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DELIVERY ASSESSMENT PROJECT FOR WOOD PROCESSING PLANT

Abstract: In the current situation the economic activity of wood processing companies is largely determined by the quality of the raw material. Production processes, skilled workers or similar organization rules do not allow for a significant competitive advantage. That is why the issue of supply logistics, and more specifically the assessment of supply, is the key point in the assessment and qualification of suppliers. One of such developing plants is the Wood Processing Plant located in the village near Dębica in the south-eastern Poland. The need to meet the high expectations of overseas customers forced the plant to develop a supply assessment procedure. The design of such procedure has been presented in this study.

Keywords: supply assessment, supply, sawmill, quality

INTRODUCTION

An ever increasing competition in the market and changing customer requirements impose on the organization the obligation to constantly improve the quality of the products and services offered by them. Individuals who want to take a competitive advantage are looking for effective management methods in the market that will enable them to provide buyers with products and services that fully meet their expectations. An important element in the smooth operation of a company is the quality of the purchased materials and the semi-finished products as they determine the quality of the final product and, consequently, meet both the needs and the requirements of the customer. In order to prevent some disruptions in the production process caused by the lack of suitable materials, individual companies must ensure that the purchasing process, as well as the control of supplies and suppliers are properly followed. These processes require continuous monitoring so that the improvements can be made. [2, 3] In order to monitor these processes efficiently it is necessary to document them using special registers and forms. Many methods and tools are used to evaluate the supplier, e.g. supplier self-presentation, vendor audits, third-party references, company visits, trade fairs, trial orders, etc. In the range of these instruments it seems appropriate to indicate one suitable for a typical woodwork. This article has been devoted to this issues presenting in it one of the original solutions in this area.

ROAD TO QUALITY IN WOOD PROCESSING PLANT

The analyzed deliveries were made to the Wood Processing Plant located near Dębica in the Podkarpackie Voivodship (south-eastern Poland) at the A4 motorway junction. Apart from the production hall on the premises of the company there are also located office spaces, warehouses, pick-up yards, sawmills, drying rooms and garages. The Wood Processing Plant was established in 1995 as a sawmill production company. In the late nineties the company began to manufacture and assemble wood carvings. This time and the early years of the previous decade were the period of dynamic development of this sector. The companies had no trouble selling their products, and the market demand exceeded the supply. After year 2000 the structure of sales of windows in the market began to change radically. The share of sales of wooden windows decreased in favor of PVC windows. Market growth did not compensate for structural changes and the sale of wooden windows began to soar. Unfortunately, most companies did not see the changing trends and did not make the right strategic decisions to keep the company from falling revenues. This was also the case

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with the Wood Processing Plant. The company located its products mainly in the developer market. The negotiating power of the large executive companies that were operating in this market was enormous. This, coupled with declining demand, led to a decline in sales profitability. The opportunity to get out of this situation was the production of the highest quality products. To make this possible, it was necessary to pay attention not only to the quality of the production but also to the quality of the supply. The Wood Processing Plant is a plant that is able to guide the whole process from the acquisition of oak elements through the process of their modification, until the high quality production process of the final product. The capacity of the wood modification line still allows other flooring service providers to do this. Simultaneously, the acquisition of the Swiss, German and Austrian markets forced efforts to maintain high quality. For this purpose, an improvement of supply assessment was undertaken. [1]

AN ANALYSIS OF SUPPLIES IN THE WOOD PROCESSING PLANT

When analyzing the market of wooden products, the imbalance between the demand for high quality wood and the availability of wood begins to be visible. This is due to the specific nature of this natural raw material. It cannot be produced in large quantities. The quantity of wood material harvested is limited by its growth. For many years, it has accounted for about 60% of the mass of wood. This is due to the need to increase the so-called forest cover in Poland. The forest cut must be smaller than its growth. This causes a reduction in the age of the trees that are being cut (fewer and fewer woods are remaining), and thus the reduction of the diameter of the available wood material. Unfortunately, with the reduction in diameter the quality of the raw material is also decreasing. All this reduces the supply of quality wood, which, with even unchanged demand, needs an increase its price. In this situation, the key strategic element of the business is an access to the appropriate quality class and optimal use of the raw material. From the point of view of the Wood Processing Plant it is necessary to assess carefully the quality of the supply.

