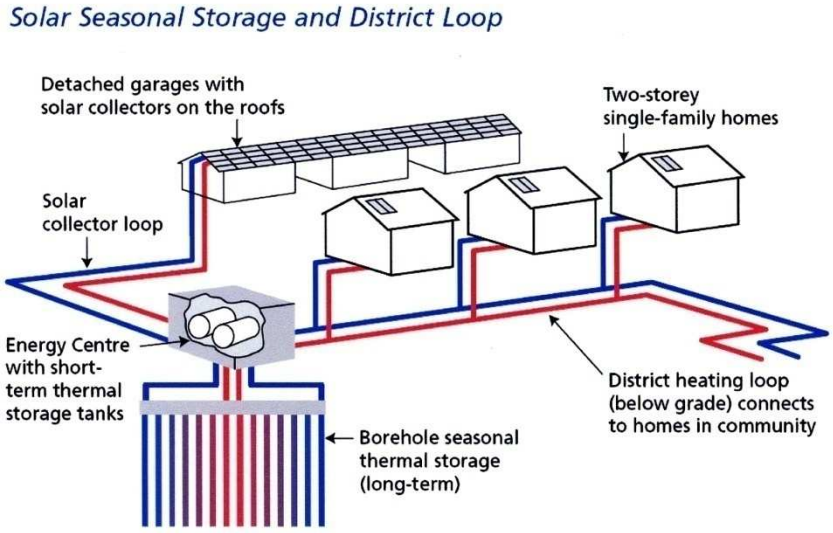

Fig. 2. Collection and storage of solar energy.

Source: [10]

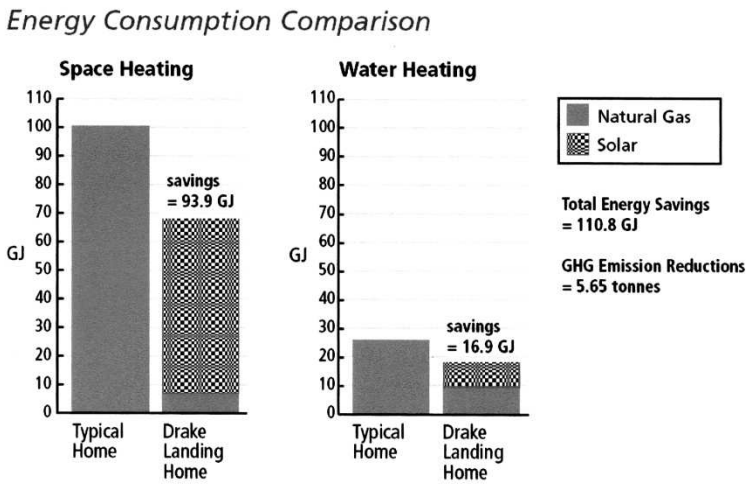

Fig. 3. Comparison of energy consumption at Drake Landing Solar Community in Okotoks
Source: [10]

Two methods of solar energy consumption are commonly known, i.e. processing solar radiation energy into heat or into electrical energy. The application of solar radiation energy to heat buildings is still scarce in Poland. Taking inventory of national implementations of solar systems is difficult, as these are basically small or insignificant units. It is estimated that approximately 10,000 m2 of air collectors and about 1,500 m2 of liquid collectors used to heat up tap water were installed by 1997 [4].

However, solar energy can be used in an array of applications – processing solar radiation energy into thermal energy to warm up buildings, especially during spring/autumn and in winter, as well as solar energy utilisation to heat tap water.

No matter how enormous the potential energy of the sun is, its exploitation requires proper conditions. Land insolation, which restricts the possibilities of solar energy use, is the most important condition.

Generally, in Poland, good conditions for the use of solar energy are present; however, the level of insolation (the amount of solar energy reaching a given unit of area in a specific time) varies throughout the year. The full energy value of solar radiation totals from 900 kWh/m2 per year to 1200 kWh/m2 per year (between 8 am and 4 pm during a day, the sun delivers approx. 4.8 kWh/m2) [3].

The level of insolation limits the possibility of using solar energy to heat buildings, because during a heating season, which usually lasts half a year, only some 20% of total insolation reaches the area of the country.

Table 1 shows the level of insolation for particular regions of Poland [2, 7].

Table 1. Level of insolation for particular regions of Poland

Region	Year January-December	Summer half-year April-September	Winter half-year October-March	Summer season Juni-August
	kWh/m^2			
seaside zone	1076	881	195	497
eastern part of Poland	1081	821	260	461
central part of Poland	985	785	200	449
western part of Poland	985	785	204	438
southern part of Poland	962	682	280	373

Source: Own study based on [9]

The presented data show that any amount of solar energy reaching Poland during a year is sufficient; however, it may be inadequate in winter to ensure proper level of buildings heating. Still, it only concerns buildings characterised by low energy classes, which require much more energy to guarantee sufficient heating. In the case of passive buildings, utilisation of solar heating is enough to ensure complete thermal comfort. Regardless of the season, solar energy can be collected in solar collectors and used to warm up water or as auxiliary source of heating [9].

SUMMARY

Renewable energy sources play an important role in the energy security of countries which depend on the import of conventional materials. Propagation of renewable energy brings measurable benefits to local communities and contributes to the development of a given region. Additionally, reduced environment pollution is an important factor in favour of this type of energy.

Solar energy provides many opportunities. The above-mentioned approaches and examples of solar energy exploitation are just a small part of all possible variants. Despite the necessity of making substantial investment expenses at the initial stages, renewable energy sources start to be increasingly popular around the globe.

In many countries, solar collectors or wind farm produce energy sufficient to supply entire housing estates. So far, the solutions used by Polish investors have been much simpler, although solar collectors can be found on buildings much more often than a few years ago.

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INNOVATIONS IN POLAND, THE EUROPEAN UNION, EUROPE AND THE WORLD

Abstract: Innovations generate savings and at the same time enable small and medium-sized companies to have competitive advantage on the market. Building globally applicable mechanisms is also of great importance. These are the most important prospects ahead of an electronic economy and they simultaneously constitute an opportunity for the development of many countries, including Poland. In order to develop modern technologies, efficient company management is important, as well as making use of clients' experience and creating new solutions taking their needs, opportunities and problems into account. The article presents the status of innovation and the influence of demographic development, innovations financing and R&D activities on a long-term strategy for the social and economic development in Poland, Europe and around the world.
Key words: innovations, research and development, financing

INTRODUCTION

Globalisation, increasing market requirements, technological advancement, shortened life cycle of products; these are the factors that force enterprises to improve their organisational structures, especially by means of IT technologies and innovation. In the 21st century, innovations – in particular Information Technology systems and the Internet – have become an essential tool supporting and facilitating the work of every enterprise. Modern IT systems that help management are a necessity at every company. The development of state-of-the-art information technologies is of significant importance for the Polish wood industry, and introducing innovations at Polish enterprises specialising in wood processing is the fastest way to make up for the lost years.

INNOVATION IN POLAND AS COMPARED TO EUROPE AND THE WORLD

If compared with other countries, Poland looks bad. In terms of innovation, we will probably reach the level of medium-sized countries in some 20 years. In Poland, the level of education of the young (measured with the secondary school graduates index), budget expenses on innovation (figure 1 – although they are systematically reduced) as well as the number of new products launched on the market are pretty good. Meanwhile, the expenses allotted by enterprises to research and development (figure 1 – although they increase gradually), the availability of venture capital and activity of inventors (measured by the number of patents – table 1) are much below average.

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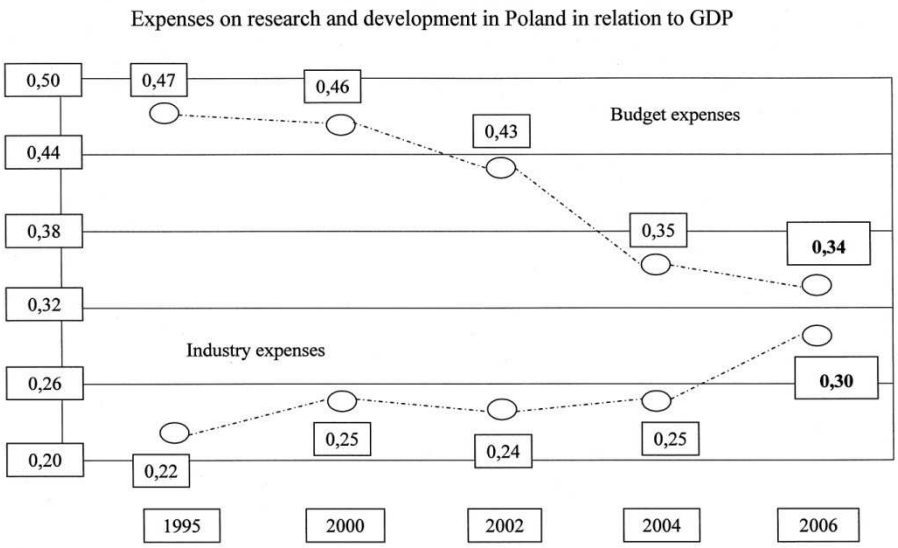

Fig. 1. Expenses on research and development in Poland in relation to GDP
Souce: Own study based on www.nauka.gov.pl and www.mg.gov.pl

Table 1. Selected rates used to assess innovation

Rates		Year	Poland	UE-27
Domestic gross expenses on R&D		2006	0,56	1,84
Number of inventions submitted for protection to the European Patent Organisation per one million citizens		2004	3,66	111,96
Number of patents granted by the US Patent and Trademark Office per one million citizens		2003	0,60	52,20
Share of high-technology products in total exports (in %)		2006	3,11	16,67
Number of broadband connections (with bandwidth of at least 144 Kb/s) per 100 citizens		2007	6,80	18,20
Expenses on IT and telecommunications technologies as % of GDP	telecommunications	2006	5,00	3,00
	New technologies IT Information Technology		2,60	2,70
Percentage of citizens aged 20-24 with at least secondary education		2006	91,70	77,80

Source: Own study based on EUROSTAT data www.epp.eurostat.ec.europa.eu

The European Union develops slower than the United States. The current level of EU development runs at about 70% of the US level. Since 1996, work efficiency in Europe has been improving slower (1.4% on average per year) than in America (2.2% on average per year). The European Union is also much slower in terms of implementing the latest technologies. Among the 300 leading computer companies in the world, 70% operate in the United States. Out of 300 companies which spend most on research and development, 46% are owned by American capital.

At present, it is possible to receive financial support for the intense development of an enterprise from various structural funds offered by the European Union. As a result, it is possible for enterprises to introduce integrated systems or innovations incurring only part of the costs.

DEMOGRAPHIC DEVELOPMENT OF POLAND, EUROPE AND THE WORLD

Demographic breakdown is an urgent problem for the European Union. As far as population is concerned, Poland is on the 32nd place among all the countries in the world and on the 6th place in the European Union. The population growth rate in 2008 was positive and totalled 0.05%, whereas in 2007 it was -0.03%. In 2008, for the first time since 1998, positive population growth was recorded. The number of people decreased by more than 41,000 in 2007. Economic emigration was the main reason for such a situation.

The greatest population decline resulting from the balance of births and deaths took place in 2006, when the number of people decreased by 32,000. A negative population growth rate in Poland oscillated between -0.04% in 1999 and -0.09% in 2006. For comparison, in the 90s of the previous century, the average annual population growth rate was running at a level of +0.09%, whereas in the second half of the 90s, the growth dynamics was nil.

Increasing average life expectancy in Poland has been recorded since 1992. In 2007, it amounted to 75.19 on average – 71.18 for men and 79.44 for women. Based on that, Poland is ranked on the 54th place among all 192 countries of the

world. Since the beginning of the 90s, life expectancy has increased by 4.3 years for men and almost 4 years for women. On average, life expectancy in the world totalled 65.82 in 2007 – 63.89 for men and 67.84 for women.

The number of children per one woman in childbearing age has been falling dramatically; the Total Fertility Rate (TFR) in Poland amounts on average to 1.3 – 1.4. The rate should be at least 2.11 to counteract a population decrease. This value was exceeded for the last time in Poland in 1988. If the average fertility rate oscillated around 1.4 for a longer period, every successive generation would be less numerous than the generation of their parents by approximately 35% [Coyle et al 2002].

In the USA, the Total Fertility Rate amounts to 2.1, i.e. it meets the condition ensuring simple replacement of generations. The rate in Europe is very low – on average 1.5 (Ireland – 1.88, France – 1.92). On the other hand, in Africa it amounts to 5.2, in Asia – 2.7, in Australia and Oceania – 2.5.

Generally, in 59 countries of the world with some 44% of the entire global population, the number of births is not sufficient to avoid aging of the society. In 2050, every fourth European will be retired and every third – an immigrant. Only about 58% of Europeans will belong to neither of the two population groups.

The most important reasons determining unwillingness to have children include difficult economic conditions of families, increased interest in education, difficulties on the labour market, reduction of family and social benefits as well as lack of family-oriented philosophy in social politics.

PROBLEMS WITH EMPLOYMENT OF QUALIFIED WORKERS IN POLAND

Migration is one of the greatest weaknesses of Polish demography. In 2008, negative balance of definite foreign migrations amounted to more than 15,000 people (as compared to 20,500 in 2007). The most rapid increase of permanent emigrants took place in 2006. This problem also concerns workers and people employed in the wood industry, which was faced with a real problem connected with the shortage of qualified workers in the period of economic prosperity from 2006 to 2008. Due to a mass migration in Poland, a substantial increase of costs was recorded in 2007; competition from Scandinavia and Great Britain attracted big numbers of Polish qualified workers from the wood industry, especially the furniture sector, which led to a significant pay increase.

Numerous salary rises taking place in Poland at that time caused inflation, which in turn intensified the demand for even higher salaries and had an unfavourable influence on the Polish economy. It resulted in the so-called second-round effect [Liwowski, Kozłowski 2007]. The effect mostly affected large state-owned companies. Constantly increasing inflation was an argument justifying people's salary demands. An average increase of salaries was slightly higher than the average inflation rate. Mainly food products and fuel were getting more expensive. Meanwhile, the second-round effect was nowhere to be found in private enterprises. People employed there do not pay so much attention to inflation; the pay level at foreign companies of the same branch is a much more important criterion for them. The pay level did not grow so much, because economic recession hit the West earlier than Poland.

It is estimated that due to migration, the growth potential of the European economy will have fallen from 2 – 2.25% at the beginning of the first decade of the 21st century to merely 1.25% by 2040.

Without proper reforms, Europe's position on the list of most powerful economic regions in the world will deteriorate as compared to the United States, the so-called BRIC countries (Brazil, Russia, India, China) and South-East Asia.

EXPENDITURES ON INNOVATION AND SCIENTIFIC RESEARCH

The degree of innovation in European countries is highly diverse. The leading states include Germany, Switzerland, Sweden, Denmark and Finland. Poland, together with Spain, Slovenia, Slovakia, Latvia, Estonia, Romania and Bulgaria, belongs to the group of countries where innovation is rather low [Dębski 2008].

Poor innovation of the Polish economy results from the fact that companies invest insignificant resources in this particular field of their commercial activity. In the Polish budget, the resources for innovation (figure 2), scientific research and R&D (figure 3) are exceptionally meagre. According to the Ministry of Economy, annual expenses on research and development, as compared to Gross Domestic Product, total 0.59% in Poland; the same rate totals 1.93% in the EU and 2.6% in the US. Japan spends the most (i.e. 3.2%), whereas China allots 1.3% of its GDP for research and development.

In Poland, the rate of outlay increase is very low; it usually oscillates around 0%. Recently, the rate has been negative, which means that the expenses have been reduced. Luckily, the resources assigned for both innovation (figure 2) as well as research and development (figure 3) by the industry have increased.

Innovation expenditures grow most dynamically in China (18.6% on average per year), although the base ($59.8 billion) is relatively low ($282.3 billion in the United States, $180.1 billion in Europe and $103.7 in Japan). In the European Union, the increase of expenses runs at 2.4% on average annually; in the US – 0.4% (the country is in deep recession since 2007, which is not favourable for outlay increase), in Japan - 2.2%.

The situation is much worse in terms of average expenses on research and development per capita; in Poland it amounts to only $66.8 as compared to $418 in the EU.

Insufficient investments in the field of innovation in Poland result in a very small share of Polish innovative enterprises (16.9%) in the entire population of companies (the respective index is 51% in the European Union).

Poland's achievements in the scope of intellectual property protection are the weakest – the number of submitted patents is very low. The rate totals on average 2.7 patents per 1 million citizens. It is not much even when compared with the neighbouring states of Central and Eastern Europe. Respective indices, according to the European Union statistics, total 10.9 in the Czech Republic, 18.3 in Hungary, and 32.8 in Slovenia. In the European Union, the number of patents amounts to 133.6 per 1 million citizens.

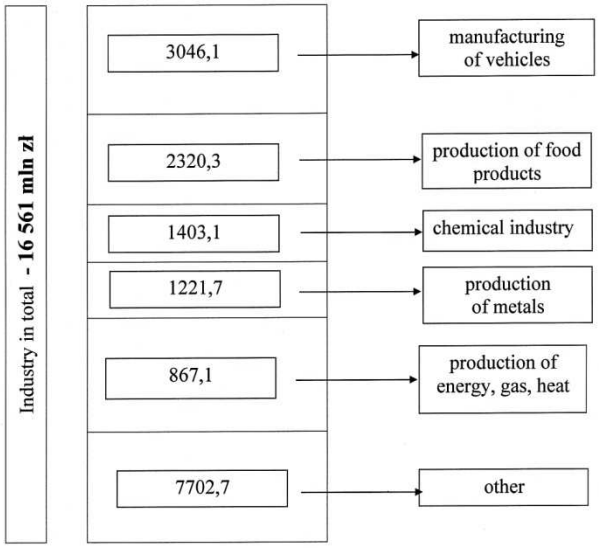

Fig. 2. Expenses of the Polish industry on innovative activities in million zl
Souce: Own study based www.mg.gov.pl

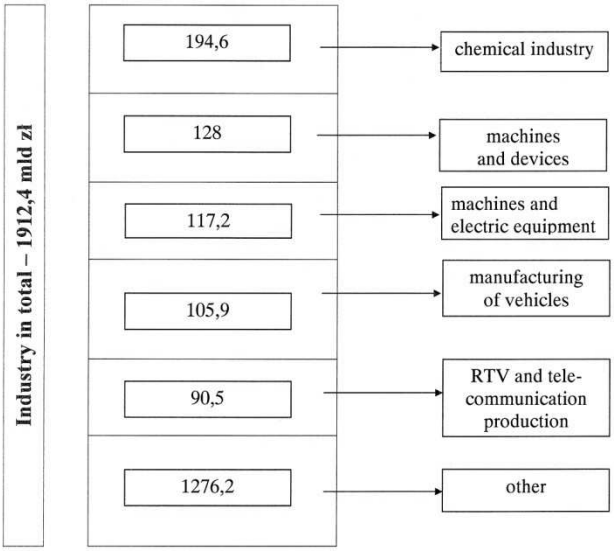

Fig. 3. Expenses of the Polish industry on research and development in PLN million
Source: Own study based on www.nauka.gov.pl and www.mg.gov.pl

The participation of high education institutions and scientific entities in innovative programmes, research and development initiatives and submitted patents is insignificant, mostly due to problems with financing. E.g. in Poland, according to Eurostat, only 3% of ideas for new products are created at higher education institutions. The rate is 4% in Slovakia and 7% in Sweden. The situation of the Polish wood industry is similar [Welfe 2007].

The aforementioned financial barriers are the most significant cause determining poor relations between the industry and scientific and higher education institutions. Other reasons are also mentioned – research workers lack proper knowledge on the matters entrepreneurs are interested in, legal barriers, difficulties in mutual collaboration, lack of interest in commissioned problems expressed by scientific institutions, and finally difficulties in communication.

Table 1 presents the most important rates that can be used to assess innovation in Poland and in the European Union. Only expenses on IT and telecommunications technologies in the scope of new technologies, measured as % of GDP, have been compared. The percentage of citizens aged 20-24 with at least secondary education is more favourable in Poland than in the EU. All other rates and indices are much worse than the rest of Union.

CONCLUSIONS

Innovations have an influence on the level of employment and education, scientific and development research, human capital investments as well as knowledge, therefore they condition the development of a contemporary economy. They support achievements and help to maintain high GDP increase in the long term. It is extremely important for the Polish economy to bridge the gap in the field of innovations between the European Union, the US and Japan, especially with the BRIC countries developing fast. Generally speaking, Poland needs to establish a long-term strategy for social and economic development based on knowledge; this is the role of education, including scientific research and development projects in the field of wood industry economics.

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DETERMINANTS OF THE DEVELOPMENT OF THE MARKET IN WOOD BIOMASS FOR ENERGY PURPOSES

Abstract: In Poland among main determinants of the development of the market in wood biomass for energy purposes are the following: climatic hazards, energy safety, legislation, and European Union funds. However the overriding factor is the necessity to reduce CO_2 emission to protect the climate. This necessity was the starting point for a series of legal and organisational agreements. Wood biomass for energy purposes may be of special importance under Polish circumstances but there is still a lack of appropriate technical and financial solutions relating to the process of its use. There is also a lack of comprehensive knowledge about its supply and consumption.
Key words: wood biomass, wood crops, renewable energy source, climate hazard, energy safety, legislation

Wood is one of the oldest energy carriers; however, only recently it is possible to talk about the phenomenon of actual market in wood biomass[36] for energy purposes. Therefore it is important to identify factors which essentially influence the rising significance of wood biomass and to gain knowledge about them. The aim of this article is to present main causes of this phenomenon (climatic hazards, energy safety, legislation, and EU funds) which are actually a consequence of a superior impulse, i.e. the necessity to protect the climate and natural environment.

CLIMATIC HAZARDS

Ecological results of energy consumption have been observed for many ages. Huge local contamination of air, water and soil were noticed in the early stages of industrial economy, whilst combustion of wood led to cutting out of forests in many areas. The importance of energy for improvement of living conditions and technological progress is unarguable; however it must be stressed that the processes of energy use are accompanied by side effects in the form of natural environment degradation. Technical and technological progress, higher energy consumption, i.e. in general human activity, cause an increase in greenhouse gases emission and thus constitute the main reason why the earth's atmosphere has been growing warmer. The main harmful substances emitted in power engineering of fossil fuels are: sulphur oxides, nitrogen oxides, carbon dioxide, dusts, and hearth waste.

It is forecasted that average world index of per capita demand for primary energy will rise from the level of 1.7 toe in 2002 to around 2.0 toe in 2030. In OECD countries this index will rise from around 4.7 toe to 5.5 toe, respectively, whilst in developing countries from 0.8 toe to about 1.1 toe (low growth of the index in developing countries stems from high population growth). In connection therewith in the discussed period emission of CO2 will grow from 23.6 billion tonnes to 38.2 billion tonnes and according to the forecast in 2030 the share of individual fuels in CO2 emission will be as follows: from coal 36%, from crude oil 39%, and from natural gas 25%. It should be emphasised that amongst those fuels coal is "the most emissive" (according to estimation 1 toe of fossil fuels is responsible for CO2 emission in the amount of: coal – 3.9 tonnes of CO2, crude oil – 2.6 tonnes of CO2, and natural gas – 2.3 tonnes of CO2).37 Bearing that in mind it is obvious that sources of "green energy" have been becoming more and more important and the search for such sources was directed also at wood biomass which is characterised by zero balance of CO2 emission.

ENERGY SAFETY

One of the elements of energy safety is diversification of energy sources. The weaker the dependence on import of energy raw materials and the bigger the share of various energy sources, the greater certainty of supplies and stability of prices (in the first place – prices of energy carriers, and then – prices in the whole economy). These actions encompass also an increase in the share of renewable energy sources in total energy generation, and thus an increase in wood biomass

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[36] *Wood biomass – from forest (including billets, rounds, and chips) and waste from forestry and wood and paper industries (including bark, sawdust, and black liquor). Charcoal, as a solid product of biomass degasification, also belongs to the group of solid biofuels from wood biomass [A. Szostak, E. Ratajczak, M. Lorenc-Michalska, G. Bidzińska, Analiza źródeł biomasy na cele energetyczne ze szczególnym uwzględnieniem drewna z plantacji drzew szybkorosnących, Maszyn., Wood Technology Institute, Poznan 2008].*
[37] *Based on: J. Soliński, Energy Sector of the World and Poland. Evolution, Current State, Prospects to 2030, Polish Member Committee of the World Energy Council, Warsaw, May 2007.*

consumption as well. The said diversification is visible in many European countries in the form of greater importance of gas and renewable energy sources and also the use of nuclear energy etc. (Table 1).

Table 1. Share of main energy sources in generation of electric energy in Poland and chosen European countries (in %)

Countries	Coal	Natural gas	Crude oil	Nuclear	Water	Wind	Biomass
Czech Republic	58.8	4.9	0.3	30.9	3.9	0.06	1.1
France	4.0	4.4	1.2	78.4	10.7	0.4	0.9
Latvia	-	42.9	0.1	-	55.1	0.9	0.8
Germany	41.9	12.2	1.5	26.3	4.3	4.8	3.3
Poland	**91.9**	**3.1**	**1.5**	**-**	**1.2**	**0.2**	**1.2**
Great Britain	37.7	35.9	1.2	18.9	2.1	1.1	2.5
Italy	14.1	52.3	14.6	-	13.8	0.9	2.1

Source: Own study based on: Energy. Yearly statistics 2006, European Commission, Eurostat Statistical Book 2008

As regards electric energy in Poland over 90% of it is generated from coal, whilst other energy sources, including renewable sources, are not sufficiently developed. In 2007 the share of renewable energy in total energy production was 6.9% and in total energy consumption 5%38. According to official data biomass dominates the structure of national energy generation from renewable sources (over 90%) but it should be stresses that majority of this biomass comes from wood (other components are different vegetable and animal substances which are biodegradable, for instance straw and municipal waste) – Figure 1.

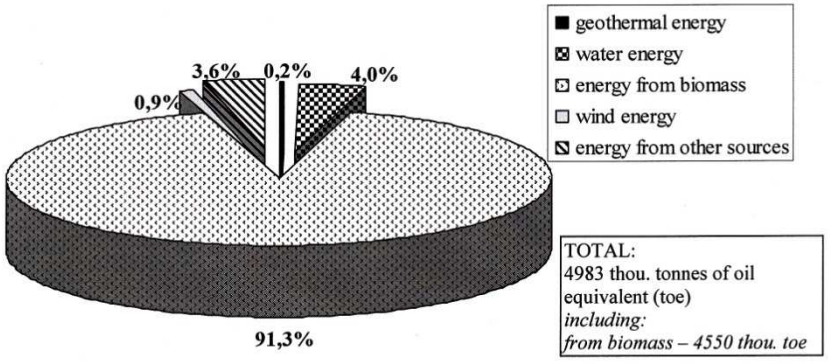

Fig. 1. Structure of renewable energy production in Poland in 2007
Source: Ochrona środowiska 2008, Central Statistical Office, Warsaw 2008, p. 230

In Poland a key task in energy production is to increase the use of renewable energy sources, including energy generation from exactly wood biomass – one of the main sources of "green" energy of high potential. For example, around 200 thou. m3 of wood biomass may be obtained annually from the total area of quick growing tree plantations in Poland (on the assumption that 20 tonnes of dry wood mass may be obtained from 1 hectare of plantation). 39

LEGISLATION

Presently set legal requirements concerning both reduction in the emission of greenhouse gases and the use of renewable energy sources (RES) are another phase of actions started as early as at the turn of 1980s and 1990s. In 1992 the Earth Summit was organised and during that event the United Nations Framework Convention on Climate Change was signed. The consequence of those events was conclusion of the international agreement in 1997 (The Kyoto Protocol)40 whose task was to propagate actions striving after reduction in the emission of greenhouse gases41. The aim of such undertakings was to set pro-ecological programmes for the whole world economy. It should be emphasised that without dialog at a world level it would not have been possible to make people aware of problems and threats concerning exploitation of the environment, and thus develop specific strategies for taking actions. The commitments stemming from international agreements on a global level imposed an obligation to take up actions of regional and national character. As a community of states the European Union has also addressed the issue of climate warming and the necessity of introducing changes by particular member states. The following items should be enlisted among major EU documents which take up the topic of renewable energy sources, including biomass: White Paper – Energy for the Future: Renewable Sources of

[38] *Ochrona środowiska 2008, Central Statistical Office, Warsaw 2008.*

[39] *A. Szostak, E. Ratajczak, M. Lorenc-Michalska, G. Bidzińska, Analiza źródeł biomasy na cele energetyczne, op. cit. Furthermore the issue of obtaining wood biomass from plantations was also discussed by such authors as: K. Fechner., Rośliny energetyczne zamiast cennego drewna, Gazeta Drzewna 2006, no 2; A.Grzybek., Zapotrzebowanie na biomasę i strategie energetycznego jej wykorzystania, conference materials: Rola biomasy w produkcji energii, Polish Federation of Engineering Associations – NOT, Polish Engineering Committee FSNT-NOT for Energy Management, Białowieża, November 2008; E. Ratajczak, Empirical research on wood flows in Poland, National wood resources balances workshop, UNECE Timber Committee/FAO European Forestry Commission, Geneva 2008.*

[40] *The Kyoto Protocol was ratified by Poland in 2002.*

[41] *Based on: Świat wobec zmian klimatu, www.biomasa.org/index.php?d=artykul&kat=27&art=15 and The Kyoto Protocol, www.biomasa.org/index.php?d=artykul&kat=29&art=21.*

Energy COM(97)599 (the basic goal of this document is to increase the share of renewable energy in total fuel and energy balance of the European Union countries), Biomass Action Plan COM(2005) 628 (above all this document discusses the potential of biomass and its use), Renewable Energy Road Map. Renewable energies in the 21st century: building a more sustainable future COM(2006) 848. And at the legislation level the key Directives are the following: Directive on the promotion of the use of biofuels or other renewable fuels for transport42 and Directive on the promotion of the use of energy from renewable sources 43 which states that till 2020 the share of energy from renewable sources in final energy consumption is to be 20% for the European Union and 15% for Poland.

In Poland renewable energy sources have been gaining more and more attention which is reflected in such documents as Poland's Energy Policy till 2030 and Multi-annual programme of promotion of biofuels and other renewable fuels in transport for the years 2008-2014. Since in Poland biomass is of special importance in the structure of renewable energy sources (including wood biomass) legislation mechanisms concerning the use of wood for energy purposes are created. Under changes made to legislation, in the years to come there is to be a change in the approach to sources of wood biomass intended for energy purposes. In accordance with the Regulation of the Minister of Economy44 "green energy" is to be produced first of all from biomass originating from the so-called "energy" plantations or agricultural waste and residues. It is forecasted that the share of this biomass in the next years will rise gradually – to 100% in 2015 (Table 2). Thus it means a lower share of wood biomass originating directly from forestry and wood sector (forest and industrial wood waste). Waste which is side product of wood processing may be used for energy purposes only at the sites where it is created and in production units of power lower than 5 MW. Such way of wood biomass use to a great extent stems from the opinion that the use of wood biomass for energy purposes, especially biomass originating from forestry and wood sector, should not cause deficiency of wood for industrial purposes (in this area the use of wood for material becomes a priority).45 It is connected with great importance of wood industries for the Polish economy and the fact that added value of goods produced by those industries (composite wood materials, furniture, and paper) is many times higher than added value of wood used as fuel.

Table 2. Share of wood biomass from "energy" plantations in production units of different powers

Years	Share of biomass from "energy" plantations or waste and residues from agricultural production (…)[1] in the case of		
	production unit of electric power higher than 5 MW	hybrid system of electric power higher than 20 MW	production unit of electric power higher than 20 MW
2009	10 %	10 %	
2010	25 %	20 %	20 %
2011	40 %	20 %	20 %
2012	55 %	20 %	20 %
2013	70 %	25 %	25 %
2014	85 %	30 %	30 %
2015	100 %	40 %	40 %
2016		50 %	50 %
2017		60 %	60 %

[1] *(…) and industry processing its products, and also from part of other waste which is biodegradable, excluding forest waste and residues and also industry processing its products*

Source: Based on the Regulation of the Minister of Economy of 14 August 2008, op. cit

EUROPEAN UNION FUNDS AND SUBSIDIES

Various subsidies and European Union funds have a significant influence on stimulation of wood biomass market development. As regards biomass from agriculture the overriding regulation is Common Agricultural Policy (CAP) which establishes among other things system of direct payments (Council Regulation (EC) No 1782/2003)46 and supports modernisation of agriculture and increase in added value of agricultural and forest products (Council Regulation (EC) No 1698/2005)47. Based on the principles of the Common Agricultural Policy Poland created mechanisms for support and control of the so-called energy plantations. In Polish legislation a key act concerning this field is Act on payments within

[42] *Directive 2003/30/EC of the European Parliament and of the Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport*

[43] *Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources*

[44] *Regulation of the Minister of Economy of 14 August 2008 on detailed scope of obligations to obtain and present to be discontinued certificates of origin, settlement of replacement payment, purchase of electric energy and heat generated in renewable energy sources, and the obligation to confirm data concerning the amount of electric energy generated in a renewable energy source (JoL No 156, item 969).*

[45] *E. Ratajczak, G. Bidzińska, J. Pikul-Biniek, A. Szostak, Stałe monitorowanie zmian w polskim sektorze leśno-drzewnym według standardów Komitetu Drzewnego EKG ONZ/FAO, Wood Technology Institute, Poznan 2008; E. Ratajczak, Drewno źródłem materiałów i energii, Gospodarka Materiałowa i Logistyka 2008, no 7; E Ratajczak, Wood and its substitutes; wood as a source of energy, a paper for: Sustainable Forest Management and Climate Change, Forest Day 2 – UNFCCC COP14, 6 December 2008, Poznan, Poland.*

[46] *Council Regulation (EC) No 1782/2003 of 29 September 2003 establishing common rules for direct support schemes under the common agricultural policy and establishing certain support schemes for farmers*

[47] *Council Regulation (EC) No 1698/2005 of 20 September 2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD), article 26 and article 28.*

the framework of direct payments systems48. The act defines principles and conditions of payments and sets mechanisms for verification of payment applications and control of feasibility. At the same time it should be emphasised that after the health check of the Common Agricultural Policy, which was done in 2008, it is planned to abolish present payments to "energy" plantations. In the face of these changes the importance of European Union funds is growing. The framework of Rural Areas Development Programme encompasses actions supporting projects concerning production of energy materials from biomass: "Differentiation towards non-agricultural activity", "Establishment and development of micro enterprises". And within the framework of action "Basic services for economy and population in rural areas" support is granted to initiatives connected with production and distribution of energy from renewable sources, especially wind energy, water energy, geothermal energy, solar energy, energy from biogas or biomass. Another programme offering subsidies for renewable sources (including biomass) is Infrastructure and the Environment Operational Programme (action "Environmentally friendly energy infrastructure and energy efficiency") supporting investments concerning building or modernisation of electric energy production units using biomass, biogas, wind and water energy (e.g. wind power stations, power stations using biomass or biogas, small water power stations of power up to 10 MW) and also units producing electric energy and heat in combination with renewable energy sources (e.g. combined heat and power plants using biomass). Apart from actions at a national level there are regional initiatives supporting biomass which are carried out within the framework of Regional Operational Programmes.

WOOD BIOMASS MARKET

There are many definitions of market. According to one of them the term market means the total of relationships between entities participating in exchange processes.49 Transposition of such approach to wood biomass allows a definition of the wood biomass market as the total of relationships between entities participating in exchange processes where wood biomass is the object of buy and sell transactions. Relationships in this market are defined between its three basic categories, i.e. demand, supply and price, by laws of demand and supply.

Since in Poland using of wood biomass at industrial scale (combustion in large production units) is a relatively new phenomenon, there is still a lack of mechanisms ensuring consumers easy access to biomass. Consumption of biomass mainly by combined heat and power plants of high power and not by local energy sources contributes to a situation where biomass is often available in locations distant from these sources. Another issue is a lack of actual balance of biomass resources which makes it difficult to prepare forecasts that are starting points for investments (this concerns both biomass producers and consumers).50 At the time being some small scale biomass market connected initiatives are taken up (e.g. an Internet biomass exchange – biomasa.pl). Moreover, establishment of Regional Energy Biomass Exchanges (REBE) is suggested. The main tasks of REBEs would be51:

- purchasing energy biomass from its producers,
- converting biomass into energy fuels and their storage,
- supplying interested power stations with biomass fuel,
- balancing of biomass resources and demand for biofuels in the region,
- helping investors to obtain financing for investments necessary to set up energy plantations,
- cooperating with science centres in the field of good agricultural practices, new varieties of energy plants, technologies for converting biomass into fuel and generating energy from biomass,
- cooperating with agricultural agencies, ecological funds, banks, state forests, science centres, and self-governments.

Regional exchanges would be only an element of the market in wood biomass intended for energy purposes. However, to a great extent they would solve the problem of ensuring that biomass producers would find consumers of their product (this would be achieved also by means of multi-annual contracts) and ensuring that power stations are supplied with right amount of good quality fuel (also in the long run).

SUMMARY

Wood biomass is a renewable energy source of high potential which may be of special importance under Polish circumstances. However, despite the fact that interest in this product has been on the rise in recent few years, there is a lack of comprehensive knowledge about its supply and consumption. Achievement of the goal, which is an increase in the share of energy from renewable sources in Poland, requires not only that we overcome technical problems but also that we take right organisational actions in the field of fostering new solutions as well as actions in the spheres of law and finance.

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[48] *Act of 26 January 2007 on payments within the framework of direct payments systems (JoL of 2007 No 35, item 217; No 99, item 666, of 2008 No 44, item 262, No 98, item 634).*

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IMPACT OF EUROPEAN MARKET DEMANDS ON POLISH PELLET EXPORT

Abstrakt: Global trends of price increase of conventional energy sources, compatibility with the trends for environment protection, as well as the need for the diversification of energy sources resulted in general growth of interest in ecological fuels. Forestry entrepreneurs, bearing in mind high profitability of pelleting by-products of the forest-products manufacturing process, as well as the current situation on the European pellet market, more and more often decide to undertake pellet production. Having an adequate, fully sufficient amount of raw material they become independent from the outer suppliers eliminating the cost of purchase and transport of sawdust, chips and pieces of wood. At the same time they possess competitive advantage over the remaining producers of fuels based on the by-products of the forest-products manufacturing process. However expansion and holding both European and ever more demanding domestic markets requires guaranteeing not only attractive price but also adequate product quality.
Key words: quality, requirements, norms, certificates

INTRODUCTION

The success of each economic venture is conditioned by the market and its players with characteristic needs, preferences and requirements. So as to operate effectively, guaranteeing long-term product sales at a satisfactory price those requirements should be met.

Pellet market is relatively young yet rapidly developing, especially in Scandinavian countries, Germany, Austria and Italy. This fuel powers both household heating systems as well as heating systems of public utility buildings. In Poland still due to rather common social conservatism and the lack of adequate financial incentive the consumption of this fuel is low (70 000t/annually). Therefore, the majority of pellet produced in Poland (83%) is and will be exported onto demanding European market. Currently many plants in various countries encouraged by excellent development prospects of that market decided to launch or develop pellet production. Expected, due to that situation, growing competition will eliminate from the international market all companies which will be unable to guarantee stable product quality. Also domestic market under the pressure of Ukrainian and Belorussian import is bound to become more demanding.

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NORMS

Works on pellet standardization and creating European norms, already in force in all EU countries, have been carried out for a few years now. They are conducted by Technical Committee (TC 335) of European Standardization Committee (CEN) and relate to order analyses and controls of all types of bio-fuels including pellet. Even though adopting that norm is expected in 2009, the obligation to use it in practice in all EU countries will come in force after three years of its publication. Currently the market is using regulations drew up by four countries: Austria, Germany, Sweden and Italy. In table1 selected parameters characteristic for pellet have been gathered in accordance with Austrian, German and Swedish norms and each criteria has been evaluated.

Table 1. Comparison of selected figures characteristic for pellet in accordance with: ÖNORM M 7135, DIN 51731, DIN plus (certificate), SS 18 71 20 /1Group

Quality criteria	Units	ÖNorm M 7135	DIN 51731	DIN plus	SS 187120 1 grupa
Diameter	mm	4≤d<10 ******	4≤d<10 ******	4≤d<10 ******	4≤d<10 ******
Length	mm	5 x D***	<50	5 x D***	4 x D***** 5 x D***** (2 gr.)
Density	kg/dm³	>1,12	1,0< Gęstość< 1,4	>1,12	Bulk density ≥ 600 kg/m³ ≥ 500 kg/m³ (2 gr.)
Ash	%	<0,5*; *******	<1,50	<0,5*; *******	< 0,07 < 1,50 (2 gr.) > 1,50 (3 gr.)
Moisture	%	<10	<12	<10	<10 <12 (3 gr.)
Heating value	MJ/kg	>18*	17,5<HW< 19,5**	>18*	≥16,9 ≥15,1 (3 gr)
Sulphur	%	<0,04*	<0,08	<0,04*	<0,08
Nitrogen	%	<0,3*	<0,3	<0,3*	lack of data
Chlorine	%	<0,02*	<0,03	<0,02*	<0,03
Sprinkled dust	%	<2,3	-	<2,3	<0,8 <1,5 (2 gr.) >1,5 (3 gr.)
Arsenic	mg/kg	lack of data	<0,08	<0,08	lack of data
Lead	mg/kg	lack of data	<10	<10	lack of data
Cadmium	mg/kg	lack of data	<0,5	<0,5	lack of data
Chrome	mg/kg	lack of data	<8	<8	lack of data
Copper	mg/kg	lack of data	<5	<5	lack of data
Mercury	mg/kg	lack of data	<0,05	<0,05	lack of data
Zinc	mg/kg	lack of data	<100	<100	lack of data
Halogen	mg/kg	lack of data	<3	<3	lack of data
Conclusion	---------	high requirements, first class pellet, from clean, dry sawdust without bark, very calorific, low ash content, lack of criteria for lower classes, certificate ÖNorm M 7135: high control regime – weekly sample tests,	too lenient, related to briquettes and industrial, high ash content, higher content of sulphur and chlorine, higher moisture, higher heating value – admixture, certificate DIN 51731: research – 1 per year	only certificate awarded for 5 years combines solutions of Önorm M 7135 and DIN 51731, high quality synonym, lack of class division	3 quality groups- differences were provided in brackets, remaining figures consistent with group 1, gently defines individual groups, too low calorific requirements, basis for European standards

* dry mass
** free from water and ash
*** not more than 20% of pellet may be of length up to 7,5 x diameter
**** DIN forbids using additives. This ban is not valid for small heating systems
***** in producer's storehouse
****** tolerance for diameter ± 10 %
******* allowed ash content up to 0,8%, if it is naturally higher, specific for a given type of wood

Source: own research on the basis: [ÖNORM M 7135], [DIN 51731], [SS 18 71 20], [Kowalewski L. 2007]

On the basis of the requirements stipulated in the norms each producer may apply for issuing a Certificate of using the norms. Apart from the proof of tests characteristic for a specific norm additionally the procedure of checking quality is established. Only fulfilling the conditions of a certain certificate entitles the producer to use its logo (picture1) along with the awarded registered number. Not keeping the norms of each certificate results in losing the right to use the symbols of a given certificate. Using them despite the lack of valid certificate leads to serious civil and legal consequences. Those procedures significantly increase the likelihood of keeping stable quality by the producer.

