

Import substitution in forest engineering as an indicator of the development of the forest sector of the Russian economy in modern conditions

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Abstract. The purpose of this article is to substantiate the need for the development of domestic engineering for the forest industry, to study the problems and tasks of developing domestic engineering for enterprises in the forestry sector of the economy. The necessity of import substitution in the production of equipment for key branches of the domestic timber industry is argued. Possible ways to bring the industry out of the crisis are proposed based on: the need to analyse the causes of the destruction of domestic forestry engineering; determining measures to ensure the revival of branch science and the development of forestry engineering. As a result, proposals are presented on regulatory and legal support, the purchase of samples of imported equipment in order to study and independently manufacture a similar product in the future. Further development of the industry should be based on resource-saving technologies and "green" technologies for waste processing and a circular economy. On the basis of educational institutions or as independent organizations, it is necessary to create research, research and production centres of the industry. The sanctions announced to Russia are a challenge of the times, contributing to the development of domestic science and forestry engineering. Right now it is necessary to develop the economic base of the timber industry and forestry. The aggressive policy of foreign manufacturers of forestry equipment to conquer the Russian market exacerbates the task of restoring the competitiveness of forestry engineering on innovative principles and increasing its role in the Russian timber industry.

1 Introduction

At present, the Government of the Russian Federation has identified as one of the key goals of its activities the increase in the level of competitiveness of the domestic industry in the world markets. At the same time, in order to achieve this goal, it is necessary to increase the level of technological development of the entire industry of the Russian Federation, especially its key industries.

The forestry engineering industry includes enterprises specializing in the production of machinery and equipment for harvesting, processing, and transporting forest resources. For

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the domestic timber industry complex characterized by a low level of provision with domestic machinery and equipment. In order to ensure the technological development of the domestic timber industry complex, a theoretical study of issues related to the development of domestic forestry engineering is necessary [1].

From January 1, 2022, a ban on the export of roundwood will be introduced, which should support and stimulate the development of processing within our country. The increase in production volumes of the timber industry complex is laid down in the Industry Development Strategy until 2030. However, only in terms of machine tools and technologies, the industry is predominantly import-dependent (up to 100% in some segments). This is due, first of all, to the fact that there is simply no domestic equipment, and the one that is available is outdated and does not meet modern requirements either in terms of productivity or product quality.

2 Materials and methods

Russia, as a forest power that owns almost a quarter of the world's forest reserves, cannot effectively develop the forest sector of the economy without its own material base for forest engineering.

In this article, we consider possible ways to bring the industry out of the crisis based on:

- the need to analyze the causes of the destruction of domestic forestry engineering.
- determination of measures that ensure the revival of branch science and the development of forestry engineering.

3 Results

According to the approved "Strategy for the development of the forest complex until 2030" ("Strategy-2030"), the volume of annual investments by timber processing companies in equipment is estimated at 31 billion rubles, including 25 billion invested by enterprises of the pulp and paper industry, and 6 billion is the price of equipment for logging companies. The share of imported equipment for the pulp and paper industry is 95 percent, for logging equipment - 60%.

But in our country, equipment is practically not produced both for pulp and paper industry (digesters, drying equipment, soda recovery boilers), and for logging (harvesters , forwarders, feller bunchers and feller skidders, wheeled skidders). Domestic enterprises effectively compete with foreign ones only in the segment of freight vehicles, where the share of domestic enterprises reaches 80% (figure 1) [2].

The reason for this situation is that scientific industry organizations have practically collapsed, there is no research and development. The science of the timber industry complex ceased to exist as early as the early 1990s, and not only regional research institutes, but also the central forest industry, woodworking industry, and the wood chemical industry. Lagging behind the forestry science of Russia from the world leaders today is dozens of years [3].