The system of sales by the State Forests promotes companies from the so-called purchasing history. This means that it is not possible to purchase any quantity of raw material at any time. The Wood Processing Plant has such the purchasing history and an infrastructure for the processing of wood material. Thanks to this, it achieves strategic security of raw material supply.

Table 1. List of wood supplies from the last quarter of 2016. Own research based upon [1].

Type of delivery	No. of deliveries X 2016	No. of deliveries XI 2016	No. of deliveries XII 2016	Total no. of deliveries	Percentage share
Oak frieze	13	16	14	43	23,50
Oak lamella	12	15	13	40	21,86
Pine sawn timber	21	20	23	64	34,97
Linden leaf	8	7	9	24	13,11
Round lime timber	1	0	1	2	1,09
Exotic frieze	2	1	2	5	2,73
Exotic lamella	2	2	1	5	2,73

By analyzing the delivery to the Wood Processing Plant one can notice that there are several deliveries each day, which comes up to a total of about 25 cars a week. Goods are ordered successively in relation to the technological process of the production. However, the company has so-called reserves in case of problems with suppliers. The stock would be enough for about 2 weeks.

In the Wood Processing Plant two types of supply can be distinguished. One group of deliveries are the supply of wood: oak frieze, oak slats, pine sawn timber, linden leaf, round lime timber, exotic frieze, exotic lamellas. The second group are additional materials such as adhesives, lubricants, lacquers. Table 1 lists the supply of wood from the 2016 quarterly survey.

Figure 1 shows the Pareto - Lorenz diagram [4, 5] of the raw material supply in the analyzed quarter. One can see that most of the pine sawn timber and oak friezes are supplied to the Wood Processing Plant. By means of the Pareto method the delivery that has the greatest impact on the delivery process in the company was chosen.

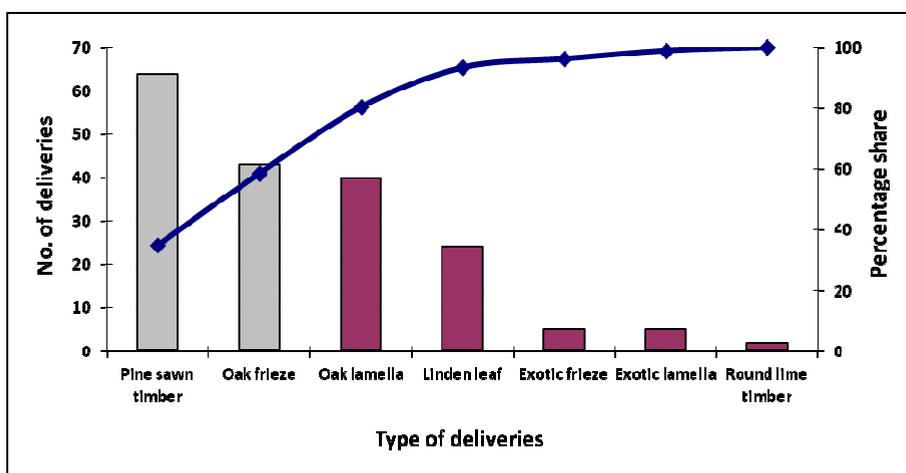


Fig. 1. Pareto-Lorenz diagram. Own research based upon [1].

Most deliveries are made by supplying pine sawn timber, hence the further part of the supplier evaluation project will be based on the evaluation of these suppliers.

In the Wood Processing Plant, the method of assessing pine sawn timber was divided into three stages:

- 1) Firstly, it was checked whether the delivered goods matched the order in terms of quantity, type and grade.
- 2) The moisture of the batch was then checked to ensure that it complied with the order. In the next step, some samples were taken randomly. A person responsible for pre-delivery evaluation, selected the samples from different locations and checked their dimensions (thickness, length, and width). This was a relatively important point because the final material had its own dimensions. When a company gets a material that is wider or smaller than the one ordered, it generates additional waste. Larger waste means less good raw material, and therefore higher losses on the batch. During this stage of the delivery the quality is also checked quality, i.e. whether the wood is not faded, moldy, blanched and the attention is paid to the number of knots. The second evaluation step is after unloading and preparation of the material for further processing.