Certificate ÖNORM M 7135 geprüft **Certificate DIN geprüft** **Certificate DIN Plus**

Picture. 1. Certificate logo ÖNORM M 7135 geprüft, Certyfikat DIN geprüft, Certyfikat DIN Plus
Source: [Normen für Holzpellets 2009]

PELLET QUALITY CLASSES AND MARKET REQUIREMENTS

From the above presented evaluation criteria, in accordance with various norms, it can be deducted that only Swedish norm divides product into three groups, what from the market point of view, is insufficient. In practice, which describes pellet as bio-fuel made from other than wooden types of biomass even 6 quality classes can be found out of which 4 relate to wooden pellet:

- I class (DIN Plus) – most sought after product with ash content up to 0,5%,
- II class – popular pellet with ash content up to 0,8% and calorific value not lower than 17,5 MJ/kg, due to one or a few parameters cannot be classified as DIN Plus,
- III class – visibly worse fuel with ash content of about 1%, less calorific (from16,9MJ/kg), of higher moisture content,
- IV class – industrial pellet, fulfilling the requirements of DIN geprüft norm with calorific value from 16,9 MJ/kg,
- V and VII class – pellet from biomass, ash content up to 3 % (V class) and 6% (VI class) and calorific value from 15 MJ/kg.

Lower pellet classes usually apart from higher ash content are characterized by other worse parameters. Their price as a result of worse quality is also lower.

Division of pellet market into classes is the result of a variety of forms in which pellet is used. Fuels of the highest class are vital for delicate retort burners and worm feeders. Slightly worse fuel of second class may be used in pipe burners installed in some boilers. The product from lower quality classes may be used in burners with systems shattering ash. Energy sector has even lower requirements.

THE IMPACT OF PELLET COLOUR ON PRODUCT ATTRACTIVENESS

One of the main pellet features having a crucial impact on the decision concerning its purchase is its colour. The most sought after, from market point of view, is bright pellet. For Italian clients for example more important criteria than the certificate is pellet colour. Not always however, adopting colour as quality parameter is justified. Pellet made from hard wood such as oak or exotic types of wood will naturally be darker. In such case, colour in no way will influence product quality. Wood range of colours is very wide and even within one species there will be brighter and darker variations. The brighter pellet can be made from spruce wood, of bright colour will also be a product obtained from pine. Dark colour is disturbing for consumers due to associations with higher ash content and lower calorific value, because such colour may be the result of darker pieces of bark (over 5%). High bark content and its contamination with sand will result in higher ash content. This problem may be eliminated processing forest by-products made from previously debarked wood. Other cause of dark pellet colour might be toxic fungi, contained in sawdust from long-term storage. Product from such raw material possesses lower calorific value which justifies clients negative attitude. Due to huge, in recent years, interest in all forest by-products in Poland, unlike in other Eastern European countries such problem does not exist. Therefore, Polish pellet is competitive quality-wise to products coming from our eastern boarder. Pellet dark colour may also be caused by drying sawdust under the stream of hot fumes. Sawdust is then covered by sooth which exposed to high temperature is partially carbonized from the outside. Additionally, turpentine substances are evaporated, due to which calorific value is also lowered. While changes in lignin result in making sawdust burning process more difficult what lowers pellet quality. Unfortunately, common in Poland, usage of drum driers results in dark colour of the most of Polish pellet. This drawback may be eliminated by using air heat exchanger, which receives the heat of fumes substituting it with clean hot air [Kowalewski L. 2007(2)].

REMAINING QUALITY PARAMETERS

Defining quality standards is one of the main elements facilitating transaction. Because the norms are not obligatory the recipients of large volumes of pellet require quality guarantee in the form of laboratory tests or certificates of norms binding in purchasers country. Plans for expanding Polish export, especially to highly demanding Alpine countries will require systematic tests and presentation of their results. However not all tests are of the same diagnostic value. Sometimes presented results significantly differ from the real pellet quality.

The most reliable is the result of laboratory test of a sample of directly ordered fuel. However due to its cost, such tests are carried out only at a specific request of the recipients making mass purchases. Samples are taken at random from an already prepared dispatch for example after ship loading, subsequently undergoing analysis in accredited laboratory. Fast verification of fuel value would be made easier by launching by larger industrial pellet producers mini-laboratories in which the key product features such as: calorific value, ash content, abrasibility, density and moisture content would be verified. Analysis of such results would be beneficial also for the producers becoming an additional tool for raw material and technological processes quality control. Unfortunately, such solution is very expensive.

Reliable document which value however is limited to a tested sample is the certificate of norm conformity. Its credibility is lower, because producers apply for it once or twice a year. Additionally, the certificate evaluates only the quality of a specific delivered sample, which may be meticulously selected by the producer. Therefore, the result of such test does not guarantee the quality of purchased product.

The least credible are the results of laboratory tests. Such analysis may be done by every laboratory. The result of this analysis relates to a sample from the past, which quality may be of substantial difference from the quality of currently produced pellet. Apart from that there is no guarantee that testing procedure is compatible with the requirements of a given norm, what is of crucial importance when obtained results are on the verge of critical values [Kowalewski L. 2007(2)].

CONCLUSIONS

1. Effective competition on European pellet market requires not only offering product at a lower price but also demands product which meets the growing expectations of the recipients. Therefore, it is essential to carry out market segmentation in order to identify groups of recipients with similar product expectations and directing to that group the pellet of adequate, precisely defined parameters.
2. Highest quality pellet (class DIN Plus - ash< 0,5%) is required by the consumers using boilers with very delicate burners. Producer's success in this segment will be conditioned by the need to increase the demands from sawdust used in the production, and as a consequence diversifying its prices depending on the class of their cleanness. Second segment comprises the clients with slightly less demanding installations ready to buy pellet of lower quality (ash < 0,7%). Gathered in the third segment owners of pipe or retort burners will be satisfied with worse (ash 1%) but cheaper fuel. The representative of the fourth, the least demanding segment (ash > 1 %) is energy sector.
3. Polish pellet producers, who due to raw material quality and used technologies are not able to keep high quality of their product should sell it at a lower price to rapidly developing energy sector of Western Europe. Since for that group of recipients calorific value and not pellet size is a key parameter, it is recommended for increasing efficiency, to produce pellet of 10mm in diameter, what will facilitate large scale operations.
4. Exporters with limited possibility to increase production should put maximum emphasis on the quality of pellet and sell it to the most fussy group of clients. Increasing quality requires changes in the way sawdust is dried using air heat exchangers and lowering drying temperature (to 300°C). Similar results can be obtained using installations for sawdust screening and cleaning. Despite quality improvement it is also vital to get one or even a few certificates.
5. Accurate technological preparation is vital however not sole condition of success on the European pellet market. It has to be supported by other activities such as: co-operation of Polish pellet producers, professional marketing, participation in foreign fairs, export promotions and joint logistic operations.

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SITUATION ON EUROPEAN PELLET MARKET

Abstract: Unstable market, growing prices of conventional fuels both in Poland and the entire world, as well as the increasing ecological consciousness lead to the increase in interest in alternative energy sources. One of them is pellet – ecological fuel, produced from the by-products of the forest-products manufacturing process, price-wise attractive, easy to transport, store and distribute.

The most sought-after raw material for the production of pellet are sawmill by-products. Their owners – the plants processing wood, invest in pellet production lines and making use of the by-products created during their main activities such as sawdust, chips and pieces of wood. Due to that they become more competitive than the producers who are forced to buy their raw material at the same time making their operations more profitable. Apart from numerous factors determining the success of that demanding high investment venture, also the prospects of EU pellet market development should be researched as 80% of Polish pellet is sent there.

Key words: pellet, pellet market, consumption, production, efficiency, prices, development prospects

THE DIVISION OF PELLET MARKET IN EUROPE

In recent years dynamic development of pellet market can be observed almost in all EU countries, however the structures of individual national markets vary slightly. In Benelux countries and the UK pellet is burnt in big power plants as a substitute for coal. Similarly in Scandinavia: Denmark and Sweden large installations using that fuel are built in heat and power plants. Around 60% of Swedish pellet is used in power plants for the production of electricity [The development of pellet industry in Europe 2008]. While in Austria and Germany market of small boilers used in detached houses is predominant. At the same time in Italy pellet is most frequently used to supply chimneys and stoves powered by pellet [Wach E. 2004].

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Among the leaders using pellet for energy production there are: Sweden, Italy, Denmark, Germany, Holland and Austria what can be supported by data from table 1, showing the usage, import, export and pellet production volume in selected countries of the EU.

What can be seen in table 1 European market was divided into the recipients and deliverers of pellet. In the recent years Poland became a significant producer and exporter of that fuel with a rather small inner demand (share of consumption in the total production amounts to 28%). Similar situation is characteristic for Estonia (2,6%), Spain (7%), Lithuania (8,8%), Romania (21,4%), Czech Republic (22,6%) and Latvia (23%). Among Balkan states Croatia (194 000t/annually), Slovenia (15 000t/annually) as well as Bosnia and Herzegovina (120 000t/annually) are major producers with a minute domestic consumption of 5-15%, exporting their products mainly to Italy. Also Russia, not included in the breakdown, produces mainly for export. From annual production of 550 000t, only about 40 000t (7,3%) enters domestic market. In Ukraine producing 60 000t of pellet annually there is a similar situation, just like in Belorus which produces 40 000t and almost 100% of it is assigned for export [Rakitova O. Ovsyanko A. 2009 r.]. Domestic demand is also satisfied by Finland exporting substantial surplus of the product (270 000 t/annually). While the importers of pellet are mainly: not-offering-high-prices Danes (890 000t/annually) and Dutchmen (756 000t/annually), Englishmen (556 000t/annually) as well as Swedes (400 000t/annually), making significant purchases in Russia, Estonia, Latvia and Lithuania.

Detailed situation on pellet markets in the countries with the highest pellet consumption has been presented below.

Sweden

The biggest pellet consumer and producer in Europe is Sweden. Sweden is the biggest consumer of pellet in Europe. Pellet production in this country started in the 80s. At the beginning Sweden produced annually 50 thousand tons of pellet, gradually increasing production. Dynamic development of pellet production in this country took place in the 90s, which was a direct consequence of introducing in Sweden at the beginning of the 90s the tax for CO2 emission. As a result in 2005 Sweden produced 1 300 thousand tons of pellet. Currently the majority of pellet there is produced by 20 large plants and 35 smaller ones with a total capacity of 1 357 thousand tons (Table 1). This fuel is used both in large 10MW boilers as well as in small family houses. It is very popular in Sweden to use pellet burners in existing boilers.

Table 1. Domestic consumption, import, export and pellet production volume in the EU between 2004 and 2008

Country	**Number* of plants**	Domestic usage				Import				Export				Production/capacity	
		thousand Mg per year													
		2004	2005	2007	2008	2004	2005	2007	2008	2004	2005	2007	2008	2007	2008
Austria	25	180	210	450	513	-	-		-	100	60	250	113	700/902	626/978
Belgium	10	-	-	700	800	-	-	580	315	-	-	-	-	120/215	485/550
Bulgaria	19	-	-	12	25	-	-	-		-	-	-	-	13/23	27/62
Czech Republic	7	10	21	27	38	-	-	-		-	-	-	130	27/118	168/258
Denmark	9	750	800	960	960	600	650	810	890	-	-	-	-	150/370	70/349
Estonia	16	1	1	10	10	-	-	-	-	-	-	230	370	240/360	380/438
Finland	23	60	55	80	150	-	-	-	-	200	194	140	270	220/450	370/560
France	21	50	50	130	150	-	-	-	-	-	-	60	90	190/540	240/1392
Greece	9	-	-	50	77	-	-	-	-	-	-	-	-	50/70	77/79
Spain	15	4	4	4	7	-	-	-	-	-	-	91	93	95/160	100/250
Netherlands	2	-	-	665	876	-	-	557	756	-	-	-	-	108/125	120/130
Ireland	1	-	-	5	10	-	-	-	-	-	-	10	5	15/70	15/70
Latvia	32	-	4	5	7	-	-	-	-	40	65	65	73	70/120	80/120
Lithuania	21	-	5	30	30	-	-	-	-	300	125	100	100	130/380	130/313
Germany	55	140	330	630	900	25	75	-	-	-	-	470	580	1100/1995	1480/2400
Norway	0	22	20	32	35	-	-	-	-	-	-	13	-	45/135	35/135
Poland	**26**	**6**	**25**	**63**	**120**	-	-			**114**	**175**	**266**	**305**	**329/545**	**425/664**
Rumunia	9	-	-	10	25			-	-			98	88	108/214	117/242
Slovak Republic	15	20	27	30	32	-	-	-	-	-	-	57	85	87/100	117/142
Slovenia	3	-	-	5	5							110	110	115/165	115/165
Switzerland	8	24	41	75	90	-	-	36	-	-	-	-	-	39/109	90/171
Sweden	97	816	815	1500	2100	350	330	100	400	-	145	-	-	1400/2032	1700/2200
Hungary	12	-	-	7	12	-	-	-	-	-	-	-	-	10/15	12/15
United Kingdom	20	2	2	180	750	-	-	51	556	3	3	122	-	129/176	194/245
Italy	93	220	230	850	1000	20	20	328	350	-	-	-	-	522/700	650/750
Total	**500**	**2285**	2640	6510	8622	995	1075	2462	3267	757	767	2082	2412	6012/10089	7823/12798

** number of plants with productivity over 5 000t of pellet annually*

Difference between import and export, amounting in 2008 to 855 000t and the difference between the volume of consumption and production of 899 000t in the countries included in the table is the result of covering the shortage of product with import from Canada and Russia as well as accumulated reserves.

Source: own research on the basis of data [PELLETS@LAS Project Results 2009]

The ambition of Swedish government which was expressed by its Prime Minister Mr. Göran Persson in Malmö in October 2005 is a complete liberation from oil within the next 15 years. Biomass, bioethanol and biogas are to replace not just oil but also gas and coal. Implementing those plans might be difficult, however the pro-ecological policy, which is being introduced in Sweden for years now resulted in quite a few achievements in this particular sector. Over the last 30

years the usage of oil for heating houses decreased by 70%, while oil usage for the production purposes has remained stable since 1994 even though the level of production since then grew by 70% [Tubylewicz 2006]. A certain system of incentives is to facilitate the implementation of the vision of Green Sweden. In the near future owners of houses who decided to use alternative sources of energy are to get special tax relieves similarly to the users of environment-friendly cars using 85 of ethanol or hybrid ones.

Even now the owners of such cars are exempt from paying so called city congestion taxes, that is from fees charged for entering Stockholm or in some regions they may park for free.

Swedish government policy, as well as consequent development of the system of numerous incentives encouraging pro-ecological behaviour are bound to result in the increase of the demand for pellet. This may subsequently lead to further price increase of that fuel which is already the most expensive in Sweden than anywhere else (255 Euro/ton). It is estimated that exporting pellet to Sweden will amount to approximately 1 million ton a year [Oleszkiewicz 2005], creating a huge market also for Polish producers. In 2008 Sweden imported about 400 000t of pellet. Currently there are 97 producers among them 5 large ones (over 100 000t annually) and 51 very small ones (up to 5 000t annually) manufacturing 1 400 000t of pellet annually.

Italy

The share of biomass in the usage of renewable energy sources in Italy amounts to almost 50%. The most modern and convenient fuel possesses from biomass is pellet. Over 4 times increase in the consumption of that fuel in Italy, in the last 4 years, resulted in the fact that despite a gradual production growth (Table 1) Italy is still forced to make up for the shortage of the product importing it from Austria, Spain and Germany. In 2008, 350 000t of pellet was brought to Italy. German producers are the most active on Italian market offering DIN Plus pellet at a very attractive price, even though rather mild winters in that part of Europe (10-14ºC in 2006) are not always conducive to the amount of sales expected by pellet sellers.

Dramatic growth of pellet consumption took place in Italy between 2005 and 2007, when its usage grew from 230 000 to 850 000t/annually. It was the result of installing in 2006, 100 000 fireplaces, which even taking into consideration a smaller usage per unit makes Italy the most dynamic pellet market. Currently 93 plants with the total productivity of about 750 000t produce 650 000t of pellet annually. Majority of them are smaller plants producing up to 30 000t (53% of total production). There is lack of plants producing over 70 000t of fuel per year. The necessity to satisfy domestic demand with import (350 000t in 2008) and the possible prices of 199 Euro/t (April 2009) of that fuel on Italian market make it an interesting alternative for Polish pellet producers selling pellet on Polish market at 132Euro/t. However competition from Romania which exports, mainly to Italy, over 80% of its intensively developed production, should be taken into serious consideration.

Denmark

The third largest pellet consumer in Europe is Denmark. While in 1993 heating systems used approximately 110 000t of pellet per year, over the period of 15 years the number grew almost 9 times reaching in 2008, 960 000t. At the same time production level in this country for the last couple of years systematically declined. In 2008, mainly due to problems with raw material only 70 000t of pellet was produced there, despite declared productivity of about 350 000t per year. Due to that also this country belongs to the biggest pellet importers in Europe.

It should be expected that within the next few years over 300 thousand households are to be equipped with installations burning pellets [Oleszkiewicz 2005]. Recently 300 blocks of flats had new pellet burning boilers fitted. Also 30 projects concerning modernization of local boiler houses were implemented replacing conventional fuels with pellet. Additionally it has been agreed that all new boilers will be using this particular fuel. The increase in pellet consumption is also supported by legal and economic regulations, such as the obligation of local communes to heat the properties which belong to them using only pellet. The conditions will naturally facilitate the increase of pellet import also in Denmark.

Austria

Using pellet in Austria started in 1997, when the first installations for burning pellet appeared on the market [Wach 2004]. At the end of 2002, 17 thousand such installations were in operation in Austria. Currently, approximately 25 thousand households in Austria are using pellet for heating purposes. It has been calculated that if 8kW is needed to heat one household it requires 3200 kg of pellet annually, while installation cost is a one- time expenditure of approximately 8000 Euro. In the region of higher Austria that is Steyermark around 30% of all households uses only pellet for heating houses and water [Oleszkiewicz 2005]. There are approximately 15 thousand boilers burning pellet fitted there. The number of installations using pellet also grows in public and industrial properties.

In newly built houses with lower demand for heating more and more often pellet stoves and fireplaces are being installed. The share of oil heating in such houses fall recently from 40 to 8%. The majority of heating systems being installed in Austria are based on fully automated 25kW boilers. Those installations are made by 30 companies specializing in boiler and burner production, which have to follow a very strict and detailed regulations aiming at safety improvement and limiting emissions. Austria implemented a distribution system with tanker home delivery while some boiler producers guarantee pellet supply at a fixed price along with boiler purchase. Pellet in Austria is produced by 30 plants with total annual capacity of 978 thousand tons (Table 1).

High hi-tech boiler sales in pioneering in that field Austria results in yearly growth of pellet consumption. Significant surplus of pellet supply in the first half of 2005 and stable, for a long time, low pellet prices encouraged both individual, as well as corporate energy consumers to chose that energy source. Unfortunately, related to the growth of demand for that product, increase in prices and product shortage on the market resulted in gradual slowdown in the pace of its consumption over the next couple of years. In 2008 in Austria 45 plants with annual productivity of 978 000t produced 626 000t of pellet.

Despite a developed local market (consumption of 513 000t) Austria still remains pellet exporter, although in 2008 in comparison with 2007 its overseas sales decreased by 50%. Currently Austrian producers carry out the expansion on Italian market. Selling good quality products at very low prices they are trying to eliminate Polish pellet producers.

Germany

The second biggest pellet producer and at the same time its biggest exporter is Germany. Similarly to Austria, German market is developing mainly so as to use pellet in small boilers. While in 2000 in Germany only 2 000 pellet powered boiler houses were in operation, in 2003 the number reached 20 000 [Wach E. 2004], and in 2008 – 105 000. It is forecast that their number in 2009 will amount to 140 000 [Marktentwicklung Holz-Pelletsheizungen 2009]. Taking into consideration annual pellet consumption per capita (11kg) in comparison with the consumer from Austria (50-60kg), a high potential of German market may be expected. Unfortunately, after the boom of 2005, when the investors encouraged by low fuel prices bought in 2006 approximately 26 000 heating installations (growth by 65%), severe winter of 2006/2007, pellet shortage and the increase of its price cooled the market down. As a consequence in 2007 boiler sales declined to 13 000. Later stabilization and the situation on the market of conventional fuels resulted in the installation of 23 000 more boilers in the following year. Apart from individual investors also communes are considering the possibility of burning pellet so as to possess energy for heating community buildings and their running water. Following the growing demand for pellet the number of its producers and their capacity grow as well. As it can be seen from table 1, in 2008, 55 plants of total annual productivity reaching 2 400 000 were in operation in Germany. Annual productivity of ten of them exceeded 100 000t. The majority of both pellet producers and consumers is located in the southern part of the country, what results in locating there companies producing pellet boilers, as well as the development of distribution chain there. Using all potential capacity now would facilitate powering approximately 400 000 household installations, at an annual pellet consumption of 6t per house that is 4 times more than the number of boilers used in 2008 (105 000)[Produktionskapazität wächst: 2,6 Millionen Tonnen Holzpellets in Deutschland 2008]. Increase of annual productivity by 700 000t planned for the next two years will satisfy the needs of further 100 000 pellet burning installations. However among many heating units assigned for pellet burning there is still shortage of big installations, for example in power plants. High surplus of pellet supply over domestic demand along with a disproportionate growth in the number of boilers (forecast for 2009 - 40 000 units), will result in growing German expansion onto European markets and will become serious competition for Polish pellet producers.

DEVELOPMENT PROSPECTS OF EUROPEAN PELLET MARKET

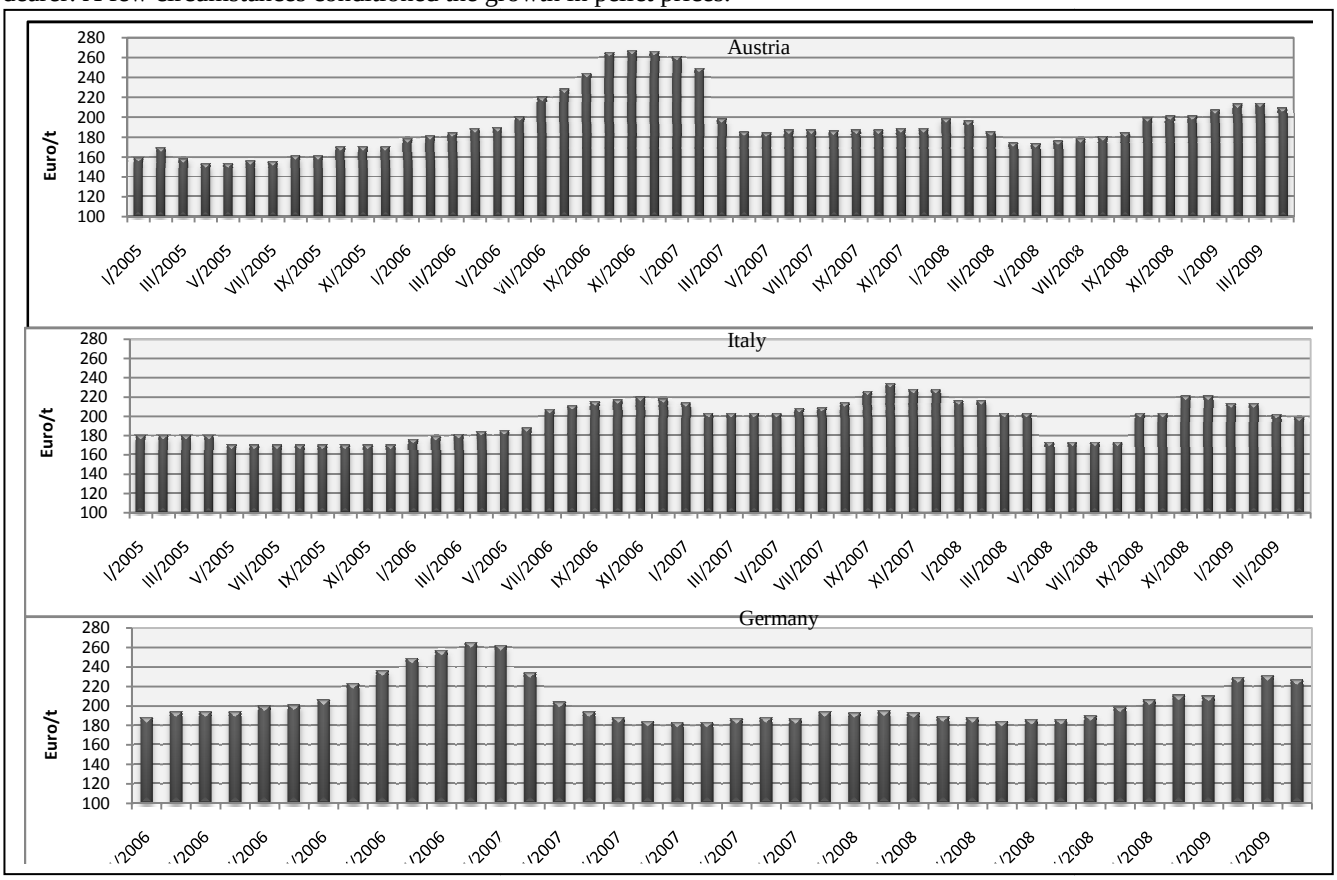
The analysis presented above shows that the volume of pellet market in Europe can be currently estimated at over 8,5 million tonnes burnt in a couple of dozen countries (table 1). In 2008, 500 pellet plants existed in Europe. Their number gradually grows, although the pace of growth due to world economic crisis temporarily declined. Despite that many countries still invest in the increase of capacity, expecting in the upcoming years both the growth of domestic consumption as well as import. Opening a couple of dozen new plants in Spain, France, Slovenia, Czech Republic, Slovakia, Ukraine, Belarus and Balkan States proves the trend. Production also grows very dynamically, in Russia which similarly to Ukraine and Belorus possess much more raw material potential than Poland. Shortage on Italian market is supplemented with import from the USA, Canada, Argentina and Brazil or even Egypt and China.

Global trends show that over the next few years pellet market will be developing, which should be a significant encouragement for potential producers and exporters from Poland. The fastest increase in consumption is forecast in the UK, Denmark, Sweden, Germany and Austria, where in 2009 pellet market is expected to grow by 25-30% [Egger, Öhlinger 2009]. In England, already in 2008 a rapid increase in pellet consumption was recorded, reaching 750 000t. Some hopes are linked to such old EU countries as Ireland, Belgium and the Netherlands with a very long fireplace tradition. On those demanding markets Polish producers should try to compete not just with lower price which is also offered by Russian producers but mainly with product quality.

The development of pellet market in Europe to a large extend depends on deciding whether pellet in the future will be used in small installations for heating households, schools and shops or in large installations where it could substitute significant amount of coal. If the market is dominated by institutional and industrial recipients even more dynamic development may be expected.

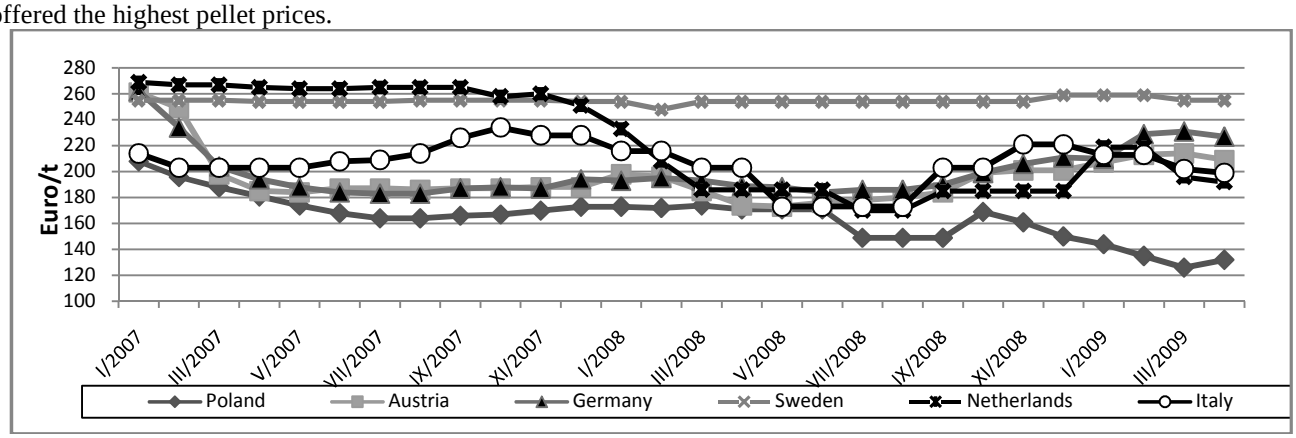
PELLET PRICES ON EUROPEAN MARKET

The analysis of charts presented on picture 1 shows that in the analyzed period, that is from January 2005 till April 2009, pellet prices on European market underwent some fluctuations. Following a relative stability in spring 2006 pellet grew dearer. A few circumstances conditioned the growth in pellet prices.



Picture 1. Pellet prices in Austria, Italy and Germany between January 2005 and April 2009.
Source: own research on the basis of data [PELLETS@LAS Project Results 2009]

As it can be seen from picture 2 the highest and most stable prices are characteristic for Swedish pellet market. Prices in other analyzed countries, excluding Poland, were exposed to similar changes and only till December 2007 Dutch market offered the highest pellet prices.



Picture. 2. Comparison of pellet prices in selected EU countries in the period from January 2007 till April 2009.
Source: own research on the basis of data [PELLETS@LAS Project Results 2009]

In the period from March till June 2008 pellet prices in Austria (173 - 185 €), Germany (184 – 193 €), Holland (170 - 186 €), Italy (173 – 203 €) were comparable, in Poland they were a bit lower (149 -174€) while in Sweden (254 €) approximately 25% higher. In the following months seasonal, however not equal growth in pellet prices took place on all analyzed markets. The biggest difference was noted on Polish market, where pellet prices from April 2009 (132 €) were lower from the highest prices by 93% (Sweden - 255 €)) and by 43% from the lowest on the European market (Holland - 192 €), which is a prove for price-wise competitiveness of Polish producers. Forecast for the upcoming years shows that pellet prices for large heating systems will be evened out among various countries. While prices of fuel assigned for individual households will depend [Reports Wood Resource Quarterly 2009]. Due to economic crises many house owners, for example in Germany, recently decided to change heating systems what led, not only in this country but also in Austria and Switzerland, to the growth in pellet prices in July by 4% in comparison to May and by about 22% in comparison with the analogical period of the previous year [Pellet fuel in the time of crises 2009].

CONCLUSIONS

1. Sweden, Italy, Denmark, Germany, Holland and Austria are among the countries excelling in using pellet for energy production
2. European pellet market is divided into its recipients and suppliers. Among the major suppliers there is Estonia (370 000t/annually), Poland (305 000t/annually), and Russia (510 000t/annually), Ukraine (60 000t/annually) and Belarus (40 000t/annually). Among pellet exporters there are also: Germany (580 000t/annually) and Finland (270 000 t/annually), having a significant product surplus. Domestic production is supplied by import in Denmark (890 000t/annually), the Netherlands (756 000 t/annually), England (556 000 t/annually), Sweden (400 000t/annually) and Italy (350 000t/annually).
3. 25-30% market increase forecast for 2009 in the UK, Denmark, Sweden, Germany and Austria creates a chance for potential price-wise competitive producers and exporters from Poland, providing that product high quality is maintained.
4. Dynamics of pellet market development in Europe will be determined by the structure of its recipients. In case it is dominated by institutional and industrial consumers rapid development may be expected.

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***Katarzyna Mydlarz, Marek Wieruszewski*[54]**

UTILISATION OF RENEWABLE ENERGY SOURCES IN WOOD-INDUSTRY ENTERPRISES

Abstract: The energy crisis observed in Poland as well as in many other countries in recent years made many decision-taking persons realise – in particular those from European countries - the need to look for new energy sources.
This study aims at showing possibilities of utilisation of alternative sources of energy, especially in the wood industry, and at presenting potentials for waste which is created in wood processing enterprises.
Key words: energy sources, wood, timber industry, waste

INTRODUCTION

Increased demand for energy, both in developed and developing countries, as well as pressures on limiting emissions of noxious compounds into the atmosphere cause a growing interest in renewable energy sources. In the European Union, energy derived from renewable resources constitutes a more and more important component of the overall energy balance. This is understandable in view of a continuous development of industry which, from year to year, increases consumption of shrinking, non-renewable energy sources – oil, coal or natural gas.

Diversification of energy sources leading to increased proportions of unconventional sources makes the use of local, unconventional renewable resources attractive. It opens up new perspectives for small electricity-generating plants which are strongly supported by economic policies of the European Union. Last but not least, it can liberate a given country from imports of conventional sources of energy and contribute significantly to energy stabilisation in conditions of changing political and economic environment in the world.

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DIRECTIONS OF DEVELOPMENT OF ENERGY RENEWABLE SOURCES IN POLAND

Energy renewable sources (ERS), primarily due to their harmlessness to the environment and inexhaustible nature, have recently been gaining in importance and popularity. These are features which distinguish them from conventional sources which, as demonstrated by many experts, may become completely depleted within the next few decades. The popularity and importance of renewable energy sources have certainly been greatly helped by EU regulations and directives determining their proportions in the total fuel-energy balance of a given country. According to the "Strategy of Development of Renewable Power Engineering" and the governmental document "Climatic policy until 2020", Poland is supposed to increase the share of renewable energy up to 7.5% by the year 2010 and up to 14% by the year 2020. The above targets constitute an enormous chance not only for the utilisation of natural resources but also for those which are the effect of human activities (Strategy of development... 2002).

The basic renewable resources include: solar, river and wind energy, geothermal sources as well as biomass which, due to possibilities of its utilisation in all climatic conditions and in all part of the country, appears to be the most likely direction of development.

Biomass belongs to the most frequently utilised contemporary sources of renewable energy. It can occur in various physical states, although for energy purposes, the most frequent state of biomass is solid. "The basic biomass solid fuel is forest biomass (fuel wood) occurring in the form of chunks of wood, round timber, chips, briquettes, pellets and wastes from forests in the form of substandard timber: branches, poles, small branches, bushes, brushwood, stumps as well as wastes from wood (sawdust and shavings) and pulp-wood industry – black liquor" (Energy from renewable sources 2008). Another group of fuels are materials derived from farming biomass plantations intended to produce energetic materials, for example fast-growing trees such as willow tree (*Salix vinimalis*). This kind of energy source allows managing of infertile or contaminated land on which it is not possible to grow edible plants and to utilise wastes created by industry, especially wood industry (www.bimass.org).

When selecting biomass as a source of energy it is important that its burning, in contrast to the burning of fossil fuels, is neutral for the environment. The emission of CO_2 during biomass combustion is equal to the amount of carbon dioxide plants took up during their growth, so the final balance is zero. In addition, ashes that develop in the process of biomass incineration provide an excellent fertiliser which can be used to fertilise cultivation of edible plants (Demianiuk L. 2002).

Biomass is utilised mainly locally where no transport and storage in the form of reserves is necessary which, in final account, increases heating costs and, consequently, total costs which have to be paid by an enterprise. Figure 1 presents production of renewable energy in Poland in years 2000 to 2007.

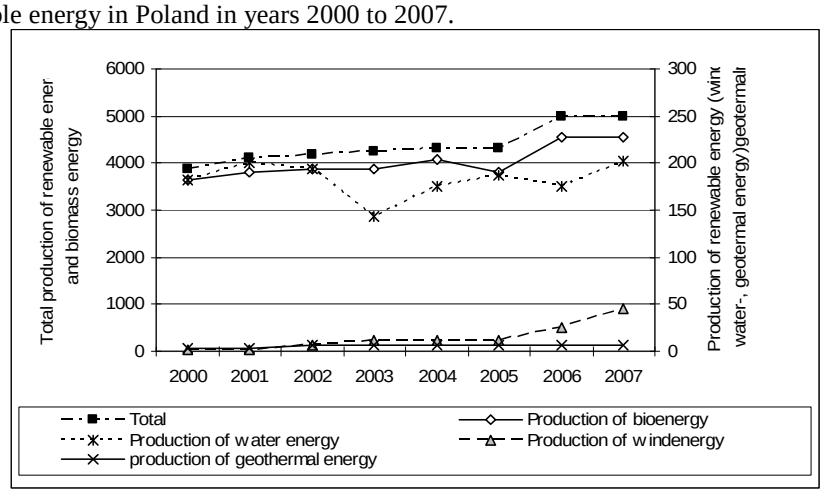

Fig. 1. Production of renewable energy in Poland in years 2000 to 2007 in thousands of tons (ton of equivalent oil)
Source: own elaboration on the basis of data from the Main Statistical Office – GUS

It is evident from the diagram that the production of renewable energy derived from biomass constitutes the highest proportion among all alternative energy sources in Poland. According to GUS data, the proportion of biomass in the total production of renewable energy amounts to approximately 90%, whereas, for example, the share of wind energy does not exceed 1%. However, taking into consideration a growing interest of investors in construction of wind mills, as observed in recent years and shown in the diagram as a small but growing proportion of wind energy in the total energy balance, it is fairly likely that this production will be far greater in future. However, despite these predictions, quantities of wind energy in Poland will certainly not equal the amount of energy derived from biomass since high investment costs involved in the reconstruction of the network infrastructure and construction of windfarms as well as constraints connected with the availability of land characterised by appropriate wind factors will prevent it (www.biomass.org).

CURRENT SITUATION IN WOOD INDUSTRY ENTERPRISES

The increase of prices of traditional energy carriers observed in recent years forces entrepreneurs either to limit their consumption or to look for alternative sources. This situation is observed, among others, in enterprises of the wood industry sector. In spite of higher costs of energy and heating, these companies still find themselves in a quite comfortable situation. As manufacturers of wood articles, they generate significant quantities of waste which used to pose a considerable problem in terms of their rational management before and which now can be and actually are easily utilised, for example, to heat buildings, factory facilities or heating water for the needs of the enterprise.

Figure 2 presents biomass utilisation in industry against the background of its total consumption in Poland in 2001 – 2007.

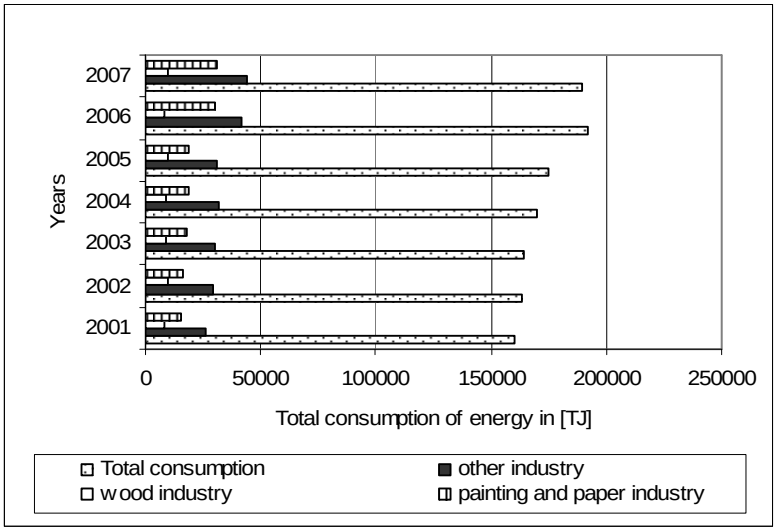

Fig. 2. Biomass consumption in wood and paper industry against the background of its total consumption in Poland in 2001–2007 [in *TJ*].

Source: own elaboration on the basis of data from the Main Statistical Office – GUS

It is evident from the above data that the wood industry alone utilises approximately 30% of the biomass used in the entire industry and together with paper and printing industries, its proportions amounted from 88.5% in 2001 to 92.4% in 2007. This significant biomass consumption in paper and wood industries was the results of the specificity and potentials of these two branches of industry.

Enterprises of primary wood processing are in an exceptionally favourable situation since wastes which are obtained there can be utilised both in a non-processed form or be used as initial material for bio-fuel production. Direct waste utilisation for energetic purposes is not always possible due to the level of moisture content or the form of the waste material. In addition, non-processed raw materials often exhibit worse thermal properties and, therefore, they are subjected to various types of processing. The most frequent operations employed for the purpose of turning plant material into solid bio-fuels include: drying, grinding, granulation and briquetting. Sawdust, wood shavings and bark are among the most frequent wastes which develop in the course of wood mechanical processing with the estimated quantity of 3 million tons per year with only about 49% of this material being utilised for energetic purposes (*Demianiuk L.* 2001, *Hejft R.* 2002). It should be remembered that the amount of created wastes possible to utilise as sources of renewable energy depends on the achieved material efficiency of individual sectors of industry, conversion processes, specific assortments as well as technological production conditions. So these factors exert a decisive influence on the level of raw material utilisation and, hence, on the proportions of produced wastes. Example indices of the obtained efficiencies in primary processes of coniferous as well as oak and beech timber are shown in Figures 3 and 4. The obtained material efficiencies in processings in this branch of wood industry illustrate clearly the proportion of waste materials developing in processing operations. These considerable proportions – sometimes reaching even 75% of the volume of the processed timber – provide one of the largest biomass sources for energetic processes (Hruzik G. 1993, 2006).

