Machine-Building Enterprise Work Improvement Based on Application of the Process Approach

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Abstract. Any modern machine-building enterprise is a complex system consisting of many organizational elements with clearly defined functions, boundaries and resources. The size of these resources determines the planned productivity of the enterprise. At the same time, an enterprise is a social system that has non-linear properties, since the human factor is involved. Therefore, situations are possible where even small beneficial changes in the nature of the interaction in the production system can cause a significant increase in productivity. However, situations are also possible when large transformations that consume significant resources do not lead to desired achievements or even worsen the existing state. This article discusses the application of process-oriented thinking in the practical work of an enterprise at all its levels.

1 Introduction

The results of the modern enterprise functioning depend directly on the chosen scheme for activities implementation[1,2]. In practice, the structural model of enterprise functioning in the form of a hierarchy of powers has received the greatest application. Such an organization of human interaction in production has large inertia. Corrections, changes, improvements require a serious investment of time and effort by managers. Especially much time is spent on meetings in order to coordinate the positions of various structural divisions. This model does not, in fact, consider the actions of employees who directly create new values for consumers.

This opportunity is provided by the application of the process approach. The process approach involves the allocation of separate independent types of activities. These activities use the resources and allow management to transform input elements to output. The international standard [3] gives the following definition: "A process is a set of interrelated and (or) interacting activities that use inputs to obtain an intended result."

The input elements of the production process are material objects that can be converted into goods and services needed by the next process. In this case, the next process acts as a user (consumer) of the results of the previous process. Thus, the rule formulated by Kaoru Ishikawa is fulfilled: "The next process is your consumer" [4]. Output elements, in fact, are the results of actions under this process.

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Each process in the enterprise has two roles. It is necessarily someone's consumer and, at the same time, someone's supplier. As a consumer, the process has the ability to expose its internal requirements to suppliers. But at the same time, as an internal supplier, it undertakes to accurately fulfill all the needs of its internal consumers. Thus, within the enterprise, the most important principle of successful business "Customer orientation" is implemented, as reflected in international standards [3]. At the same time, within the enterprise, the relationship "boss - executor" is transformed into interaction according to the rule "supplier-consumer". This is a fundamental difference from the traditional approach to management activities.

The process approach allows you to abstract from the personalities of individual employees and focus on the actions that need to be performed to create the products that the consumer needs. This view captures an important circumstance: the products needed by the consumer are the result of joint activities of employees and appear only with the correct execution of the sequence of necessary actions. With the process approach, cooperative relationships are built, in which the "product" of one process becomes the source material (means) for another process. Or the product of the work of one - methodical or constructive knowledge - becomes knowledge or knowledge means for another [1]. Thus, all activities of an enterprise in general can be represented as a system of interrelated and interacting processes (fig. 1).

Fig. 1. An example of a system of interrelated processes.

In each process, a certain activity of people is carried out, which involves the use of the necessary resources and the presence of control actions to achieve the their goals.

2 Materials and methods

As an initial layout for creating a process model for the functioning of a manufacturing enterprise, the following option can be used, shown in Fig. 2.

Fig. 2. Processes of value creation in the enterprise.

This model presents the basic processes necessary for any organization to fully implement its activities.

The main purpose of the sales process is to find out as much as possible in detail the requirements and expectations of existing and of potential consumers to the products for which they are willing to pay. The manufacturing process should be able to fully meet all the stated requirements and even surpass them, and the procurement process should provide the manufacturing process with everything necessary in a timely manner.

Each process must be described in detail, taking into account the specifics of a particular production. The model being developed should include actually performed actions, and not to “invent” processes. The process description team involves not only the participants in the process itself, but also representatives of the consumer and supplier processes. At the same time, the description of processes and the connections between them should facilitate interactions within the enterprise, and not to complicate them.

It is recommended to adhere to the following sequence of steps for describing processes:

The first step: Formation of a general process model of enterprise functioning, indicating the direction of interactions between processes and the boundaries between them.

Second step: Description of individual processes, which gives an idea of the inputs and outputs of each specific process (its internal suppliers and internal consumers), activities within the process.

Third step: Description of the procedure for performing actions in the process (in production processes, this is a description of the performance of individual technological operations).