Then there are hidden defects that cannot be checked before. Occasional poor quality of wood hidden in the middle or bottom of the pallet occurs.

- 3) In the last part of the evaluation, the waste from the batch is evaluated, which is then converted into percentages.

Table 2 shows the processing of the batch in the Wood Processing Plant, i.e. calculating how many [m³] is obtained from the finished product [m²]. In the final section the performance of the obtained sleepers in m² from 1m³ was checked. Such documentation is provided for primary suppliers marked D1 or D2.

Table 2. Method of calculating the productivity of pine sawn timber.

Supplier	Range	Quantity of material taken M3	Quantity of sleepers obtained M2	Performance of the sleepers obtained in m ² from 1 m ³ of sawn timber
D1	Pine sawn timber wet	7,000	386	55
D1	Pine sawn timber wet	26,588	924	35
D1	Pine sawn timber wet	18,400	992	54
D2	Pine sawn timber wet	23,000	1284	56
D1	Pine sawn timber wet	33,480	1508	45
D2	Pine sawn timber dry	40,787	2354	58

Source: Own research based upon [1].

In case of problems resulting from the difference between the ordered and the delivered goods, the complaint is filed. Price adjustments are usually made for material of a different class or quality, or a quantitative correction for less material. Ultimately there is a resignation from the supplier.

The lack of regular evaluation of suppliers at the Wood Processing Plant caused several quality problems. In principle no evaluation of deliveries was made, only the choice of suppliers. The past selection of the suppliers was based on the supplier's history and its good market position. It was stated that the knowledge of suppliers was synonymous with quality of supply and that it was sufficient knowledge. It turned out that changes were necessary as only one person had dealt with orders for a few years.

When evaluating the performance of a given supply, the materials from the two main suppliers were measured so far. This was not enough compared with other suppliers where such conversions did not taken place. In this case, the best way to resolve a company's current situation was to review the delivery regularly and check its performance at least once a month from the supplier. In case when such results were not comparable, a more frequent measurement should be introduced in order to control better the delivered raw material. Past inspections of deliveries only from the companies from which the Plant ordered the most was not a measure. This did not give the Plant an opportunity to consider the supply from the additional suppliers, and thus the opportunity for the supplier to become a qualified supplier. This was an activity that did not develop and did not expand the scope of the main suppliers. This means that the suppliers to whom the Plant has been ordering for several years may feel comfortable and allow the delivery of inferior material, knowing that the company will order them anyway. Suppliers are limited, but they cannot deliver poor quality or lower quality



products. The solution to this situation is the introduction of a systematic assessment of supplies and the suppliers.

DRAFT OF THE SUPPLY ASSESSMENT PROCEDURE FOR THE WOOD PROCESSING PLANT

As a part of the improvement of the supply assessment process in the Wood Processing Plant the special procedure has been prepared. It is run by the competent quality control officer or the designated deputy. The main assessment document is a supply register. The basis for updating and preparing the supply register is an analysis of current deliveries. The supplies assessment written down in the F-01 Form F-01 (3) should be grouped according to the type of product delivered and the statement should be done quarterly. The protocol should be delivered to the Purchasing Manager by the end of the last business day ending the quarter.

Table 3. Protocol of supplies assessment F-01.

Protocol of supplies assessment No. ...					
Quarter, year....					
No.	Supplier	Quality assessment (month, year)	Quality assessment (month, year)	Quality assessment (month, year)	Average quality assessment

Source: Own research

The quality assurance review should be carried out by the QC staff in consultation with the shift manager on the production floor. The results are listed on the F-02 supply assessment sheet (Table 4).

Table 4. F-02 Supply Assessment Sheet.

Supply Assessment Sheet No. ...							
Point score (from 0 to 5)							
No.	Supplier	Quantity	Humidity	Dimensions	Visual assessment	Performance	Date

Source: Own research

The collected information is provided up to 2 working days from the completion of the material's performance measurements to the Purchasing Manager. Deliveries are selected at random, while maintaining a dependency: one supplier is evaluated once a month.

In the case of evaluation of supplies, the following scale is taken.