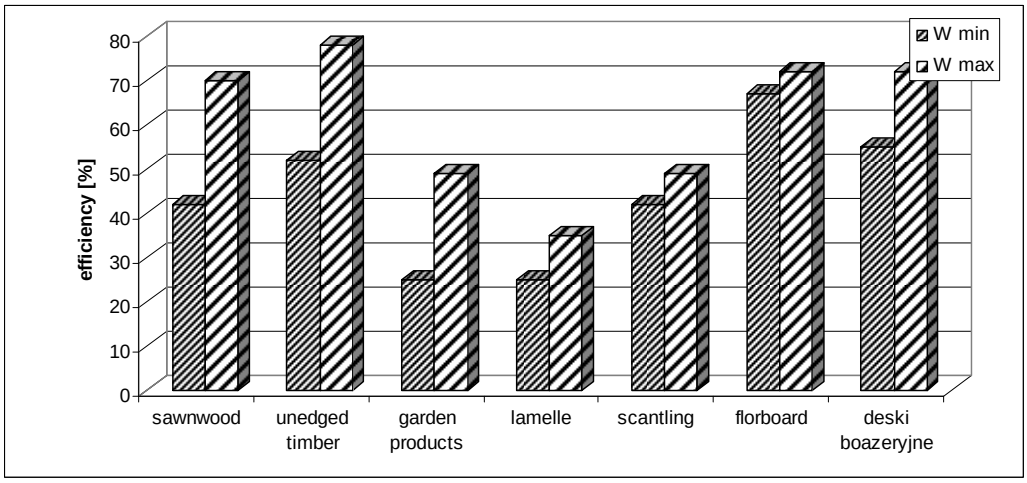

Fig. 3. Efficiency of conifer sawn wood

Source: Hruzik 2006

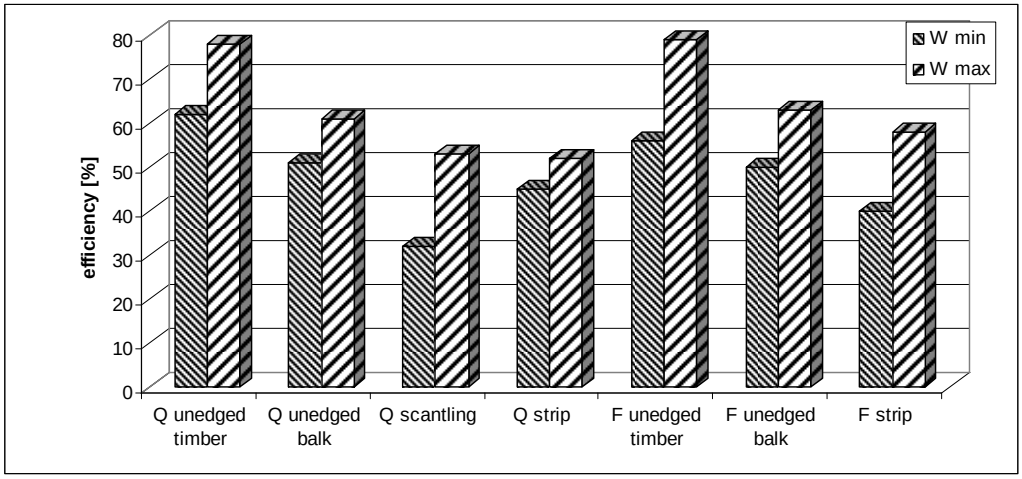

Fig. 4. Efficiency of oak and beech sawn wood: Q – oak, F – beech
Source: Hruzik 1993, 2006

Wastes of plant origin, e.g. sawdust or wood shavings, consist of particles of varying sizes; pine sawdust is made up of 31.3% particles stopped on the sieve with 1.5 x 1.5 mm mesh, 13.5% - with 3 x 3 mm mesh and 15.4% with 2 x 2 mm mesh providing good material for briquetting or granulation. According to the BN-78/1135-04 standard, a briquette is a cylinder or cuboid with a diameter of 15-30 mm or base side of 60-120 mm, whereas granules are cylinders or cuboids with a diameter or base side of 15 mm. The initial moisture content of the raw material for solid bio fuel production should be in the range of 10% and the obtained ash content – at volumetric mass (density) at the level of 600kg/m^3 – should not exceed 0.7%. If the above-mentioned parameters are met, the achieved calorific value should be about 19 MJ/kg.

Among the most popular energetic products are pellets, whose shape resembles small briquettes. The best quality pellets are manufactured from pure timber sawdust without any additives and are characterised by about 8% moisture content, volumetric mass of approximately 600kg/m^3 and calorific value of about 19 MJ/kg. The granulate is made up of sawdust, shavings, chips, wood bark as well as other wastes from timber processing. It does not contain any substances of glue type or lacquers and the only bonding substance is natural adhesive. Next, the raw material is brought to a homogeneous form, pressed under the pressure of about 15-60 MPa and extruded through an appropriate die diameter and dried.

Although the processing of waste biomass facilitates its energetic utilisation, it is an expensive process. Despite this, the advantages of the new fuels, i.e. their increased density and heat of combustion, absence of CO_2 emissions as well as smaller NO_x and SO_3 emissions all cause the interest in techniques of bio fuel production to be on the increase.

Table 1 presents literature results of investigations concerning heat of combustion carried out for selected materials at 0% m - moisture content for dry matter of the fuel (Obidziński 2002, 2004).

Table 1. Results of investigation concerning heat of combustion carried out for selected materials

Material		heat of combustion [MJ/kg, MJ/l, MJ/m^3]	heating value [MJ/kg, MJ/l, MJ/m^3]
Spruce sawdust		18,89	17,58
charcoal		31,55	30,23
hard coal		32,82	16-29
furnace oil		--------	41-46
natural gas		38,147	34,43
pellet		19,5	18.6
paper (waste)		17,05	16,39
bark:	oak	19,05	17,51
	birch	23,37	21,86
	alder	21,73	20,31
	willow	18,19	16,76
	pine	21,08	19,66
Straw:	rye	17,78	17,12
	rape	19,14	17,82
	buckwheat	20,12	18,76

Source: Own elaboration on the basis of heat of combustion and calorific value of the examined materials for fuel dry matter.

It is evident from the above comparison that charcoal is characterised by the highest calorific value of 30.23 MJ/kg with waste paper as the lowest – 16.39 MJ/kg. For comparison, the calorific value of hard coal amounts to 27-33 MJ/kg, brown coal – 25-27 MJ/kg, fuel oil – 41-46 MJ/kg and gas – 35-49 MJ/kg[5]. The energetic value of pine sawdust at the level of about 17 MJ/kg or pellets of about 19 MJ/kg is lower in comparison with the remaining sources. Nevertheless, the use of biomass, due to low utilisation costs and ecological factors, places this material at the same level or even higher in comparison with conventional raw materials and fully justifies its utilisation in energy sectors.

RECAPITULATION

Renewable energy sources have been increasingly gaining in importance in recent years, but in spite of this, their potentials are still not fully utilised. It is evident from literature information that in Poland the technical potential of renewable sources constitutes nearly 90% of the demand for energy of which the biggest one – apart from geothermal and solar energy – is attributed to biomass. In the case of such a popular source of energy, all over the world, as biomass, apart from energetic considerations, another equally important factor is the possibility of utilisation of production wastes which, from troublesome materials for many enterprises, especially in wood industry, have become a valuable material and a source of additional income.

When justifying the need to increase the share of ERS in global energy consumption, attention is also drawn to the depletion of conventional sources of energy and ecological considerations which, in the situation of continuous environment contamination and the ever growing global warming, provide a serious encouragement and priority.

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ŘÍZENÍ ENERGETICKÝCH PROCESŮ S CÍLEM SNÍŽENÍ NÁKLADŮ FIRMY

ENERGY PROCESS MANAGEMENT TO REDUCE COMPANY COSTS

Abstract: The paper focus on energy processes, their management and possibility of cost savings. The target of the energy processes is defined. These processes belong to supply processes as the one of the part of process splitting (main/core, control and supply). The paper describes processes with the view to their inputs (energy medium), owners, information and the final customer. The next view considers organisation structure and processes passing through it.

Key words: energy costs, cost savings, process, process management, process target, process matrix, organizational structure, subsidiary processes, administrative processes, energy processes, duplicate activities, input, output, process owner, process customer

ÚVOD

V současném ekonomickém prostředí, zmítaným recesí, firmy ještě intenzivněji obracejí svou pozornost směrem k úsporám energií.

Tato oblast je, se svými mnohdy nepopsanými (nezmapovanými) procesy, černou ovcí nejen velkých výrobních podniků. Plýtvání energiemi, distribuční ztráty, duplicitní aktivity a například nesprávně nastavené plány revizí a kontrol neumožňují optimalizovat náklady na energie. Příspěvek se zabývá podpůrnými energetickými procesy, taktéž nazývanými administrativním, jejich řízením, přínosy a bariérami zavádění. Nahlíží taktéž na energetické procesy a subprocesy z hlediska jejich vstupu, neboli médií, dále pak vlastníků, informací a konečného zákazníka. Není zapomenuto ani na možnosti úspor nákladů včetně identifikace oblastí, kde je možno tyto náklady snižovat a chování vybraných energetických nákladů v době krize. V dalším části příspěvku je uveden krátký pohled na organizační strukturu procesní firmy. V útvarech energetiky logicky probíhají další aktivity tvořící proces jak je např. administrativa, legislativa, reporting, nákup, prodej, řízení lidských zdrojů, systémové zabezpečení, aj., ale od těchto aktivit je v příspěvku abstrahováno.

1. PROCESNÍ ŘÍZENÍ (ENERGETIKY)

Dle Petra Mančíka ze společnosti Logica s. r. o. by se samotným procesním řízením měly zabývat společnosti, které jsou v dobré ekonomické a tržní pozici s cílem jejího zlepšení. Firma v problémech může takovouto změnou v případě dopuštění se implementačních chyb svoji situaci významně zhoršit. Toto tvrzení platí v energetice dvojnásob. Je nutné mít na paměti zachování redundancí u všech druhů médií nejen z důvodu zachování plynulosti výroby, ale i bezpečnosti.

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Procesní řízení lze charakterizovat maximální snahou o integraci činností mezi jednotlivými řídícími jednotkami, které fungují do značné míry autonomně [5].

Další autoři popisují procesní řízení jako systematickou identifikaci a management procesů používaných v organizaci a zejména jejich vzájemné působení. Procesní řízení je definováno jako metodologie pro hodnocení, analyzování a zlepšování klíčových procesů, založená na potřebách a přáních zákazníků [1].

Bohužel se firmy využívající procesní řízení zaměřují přednostně na hlavní procesy a podpůrné odsouvají na „druhou kolej". Ale bez podpory a zajištění podmínek pomocí podpůrných procesů by hlavní nebyly schopny efektivně fungovat. Energetické procesy patří do skupiny podpůrných/administrativních procesů jako jedny z nejdůležitějších.

„Energetika je srdcem výroby." „Energetiku zaměstnanci jiných útvarů nevidí, jsme na zemi, pod ní i ve vzduchu." „Nesmíme si dovolit sebemenší přerušení dodávky médií." Takto popisují svůj útvar dotčení zaměstnanci.

Chceme-li hovořit o procesním řízení energetiky, musíme si napřed stanovit cíl, kterého chceme dosáhnout. Cíl musí být S.M.A.R.T., tzn. přesně formulovaný (specific), měřitelný (measurable), adekvátní potřebám organizace (aligned), reálný (realistic) a časově ohraničený (timed).

Hlavní cíl procesního řízení energetiky můžeme tedy charakterizovat jako včasné zajištění energetických dodávek pro plynulou výrobu v potřebném množství, co nejvyšší kvalitě a při nízkých nákladech. Další atributy, kterými je třeba se zabývat, jsou: vlastník procesu, zákazník, vstup, výstup a zpětná vazba.

Možné zobrazení vztahů mezi procesy a jejich cíli přináší následující matice (viz Tab. 1)

Tab. 1. Matice procesů a cílů

	Cíl 1	Cíl 2	Cíl 3	Cíl n
Proces 1	1	3	0	x
Proces 2	2	0	1	x
Proces 3	0	0	3	x
Proces n	x	x	x	x

0 - proces neovlivňuje cíl

1 - proces mírně ovlivňuje cíl

2 - proces ovlivňuje cíl

3 - proces významně ovlivňuje cíl

Zdroj: vlastní zpracování

1.1 Přínosy procesního řízení energetiky

Řízení energetických procesů přinese mimo jiné i:

- možnost analyzování procesů, jejich měření a optimalizaci
- zvýšení rychlosti řízení distribuce energetických médií a zkrácení doby odezvy požadavků výroby
- snížení nákladů (personálních, nákladů energetických ztrát, aj. viz Kap. 4.)
- zvýšení výkonnosti energetiky
- zlepšení kvality komunikace a systémového zabezpečení (měření a regulace médií)
- zprůhlednění distribučních cest a řízení toku
- zvýšení jakosti výroby eliminací výpadků z přerušení dodávek energií
- optimalizace řízení údržby
- zlepšení orientace na zákazníka (odběrové místo výroby)
- zlepšení zapojení (motivace) zaměstnanců, nastavení odpovědnosti a pravomocí, rovnoměrné pokrytí směn, ad.

1.2 Bariéry zavedení procesního řízení v energetice

Bariéry zavedení procesního řízení je nutné analyzovat již při úvahách o samotné implementaci. Jedná se především o:

- rezistenci zaměstnanců (historické hledisko, neochota ke změnám, obava ze ztráty zaměstnání, ad.)
- znalostní bázi[56]
- neodpovídající organizační strukturu[57]
- normy a nařízení
- nízký tlak na ISO certifikaci energetické oblasti podniků
- systémové zabezpečení, aj.

[56] *U procesů znalostně nenáročných lze až 80% průběhu vykonávat běžnými zaměstnanci se základním zaškolením, tzn., že pouze 20% případů vyžaduje přítomnost specialistů a jejich know-how. V procesech znalostně náročných, kam řadíme i energetiku, lze 60% průběhu procesu vykonávat zaměstnanci se základním zaškolením. Podobný poměr by se měl objevit ve skladbě personálního zajištění útvaru. Běžně se stává, že vysoce odborní zaměstnanci vykonávají běžné rutinní aktivity, které mohou vykonávat zaměstnanci se základním zaškolením. [2] Problémem funkčně řízených organizací je nedostatek multiprofesionálních zaměstnanců, kteří jsou schopni obsáhnout více znalostně náročných operací v procesu.*

[57] *Organizační struktury jsou nepřítelem procesů. Každá změna organizační jednotky v průběhu výkonu procesu vytváří určitý blok, který zhoršuje jeho výkonnost. Negativní dopady lze eliminovat pomocí rolí a jejich dynamického přiřazování. [2]*

2. ENERGETICKÉ PROCESY DLE VSTUPU

V útvarech energetiky je organizační struktura převážně koncipována na základě jednotlivých médií vstupujících do procesu (viz Obr.1).

Obr. 1. Příklad organizačního schématu útvaru energetiky ve výrobním podniku
Zdroj: vlastní zpracování

Základní aktivity:

- odbor Energetiky
  - vedení lidí, školení a certifikace, administrativa, reporting, nové technologie, ekonomika, systémy, atd.
- oddělení Elektro
  - elektrodispečink, rozvodny, trafostanice, rozvody
- oddělení Voda, vzduch
  - recirkulační stanice, ČOV, kompresory, tlakové nádoby, potrubí
- oddělení Technologická pára
  - redukční stanice, parovody, tlakové nádoby, aj.
- oddělení Údržba energetiky
  - opravy potrubí – svařování, opravy zařízení – kompresory, atd.

Z uvedeného je patrné, že hlavním vstupem (z pohledu médií) do procesů jsou:

- elektrická energie
- voda
- stlačený vzduch
- technologická pára

Následující tabulka přináší ukázku procesů dle definovaných vstupů (médií). Na základě vývoje a nových trendů v energetice lze dále doplnit větrné proudění (větrné elektrárny), sluneční záření (fotovoltaické elektrárny) a např. vibrace (hlukové stěny).

Tab. 2. Procesy dle vstupu

Vstup	název procesu	cíl	vlastník	výstup	zákazník	systém, informace	technologie	vybrané aktivity/subprocesy	metriky
elektrická energie 110kV	Nákup, transformace a distribuce elektrické energie	dodávky elektrické energie pro plynulou výrobu a administrativu v potřebném množství, optimálním parametru a při	vedoucí odboru	elektrická energie 6kV	centrální rozvodna, podružné rozvodny, výrobní technologie, externí odběratelé	AISYS	rozvodny, trafostanice	měření a regulace, kontroly, revize, preventivní údržba, opravy, systémové zabezpečení, reporting, vedení lidí, administrativa, legislativa, ekonomika,hasičský dohled, …	ČK/den, ČK/Q_média, Náklady, Q_zam., čas, četnost kontrol a revizí, Q_paralelních aktivit, Q_unifikovaných aktivit
vzduch	Výroba, transformace a distribuce stlačeného vzduchu	Včasné zajištění dodávky stlačeného vzduchu pro plynulou výrobu v potřebném množství, optimálním parametru a při nízkých nákladech.	vedoucí odboru	stlačený vzduch 6 Bar	výrobní technologie, nevýrobní technologie, externí odběratelé	HELIOS	tlakové nádoby, potrubí	měření a regulace, kontroly, revize, preventivní údržba, opravy, systémové zabezpečení, reporting, vedení lidí, administrativa, legislativa, ekonomika,hasičský dohled, …	ČK/den, ČK/Q_média, Náklady, Q_zam., čas, četnost kontrol a revizí, Q_paralelních aktivit, Q_unifikovaných aktivit

Zdroj: vlastní zpracování

3. ORGANIZAČNÍ STRUKTURA PODNIKU A PROCESY

Organizační struktura procesně řízeného podniku je tvořena procesní strukturou firmy (horizontální) a útvarovou strukturou (vertikální), která procesní strukturu podporuje. Při zavádění procesního řízení do firmy je nutné odhlédnout od stávajícího, tradičního modelu. Je třeba přehodnotit všechny vazby a vztahy, formulovat správně popisy pracovních míst včetně znalostní báze jednotlivých rolí, nastavit kompetence a odpovědnosti, určit vlastníky procesů. Není cílem popisovat jednotlivé typy organizačních struktur. Podnik bude vždy postupovat dle svých možností a potřeb. Zavádění procesního

řízení je nekončícím procesem. Ten, kdo tvrdí, že má podnik již zavedené procesní řízení, hovoří o procesně mrtvé firmě. Z našeho pohledu se jeví nejvhodnějším základním stavebním kamenem maticová organizační struktura, kde je ale nutné citlivě přehodnotit pravomoci mezi jednotlivými manažery a jasně definovat vlastníky procesů. Největší zastoupení ve výrobních podnicích má liniová, liniově štábní, divizní a maticový typ struktury. V útvarech energetiky pak převládá typ liniově štábní organizační struktury koncipované dle vstupu, resp. média do procesu.

Orientace na procesní řízení je jedním z klíčových dogmat současného managementu. Organizační uspořádání organizace úzce souvisí s nákladovým řízením a kalkulacemi. [4] Správná organizační struktura útvaru energetiky je proto prvním krokem úspěchu k úsporám v oblasti nákladů.

4. POHLED NA NÁKLADY

Jedním z hlavních cílů každého podniku je trvalé snižování nákladů. Energetické náklady patří svým podílem mezi největší a skrývají obrovský potenciál úspor. Procesní model určuje aktivity, které můžeme měřit a přiřadit k nim materiálovou potřebu tzn. je možno k nim následně přiřazovat i náklady a výnosy. Cestou jak poznat náklady procesu je vykazovat je podle skutečného důvodu jejich vynaložení, ne na místo jejich vzniku. Tímto způsobem odhalíme to, co vlastně v podniku děláme.

Možností je přechod od převládajícího funkčního způsobu řízení, vyznačujícím se dělením práce mezi funkční jednotky vytvořené na základě jejich dovedností, k procesnímu způsobu řízení firmy a také nákladů. Firma pak tedy není řízena potřebami jednotlivých funkčních jednotek ale orientací na výsledek práce (produkt). Práce není vykonávána separátně v oddělených funkčních jednotkách, ale naopak jimi protéká. Celý systém je pak řízen potřebami zákazníka, zpravidla formou řízení interakcí a rozhraní, což znamená řízení produktů a meziproduktů. Při procesním způsobu dochází ke zlepšením obvykle optimalizací a zjednodušením celého toku práce. [3]

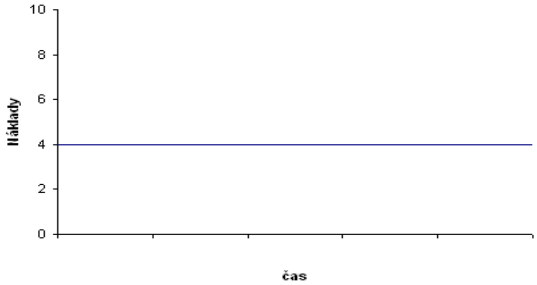
V následujícím přehledu jsou uvedeny vybrané prostředky a oblasti, ve kterých lze hledat úspory (viz Tab. 3).

Tab. 3. Prostředky a oblasti úspor

Prostředek	Cíl (vybraná oblast snížení nákladů)
odpovídající nastavení pracovního harmonogramu	headcount
duplicitní aktivity	headcount
systémové zabezpečení	investice do oprav a údržby, headcount
optimalizace distribučních cest	energetické ztráty, nákup médií
outsourcing neefektivních činností	headcount
přesné týdenní plány odběrů energií, odpovídající odběrový diagram	sazby energií - nákup
nové technologie (fotovoltaika, vibrační stěny, větrné elektrárny, nový typ čerpadel a kompresorů, apod.)	nákup a výroba médií

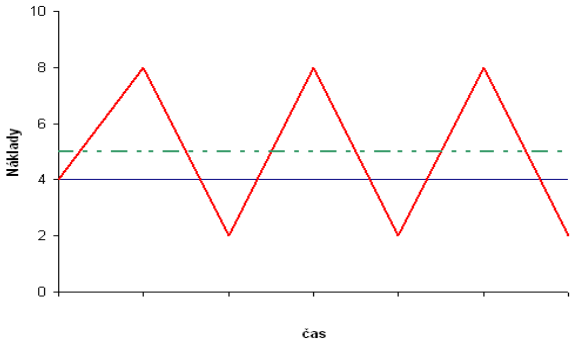
Zdroj: vlastní zpracování

Nucené omezení výroby a neúměrné snižování nákladů s sebou ovšem také nese kontraproduktivní efekty. Jako příklad můžeme uvést zvýšení nákladů na energii vlivem nerovnoměrného odběru, způsobeného vynucenými odstávkami. Tento příklad bude demonstrován na následujících jednoduchých grafech.



Obr. 2. Vývoj energetických nákladů při nepřerušené výrobě
Zdroj: vlastní zpracování

Obr. 2 zachycuje náklady na energie při nepřerušené výrobě. Odběr energie v této situaci je nastaven na předem dohodnutém objemu s distributorem, a proto je také aplikovaná konstantní zvýhodněná sazba, což umožňuje také dodavateli energií efektivnější plánování a zatížení energetické sítě. Při odstávkách výroby, které mají za cíl jednak omezit výrobu, aby se nevyrábělo na sklad, a jednak ušetřit energetické náklady, tak dochází paradoxně k situaci, kdy výkyvy v odběrech energie při odstávce výroby, při najíždění nové výroby (červená křivka na Obr. 3) atd. znamenají nedodržení dohod s distributorem energie, který na toto reaguje zvýšením sazby za energii. Ve svém důsledku se potom zvyšuje i průměrná sazba za energii (zelená přerušovaná přímka Obr. 3), což zvýší také celkové energetické náklady.



Obr. 3. Vývoj energetických nákladů při odstávkách výroby
Zdroj: vlastní zpracování

ZÁVĚR

Zavedení procesního řízení v útvarech energetiky výrobních podniků není jednoduchou úlohou a jedná se o trvalý, nikdy nekončící proces. Může však jistě přinést nemalé úspory v nákladech a umožní mj. snadnější kontrolu a řízení těchto útvarů. Oblast podpůrných procesů je dosud „zanedbávanou“ částí procesně řízené firmy. Energetické procesy patří k důležitému stavebnímu kameni fungování výroby a podniku jako celku a zaslouží si proto velký podíl pozornosti.

Summary: In the current economic environment, suffering from recession, the companies are even more intensively turning their attention toward energy saving.

The implementation of process management in the energy departments of manufacturing enterprises is not a simple task and it is a permanent, never-ending process. However, it can certainly bring considerable savings in costs and enable i.a., facilitating the control and management of these departments. An area of support processes is still a "neglected" part of a process-driven company. But energy processes are an important building stone of production functioning of the enterprise as a whole and therefore deserve a large share of attention.

This area is, with its often undefined (unmapped) processes, the black sheep of not only large manufacturing enterprises. Wasting energy, distribution losses, duplicate activities and e.g. incorrect settings of plans for revision and control do not allow optimizing energy costs. The paper deals with supporting energy processes, also called administrative, their management, benefits and implementation barriers. It also takes a look at energy processes and sub-processes in terms of their entry, or the media, as well as owners, information and the final customer. Nor are forgotten the possibilities of cost savings, including the identification of areas where it is possible to reduce these expenses, and conduct of selected energy costs in times of crisis. In the next part of the paper is given a brief insight into the organizational structure of a process company. In energy units logically take place other activities forming process such as e.g. administration, legislation, reporting, purchasing, sales, human resource management, system security, etc. However, these activities are in the paper abstracted.

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Ján Parobek, Hubert Paluš, Vladislav Kaputa[58]

INTRODUCTION TO WOOD MATERIAL FLOW ANALYSIS IN SLOVAKIA

Abstract: This paper deals with the issue of wood material flow analysis in the Slovak Republic. Theoretical approaches of monitoring wood flows as well as partial results and ideas for future research in this area are outlined.
Keywords: material flow analysis, wood, wood assortments, wood products

INTRODUCTION

The forest provides production and non-wood-production functions which contribute to maintaining and improvement of the life quality worldwide. The sustainable development links economic, environmental and social developments issues. The share of the forestry on the GDP (approx. 3 %) is not so significant. In spite of this fact Slovakia belongs to the most forested countries (42 %) in the Europe. Slovak economy and society have passed through many changes during the last 20 years. Thought new circumstances did not influence wood supply and it structure significantly, the changing market

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environment and traditional socio-economic factors influenced relations between supply and demand on the wood market. Present trends, market conditions, actual economy crisis and open trade possibilities determine to a large extent territorial structure of roundwood deliveries not only internationally but also on regional and domestic markets.

MAIN COMMODITIES SUPPLIED TO THE WOOD MARKET

According to the valid Slovak Technical Standards the roundwood is categorized into timber assortments. The criteria for classification are based on the tree species, timber dimensions (length and diameter) and the presence of wood defects (quality). Each quality class includes timber for particular use within industrial processing or for the final use. For coniferous and non-coniferous wood, these standards distinguish the following quality classes of assortments: I. quality class - veneer logs (used for production of sliced veneer), II. quality class - veneer logs (used for production of rotary cut veneer), III. quality class - sawlogs, IV. quality class - posts, pit props, poles, and other industrial wood, V. quality class - pulp wood for chemical and mechanical processing, VI. quality class - fuel wood. In foreign trade relations, timber classification standards of foreign timber markets are also used. Apart from the dominant wood assortments (sawlogs and pulpwood), whole lengths, wood chips and standing timber are also offered to the market.

MATERIAL FLOW ANALYSIS

The analysis provides relevant information about the consumption of wood as a material. Monitoring of wood use could be problematic for final productions of specific commodities, as well as, semi products as wood waste, which could be use for next processing. This is important information since final data of products and materials consumption are hard to obtain. The aim of this study is to describe the method of wood and wood products flows in Slovakia. In order to analyse wood flows in Slovakia it is important to identify main wood and wood products uses and the main flows the wood passes on its way to the final consumers.

Wood flows could be described by three dimensions. The first dimension is territorial and indicates the origin or destination of the wood and wood products flows (domestic or foreign). The second dimension is a product – chain or life cycle dimension accounting for direct (as input) and indirect wood and wood products flows. The third dimension is product dimension which describes enter of wood and wood product to any wood processing (or other) industry or not. (if wood and how much of wood is used or unused).

Material flow analysis can (MFA) can be expressed by four criteria (according to the classification principles). The first is a comprehensive perspective which focuses on a socio – economic system and ecosystem. The second is reference system (global anthroposphere, national or regional system etc.). The third criterion refers to examination of material flows. The first socio-economic perspective includes "total material metabolism", energy flows or specific materials. According to ecosystem perspective the flows are compared to resources availability, changes of natural stocks, absorption capacity or reference flows within the natural system. The last, fourth criterion involve the time aspect and the flows are defined in mass units per time period. In the special case of individual need oriented MFA, the system under study is additionally related to an individual need (e.g. wood resources). MFA describes such subsystems as networks of technical or economic processes, which are linked by material flows (Baccini and Brunner 1991). It applies a general mathematical description of the process network based on the wood flow. Beyond this definition, it is a generally defined method allowing for a large variety of system's definitions as well as an integration of various modelling approaches. Several different model approaches were introduced to describe the development of material stocks. Economic parameters can be included into this general model by adding financial flows (expenses, income and value added) and financial stocks (financial assets). Mathematical description and calculation of the material flows - the mathematical description of MFA describes the system with variables given by the systems analysis. It is used for data simulation (e.g. calculating the best estimates of wood supply) and modelling. MFA systems are fully described in time and space with system variables. Balance volume can be described by the following general equation:

$$\frac{dM^{j}}{dt} = \sum_{r} Arj - \sum_{s} Ajs \qquad [1]$$

M (j) (t): amount of material in Wj (wood harvesting)

Arj (t): material flow from Wr to Wj (wood products and semi products)

Ajs: selected balance volume (process)

Balance equations describe the general interactions. Regarding materials, elements and energy, the input flows equal the output flows plus net accumulation.

The balance equation is generally also valid for financial flows. For processes with financial assets we can either model financial flows equivalent to cost calculation or neglect financial assets and net accumulation in the mathematical description by estimating expenses and incomes.

PRODUCTION AND CONSUMPTION OF WOOD

Changing environmental situation and transition of all sector of Slovak economy to a market economy consequently increase the importance of forestry industry. This is a guarantee of the ecological and balanced multi-functionality of the forest and emphasis on its public welfare functions, conservation, wood and non-wood production. Figure 1 illustrates a simple wood flow. Only wood (total production) and wood assortments (logs as a sum of I. - III. quality classes, pulpwood - IV. quality class, other industrial roundwood - V. quality class and fuelwood VI. quality class) are taken into account. A share between coniferous and non coniferous roundwood harvested in Slovakia changes every year according to the volume of accidental felling. In general point of view amount of consumption (C) is smaller than production (P). The main wood assortments are logs and pulpwood representing more than 80 % of all production.

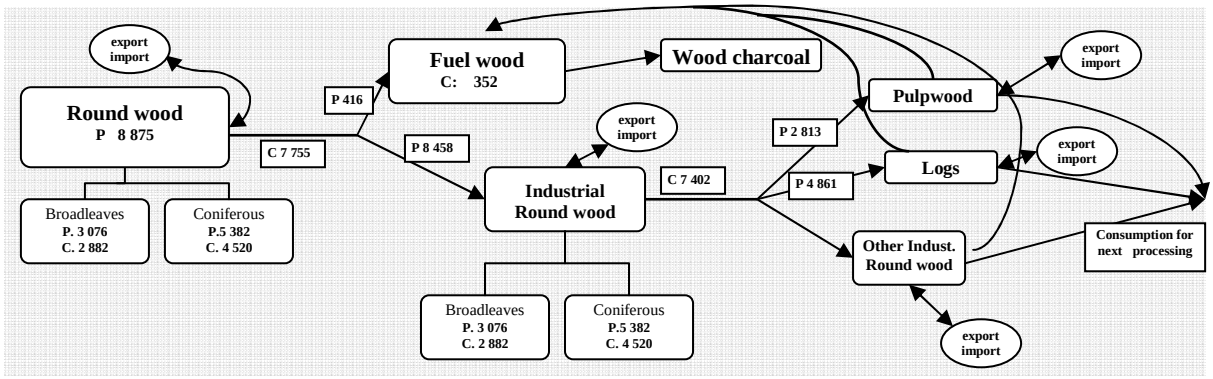

Fig. 1. Production and consumption of raw wood assortments in the year 2007

INTERACTION OF WOOD FLOWS – INPUT VERSUS CONSUMPTION

To describe interaction between input and consumption of wood several indicators can be derived.

Input indicators: Direct wood input (DWI) comprises wood used in the forest industry for further processing. This equals domestic production plus import. Total wood input (TWI) includes additionally the unused domestic resources. This is wood moved by extraction but not entering to the next processing (DWI + unused domestic extraction). Total wood requirement (TWR) includes also indirect flows associated with imports and therefore taking places in other countries (TWI + indirect flows).

Consumptions indicators: Domestic wood consumption (DWC) is described as DWI minus export. Total wood consumption (TWC) is TWR minus export and their indirect flows.

The relation between input and consumption of roundwood indicators during the years 2003 – 2007 is described in figure 2. The windthrow disaster (end of the year 2004) had significant impact to the accidental felling in 2005 (DWI and export was increasing). According to higher value of exported comparing imported wood DWI is always over DWC. (considerably in 2005). However, long term development of the wood production is rather stable (light increasing).

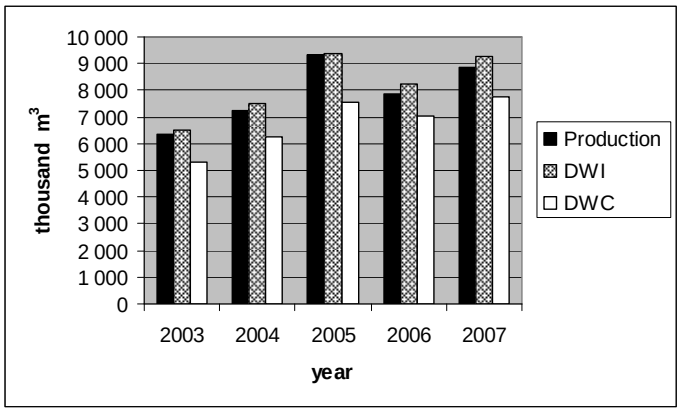

Fig. 2. Roundwood input versus consumption in Slovakia during the years 2003 - 2007

CONCLUSION

The paper presents the introduction and partial results of wood flows analysis in Slovakia. Methodology of TWR and DWI indicators calculating could be based on using either national or international databases. At the present time it is very difficult to calculate indicators as TWR or TWC using available official data (national and international statistic databases). The paper outlined possible ways how to analyse and evaluate wood material flows in the Slovak Republic.

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Tomasz Parys

SELECTED WEBSITE DEVELOPMENT TECHNOLOGIES USED IN FURNITURE INDUSTRY PORTALS AND VORTALS IN POLAND

Abstract: In this study the selected website development technologies were introduced. It shows the short profil of furniture industry internet sites. The principal part of this study is the analysis of these sites at an angle of technologies used to build them, together with the synthetic discussion of received results.
Keywords: website development technologies, furniture industry, internet portal and vortal

1. INTRODUCTION

Internet has currently become a common communication medium, used in all fields of human activity. Even if many tools have been created to support the Internet-based communication, websites have remained the most popular of them. A website is not only a window to the world, or a tool for information exchange, but mostly it provides means for presentation of an entity in the net. Therefore its layout, response speed and content have been becoming still more important. The more attractive is a web page and if it is developed using state-of-the-art technologies, the more likely it is that it will be noticed and frequently visited. This study presents selected website development technologies as well as their utilization for furniture industry portals and vortals development.

2. SELECTED WEBSITE DEVELOPMENT TECHNOLOGIES

2.1. HTML

HTML (HyperText Markup Language) is the basic web content description language. It is one of the oldest and thus one of the most widespread web site development technologies. It employs mark ups, e.g. commands placed in angled brackets, e.g. <A> also known as tags, which may additionally include parameters. The majority of tags requires a matching trailing tag, e.g. </A>, but there is a group of tags that do not need one, such as
. HTML is a parsed language, i.e. basing on tags, the web browser displays (builds) an image of a particular web page. Its feature, non-existing in any other programming language, is that it does not generate errors and potential mistakes made in the code are simply ignored [2].

Web pages coded in HTML are plain text files, which means that they do not contain any information intended for a specific application or platform. They are readable in any flat text editor. HTML files contain the proper text to be displayed on the web page and tags used for marking up elements of that page as well as its formatting structure and links to other web pages and multimedia elements [1]. This is a document description language – it contains a set of tags describing its structure, layout and formatting of various objects on the page. IT is also independent of the hardware and software platform,

2.2. XML

The XML (Extensible Markup Language) language consists only of some core expressions. While creating an XML document, contrary to HTML no fixed set of tags is used. Instead, custom tags are defined, which can be assigned with any name. Therefore XML is also described as an extendable programming language. This is where the power and the flexibility of XML comes from, as this formats allows to simply store any data. By separating the text from the form, one may focus on the data itself. XML is in practice a group of script languages compatible with requirements of that specifications. By using a common XML format, normal programs can easier exchange data and the information published can be more easily processed. The language permits overcoming the compatibility gap between many computer systems, allowing their users to quickly and more easily search for and exchange various types of data [4].

2.3. XHTML

The specification of the XHTML (Extensilble HyperText Markup Language) does not describe any tags. It only defines changes, which shall be introduced to a HTML document, so that it becomes a XHTML document. In practice, there are very few differences between XHTML and HTML. The differences are only limited to several formal requirements, which include: the requirement that tag names are written only in lowercase and the requirement to place parameter names between quotation marks. A correctly constructed XHTML document is de facto compatible with the XML specifications. XHTML-compatible documents, require validation, i.e. checking whether they are actually compliant with that specifications. XHTML documents must be unanimously interpreted by other users without any problems. This is in the interest of every user, as the standard is used in general e-commerce (e.g. by Internet shops).

2.4. CSS

CSS (Cascading Style Sheets) are an extension, which is helpful in web page development. Style sheets allow authors to apply typographic styles and instructions to elements of a web page. The word “cascading” determines what happens when several sources of style information compete over an element of a web page. Using style sheets provide greater control over the web page layout and at the same time allows separation of the web page content from its structure. Using style sheets, it is possible to specify traditional attributes, such as font size or inter-line and inter-character spacing. Style sheets also provide methods for determining indentations, margins and positions of elements. Multiple HTML pages can be linked to a single style sheet. This means that not only a single change may be made, that will effect each copy of the respective element on one web page, but also it is possible to apply changes on hundreds or thousands of web pages by editing a single line of a style sheet only. The goal of CSS creators was to combine flexible means of web page styles control and means for controlling individual elements on web pages with a relevant style hierarchy [1].

2.5. JAVASCRIPT

JavaScript is a client-side scripting language, which adds interactive features to web pages and permits web site developers to control various aspects of web browser operation. JavaScript allows additional link information to be displayed, development of effects related to mouse cursor movements, altering web page contents according to a pre-set conditions, random generation of web page content, loading content into new web browser windows and frames and repositioning of elements on the web page using CSS. Name of the JavaScript language is only incidentally similar o the name of Java programming language. Despite some similarities in the syntax of Java to JavaScript, in order to learn JavaScript one does not need to know Java. JavaScript allows to add various options to a web page using short snippets of code, with easy to understand syntax [2]. JavaScript allows elements and effects, which are not supported by a plain HTML – such as forms or animations to be included on web pages.

2.6. FLASH

Flash technology permits to create a line-art animation. It allows a motion sequence, with accompanying sound track to be created, which is also referred to as movie. The advantage of Flash is the very process of movie and line art generation, which is automated. Also, animations created in Flash are considerably light weight. Flash presentations can be included on a web page or can act as a web page [7]. Thanks to advanced scripting capabilities, application of Flash presentation is only limited by developers' imagination. Many aspects causes that this is an ideal technology for combining websites and interactive elements. It's significant advantage is scalability, as line art pictures and animations can be zoomed-in without loss of fine detail, which causes that it is quire easy to fill the whole browser window with a Flash-scripted interface without causing the source file to grow too much [2]. The Flash technology includes, designed specially for its purposes, object-oriented programming language called ActionScript. It is responsible for communicating with external files - both for file reading and writing – for communication with database and for handling all Flash events [3].

2.7. PHP

PHP (Hypertext Preprocessor) is a simple to learn language, which offers exceptional performance, tight integration with almost any database system used, stability, portability and almost unlimited options for web pages development. This language is an open source solution, which means it is free of charge. The goal of PHP is to allow web developers to rapidly write dynamically-generated web pages. The language has many applications. In practice, it is frequently used for collecting data from forms, which are then saved to files and sent over e-mail. It is also used for purposes of user authentication as well as to limit their access to certain sections of a web site. It is used for dynamic image generation and for data encryption purposes [6]. The PHP language is a server-side language, which means that the code in that language is stored on the host computer serving a web page to users wishing to view it. At the time when a user enters a web page written in PHP, the server reads instructions in this language and processes them accordingly. The code executed by the server sends its output to the web browser, in the form of a HTML code.

2.8. ASP.NET

ASP.NET is a component of the Microsoft.NET Framework platform, permitting development, deployment and execution of network applications and distributed applications. It is free of charge technology, which can be used for creation of small applications, private websites as well as large commercial applications.

ASP.NET is a technology, which allows to easily create dynamic web pages and to manage them. It is the latest generation of the original ASP technology, providing multiple improvements and extensions. ASP has made development of web sites cooperating with databases a very easy task. However it lacked features of advanced programming languages, such as object-oriented programming, complex code, portability, XML network services and a class library designed specially for the Internet or language architecture.

SHORT VIEW ON FURNITURE INDUSTRY WEBSITES

A distinctive feature of Polish furniture-related websites is that in majority, these are websites of furniture industry manufacturers or commercial companies selling furniture. During recent years the importance of the Internet as the potential source of information for wood industry products and services recipients as well as for students of wood-processing faculties has increased. Recent appearance of numerous of websites dedicated to these topics in the Polish internet [ref. 5] proves the growing interest in the general wood-processing related topics.

