

## QUALITY IMPROVEMENT WAYS OF WOODEN PRODUCTS

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### ABSTRACT

*Tools of quality management serve for collecting and processing of data concerning different aspects of quality. They are instruments of supervising (monitoring) and diagnosing processes such as: designing, production, control, assembly and all different action appearing in the cycle of the product existence. Their meaning results from the fact, that without administering the honest and full information, it is difficult to say about taking effective action in the scope of systematic improvement of the product quality level. Article presents research results concerning quality improvement in chosen company from woodworking industry.*

**Keywords:** quality, management, wooden products

### 1. INTRODUCTION

Quality is defined as both a prescribed degree of homogeneity and reliability achieved at low cost and according to market requirements and an ability for use and application.

Currently, the quality of business processes is a system designated the interrelationships between marketing, logistics, management techniques and technology and production technology, and become the determinant of customer needs, which is important for the rapid implementation of the contract, price, and above all, greater functionality of the product compared to the competition .

Due to increasing clients requirements, as well as technological changes, as well as problems in production that are critical to the quality of the product produced, there is a need for continuous improvement of processes and products, which involves the use of tools and methods of quality level management.

Manufacturing companies are increasingly turning to the patterns derived from Japanese culture and management practices, which represents Kaizen - the principle of continuous improvement processes. Kazien philosophy can be characterized as [5]:

- method of constant improvement,
- endless search for perfection,
- process of continuous improvement of product quality,
- workers striving to improve all aspects of the organization.

Application of Kaizen philosophy is focused on continuous improvement of products, processes within the organization. But the name "continuous improvement" cannot fully make sense of the term. It is a long-term improvement, step by step, every day, made by each employee, from executives through to workers in serial. It requires the inclusion of the thought process at every stage of production. Furthermore, it is a response to the traditional approach to automated mass production, which eliminates the need for an informed assessment of the task. Kaizen process includes [3]:

- continuous surveillance and problems searching,
- analyzing and defining the problem,
- research the causes,
- preparation of a solution,
- try out in practice and seek irregularities,
- implementation and monitoring of results,
- standardization.

Activities mentioned above are the subject of quality management tools and quality management methods. Quality management tools used to collect and process data related to various aspects of quality. They are instruments of surveillance (monitoring) and diagnostic processes of design, manufacture, inspection, assembly and any other activities occurring in the life cycle of the product.

Their importance stems from the fact that without the availability of reliable and complete information, it is difficult to talk about taking effective action in the field of systematic quality improvement. For the traditional quality management tools are included: a flowchart, diagram the causes and consequences - Ishikawa diagram, Pareto-Lorenz diagram, control sheets, histogram, a graph of correlation variables and Shewhart control charts.

## **2. CHOSEN TOOL IN THE PRODUCT QUALITY MANAGEMENT**

The most popular tool applying in product quality management is Ishikawa diagram, well-known also as a fish bone diagram. It is diagram of causes and effects that is very simple in applying and quite effective because of its methodology. It has many areas for applying and fulfill some functions, among others such as [5]:

- they are helpful for groups or individual persons to notice the entire complexity of the situation,
- serve as the way of registering ideas,
- reveal not-revealed until now relationships between individual causes,
- are helpful with discovering the source of a problem,
- analyze expected results of given direction of proceedings,
- keep an eye on essential occurring associations,
- constitute plan or problems map, which it is possible to put on the area of the workshop or in the office.

Drawing up a chart has to be an effort of many workers, because failures usually have their origins in different fields of action. Therefore, the team should consist of people with high expertise, who will also have to disclose reasons for the deficiency, including those caused by them. Working the diagram out can be realized in a few phases [4]:

1. Determining main causes. A so-called 5M attempt is most often practiced, according to which the most important groups of factors influencing on the process result are connected with: man, machine, method, material, environment and management. Groups of factors should be selected to the solving problem every single time.
2. Determining secondary factors i.e. the ones, which are directly connected with main factors and constitute developing them.

3. Choice of the critical factor. Pareto-Lorenz analysis can be applied during choosing process of crucial factors (described in the previous number).

Principle 20/80 is a technique that allows the establishment of guidelines for measures to improve the quality of processes, products or services. Organizes data in terms of their validity. It can also show whether the quality improvement program was effective, by using it before and again after the introduction of specific measures. Generalizing it can be stated that generally a small number of causes, people, the situation is responsible for the vast majority of these phenomena [1,5].

### **3. CHARACTERISTICS OF THE RESEARCH OBJECT**

The beginning of analyzed enterprises activity was dated on 1997 year, when carpenter master founded the small production plant. The philosophy of the enterprise was to satisfy the demanding needs of customers who depend primarily on the best quality goods and services at the highest level. Market needs and the development of the company caused that the owner was forced to employ more staff and increase production. It was connected directly with the relocation company so that the production surface had to be increased. Over 10 years experience in carpentry-related companies has resulted in completing the crew, who professionally manufactures, assembles and sells wooden windows, doors and PVC. The idea of the company is to produce high quality windows, therefore, carefully selects suppliers of hardware, moldings, glass and other accessories, putting them to the demanding requirements for modern, reliable and timely delivery.