1. Delivery Quantity - from 0 to 5:
 - 5- always according to the order,
 - 4- less than 5% of the order,
 - 3- 5-10% of the order is missing,
 - 2- 10-15% of the order is missing,
 - 1- 15-50% of the order is missing,
 - 0- > 50% of the order is missing.
2. Humidity - scale from 0-5:
 - 5-piece product according to the order,
 - 4-increased humidity by 10-15%,
 - 3 - increased humidity by 16-20%,
 - 2- increased humidity by 21-30%,
 - 1- increased humidity by 31-50%,
 - 0 - total non-compliance with the order.
3. dimensions - scale from 0-5:
 - 5-dimensional board in accordance with the order,
 - 4-dimensional board size 5% larger,
 - 3- board size greater than 5-10%,
 - 2- board size greater than 10-15%,
 - 1-dimensional board larger by more than 15%,
 - 0- board size too small.
4. Visual assessment - scale from 0-5:
 - 5- good product, no visible defects (fungus, mold/ knots),
 - 4- good product, detectable defects are unitary,
 - 3-10-30% of the non-compliant batch (molded or too many knots in the boards),
 - 2-30-40% of the non-compliant batch (overgrown, too many knots in the boards),
 - 1-40-50% of the non-compliant batch (ducked, exaggerated with too many knots),
 - 0 - the product is fattened, molded.
5. performance- scale from 0-5:
 - 5- The number of obtained sleepers in m² from 1 m³ to 55,
 - 4- The number of obtained sleepers in m² from 1 m³ from 50-54,
 - 3- Number of obtained sleepers in m² from 1m³ from 45-49,
 - 2- Number of obtained sleepers in m² from 1m³ from 40-44,
 - 1- Number of obtained sleepers in m² from 1m³ from 9-31,
 - 0- The amount of sleepers obtained in less m² from 1m³ less than 30.

The performance evaluation of the material received is made by the shift manager on the production floor, and the results are recorded on the "F-03 Delivery Performance Assessment Sheet" (Table 5).

The collected information is provided at the end of the material performance measurement to the QC employee.

Such the procedure of the suppliers' assessment was tested in the next quarter and it turned out that the Wood Processing Plant cooperated with seven suppliers during that period. Thanks to the analysis, it was possible, for example, to identify the supplier with the highest performance. Interestingly, in the next evaluation his performance was significantly lower. The introduction of the

assessment of the supply makes it possible to capture such situations, and also forces suppliers to take care of the quality of supply.

Table 5. ZDTB 5.6 / F-03 Performance Evaluation Sheet

Performance Evaluation Sheet No. ...				
Month, year				
LNo.	Supplier	Quantity of material taken M3	Quantity of sleepers obtained M2	Performance of the sleepers obtained in m2 from 1 m3 of sawn timber

Source: Own research

CONCLUSIONS

The supply assessment system should be a crucial issue for the selection of suppliers. This is especially important if the company's past performance was based solely on objective information. An example of this could be the very successful Wood Processing Plant. Company development based on product quality and at the same time unstable raw material market in this area led to the need to change the approach to supply assessment. The previous assessment, based on the existing cooperation, had to be replaced by a more sophisticated approach. Therefore, a draft proposal for a procedure for the evaluation of deliveries was prepared, which should ultimately lead to the proper selection of suppliers. The score was prepared according to the criteria: quantity, humidity, dimensions, visual assessment and, above all, performance. The prepared delivery evaluation procedure during testing has shown its sensitivity to quality degradation. The supplier with a long supply history, in the general sense of providing high quality lumber, has provided low-performance material. The capture of this fact influenced his assessment, and it is hoped that in the future this supplier as well as others knowing the method of supply assessment will try their best to play the role of a qualified supplier.

REFERENCES

1. Byra M., Pacana A.: Projekt systemu ocen dostaw i dostawców dla Zakładu Drzewnego, Unpublished material, Rzeszów 2017
2. Liberko I., Pacana A., Gazda A.: *Wybrane zagadnienia logistyki*, Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów, 2012
3. Pacana A.: *Logistyka zaopatrzenia*. W: *Logistyka w przedsiębiorstwie* pod red. W. Zieleckiego, OWPRz, Rzeszów 2010
4. Pacana A.: *Zarządzanie jakością w logistyce*. w: *Zarządzanie logistyczne* pod red. J. Sępa, OWPRz, Rzeszów 2010
5. Sęp J., Perłowski R., Pacana A.: *Techniki wspomaganie zarządzanie jakością*, Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów 2010