The present study focuses on a part of these websites, namely on portals and vortals. For purposes of this study's analyses, the following furniture industry portals and vortals have been selected: www.meblarstwo.pl, www.meble.pl, www.emebel.pl, www.meble.com.pl, www.4meble.pl, www.emeble.pl, www.infomeb.pl. As a supplement, the www.stolarstwo.pl portal has been added to the group of websites being analyzed, as this portal covers the broadest range of topics of all analyzed websites and is targeted at the forestry, wood and furniture industries. The websites selected for this study have been analyzed in terms of forms of advertisements that can be found on them.

ANALYSIS OF WEBSITE DEVELOPMENT TECHNOLOGIES USED IN FURNITURE INDUSTRY PORTALS AND VORTALS

The following table presents results of furniture industry portals and vortals analysis in terms of technologies used for their development. The table presents the state as of July 2009, when it was performed.

During the analysis, it has been assumed that a website does not use HTML if its code was compatible with XHTML. However use of XML by websites has only been indicated, when that specification was used, in addition to XHTML language, e.g. to handle RSS data feeds.

Table 1: Website development technologies used in furniture industry portals and vortals

	meblarstwo.pl	meble.pl	emebel.pl	meble.com.pl	4meble.pl	emeble.pl	infomeb.pl	stolarstwo.pl
HTML	-	-	-	+	+	+	-	-
XML	-	+	+	-	-	-	-	-
XHTML	+	+	+	-	-	-	+	+
JAVASCRIPT	+	+	+	+	+	+	+	+
CSS	+	+	+	+	+	+	+	+
PHP	-	+	+	+	+	+	-	+
FLASH	+	+	-	+	+	-	+	-
ASP.NET	-	-	-	-	-	-	-	-

source: own research

Furniture industry portals and vortals should be given a positive score, with respect to technologies utilized for their development. Only three of the analysed websites (namely: meble.com.pl, 4meble.pl, emeble.pl) were developed basing on the HTML language with some extensions. Only two websites (meblarstwo.pl and infomeb.pl) do not utilize the PHP technology, and one (4meble.pl) uses it in a limited scope – e.g. to support the login authorization procedure. However all of the websites analyzed use JavaScript and CSS. Flash technology is used on five websites (emebel.pl, emeble.pl and stolarstwo.pl do not use it). It shall be noted however, that the technology is used merely to support advertisements developed in this technology, rather than as a tool for the overall website development. None of the analyzed portals and vortals use the ASP (ASP.NET) technology. This can be explained by a relatively low popularity of Microsoft software as a software development platform to handle web servers.

CONCLUSION

Furniture industry portals and vortals were developed using state-of-the-art technologies, which contributed to their apparent visual attractiveness and that their correct displaying (parsing) in all popular web browsers. The only demand that can be made to authors and administrators of these websites could be to introduce more variation to forms of the published content presentation.

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RENEWABLE ENERGY CLUSTERS - DRIVERS OF THE POLISH FORESTRY-WOOD SECTOR

Abstract: Clusters constitute a form of cooperation which allows companies to gain more than if they acted in the market alone. Many benefits stem from activities taken up by cluster members and consequently these initiatives are strongly promoted by EU programs. Companies of the Polish wood industry can also profit, thus more and more wood clusters are formed, also in the field of renewable energy. The article presents benefits derived from the existence of well-established clusters as seen from the perspective of the entire economy, regions and finally companies of the Polish wood industry. Further along, the paper provides an overview of clusters functioning in the Polish wood sector, relating to different fields: renewable energy, furniture, builder's joinery, paper, and printing. At the end, a case study of the "Bioenergy for the Region" Cluster is presented.
Key words: clusters, Polish wood sector, benefits, EU support, renewable energy

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CLUSTER BENEFITS FOR THE WOOD INDUSTRY

The term "cluster" has been introduced into business administration and management literature by Michael E. Porter, referring to "industries related by links of various kinds" [Porter 1990], and more specifically to "geographic concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated organizations (such as universities, standard agencies, trade associations) […] in particular fields that compete but also cooperate" [Porter 1998b]. Thus, clusters are a form of cooperative competition referred to as *coopetition*[60] which can lead to many benefits, also for the forestry-wood sector. Generally, the concept of clusters is based on the idea that companies which cooperate achieve more than if they acted in the market alone. Benefits of clustering can be divided into those affecting the entire economy, a certain region or companies directly. A review of literature shows that there are significant benefits at enterprise level and several of them can be applied to companies of the Polish wood industry (Table 1).

Economic benefits can also be divided into *scale effects* (which create external competitive advantage towards companies which do not participate in clusters) and synergy effects (which give rise to internal competitive advantage resulting from the possibility to learn from other members etc.) [Błasiak-Nowak 2007: 86]. Through scale effects (thanks to specialization of factors) productivity is increased [EC 2003]. Porter notices that for a cluster to be successful, efficient communication and flow of information among cluster members has to be provided. Moreover, interestingly, companies which cooperate within a cluster should not stop to compete, as peer pressure spurs executives to outdo one another [Porter 1998a: 83].

TOOLS SUPPORTING CLUSTERS

More than 1400 cluster initiatives have been identified to exist in the world, of which around 500 function in Europe [EC 2008: 42]. The European Union has adopted various instruments in support for clusters. The Regions of Knowledge initiative implemented under FP7 as part of the European Research Area policy aims at stimulating the development of regional "research driven clusters associating universities, research centres, enterprises and regional authorities" [EC 2008: 60]. The Community Strategic Guidelines on Cohesion, adopted for the period 2007-2013, explicitly encourage EU member states and regions to promote strong clusters as part of their economic reform strategies. In 2006, the EU adopted a broad-based innovation strategy and identified strengthening of clusters in Europe as one of the nine strategic priorities for successful innovation promotion. Furthermore, the role of clusters in driving innovation has been emphasized in the Competitiveness and Innovation Programme (CIP), which led to the creation of Europe INNOVA cluster networks aimed at searching for new types of innovation services which are verified by cluster organizations [EC 2008: 60]. Within the Europe INNOVA initiative the European Cluster Observatory was launched which provides a wide variety of data on clusters in Europe. A significant program for the energy sector is the Intelligent Energy – Europe 2007-2013 designed to contribute to a wider spread of energy efficiency practices and to a greater use of renewable energy sources. An example of a project running under this programme is Biomotion, aimed at stimulating the creation of biofuel clusters in France, the Netherlands, Germany, Poland61, Hungary and Romania. Other projects and initiatives promoting clusters include: the European Cluster Alliance; the INNO-Policy TrendChart, the Global Cluster Initiative Survey of the Cluster Initiative Greenbook, the 2006 Innobarometer survey on the role of clusters, the European Cluster Memorandum; the Clusters Linked Over Europe project; the CEE Cluster Agreement; the CLUNET project, the INNET project, the ENOC cluster network [EC 2008: 3, 39, 55]. Additionally, the following cluster training programmes are launched: the cluster academy organized by Clusterland Upper Austria, the Barcelona Clusters Summer School, or PROCluster faciliator workshops held in Finland.

POLISH RENEWABLE ENERGY CLUSTERS

Most clusters functioning in Poland are still at the initial stage of their life cycle, thus benefits should be analyzed in an ex ante perspective [Staszewska 2009: 33]. This is also the case for clusters of the wood sector, including those concentrating within the renewable energy field. At the end of 2008 about 120 clusters and cluster initiatives62 (CIs) were identified to exist in Poland (most – 22 – in the Lubelskie Province), of which 21 focus on companies and institutions of the wood sector. These are located in almost each of Poland's provinces and cover different branches of the sector, i.e. renewable energy (3 clusters, 6 cluster initiatives), furniture (3 clusters, 3 cluster initiatives), wood industry (3 clusters), builder's joinery (1 cluster), paper (1 cluster initiative), printing (1 cluster initiative) – graph 1. As one can notice, renewable energy clusters play a very significant role on the map of Polish wood clusters.

THE BIOENERGY FOR THE REGION CLUSTER

The Bioenergy for The Region Cluster (Klaster Bioenergia dla Regionu) is an example of a well functioning cluster in Poland. The coordinator of the Cluster is the Association of Economic Consultants Pro-Akademia, seated in Łódź, the Łódzkie Province. The Cluster is made up of 21 companies directly or indirectly related to the bioenergy field as well as of business support organizations, R&D institutions and local self-government units – table 2.

The aim of the Cluster is to support sustainable bioenergy development in the Łódzkie Province with regard to the implementation of the integrated energy and climate change package of the European Commission to cut emissions for the 21st century. The project is based on the "Road map of bioenergy sustainable development of the Lodz Region" which defines ecological aspects of the strategy of the development of the Region. In order to benchmark the best eco-energy practices the project is also carried abroad. In April 2008 the European Commission acknowledged the "Bioenergy for the

[60] *For more on coopetition see: [Brandenburger, Nalebuff 1998]; [Cygler 2007].*

[61] *A biofuel cluster has been formed in Poland within the Biomotion (standing for Bio Fuels in Motion) Programme in March 2008. Its coordinator is the Poznan branch of the Institute For Buildings Mechanization and Electrification of Agriculture (IBMER).*

[62] *Cluster initiatives are made up of key players of chosen clusters and are designed to systematically influence development potential of these clusters.*

Region" project as a valuable contribution to the promotion of Sustainable Energy and the Cluster became an official Partner of the Sustainable Energy Europe 2005-2008 Campaign63.

CONCLUSIONS

Research shows that there are many potential benefits of creating clusters. Taking into account current changes taking place in the market, such as globalization, innovative technologies, competition or new consumer behaviour, it is advisable for companies to search for alternative tools of gaining market advantage, such as cluster formation and active membership. At the moment about 20 wood clusters are functioning in Poland, however some of them are still not well managed and promoted. Some initiatives fail to continue its development once EU financial support is over. It should be emphasised that this support is significant as the Community acknowledges clusters as a means of increasing the competitiveness of Europe. A positive sign in Poland is the number of clusters focusing on the renewable energy field on "the map" of wood clusters.

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63 *The Campaign is a European Commission initiative in the framework of the Intelligent Energy - Europe (2003-2006) programme, aiming at raising public awareness and promoting sustainable energy production and usage among individuals and organisations, private companies and public authorities, professional and energy agencies, industry associations and NGOs across Europe.*

Włodzimierz Popyk, Wojciech Lis, Elżbieta Mikołajczak

INNOVATIONAL ACTIVITIES OF WOOD PROCESSING AND FURNITURE PRODUCING ENTERPRISES IN THE YEARS 2000-2007

Abstract: The article presents the diagnostis of innovation activities in wood products and furniture industries. Huge risk and belief that R&D activities are of low efficiency in the Polish conditions as well as long duration of the process lead to relatively low level of investment of industrial enterprises in R&D. The domination of investment expenditure reflects the technological character of innovation introduced in wood and furniture industry. As far as innovativeness is concerned, furniture industry shows the level similar to the results of the Polish industry as a whole, that in 2007 was 37%. However, the level of innovativeness in wood industry as compared to industry in general is much lower.
Key words: innovativeness, wood working industry, furniture industre

INTRODUCTION

Long-term and effective development of industrial enterprises, and in consequence all the national economy at the present stage of social development is closely connected with the ability of enterprises to use their activities to attain scientific and technological development. The application of scientific and technological knowledge to industrial production and the use of all types of new solutions for various spheres of activities of an enterprise is the mark of its modernity and innovation. From this point of view, innovations are perceived as one of the basic tools in the creation of the added value of an enterprise. They influence in a significant way the competitiveness of enterprises and decide to a large extent about their level of development and the dynamics of the development of the national economy as a whole.

Innovative activity may be perceived as a process of adaptiation of scientific and technological progress to production. Innovativeness means introduction of significant changes in the approach used so far, with the application of scientific and technological achievements that induce improvement in the quality of the enterprise's activities. The consequences of these changes are usually certain technological, economic and social profits.

In the literature concerning the subject there is no single definition of innovativeness, although all are similar in character. In the discussion concerning innovativeness we can use the definition of innovative activities used in statistical studies conducted by the Central Statistical Office (CSO). This definition specifies innovative activities as a series of actions of scientific, technological, organisational, financial and commercial actions with the aim of developing and introducing new or significantly improved products and procedures. These products and procedures are new from the point of view of the enerprise introducing it.

The aim of the innovative activity of enterprises is above all the development of the economic organisation, and therefore gaining competitive edge on the goods and services market. Until recently innovative solutions concerned mostly technical and technological spheres of an enterprise. Presently, the understanding of innovativeness in a company is concentrated not only on introducing innovative solutions in the production process. Innovativeness in an enterprise is perceived as a complex and multifaceted activity, also in spheres not connected with technology. Generally adopted international typology of technological innovations in industry and market services encompasses four types of innovations:

- technological product innovation,
- technological process innovation,
- organisational innovation,
- marketing innovation.

Important role of innovative activity in the economic process was noticed as early as in the 19th c. by J.Schumpeter, the author of the theory of economic development based on innovativess. According to him, in the institutional structure of the society the most important role is played by an enterpreneur, who, on his own initiative and taking risk, introduces a new technology and innovative products to economy. Other producers copy and popularise already tested methods of production. The source of economic development is the innovative activity of an enterpreneur, who should be well remunerated for his creative activity. A stream of inventions flowing into the economy, due to enterpreneur's innovativeness, creates the atmosphere of optimism among investors, that favors the development of positive economic situation.

Despite considerable profits connected with the introduction of innovations, activity in this sphere requires adequate financial input and accepting certain risk. It is also difficult, especially at the initial stage, to assess the profitability of the enterprise.

Eagerness of enterprises to take up innovative activity and introduce innovations is determined by various factors. The most important ones include:

- the size of the enterprise - it reflects the ability of the enterprise to generate adequate financial input. Large enterprises introduce innovations more frequently than small and medium ones.
- branch of the enterprise (type of activity) – high technology companies are more innovative than 'low technology' ones.

Promoting and supporting innovative activities in various branches of activity is at present one of the main aims of the economic polity of the EU, including Poland. Adopted Lisbon Strategy defines the significant role of innovative activity in boosting the economic development and increasing competitive edge of enterprises in the European Union. The means of attaining these strategic goals was boosting Reaserch and Development and effective adoption of the obtained results by the enterprises.

EXPENDITURES ON RESEARCH AND DEVELOPMENT ACTIVITY

Despite wider and wider understanding of the importance of the innovative activity for the development of the Polish economy, involvement in this sphere still is far from the European standards. The important bareer to proper development of the Polish innovation system is lack of relevant funding that leads to underdeveloped R&D activity and lack of transparent and coherent programmes aiming at development of innovative sphere.

The level of funding of R&D in Poland and the structure of sources of funding is significantly different from the European standards, which is reflected in the quality and effciency of the outcome of this activity adopted by the economy. It reflects uderdeveloped sector of high technologies and limits the possibility of creation of relevant infrastructure in this respect.

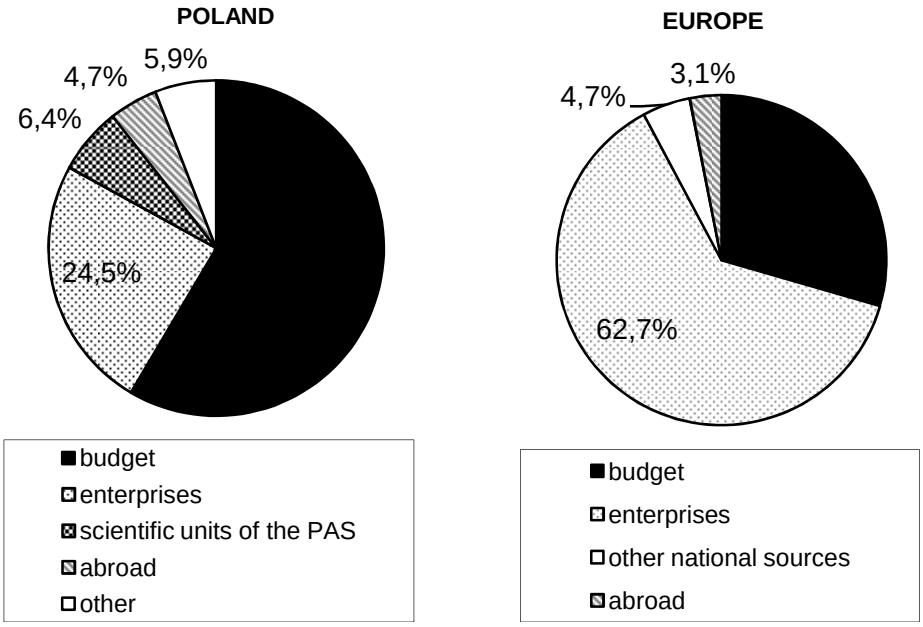

Fig.1. The structure of financing R&D according to sources of funds in Poland and the EU

Source: author's evaluation on the basis of CSO's data

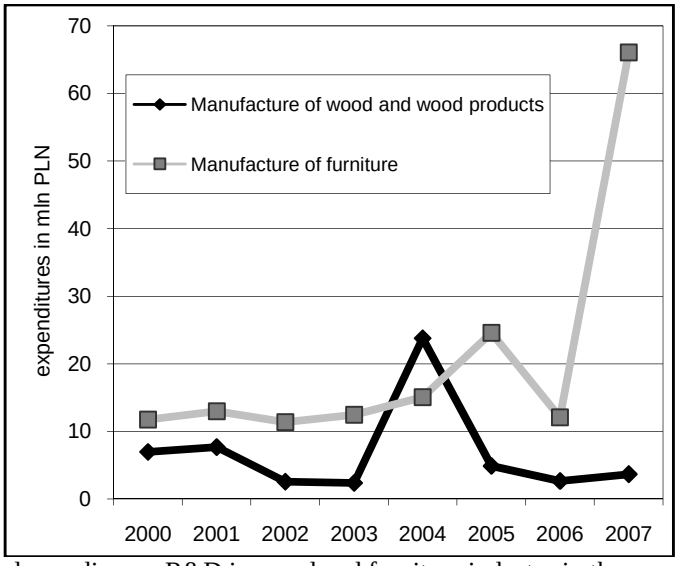

Fig.2. Internal spending on R&D in wood and furniture industry in the years 2000-2007

Source: author's evaluation on the basis of CSO's data

The structure of funding of R&D according to funding sources in Poland and the European Union is shown on fig. 1. The level of financing of R&D in Poland set against the EU countries is characterised by low percentage as compared with GDP. In 2007, similarly to 2006, funding of R&D amounted to about 0.6% of GDP, while the mean value in the EU states was about 1.8%. Majority of means used for this purpose in Poland (58.5% in 2007) comes from the state budget. Financing of R&D activities by enterprises in Poland constitutes about 24.5% of the total sum. In the EU as a whole most funds for R&D (62.7%) comes from enterprises.

Poland, in the view of funding of R&D, did not approach the goal set by the Lisbon Strategy of 3% of GDP in 2010, two thirds of which are to be provided by the business sector.

Huge risk and belief that R&D activities are of low efficiency in the Polish conditions as well as long duration of the process lead to relatively low level of investment of industrial enterprises in R&D. It refers also to wood and furniture enterprises.

Expenditure on R&D is a significant but still insignificant element of innovative activity of Polish wood enterprises (fig 2.). In consecutive years of the studied period the sums spent were smaller and smaller. Expenditure fell from 7 million PLN in 2000 to 3.7 million PLN in 2007. It has to be underlined that the record investment in R&D in this sector was done in 2004 - it was a sum of 23.8 million PLN.

Positive trends may be observed in R&D financing in the furniture sector. It is proved by systematic increase in expenditure: from the level of 11.8 million PLN in 2000 to 66 million PLN in 2007.

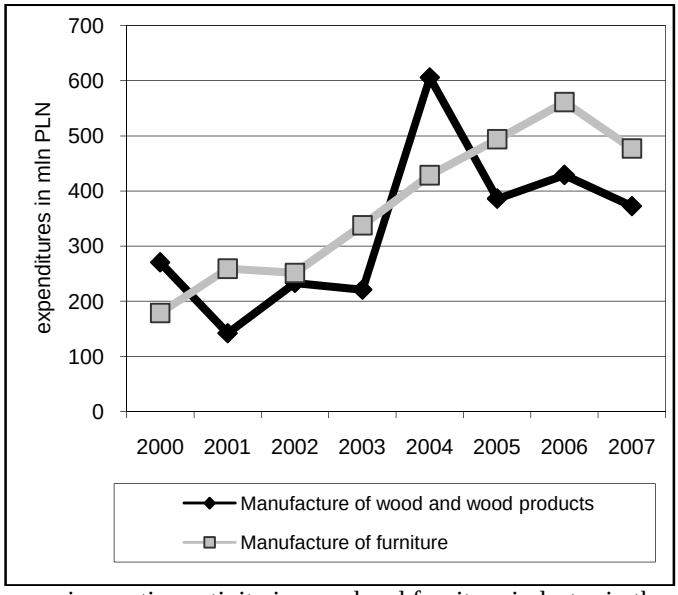

Fig.3. Expenditure on innovative activity in wood and furniture industry in the years 2000-2007
Source: author's evaluation on the basis of CSO's data

Despite quite differentiated trends in financing R&D, general expediture for innovative activity has been systematically rising (fig. 3). In the years 2000-2007 financing innovative activity in wood industry rose from the level of 270 million PLN in 2000 to 372 million PLN in 2007. In furniture industry expediture on innovation in this period role from the level of 178 million to 477 milion PLN. The best period in the financing of innovation in wood industry was the year 2004, about 606 million PLN was spent that year. Resources allocated to innovation in 2007 in wood industry amounted to about 2.2 percent of the total sum spent by all processing industries. In case of wood industry it was 2.8 %.

The structure of expenditure on innovative activity in wood and furniture industry in the years 2000-2007 is presented in table 1.

Table 1. The structure of expenditure on innovative activity in wood and furniture industry in the years 2000-2007

Sector	Type of activity	financial expenditure in million PLN							
		2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Manufacture of wood and wood products	R&D activity	65,1	2,4	2	3,2	5,6	4,8	4,8	4,4
	purchase of new technology	0	0,1	0,1	0,5	0,3	2,5	3,6	0,2
	purchase of machines and technological equipment	149,3	105,9	175,8	169,3	524,3	262,7	270,6	256
	investment in buildings	50,8	36,1	52,6	44,3	65	108,6	143,5	101,7
	personnel training in the sphere of innovation	0,1	0,2	0	0,1	3,5	0	0,4	0,1
	marketing of new products	2	0,8	0,5	1,6	4	1,8	2,2	1,4
Manufacture of furniture	R&D activity	13,1	13,4	13,7	11,4	11,8	11,2	13,3	16,5
	purchase of new technology	3,9	1,1	0,4	0,6	3,3	12,7	59,4	0,2
	purchase of machines and technological equipment	71,2	120	110,9	231,9	203,9	271,5	223,2	234,5
	investment in buildings	73,9	109	113,4	84,8	184,8	178,2	218,2	210
	personnel training in the sphere of innovation	0,6	0,3	0,3	0,3	2,2	0,9	2,2	0,5
	marketing of new products	11,4	8,2	3,8	3,5	9,3	7,5	9,3	6,8

Source: author's evaluation on the basis of CSO's data

In the structure of expenditure on innovation of Polish wood and furniture enterprises investment spending is the dominating category. Most investment expenditure is allocated for the purchase of machines and technological equipment necessary for the innovation process. In the studied period the expenditures for theis purpose rose almost twice, from the level of 149.3 million PLN in 2000 to 265 million PLN in 2007. For the furniture industry it rose almost three times, from the level of 71.2 million to 234.5 million PLN. In the case of wood enterprises the characteristic feature was similar

investment in technological innovations and investment in buildings. In relation to wood industry investment in buildings connected with the technological process in 2007 was almost two times lower than the investment in technological means, while in the previous years these proportions were even more different. Expenditure on innovation is a proof of constant need of modernising technological equipment of enterprises and modernisation and development of production sites as well as distribution and sale points.

Innovative activity encompasses also changes in the organisation of an enterprise and changes in the marketing of products. Expenditure on this type of activity in wood and furniture industry are of relatively low importance. It is also worrying that in the structure of expenditure on innovation in wood and furniture industries funds for R&D are quite low. In wood industry in 2007 for this purpose only 4.4 million PLN was allocated, and in the furniture industry - 16.5 million PLN. Low engagement of enterprises in this sphere quite substantially limits the effectiveness of adopting modern solutions and increases the risk while introducing them.

Very low expenditure of wood and furniture industry is allocated to personnel training in the sphere of innovation and marketing of new products. In the consecutive years of the studied period expenditure allocated for this purpose were systematically diminished. In 2007 for wood industry they amounted to 1.5 million PLN and for furniture industry to 7.3 million PLN.

THE LEVEL AND CHARACTER OF INNOVATION

The directions and level of expenditure of financial resources on innovative activity of wood and furniture industry reflect the character of innovation in these sectors and their dimension. The domination of investment expenditure reflects the technological character of innovation introduced in wood and furniture industry. Technological innovation is understood as objective perfectioning of a product's characteristics or a process or system of distribution existing so far. The range of innovative activity is shown by the participation of enterprises which have introduced technological innovation (fig. 4).

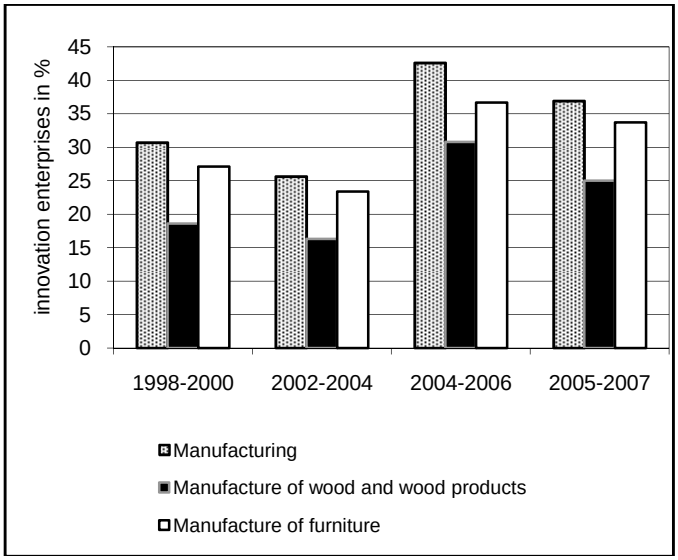

Fig. 4. Participation of enterpises which have introduced technological innovation in wood and furniture industry
Source: author's evaluation on the basis of CSO's data

The participation of innovative enterprises in the studied period rose. In the years 1998-2000 for wood industry it was at the level of 18.6%, for furniture industry 27.1%. At the end of 2007 the participation of enterprises that introduced technological innovation was calculated to be at the level of 25% for wood industry and 33.7% for wood industry. The biggest dynamics of innovation introduction in those branches was observed in the years 2004-2006. The percentage of innovative enterprises amounted to 30.8% in wood industry nad 36.7% in furniture industry. As far as innovativeness is concerned, furniture industry shows the level similar to the results of the Polish industry as a whole, that in 2007 was 37%. However, the level of innovativeness in wood industry as compared to industry in general is much lower.

A characteristic feature for wood industry is the dominance of process innovation over product innovation (fig. 5). It means that wood companies introduced more innovations concerning the production process than new products. It is a clear departure from the trends in the EU countries, where innovations concern mostly perfecting products and introducing new ones. Other character of introduced technological innovations was observed in the furniutre enterprises. In this branch there dominate innovations of products. The participation of enterprises that introduced product innovations rose from 25% in the years 1998-2000 to the level of 28% in the years 2005 –2007.

An important measure of effectiveness of innovative processes is the index of perfecting the production process, denoting the participation in sold production new and modernised products in the total value of sold production (fig. 6).

The lowest level of sale of new and modernised products was shown by wood processing enterprises. The percentage of sale of this type of products in the studied period was systematically falling. It was as low as 15% in 2000 and 8% in 2007.

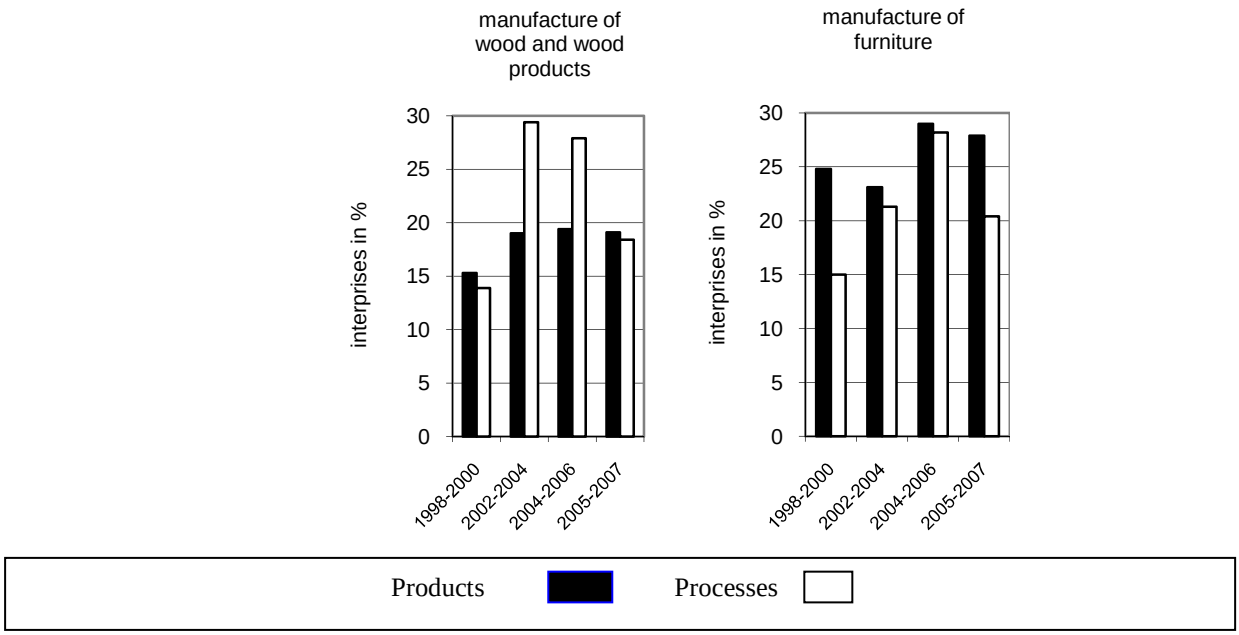

Fig 5. Percentage of enterprises that introduced new or significant products and processes in wood and furniture industry.
Source: author's evaluation on the basis of CSO's data

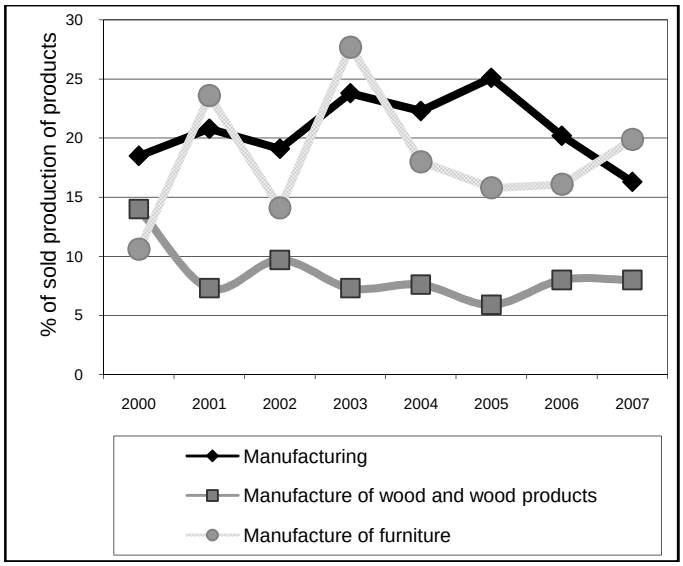

Fig. 6. Percentage of sold production of new and modernised products in wood and furniture production
Source: author's evaluation on the basis of CSO's data

The sale of innovative products produced by the furniture industry in the years 2000-2007 ranged from 17 to 25%. It was a comparable for the Polish industry as a whole, it amounted to 20% in 2007. Better results of sales of innovative products obtained in the furniture industry can be explained by the competitive edge of product innovation. Improvement of product quality, widening the offer of products increases the competitiveness of a company. Introduction of product innovation allows to expand and diversify effectively, and therefore eliminate high degree of vulnerability of a company to disturbance in company's environement.

SUMMARY

The position of industrial enterprises in ever-changing economic environment to a large extent depends on the proper development of widely understood innovative activity. Successful companies are mostly those that a creative, innovative, flexible and are able to manage those factors effectively. Modernity of companies and their innovativeness are to a large extend dependent on the effective use of technological advances in their operations. This requires adequate funding of R&D activity.

In the structure of expenditure on innovative activities in the wood and furniture industry, financial means are used most of all for technological development of workplace. Very small percentage of expenditure is used for R&D activtiy and non-material technologies.

Compared to the level of innovativeness of the west European countries, the wood industry in Poland is characterised by low level of innovativeness. Contrary to the European trends, where product innovations give the competitve edge, in the Polish wood industry dominate the process innovation. A little better results in this respect are shown by the furniture

industry. The development of innovative activity in this sector in the recent decade lead to a balance between introduced process and product innovations.

The lack of proper development of innovative activity in the Polish economy is a result of a number of obstacles that effectively litmit activities in this sphere. Among chief factors that make innovative activity difficult are: lack of own and external resources for financing innovative activity, high costs of introducing innovations, lack of properly qualified staff and lack of access to scientific and technological knowledge.

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PRICE COMPETITIVENESS OF SLOVAK COMPANIES DURING THE PERIOD OF ECONOMIC CRISIS AND AFTER ENTRY OF SLOVAK REPUBLIC INTO EUROZONE

Abstract: On the base of contemporary stage of controlling utilization in business and based on analysis of theoretical and practical approaches we present chosen methods, models and techniques of business controlling. Our primary interest focuses not only on theoretical basis of solution but also on practical application under conditions of Slovak companies, during financial and economic crisis and under conditions of conversion on Euro currency.

Key words: Controlling, Recesion, Competition, Prices, Costing

INTRODUCTION

Contemporary financial and economic crisis under Slovak conditions is determined by many specific indicators (conversion on Euro currency, pro-export economy focus, low state debt, relatively high level of unemployment, big regional differencies etc.) which highly impact its course, behaviour of particular players as well as effects on business subjects and on the whole Slovak economy.

Latest quantitative macroeconomic indicators and results of Slovak economy show negative development in more fields (negative economic growth measured by GDP, growth of unemployment, growth of budget deficit and deficit of public finance). But on the other hand we can say that reached results and its decline is comparable with development in V4 countries.

From the last year development of Slovak republic (SR) we can see many important changes in behaviour of particular subjects – government, business subjects, households. As a common determinant of their reactions on changed economic conditions it is effort to more rational behaviour and adoption of actions focusing on expenditures consolidation.

New Euro currency accepted just in the time of world economic crisis can be mentioned as one important feature which highly differs Slovak economy conditions from those in neighbour countries. Many studies and analysis present that Euro acceptance had many positives from the longrun period (more foreign investment, currency stability, business area stability, elimination of currency differencies, simplification of trade, decreasing of transaction costs, lower capital costs, higher transparency of prices etc.). As a negative aspect of Euro it was considered the lost of independent monetary policy of NBS and also higher level of inflantion after currency acceptance (temporal effect) and single costs of currency transition.

Contemporary development of Slovak economy under above mentioned non-standard conditions can be characterised that we can see partial and at the same time integrated impact of two decisive important factors:

- world financial and economic crisis,
- new Euro currency acceptance.

New currency accepted just during world crisis causes that many positives and negatives, presented in studies, have not expressed till now or they have different or neutral or contrary impact. As an example we can mention relatively low level of inflation (but it can be transformed into negative deflation) after Euro acceptance because of financial and economic crisis influence. On the other hand we can mention stability of exchange rate which seems to be during these crisis years (currency devaluation in other countries) as a handicap for Slovakia and its chosen branches (retail market, tourism, hotels and restaurants) compared to other V4 countries (Czech republic, Poland, Hungary). When we look at the

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same problem by the eyes of Slovak consumers, we can see advantages of new currency just now in the times of world economic crisis. There are the following advantages: prices transparency, simplification of tourism and travel, cheaper foreign products and services as it was supposed before conversion into Euro currency. But because of crisis, there are eliminated positive impacts as higher foreign investments and stability of business environment. The same impact (positive or negative) as before Euro acceptance we can specify the following – elimination of currency differences, simplification of trade, decreasing of transaction costs, the lost of independent monetary policy of NBS, single costs of currency transition.

In spite of the above mentioned factors impact we can specify the following decisive negative aspects caused separately by the world financial and economic crisis:

- strong decline of Slovakia export[67] caused mainly by demand crisis in the world markets,
- lower utilization of production capacities within Slovak companies in the chosen branches (automotive industry, engineering, woodprocessing industry, metallurgy, chemical industry, electrotechnical industry, shoemaking industry etc.)
- lower foreign capital input and lower investment consumption,
- growth of unemployment in the chosen branches, decline of hoseholds consumption, total growth of unemployment[68],
- decline of investment and consumers loans,
- decreasing of tax income for national budget and its higher deficit.

Given negative trend of the chosen Slovak economic indicators further grow worse because of Euro currency just now, during world financial and economic crisis.

As the decisive influence of both impacts it can be specified the following:

- strong decline of Slovak retail market revenues as a result of consumers foreign purchases which was caused by the decline of ability co compete with prices. This was affected by the both impacts:
  a) new currency acceptance – assessment of the fixed exchange rate SKK/EUR in 30th June 2008 (before new currency introduction). This exchange rate was 15% below the central parity,
  b) world financial and economic crisis – strong decline of national exchange rates compared to EUR in the neighbour countries[69]: Czech republic – 10%, Hungary – 20%, Poland – 30%
- lower capacity utilization in the chosen branches (retail market, tourism, hotels and restaurants)
- decreasing of budget incomes and its higher deficit because of lower VAT and consumption tax incomes,
- unemployment growth in the chosen branches.

Effect from the above mentioned and many other impacts (we don´t deal with all aspect because of the paper topic) and its further implications in Slovak economy result into strong decline of GDP growth. Before the crisis Slovak GDP growth reached +9% p.a. and its latest forecast for the year 2009 is assessed at -5% or -6% p.a. what finaly results (in simple presentation) growth decline -15% p.a. Such a decline represents relatively worse development comparing to other V4 countries.

Managerial methods and tools used in business practice are very often focused on the periods of stable macroeconomic development. The main task for the managers during this crisis should be looking for such a managerial tools which will be taking into account this specific economic cycle. A goal of this paper is to analyse and take into account specific conditions of Slovak economy development and further suggest suitable managerial methods – planning and control of costs and earnings from internal (in-plant) point of view. This can be titled as in-plan controlling methods. We think that complex approach can support application success of these methods and tools implementation into business practice within Slovak companies during the world financial and economic crisis.

TASKS AND METHODS OF IN-PLANT PLANNING AND CONTROLLING WITHIN THE MANAGEMENT OF COSTS AND PRICES DURING ECONOMIC CRISIS

Theory and practice divide business controlling into strategic and operative which is further divided into in-plant, financial and investment controlling. A task of in-plant controlling is mainly to manage operating profit and therefore it is highly related to in-plant (operative) accounting and in-plant planning of operative profit. Basic goal of this part of controlling is mainly profit, reached by particular business units. This profit doesn´t take into account out of units impacts (impacts related to methods of financial management, special extra impacts etc.).

From the above mentioned we can see that in-plant controlling doesn´t use information from financial accounting and neither profit presented in this financial accounting. Statement of profit and loses (standard statement of financial accounting) contains operating profit but structured according to Income tax law what is improper for the purpose of in-plant management.

As it is evident from the above mentioned, profit is monitored by other methods within in-plant controlling as it is presented below:

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[67] *According to Slovak stats–during the first 5 months of 2009 Slovak export declined at 27,85% y.a.y. /Resource: http://http://portal.statistics.sk/*

[68] *According to OECD stats– harmonized unemployment in May 2009 reached 11,1% in Slovak Republic what represents 3rd highest level within OECD countries. /Resource: http://www.oecd.org/*

[69] *Till July, 7, 2009 exchange rates of V4 national currencies decline comparing to EUR during the last year: CZK – 10,93 %, HUF - 20,34 %, PLN – 33,76 % .*

Table 1. Profit presentation according toin-plant controlling

	in tsd. €	in %
Sales	1.000.000	100
- Direct costs	750.000	75
= Compute margin I	250.000	25
- Fixed costs of a company	200.000	20
= Compute margin II	100.000	10
- Neutral costs +Neutral revenues	50.000 -	5 -
= Profit/Loss	50.000	5

Table 2. Operating profit plan in the system of step calculation

	Market price
-	Discounts and exchange rate loss
-	Variable costs of production and marketing (direct material, direct wages, technology energy, packages, duty, transport etc.)
	CM I
-	Fixed costs of a product (R&D costs, promotion costs, distribution costs etc.)
	CM II
-	Fixed costs of production line (multiple costs for more products)
	CM III
-	Fixed costs of business unit (depreciation of machines, buildings, vehicles, wages of administrative employees, energy, material burden etc.)
	CM IV
-	Fixed costs of a company (depreciation of machines, buildings, vehicles, wages of administrative employees, energy, material burden etc.)
	OPERATING PROFIT/LOSS

As a profit it is mentioned indicator called as "compute margin" (economic margin for the fixed costs coverage of particular business units and for the planned profit generation). Basic compute margin can be specified as "CM I" and it is counted as sales minus direct (variable) costs. When a company can monitor fixed costs also according to particular departments and not only as a whole then it could be calculated compute margin II and III by the deduction of fixed costs (see Table 2).

One method of fixed costs selection is shown in Table 2. It represents basic classification of fixed costs and it can be adjusted according to planning and controlling needs. For example, fixed costs of a business unit can be divided on depreciations, interests, non-technology energy, wages. Other compute margins should be monitored. A goal of detailed classification is to assure flexible planning and controlling of operating profit by more compute margins reached by the continuous deduction of particular items of fixed costs.

