The Factors of Ensuring Sustaining Manufacturing Competitiveness

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ABSTRACT

A strong and advanced industry ensures full competitiveness of the national economy, and innovative and technological renewal of enterprises increases the overall stability of the economy of Uzbekistan. Development aimed at stabilization of economic processes requires the extensive introduction of innovative changes in all directions of production activity based on the achievements of scientific and technical progress. In the article increasing the number of new types of complex products with new consumer characteristics to the market and increasing their quality, factors aimed at successfully solving these problems are shown.

Keywords: Competitiveness, a product with new consumer characteristics, modern technology, factors of competitiveness, economic efficiency, quality of manufactured products, the flexibility of the production process.

Introduction

In order to maintain market share in the conditions of increasing competition, chemical and construction machinery enterprises need to solve several problems - introduce new types of complex products with new consumer characteristics to the market and increase their quality [1-4]. Successful solutions to these problems can be achieved by introducing innovative programs aimed at:

1. Organization of new, highly efficient production, including with foreign participation, by developing and implementing an optimal strategy for the modernization of enterprises and their development based on the news;
2. Introduction of advanced technologies into production processes, equipping with new highly efficient production machines and equipment, and mastering modern and advanced technological management systems in them;
3. Development of the production of new machines and technological equipment that ensures productivity, saving energy and resources (one kilowatt-hour of electricity saved is enough to melt one and a half kilograms of steel);
4. Development of technical regulations and other regulatory documents in technical regulation harmonized with international standards.

Only a strong and advanced machine-building industry ensures the full competitiveness of the national economy, and the innovative and technological renewal of machine-building enterprises increases the stability of the machine-building complex of Uzbekistan [5-9]. Development aimed at stabilizing economic processes in mechanical engineering requires the extensive introduction of innovative changes in all areas of production activity based on the achievements of scientific and technical development [10-15].

Methodology

The level of competitiveness of modern (high) technologies should be evaluated by 3 factors:

1. Economic efficiency;
2. Quality of manufactured products;
3. Flexibility of production process.

Economic efficiency - competitiveness according to economic indicators (labour productivity, cost, resource density, energy intensity, etc.).

Quality is a set of features and characteristics that enable a product or service to meet specific needs.

Production flexibility is the ability to quickly "reset" the technological process, and produce a new type of product, to change its quality [16-21].

Table 1. The main symptoms of modern technology

High efficiency	Scientific
Systematic	Durability / Technical support
Stability and reliability	Provision of highly qualified personnel
Structural-parametric optimization	Computerized technological environment
Mathematical modelling	Environmental cleanliness
Flexibility	High performance and quality requirements

In ensuring high efficiency, functional cost analysis - FXT (Functional cost analysis - FCA, Activity Based Costing -ABC) is a technology that allows you to estimate the actual cost of a product or service, regardless of the organizational structure of the company. Direct and indirect costs are allocated to products and services based on the number of resources required at each stage of production [22-26].

The actions performed in these steps are called functions in the context of the FXT method. Mathematically FXT is written as:

$$\frac{FK}{X} \to max \qquad (1)$$

here:

FK - reflects the totality of the characteristics of the analyzed object necessary for the consumer;

X is the amount of costs necessary to provide the required consumer characteristics.

The purpose of FXT is to ensure that the funds allocated for the production of products are properly allocated to direct and indirect costs. This allows estimating the costs of the company in the most accurate way. It is used as a methodology for continuous improvement of products, services, production technologies, and organizational structures [27-31].

The essence of the method is the element-element development of the structure, dividing the elements into main and auxiliary ones according to the principle of operation. FSA's mission is to achieve the highest consumption characteristics of products while reducing all types of production costs [32-38].

Basic Principles of FXT:

- The consumer is not interested in such a product, but in the benefits of using it.
- Consumers tend to reduce their costs.
- Functions of interest to the consumer can be performed in different ways, and therefore with different efficiency and cost.
- Among the possible alternatives for the implementation of functions, there are options for which the ratio of quality and price is acceptable for the consumer.
- The cost of a function is affected by:
- the cost of implementing the principle of action: energy costs, availability and cost of materials, consequences of side effects, etc.;
- structural features: simplicity of the forms of parts (manufacturing), their relative position and quantity (variety), etc.;
- parameter indicators: material consumption of parts, their dimensions and surface quality, manufacturing and assembly accuracy, etc.

The FXT method is a performance algorithm: the sequence of functions required to produce a product or service is determined. First, all possible functions are defined [37-41]. They are divided into two groups: those that affect the value of the product/service and those that do not. In addition, at this stage, the sequence is

optimized: steps that do not affect the value are eliminated or reduced, and costs are reduced.

1. Total annual costs and number of working hours are determined for each function.
2. For each function, based on the calculations based on above, a quantitative description of the source of costs (cost-driver) is determined.

