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ORGANIZATIONAL AND TECHNOLOGICAL PROBLEMS OF MATERIAL BASE MODERNIZATION OF RUSSIAN ENGINEERING

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Abstract

This article describes the current organizational and technological problems of modernization of engineering in Russia, assessed the current situation of the industry and the degree of implementation of scientific and technical development and the level of preparedness of personnel in their selection and application in the enterprise. The study examines the degree of state participation in modernization and the level of involvement of the company's management in strategic business planning and assessment of its potential in the global market. Intersectoral reserves are shown to increase the technological level of engineering enterprises. Ways to increase the competitiveness of enterprises and reach a new level have been developed. The most favorable concept of enterprise management was thought out, there the functional responsibilities of all management personnel were clearly delineated. The dynamics of technical and economic indicators was formed on the basis of the Russian Federation and, in particular, the Samara region. It was revealed that the growth of automation does not produce the expected effect without an outstripping growth rate of workers' qualifications. In the framework of the implementation of the new equipment highlighted the importance of innovative equipment that can significantly streamline your workflow and provide "know-how" in the modern tendencies that can compete with global peers and to take a leading position. The importance of prioritizing costs was emphasized, because it is one of the conditions of the integration of leading industries in technological environment and the correct course of action is the key to successful and competitive business.

Keywords: Modernization, innovation, technology, engineering enterprises, organization.

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1. Introduction

In the current conditions of economic transformation, engineering plays a special role, since it is this industry that ensures the country's economic growth and its defense capability. It is important to note that the share of engineering in production is only 20%. While in foreign countries – from 36 to 49%. Therefore, more and more urgently there is a need to modernize enterprises and introduce new management methods (Tatarskih, 2016).

Modernization implies an “upgrade” of the material base of mechanical engineering, which leads to enormous financial costs in connection with the necessary research. In fact, industrial enterprises operate on the basis of obsolete equipment, the obsolescence of fixed assets is 65-75%. In this case, we are talking not only about increasing the level of profitability from 25%, but also about carrying out systemic modernization, which is based on the emphasis on innovative activity of enterprises. Therefore, engineering as a factor in increasing the country's economic potential should effectively deal with a number of organizational and technical problems in modernizing the material base of enterprises. (Vishnyakova, 2018).

2. Problem Statement

When carrying out modernization of the domestic machine-building complex, enterprises face a number of problems:

- Complexity in the system management of the engineering complex, which includes forecasting, planning, organization, coordination, motivation, accounting, control. In practice, there is an urgent need for management personnel that can develop effective risk control measures (Arenkov, Smirnov, Sharafutdinov, & Yaburova, 2018).

- The illiteracy of managers, which leads to a crisis situation and, as a result, to the low competitiveness of the enterprise, which also leads to the loss of sales markets and low attractiveness for investors; (Edquist & Borras, 2013).

- Lack of comprehensive support for engineering, including personnel, information, scientific and innovative support. In view of the rational distribution of funds, priorities are not always set in the direction of the desired structural unit;

- Issues of intersectoral specialization and interaction of enterprises with each other: engineering development strategies should be determined at the federal level and at the level of individual regions, in which the main goals and sources of investment of enterprises will be clearly stated;

- Low capacity utilization: only 25% – 40%;

- Insufficient use of scientific and informational potential of industrial research institutes and scientific and technical centers of large enterprises;

- The lack of competitiveness of engineering products, since in practice only about 4-5% is exported;

- A previously thought-out system for maintaining personnel potential was not economically thought out.

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Everywhere, the problem of downgrading the importance of branch science within the framework of research centers remains, having a high scientific potential and an experimental experimental base for solving the problems that arise when creating new products. Often, regions of the country do not use the experience of other districts in practice, and innovation activities by the federal authorities are not sufficiently funded.

In an age of rapid technological development, enterprises still use manual labor, as a result, mechanical engineering is characterized by a slow increase in the level of automation. For more than 30 years, enterprises have been resolving equipment problems only “at the moment”, but have not invested in the purchase of new and innovative equipment.