More detailed specification of fixed costs has positive impact on the assessment of lower price margins for the products. When the step calculation will be realised in practice like it is shown in Table 2 then it will be possible to arrange only basic price margins. More detailed specification of fixed costs enables to prepare better plan of price margins.

Basic price margin (margin 1) represents price of products which cover total costs (variable and fixed costs) and which bring required (planned) profit. But this can be used only in time of sufficient demand for products. During recesion when supply is higher than demand, companies´ sales decline and capacity is idle. One way how to increase capacity utilization and cover at least fixed costs is to support demand by temporal price cut. In the next, it is possible to cut prices to the lowest level which can be, in the short term, level of variable costs.

The following example presents a model with 4 price margins which can be expanded about next 2 ones in the necessity:

1. 1st margin: price covers total costs+required profit
2. 2nd margin: price covers total costs (variable+fixed)
3. 3rd margin: price covers only variable costs+fixed costs of production
4. 4th margin: price covers only variable costs

In the Table 3 there are planned sales and costs of particular products according to required profitability, according to market demand and production situation – company´s capacity, actual material standard and labour consumption standard. Italics represents calculated compute margins for particular levels and operating profit for the whole company in € and in %.

Table 3. Starting situation of a company – plan

	Product A		Product B		Product C		In total	
	€	%	€	%	€	%	€	%
Total sales	30 000,-	*100,0*	10 000,-	*100,0*	40 000,-	*100,0*	80 000,-	*100,0*
- Variable costs of marketing in total	7 000,-	*23,3*	2 000,-	*20,0*	6 000,-	*15,0*	15 000,-	*18,7*
- Variable costs of production in total	10 000,-	*33,3*	5 000,-	*50,0*	15 000,-	*37,5*	30 000,-	*37,5*
Compute margin I	***13 000,-***	***43,4***	***3 000,-***	***30,0***	***19 000,-***	***47,5***	***35 000,-***	***43,8***
- Fixed costs of production	5 000,-	*16,7*	1 000,-	*10,0*	9 000,-	*22,5*	15 000,-	*18,8*
Compute margin II	***8 000,-***	***26,7***	***2 000,-***	***20,0***	***10 000,-***	***25,0***	***20 000,-***	***25,0***
- Fixed costs of a company							8 000,-	*10,0*
PROFIT/LOSS OF A COMPANY							**+12 000**	***15,0***

Lower price margins of products will be assessed by the methodology which contains the next partial steps:

1. Calculation of coverage rate in % from the planned sales

Coverage rates in % from the planned sales are assessed for particular price margins. Planned profits are required profits for particular products in order to reach sufficient profitability, respectively costs coverage (see Table 4). The second price margin covers total costs but without profit making. Because compute margin II (20 000,- €) covers total costs and up to 60% (12 000,- from 20 000,- €) from this amount contributes to profit making, it is possible to resign this 60% in the second price margin. So in the following, company resigns 60% from CM II in products A, B, C. The third price margin doesn´t cover total costs. Sales cover only variable costs and fixed costs of production. Fixed costs and required company´s profit are temporarily not covered. So we can resign the whole scale of compute margin II. The company continuously resigns 100% of CM II in products A, B, C. The fourth price margin covers only variable costs. Sales cannot cover fixed costs and planned profit. P Company can afford to reach sales only as high as variable costs are and it resigns CM I which is temporarily zero.

Table 4. Calculation of coverage rate

Price margin	Product A	Product B	Product C
1	*100 %*	*100 %*	*100 %*
2	*84 %*	*88 %*	*85 %*
3	*73,3 %*	*80 %*	*75 %*
4	*56,6 %*	*70 %*	*52,5 %*

2. Assessment of calculation rates

Calculation rates are assessed by the similar method as it is used in standard absorbed costing. As the cost allocation base can be determined e.g. total variable costs of production.

$$\text{Calculation rate} = \text{planned coverage rate} \;/\; \text{percentage share of cost allocation base to sales} \qquad /1/$$

Table 5. Assessment of calculation rates on the base of variable production costs

	Product A	**Product B**	**Product C**
Percentage share of variable production costs on sales ⇒	33,3 %	50 %	37,5 %
Calculation rate for the price margin ⇓			
1	3,00	2,00	2,67
2	2,52	1,76	2,27
3	2,20	1,60	2,00
4	1,7	1,4	1,4

3. Assessment of lower market price margin

Calculation rates will be used for the assessment of price margins for particular products. Certainly, as the cost allocation base must be used the same parameter as in the previous step, it means variable costs of production.

$$\text{market price} = \text{allocation base} \times \text{calculation rate} \qquad /2/$$

Table 6. Assessment of lower market price margin

Price margin	Product A	Product B	Product C
1	10 000 x *3,00* = **30 000*,-**	5 000 x *2,00* = **10 000,-**	15 000 x *2,67* = **40 000,-**
2	10 000 x *2,52* = **25 200,-**	5 000 x *1,76* = **8 800,-**	15 000 x *2,27* = **34 000,-**
3	10 000 x *2,20* = **22 000,-**	5 000 x *1,60* = **8 000,-**	15 000 x *2,00* = **30 000,-**
4	10 000 x *1,70* = **17 000,-**	5 000 x *1,40* = **7 000,-**	15 000 x *1,40* = **21 000,-**

***Note:** Values given in the table represents sales in €. These sales must be divided by planned production amount in order to assess market prices per 1 production unit.*

CONCLUSION

In this paper we have analysed and presented the chosen controlling tools and possibilities of its application in the managing of Slovak industrial companies during the time of world financial and economic crisis. Primary goal of in-plant planning and controlling is to manage operating profit. Because of lower competitiveness of Slovak companies related to other V4 countries we suggest to apply system of lower price margins methodically based on step calculation and on compute margins.

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OPTIMIZE SUPPLY USING TOOLS FINANCIAL CONTROLLING

Abstract: Controlling is a specific activity dealing with information, it is a process of information support incoming more and more strongly to the control over value creation process in a business and is aimed to eliminate its shortcomings. New concepts, methods, technics and tools of controlling are used more frequently in order to increase profit of the company and build financial stability. If the company wants to be successful it has to prepare conditions for application of controlling. It is needed to improve company´s activities and adapt to new unexpected conditions rising at the market competitions. The controlling application in wood-processing industry, as well as in other economy branches is very difficult.

Key words: Controlling, financial controlling, controlling of stock..

INTRODUCTION

Nowadays, when every business has the right to choose their next direction of development is essential to success on the road to ensure high quality management system. One way of improving management is the application management system based on control and financial control subsystem.

Financial control is defined as the management of cash flows primarily externally enterprise. Its aim is to ensure the financial equilibrium of the enterprise at any moment, taking into account the goal of profitability. One of the main functions of financial control management is the process of capital, ie analysis, planning and supervision of financial-economic effects of various directions of use of capital. In the field of short-term use of capital is controlling the process of capital tied in items venture current assets (working capital).

METHODOLOGY

The article deals with the possibility of optimization of working capital in the part of the conditions selected business, ie. a matter which falls within the controlling stocks. In current theory, there are several approaches to optimizing stock company, but have one common aspect - effort to select from a wide range of indicators such as the most adequate view the situation in the enterprise, and under which can workers of controlling department propose steps to improve the situation.

Following analysis of the approaches selected authors [20, 21, 22, 25] we considered relevant indicators, taking into account the specificities of the company to optimize stock indicators selected periods and stock turnover ratios of turnaround. Subsequently we determined the optimal amount of insurance, average and maximum supply of material

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needed for production of TOP ten company products and compared to the current situation, we recalculated the economic effects of our proposed variants of the reduction of stocks of material.

CONTROLLING SUPPLY

Company DECODOM Ltd. specializes in the production of furniture based on chipboard and laminating films. The company production program consists of production of kitchen furniture, living room furniture, universal furniture sector, lobby furniture, bedroom furniture, student and office furniture.

For the analysis we selected the TOP 10 products of DECODOM Ltd., which constitute on average only 10% of total turnover 1 579.198 million. Eur. It's because of the large number of individual parts, which the company produces. These parts are about 30 000 pieces, so we focused only on individual furniture kits that are bestsellers on the market.

For the optimal strategy for managing inventory is to be considered a method of refilling, maintenance and drawdown of stocks, which is the minimum sum of costs associated with acquisition and maintenance of inventories and losses associated with their shortcomings.

Most frequently indicators used for characterization of stocks turnaround are well known indicators of stock turnover period and turnaround coefficient. Their values are listed in Table 1.

Table 1. Calculation of parameters of stock turnaround

	Units	**2003**	**2004**	**2005**
Stocks	to 31.12. v Sk	135 355 004	134 347 926	207 446 786
Turnover	to 31.12. v Sk	1 366 749 182	1 477 205 509	1 579 198 205
Stock turnover period	days	36	33	48
Turnaround coefficient	number of revolutions per year	10	11	8

For each enterprise is properly to determine the optimum amount of buffer stocks to avoid unnecessary commitment of available capital.

Insurance stocks:

$$Zp = R \,.\, \sqrt{t_n \;.\, \delta_m^{\,2} + \delta_\pi^{\,2}} \qquad (1)$$

ZP - buffer stocks

R - insurance agent indicating the number of deviations from the overall average, which will provide the insurance pool (statutes estimate)

tn - uncertainty interval in months

$\delta_m^{\,2}$ - the dispersion of consumption set by monthδ

$\delta_\eta^{\,2}$ - the variance in supply during the past period in units of mass

$$\delta_{\mathrm{m}}^{\,2} = \frac{1}{4}\sum_i \,.\,(M - M_P) \qquad (2)$$

M - the actual volume of consumption in the period in units of mass

MP - planned consumption in the period in units of mass

$$\delta_\pi^{\,2} = \frac{1}{4}\sum_i \,.\,(D - D_P) \qquad (3)$$

D - the actual volume of deliveries in the period in units of mass

DP - the planned volume of supply in the period in units of mass

The following Table 2 shows calculations of insurance stocks material TOP 10 products and comparison of results with insurance stocks down businesses.

Table 2. Determination of buffer stocks for the TOP 10 products

	The buying price mat.	Buffer stocks (ZP) determined by company		Buffer stocks (ZP) Convert	
	Sk/m^2	m^2	Sk	m^2	Sk
Gomera	165	3 000	495 000	1 787	294 588
Derby	154	2 900	446 600	1 624	250 096
David	115	2 800	322 000	1 587	182 505
Expres	112	2 750	308 000	1 562	174 944
Florida	98	2 700	264 600	1 530	149 940
Fiore	123	2 700	332 100	1 476	181 548
Derby Berlin	112	2 500	280 000	1 450	162 400
David B	132	2 500	330 000	1 446	190 872
Denver	145	2 400	324 000	1 427	206 915
Canaria	144	2 300	331 200	1 413	203 472
Total			3 433 500		1 997 280

The results suggest that the company holds unnecessarily large buffer stocks and taking into account the risk of unpredictable needs and to ensure continuity of operations. The total cost difference for the buffer stocks is the amount

1 436 220 SK (3 433 500 - 1 997 280). If the company reduced its outstanding stock to the value of our proposed, its cost would be reduced by 42%. The company has actually held more stocks than the value of insurance stocks. Therefore, we next compared the amount of costs that a firm invests an average of materials TOP 10 products with the cost to us, suggested max. stock.

In order to ensure the continuity of the process holds for the enterprise storage material in the average 39 days (stock turnover period) of the total monthly volume of stocks, which show how the calculations of unnecessarily high amounts of capital tied in stock.

Average and maximum supply of various products, we have calculated as follows:

$$Z_i = \frac{(Z_{max} - Z_p)}{2} + Z_p \quad (4)$$

Zi - the average stock of i - th material
Zmax - maximum supply of material in units ui - th material
Zp - buffer stocks i - th material in the physical units
Di - the delivery of material in the physical units

For the calculation of the maximum inventory i - th material we used the following formula:

$$Z_{max} = Z_p + D_i \quad (5)$$

The results of the amount of stock calculations and conversion costs for businesses and stock average maximum stock are listed in Tables 3 and 4.

Table 3. Calculation of average and maximum supply TOP 10 products

	Average stock (m^2)		Maximum stock (m^2)
	Enterprise	Convert	Convert
Gomera	12 300	5 990	10 193
Derby	9 200	4 782	7 940
David	9 200	4 742	7 897
Expres	9 100	4 612	7 662
Florida	9 000	4 422	7 313
Fiore	8 000	4 218	6 959
Derby Berlin	7 500	4 067	6 683
David B	7 900	4 055	6 683
Denver	7 900	3 969	6 510
Canaria	7 500	3 897	6 380

Table 4 Conversion costs for businesses average stock recalculated maximum stock in TOP 10 products

	The cost for enterprise in a given Zi SK	**The costs when we set zmax SK**
Gomera	2 029 500 (12 300 x 165)	1 681 845 (10 193 x 165)
Derby	1 416 800 (9 200 x 154)	1 222 760 (7 940 x 154)
David	1 058 000	908 155
Expres	1 019 200	858 144
Florida	882 000	716 674
Fiore	984 000	855 957
Derby Berlin	840 000	748 496
David B	1 042 800	882 156
Denver	1 145 500	943 950
Canaria	1 080 000	918 720
Total	**11 497 800**	**9 736 857**
Difference		**1 760 943**

The difference in costs is therefore an amount of 1 760 943 Euro, which could save the enterprise.

EVALUATION ANALYSIS

We focus on deeper analysis TOP 10 stocks of products, this means for the determination of insurance stocks, the total average stock and maximum stock.

The amount of buffer stocks established enterprises in economic terms represents a redundant and inefficient binding of financial resources. The current system of supply, which is regular, it is unnecessary for enterprise to hold so high stocks. In all cases, we suggested the stock is lower than the amount currently held by the average stock in the company. At high stock and low efficiency of their use appears to be dwindling stock.

Enterprise justifies the amount of its stock that the operation is continuous. Of course, when the emergence of unforeseen events that would result in the interruption of production, costs of restoration would be much higher than the

cost of capital, which binds the enterprise in stock. Reducing inventory on our proposed volume should, however, when the emergence of an unforeseen event does not jeopardize the operation of the enterprise.

The analysis shows that the current system of supply undertaking holds in store stock of material production insurance top 10 products in the total value of 3 433 500 SK. In our proposed variant of the cost of this material decreased to 1 997 280 Euro, which represents a saving of up to 42%.

In further analysis, we focused on the comparison of costs for undertaking the average stock of materials and we set the maximum stock material product in TOP 10. From the calculations show that if the enterprise has kept us up to the stock conversion, save the capital in the amount of EUR 1 760 943 - compared to the amount originally proposed.

These differences are large enough for the enterprise to reconsider their stocks and addressed the idea of optimization on the basis of our proposed procedure.

CONCLUSION

In the article we focus on controlling inventory, particularly for its optimization. The main objective of article was to analyze the situation of stocks in the reporting enterprise DECODOM Ltd. and optimization proposal tied in the capital stock. Consequently, recommendations have been adopted for the successful implementation of financial control, especially controlling stock in the enterprise, which is possible with sub-clones used in any enterprise.

Controlling is a modern method of management, dynamically evolving and emerging new knowledge and potential uses. No company, no manager is unable to make the jump directly to perfect the use of all the options that control offers. If a company wants to succeed in today's complex must go after the new and modern management systems. Even in the control it is therefore important to prepare the company for its successful application to improve and adapt to new circumstances and unexpected conditions, which are generated in the market in a competitive environment.

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BASIC INDICATORS OF MEASURING PRODUCTIVITY AND THEIR APPLICATION ON MACHINERY PRODUCTION ORDERS

Abstract: The paper is concerning on productivity measurement indicators and their application on manufacturing orders. The goal of the paper is to apply selected productivity measurement indicators to individual manufacturing order and compare productivity results in two periods.
Key words: productivity measurement methods, productivity indicators, manufacturing order

INTRODUCTION

Productivity means efectiveness of using production factors in transformation process. We understand it as „ratio between output and input for a given time period with required quality“ and we can describe it with folowing formula productivity=output/input. If we produce more beneficial things by using less amount of sources, the productivity rises. High productivity decreases costs and enables decrease price of products, what means posibility to widespread number of customers or increase profit form each product, increase salaries and dividends and acquire additional investors [1].

1. PRODUCTIVITY AND ITS MEASURING

Types of productivity measuring [3]:

- parcial productivity – ratio between output to individual input.
- multi-factor productivity - ratio between output to group of inputs.
- total productivity - ratio between output to total inputs.
- index of productivity - compares reached productivity with productivity standards.
- comparative analysis - compares productivity of competitive firms.

Total productivity informs about total effectiveness of enterprise transformation process. In general, it is possible to express total productivity by following relation

$$\frac{\text{output}}{\text{sum of inputs}} = \frac{\text{output}}{\text{labour + capital + energy + material}}$$

Parcial productivity evaluates productivity of individual sources. It is defined as proportion of the total (gross or net) output to a certain type of input. In general, it is possible to express partial productivity of certain input (e.g. labour, material, energy, capital) as following ratio

$$\frac{\text{output}}{\text{input (e.g. labour)}}$$

Multi-factor productivity reflects result of combination of some sources used for obtaining of certain output. It is proportion of the total ouptut to labour plus other incoming factors (e.g. capital, energy and etc.)

$$\frac{\text{output}}{\text{inputs (e.g. labour + capital)}}$$

Index of productivity compares really reached level of productivity with productivity standards. This index evaluates percentage changes in productivity. It is relevant to total, multi-factor and partial productivity.

$$IP = \frac{\text{actual productivity}}{\text{productivity standard}} = 100$$

Comparative analysis represents productivity comparison of competitive firms or departments or etc.. In this case deviation of productivity level is usually expressed in %.

$$\frac{\text{productivity of firm A}}{\text{productivity of firm B}} = \frac{\dfrac{\text{output of firm A}}{\text{inputs of firm A}}}{\dfrac{\text{output of firm B}}{\text{inputs of firm B}}}$$

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For measuring productivity companies use performance indicators. Following table presents survey of most frequently used indicators.

Tab. 1. Productivity measuring

Input measures	*Output measures* Physical volume (V)	Revenue (R)	Profit (Z)	Added value (A)
Total investment (I)	V/I	R/I	Z/I	A/I
Fixed investment (If)	V/If	R/If	Z/If	A/If
Number of employees (N)	V/N	R/N	Z/N	A/N
Total of hours worked (H)	V/H	R/H	Z/H	A/H
Wages of employees (W)	V/W	R/W		A/W
Costs of material (M)	V/M	R/M		
Total Costs (C)	V/C	R/C		

Source: [4]

Performance indicators in the first table column are based on physical output or on ammount e.g. in weight or volume units. This indicators are primarily used in the industrial companies. Second and the third column deals with financial indicators concentrated on profit and loss. These indicators oare primarily use in financial reports. The last column correspond to performance indicators based on value added. Added value is defined as revenues minus operating costs (materials, energy and purchased services). It represents value added, which company creates through employing labour and capital [5].

2. CASE STUDY OF COMPARING PRODUCTIVITY OF MACHINERY PRODUCTION ORDERS.

In the second part of the contribution we counts selected productivity indicators for two equal orders (production of 30 pcs. of clamps (Fig 1, Tab 2)) realized in the two different periods (year 2006 and 2008). Concerning obtained data we will focus on calculation of total productivity and partial productivities of individual inputs (material, energy, capital and labour) and also labour productivity measured by value added. Basic input data for the productivity analysis provided by manufacturer are presented in table 3.

Fig. 1 Clamp PNV 24 3160

Tab. 2. Technical characteristics of clamp PNV

B	h	I_{max}	h_1	h_2	t	b	I_1	I_2	M_{kmax} (NM)	FU (A)	Weight (kg)
80	30	85	59	7	56	78	178	282	6	1500	3,4
125	40	130	73	8	96	122	230	339	11	2500	7,6

Source: processed from manufacturer data

Data in the table 3 are in Slovak crowns. In the column „plan“ are assumpted data counted before production and in the column „real“ are really reached values of the orders production in the particular years.

Tab. 3. Basic input data

year	2006		2008	
item	plan	real	plan	real
Material	229350	288319	304200	294998
Salaries	37290	32079	38910	38196
Social sec.	13127	11292	13696	13445
Direct costs	279767	331690	356806	346639
Overhead	205095	176434	155640	152784
Total costs	484862	508124	512446	499423
CT/VT	521400	483000	537000	537000
Value added	241633	151310	180194	190361
Profit	36538	-25124	24554	37577

Source: processed from data provided by manufacturer
Note. Overhead was 550% in 2006 and 400% in 2008.

Comparison of orders productivity based on real values

In the following table 4 are presented input data for calculation of orders productivity for year 2006 and also for year 2008. These values are real revenues and costs of examined order.

Tab. 4. Really reached revenues and costs

		2006	2008
Outputs	products [SKK]	483000	537000
Inputs	material [SKK]	288319	294998
	overhead [SKK]	176434	152784
	CT/VT [SKK]	0	0
	salaries + social security [SKK]	43371	51641
Total costs		508124	499423
Profit		-25124	37577

Source: processed from Table 3 data

Concerning the fact, that the provided data failed to satisfy demands for planned productivity analyses and particularly labour productivity measured by value added by methodology from Synek [1], we had to recalculate these data, resp. make best possible estimate of missing values.

In the first we recalculate total material costs from table 4 to costs on 1 kg and number of kg necessary for production of given number of products. For recalculation we used weight of analyzed clamp PNV (smaller type) equal to 3,4 kg.

Secondly labour costs in the year 2006 we re-counted by average monthly salary in industrial production (20180 SKK, Source: Slovak Bureau of Statistics) increased by social security (roughly 35 % of gross salary in the year 2006 and 36 % of gross salary in the year 2008). For the year 2008 (according to not publishing average industrial salary in the time of writing article) we multiply average industrial salary for year 2006 by the index of changes of average salary in Slovakia in the year 2008 in compare with year 2006 (21 782/18761 = 1,161). In the recalculation we further assume average monthly working time fund equal to 166,7 hours (2000 hours a year).

For overhead recalculation to energy and capital costs we used the estimate of data provider - 50 % are energy expenses and the rest we will consider as capital cost. Energy (we will understand as electricity energy) price for businesses and organizations in the year 2006 was around 3,0 SKK/kWh (Source: VSE a.s. Price list for electricity for businesses and organizations for years 2006) and in the year 2008 around 3,3 SKK/kWh (Source: VSE a.s. Price list for electricity for businesses and organizations for years 2008).

In the table 5 are result of these recalculations of data from table 4.

Tab. 5. Recalculated real revenues and costs

Inputs - outputs				2006 (0)	2008 (1)
Outputs	products	pieces	q	30	30
		price [SKK]	p	16100	17900
Inputs	material	ammount [kg]	v_1	102	102
		price [SKK]	p_1	2826,657	2892,137
	energy	ammount [kWh]	v_2	29405,67	23581,82
		price [SKK]	p_2	3	3,3
	capital	[SKK]	p_3	88217	77820
	labour	[hours]	v_4	265,39	275,22
		price [SKK/hour]	p_4	163,4236	187,6353

Source: recalculation from table 4 data

From data in table 5 we calculated table 6 where in the first column we multiplied prices from the year 2008 with output, resp. ammount in the year 2006. In this column are eliminated price effects. In second column we multiply prices from the year 2008 with output, resp. ammount in the year 2006 and by ratio of output in the year 2008 to 2006. In this column are eliminated effects of different output levels.

Tab. 6. Recalculated real revenues and costs for elimination of price change effect and output change effect

		2006	2008	Recalculated values for 2006 p(1)*v(0)	Recalculated values for 2006 $p(1)*v(0)*\frac{\boldsymbol{q(1)}}{\boldsymbol{q(0)}}$
Outputs	products [SKK]	483000	537000	537000	537000
Inputs	material [SKK]	288319	294998	294998	294998
	energy [SKK]	88217	77820	97038,7	97038,7
	capital [SKK]	88217	77820	88217	88217
	labour [SKK]	43371	51641	49796,54	49796,54
Total costs		508124	499423	530050,24	530050,24
Profit		-25124	37577	6949,76	6949,76

Source: recalculation from table 5 data

Note. Because in the year 2006 and 2008 was output equal (30 pieces of clamps), both columns with recalculated values has equal values.

Total and partial productivity comparison

Total productivity of order, so the proportion of total outputs to total inputs we calculate from formula mentioned in the first chapter. After appointing of values from the first and a second column of table 6 to formula we get following values for years 2006 and 2008:

$$CP2006 = \frac{483000}{508124} = 0{,}95 \quad CP2008 = \frac{537000}{499423} = 1{,}07$$

and with use of third column of the table 6 with recalculated values we reach value of recalculated total productivity in year 2006

$$CP2006p = \frac{537000}{49796,24} = 1,013$$

Afterwards we count index of total productivity:

$$ICP\left(\frac{2008}{2006}\right) = \frac{CP(2008)}{CP(2006)p} = \frac{1,07}{1,013} = 1,056$$

From the index results we can state, that after elimination of price change effect the total productivity of the investigated order increased by 5,6 % in the year 2008 against year 2006.

For deaper understanding of partial effects of individual inputs on increase of order total productivity we calculate from table 6 indexes of productivity for individual inputs by following formula:

$$\text{Index of input productivity} = \frac{\frac{\text{products}}{\text{input}} \text{ of year 2008}}{\frac{\text{products}}{\text{input}} \text{ of year 2006 recalculated}}$$

Index of material productivity = 1.
Index of energy productivity = 1,25.
Index of capital productivity = 1,13
Index of labour productivity = 0,96

Labour productivity measured by value added

In this part of the contribution we counts productivity of labour measured by value added on crown of labour input from table 6 data by formula :

$$P = \frac{\text{output} - (\text{material} + \text{energy})}{\text{salaries} + \text{social security}}$$

From data of the first and second column of table 6 we calculated following productivity of labour in the particular years:

$$P(2006) = \frac{483000-(288319+88217)}{43371} = 2,455 \qquad P(2008) = \frac{537000-(294998+77820)}{51641} = 3,179$$

and with use of third column of the table 6 with recalculated values we reach value of recalculated labour productivity in year 2006

$$P(2006)p. = \frac{537000 - (294998 + 97038,7)}{49796,54} = 2,91$$

Afterwards we count index of labour productivity:

$$IPP\left(\frac{2008}{2006}\right) = \frac{P(2008)}{P(2006)p} = \frac{3,179}{2,91} = 1,092$$

In this index is eliminated effect of prices changes of the material, energy and labour in investigated periods. Based on computed index of labour productivity we can state, that the order was produced in the year 2008 in comparison with the year 2006 with increased productivity of labour measured by value added by 9,2%.

CONCLUSION

On the base of provided information about two equal orders realized in machinery enterprise in the years 2006 and 2008 we calculated indicators of total productivity, partial productivities and labour productivity measured by value added. Concerning the fact, that the provided data failed to satisfy demands for planned productivity analyses, particularly analysis of labour productivity measured by value added by methodology from Synek [1], we had to recalculate these data, resp. make best possible estimate of missing values. From the calculations we can state, that after elimination of price change effects the total productivity of investigated order increased by 5,6 % in the year 2008 against year 2006. On the increase of total productivity were positively participating increases of energy and capital productivity, neutral effect has material productivity and negative influence has labour productivity (measured by total output value) which decreases. From the analyses we can conclude that the machinery firm was manufacturing investigated order with higher total productivity in the year 2008 against year 2006, but it should focus on increase of labour productivity, which in comparison with other inputs negatively influenced rise of total productivity. But this decrease of labour productivity could be relative, because if we change indicator (in our case to measuring labour productivity by value added) these decrease will change to increase (in the case of our calculations by 9,2%). So in the selection of productivity indicators we should take into consideration purpose of its calculation.

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INFLUENCE OF RAW MATERIAL LIMITED AVAILABILITY ON FINANCIAL RESULTS OF WOOD INDUSTRY COMPANIES

Abstract: This article contains a methodical proposal of volume of output forming, giving consideration to raw material and various assortment of wood materials limited availability and restriction to market absorption according to particular products from company's offer. Methodology takes into account influence of restrictions on volume of sold production, fulfilling minimal volume, described by break-even point.
Key words: wood, profitability, market, break-event point.

1. INTRODUCTION

Longstanding observation of wood market leads to conclusion, that main barrier of wood industry development is raw material limited availability. It is especially noticeable in sawmill industry, veneering branch, but also plywood industry, however in the minor range. Wood deficit also depends on decreasing demand directly connected with economic trend changes. It is commonly known that market economy experience trade cycle changes, from economic recovery, through slowdown, up to economic recession, what we can observe nowadays (2008, 2009).

Main wood supplier in Poland, State Forests (Lasy Państwowe) accomplish their felling plans as a result of forest economy, while they are having limited possibilities of volume delivery control against changing demand for raw material. Wood industry companies, especially the bigger ones, can base on import and that is what they usually do, but in the profitability account they have to take into consideration significant transport expenses, especially in case of larger distance from suppliers. This companies can also notice various formal impediments, which restrict imported wood supply opportunities, e.g. severe sanitary regulations etc.

Therefore in respect of raw material limited availability, especially some species and quality classes, it is necessary to build wood working operative plans in a way, that will let to obtain possibly highest business operation profitability. In some cases success can mean surviving on the market, i.e. holding volume of output over break-even point.

2. OPTIMISATION OF PRODUCTION PATTERN WITH RAW MATERIAL LIMITED AVAILABILITY

Volume and structure of wood materials output optimisation formula should take into account wood working profitability criterion function in the form of:

$$\sum_{i=1}^{n} P_i \cdot f_t(c_i - k_i) \rightarrow \max$$, where:

P_i – sales volume of product number i,
$i \in \langle 1,n \rangle$ – number of product,
f_t – factor of company share in profit before tax (before CIT taxation),
c_i – sales price of product number i,
k_i – unit self - cost of product number i.

Value of criterion function aim at maximum, while basic conditions limiting its growth are considered, which influence on the structure of company's market offer shaping.

Volume of output counted in natural units, for product of number i, contain in bracket:

$$P_{\lim i} \geq P_i \geq P_{\lim isj}$$, where:

$P_{lim\ i}$ - volume of output of product number i, that is bought by buyers,
$P_{lim\ isj}$ – volume of output of product number i, that is limited by raw material availability in a species, dimension and quality class, i.e. wood assortment number j,
$j \in \langle 1,p \rangle$ - number of wood material assortment.

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It is known, that influence on absorption of market limiting possibilities of sell product number i ($P_{lim\ i}$) is restricted in given cyclical phase, therefore structure of output must be chosen in a way, that raw material will be beneficially used and its availability is limited by P_i increase to value of $P_{lim\ isj}$.

From the wood industry company practice it is known, what is the unit raw material consumption on given product.

Planning consumption of raw material assortment s_{ij} (of number j) should be directed on magnification of criterion function, i.e. operating production profitability of particular products, considering the most important condition limiting increase of production bought by buyers:

$$\sum_{i=1}^{n} P_i \cdot s_{ij} \geq s_j \text{ , where:}$$

s_{ij} – planned volume of wood material consumption in assortment of number j for production of product number i,

s_j – volume of confirmed orders on wood material in assortment of number j, in analysed period (usually one month, related to company's production operative plans).

Construction and technology of wood products frequently needs usage of various wood materials in diverse species, quality classes, e.g. in plywood industry better logs are rotary cut for outside layers and the worse are for inner layers.

Sometimes amount of one assortment is large enough, but the company can run out of the other, especially in short supply with bigger dimensions and higher quality classes in given species, which is essential to produce more products, that can be bought by buyers.

Such a situation causes limitation:

$$P_i \leq P_{\lim i}$$

Raw material restrictions limiting volume of output of product number i can be defined with correlation:

$$P_{\lim isj} = \sum_{j=1}^{p} \frac{s_j}{P_{\lim i} \cdot s_{ij}} \text{ , where:}$$

This correlation can find implementation, if production of product number i is the most profitable, what occurred in periods of shortage in the past term of years. Nowadays seller is looking for buyers, not vice versa, that is why, while building operative production plan for given period, market offer inclusive of wider products assortment has to be taken into account, which can use to its production available raw material. It is showed in the relation:

$$\frac{s_j}{\sum_{j=1}^{p}\sum_{i=1}^{n} P_i \cdot s_{ij}} \leq 1$$

Taken into account above relation, rate of factory capacity usage can be examined with the application of measure which is in fact similar to efficiency indicator of technical equipment e.g. engine.

$$\eta_p = \frac{\sum_{i=1}^{n} \cdot P_i \cdot f(c_i - k_i)}{\sum_{i=1}^{n} P_{\max i} \cdot f(c_i - k_i)} \rightarrow \max(0{,}80)$$

provided that raw material limitations are fulfilled.

3. BREAK-EVEN POINT IN RAW MATERIAL AND WOOD MATERIALS PROCESSING

Tough market of raw material causes undercapitalization of sawmill industry companies (especially small companies), which leads to the situation that their survival on the market is endangered.

Volume of output (or value of production) below break-even point in the longer period, usually one year, leads to business failure. Small sawmill identifying difficulties in round wood supply, even having distribution for sawn wood, do not have to survive, because income from production may be not enough to cover standby cost of carrying company.

Break-even point shows relation:

$$\sum_{i=1}^{n} P_i(c_i - k_i) = \sum_{k=1}^{m} K_{sk} \text{ , where:}$$

K_{sk} – value of standby cost of k kind,

$k \epsilon <1,m>$ – number of standby cost kind.

Fulfilment of above relations could impede to maintain break-even point condition and it can result in bankruptcy. Rate of factory capacity usage can be measured with the rate of its use while exceeding break-even point:

- influence of market capacity on offered products:

$$\eta_{BEP1} = \frac{K_s}{\sum_{i=1}^{n} P_{\lim i}(c_i - k_i)} < 1$$

- influence of raw material availability:

$$\eta_{BEP2} = \frac{K_s}{\sum_{i=1}^{n} P_{\lim isj}(c_i - k_i)} < 1 \text{ , where:}$$

η_{BEP1} – factor of standing cost cover grade in conditions of limited sale possibilities,

η_{BEP2} – factor of standing cost cover grade in conditions of limited raw material delivery possibilities.

It must be noticed, that f = 0, because in break-even point or below we do not pay income tax.

4. SUMMARY

Above relations can make operative management in wood industry company much easier with taking into account raw material and wood products limited availability, but also restrictions on the trade area. Formula can and should enable optimal structure of output formation provided for described criterion function and other functions limiting its value i.e. after-tax profit from ordinary activity. It is also possible to examine rate of factory capacity usage considering above relations.

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Wacław Szymanowski; Magdalena Olkowicz[73]

APPLICATION OF THE INTERNET FOR BUILDING THE MARKETING PLANS IN MICRO, SMALL AND MEDIUM ENTERPRISES OF WOOD INDUSTRY

Abstract: The article brings up the subject of usefulness information placing in the Internet to make marketing plan for activity of micro, small and medium enterprises of wood industry. It also shows the capabilities of using them to write the marketing plan. The conclusion is: the Internet is as much advanced developed the data base now, so it can systematicaly replace the traditional sources to make the marketing plan and shorten considerably time and reduce costs to create it. There is only one problem – the businessmen will always have to think about honesty and authenticity of information placing in the Internet.

Key words: Internet, micro, small and medium enterprises; marketing plan, source of information;

INTRODUCTION

The marketing action starts, when an enterprise begins execute its main object of management, which is a customer's satisfaction. That is why a producer ought to realize how important customers' future needs and wishes are.

The trading operation on the market will achieve expected results, if aims of business action were chosen at the beginning of enterprise existence. Then the best, the most profitable and the most payable for businessman methods their realization are selected. Unfortunately, the planning definite in this way, is not a common process in polish enterprises. In the timber industry, which are characterized by disintegration and big competition, this problem is. It is specially exprested in micro, small and medium enterprises. It is worth to notice the need of planning in that sector of the economy and benefits from entering into those process.

The enterprise may achieve big success on the market without spending a lot of money on creating action plans. A chance of progress in planning (specially the marketing planning) may turn out the Internet that is unlimited data and information base today. That is the reason why owners micro, small and medium enterprises should look for an alternative method of business management which has been previous unpracticed by them.

MARKETING PLANNING IN MICRO, SMALL AND MEDIUM ENTERPRISES

The marketing planning is a kind of planning that has got a functional capacity. During planning the opportunities of enterprise development are estimated in detail in the light of its resources. On the other hand all operations are connected with the aims which an entrepreneur has already set at the beginning of enterprise existence. An undoubted trump and a characteristic feature of the marketing planning is flexibility. The correcting possibility of assumption (e.g. aims, methods, assignment, enterprise necessities) or even plans that has already been realising, enables to extend an enterprise action options. It also has an influence on improving the chosen strategies all the time through periodic verification theirs with a current situation on the market.

The directorial personnel should realise how important a planning necessity is, as well as they should notice advantages which has got small enterprises, for example: simplified procedures in comparison with big companies; shorter and cheaper researches concern closer and further enterprise surroundings; easier definition of assumption and strategic aims. In the last ten years has appeared the other feature that speaks for introducing the marketing planning in the micro, small and medium sector. It's an easy accessibility to the large data base like the Internet is.

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THE INTERNET AS A SOURCE OF INFORMATION

The Internet has made easy a planning in the past few years. It also enable businessmen to have an access to the most of valuable data and information. If they were analysed correctly, they would be used with success as a source of information to build marketing plans. Principally they are of use in preparation of a further enterprise surrounding analysis or a market competition analysis.

However hard we try, the finding data and information that are necessary, is not always fast or easy. Many times if one problem is studied, a lot of web pages need to be searched when we look for research materials. As well we have to bear in mind fact, that some information which was published in the Internet, could be false and unreliable. There is always probability of use incorrect information, sometimes with errors or modified intentionally by somebody and then placed in the web pages.

Despite the internet source disadvantages above mentioned, it is worth to name its many advantages too. The most important Internet trumps are: opportunity of finding all kind of analysis, tables, balances, statistics and scientific researches results prepared by various experts. As examples it is necessary to point at a web page of Central Statistical Office (GUS: *www.stat.gov.pl)* or Ministry of Government in Poland *(www.mg.gov.pl)*. By the way without many difficulties we can also have an access to the many of periodical financial reports belong to some market competitors. As a rule it is enough to log in a concrete web service for a fee (e.g.. *www.notoria.pl* or *www.infoveriti*.pl). A whole procedure progresses quickly and ably because a charge is paid by means of sms message that is sent to the following telephone number. The other important thing is the direct access through the Internet to some news which could be never make accessible in the traditional way or some clerks do not want to show them.

ELABORATING THE MARKETING PLAN

The marketing plan, that was built in the traditional way, required collecting the data and information from many sources: started with literature (e.g. books, press, publications), through scientific conferences and symposiums, with the information coming from: offices, institutions, institutes and universities at the end. The process of seeking the data and information for making a traditional marketing plan was arduous and took time. Apart from that overall costs of marketing planning were quite high because they has been much lifted by procedures of news earning for example: drive to offices, institutions taking working hours under consideration and payment for gained documents, data or information. In that situation there is also need to employ qualified people who can analyse and elaborate the collected data.

The comparison a traditional marketing plan with a plan which has been written on the basis of the internet data and information, was put in the table 1.

Table 1 The comparison a traditional marketing plan with a plan based on the internet source

A traditional marketing plan	A marketing plan based on the internet source and data from an enterprise
Need for looking for data and information in many traditional sources;	• The most of necessary data and information is placed in the Internet;
• Problem with access to some data and information e.g. from offices, institutions;	• Logging on some web services for a fee, stand in the way to get news from the Internet;
• Looking for some news in many places (e.g. offices, institutions, libraries) taking their opening hours under consideration;	• Working on one computer place with the Internet access, the most of news is possible to find regardless of day or night time;
• A collected data analysis by oneself: make tables, balances, reports and charts;	• The possibility of use tables, charts or reports prepared by experts and published in the Internet;
• The need to employ qualified people who can analyse and elaborate the collected data;	• Use of tables, charts or reports (published in the Internet) prepared by experts allows to concentrate on right understanding them;
• The longer time to build a marketing plan;	• The saving of people's time and energy;

Source: Olkowicz M., The possibilities and the scope of application of the Internet for building the marketing plan for "Stolarka Wolomin S.A.", master's thesis; the tutor: dr hab. Wacław Szymanowski, prof. SGGW; Warsaw University of Life Sciences, Department of Technology, Organisation and Management in Wood Industry; Warsaw, July 2009.

Building the marketing plan based on the internet data and information, considerably makes easier this procedure and saves the employees time and energy. In regard to costs of made the plan, they among other things consist of payment for logging on some web services for a fee and the salary for writing the plan. On the assumption that the enterprise for whom the plan is created, accesses the data from the inside business documentation, the marketing plan writing can be charged a person from outside the enterprise. However in the businesses with a small initial capital, the marketing plan could be also prepared by the owner (as a rule acting manager), accountant or other employees. It is important for enterprises from the micro, small and medium sector to pay attention to the necessity and need of the marketing plans building. Therefore the growth of businessmen awareness should cause using the internet instruments and deriving benefits which they reapes in order to consolidate their hold on the market through the marketing planning.

A typical structure a marketing plan is showed in a table 2. It is also contains a column with mentioned the data and information sources which can be used in the particular stages of plan writing. The aims of every plan stages are pointed in the same table 2.

Table 2 The structure of a marketing plan taking aims and information sources under consideration

No	*PART OF PLAN*	*AIMS*	*SOURCE OF DATA AND INFORMATION*
1	Summary for management	• Present main: assumption of a plan, its aims and recommendations make possible shows its essence; • Directly next to summary contents is put;	• Written on the basis of the rest stages of plan which has been made;
2	Current marketing situation	Show main data concerns: further surroundings, a market, competition, distribution, costs and expected profits, which help to prepare a SWOT analysis;	• The Internet – web pages of: departments, offices, institutes, universities, wood and furniture vortals, newspapers, libraries, specialist business, web services makes data base accessible; • Data from enterprise;
3	Possibility and problems analysis	Define the most important possibilities (advantages) and enterprise faults too which can have an influence on reaching aims by businessman;	On the basis of above mentioned sources
4	Aims	Show plan aims concern: sale size, share in market and profits;	On the basis of above mentioned sources
5	Marketing strategies	Show a way to realise aims when marketing instruments are used	On the basis of above mentioned sources
6	Operation program	Answer question: What will be done? Who will be working on? When will it be carried out? How much will it be cost?	• On the basis of above mentioned sources • Data from enterprise;
7	Planned results	Point at business forecast on the basis of that: plans, a timetable of material supply, a production plan, a plan of hire new people and marketing action will be prepared;	• The Internet – web pages of: departments, offices, institutes, universities, wood and furniture vortals, specialist business, web services makes data base accessible; • Data from enterprise;
8	Monitoring	Show methods of control a plan realization.	• On the basis of enterprise observation; • Following the situation on the market through the media and Internet.

