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A RESEARCH ON PRODUCT PERFORMANCE IN QUALITY MANAGEMENT SYSTEM

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ABSTRACT
The principles of quality management, according to ISO 9000:2000 represent overall decision for managing and conduct of organization with the aim of constant improvement of perfomances and focus on the demands of buyers and other interested parties. The methods and system tools of quality management are used in the work concerning research of quality characteristicsof the product and factors that affect variation of demanded characteristics. Product performances are brought into correlation with the performances of the system where the processes are taking place. For this research we will need Paretto diagram, QFD and Delphi method and Ishikawa diagam.
Keywords: performances, key characteristics, variation factors, key processes

1. INTRODUCTON
Contemporary business surrounding for the majority of organizatons is dynamic, complex and unpredictable. Consequently it is implied that the organizations define strategies for acomplishing their long term goals. The organization has to determine the conception and select required resources to reach its goals. In other words contemporary business includes constant measurements and analysing of business performances to find out critical data and information on key processes, inputs and results to be capable of making decisions on all levels of organization. Performances of the product quality appeared to be the most important for the survival of the organization on the market.
The process and system principle of quality mangement was analysed in the work and we also gave an example of utilization of methods and tools for quality control of research of the key performances of the products and their correlation with the performances of the organization where the processes are taking place.

2. PERFORMANCES OF ORGANIZATION AND PRODUCT AND THE PRINCIPLES OF MANAGEMENT
The principles of management represent overall decision for managing and conduct of organization with the aim of constatant improvements of performances and focus on the demands of buyers and other interested parties. The most important role in quality management refers to the function of management in business processes beginning with supreme management with explicit emphasis on the request for system and process approach, and necessity of using the facts at making decisions.
It is the assumption that organizations , where the model of quality management system which is in accordance with demands of international standards ISO 9000:2000, have processes that enable products with performances expected by a buyer. Undoubtfully, the performances of product are in correlation with the performances of organization where the processes are taking place. The process can be defined as a cluster of mutually connected activities that turn into inputs and outputs. To achieve the activities we need appropriate resources such as people, materials, etc. (Figure 1).

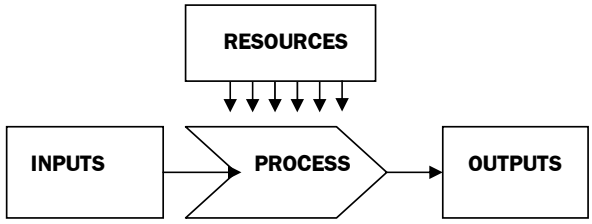

Figure 1. The basic definition of the process

Every process has its users and interested parties (internal or external ones) affected by the process and which, according to their needs and expectations, define demanded outputs. By analysing data about performances of the process we determine the necessity for corrective measures or process improvements. All the processes should be adjusted with the aims of organization and projected to create additional values concerning the area of working and complexity of organization.
The process approach has been significantly upgraded and extremely contributes to the way of organizing and conduct of the activities in creating values for users and other interested parties. The organizational structure is mostly accomplished through functional units and hierarchical systems. The conduct is frequently set vertically, and responsibility for planned outputs is divided into functional units. The final user is not always known to everyone who is involved in these processes. The process approach introduces horizontal management, by prevailing barriers among functions and focusing them on the main goals of organization.
An organized approach can use many processes, and in addition it gives the sequence of steps for one of the possible methodologies: process identification of the organization, process planning, implementation and measuring of the processes, the analysis of the processes and corrective measures and improvement of the processes. Some of the steps can be performed simultaneously.
If the planned requirements of the process are reached, the organization has to focus on the efforts of raising the performances of the process to the higher level. The methods of improvement should be defined and applied, and the efficiency of improvement should be verified.
A very important principle of quality management is a systemic approach to management that is being characterised as consistent work of the process network. A systemic approach was Deming's initial base for setting up of the production model as a system whose substance is the approach to have consumers or buyers of the product as interested parties and distributors of production equipment and materials in addition to the organization where it is taking place. In this structure all the interested parties act as if they are being integrated whereat they form so called chain of supply. The systemic approach means that identification, comprehension and management of mutally connected processes as a system contributes to efficiency in reaching the organization goals. Within this concept the system of quality management is presented as a cluster of mutually connected processes.

3. A RESEARCH ON PRODUCT PERFORMANCE USING METHODS AND TOOLS OF QUALITY MANAGEMENT

We give an example of how to use methods and tools of quality management system for research of product performances and the process selection that enable required performances (characteristics). [2] For this research we used the elements of conjunction (screws and nuts). The research was performed in two phases:

- the research of the cause of exceptions from projected quality characteristics,
- the research of influential factors on the causes of exceptions

According to the repeated research we determined the key processes whose conduct and control enable the surveillance over important characteristics of the product.

3.1. A research on the causes of exception from required quality characteristics

For the research of the cause of exception from required quality characterists we applied a model based on the Brainstorming method, by collecting and using the ideas of many participants. To conduct a poll we prepared a questionnaire where we asked for opinions and answers with an explanation for all the suggested causes of exception on quality characteristics for all researched

groups of quality characteristics. The poll was conducted among the experts for production of screws and nuts in several factories, and among the experts who worked in the factories for production of screws. The experts in the firms were chosen in all areas: construction, technology, control, production, maintenance, sales and management. The questionnaire was completed by 31 experts.
On the basis of the questionnaires we made the tables for research of the cause of exceptions from required quality characteristics. The tables are formed for all the groups of quality characteristics. For every quality characteristic we made a Paretto diagram. In figure 2 we give an example of a Paretto diagram for two characteristics of screw quality: the diametre of stem and the height of head. On the ordinate of the diagram we give the frequency of the expert's remarks, and on the X-axis the causes of exception from the required quality characteristics, the manner they are numbered in the questionnaire.