For example, if the annual costs of operating the press, including direct and overhead costs, are estimated at $250,000 per year, and 25,000 items are passed during this time, then the estimated source of costs cost is $10 per product.

The FCA uses two types of sources to allocate costs:

1. Activity drivers that show how cost object behaviour affects the level of feature detail.
2. Resource drivers that show how activity levels of functions affect resource consumption.

After all the functions are identified with their sources of costs, the final calculation of the production costs of a particular product or service is made.

The technical development of industrial production ensures obtaining the final product and means the change of the technical subsystem, which includes the change of elements such as means, methods and organization of production [439-44]. In the concept of the development of the technical level of production, it is defined from the point of view of the unity of production results: the technical level defines the level of improvement of the material conditions of production, means of labour, technology and organization of production, ensuring the achievement of the specified production results with minimum costs of living and material labour. That is, the technical level of production means the level of technical progress of techniques and technology, including the quality of raw materials and materials, the level of organization and management, and the quality of production.

The tasks of assessing the technical level of production include:

1. Analysis of the technical level and development of technical development plans based on this.
2. Certification of production facilities according to the technical level.
3. Identifying reserves to increase the technical level.
4. Identifying the most backward sectors.
5. Development of technical (innovative) development programs.
6. Definition of technical (innovative) policy.

Evaluation of the technical level of production should be based on the following principles:

– the principle of consistency requires considering the object of assessment as a system of interrelated characteristics of the object and the external environment in accordance with the objectives of the assessment;
– the principle of expediency is that before assessing the technical level of development of the object, it is necessary to form the goal and set the tasks;
– the principle of the optimal number of indicators requires the selection for evaluation of such indicators that provide a sufficient amount of information for evaluation;
– the principle of similarity implies a constant comparison of the properties of the object with similar objects known in the field in order to find a similar object and use it to evaluate its indicators;

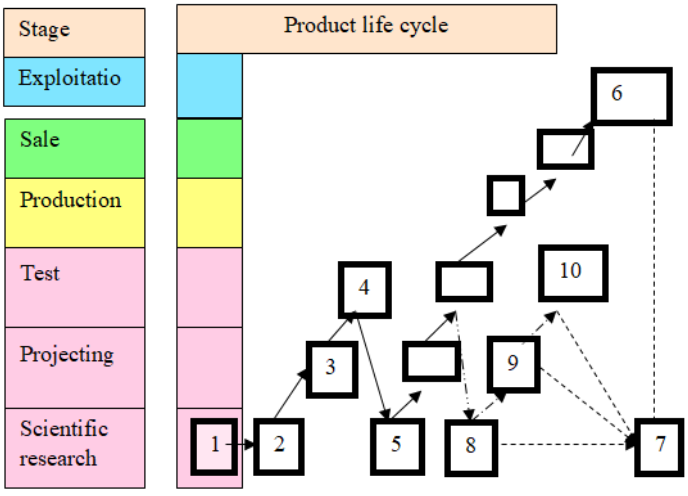

Figure 1. Product life cycle, according to research.

– the principle of priority means taking into account the importance of the features of

the evaluated object when evaluating for a specific purpose;

– the qualitative principle forces the use of level indicators in the evaluation of objects. The level of development is a relative characteristic based on the comparison of the development indicators of the object evaluated in the compared periods or the comparison of the compared objects in a certain period. Thus, as a relative characteristic, the degree presupposes the existence of a base for comparison - the compared period or the compared object.

Absolute indicators describe indicators for a specific time or period. At the instant of time, the absolute values show the state of the event (average age of machines and equipment), for the period - the results of the process (the level of electricity consumption).

Relative indicators are based on the comparison of the development indicators of the comparable objects in comparable periods or in a certain period, the comparison of the absolute indicators of the evaluated and the base (reference) object and serve to evaluate and compare the intensity of technical development.

Similar objects based on absolute values – Relative values or relative value values are derivatives (secondary) of absolute values. The interval scale contains information about how the objects differ in the measured characteristic.

In Uzbekistan, statistical monitoring and assessment of the relevant quality of machines and equipment are organized at intervals: 0-5 years old - new; 5-10 years - outdated; 10-20 years - needs modernization; Over 20 years old - needs to be replaced.

The decisive factor in Uzbekistan's scientific-technological and economic competitiveness is the rapid technological development of production industries. This requires constant monitoring of strategic development, determination of the generalized results of the implementation of programs and activities, and assessment of the level of technological development.

Many processes of innovative product development cannot be managed without a quantitative assessment of the achieved level. This determines the great attention of scientists and industrial practitioners to the development of methods and tools for evaluating the level of technological development of production.

To understand the technological development of the industry, it is necessary to develop a system of methods and indicators for evaluating the level of technological development used at all levels of production organization and management.