Source: Szymanowski W., *The marketing planning in micro, small and medium enterprises in wood industry*; conference; Rogów 2002r;

SUMMARY

Nowadays the Internet is the newest source of data and information. It could be useful for the marketing planning by entrepreneurs. In some case of enterprises (e.g. micro or small), the much of information placed in the Internet has got scope that is enough for building the marketing plan and the Internet can be an only source of news at that time.

The marketing plans based on the internet source are the chance of micro, small and medium enterprises development. Especially in difficult the economic situation which came out in the end of 2007 ("the economic crisis 2007-2009") all over the world, the marketing planning could be the helpful means for businessmen to protect enterprises from depression.

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Marek Tabert, Wojciech Lis[74]

BIOENERGY FROM WOOD WASTE

Abstract: Attempts to reduce carbon dioxide emissions released in combustion processes of fossil fuels face technological and economic barriers. Thus new sources of energy are searched for, which would be the least possible nuisance for the environment or which environmental impact would be neutral. Wood pellets were characterized as a bioenergy raw material with considerable development potential. Ecological and economic effects of their application were discussed. Costs of generation of 1 kWh energy from selected types of fuels were compared.
Key words: bioenergy, biofuels, wood pellets, heating boilers

1. INTRODUCTION

As late as two hundred years ago people obtained energy required for heating and cooking almost entirely from wood. Later the primary fuel was coal, followed by crude oil, natural gas as well as uranium. In the course of combustion of these fossil fuels waste products are formed, which are subsequently released to the atmosphere. Emitted gases have a negative effect on the natural environment. This fact is the primary drawback of fuels used to date. Another disadvantage of their application is connected with the fact that resources of these fuels are limited and world demand for energy is constantly increasing.

Combustion of hard coal, brown coal and crude oil leads to emissions of large amounts of gases, first of all carbon dioxide. Increased emission of CO_2 to the environment disturbs the natural balance of this gas in the Earth's atmosphere. Scientists and conservationists generally share an opinion that an excess of this gas in the atmosphere, caused by human activity, has played a significant effect on climate change, observed particularly since the beginning of the 21st century.

Attempts to reduce carbon dioxide emissions released in combustion processes of fossil fuels face technological and economic barriers. Thus new sources of energy are searched for, which would be the least possible nuisance for the environment or which environmental impact would be neutral. In this respect biofuels seem to be particularly promising. Energy generated from biofuels is referred to as bioenergy. Among different types of biofuel considerable interest has been observed in wood, including wood waste. Energy coming from wood, thanks to its obvious economic and ecological advantages, has been again gaining in popularity, particularly in the European Union countries and in the Unites States. In terms of energy efficiency the consumption of 2 kg of wood pellets made from wood waste is equivalent to 1 litre of heating oil.

2. WOOD PELLETS AS NEW BIOENERGY MATERIAL

Wood is one of the most important forests products. It is a versatile raw material, commonly found and applied, accompanying people throughout their lives. Wood is used in the production of e.g. whole housing buildings and structures (bridges, sports facilities, catering facilities), structural components of buildings and structures (e.g. rafters, floors, windows, stairs), moveable and built-in furniture, as well as paper, tool elements, toys, etc. In the process of manufacture of products from wood considerable amounts of wood waste are generated. One of such wastes is sawdust. It became raw material for the production of wood pellets (pol. granulat drzewny, pelet). In Poland the term "pelet" does not have a clear-cut, commonly applied definition. German and Austrian standards define pellets as wood pellets from pure hardwood sawdust. The European standard uses the term "pellets", which was defined as pelleted material with a diameter from 6 to 25 mm. At such a broad definition most pellets offered on the Polish market are consistent with the European standard.

Wood pellets are used as fuel combusted first of all in heating boilers. Figure 1 presents a mass of pellets and an individual pellet.

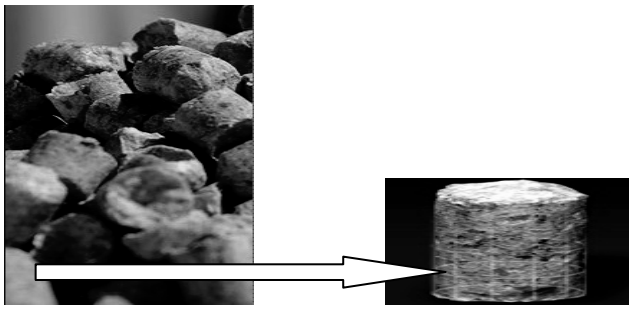

Fig. 1. Pellet mass and a single pellet
Source: a study by the author.

The diagram given in Fig. 2 explains in a synthetic way why combustion of pellets, as a wood product, generally does not introduce new pollutants to the natural environment.

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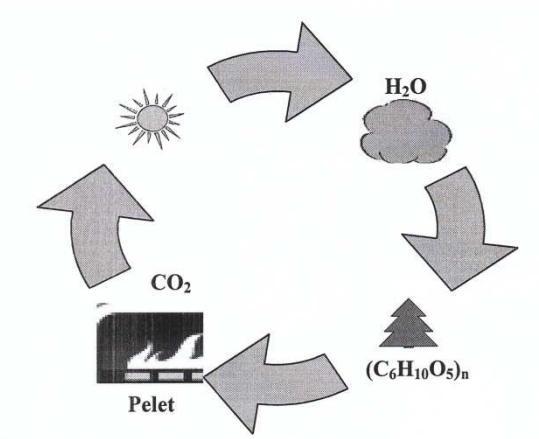

Fig. 2. The cycle of CO_2 in nature taking into consideration combustion of wood in the form of wood pellets.
Source: a study by the author.

Carbon dioxide released during wood combustion enters the natural cycle as a result of its absorption by green plants, particularly forests. Forests are ecological systems, which thanks to solar energy are automatically and continuously renewable. Green plants transform CO2 into organic substances, first of all cellulose (C6H10O5)n, which is the basic component of wood. As a result the amount of carbon dioxide in the natural environment remains constant, circulating in the natural cycle. For this reason, wood material combusted in different forms is considered to be an ecological source of energy (www.pellets.pl/pellets/energia_drzewna.php).

Poland has considerable, unused resources of energy biomass. They are estimated at approx. 40 million ton annually (Lewandowski 2001). These resources include straw, wood waste, reed and grasses. Approximately one third of Poland's area (28.8%) is covered by forests. Every year forests produce 9 million m3 wood waste, which when not managed and left in the forest constitute a medium and feeding grounds for fungi and pests, thus deteriorating the sanitary condition of forests. Timber harvested from forests is processed into final products by wood industry. It is estimated that during these processes from 100 m3 timber only 25 m3 sawnwood processed into final products are obtained (Seredyński 2003). The rest is waste, which - similarly as wood waste generated in the forest in the course of felling - so far has been managed only to a slight degree (Guzenda, Świgoń 1997).

According to the amended Energy Law Act: "a renewable energy source is a source utilizing in the processing process wind power, solar radiation, geothermal energy, sea wave, current and tidal energy, hydro power and energy generated from biomass and biogas" (the Act of 24 July 2002 amending the Energy Law Act). A modern biomass energy source is connected with fuel pellets. Raw material for the production of this type of pellets may be practically almost any plant species. However, wood waste, i.e. sawdust, trimmings and chips, has the highest calorific value. Dried and appropriately comminuted wood material is heated, as a result of which process lignin, one of the primary components of wood, receives adhesive properties. The hot mass of wood particles is crushed under high pressure, automatically glued and pelleted, as a consequence receiving the form of pellets.

Pellets, meeting quality parameter requirements of standard DIN 51731 are efficient, ecological and renewable fuel produced from sawdust and formed as pellets. They are characterized by high calorific value (18 – 19 MJ/kg) in comparison to other biofuels and low ash contents (0.2 - 0.4% burned fuel). Pellets are shaped as tightly pressed cylinders with a diameter of 6 - 8 mm and length of approx. 2 - 4 cm. The primary advantages of pellets include low heating costs, negligible CO2 and SO2 emissions and slight amounts of ash, no contents of noxious substances and easy use (Kryłowicz et al. 2004). Wood pellets are sold under different brand names: Pellet Premium+, Ecopellet, Pellet Premium and Pellet Standard. Individual types of pellets differ in their calorific value and price. The primary producer of wood pellets in Poland is BARLINEK S.A., which offers a product called "pelet barlinecki" (70% softwood sawdust and 30% hardwood sawdust).

The origins of wood pellet production stem from feed industry. In the late 1980's a feed producer, operating at the US-Canadian border, started to manufacture in the period of reduced demand for feeds wood pellets from sawdust as an addition to horticultural composts. Some customers started to use this product as fuel, observing good energy results. Soon the concept of this new application of wood pellets gained interest on the part of a bigger group of entrepreneurs, becoming their main source of income. This product reached Europe in mid-1990's, first Austria and the Scandinavia (Kryłowicz et al. 2004).

Raw biomass is susceptible to decay. In this form the material readily absorbs moisture from air, thus intensifying putrefaction processes, which particularly pertains to green plants and to a limited degree to industrial wood waste. In contrast, pellets are resistant to natural decay processes, since their smoothed surface effectively protects them against absorption of moisture from air. Thanks to their form pellets may be automatically fed into boilers. Modern boilers fed with pellets are as a rule automatic. During combustion of pellets a very small amount of ash is produced, which in most cases may be removed as seldom as several times a month. Ash left after combustion of wood pellets is composed of inorganic compounds, mainly potassium and calcium carbonates, and constitutes good quality mineral fertilizer for horticulture. Operation of pellet boilers is similar to that of oil or gas boilers. In contrast, it is almost two times cheaper.

Pellets occupy from ten to thirty times less space than the original raw material. Thus their storage and warehousing costs are similarly lower. Transport costs are approx. seven times lower. As a result of biomass concentration in the pellet form the calorific value is increased. Good pellets have a calorific value exceeding 70% calorific value of the best grades of

coal. At the same time the efficiency of equipment burning pellets is on average two times higher than that of equipment burning coal. As a result pellets produce more heat that an identical amount of coal. Dry biomass is more flammable than coal and pelleting increases the flash point. Although pellets constitute a material which burns readily, it is still resistant to self-ignition, it does not explode and may hardly lead to an outbreak of a fire.

3. ECOLOGICAL IMPACT AND ECONOMIC EFFECTS OF APPLICATION OF WOOD PELLETS

The use of wood pellets has a positive ecological impact as a result of the phenomenon of substitution. This phenomenon results from the fact that energy produced from fossil fuels is replaced by energy coming from pellets. This leads to a reduction of emissions of noxious gases, which are waste products of combustion processes of fossil fuels. For example, a larger production line manufacturing wood pellets in the amount of approx. 2 5000 ton annually supplies fuel required to heat approx. 5 000 typical detached houses (assuming that one house consumes 5 ton fuel annually). Such an amount of wood pellets may also be used to supply for a period of 1 year a small heat and power plant equipped with power units of 2 x 7 MW. Application of wood pellets from the annual production of this line results in a reduction of carbon dioxide emission by approx. 106 000 ton (approx. 55 million m^3), sulfur dioxide emission by approx. 3 300 ton, dust by approx. 1 800 ton and nitrogen oxides by approx. 1 850 ton (Seredyński 2003).

Table 1 lists results of comparisons of effective costs of generation for 1 kWh energy from selected types of fuel.

Table 1. A list of generation costs of 1 kWh energy for selected types of fuels

Type of fuel	Unit of measure	Calorific value of fuel [kJ/unit]	Gross price of fuel* [zł]/unit]	Generation cost kWh [zł/kWh]	efficiency of boiler [%]	Effective generation cost [zł/kWh]
1	2	3	4	5	6	7
Heating oil	l	35610	2,51	0,25	92	0,27
Liquefied petroleum gas – propane	l	45600	2,50	0,20	92	0,22
Natural gas GZ-50	m^3	34440	1,79	0,19	92	0,21
Coal sorted smalls of 5 - 25 mm (Ekogroszek)	kg	25000	0,91	0,13	82	0,16
Coke	kg	27000	0,88	0,12	40	0,30
Ecopelet	kg	19000	0,75	0,14	82	0,17

**Mean gross prices according to the levels from the period*
Source: a study by the author.

In these calculations the cost of installation of heating facilities was not included. In professional literature on the subject calorific value of individual fuels is given most commonly as the value falling within a certain range. In Table 1 mean values were assumed for the purpose of calculations. The highest calorific value is found for liquefied petroleum gas – propane. In turn, the lowest calorific value was recorded for pellets (ecopellets), being over two times lower than that of liquefied petroleum gas.

Fuel prices are characterized by variation not only within long-term periods extending over many years, but also within a year. Moreover, differences are found in fuel prices depending on the region of the country. Thus prices of compared fuels were established on the basis of offers given by suppliers in the Internet, collected during a relatively short period from 01 to 10.08.2009. Mean values were calculated based on the presented price lists proposed by different suppliers and for different regions of the country.

The direct cost of generation for 1 kWh (column 5, tab. 1) was calculated by dividing the gross price by the calorific value and expressing the result in kWh, applying the conversion factor 1 kWh = 3600 kJ. Under operating conditions the efficiency of heating facilities is crucial, and it varies depending on the type of the applied fuel. Efficiencies of boilers presented in Table 1 were established as means based on the information given in offers presented by boiler producers on their websites. Taking into consideration efficiency of boilers the effective cost of generation of 1 kWh was calculated for individual types of fuel. Coke turned out to be the least economical fuel, while the most profitable fuels were coal sorted smalls "ekogroszek" (0.16 zł/kWh) and "ecopelet" (0.17 zł/kWh). The difference between the least economical fuel and the best was almost two-fold.

Prices of fuels given in Table 1 and results of calculations obtained on their basis in terms of values are true only for the period in which current prices of analyzed products were collected. Prices of energy raw materials fluctuate considerably over time, first of all under the influence of global economic factors. These prices are also significantly affected by exchange rates, mainly that of Polish złoty to US dollar and Euro. In turn, the ratios of prices of analyzed fuels are much more stable. They undergo much smaller fluctuations, which are observable generally over longer periods. Thus results concerning the effective cost of generation of 1 kWh energy (tab. 1, column 5) are of higher value for research purposes if they are analyzed in terms of relations between them.

As a result of the use of wood pellets to generate heat energy we also gain several positive additional effects. New jobs are offered in the opened pellet production plants and in cooperating enterprises. A wood pellet production plant employs directly several or around a dozen workers. However, as rough estimates show, together with cooperating enterprises it may activate up to 170 new jobs. The biggest numbers of people are given positions in the procurement of the production plant with raw material and in the distribution of the final product. Moreover, workers are employed in the production, sale, installation and servicing heating facilities fueled with pellets.

Economic benefits from the production and application of wood pellets are wider in scope that the individual business success of the pellet producer. A higher number of pellet production plants operating in a region may lead to the improvement of its balance of payments, particularly if it is connected with opening of power plants using this fuel. This concerns first of all regions with more than average forest cover, where as a consequence the potential supply of wood

waste is high. Such a situation is an incentive for entrepreneurs to open pellet production plants and cooperating power plants. As a consequence of their activity soon economic effects connected with the scale of production may be observed. As a result of the manufacture and use of fuel in the form of wood pellets in that area the purchase of energy or its carriers from other regions of the country is reduced. The Güssing district in Austria may serve as an example of economic success in this respect (Kubicka 2007).

Moreover, the production of pellets for export is developing due to the considerable demand for this product aboard, particularly in Germany. The scale of this demand may be evidenced by the fact that certain Polish producers have sale contracts for their entire future production for many years ahead. Increased demand for wood waste increases the number and range of silvicultural procedures performed in neighbouring forests, which in turn improves the sanitary condition of forests. Increased demand for the raw material for pellet production also results in changes in the cropping structure in the area. Plantations are established of plants, used after processing in pellet production for energy generation purposes. Modern technologies are implemented to manufacture heating equipment with high development potential. The example of the Czech Republic shows that the production of equipment for pellet combustion, such as furnaces, burners, boilers, fireplaces, etc. is highly profitable.

4. CONCLUDING REMARKS

The development of bioenergy production based on wood waste has certain limitations resulting from the volume of potential raw material resources. The best material for the production of wood pellets is hardwood. Its most profitable resources will soon be completely utilized. It seems that in this situation good development prospects would be offered by incorporating into the resource base also plantations of fast-growing woody plants of willow species (Salix viminalis). Plantations of this plant make it possible to use poor or contaminated soils for cultivation, which additionally results in the implementation of alternative agricultural production (Wiśniewski 2000).

Another direction for the development of bioenergy based on wood waste is found in the thermal conversion through their gasification or pyrolysis with the generation of gases, to be next burned in combustion engines or gas turbines. The presently used gasification technologies are characterized by insufficient conversion efficiency and are still pilot plants rather than commercial installations.

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Marek Tabert, Włodzimierz Popyk

HEATING EQUIPMENT FUELED BY WOOD PELLETS

Abstract: New sources of renewable energy are being developed. The structure and volume of energy production from renewable sources are discussed. Potential resources of these sources in Poland are indicated. Biomass, particularly wood pellets, is gaining considerable importance in the production of bioenergy. The best boilers burning wood pellets, available on the market are characterized in terms of their technical and economic properties.

Key words: sources of renewable energy, biofuels, wood pellets, pellets, heating boilers

INTRODUCTION

Polish power engineering is based on hard coal, coke and brown coal. It is estimated that approx. 75% national energy consumption is covered by energy coming from combustion of these fuels. At present the structure of utilization of energy raw materials results from their resources found in Poland and the long-term tradition, enforced by the strategy of energy self-reliance. However, ecological and economic barriers are mounted, requiring the search for new sources of energy. Increasing attention is being focused both in terms of the legal and economic aspects on environmental pollution.

Excessive air pollution is recorded at over 20% area of Poland. According to analyses conducted by the Institute of Environment Protection – KASHUE (Dębski et al. 2009), Poland was characterized in 2007 by particulate pollution level of 1.4 t/km2 annually (435.6 Gg TSP – total suspended particulate) and sulfur dioxide emission of 3.5 t/km2 annually (1 131.03 Gg annually). These are considerably better results than those recorded in the early 1990's, but still much less advantageous than those in the other EU countries. The primary source of pollutants emitted to the atmosphere is connected with the processes of energy production – 92%.

In view of the observed climate changes the emission of greenhouse gases, including carbon dioxide, is increasing in importance. Its emission to the atmosphere caused by human activity is considered to be the main causative factor in changes leading to climate warming. The emission of CO2 in Poland in 2007 was estimated at approx. 328.27 million ton (Olendrzyński et al. 2009). Reduction of CO2 emission to the atmosphere is becoming a key ecological and economic problem, thus the search and development of renewable energy sources. The basic requirements which modern sources of thermal energy need to meet include low emissions of sulfur dioxide and carbon dioxide to the atmosphere. The use of such fuels leads to a limitation of the greenhouse effect.

THE ROLE OF BIOMASS IN UTILIZATION OF RENEWABLE ENERGY SOURCES

According to the expert opinion of the European Renewable Energy Centre entitled "Economic and legal aspects of utilization of renewable energy sources in Poland" (EC BREC, 2000) the proportion of energy coming from renewable sources in the structure of primary energy carrier consumption in 1999 was estimated at 2.5% (i.e. 104 PJ). At the same time, the proportion of renewable energy sources in the global fuel-energy balance is approx. 18%. At present in the Polish energy balance the share of renewable energy still remains low. Table 1 presents the structure of sources and the volume of renewable energy production in Poland (www.pv.pl/upload/200402161126530.StrategiaOZE.pdf).

Table 1. Structure and volume of renewable energy production in Poland in 1999

Renewable energy sources	Proportion [%]	Produced energy [PJ]*
Biomass	98,05	101,8
Hydro power	1,83	1,9
Geothermal energy	0,1	0,1
Wind energy	0,01	0,01
Solar radiation energy	0,01	0,01
Total	100	103,82

**PJ (petadżule) = 10^{15} J*

Source: Strategia rozwoju energetyki odnawialnej (2000).

In the Strategy for Development of Renewable Energy Production, passed by the Parliament in 2001 the objective of reaching the proportion of renewable energy in the national energy balance at 7.5% was adopted for the year 2010 and 14% for 2014 (Strategy…2000). It is estimated that total energy demand in 2010 will be 4570 PJ. Reaching the 7.5% share of energy from renewable sources in the primary energy balance means that it is necessary to produce in 2010 approx. 340 PJ energy from renewable sources. In relation to the level of production capacity available for the renewable energy sector in 1999 it is equivalent of generation of additionally 235 PJ bioenergy. This will require a considerable increase in investment outlays for renewable power generation. Table 2 presents the volume of energy which may potentially be generated by renewable energy sources in Poland.

Table 2. Potential volume of energy from renewable sources within a year in Poland

Energy source	According to the expert opinion EC BREC* (EC BREC 2000)[PJ]	According to the strategy for reduction of greenhouse gas emissions [PJ]	According to the report prepared for the World Bank (Hauff 1996) [PJ]
Biomass	895	128	810
Hydro power	43	50	30
Geothermal resources	200	100	circa. 200
Wind energy	36	4	4 – 5
Solar radiation energy	1340	55	370
Total	2514	337	circa. 1414
Total consumption of primary energy in Poland in 1998 r.: 4069,6 [PJ]			

**EC BREC (Baltic Renewable Energy Centre)*

Source: Strategia rozwoju energetyki odnawialnej (2000).

Estimates of volumes of energy were prepared by three groups of experts. Results of their analyses in certain cases differ rather considerably. However, in all these findings the evaluation of the potential for renewable energy in relation to the objectives assumed in the Strategy for the Development of Renewable Energy Production indicates that these assumptions may be realized. Relatively the biggest hopes for the utilization as a renewable energy source are connected with biomass. Its proportion in the fuel balance of renewable energy in Poland has been increasing gradually. Biomass may be used for energy purposes in processes of direct combustion of solid biofuels (wood, straw), gaseous fuels in the form of biogas or processed into liquid fuels (oil, alcohol).

In Poland utilization of solid biofuels for energy purposes is the fastest developing area of energy generation from renewable sources. This development is occurring under market conditions, with no support from the state and generally based on technologies available in Poland. A goods and services tax was even imposed on the sale of biomass, with a VAT rate of 22%. The potential introduction of state support for the production of energy from renewable sources is only being analyzed at present. The considered options include a reduction of investment costs connected with the use of renewable energy technology as a result of the introduction of tax preferences, mainly for private investors. This refund system is already applied in four EU countries, i.e. Austria, Belgium, Portugal and France.

PROPERTIES OF WOOD PELLETS

Pellets (mini briquettes or wood pellets) are used in combustion in burners, furnaces, boilers, fireplaces and other heating equipment. Their calorific value is 4.8 – 5 kWh/kg (18 – 20 MJ/kg). Pellets are produced from pure sawmill sawdust, trimmings, chips and broken wood. A variety of fuel pellets is also manufactured from cereal grain, stems of green material, straw, hay and other combustible waste matter. Table 3 lists basic parameters of wood pellets and for comparison selected properties of heating oil.

Table 3. Basic parameters of wood pellets and heating oil

Type of parameter	Value of parameter	
	Pelet	Heating oil
Diameter [mm]	6 - 8	-
Length [mm]	10 - 38	-
Calorific value [MJ/kg]	16 – 19,5	39 - 42
Power output [kWh/kg]	Circa 4,7	11- 12
Bulk density [kg/m^3]	630 - 750	-
Moisture content [%]	6 – 12	1
Ash content [%]	<1,5	0,2
Sulfur content [%]	<0,1	0,2 - 1
CO_2 content [%]	Circa 0	-
Occupied volume [m^3]	Circa 1,5	-
Gross price	650 zł/ton	3,00 zł/litre

Source: the author's study based on http://www.biopal.com.pl/

Material for production of wood pellets has to be comminuted to a fraction of 1 - 2mm, dried to 8 - 15% moisture content. If the material is not viscous, it needs to be mixed with a binding agent (with oil cake being most suitable). Efficiency of machines drops by 30 - 50% for straw and sawdust, while it reaches a maximum when e.g. oil cake is used.

Wood pellets are produced similarly as briquettes in mechanical pelleting machines, in the process of pressing wood mass under a high pressure. Lignin serves as the binding agent, which when heated receives adhesive properties, together with resins contained in sawdust. The average price for pellets in Poland in 2009 is 750 złotys/ton. Wood pellets are sold in bags of 15 kg, 20 kg, 25 kg, as well as big bags (1000 kg), and in bulk. In smaller burners pellets with a diameter of 6 – 8 mm are used, while in bigger (industrial) burners – those with a diameter of 8 – 12 mm.

CHARACTERISTICS OF LEADING EQUIPMENT FOR COMBUSTION OF WOOD PELLETS

The offer of boilers using wood pellets available on the market is relatively wide. There are approx. 20 producers and importers operating at present on the market, who sell automated boiler installations burning wood waste in the form of pellets. Investment costs of these installations may be estimated at 500-1000 złotys/kW, depending on the degree of technological advancement of the equipment. Increasing interest is observed in small output boilers, used to meet the needs of individual households. There are approx. 10 producers of low-temperature heating boilers burning wood (of 20 - 80 kW). The cost of purchase of such a power unit, installed without adaptation of the boiler room, may be estimated at 130-150 złotys/kW. At present on the Polish market in terms of technology the most advantageous solutions are heating furnaces offered by KOSTRZEWA.

KOSTRZEWA is a company established in 1978. Starting from the beginning of their activity it has been involved in the production of central heating boilers using biomass and fossil fuels. As a result of continuous modernization and improvement of manufactured equipment the enterprise gained the position of a leader among Polish producers of boilers for solid fuels (pellets@pellets.pl; http://www.kostrzewa.com.pl/). The latest product (2008) launched by KOSTRZEWA comprises Pellets® Fuzzy Logic boilers, produced in variants with varied output of 15 to 75 kW. They are used in central heating and may be used to heat utility water. They are ecological, offering a source of heat being two times cheaper than gas and oil and three times cheaper than electricity. Table 4 lists area of facilities, power of boilers required for their heating and basic dimensions of this equipment, as well as prices.

Table 4. Basic characteristics of Pellets® Fuzzy Logic boilers by KOSTRZEWA

Area of facilities [m^2]*	Power of boiler [kW]**	Depth [mm]	Height [mm]	Width [mm]	Flue diameter (smoke conduit) [mm]	Price [zł]
50-200	15	960	990	1050	160	12600
100-300	25	1080	1150	1230	160	13200
296-530	40	1080	1280	1230	160	16600
370-660	50	1080	1370	1230	160	18600
550-1000	75	1476	1410	1465	160	25900
600-1300	100	bd	bd	bd	bd	bd

**height of facilities*

***Power of equipment needs to be selected according to heat demand of the building*

Source: the author's study based on marketing materials by KOSTRZEWA - http://www.kostrzewa.com.pl/

Pellets boilers are a group of automatically fired up heating equipment. Boiler operation is controlled by a lambda probe (Fig. 1) and the innovative method to control combustion processes, using an algorithm based on the fuzzy logic principles. Fuzzy logic is a generalization of classic, two-valued logic. It is applied first of all in control systems of equipment, in situations when classic logic is not effective due to the occurring ambiguity. The Fuzzy Logic control method makes it possible to reduce fuel consumption by up to 15%, to a considerable degree it eliminates the formation of pollutants and furnace black as well as condensation of water vapour in the boiler.

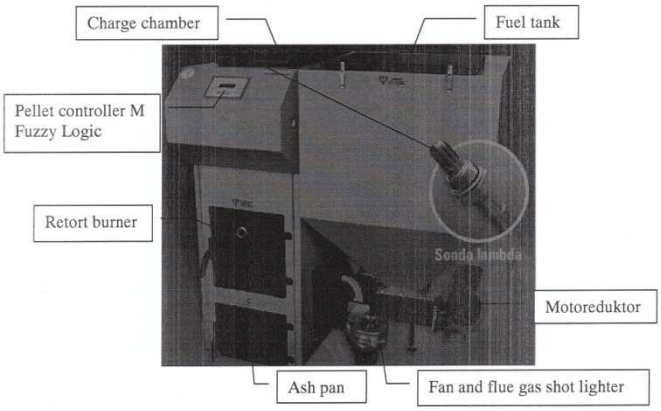

Fig. 1. A central heating water boiler Pellets® Fuzzy Logic firmy KOSTRZEWA Sp. J.
Source: the author's study based on marketing materials by KOSTRZEWA - http://www.kostrzewa.com.pl/

Boilers of this type are adapted to combustion of wood pellets, coal sorted smalls, cereal and wood. Wood may be burned on an additional grate, with which the boiler is equipped. Over the entire range of power of these boilers combustion processes meet the requirements of Polish and European standards of flue emissions (PN-EN 3030-5:2002), at the same time exhibiting high efficiency. This means that during their operation a bigger amount of fuel is conserved in comparison to traditional boilers. These boilers have certificates of innovative products, with KOSTRZEWA being a proprietor of protection right to the Pellets® trade mark. Pellets Fuzzy Logic boilers received many awards during professional fairs in Poland and are setting a new trend in the development of equipment for combustion of solid fuels.

Pelleted fuel is fed to a high capacity tank. Charge (filling) of such a tank, depending on the energy demand of a building, facilitates automatic operation of the boiler for 7 up to 30 days. Advantages of the boiler include a steel boiler exchanger, a burner adapted to combustion of pellets and cereal (when the steel burner tip is applied) and coal smalls (using a cast iron burner tip). In order to provide easier operation and reduce the amount of consumed fuel the Fuzzy Logic method was applied to control the operation of the boiler, thanks to which the power output of the equipment is adapted to the heat demand of the building. In turn, the lambda probe facilitates smooth regulation of rotations of fans forcing air to the boiler, as a result of which the amount of air needed for combustion is automatically regulated. The standard equipment of the boiler includes the function of automatic firing up of coal smalls and wood pellets.

Efficiency of the boiler depends on the efficiency of heat transferred to the exchanger and on the efficiency of the fuel combustion process. The vertical exchanger is produced from boiler steel with a thickness from 4 mm to 6 mm. An appropriate shape and length are characteristic properties of this design. Strong points of the applied solution include first of all lower susceptibility to ash deposition on exchanger walls. Ash falls down by gravity to the ash pan. In order to reduce resistance of flue flow an exhaust fan mounted in the flue, aiding the natural flue draft.

In comparison to the combustion of liquid or gas fuels, combustion of solid fuels is a more complex process. An adequate amount of air needs to be supplied for combustion, air has to be mixed thoroughly with fuel and next combustion products, i.e. ash, need to be removed. The above mentioned requirements are met by the retort burner (Fig. 2).

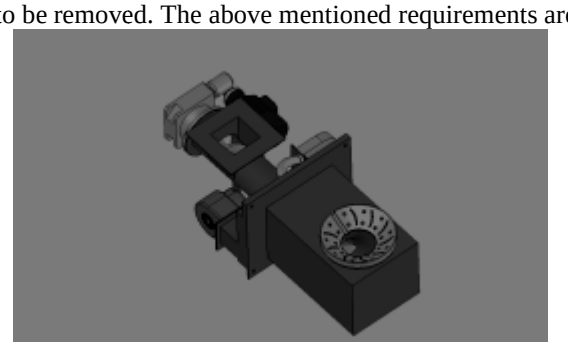

Fig. 2. The retort burner with flame modulation for the combustion of pellets or cereal grain
Source: marketing materials by KOSTRZEWA - http://www.kostrzewa.com.pl/

Until recently combustion of wood pellets was run in cast iron burners, which were constructed for the combustion of coal sorted smalls. After a series of trials a steel burner was designed, adapted to the combustion of pellets and grain (Fig. 3).

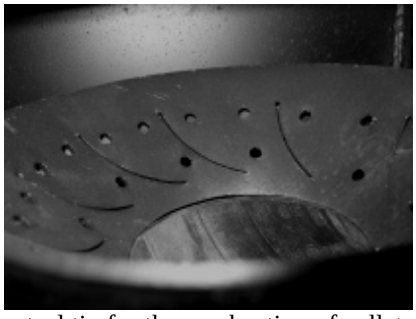

Fig. 3. The steel tip for the combustion of pellets and grain
Source: marketing materials by KOSTRZEWA - http://www.kostrzewa.com.pl/

The structure of the furnace was made from steel, since this material is characterized by lower sensitivity to lack of water, to boiler scale and sudden changes in temperature. Cast iron used to date resulted in excessive weight of the structure, high flow resistance and considerable inertia as a consequence of bigger material density. Moreover, cast iron as a material imposed design limitations caused by its production technology.

The core of the boiler is the controller, a specialized electronic system, responsible for the maintenance of constant boiler temperature as a result of adequate doses of fuel and air. It also controls the operation of the heating system in a building. The controller works in two stages:

- Stage 1 consists in the effective and economical control of the combustion process in the boiler. The effect is obtained by burner flame modulation through controlled inflow of primary and secondary air and next mixing it in the combustion chamber. In this process an algorithm based on fuzzy logic is applied. The appropriate operation of the burner is confirmed by the measurement of oxygen residue using the lambda probe at the flue outflow from the boiler (Fig. 4). In case of deviations from the model air inflow to the burner is automatically adjusted.

Fig. 4. Lambda probe
Source: Marketing materials by KOSTRZEWA - http://www.kostrzewa.com.pl/

- The second stage consists in the appropriate separation of the heating agent into individual receivers (radiators, floor heating and hot utility water exchanger). Fuel is conserved as a result of precise dosage of heat to receivers so that the calculated temperature is not excessive.

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http://www.biopal.com.pl/

Leszek Wanat

WOOD MARKET SCIENCE A NEW DISCIPLINE OF ECONOMIC SCIENCES SUPPORTING KNOWLEDGE-BASED ECONOMY DEVELOPMENT

Abstract: Taking into account the need of arranging and proper organisation of the wood market in Poland, it would be necessary to consider resigning from the traditional methods of market management, which in the present situation lead only to causing conflict between the participants of the market and thereby bring about its stagnation. The accurately described and newly formulated wood market science (German: *Holzmarktlehre*), being a specialist economic discipline, could become helpful in this scope. After putting all concepts into order and applying modern economics tools, it is likely to become an innovative discipline that will actively support the development of Polish "knowledge-based economy".
Key words: wood market science; *Holzmarktlehre*; knowledge-based economy; educational process; new economic discipline.

INTRODUCTION

Scientific discussion has always been conducive to development, even if it has been accompanied by stormy exchange of ideas or a dispute. On the contrary, lack of discussion may lead to stagnation and even regression. It mainly concerns economic sciences that describe the reality, which – unlike in exact sciences – is subject to a constant change. This "reality is changing so fast that is hard to expect immediate formation of ready theoretical solutions, which would include the changes comprehensively" [1]. This tendency also incorporates a relatively new concept, which owes its popularity to the OECD report published in 1996 and the Lisbon Strategy [2]. This new concept is called "knowledge-based economy - KBE", which is supposed to replace traditional management. It seems that despite reservations expressed by some theoreticians the wood industry should be supported by its own approach to "knowledge-based economy". The exceptional need for innovation on the wood market is confirmed by its importance as regards the development of innovative undertakings concerning, for example, rational utilisation of renewable energy sources.

This article is supposed to propose introducing to the Polish system of sciences a new economic discipline, which thanks to the integration and synthesis of terms so far scattered in other disciplines offers a new approach to the totality of phenomena combining forest management with wood management, occurring during the economic process determined by the market. The said direction has already been proposed by scientific circles from German-speaking countries and is called the wood market science (German: *Holzmarktlehre*) [3]. After putting all concepts into order and applying modern economics tools, it is likely to become an innovative discipline that will actively support the development of Polish "knowledge-based economy".

FROM KNOWLEDGE-BASED ECONOMY TO THE DEVELOPMENT OF WOOD SCIENCES AND WOOD INDUSTRY

When talking about knowledge-based economy, it is worth finding out what the economy was based on before, if not on knowledge? Actually, economic growth factors included, beginning with the classic ones, soil (and natural resources), labour force and capital, through organisational know-how and educated, highly qualified manpower, to complementary depiction of the latter elements in the form of "knowledge". However, the share of knowledge in the functioning of a given economy was already present in the ancient times, but it was too little to have been considered the fundamental and most important causative factor for its development. [4] Knowledge-based economy (KBE) consists in generating practical knowledge (innovative ideas) and changing such knowledge into material or social profits and benefits. The formerly used term "new economy" turned out to be too ambiguous. Initially, it was associated with information technologies. The reason for that was connected with the statistical data used to analyse the American economy in the 90s of the previous century which indicated a productivity increase in organisations making use of information technologies to change business processes (Business Process Reengineering). Therefore, "new economy" has been changed into "e-Economy" or "Digital Economy". At present, the term "new economy" is often associated with "knowledge-based economy". OECD claims that quickly developing economy depends to an increasingly larger extent on the effective knowledge management, i.e. acquiring, generating, distributing and utilising knowledge in organisations (enterprises) [2].

In order to prevent an innovative economy from being perceived as merely a virtual being, it becomes necessary to describe it in economic categories (specification of proper measures), which would allow for e.g. making international comparisons.

Descriptions of knowledge-based economies, available in literature, are based on two major models [5]:

1) a detailed method with the application of many different types of data (even up to several hundreds rates or indices according to this approach);
2) an attempt of selecting or creating a few or one measure, within this scope alternatively:
   - generally acceptable rates are selected (e.g. GERD as percentage of GDP);
   - or rates constituting conglomerates of other rates are created, where two main trends can be distinguished:
     * OECD attempts of measuring added value generated by industries and knowledge services;
     * KBE measuring from the angle of its pillars according to the concept proposed by Dahlman and the World Bank Institute. [6]

Taking into consideration the Knowledge-Based Economy Rate, specified according to the Knowledge Assessment Methodology, Poland was ranked on the penultimate place in the group of countries that had undergone system

transformations and later joined the European Union (however, above the average value for all 21 countries after transformation and Turkey) [7].

So far, it may seem difficult to find an analogous analysis that would describe the position of the wood market in Poland as well as forest and wood management in a wider context. Poland lacks generally acceptable methods or suitable indices, and the need for such research is often questioned. Meanwhile, it has turned out that the conflict between the raw materials market (forest resources) and the production market (determined by the needs of the wood industry) is growing in Poland. Some demand interventions and expect the market to be regulated instrumentally. The role of science (unfortunately, including knowledge-based economy) and tools the economy has at its disposal are put on the sidelines. The most natural factor shaping economic relations has been and probably will always be the market. Taking that into account, it is necessary to notice the need of introducing the wood market science as a detailed discipline into economic practice. It should allow for not only putting the knowledge in this scope and its innovative application in order, but can also become an instrument that will enable the wood market participants to find an understanding, which in practice will be beneficial for the balanced development of forest and wood management in Poland.

WOOD MARKET SCIENCE AS A CHALLENGE FOR POLISH SCIENTISTS

There have been very few attempts of formulating a definition of the wood market in Poland and they have often been only fragmentary. Even if based on economic sciences, they have always referred to macro- and microeconomics, or situated the subject of research in a joint area called mezoeconomics. Nowhere in the literature can one find full support for the wood market research based on a separate and independent discipline, which the wood market science has the chance to become. Meanwhile, in German-speaking countries, especially in Germany, a concept and discipline referred to as Holzmarktlehre was worked out, which initially was supposed to support wood resources market research (according to forest management) [8]. With time, it also included forest and wood management integrally (Mantel K.). Holzmarktlehre is often unfairly associated with the science of wood commodities, sometimes with the science of wood industry commodities in connection with circulation of goods, and other sciences [3, 9]. Polish sources propose dealing with the wood market based on economic sciences more in the field of wood science economics (Ratajczak E., 2001) [12] rather than independently (Wanat L., 1992) [13]. Meanwhile, against dynamic development of not only the market "as is" but also branch markets, it seems justified and necessary to implement in the scientific workshop, on the one hand, an already known discipline (based on the Holzmarktlehre concept) as well as, on the other hand, a completely new science on the wood market [10, 11]. Not only has the scope of the term become wider, but also the very subject of research has changed.

Presumably, arranging the already existing and formulating new rules of the wood market science will be conducive to making the process of changing the traditional forest and wood management into knowledge-based economy more dynamic. Antagonists will probably say that it would be enough to increase expenses on scientific research and information technologies, and the need of introducing a completely new discipline is not justified. However, when faced with the necessity of proper knowledge management, it may turn out that the traditional methods of generating, transferring and implementing knowledge are becoming impractical, because:

- scientific research is carried out separately from the reality, is often specialist (fragmentary) and does not fulfil the real needs of an enterprise;
- the main aim of such research is precise description of the reality, but not shaping a better reality by participating in changes;
- in the traditional system of education, students learn by memorising various aspects and not by means of applying the knowledge into practice (in order to pass an exam) or solving problems;
- in organisations, the work is performed with the use of the best available technical knowledge and the aim is short-term – material profit; management is conducted through forecasting, coordinating and controlling work [2].

Everything is obviously based on the assumption that the necessary knowledge (the so-called explicit knowledge) exists. However, science is never constant; new theories and methods concerning knowledge management are created all the time. Therefore, with reference to such economically sensitive reality as in the case of the wood market, new methods should be applied, which are aimed at generating practical knowledge in the form of innovative ideas, their implementation and consequently making changes.

Summary

Taking into account the need of arranging and proper organisation of the wood market in Poland, it would be necessary to consider resigning from the traditional methods of market management, which in the present situation lead only to causing conflict between the participants of the market and thereby bring about its stagnation. The accurately described and newly formulated wood market science, being a specialist economic discipline, could become helpful in this scope. Obviously, it is necessary to work out the scope of the concept, methodology and relations with other similar disciplines, as well as propose an innovative perspective of the issues this discipline should deal with.