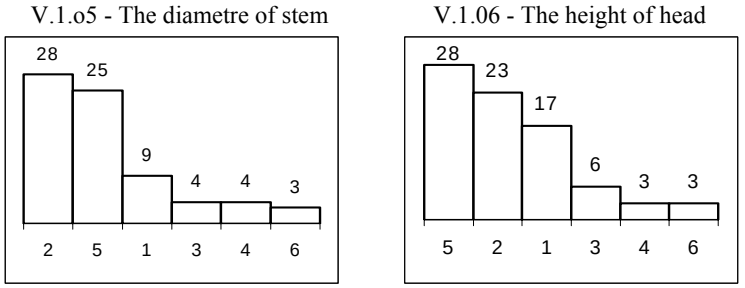

Figure 2. Paretto diagram for screws: The diametre of stem and the height of head

For the research of significance of the causes of exceptions from the requested quality characteristics we also used a QFD-method. For the nuts and screws we used four QFD-cards and the reason is the presence of more quality requirements of these products.
On the basis of the conducted research the most frequent causes of variation from the required quality characteristics in production of nuts and screws are: worker, tools, material, process regime and machine-equipment.
It showed that the order of the most influential causes of exceptions from the requested quality characteristics is not the same for all types of screws and nuts, except for the 'machine-equipment' which is the fifth cause according to their significance. The four remaining causes of exception may partially vary in their order depending on the quality and type of helical products. In figure 3 we have the significance of the causes of exceptions by nuts presented in percentage.

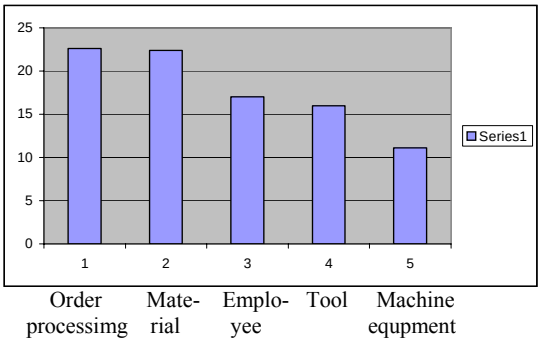

Figure 3. Significance of causes of the exception by nuts

3.2. A reseach of influential factors on the causes of exception

For the research of the most influential factors on the causes of exception from the requred quality characterisitcs we also used a Brainstorming method. The most influential ten factors were suggested for five already researched causes of exception. The team of eleven experts was chosen for production

of screws and nuts. They were asked to give their opinion about the ten most influential factors being offered on five researched causes of exception. There was a discussion on the most suggested influential factors and they also discussed other influential factors. They made their remarks independently. Ishikawa diagrams for five researched causes of exception were made. Figure 4 presents the Ishikawa diagram for the cause of exception - 'tool'.

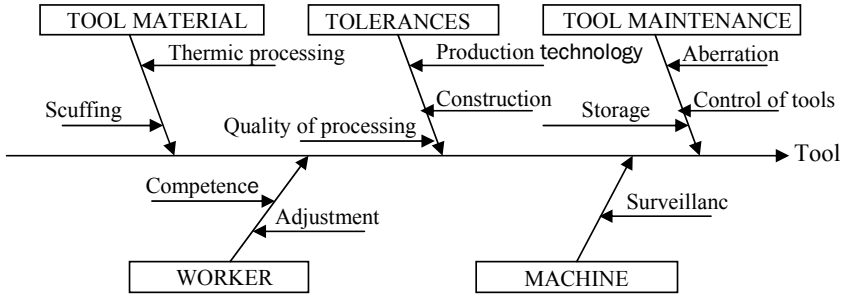

Figure 4. Ishikawa diagram for the cause of exception - 'tools'

Many factors are presented on Ishikawa diagrams. The factors are grouped according to their characteristics and similarities by the influence on the cause. In each group of factors we can pick out a factor characteristic for the group and it represents the leading factor. Other similar factors are attched to the leading factor in the group and those factors determine the leading factor closer.
To research the significance of influential factors on certain causes of exception, after conducted discussion, we made tables for all five causes of exception from the required quality characteristics. Delphi method was used for this research. After processing of the tables we presented the ranking of certiain influential factors. We give the example of the most influential factors for two causes of exception. 'Material': mechanical features, the selection of material, size and shape, chamical structure, plasticity; 'machine-equipment': technological level, adjustment, maintenance, operation and the conditions of exploitation.
To maintain the projected characteristics (performances) of product quality we chose the processes where the influential factors on quality characteristics begin and where we can control them: staff training, the technology projecting, the construction of tools, the development of the product, maintenance, the reception and research of the materials.

4. CONCLUSION

This work has intention of implying to methodology which is available in the quality theory whose implementation reduces the risk of incorrect managing ideas. In the work we give the procedure of implementation of this methodology in the example of helical products, but the methodology is also applicable in other fields of industrial manufacture with some practical adjustments.
The result of the conducted researches are confirmed key processes for production of screws, and by management and control of of the same we enable the surveillance over important characteristics of helical products. The conducted methodology clearly implies to potential causes and factors that can lead to exception from the required values of the characteristics which enables the right selection of the control methodology and learning techniques.

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