The structure of human resources in analyzed enterprise is as follows: the majority (61%) of production workers are male. The crew is for all levels of education: 12% of workers with primary education, 15% of workers with higher education, 32% of workers with vocational education and 41% of workers with secondary education). The largest group of employees are under the age of 30 years (44%) and lowest in age 60-65 years (3%).

In the staff's opinion, the most important strategic area is the quality (26%). Safety at work took an equally high positions. Employees believe that last area of the classification in the ranking of the most important strategic areas are morale of the crew. Analyzed company has the department involved in the study of quality products. The all components used in the production are the object of quality control.

### **4. ANALYSIS OF CLIENTS COMPLAINTS - PRODUCTION FAILURES**

The article presents the results of the clients complaints analysis that have been declared and recognized by analyzed enterprise in the production of wooden windows in 2010. The value of reported complaints accounted for nearly 4,5% of the total sales value of this commodity group. The most commonly reported complaints (and because of their percentage of the sold windows value) include:

- improper size (25%),
- warping windows' elements (12%),
- closing hardware failures (18%),
- lack of windows' tightness (13%),
- flaking paint or varnish (9%),
- rupture of the structure of wood (6%),
- mechanical damage outline of wood and glass (4%),
- paint discoloration (3%),
- cracks in window glass (8%),
- diversity of the deck and staining (2%).