They should be in accordance with the following principle: the indicators consistently and adequately reflect the main essence of technological development in units of value accepted in economic practice; use of the existing system of statistics and accounting reports to calculate the received indicators; the use of international statistical rules, the system of national accounts should allow comparison with foreign data; the number of indicators is minimal and at the same time to reflect the process of technological modernization sufficient, not burdened with irrelevant process indicators; indicators should be "from the beginning to the end" from the initial stage of production to enterprise and branch complexes; calculation of final indicators does not require complex mathematical methods,

Compliance with the established principles requires a clear definition of the important features of the latest technologies. They are characterized by the constant growth of capital intensity. Many technologies also require expensive raw materials, and the high productivity of the used equipment leads to a significant increase in the mass of raw materials, materials and equivalent resources involved in the production process.

The newest technologies, as a rule, are characterized by complex mechanization and automation of processes, which leads to a relative (absolute) decrease in the number of employees. This leads to a decrease in the capital of the enterprise spent on live labour, which is accompanied by a high demand for the skills of workers in conditions of automation of production and high scientific intensity.

The highlighted features of modern technological development allow us to propose a methodology for evaluating the technological level of production using three additional indicators:

1. The share of added value in the total volume of the company's products sold as a reflection of the economic effect obtained as a result of the introduction of technological innovations;
2. The share of highly educated company employees in the total number of employees as a reflection of the level of research intensity of production;
3. Functional and cost structure of capital is the main indicator.

Ideally, all three indicators should have positive growth dynamics. If their vectors coincide and the growth rates are as close as possible, then the development of production and the change in its technological level will occur optimally. If only the functional and cost structure of capital increases, and the share of added value decreases, this may mean an underestimation of the human factor. That is, the system of indicators sufficiently reflects the changes and the situation in various industrial enterprises, which are very different from each other in terms of production technologies. It can be assumed that this methodology can be used for facilities whose performance is unknown, including detailed information at the industry and country levels. The aforementioned system of indicators can serve as a tool for predicting results with a certain degree of approximation to possible real data.

Normative (approved or defined) quality indicators at the design and design stage: U_r - the perspective (specified) value of the technical level of the manufactured product, U_{prod} - production quality level at the production stage, $U_{t.m}$ - the quality level at the sales stage, U_{ex} - use The level of performance in the (exploitation) phase, U_{ut} is the quality level in the last phase of the life cycle. As a result, the general indicator of the quality level U_k can be determined as follows:

$$U_k = U_r + U_{prod} + U_{tm} + U_{ex} + U_{ut} \quad (2)$$

It is possible to fundamentally change production as a result of the creation of perfect labour tools and the development of fundamentally new technologies. The development and improvement of any modern production currently require the following:

- creation of automation and robotic systems;
- extensive use of computers;
- extensive use of digital control machines;
- introduction of new technology and equipment;
- creation of automated control systems;
- optimization of technological processes and processing modes; creation of flexible automated complexes;
- creation of new structural materials based on scientific and technical development and their wide use;
- more use of extremely hard, heat-resistant, composite, polymer and other materials in production;
- dramatically increase the technical complexity and reliability of equipment.

The selection of a technological process as a part of the production system in which the scientific and technical development of production is carried out directly creates the prerequisites for finding the objective laws of this development. The next step is to analyze possible options for development, rationalistic or heuristic, to determine the laws of development.

Technical solutions of the rationalistic type have characteristics that describe the technical and economic characteristics of this variant of the technological process:

1) increase labour productivity by reducing the share of real labour costs per unit of production;
2) the increase of past labour spent on the unit of production to increase labour productivity;
3) reducing the efficiency of rational decisions with the development of the technological process;
4) the time and effectiveness of rationalistic technical solutions are limited.

Thus, the law of rationalistic development of the technological process can be formulated: in the course of the rationalistic development of the technological process, direct replacement

of real labour spent in the technological process, labour working in mechanisms, that is, is replaced by past work.

If we calculate these costs for one employee, we take as an indicator the number of jobs previously performed by one person working in the technological process. This technological equipment - Y as a parameter of "technological labour" indicates the amount of past work carried out for the work of one person working in this process.

Conclusion

- In ensuring high efficiency, functional cost analysis is a technology that allows you to estimate the actual cost of a product or service, regardless of the company's organizational structure.
- The selection of a technological process as a part of the production system in which the scientific and technical development of production is carried out directly creates the prerequisites for finding the objective laws of this development.
- The level of technological development is represented by the levels of technological impact, technological intensity, technological organization and management, and technological adaptation.
- In mechanical engineering, modern technology represents logic, dynamic changes, internal and external supply and means of production, technological development and interaction of management and organic relations.
- The selection of a technological process as a part of the production system in which the scientific and technical development of production is carried out directly creates the prerequisites for finding the objective laws of this development.

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