Finally, the main and unsolved problems are still associated with the lack of the necessary information base. It hinders the analysis and forecasting of risks of industrial enterprises, and builds a chain of other problems that adversely affect the effective and efficient activities of companies.

3. Research Questions

In the process of research, a number of questions were considered:

- What factors slow down the process of modernization of the material base of mechanical engineering?

- How does the state contribute to the implementation of scientific and technological developments in the industry? How effective is enterprise support?

- How can organizational and technological problems of modernization be solved? What are enterprises doing to date?

4. Purpose of the Study

The main objective of the study was to analyze the trends in the development of mechanical engineering in Russia. Also, an assessment of the current state and degree of equipment of the material and technical base of enterprises. As a result, the identification of organizational and technological problems that impede the modernization of engineering.

5. Research Methods

To this end, the statistical data were studied according to the degree of equipment of enterprises and the introduction of scientific and technological developments in their activities. As well as the methods and ways of modernizing enterprises were compared taking into account their potential. Results were appreciated.

6. Findings

In Russia, most enterprises are little adapted to the changes and implementation of scientific and technical progress, since the focus of attention is not focused on innovation. As many as 44% of enterprises do not have new products and do not invest in development. And only 3% of companies are guided by the

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world market and rely on original products. According to the experience of international companies, project financing can be carried out not only by the state. But in this case, the enterprise must demonstrate its innovative and strategic development path, thereby confirming its potential (Tatarskih, 2018).

It is important to correctly classify the functions of technological potential management. They form two main blocks:

1.Internal functions: at the enterprise level, it is necessary to analyze the potential, evaluate and predict the level of equipment and implementation of scientific and technical progress, conduct accounting and control over technological development;

2.External functions: at the industry and inter-industry level, analyze trends in the development of scientific and technical progress, forecast innovative potential, strategically plan the development of the material and technical base and coordinate research institutes.

An important aspect is the interest of participants in the modernization of the enterprise. In this case, the process must be coordinated in the hands of a professional in order to prevent spontaneity and "chaos" in the company. The role of the coordinator should be fulfilled by the state, since the solution of tasks for the further development of the machine-building complex is possible with sufficient funding from the state. Foreign investors cannot fully change the current situation in Russia (Khrapov & Turchaninova, 2017). By following the dynamics of changes in the indicators of the development of engineering, we can confirm the fact that over the past 15 years, the basic technical and economic indicators characterizing the innovative potential of the main resources of the enterprise have decreased. The result is presented in table 01.

Table 01. Dynamics of basic technical and economic indicators of the development of engineering in the Russian Federation and the Samara region

№	Indicators	Years					
		1995	2000	2005	2010	2015 assessment	2020 forecast
1	Updating of fixed industrial production assets, %	0,6/0,7	1,0/ 1,1	**1,9/2,1** 1,9/ 2,1	2,0/ 2,2	2,5/ 2,6	2,8/ 3,1
2	The proportion of the most important types of world-class products in the total volume of their production, %	4,0/ 14	4,2/ 6,8	6,0/ 9,0	9,0/ 15,0	10,0/ 11,0	11,0/ 12,0
3	Updating of products, %	4,0/ 4,6	4,2/ 4,7	4,7/ 6,3	6,0/ 7,9	8,0/ 9,0	8,5/ 9,2
4	The proportion of equipment equipped with microprocessors, %	3,2/ 3,9	3,2/ 4,0	4,1/ 6,0	4,5/ 7,0	9,0/ 10,0	12,0/ 14,0
5	Electricity labor of workers, thousand kW · h	14,0/ 15,3	14,4/ 17,0	15,0/ 17,8	15,8/ 17,9	16,0/ 17,5	17,6/ 18,9
6	The average age of the main technology equipment, years	21/ 18	22/ 18	20/ 18	18/ 16	18/19	17/16
7	Design Automation technological work,%	11/ 13	12/ 14	14/ 16	16/ 19	25/ 29	29/ 32
8	The proportion of manual workers labor, %	25/23	23/21	22/20	18/16	14/12	12/10