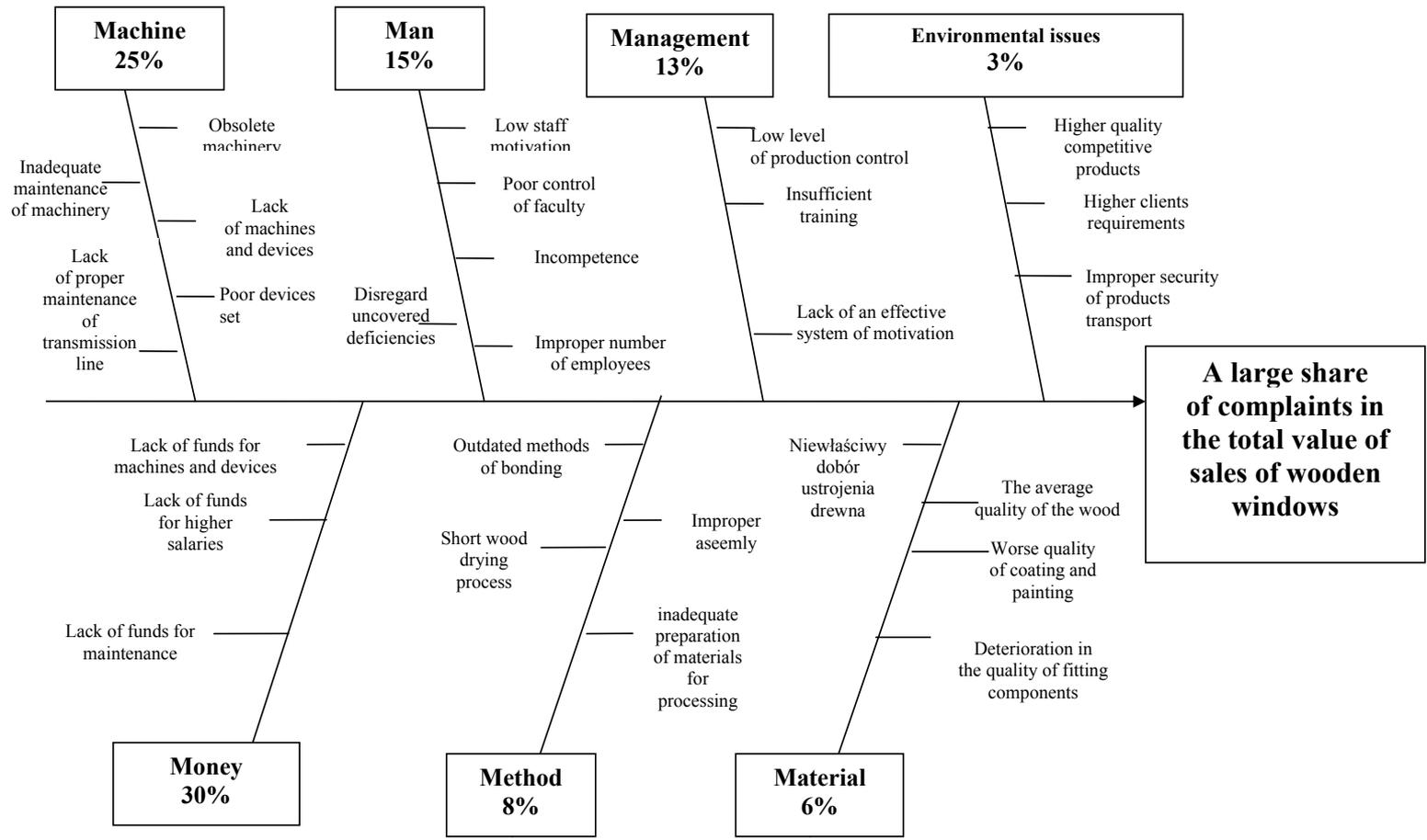


Figure 1. The Ishikawa diagram for wooden windows complaints recognized by producers in 2009.  
 Source: own study.

Figure 1 presents an analysis of the problem concerning a large number of complaints recognized by analyzed manufacturer of wooden windows made by using the Ishikawa diagram. It was aimed on searching sources of problem that concerning of clients complaints called to the analyzed company. Diagram was constructed based on the principles 7M, which is having such major causal factors, such as: man, machine, method, material management, environmental problems, money. A detailed description of the analyzed subjects (Fig.1).

It can be stated that the majority of nonconformities are cumulated in the factor called 'money' and 'machine'. Those two groups are dominated group of factors that cause several failures in the production of windows production and clients complaints. Factor 'money' causes lack of funds for machine investments what is consequences for lack of proper trainings for workers.

Data concerning reported and determined clients complaints coming from the annual period are contained in the table 1 and they are ranked according to the value of the complaint type. However, figure 2 shows a graphical interpretation of the results presented in Table 2.

*Table 1. Main factors causes contributing to complaints of wooden windows with regard to Ishikawa diagram*

<b>Denotation</b>	<b>Factor - reason</b>	<b>Percentage share in the whole of factors – reasons [%]</b>
<b>N1</b>	Men	15%
<b>N2</b>	Machine	25%
<b>N3</b>	Method (manufacturing technique)	8%
<b>N4</b>	Material	6%
<b>N5</b>	Management	13%
<b>N6</b>	Environmental issues	3%
<b>N7</b>	Money	30%

Source: own study.

*Table 2. Pareto-Lorenz diagram for main reasons of wooden windows complaints in 2010*

<b>Denotation factor - reason</b>	<b>Percentage share [%]</b>	<b>Accumulated values [%]</b>
<b>N7</b>	30	30
<b>N2</b>	25	55
<b>N1</b>	15	70
<b>N5</b>	13	83
<b>N3</b>	8	91
<b>N4</b>	6	97
<b>N6</b>	3	100

Source: own study.

Graphic interpretation of the data contained in those tables is in Figure 2.

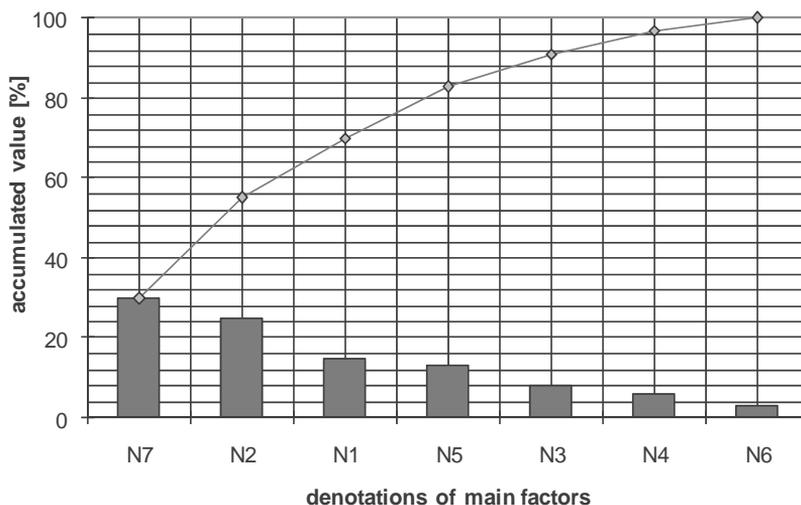


Figure 2. The Pareto–Lorenz diagram for the main reasons of wooden windows complaints recognized in 2010 (Source: own study)

## 5. SUMMARY

Among the basic causes of wooden windows complaints, recognized by producer X in 2010 year were: outdated machinery, lack of funds for the renovation of machinery, lack of adequate financial resources for machinery and equipment maintenance, short wood drying process, as well as insufficient faculty quality control, low level of motivation, incompetence of employees, too few staff, ignoring the production of deficiencies found.

Guided by the principle of Pareto 20/80, it was revealed that two main factors, such as obsolete machinery and lack of adequate funds for its repair, contribute to the occurrence of reported and recognized complaints in 2010.

## 6. REFERENCES

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