Following the collapse of the USSR, the collapse of large timber enterprises into many small ones deprived domestic forestry engineering enterprises of the vast majority of consumers of their products. In those years, the owners of forest enterprises were well aware that there were no guarantees in the future. Therefore, practically no one made long-term plans for the development of enterprises, did not bother with the problem of updating the machine park. They tried to snatch more and faster, using the machines and equipment left over from the Soviet era. However, this was not only the case in the forest sector of the economy.

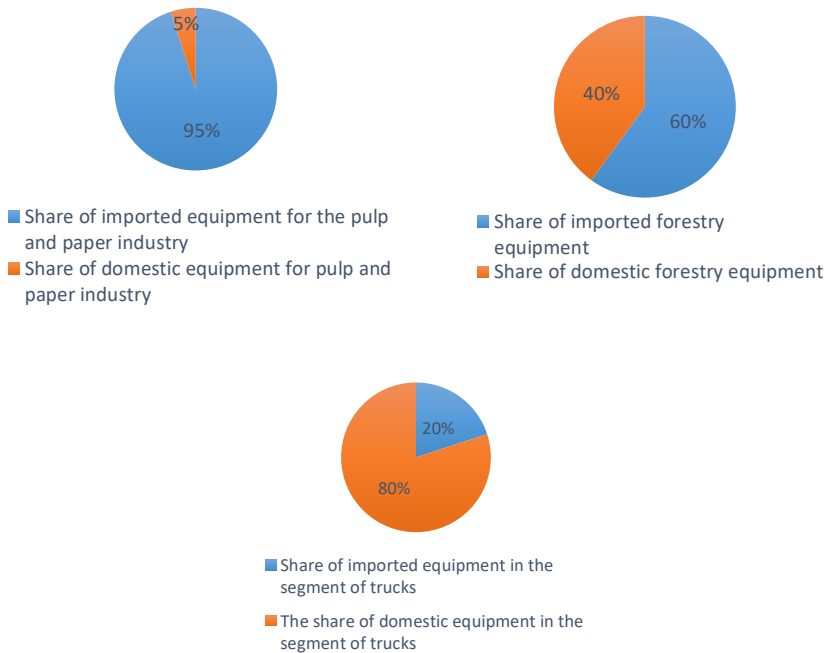


Fig. 1. Shares of imported equipment by main segments of the forestry sector of the economy.

Having turned into joint-stock companies, having lost state orders and orders from machine-building enterprises, branch research institutes and design bureaus ceased to exist.

One of the main reasons for the lack of demand for domestic engineering products are the mass processes of disaggregation of timber enterprises (timber enterprises, associations) and the emergence of numerous small-scale loggers during economic reforms.

The vast majority of small-scale loggers do not have the financial means to purchase equipment and use worn-out, handcraft-repaired, and in many cases even agricultural equipment in the forest [4].

Today, timber harvesting in Russia is carried out with imported saws and machines. There are practically no capacities for the production of this equipment in Russia. In the "know-how" of the design and production of modern forestry equipment, we are catastrophically behind.

The main directions of scientific and technological progress in the logging industry were formulated by Doctor of Technical Sciences, Professor G. M. Anisimov. He considered scientific and technological progress as a single, interdependent, progressive development of science and technology of an industry or sub-sector, which is the basis of social progress, based on science and technology, mutually stimulating and accelerating the development of each other. The scientific and technological progress of any industry is determined by the progressiveness of production technology, the technical level of the machines and equipment used, and the optimality of organizational and technological measures [5].

In developed branches of mechanical engineering, for example, in the defense industry, scientifically based forecasting systems have been developed: production technology, technical level and potential properties of developments or objects, search for progressive technical solutions. There is a general forecasting theory that provides for three types of forecasts: short-term, medium-term and long-term, which consider development trends and the expected future state of the forecast object for periods of 5–10, 10–15 and 15–25 years, respectively. In the forest industry, the lack of a clear technical policy, developed and

legalized concepts for the development of sub-sectors has led to stagnation, technical and economic dependence on foreign producers [6].