Management processes should be described according to the same rules as the processes of material transformations.

For each process should be defined: a "process owner", inputs and outputs of a particular process, resources and control actions, an algorithm of actions in the process. The process owner is responsible for the results of the operation of his process. Therefore, he must be formally given all the necessary powers related to the right to determine the requirements for all internal suppliers of his process. The process owner must continually study, monitor, and analyze the performance of his process. The results of the analysis should be regularly shared with those involved in the process in order to identify opportunities for improvement. The role of the process owner is to organize the activities in such a way that it completely excludes the release of substandard products (provision of inappropriate services). Quality should be an indispensable result of every process [5].

From the point of view of controllability, any production process can be in one of two states: in a stable (controlled) or unstable (uncontrolled) state. A process is considered stable if there are no “special causes of variability” [5,6]. Such a process can be controlled, it can be improved, made more productive, more efficient, more effective. If “special reasons for variability” appeared in the process, then such a process cannot be controlled. In this case, the consequences of control actions cannot be foreseen.

It is possible to reveal the presence and nature of special causes of variability using a special statistical tool - control charts [5,6]. Only participants in the analyzed process can determine the type of special cause when it occurs. External, outside specialists are objectively unable to do this. Therefore, it is important to familiarize the participants in the processes of all levels of the enterprise with the purpose and rules for the use of control charts [7-8]. A useful experience of the practical use of control charts at industrial enterprises in Japan can be found in [9].

The controlled processes are combined into a single production system. The properties of such a system are largely determined by the nature of the interaction between them. The owner of the production system (usually the head of the enterprise) has the ability to modify existing interactions between processes. It is known that the properties of the entire system are largely (by 80%) determined by the nature of the interaction between its elements. Thus, the head of the enterprise, establishing interaction between the processes, gets the opportunity

to influence the productivity of the entire enterprise. In this case, one should act according to the algorithm laid down in the PDCA cycle (Deming cycle) [5] (fig.3).

Fig. 3. Deming cycle.

The Deming cycle is a tool for organizing any activity and its continuous improvement. This tool can be equally successfully used in their work by both the head of the enterprise and the owners of processes, as well as specialists and performers.

At the enterprise level, the Deming cycle is implemented as follows. At the Plan stage, the activities of the enterprise as a whole are planned. The goals and processes necessary to achieve results in accordance with customer requirements are defined. At the Do stage, all the actions provided in the processes for the production of products are performed. If necessary, education and training of personnel is carried out. At the Check step, the level of customer satisfaction is assessed, the parameters of the processes and the characteristics of the products are measured. At the Action stage, actions are taken to improve the characteristics of the product, its production processes and the interaction of these processes within the system on the next turn of the Deming cycle.

This approach to the implementation of the enterprise allows to constantly improve products in the interests of consumers, eliminate losses along the entire production chain, and reduce the cost of producing goods required by customers.

3 Discussion and conclusion

The application of the process approach makes it possible to visualize the actions of people when creating value. A visual representation of the combination of individual processes and their interaction in the form of a general model helps to see a holistic picture of the movement of created products in production without missing any individual important details. This allows to objectively respond to the occurrence of local deviations from plans and promptly carry out corrections, as well as to develop and implement corrective actions.

Process-oriented thinking leads to a more complete understanding by employees of the content and role of their own activities in production. An environment is created in which conditions are formed for creativity, the manifestation of initiative and responsibility.

The employees involved in joint activities are able to realize the potential inherent in the production system to the greatest extent.

Process-based management allows you to take a fresh look at the enterprise. It provides transparency in the functioning of all processes and leads to a different distribution of powers, replacing interactions between departments with interactions between processes.

The result of such transformations and a new vision of production activities is the acquisition of additional competitive advantages by the enterprise. The quality of products is increasing, labor productivity is increasing, losses are decreasing, and production costs are decreasing.

The experience of conducting trainings on the application of the process approach at the enterprises of the Ural region showed that the main obstacle to the introduction of this method is resistance from the top management. The resulting conflict of interest is based on a misconception about the difficulties and inconsistencies in the application of the process approach. Nevertheless, as the practice of Japanese companies shows, the future of successful enterprises lies in the development and application of the process approach.

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