The role of the new discipline in the educational process (on the academic level) is not to be underestimated either. During the construction of a knowledge-based economy we should not forget about building a knowledge-based society. Currently, the two pillars seem to be a foundation for the balanced development of the branch, economy and the entire Poland. Today, creating a wood market science and conducting research in the proposed scope seem a challenge and at the same time an invitation for international scientific centres, which deal with the problems of wood market economics, to work on a common strategy. The perspective of the wood market and the space of the very market science are obviously of great interest for the author of this article; however, taking into account the need of finding common solutions and cooperating.

Departing from traditional economy and heading towards knowledge-based economy, we want to replace capital with knowledge, consider employees not a source of costs but an investment, have an effective structure which is not dependant

on degrees and levels, but on skills and qualifications. We are thinking of a participatory style of management (instead of a style based on orders), of a strategy aimed at not only competition but on cooperation, and of organisational culture based on trust – not only submission. Perhaps it will be possible to assume that constant changes are not a threat, but an opportunity for development; that it is possible to change single-direction relations with customers through the market into interactive relations based on cooperation, which in turn will cause that the market value of our innovative undertakings will not depend on merely possessing assets, but will increase thanks to the intellectual capital.

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Leszek Wanat, Wojciech Lis

PROMOTION OF BEST PRACTICES - PROJECT PROPOSAL FOR THE WOOD INDUSTRY IN POLAND.

Abstract: In various countries, the definitions of a "best practice" can differ depending on the law, particular economic and political situation, or cultural and historic difference. Measures leading to the promotion and replication of best practices, for example in the scope of municipal services management in local self-governments, have been implemented in Western Europe successfully. It seems that showing analogous innovation-stimulating actions on the Polish wood market is enough to obtain the desired effects. This article is aimed at proposing implementation of best practices in the field of energy efficiency on the wood market as tools supporting Polish projects in terms of rational generation and utilisation of energy from renewable sources.
Key words: energy innovations; renewable energy sources; best practices; wood market, database.

INTRODUCTION

Recently, best practices have become an extremely popular means of support for many innovative projects. In some circles, best practices have simply become fashionable, although the scope of this term does not seem to be clearly specified. Scientists understand it differently from business people; the same applies to governmental circles, self-government units and a Smith – they all grasp the idea in a different way. Meanwhile, the increasing importance of various supporting tools in the promotion of knowledge management needs to be noticed. It has been known for many years that creation, use and diffusion of knowledge is of utmost significance for economic growth as well as development and prosperity of communities. It particularly concerns innovative undertakings connected with the rational utilisation of renewable energy sources by various branches of the economy. This article is aimed at proposing implementation of best practices in the field of energy efficiency on the wood market as tools supporting Polish projects in terms of rational generation and utilisation of energy from renewable sources.

WHAT IS A BEST PRACTICE?

In various countries, the definitions of a "best practice" can differ depending on the law, particular economic and political situation, or cultural and historic difference [1]. Nevertheless, it is possible to propose a universal concept; but

generally, best practices are always innovative projects that have been successfully implemented within regions and municipalities. They constitute practical solutions to particular problems and have proven results.

In order to be able to consider a given undertaking a best practice, it should meet several criteria:

- fulfil the regulations of both national law and European directives,
- indicate methods and measures, which need to be undertaken by regional authorities, municipalities or energy agencies with the support of external organisations, if possible,
- be "economically realistic", which means that by means of implementing a given practice, a particular municipality or enterprise should be able to carry out such a project without special financial, time or organisational restrictions (feasibility and efficiency),
- be beneficial for the environment, i.e. characterised by energy efficiency and environment friendliness, and as a consequence, be able to be implemented in other regions, municipalities, enterprises (replication).

The actual value of best practices is determined by the ability of transferring the solutions, which have already been applied, to other municipalities, regions and – with time – even to other countries, despite the obvious limitations.[3]

What is more, having in mind energy efficiency, executing a best practice should influence:

- fuller combination of urban area development with balanced energy utilisation,
- better use of structural funds on national, regional and local levels,
- the interest expressed in a given project (practice) by various types of organisations and municipalities with the aim to include (in the largest possible extent) matters connected with energy utilisation in the planning of urban area development,
- increase of awareness in the field of balanced energy development.

FROM INNOVATION TO BEST PRACTICE

Innovation can be managed – even in a systematic manner. It is possible to argue over whether it has originated as a result of inspiration or hard work. Discipline is necessary in the approach to innovation. Peter F. Drucker, an American professor of management, claimed that the answer was somewhere in the middle. On the one hand, he proved that there was no innovation without hard work, and that it could and should be managed similarly to every other function of an enterprise. On the second hand, there is no innovation without the courage to go beyond the actual standards of actions. Managers should seek simple and concrete solutions to existing problems. The best distinction for an innovation should be as follows: "That is so obvious!" Initially, a valuable innovation seems inconspicuous, whereas the too ambitious ideas, which are supposed to revolutionise the entire industry, usually do not work out. In perspective, innovation gives rise to activeness, talent, ingenuity and knowledge. It has the actual impact on the market, but the process of creation takes a lot of time. Simultaneously, however, lack of conscientiousness, persistence and involvement of an enterprise may foreshadow a certain failure. Drucker was interested in a human being as a subject and at the same time foundation of management. Professor Drucker claimed that the matter of innovation and personal engagement of employees (project leaders), which consequently determined success, was much more important than company finances. [2]

Joseph Schumpeter in turn said that **innovation played a key role in entrepreneurship**. An innovative entrepreneur is a person who introduces innovations while looking for extraordinary profits. It does not mean copying the solutions of others, but a pioneer approach to solutions of great value for the economy. [2] He claimed that insignificant changes, which required merely no investment expenses, resulted in the biggest advantages and at the same time increased the usable values of a product and convinced larger crowds of consumers.

Innovation, according to Schumpeter, can mean:

- Launching a new product, which has not been known to the consumers so far, or introducing new quality of already existing goods.
- Introducing a new method of production, which has not been tested thoroughly in a given branch. However, the method needs to be based on a new scientific discovery. It may also concern a new method of commercial service.
- Opening a new market, i.e. a market where a given branch of manufacture has not been present yet, regardless of the fact if the market already exists or its formation has just begun.
- Appropriation of a new source of materials or semi-finished products supply, regardless of the fact whether the source has already existed or has been created for the first time.
- Establishing a new organisation of industry branches, e.g. building a monopolistic position or breaking it.

With determination, Schumpeter was creating what was new in management. The "new" is considered the driving force of the entire process of – as we assume – positive changes. [8]

The innovation desired today is somewhere between the two essentially radical approaches. The OECD methodological guide "Oslo Manual" tries a certain synthesis of the above-mentioned approaches. It describes innovation as "implementation/commercialisation of a product with improved performance characteristics such as to deliver objectively new or improved services to the consumer. A technological process innovation is the implementation/adoption of new or significantly improved production or delivery methods. It may involve changes in equipment, human resources, working methods or a combination of these." [2]

While researching innovative processes, the very measurement of enterprises' innovative activity is not the only important thing, but also their relations with the surroundings, in particular with other firms and business-environment institutions. Best practices seem to be a very good tool for innovation stimulation.

PROPOSAL FOR PROMOTION OF BEST PRACTICES ON THE WOOD MARKET

Measures leading to the promotion and replication of best practices, for example in the scope of municipal services management in local self-governments, have been implemented in Western Europe successfully. [4] It seems that showing

analogous innovation-stimulating actions on the Polish wood market is enough to obtain the desired effects. Therefore, we suggest creating a database in cooperation with scientific units, which would promote activities aimed at energy efficiency improvement. In our system, the activities would be limited to the cooperation of the wood industry with municipalities and non-governmental organisations in the scope of utilising renewable energy sources available on the wood market. [10] Still, it does not exclude further development of the database and including other branches of the economy.

The organisational and administrative framework of such a project would be typical for similar, already existing initiatives. Meanwhile, defining the so-called aggregate methodology for database creation is important in order to enable its general availability through the latest accessible technologies. [6]

The descriptions of best practices, stored in the database, should provide both entrepreneurs as well as local authorities with information on the most effective way of using structural funds and other financial resources, especially in relation to the matters connected with energy, which constitute an inseparable element of regional development.

The descriptions of best practices should be characterised by suitable quality and substantive content – they should present modern, current and effective undertakings, which are suitable for a given problem and concentrate on the most important issues. The most essential matters include, among others, energy efficiency improvement in municipal buildings, public lighting, public transport, housing development, central heating as well as utilisation of renewable energy sources, balanced development of districts, planning of urban areas development, regeneration, etc. [5] Executing best practices brings most desired effects with simultaneous support and active involvement of all the participants, especially local decision makers, municipalities, energy agencies, non-governmental organisations and individuals who are to be directly affected by the results of the actions undertaken.

DESCRIPTION AND PRESENTATION OF A BEST PRACTICE DETERMINES ITS SUCCESS DURING REPLICATION

The best practice case study

When preparing a best practice description, it is important to fulfil several conditions.

Such a description should include:

- definition of a problem in a given context,
- precise objective of an undertaking,
- justification for a given solution,
- assessment of results.

Generally, one should be aware of the fact that such a description should include all the information that the very author of an innovative project would like to make use of if they were once again faced with an analogous problem.

Before a chosen project is to be carried out in a company, region or municipality, it is first of all necessary to find out everything about a given situation and a particular problem taking into account the following:

available financial means,
required technical solutions,
legal restrictions,
time limits, etc.

The second stage is connected with the process of looking for solutions and selecting the best one. A solution can be sought in projects which have already been carried out in another region or municipality where the same problem has been resolved. When preparing descriptions of best practices, it is important to take into consideration:

a) utilisation of renewable energy sources:

- biomass
- wind energy
- geothermal energy
- solar energy
- water power plants

b) rational consumption of energy:

- balanced development of societies,
- balanced building systems, energy-saving residential buildings, thermal modernisation of buildings, modernisation of heating systems, lighting modernisation, balanced transport, as well as,

c) environment protection (air protection, waste management, water management, sewage management).

The third stage consists in assessing the results of already undertaken actions, which include costs of implementation, obtained savings, return of investment period and the environment effect. A description of best practices should include information on the institution in charge of project execution, the potential supplier of equipment and the monitoring institutions (i.e. the one responsible for the assessment and certifying the obtained savings and other results).

A description of best practices should encourage others to replicate the same actions by means of evaluating the benefits (for the environment and the economy) connected with their implementation. Therefore, it is of utmost importance to propagate and distribute such descriptions, which – under the proposed project – would take place through an Internet website (and in the future, by means of bulletins, brochures, exhibitions, seminars, workshops and conferences addressed to potential beneficiaries). [9]

Pay attention to several practical tips and guidelines:

a) Presentations of best practices (descriptions of already carried out and completed projects) can serve as templates for urban area development.

b) Examples of best practices can be used for other purposes only if a given situation is similar to the one described. Such a description can be a good example for balanced growth, utilisation of renewable energy sources or environment protection,

which may be helpful in the process of looking for an individual solution; nevertheless, usually, it must be properly adjusted to particular legal conditions as well as individual needs and expectations.
c) Descriptions from other countries or international sources can provide many useful solutions and technical details in the form of guidelines as regards balanced development of urban areas and the use of structural funds in the projects concerning city areas. However, their simple and direct replication will not be possible due to particular conditions of a given country.
d) Descriptions of best practices should include a date, otherwise, it may turn out that the presented undertaking is somewhat archaic, or a better and more modern technical solution has been discovered after its implementation. Thereby, best practices should be updated as well as examined in the whole, multi-aspect context. [7]

Examples of best practices promoting energy efficiency

A balanced approach to shaping developmental perspectives is a real challenge, because so far, Polish enterprises have not cared for the natural environment, competitiveness as well as high quality of products and services to a large extent. Wanting to propose creating a database with information on selected possibilities of generating "green energy" and concerning the wood industry, it is a good idea to start with a few examples of effective collaboration between self-governments, companies and local communities. The already implemented best practices can serve as pilot projects for the commencement and further execution of projects aimed at promotion of new, innovative measures.

Here are a few examples [11,12]:

1. Utilisation of straw as a source of thermal energy generated from biomass at a family farm in Drobak and Peter Flatl's agricultural household near Brandbu, Norway.
2. Effective application of renewable energy sources in the Norwegian region of Brandbu (production of pellets from biomass at the Grand tre sawmill).
3. The use of pellets (thickness 8 mm and 6 mm), manufactured by Statoil Trepellets from post-productive parquet floor remains, to heat households in Brandbu, Norway.
4. The wood industry and technology cluster *(Cluster Holz und Technik)* in Bolzano, Italy – cooperation and innovation between 175 small traditional family companies.
5. The construction of an 8 MW municipal boiler plant (utilisation of wooden chips) together with a heat distribution network for the town of Nowa Dęba; construction of a fuel preparation plant and implementation of plantation production of willow biomass with processed sewage sludge from the municipal sewage treatment plant used as a fertiliser.

The aforementioned examples, together with other existing initiatives, for example the "Bioenergy Cluster for the Region" operating on the territory of the Lodz Voivodship [12] or the supportive actions undertaken by the Association of Municipalities Polish Network "Energie Cités" in Cracow [11], are all aimed at generating new innovative initiatives in Polish firms and regions. So far, Poland's achievements in this field are modest, but the potential opportunities are promising.

SUMMARY

It seems obvious that promotion of best practices, which unite enterprises of the wood industry as intermediaries in the supply of components for energy-efficient companies and energy recipients, such as municipalities, companies operating on their territories and finally individual consumers, can be conducive to the revival of cooperation between these sectors. If, based on the framework presented in this article, circles connected with the economics of the wood industry worked out their own initiative of best practices as regards renewable energy utilisation in the wood sector, it would become an interesting addition to the already existing measures propagating renewable energy sources.

Even if someone made an accusation that projects of this type do not generate direct financial profits, require efficient organisation and wide cooperation, it would not be anything new. That is what happens with the majority of innovations; they cause fear of the unknown and at the same time are connected with the necessity of being actively engaged. Meanwhile, if business-oriented entrepreneurs who promote renewable energy sources do not have to be convinced, it is worth making self-government authorities aware of the positive aspects of best practices. During training sessions, presentations, meetings or other educational activities, it is necessary to convince partners that working out best practices as regards energy efficiency is connected with:

a) distinctions for activeness and innovative operations of a self-government, its authorities and selected individuals,
b) promotion of a municipality – by means of propagating creative, valuable and innovative projects as regards organisation and administration,
c) self-government's participation in the process of shaping and building a civil society through experience exchange with other self-governments, the private sector or the scientific environment (experience exchange groups).

It should be underlined that being open to a dialogue on scientific, organisational and administrative levels as well as deciding on an approach that includes life practice have always been not only conducive to the development of one's own company or municipality, but also constitute an inspiration for balanced growth of regions, countries and communities, in which we live and work everyday, and whose future we build.

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SELECTED OSCULATE TIMBER USED IN BUILDING CONSTRUCTIONS

ABSTRACT: Qualities of won design elements in research from production of wood construction definite pine timber. Work included comparison of specificity resistance and with reference to proper objective norms with taking into consideration dimension partition of semi-finished article qualitative raw material. The study of mechanical properties of the samples included the determination of elasticity of the average large-size module.
Key words:, wood, timber industry, waste

INTRODUCTION

Timber has a number of advantages unattainable with other natural materials, for example, ease of processing, high mechanical resistance at its own low density, thermal insulating power, possibility of easy waste management and, last but not least, it is a renewable and widely accessible material. Its few disadvantages, from the point of view of the construction industry, include its structural anisotropy, biodegradability and flammability. Timber mechanical and physical properties are among the principal parameters affecting suitability of timber material for its application, especially in building industry

In order to increase the level of timber raw material processing and to eliminate its defects, attempts are made to manufacture purpose-oriented elements. They are utilised both in the form of solid as well as glued elements. Attempts are being made to achieve maximal quantitative efficiency of full-value elements as the most desirable, as confirmed by numerous investigations in the field of timber quality and its suitability for further processing, for example the study by Pachelski Żytecki, Iskra (1966), Buchholz, Hruzik (1970), Cegiel, Hruzik (1974), Hruzik (1979) and co-workers.

The aim of the study was to determine physical and mechanical properties of harvested timber and glued timber assortments intended for building industry. The performed investigation made it possible to obtaining data about strength parameters and suitability of harvested sawn materials upgraded for production purposes by defect elimination and gluing.

METHODOLOGY AND RESEARCH RESULTS

A total of 138 glued, large-sized missive (pine AS,AR,GS,GR) and glue pine (glue MUF 1247/2526 – pine B, C, H, I, glue ReF 1714/2520 - pine D, J, glue EPI 0320/1993 – pine E, K) samples were prepared for purposes of this experiment. They were allocated into groups which differed regarding the applied glue and cross-section. The experimental samples were obtained using three different glues employed in the production of building glued materials.

During the performed experiments, in order to determine basic features of pine wood for purposes of experiments, such physical properties as: annual increment, proportion of late and early wood in annual increments, density (in accordance with the PN-77/D-4101 standard) as well as absolute moisture content (in accordance with the PN-77/D-4100 standard) were determined.

Fig. 1 and 2 illustrate high width variability of annual wood increments from which sample were obtained. This may have exerted some influence on the observed negative strain distribution in the course of mechanical loading and may have caused wood warping following different desorption strains in the neighbouring layers of the element. The minimal measured annual width increment in pine wood amounted to 0.16 mm, whereas the maximal one – up to 7.18 mm. Ring annual increment of wood obtained from glued pine samples was greater and ranged from 0.11 mm to 7.47 mm.

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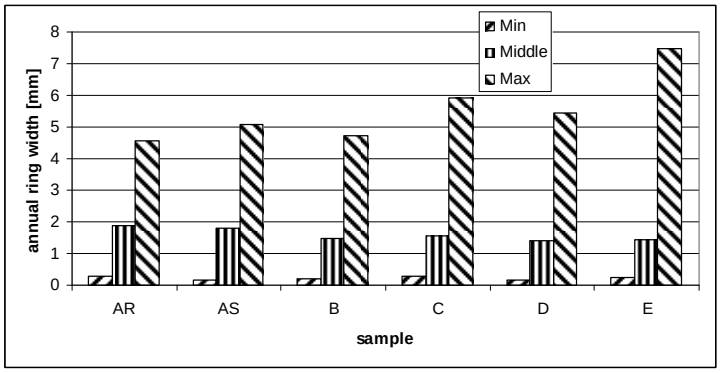

Fig. 1. Characteristic values of annual increment widths for whole samples "h120"

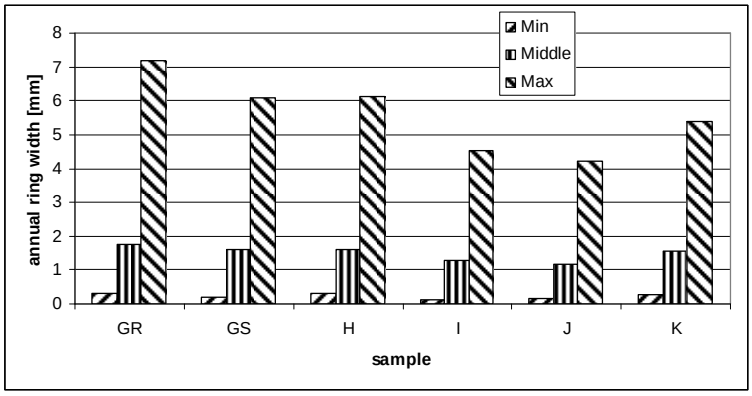

Fig. 2. Characteristic values of annual increment widths for whole samples "h150"

The obtained research results confirmed significant variations in widths of annual increments in neighbouring layers. Increment widths in relation to the layer of sample origin and averaged results of all samples from a given batch were itemised and the difference in ring distribution/graining was apparent. So, in the case of glued pine timber, the mean width of annual increments ranged from 1,47 mm to 1,55 mm in group "h120" and from 1,17 mm to 1,61 mm in group "h150". For massive timber, the above intervals ranged from 1,61 mm to 1,86 mm in group.

The proportion of late wood in the timber of coniferous species was found to influence timber mechanical properties. The mean late wood proportion in group "h120" in solid pine wood samples amounted to 38%, in glued pine wood – 31% and in glued spruce – 27%. In the case of group "h150", the mean share of late wood in solid pine wood samples amounted to 29%, in glued pine wood – 28%.

The obtained results confirmed mean proportions of late wood in pine timber intended for gluing at the level of 30%, in solid pine wood – at 33%.

The results of absolute moisture content investigations of large-sized timber samples revealed that the differences between adjacent batten layers in samples did not exceed 3.5%, so they fell within the acceptable interval of 5%.

Density is one of the basic factors determining timber mechanical strength. The results obtained in the course of the performed experiments revealed that the material obtained from glued pine timber was characterised by the density of 520 kg/m3, while that of glued spruce timber – reached mean density of 490 kg/m3, so it was the lightest of all of the examined materials. Density differences between adjacent layers of glued timber can have a negative impact on glue bonds strength during mechanical loadings. Structural heterogeneity results in differences in the tension and compression of consecutive layers causing additional shearing strains in glue bonds. Layers of glued pine samples were characterised by densities in the range of 480 kg/m3 to 570 kg/m3, while spruce glued samples were characterised by densities in the range of 460 kg/m3 to 530 kg/m3. When interpreting density results in relation to the position of the examined samples in the large-sized sample it can be concluded that the timber material used to manufacture glued elements did not have similar physical properties.

It can be concluded from the research results on large-sized timber samples that timber gluing reduced the spread of the elasticity modulus. Investigations of large-sized glued timber samples were characterised by mean coefficient of variability of 6.5%, whereas the variability coefficient of solid timber samples reached 20.6%, so it was three times higher. The comparison of pine timber glued samples showed that their mean variability coefficient amounted to 7.9%.

In addition, when large-sized timber samples were bent, the elasticity modulus (Figure 3.)decreased with the increase of sample cross section. The obtained mean values for solid timber were found to be at the level of 9 600 N/mm2. When the above values were compared with the results given by Krzysik (1974) E=12 000 N/mm2, it was found that the elasticity modulus of the examined solid wood was 27% lower. Glued pine samples exhibited smaller spread of results than solid samples but even so they were 20% lower than literature data.

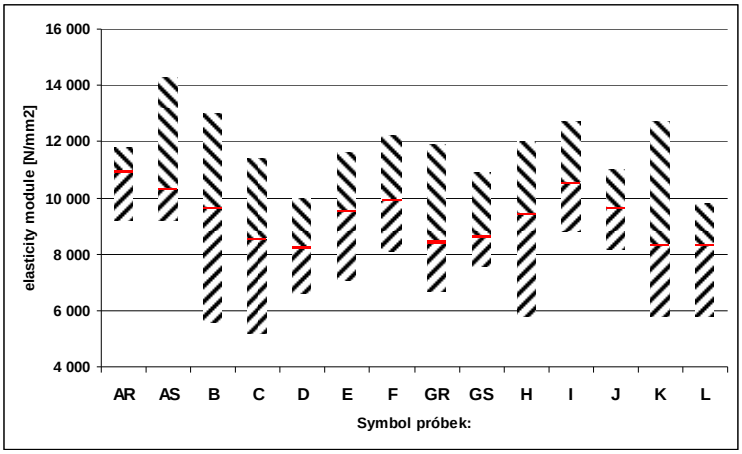

Figure 3. Characteristic values of the modulus of elasticity at 12% moisture content

In addition, the elastic modulus in the course of bending of large-sized samples decreased together with the increase of the sample cross section. Mean values for pine glued samples reached 9 600 N/mm^2 and those for spruce samples - 10 200 N/mm^2.

RECAPITULATION

The following conclusions were drawn on the basis of the performed investigations and measurements and the obtained results:

1. Large-sized, solid, pithless samples reached values of the elasticity modulus which were, on average, by 1350 N/mm^2 higher than samples containing the pith, in other words they were characterised by 17% better parameters than pith-containing wood. On average, pith-containing samples were by 26 kg/m^3 lighter in comparison with samples which did not contain a pith on their cross section.
2. Basic physical properties for the examined raw material were determined. Mean ring annual increment of solid pine elements was found to be at the level of 1.8 mm, of pine glued elements – 1.5 mm. The examined raw material was narrow-ringed. The mean proportion of late wood in pine wood amounted to 30% and in spruce wood – to 25%. Mean absolute moisture content at the time of measurement was 10%. Mean timber density of solid pine samples was determined at 550 kg/m^3, glued pine samples – at 520 kg/m^3. The obtained mean results were similar to those found in literature on the subject.
3. The elastic modulus of the examined large-sized samples was as follows: solid pine samples – 8 800 N/mm^2, glued pine samples – 9 600 N/mm^2. The above results were lower than literature data by: 27% in the case of solid pine samples, 20% - for glued pine samples, respectively.

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Anna Zaušková[76]

INNOVATION PROCESS AUDIT IN SMALL AND MEDIUM ENTERPRISES

Abstract: Innovation process creates new possibilities based on the combination of various groups of knowledge. Innovation process may be fully realized only in healthy and functional economy. Even though, the economy crisis and its negative impacts on the companies should start their innovation activities. One of the actual problems of small and medium enterprises is the measuring of effectiveness of the innovation process. In this article I deal with the establishment of appropriate tool for innovation process evaluation proceeded in small and medium enterprises by audits.
Key words: innovation process, innovation, measurement of innovation process efficiency, innovation process audit, small and medium enterprises.

INTRODUCTION

Innovation process generally gains more global character and its importance raise on all governance levels – national, regional, intra-plant. Politics of each country start to consider the position of business innovation activities support and creating the innovation environment keeping the sustainable grow of its competitiveness as the key position within plans and actions of the country. Innovation activities are successful especially in countries that are able to manage them effectively.

Innovation processes are generally considered as the key of economic and social development. Innovations are the important factor of business units grow, they are source of extra value for the customer and extra profit for the businessman. Innovations as the competitiveness pillar on one hand and as the result of creative intellectual processing of information, knowledge and skills on the other hand become the instrument of further society development which further influences the elements of innovation process and innovation management processes.

PROPOSAL OF INNOVATION PROCESS AUDIT IN SMALL MEDIUM ENTERPRISES

In order to define defects and to specify right tools to improve the company innovation process is necessary at first to realize innovation process audit. Goal of the first phase of project VEGA 1/0496/09: "Integrated model of innovation management audit aimed on evaluation and measurement if innovation and marketing processes of Slovak small and medium businesses efficiency" that has been solved on Department of Marketing, Trade and World Forestry, Faculty of Wood Science and Technology, Technical University in Zvolen, is to define and develop the proposal of innovation process audit for small and medium enterprises. Audit proposal fully respects the universality of its use for the business of each industry and their focus of activity, is aimed on the processes and business sources which are related with the innovations in business. The proposal is based on the method of selected measurable criteria but in order to keep the complexity of the evaluation even immeasurable criteria.

We can agree on the allegation that the innovation process exist in each organization, company or enterprise. If we want to develop and manage this process, we need to find the answer to the following question: *"How large it is and by what is his dimension conditioned?"* We can expect that the results of measuring can help us not only to reveal the weaknesses of existing innovation process but also to predict the innovation activity of employees. Let's try to define the basic. Four basic innovation fields which include the innovation process in company can be generally characterized for the reason of definition of measurement efficiency of innovation process methods. We are talking about product innovation, process innovation, organization and marketing innovation.

The measuring methods by itself define the fields or indicators that can be divided in measurable and immeasurable where both are important by the state of business innovation process evaluation.

PROPOSAL OF AUDIT CRITERIA ACCORDING TO THE INNOVATION PROCESS PHASE

By the proposal of innovation process audit we can start from particular phases of innovation process where audit will be aimed on each phase separately with defined measurable and immeasurable criteria.

Phases of the innovation process are following:

- Phase of invention creation,
- Phase of innovation creation,
- Phase of innovation diffusion (penetration) – see Scheme No.1.

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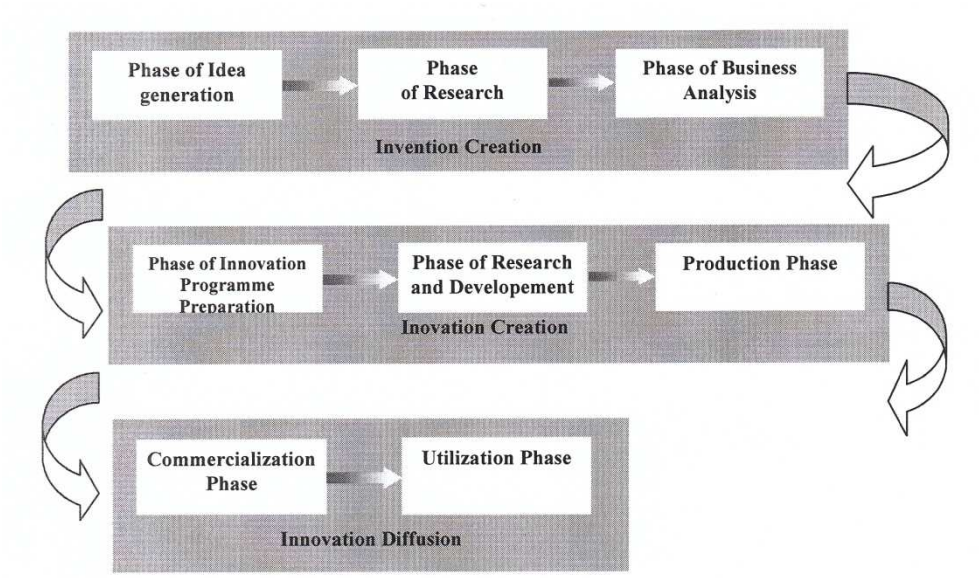

Scheme 1. Innovation process

Source: Zaušková,A., Loučanová, E., Inovačný manažment (2008)

Phase of invention creation represents the criteria which are connected with ideas sources, internal or external sources. The criteria in this phase are aimed on employees potential evaluation whose are mostly the source of invention (ideas) and improvements. So that this source would be able to generate valuable ideas, education and qualification is its condition. By creation of appropriate conditions will raise the motivation of this source to generate inventions. If there is not any human potential in the company that would be able to do this activity, company rely on the external sources – as scientific, professional and teaching institutions, cooperation with suppliers and partners, competition analysis and analysis of customer demands. In order to reach synergy effect it is optimal to combine all of the mentioned sources, where support of all participants is expected.

Phase of innovation creation represents mostly the expenses related with the tool investment which are the final tool to reach the innovation activity or the source of innovation by itself. We are talking about the research and development expenses in particular. If the company does not realize it, it is usually provided from the external sources as the machines and appliances, external know-how, software and so on. It is necessary to understand this phase of innovation process from the wider point of view and that is the reason why the proposal of audit criteria contains the measurement criteria from each field and activity that the company or business realizes. That is the only reason how can the innovation process be evaluated as the complete process without the result deformation that could happen if we chose and aimed on several fields only. This phase includes the criteria from technologies field, organization, planning, products, marketing, investments and research.

Phase of innovation of diffusion presents the final phase of the innovation process in a company. Through applying of the innovation activities in all areas of the company we can expect medium to long-term effect which is characterized by measurable criteria, such as sales from new products, geographic markets, market segments, new sales created by innovation activity, increase of new customers and so on. By evaluation of these sales we get a real feedback, which will give us information about the efficiency of individual actions and innovation activities. Other indirect indicators of successful implementation of innovation activities may be, for example not measurable indicators of the type of shortening the reaction time to customer requirements, reduction of the number of complaints, the overall increase of the product level, increase of market share and so on. We can assume that the mentioned effects of innovation activities realization will not be recorded in the same accounting period as costs invested for their implementation.

In connection with the identified phases of the innovation process, it is possible to characterize basic indicators which directly or indirectly point at the performance of innovation process in the company in determined phases.

Table 1 presents division of innovation process phases and indicators belonging to them. Measurable indicators are there identified as M and not measurable criteria as N.

Table 1. The phases of the innovation process and performance measurement indicators

Phase of innovation process	Indicator	Measurability of innovation process
Invention creation A	A1 Employees with university degree education / employees (%)	M
	A2 Costs of qualification increase / sales (%)	M
	A3 Total number of training days / employees	M
	A4 Direct / indirect employees (%)	M
	A5 Acquisition of external know-how / sales (%)	M
	A6 Workforce quality	N
	A7 Employees motivation and satisfaction supporting invention creation	N
	A8 Evaluation of status and quality of partnerships	N
	A9 Realization of competition analysis	N
	A10Level of cooperation with the surroundings - suppliers, partners, customers	N
	A11 Level of cooperation with scientific research organizations	N
	A12 Cooperation agreements in the area of innovation (institutions, state, schools)	N
	A13 New technologies monitoring, analysis of their using in a company	N
	A14 Existence of a innovation projects portfolio	N
	A15 Planning of invention and innovation resources	N
Innovation creation B	B1 Costs of research and development / sales (%)	M
	B2 Machinery and equipment provison / sales (%)	M
	B3 Investments / sales (%)	M
	B4 Expenses on preparatory phase of production and launching on the market / sales (%)	M
	B5 Realization of research and development results in the practice	N
	B6 New product technological degree	N
	B7 Competitiveness of a new product (price- costs- quality)	N
	B8 Introduction of innovation for the field of business	N
	B9 Reducing of the product development cycle	N
	B10 Period of launching a new product on the market	N
	B11 Level of information technology utilization in all processes	N
	B12 Change of organization and principles of corporate governance	N
	B13 Production flexibility (adaption of production to market requirements)	N
	B14 Planning changes of used technologies	N
Innovation diffusion C	C1 Sales from new products / sales (%)	M
	C2 Sales from patented products / sales (%)	M
	C3 Return on capital used in production (%)	M
	C4 Value of refused supplies / production consumption (%)	M
	C5 Marketing costs / sales (%)	M
	C6 Sales of new geographical markets / sales (%)	M
	C7 New market segments sales / sales (%)	M
	C8 Total new sales / sales (%)	M
	C9 Value of the claimed products / sales (%)	M
	C10 New customers / total number of customers (%)	M
	C11 Increasing of product quality levels (ISO certificates)	N
	C12 Customer requirements reaction time	N
	C13 Market share	N

CONCLUSION

The actual audit of the innovation process will be implemented through an evaluation questionnaire, which will include individual evaluation criteria grouped according to stages of the innovation process. Therefore it is divided into three main parts where each part will include questions related to the measurable and not measurable criteria.

Regarding the defined indicators a questionnaire will be drawn up for the company which will aim to determine the status of its innovation process. To obtain relevant and comprehensive results, both the general issues associated with the company and its characteristic and measurable and not measurable indicators will be included in the questionnaire. General information and measurable indicators will be completed by selecting one of the options offered for their self-evaluation

Not measurable indicators will be questioned by statements, which are assigned a number according to significance (1 to 5) that best describes the situation in the company.

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ENVIRONMENTAL BENCHMARKING AND BENEFIT OF PERFORMANCE BENCHMARKING

Abstract: In the long term, there are no alternatives to an environmentally compatible mode of production and consumption. Global warming, the loss (depletion) of stratospheric ozone and tropical forests, marine pollution and soil erosion, world-wide air pollution and the world-wide loss of biodiversity can no longer be denied. Only if every individual adapts his or her activities to the limits of our environment, can the targets presented here be achieved. In the debate on consumption patterns in industrialized societies it is assumed that at least 30 to 40 percent of all environmental problems can be traced back directly or indirectly to current consumer behaviors and one of many tools to eliminate this problem is also benchmarking.
Benchmarking is a process where companies compare their performance over time against their competition. You'll find there are areas where you are better than most. You'll also see areas where significant improvement is available.
Key words: benchmarking, benefit, performance benchmarking

INTRODUCTION:

The point of benchmarking is to focus your efforts where you can get the best return. You want the most improvement with the least investment. The goal of benchmarking is basically to learn from others best practice. It has to be noted that, especially concerning environmental issues, costs and benefits cannot always be expressed in quantitative terms. Also, benefit like the creation of network and partnership are difficult to quantify. These qualitative aspects have to be taken into consideration when assessing the usefulness of benchmarking study in the environmental field. The scope of environmental benchmarking needs to encompass all areas of an organization's activity.

1 ENVIRONMENTAL BENCHMARKING FOR LOCAL AUTHORITIES

The reasons for benchmarking in local authorities are basically the same as for private companies. The responsibilities for environmental protection and providing environmental services are increasing, and so are the costs related to them. Communities want to improve the quality of their services, and they have to do it in a cost-efficient way. With general cost pressure, the public sector is increasingly adapting practices used in the private sector, and concepts like 'new public management' (NPM) (37) are gaining importance in public services. Local authorities have to increase transparency — towards the government as well as towards the public — about how they are using the taxpayers' money. This also applies to environmental responsibilities. The public wants a healthy environment; however, it still has to be affordable and traded off against other needs. This means that local authorities have to learn how to identify and improve areas of insufficient performance. Often, municipalities use legal standards as benchmarks concerning environmental quality, and therefore set their goals according to these standards (e.g. environmental quality standards, emission limits). However, especially concerning costs of environmental protection or the citizens' satisfaction concerning environmental services, due to lack of comparison municipalities often do not know how well or how badly they are really performing and at what level they should set their goals. Comparisons with other cities and towns can in this sense help them to find out where they stand and where the performance gaps are. Environmental friendliness is also increasingly used as a marketing argument for cities in order to be more attractive for tourism or business. Such competition between communities provides further incentives to measure their environmental performance and to compare themselves with other communities.

Even if a local authority knows where it is not performing well, it might not have enough resources to develop own tools or own technologies, which can lead to the envisioned improvement. Certain processes are chronically performing badly and the involved persons might run out of good ideas on how to improve them. The core idea of benchmarking is to learn from others' best practices. It can prevent trying to reinvent the wheel by simply looking at how others do it. Best or good practice databases on sustainable urban management are increasingly built up with the aim of exchanging ideas and practices, and they can support benchmarking efforts. Environmental issues and ways for improvement should not be tackled in an isolated way. Improvements in the environmental dimension have to be compatible with financial constraints and social issues. This report takes this into consideration, focusing on areas and processes, which concern environmental responsibilities of local authorities.

2 WHAT CAN BE BENCHMARKED

It has to be clear what has to be benchmarked and what should be the expected outcome. Overall, it can be said that the idea is to find out how other communities manage to be 'eco-efficient', meaning how they manage to get a required degree of environmental protection and citizen satisfaction with the lowest use of financial resources. Local authorities have many responsibilities that are environmentally relevant. Depending on the size and the structure of the community, these responsibilities are carried out by a separate department or

integrated into another department. The following list provides an overview of some of the main responsibilities.

- ✓ Procurement (in-house ecology, procurement for public buildings, etc.)
- ✓ Urban and spatial planning
- ✓ Traffic policy (public transport, traffic reduction measures, road safety, etc.)
- ✓ Construction

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- ✓ Maintenance of green areas and biodiversity
- ✓ Energy management (energy planning, building design, standards in insulation, heating efficiency, etc.)
- ✓ Noise abatement
- ✓ Water management (providing drinking water, protection of water, wastewater treatment, etc.)
- ✓ Air (emission control, enforcement, etc.)
- ✓ Soil protection (identification and remediation of contaminated sites, protection from erosion, acidification, etc.)
- ✓ Waste management (education of public, waste collection, reuse, recycling, proper disposal, etc.)

Different aspects concerning these areas can be the focus of a benchmarking effort:

– state of the environment (environmental quality, e.g. air quality, soil quality);
– resource management (e.g. water saving, waste reduction);
– costs of environmental protection (e.g. waste management costs, soil remediation costs);
– quality of provided environmental service, measured in customer satisfaction. The customers are in this case, the citizens and the businesses/organizations located in the area (driver might be increased or chronic complaints);
– efficiency and effectiveness of enforcement (driver for improvement might be high costs, low customer satisfaction, or insufficient environmental performance of enforced processes);
– monitoring and performance measurement methods;
– environmental management systems;
– policies for influencing the drivers of pollution.

Benchmarking can be performed for a very specific process, or it can be on a higher level and relate more to organizational issues or policies. Deciding what to benchmark does not necessarily pre-define the purpose of the project. The goal of the improvement might concern the actual quality of the state of the environment in one case, whereas in another case the focus could be on environmental costs or the satisfaction of the citizen's with environmental services. The public's needs and opinions should in any case be taken into consideration when deciding on which processes to improve and benchmark. After all, the citizens' notion of environmental quality and the willingness to pay for it might differ very much from one city or region to another. Which one is the most appropriate depends on the objectives of the benchmarking and the chosen area. The different types of benchmarking require different tools and yield different benefits.

The type of benchmarking used and the objectives of the benchmarking will influence the criteria for choosing benchmarking partners. Factors that might influence the criteria for choosing partners for environmental benchmarking at local level are as follows.

• *Demonstrated performance.* The benchmarking partner should have a good or 'best' performance in the area that is planned to be benchmarked.

• *Geographic location.* The location of a partner, the climate and the geographical features might weigh heavily on selection criteria, especially in the environmental field.

• *Organizational structure.* The allocation of environmental responsibilities can differ very much between local authorities of different countries, which does not always allow comparability.

• *Type of government.* In some cases, it may be important that a partner represent a particular form of government. Differences in legislation can constrain comparability and adaptability considerably. A best practice that is applied in one city might not be applicable in another city because the competencies are distributed in a completely different way.

• *Size of partner community or organization.* Certain environmental problems or the design of policies might be very much tied to the size of the community.

• *Work processes*. The simplest benchmarking project is one that directly compares a particular function or process to virtually the same process or function in another organization. The more experienced and proficient an organization becomes at importing best practices, the better able it is to search for partners that are less similar to it self. A city could also find benchmarking partners for certain processes in the private industry.

• Performance measures. A community may prefer to select all partners from a common database in order to have a guarantee of data availability and better comparability

3 BENEFITS OF PERFORMANCE BENCHMARKING

Performance benchmarking is a good tool to find out where you stand, whether you are 'doing it right', and which the areas that need improvement are. It provides the basis for benchmarking that should go further and into more detail, like process benchmarking. Comparing performance measures against own benchmarks (e.g. goals, legal limits) within an environmental management system or the total quality environmental management system of a community is absolutely necessary in order to know the progress over time and the effectiveness of implemented policies and measures in order to reach certain goals. In fact, it is simply environmental performance measurement and control. However, performance measurement and control are a prerequisite for any benchmarking activity. The advantages of internal performance benchmarking are that it is often easier to define comparable activities, data and information are easily accessible, and often on a standard format. Internal performance benchmarking between different departments of a community, for example concerning energy use or time used for issuing permits, can be a very good tool to stimulate competition between different departments. No department likes to be the worst performer and will therefore strive for improvement. Internal data benchmarking can also help to show where within the community there might be good practices, and where the others could learn.