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9	The proportion of investments in the experimental base in the volume of all industrial capital investments, %	3,0/ 7,0	3,0/ 7,0	4,5/ 8,0	5,5/ 9,0	6,6/ 7,4	6,9/ 7,8
10	The utilization of metal (including in procurement)	0,1/ 0,71	0,71/ 0,72	0,73/ 0,74	0,73/ 0,73	0,74/ 0,74	0,75/ 0,76
11	The proportion of metal substitutes in the total volume of structural materials (by weight),%	1,4/ 4,0	1,5/ 4,0	1,8/ 4,5	2,0/ 5,0	3,2/ 5,0	3,9/ 5,3

This is due to the fact that enterprises have a high proportion of worn-out equipment, and its service life is more than 20 years. So, the existing equipment cannot provide a high quality product, and from here it does not allow it to reach the world level, increasing competitiveness.

It is also worth noting that in the engineering industry of Russia the production of equipment for the development of modern electrical technologies has significantly decreased: over the past 16 years, the volume of production of such equipment has decreased by 6-7 times (Tatarskih, 2018).

In the process of managing the acceleration of the creation of innovative engineering products, it is important to prioritize the costs associated with the production of these products relative to the significance of these stages in the production of products. These include: costs of marketing research; costs for forecasting scientific and technological progress; information service costs; research costs; costs of new technologies; development costs; the cost of acquiring new equipment and new materials.

A comprehensive state scientific and technical resource saving program is required, the implementation of which is possible with appropriate investment support from the federal structures. A more efficient use of technological and production potential is needed to solve the problems of increasing the level of energy and metal output in the country's engineering complex.

7. Conclusion

Thus, the modernization of the material base of machine-building in Russia is proceeding at a slow pace due to organizational and technological problems that impede enterprises and prevent access to the world market. It is important to pay particular attention to the degree of wear of equipment that is not able to produce an innovative and competitive product. It must be remembered that the key to successful modernization lies with the top management of enterprises and the degree of their involvement in the process. Therefore, the whole process needs to be coordinated as a whole, and not its individual elements, and not to miss all the potential that Russia has, in particular, the state should allocate sufficient financing to enterprises in order to be able to enter the global technological environment through integration.

High wear and tear of equipment inhibits the development of new working methods, which reduces the overall efficiency of enterprises and does not ensure the proper quality of products. We found out that promising directions of accelerating the development of domestic engineering can be: systemic re-equipment of the production and technical base, improvement of functional production and economic relations, industrial policy and structural optimization.

References

Arenkov, I. A., Smirnov, S. A., Sharafutdinov, D. R., & Yaburova, D. V. (2018). Transformation of the enterprise management system in the transition to the digital economy. *Russian Journal of Entrepreneurship, 19*(5), 1711-1722. [in Rus.].

Edquist, C., & Borras, S. (2013). The choice of innovation policy instruments. *Technological Forecasting & Social Change, 80*(8), 1513-1522.

Khrapov, V. E., & Turchaninova, T. V. (2017). *Search for an effective mechanism for spatial innovation development of engineering enterprises of the arctic coastal region*. Apatity, Russia: Russian Academy of Sciences Kola Science Centre. G.P. Luzin Institute for Economic Studies.

Tatarskih, B. Y. (2018). Problems of improving development management machine-building complex of the Russian Federation. In V.N. Lazareva, B.Y. Tatarskih (Eds.), *Proceedings of the VIII International Scientific and Practical Conference «Organizational-economic and innovative-technological problems of modernization of the Russian economy»* (pp. 3-13). Penza, Russia: Penza State Agrarian University. [in Rus.].

Tatarskih, B. Y. (2016). NTP and organizational and economic problems of development material and technical base of engineering in Russia. *Economy and Sociology, 3*(31), 34-41. [in Rus.].

Vishnyakova, A. B. (2018). Increase of innovative potential of the enterprises of a machine-building complex. In V.N. Lazareva, B.Y. Tatarskih (Eds.), *Proceedings of the VIII International Scientific and Practical Conference «Organizational-economic and innovative-technological problems of modernization of the Russian economy»* (pp. 24-31). Penza, Russia: Penza State Agrarian University. [in Rus.].