Performance or data benchmarking is a good diagnostic tool; however, it does not necessarily guarantee further action and improvement. A city can recognize an area of insufficient performance based on performance benchmarking. However,

the pure comparison of figures and indicators might not help any further, as it does not tell anything about the 'why' of the performance gap and about the 'how to improve'.

Performance benchmarking against other municipalities can be focused on certain areas of performance, or concern a whole system of environmental or sustainability indicators (e.g. the newly established European common indicators). Examples of compared performance figures could be concentration of air pollutants, costs of waste management, or percentage of green areas. Performance data concerning certain processes or services could also be compared with organizations other than municipalities performing the same process or service. For example, paper use and waste production within the city administration could also be compared with paper use and waste production of a bank or another service organization. Information for performing data benchmarking could be gathered from local or national statistics, environmental reports and other publications concerning environmental issues by communities or regions, personal contacts, or exchanges within networks. Increasingly, it also exists in regional or national databases with information about the performance of local services, which also contain data about certain environmental services such as waste management or wastewater treatment

Internal performance benchmarking

Within their own environmental or quality management, communities are increasingly measuring their performance concerning environmental issues in order to analyze progress over time, to compare with the set goals, or to compare performance of different departments within the community. Data have also been gathered more systematically as communities started to do environmental reporting. Data and information are collected and communicated concerning the state of the environment, the emissions into the environment, the costs of environmental protection, or the satisfaction of the citizens with environmental services. As mentioned above, the use of indicators is increasing. A limited set of indicators can simplify the analysis, and they may also be easier to communicate to decision-makers and the general public.

CONCLUSION

If properly implemented, benchmarking can lead to dramatic improvements in an organization's processes. However, there are several pitfalls that can undermine the efforts and turn benchmarking into an expensive process, which does not yield the benefits, expected .The following points is important to consider for a successful benchmarking exercise, especially in the case of process benchmarking. *Benchmarking efforts should be tied to anorganisation's strategic objectives*. It is critical to follow the dictates of integration and consistency, so that the processes and systems selected for benchmarking are the most important ones for achieving the organization's strategic intent with regard to the environment. *Setting out to benchmark a process requires the organization to carefully scrutinize its own process (es) prior to talking to any other organization.* Often, once an organization has committed to benchmarking a process, the eager team immediately wants to get on an airplane and benchmark another organization. This is called 'professional visiting'. The team will have a nice visit, but most likely they will not be asked back, no long-term contacts will be established, and it is unlikely that any serious information exchange will take place.

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PROF. DR HAB. WACŁAW PYTKOWSKI (1904 – 1989). UCZONY I NAUCZYCIEL

Życie i twórczość naukowa Profesora Wacława Pytkowskiego przypadały na bardzo ważne okresy w dziejach Rzeczypospolitej oraz rozwoju nauki.

Prof. dr hab. Wacław Pytkowski – herbu „Nowina" urodził się 2 lipca 1904 roku w miejscowości Lubiczyn w powiecie włodawskim na Lubelszczyźnie. Gimnazjum państwowe ukończył w Siedlcach. W wieku 16 lat, jako ochotnik brał udział w wojnie polsko – bolszewickiej 1920 roku. Z pola walki powrócił odznaczony Krzyżem Walecznych [5]. Następnie podjął studia uniwersyteckie w zakresie matematyki, specjalizując się w statystyce oraz studia rolnicze ze specjalizacją Ekonomiki i Organizacji Gospodarstw u prof. Stefana Moszczeńskiego. Studia rolnicze w Szkole Głównej Gospodarstwa Wiejskiego ukończył z odznaczeniem w roku 1926. W tym też roku rozpoczyna pracę naukową na etacie asystenta w Zakładzie Statystyki Matematycznej, usytuowanym na Wydziale Ogrodniczym SGGW. Zakładem kierował wówczas profesor Jerzy Spława – Neyman, światowej sławy uczony, późniejszy profesor w Uniwersytetach Cambridge i Berkeley.

Okres pracy naukowej w Zakładzie Statystyki Matematycznej był wysoce owocny. Profesor W. Pytkowski okazał się utalentowanym i twórczym współpracownikiem Prof. Jerzego Spławy–Neymana [3]. Prof. W. Pytkowskiego uznaje się za autora rachunku korelacji w rolnictwie, wokół którego stworzył całą teorię, wprowadzając do statystyki szereg pojęć, między innymi: korelacji złudnej, przedziałów ufności, teorii hipotez statystycznych, teorii rekonstrukcji i inne.

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Do końca życia prof. W. Pytkowski wielokrotnie przywoływał okoliczności współpracy z prof. J. Neymanem: liczne spotkania, wspólne dyskusje a także wspólne osiągnięcia na polu statystyki. W 1994 roku, w 100 rocznicę urodzin prof. Jerzego Spławy – Neymana odbyła się międzynarodowa konferencja w Jachrance k. Warszawy. W czasie tej konferencji prof. Witold Klonecki – matematyk z Politechniki Wrocławskiej – wygłosił referat zamieszczony w „Probability Mathematical Statistic" vol. 15 (1995) p. 7–14 [2]. Na str. 10 prof. W. Klimecki pisze, że prof. Jerzy Neyman spośród swoich uczniów cenił najwyżej Stanisława Kołodziejczyka oraz Wacława Pytkowskiego, który pierwszy zadał pytanie jak uprawdopodobnić precyzję oszacowania współczynnika regresji, co doprowadziło prof. Jerzego Neymana do zbudowania teorii ufności.

Znajomość statystyki przez prof. W. Pytkowskiego, którą można określić jako ponadprzeciętną a wyniesioną z okresu studiów matematycznych jak i współpracy z prof. Jerzym Spławą – Naymanem będzie często obecna w dorobku naukowym Profesora. Będzie robił duży użytek z tej wiedzy, kiedy w latach pięćdziesiątych i sześćdziesiątych XX w. w okresie szczelnej izolacji od nauki światowej, zaczną się prace nad wykorzystaniem statystyki w rolnictwie, a z racji zainteresowań Profesora w ekonomice rolnictwa. Profesora W. Pytkowskiego można bez przesady uznać ze prekursora agroekonometrii. Swoją wiedzą na temat ekonometrii dzielił się nie tylko z nami asystentami ale także wniósł istotny wkład konsultacyjny do cenionego podręcznika „Statystyka matematyczna w zastosowaniu do doświadczalnictwa rolniczego" autorstwa prof. Reginy Elandt.

Okres od ukończenia studiów w 1926 roku do wybuchu II wojny światowej to nie tylko współpraca z prof. Jerzym Spławą – Neymanem, ale także, a może przede wszystkim współpraca z ogromnym autorytetem naukowym, jakim był profesor Stefan Moszczeński – uznawanym za twórcę polskiej szkoły analitycznej posługującej się rachunkowością rolniczą i analityczną. Profesor Stefan Moszczeński dostrzegł w młodym wówczas asystencie zainteresowanie statystyką i duży potencjał intelektualny. Pracę dyplomową prof. Wacław Pytkowski napisał pod kierunkiem Prof. S. Moszczeńskiego na temat: „Zastosowanie korelacji cząstkowej do badań nad wpływem niektórych czynników na dochód surowy w gospodarstwach drobnych". [79] W pracy tej po raz pierwszy zastosowano rachunek korelacji w rolnictwie, wokół którego w późniejszym czasie stworzył całą teorię wprowadzając do swoich rozważań szereg pojęć obecnych do dzisiaj w statystyce.

Od X.1932 do X.1939 roku podejmuje pracę asystenta w Zakładzie Ekonomiki i Organizacji Gospodarstw SGGW, którym kieruje prof. Stefan Moszczeński [7]. Jednocześnie zostaje zatrudniony w Puławskim Instytucie Naukowym Gospodarstwa Wiejskiego na Wydziale Ekonomiki Gospodarstw Chłopskich. W roku 1933 przechodzi Profesor do pracy w Wołyńskiej Izbie Rolniczej z siedzibą w Łucku, gdzie kolejno pracuje na stanowisku Naczelnika Wydziału Ekonomicznego i zastępcy dyrektora. W 1935 roku prof. Wacław Pytkowski zostaje dyrektorem Izby, pełniąc tę funkcje aż do wybuchu II wojny światowej. Jako dyrektor Izby zebrał wokół siebie liczny zespół młodych, ambitnych inżynierów rolników różnych specjalności, z którymi pracował nad podniesieniem kultury rolnej i uprzemysłowieniem tego zaniedbanego regionu Polski.

Bogatą kartę w życiu Profesora zapisały lata 1939 - 1945. W tym okresie Profesor W. Pytkowski przebywa na ziemi kieleckiej u podnóża Gór Świętokrzyskich. Jest rolnikiem, gospodaruje w majątku rodzinnym Żony.

Od początku okupacji jest zaangażowany w pracę konspiracyjną w szeregach Armii Krajowej. Należy organizacyjnie do zgrupowania "Ponurego" – legendarnego dowódcy partyzanckiego. Organizuje zaopatrzenie oddziałów, zabezpiecza nasłuch radiowy, współpracuje ściśle z Witoldem Maringem w ramach akcji pod kryptonimem" U prawa", która przygotowywała ludzi do przyszłej administracji państwowej. Wówczas prof. Wacław Pytkowski przewidziany był na objęcie stanowiska pełnomocnika d.s. rolnych w Prusach Wschodnich.

Po zakończeniu działań wojennych, wysiedlony z majątku rodzinnego, przenosi się do Warszawy i podejmuje pracę na stanowisku kierownika w Państwowym Instytucie Naukowym Gospodarstwa Wiejskiego (PINGW - rolniczy instytut naukowy działający w Puławach w latach 1917-1950). W latach 1945 – 1950 był W. Pytkowski profesorem kontraktowym w Zakładzie Statystyki SGGW i równocześnie kieruje Działem Rachunkowości Rolnej na Wydziale Ekonomiki Drobnych Gospodarstw Wiejskich PINGW w Puławach z siedzibą w Warszawie (od czerwca 1945 roku do marca 1950 roku) [8,9]. W tym czasie Prof. W. Pytkowski przedstawia poważne opracowanie naukowe „Badania nad położeniem podczas wojny gospodarstw chłopskich".

Rok 1950 był szczególny w życiu Profesora W. Pytkowskiego. Zostaje zwolniony z pracy w Instytucie Puławskim, a także przerywa się Jego praca w SGGW na skutek osadzenia w więzieniu. Spotyka tam, w jednej celi, Profesora Wiktora Schramma. W tych niecodziennych okolicznościach, bo dodajmy, że Panowie bardzo dobrze się znali, bowiem Profesor W. Schramm był promotorem pracy doktorskiej Profesora W. Pytkowskiego w 1948 roku, przedstawionej i obronionej na Wydziale Rolniczo–Leśnym Uniwersytetu Poznańskiego. Panowie Profesorowie oskarżeni o zdradę państwa i działalność przeciw ustrojowi, wobec braku dowodów winy, wychodzą na wolność w 1952 roku.

Profesor W. Pytkowski, po wyjściu na wolność, do roku 1956, otrzymywał prace zlecone z Instytutu Matematycznego PAN, Państwowego Instytutu Melioracyjnego oraz Polskiego Komitetu Normalizacyjnego. Po „październiku 1956" został reaktywowany na SGGW. Od 1958 roku do 1974 roku pracował na Wydziale Rolniczym WSR- AR w Poznaniu [6].

Przewód habilitacyjny ukończył na Wydziale Rolniczym WSR w Poznaniu w 1957 roku uzyskując stopień doktora nauk. W roku 1958 został powołany na etat docenta i zastępcę Kierownika Katedry Ekonomiki i Organizacji Rolnictwa. W roku 1960 został kierownikiem tejże Katedry, którą kierował przez 12 lat. W roku 1972 Rada Państwa nadała Mu tytuł profesora nadzwyczajnego. W roku 1974 przeszedł na emeryturę. Zmarł 4.VII.1989 roku w Warszawie.

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[79] Praca ta jest odnotowana jako pionierska w zakresie rachunku korelacji i regresji w księgozbiorze naukowym Anglii. Stwierdzono to z autopsji w czasie wizyty naukowej na Uniwersytecie Newcastle w roku 1996 a także, potwierdza to prof. dr hab. dr h. c. Tadeusz Caliński, który korzystał z w.w. księgozbioru.

Przedwojenny dynamiczny i bardzo jak na owe czasy modny rozwój szkoły ekonomicznej prof. Moszczeńskiego, zgromadził m.in. takie postaci, jak Ponikowski, Paszkiewiczowa, Antoniewski, Czerniewska i Czerniewski, Manteuffel i Dłużewski. Do grona tego należał również prof. Wacław Pytkowski.

Wpływ myśli ekonomicznej prof. Moszczenskiego na dalszą działalność naukową prof. Wacława Pytkowskiego był znaczny. Dowodem tego może być swego rodzaju credo naukowe prof. Wacława Pytkowskiego wyrażone we wstępie do fundamentalnego dzieła prof. Moszczeńskiego *Rachunkowość gospodarstw wiejskich* (1946):

„Wielkie i płodne myśli naukowe iść mogą trzema torami:

1) nowe odkrycia naukowe,
2) usystematyzowanie przedmiotu i nadanie mu formy dyscypliny naukowej,
3) wprzęgnięcie do współpracy osiągnięć innych dziedzin wiedzy".

We wstępie tym mowa jest również o roli i znaczeniu matematyki w badaniach naukowych. Tezę swą Pytkowski uzasadnia argumentem Galtona, że „nauka prawdziwa zaczyna się tam, gdzie zaczynają się liczby i gdzie fakty dadzą się scharakteryzować formułą matematyczną".

Zasadę tę prof. Pytkowski wyznawał przez całe swoje życie. Był jednak zwolennikiem myślenia abstrakcyjnego, dedukcyjnego. Badania ścisłe były Mu niezbędne jedynie do weryfikacji swoich tez. Dlatego też był nieubłaganym przeciwnikiem bezmyślnych często badań empirycznych bez dostatecznego poznania teorii i przemyślanej metodyki.

Można więc stwierdzić, że podstawy metodologiczne myślenia i działania ekonomicznego prof. Pytkowski zawdzięczał swoim dwóm pierwszym mistrzom, tj. prof. Spławie–Neumannowi, a przede wszystkim wspomnianemu już prof. Stefanowi Moszczeńskiemu.

Niespodziewana śmierć prof. Stefana Moszczeńskiego wywołała w środowisku naukowym Warszawy i całej Polski wielką i niepowetowaną stratę (zmarł 10 lipca 1946r. w Żelaznej J.). Istniejące grono młodych pracowników naukowych było w trakcie realizacji swoich prac doktorskich i habilitacyjnych. W tej trudnej sytuacji pomocną rękę wyciągnął prof. Wiktor Schramm, założyciel i kierownik Katedry Ekonomii Rolniczej na Wydziale Rolniczo-Leśnym Uniwersytetu Poznańskiego. Pod kierunkiem naukowym profesora Schramma wykonali swoje prace doktorskie między innymi Ryszard Manteuffel[80] i Wacław Pytkowski, który w przemówieniu z okazji nadania Mu stopnia naukowego doktora nauk (odpowiednik habilitacji) podkreślił wielką rolę prof. W. Schramma w procesie kształtowania Jego osobowości [1].

Profesor Schramm był reprezentantem innej niż to wynikało z nauki Moszczeńskiego szkoły myśli naukowej. Schramm prezentował w swym myśleniu i działaniu współzależność rzeczy i zjawisk. Był twórcą jedynej w Polsce szkoły organicznej nie uznającej podziału gospodarstwa na działy i pojedynczych kalkulacji jednostkowych. Według Schramma jedynym miernikiem efektu ekonomicznego gospodarstwa jest zysk, jako wynik wzajemnie bilansujących się przychodów i rozchodów.

Prof. W. Pytkowski przejął od prof. W. Schramma ową konieczność patrzenia na gospodarstwo jako na współzależną wewnętrznie całość. W ten sposób w osobie prof. Pytkowskiego nastąpiło szczęśliwe powiązanie wszystkich wartości, jakie niosły ze sobą dwie różne, bardzo znane, szkoły. Dzięki tym wszechstronnym kontaktom osobowość prof. Pytkowskiego była szczególnie bogata.

Szukając korzeni, od których rozpoczęła się działalność prof. Pytkowskiego na gruncie poznańskim — zaczęło się to od rozprawy doktorskiej traktującej o sytuacji gospodarstw chłopskich podczas II wojny światowej (1948), którą wykonał pod kierunkiem prof. Wiktora Schramma.

W roku 1957 przedstawił rozprawę habilitacyjną „Towarowość gospodarstw chłopskich" i przeprowadził z powodzeniem przewód habilitacyjny. Opiekunem naukowym był prof. Schramm.

W 1958 r. umiera prof. Wiktor Schramm, a w trzy dni po Nim prof. Marian Trojanowski, aktualny wówczas kierownik Katedry. Katedrę przejmuje prof. Witold Staniewicz, a stanowisko adiunkta przypada m.in. ówczesnemu doktorowi nauk rolniczych Wacławowi Pytkowskiemu. W 1960 r. prof. Witold Staniewicz przeszedł na emeryturę, a kierownikiem Katedry został doc. dr n. dr hab. Wacław Pytkowski.

Dorobek naukowy prof. Wacława Pytkowskiego jest bardzo bogaty jak i ukierunkowany. W swoich pracach naukowo-badawczych kierował się dobrym znawstwem praktyki i dlatego dobierał sobie tematy trudne, do tej pory nie rozwiązane. A oto ich zakres:

1. Metodologia badań naukowych.
2. Metodologia organizacji i zarządzania wielkotowarowymi gospodarstwami rolnymi, czyli tzw. organizacja władania.
3. Organizacja i ekonomika gospodarstw indywidualnych ze szczególnym uwzględnieniem czynnika pracy.
4. Systemy produkcji rolniczej.

Metodologia pracy naukowo-badawczej jest najczęstszym wątkiem pracy naukowej prof. Pytkowskiego. Każde Jego opracowanie omawia kwestie metody pracy nad tematem. Wielką uwagę Profesor przywiązywał zarówno do samego sposobu przetwarzania danych liczbowych w toku badań, jak i do wiarygodności źródeł, z których badacz korzysta. Dlatego też zdarzały się przypadki, że z powodu braku w pracach naukowych, często nawet znanych autorów, wiarygodności danych, prof. Pytkowski dyskwalifikował uzyskane tam wyniki. W tym tkwił w głównej mierze Jego sceptycyzm w odniesieniu do prac publikowanych w owym czasie.

Swój dorobek myślowy i metodologiczny prof. Pytkowski zawarł w obszernym dziele *Organizacja badań i ocena prac naukowych* (1981). W publikacji tej znajduje się też dedykacja poświęcona pamięci wszystkich inspiratorów badań naukowych autora:

[80] *Ryszard Manteuffel – Szoege ur. 13.VIII.1903r. w Mińsku Mazowieckim, zm. 5.X.1991r. w Warszawie. Profesor SGGW, czł. rzecz. PAN, ekonomista rolny.*

"Profesorom S. Moszczeńskiemu z SGGW, J. Neumannowi z Uniwersytetu w Berkeley, W. Schrammowi z Poznania, którzy kształtowali moją osobowość i R. Manteufflowi, który po wojnie zorganizował i ukierunkował Ekonomikę i Organizację Gospodarstw pracę tę poświęcam".

W ten sposób prof. Pytkowski złożył hołd swoim wychowawcom, jak i pięknym gestem odniósł się do swego rówieśnika, kolegi z ławy asystenckiej, prof. R. Manteuffla.

Istotą powyższej pracy, która tak szybko znalazła się w rękach przeważającej części pracowników naukowych i to nie tylko instytucji rolniczych, był wprowadzony przez Autora porządek myślowy i pojęciowy. Po raz pierwszy wśród wielu tego typu publikacji nomenklatura pojęciowa powiązana została z procedurą postępowania badawczego. Autor równocześnie zapoznaje czytającego z poglądami na poszczególne kwestie różnych autorów, zarówno doby obecnej jak i starożytnej. Prof. Pytkowski nie omieszkał tam uwypuklić własnych poglądów, które niekiedy są ilustrowane przy pomocy zaczerpniętych z literatury anegdot.

Cytowane dzieło prof. W. Pytkowskiego składa się z 10 rozdziałów, wśród których znajdują się podstawowe definicje, zbiór i opracowanie materiałów, metody badawcze takie jak analiza i synteza, indukcja i dedukcja, analogia, systematyzacja, interpretacja, wnioskowanie, prawda i prawa naukowe[81], badania problemowe oraz szeroki wykład na temat typizacji i kwalifikacji oraz organizacji badań naukowych.

Czytając wymienioną wyżej pracę można zauważyć duży wpływ Kotarbińskiego na sposób interpretacji omawianych zjawisk. Na szczególne podkreślenie zasługuje ostatni rozdział pracy zatytułowany *Nauka a etyka*. W rozdziale tym rozprawia się z tzw. chałturzeniem w nauce, które - polega zdaniem Autora - na podejmowaniu tematów atrakcyjnych, łatwych, modnych i efektownych, ale opartych na powszechnie znanych metodach. Prace tego typu - zdaniem Pytkowskiego - powinny znaleźć się "za bramą" nauki.

Wychodząc z założenia, iż nauka winna być zapleczem dla praktyki, Pytkowski proponuje następującą jej metodykę:

1. Punktem wyjścia jest poznanie potrzeb nauki i/lub praktyki.
2. Wyłonienie problemu.
3. Poznanie linii rozwojowej z tego zakresu w nauce i praktyce.
4. Sprecyzowanie celu i zakresu badań.
5. Wyrozumowanie koncepcji.
6. Opracowanie adekwatnych metod badawczych.
7. Opracowanie mierników i instrukcji.

Dziedziną naukową, w której prof. Pytkowski stał się z czasem uznawanym autorytetem była organizacja i zarządzanie wielkotowarowym przedsiębiorstwem rolnym. W odróżnieniu od szkoły warszawskiej prof. Manteuffla, która wielkie przedsiębiorstwa, zwane kombinatem określała jako jednostki niezdolne do efektywnego działania, prof. Pytkowski stworzył oryginalną teorię organizacji władania tymi gospodarstwami, widząc w nich duże możliwości wzrostu gospodarczego. Teoria ta podkreśla wagę organizacji przedsiębiorstwa i rynku.

Według Pytkowskiego przedsiębiorstwo takie - to rolniczo wytwórcza jednostka gospodarcza obejmująca obszar gruntów umożliwiający produkcję rolniczą i opierająca swą działalność na zespole sił wytwórczych, zorganizowana na zasadzie doboru ich w skali zapewniającej maksymalne zaspokojenie potrzeb rynkowych i osiągnięcia największego zysku. Natomiast rynek, zdaniem Pytkowskiego, jest ojcem zysku, ponieważ warunkuje on opłacalność produkcji towaru tylko atrakcyjnego. Przedsiębiorstwo może więc działać jedynie w ramach rozwiniętych stosunków towarowych, a mianowicie poprzez:

1) wytworzenie towarów na rynek dla znanego, ale także nieznanego odbiorcy,
2) zdobywanie i nabywanie elementów produkcji na zasadzie odpłatności,
3) ponoszenie ryzyka swojej działalności,
4) dążenie do uzyskania maksimum efektu ekonomicznego.

Jest to zatem teoria, która torowała drogę z tak dużym wyprzedzeniem, gospodarce wolnorynkowej, w której każdy podmiot gospodarczy ma swobodę wyboru działalności gospodarczej, sam czerpie korzyści ale też sam ponosi konsekwencje straty.

Opracowana przez Pytkowskiego koncepcja organizacji i zarządzania państwowych gospodarstw rolnych została w pełni zaakceptowana przez praktykę tych gospodarstw. Dzięki tej strukturze możliwą stała się specjalizacja gospodarstw, szeroka kooperacja i integracja pionowa. Dzięki pracom Pytkowskiego problematyka właściwego zarządzania gospodarstwami rolnymi weszła w krąg zainteresowań badawczych innych naukowców.

Szczególnie oryginalną i odkrywczą jest praca traktująca o efektywności bodźców opublikowana w "Zagadnieniach Ekonomiki Rolnej" (1981 nr 5). Celem jej było wyjaśnienie mechanizmu i złożoności zmian systemu wynagrodzeń pod wpływem permanentnego rozwoju postępu w technice, technologii i organizacji produkcji. Zdaniem Pytkowskiego zmienność czynników w rolnictwie nie powinna przesłaniać konieczności regulowania poziomu wynagrodzeń. Jest to bardzo ważne zarówno z punktu widzenia równowagi całej gospodarki narodowej, jak też bytu pojedynczego pracownika.

Dla wyjaśnienia tego trudnego a jakże istotnego problemu Autor sięga na wstępie do klasyków naukowej organizacji pracy jak Forda i Fayola oraz korzysta z prac Kotarbińskiego i opracowuje oryginalny, przez siebie zaproponowany system wynagrodzeń polegający na zasadzie wartościowania stosunku pomiędzy wysokością premii a wynagrodzeniem. Gdy wysokość premii przewyższa wynagrodzenie dowodzi to, że mamy do czynienia z niewykwalifikowanym lub nie dość sumiennym pracownikiem. Według Fayola wysokie premie a niskie wynagrodzenie prowadzą do deprawacji pracownika.

[81] *Profesor twierdził, że praw ekonomicznych się nie odkrywa – tak jak to ma miejsce w odniesieniu do nauk przyrodniczych– lecz prawa ekonomiczne ujawniają się. Stąd symptomy, czy przebieg tych samych zjawisk ekonomicznych (np. kryzys) nie przebiegają tak samo w każdym kraju, lecz są zróżnicowane.*

W wyniku powyższych rozważań Pytkowski formułuje dwie podstawowe zasady premiowania. Zasada pierwsza zmierza do ustalenia wysokości projektowanych premii według pewnej proporcji do wartości przypuszczalnych niedociągnięć, których dzięki premiowaniu spodziewamy się uniknąć. Zasadą drugą powinno być premiowanie przede wszystkim bezpośredniego wykonawcy, gdyż premie pośrednie są na ogół mało skuteczne.

Autor w omawianej pracy dokonuje także przeglądu różnych rodzajów premii. Rozróżnia On premie strukturalne, okolicznościowe, sprzężone oraz nagrody. Aby dostosować do właściwości rolnictwa interpretację zasad premiowania prof. Pytkowski przedstawił schemat grupowania załogi w przedsiębiorstwach według służb stosownie do ich udziału w procesie produkcyjnym. Na tym tle wyjaśnia realizację zasad premiowania.

Do wielu prac Profesora zasługujących na wyróżnienie należy referat wygłoszony na XV Międzynarodowym Kongresie Naukowej Organizacji Pracy w Rolnictwie w Warszawie w roku 1970 pt. *Organization Criteria ot Labour Mechanization (Kryteria organizacyjne mechanizacji pracy).* Jest to ujęcie matematyczno-wskaźnikowe wyjaśniające główne kryteria poprawnej mechanizacji pracy.

Publikacją o szczególnym znaczeniu poznawczym i metodologicznym, którą prof. Pytkowski szczególnie cenił, była praca *Systemy użytkowania roli i ich ocena* wydana w 1979 r. w "Rocznikach Nauk Rolniczych" (Seria D, Monografie). Jest to obszerna monografia analityczna dotychczasowego dorobku naukowego jak i doświadczeń praktyki na temat płodozmianu jako systemu użytkowania ziemi. W cytowanej pracy Autor przedstawia na wstępie przebieg rozwoju naszej rodzimej myśli rolniczej i zagranicznych osiągnięć na tle postępów praktyki rolniczej przechodząc kolejno do kształtowania się systemów, w których w sposób szczegółowy rozpatruje istotę płodozmianu w ujęciu historycznym, pojęciowym jak i stosowanym.

Wśród wielu wartościowych prac naukowych autorstwa Profesora W. Pytkowskiego warto wymienić jeszcze parę, które nawiązują do najważniejszych zainteresowań Profesora. Chodzi o zasady grupowania indywiduów za pomocą dendrytu. Zasada grupowania oparta o dendryt powstała w antropologii a za jej autora uważa się prof. Czekanowskiego (1913). W antropologii doszukując się podobieństw między ludźmi z różnych obszarów geograficznych a także okresów historycznych, pewne zależności miały charakter stały. Takiej prawidłowości nie ma w ekonomii, toteż Profesor dokonał „ulepszenia" dendrytu prof. Czekanowskiego i uczynił go przydatnym do grupowania w ekonomii. Praca ta była szeroko cytowana a Profesor wygłosił stosowny referat w Berlinie na zjeździe matematyków i statystyków (1966). Pomysł i opracowanie dendrytu zostało wysoko ocenione, napłynęły opinie i gratulacje a Autor otrzymał list pochwalny z Ministerstwa Nauki i Szkolnictwa Wyższego. Metoda grupowania w oparciu o „dendryt poznański" była wykorzystana w kilku pracach naukowych również poza ośrodkiem poznańskim.

Ważną pozycją w dorobku naukowym Profesora stanowią prace z zakresu bilansu paszowego, nawiązują one do okresu przechodzenia, z żywienia inwentarza żywego a szczególnie bydła, z całkowitej samowystarczalności na zaopatrzenie w pasze pochodzące z zakupu. Chodziło o metodę pozwalającą na porównanie różnego zakresu w korzystaniu z pasz wytwarzanych poza gospodarstwem. Na bazie tej metody powstało wiele prac magisterskich ale i rozpraw doktorskich, gdzie porównywano różne metody sporządzania bilansu paszowego. Prof. W. Pytkowski był parokrotnie recenzentem tych prac.

Zagadnienie pracochłonności i pracy było często przez Profesora rozpatrywane. Żyliśmy w okresie gwałtownej substytucji pracy ludzkiej i żywej siły pociągowej przez kapitał (maszyny). Tempo mechanizacji było zróżnicowane, ponieważ dostęp do maszyn był limitowany środkami administracyjnymi, gdyż po prostu przemysł nie nadążał za potrzebami rolnictwa. Powodowało to duże zróżnicowanie w technicznym wyposażeniu gospodarstw, a to przenosiło się na wielkość zatrudnienia, wydajność pracy, tworzenie nowych zawodów a zaniku innych itp. W nawiązaniu do tej sytuacji powstało opracowanie zawierające szereg wskaźników charakteryzujących „uzbrojenie" stanowisk pracy.

Pracą naukową dającą Profesorowi wiele satysfakcji były rozważania związane z podobieństwem i różnicami w zakresie takich pojęć jak ekonomika i organizacja. W pracy zawarto głęboki wywód źródłosłowów obu pojęć, dokonano analizy historycznej zakresu merytorycznego tych określeń, aby w ostateczności zakreślić rozdzielne i wspólne obszary badań. W pracy tej jest nawiązanie do ekonomiki przedsiębiorstwa oraz podkreślenie, że nauka o przedsiębiorstwie nie jest tożsama z ekonomiką przedsiębiorstwa, że są to różne obszary pojęciowe, aczkolwiek koncentrujące się na tym samym obiekcie, jakim jest przedsiębiorstwo.

Prace dydaktyczne sprawiały Profesorowi duże zadowolenie, dbał sam i wymagał od nas asystentów dużego zaangażowania i wprowadzania zmian. W oparciu o notatki z wykładów wydał kilka wartościowych skryptów, były one cenną pomocą dla studentów.

Podsumowując dorobek naukowy i dydaktyczny Profesora należy stwierdzić, że jest on bardzo bogaty i wyraża się liczbą 128 prac poświęconych badaniom, dydaktyce, organizacji nauki i kształcenia, w tym napisał 22 książki oraz bardzo dużo referatów naukowych wygłaszanych na różnych sympozjach i konferencjach naukowych w kraju i za granicą.

Prof. Pytkowski reprezentował bardzo wysoki poziom naukowy zarówno w zakresie ekonometrii jak i ekonomiki i organizacji rolnictwa. Jako agroekonometryk był i jest znany w Polsce i za granicą, gdzie często gościł z odczytami i wykładami.

Do szczególnych sukcesów prof. Pytkowskiego należy wyprowadzenie i zastosowanie po raz pierwszy w agroekonometrii – rachunku prawdopodobieństwa (przedziałów ufności, teorii hipotez statystycznych, teorii rekonstrukcji). Profesor jest także twórcą teorii „dendrytu poznańskiego" dającej podstawy do badań analitycznych w zakresie grupowania. Prócz tego szereg wypracowanych wskaźników i wzorów matematycznych posiada nie tylko teoretyczne, ale również praktyczne znaczenie. Wymienione prace wysuwają Profesora Pytkowskiego na czoło, wśród grupy naukowców zajmujących się tą dyscypliną. Obok prof. Stefana Smidta z Krakowa był On najwybitniejszym przedstawicielem kierunku statystyczno – matematycznego w badaniach ekonomiczno – rolniczych.

W dorobku naukowym prof. Pytkowskiego uderza ciągłość rozwoju i poszukiwań, a obok tego nowoczesność i nieustanne doskonalenie swego warsztatu naukowego. Można tu przytoczyć piękny zwrot Lechonia, który często Profesor powtarzał: "Żeby znaleźć miarę nowości trzeba wchłonąć w siebie przeszłość".

Prof. Pytkowski był badaczem, który zwracał szczególną uwagę na poprawność metodyczną i metodologiczną swoich prac. Dotychczas brak było w naszej literaturze naukowej wyczerpujących pozycji z zakresu metodologii badań naukowych. Prof. Pytkowski wypełnił tę lukę swoimi pracami.

Zwrócić wreszcie należy uwagę na ścisłe powiązanie działalności naukowej profesora Pytkowskiego z praktyką rolniczą, a szczególnie z zagadnieniami ekonomiczno-organizacyjnymi w gospodarstwach rolnych. To zaangażowanie spowodowało, iż stał się wybitnym znawcą zagadnień ekonomicznych i organizacyjnych związanych z działalnością i rozwojem kombinatów rolniczych w naszym kraju.

Obok działalności naukowej, prof. Pytkowski posiada również olbrzymie zasługi w pracach dydaktycznych. Pod jego kierunkiem ukończyło prace 72 magistrantów, obroniło z powodzeniem prace doktorskie 10 doktorantów, z których czterech uzyskało habilitację. Prócz tego prof. Pytkowski był twórcą i kierownikiem jedynego w kraju studium podyplomowego dla dyrektorów kombinatów rolniczych, za co został odznaczony przez Ministra Oświaty i Szkolnictwa Wyższego. Należał do wielu towarzystw naukowych (Poznańskiego Towarzystwa Przyjaciół Nauk, był wieloletnim przewodniczącym Sekcji Rolnej Polskiego Towarzystwa Ekonomicznego i członkiem Komitetu Ekonomiki Rolnictwa PAN), gdzie wygłaszał odczyty i prelekcje.

Prof. Pytkowski pilnie śledził życie naukowe za granicą, mimo utrudnień wyjechał kilkakrotnie na sympozja międzynarodowe (Francja, Anglia, Niemcy, Włochy, Holandia), gdzie wygłaszał, bardzo dobrze przyjmowane, referaty. Jego dorobek naukowy został wielokrotnie odnotowany w notach bibliograficznych w Anglii, Francji, Włoszech i Niemczech.

Życiorys i dorobek naukowy Profesora Wacława Pytkowskiego podano bardziej szczegółowo, bowiem im wybitniejszego człowieka to dotyczy, tym bardziej życie jego należy do społeczności krajowej a nawet międzynarodowej. Społeczeństwo ma prawo poznać zasady życia i osiągnięcia naukowe wybitnych ludzi, aby w ten sposób móc kształtować wzorce do naśladowania. Dogłębne poznanie drogi życiowej pozwala doszukać się Jemu właściwej metody życia formułującej Jego linię rozwojową i wyciskającej piętno na Jego pracach, ich treści, stosowanych metodach, sposobach interpretacji wyników itp.

Prof. dr hab. Wacław Pytkowski był człowiekiem niezwykłym. Pomimo ogromnej wiedzy ogólnej oraz w zakresie ekonometrii oraz ekonomiki i organizacji rolnictwa, którą zawdzięczał swojej pracowitości i uzdolnieniom, nigdy nie zapominał o swoich Wielkich Nauczycielach: Profesorach Jerzym Spławie – Neymanie, Stefanie Moszczeńskim i Wiktorze Schrammie, podkreślając ich przymioty umysłu, wielką osobowość i szlachetność. Nigdy nie pomniejszał ich dorobku naukowego przez eksponowanie własnych osiągnięć. Wielokrotnie nawiązywał do dyskusji ze swoimi Wielkimi Nauczycielami, czuł się w wielu wypadkach kontynuatorem ich zamierzeń. Jeżeli był kontynuatorem, to trzeba podkreślić, że było to twórcze rozszerzanie wiedzy, szczególnie w zakresie metodologii badań. Kiedy w czasie dyskusji wynikały podobieństwa a niekiedy znaczne różnice w stosunku do wcześniej głoszonych tez, zwykł mówić, że u ujścia rzeki trudno dzielić wodę w potoku i identyfikować ją z odnośnym dopływem, trzeba pochylić się nad dobrodziejstwem wiedzy i docenić wkład wszystkich niezależnie na jakim etapie dołożyli swoją cząstkę.

Pracę i życie naukowców porównywał do biegaczy, którzy z pochodnią dorobku naukowego podążają na Olimp wiedzy. Był świadomy, że na tej drodze jest wiele trudności, że nikt nie zna jednej, najkrótszej, najprostszej i najbardziej poprawnej drogi, ze dojście do Olimpu jest trudne, wiąże się z wieloma ofiarami i wyrzeczeniami.

Prof. W. Pytkowski posiadał nietuzinkową osobowość i tak był i jest postrzegany przez liczne rzesze ludzi, którzy chociaż na krótko zetknęli się z Profesorem. Gdyby prof. W. Pytkowski był ceniony tylko za swoje osiągnięcia naukowe, to uwzględniając zmianę systemu ekonomiczno – społecznego a także upływ czasu po Jego śmierci, ludzie nie pamiętaliby o Nim tak, jak pamięta się Go dzisiaj w naszym środowisku.

Ludzie pamiętają Profesora jako kogoś, kto był drogowskazem; kto w czasach stalinowskich i późniejszych miał odwagę głosić odrębne poglądy, postrzegają Profesora jako człowieka godnego największego szacunku. Pomimo pewnej naturalnej kontrowersyjności, do dzisiaj wspomina się Profesora jako odważnego i bezkompromisowego w swoich ocenach zdarzeń i ludzi. Zapłacił za tą, godną pochwały postawę, ogromną cenę poniżania, ograniczania, niepewności. Pomimo ogromnego oryginalnego dorobku naukowego i cenionego w środowisku naukowym badacza, odmawiano, utrudniano i przedłużano Jego nominację na tytuł profesora. Dopiero krótko przed przejściem na emeryturę (1974) po 15 latach od habilitacji uzyskał w roku 1972 tytuł profesora nadzwyczajnego.

W licznych dyskusjach Profesor zwracał nam uwagę na postawę i etykę uczonego. Odradzał wdawanie się w nieetyczne postępowanie, w małostkowość. Wyróżniał u ludzi oprócz osoby jeszcze osobowość, dając liczne przykłady osób ze świata nauki. Wspominał, że jeżeli rozpocznie się zgromadzenie (konferencja) i przybywają jeszcze pojedynczy uczestnicy, to wejście większości pozostaje niezauważone, ale gdy wchodzi osoba, która oprócz tego posiada jeszcze osobowość, to wyraża się to lekkim szmerkiem na sali, bowiem człowiek ten wniósł oprócz wartości, które sam wyznaje jeszcze uznanie ze strony środowiska.

Mówiąc o dorobku naukowym Profesora Wacława Pytkowskiego trudno nie podkreślić Jego niepowtarzalnej osobowości i konsekwencji postawy etyczno-moralnej i patriotyczno-obywatelskiej. Był człowiekiem, który w sposób jednoznaczny i publiczny rozróżniał dobro od zła, mądrość od głupoty, naukę od rzemiosła, oraz demokrację od dyktatury. Swoją aprobatę lub dezaprobatę wyrażał jednak w sposób elegancki, pośredni, przy pomocy licznych anegdot. Słynną stała się Jego opowieść o głosowaniu w Sanhedrynie żydowskim, gdzie jednomyślne uchwały były unieważniane ze względu na sprzeczność jednomyślności z naturą ludzką. Aluzja jest tu szczególnie wymowna, tym bardziej, że głoszona była w latach sześćdziesiątych i siedemdziesiątych. Cenił prawdę i pozostał wierny tej idei przez całe życie.

Prof. Wacław Pytkowski pozostawił po sobie ogromną spuściznę, która mimo upływu czasu jest ciągle aktualna. W kwartalniku „Nauka" 3/2008 prof. dr hab. dr h. c. Rudolf Michałek rozważa granice wolności i odpowiedzialności uczonego [4]. Kończy swój bardzo ciekawy i pouczający wywód cytując moralne wskazanie Profesora W. Pytkowskiego: „Pragnąłbym, ażebyśmy w zawodzie naukowca odkryli istotne wartości i odczuli względem nauki swą miarę pewności i swego zaangażowania. By nasza praca nad sobą była wieloraka: wytrwała, cierpliwa, spokojna, systematyczna, uporczywa, rzetelna i daleka od efekciarstwa, a etyka na takim poziomie, ażeby w momencie rozstawanie się z życiem, kiedy dusza nasza zostaje sama z sobą, móc samemu sobie podać rękę."

Taką ponadczasową spuściznę zostawił nam nieodżałowanej pamięci, wielki Humanista – Filozof – Ekonomista.

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Prof. dr hab. Wacław Pytkowski (1904 – 1989)
Scientist and Academic

Summary

The paper is devoted to the memory of the famous agricultural economist in Poland Professor Wacław Pytkowski (1904 – 1989). In one's youth, after the mathematical university graduation he developed the methodology of the statistical calculation and using it in the economics of agriculture. Next, after the agricultural university graduation, he became the specialist in the area of farm organization and management. The academic papers discussing about research organization and scientific paper evaluation can be should recognized for the special academic achievement of the Profesor.