Indicators for assessing the technical level of forest machines have not been developed, similar to those existing, for example, in agricultural engineering, the values of which are approved by industry standards. In the logging industry, it is necessary to forecast: stages of development and implementation of advanced technologies, types and systems of machines, applied technical and design solutions, their parameters and potential properties.

Here is a quote from the works of Professor G. M. Anisimov: “The scientific and technological progress of the logging industry should be aimed at finding fundamentally new technical solutions, layout diagrams of individual machines and machine systems as a whole, capable of providing a technological breakthrough in logging operations in the future, which is possible if there is a flexible technology that allows the technologist of the lumber station to change the technology of work, ensuring production efficiency with the maximum use of tree phytomass” [7].

That is, at present, in the conditions of well-known economic difficulties, it is necessary to develop a real concept for the creation of a domestic logging machine complex, which can be implemented.

The lack of competitive domestic developments, technologies and equipment causes significant damage to the Russian economy. Under such conditions, the import substitution program, which the Russian government took in 2014, is essentially not working in the timber industry.

The intensity of research on the topics of the forest complex in Russia is at a low level. The same "Strategy-2030" reports that R&D spending is about 0.01 percent of the GDP of the forest industry, which is significantly lower than foreign counterparts. With an average forest R&D expenditure of 1.4 percent of forestry GDP, this figure is as high as 2 percent in Finland and 3.1 percent in Norway (figure 2) [2].

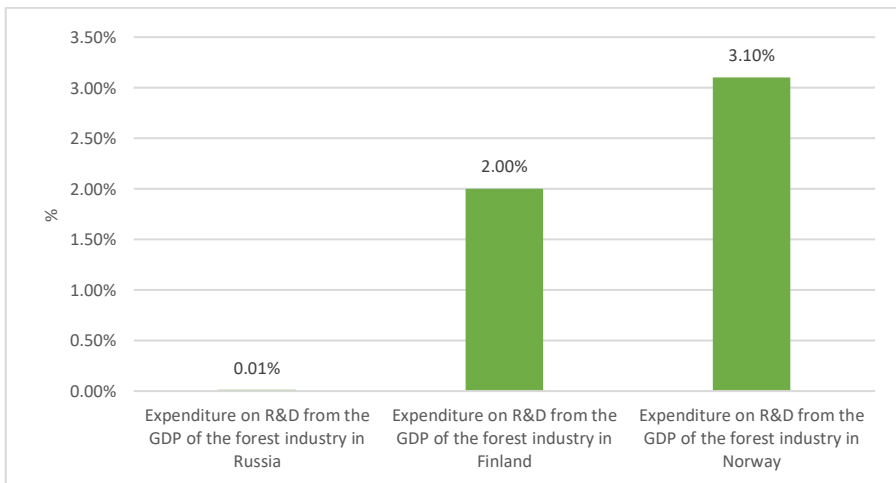


Fig. 2. Expenditure on R&D as a percentage of the GDP of the forest industry by country.

This is the main problem of the forest complex, which should be addressed by both the state (as the owner of forests) and the forest business, which is interested in advanced technologies. Now Russian enterprises are completely dependent on Western technologies and equipment. There is a solution, albeit not an easy one: it is necessary to revive the sectoral science of the forest complex.

It would not be an exaggeration to say that similar problems are characteristic of many sub-sectors of Russian engineering, but they are most acute in forest engineering.

Answering the main question: what measures to determine for the development of domestic forestry engineering, we must first of all know what the logging equipment of tomorrow should become, what are the Russian and world trends in the development of forestry engineering.

Using the materials of scientists and practitioners, it can be noted that at present the fleet of forest machines has many types and models. An analysis of the range of logging machines shows that foreign companies offer consumers more than 200 models, including various skidders, harvesters, forwarders [8].

With all the variety of machines offered for the forest, there is reason to predict that for a long time (20-30 years) the tree-length and cut-to-length harvesting of wood will remain, therefore, the design of the equipment will have to correspond to these technologies (including by about 30-40 % - whiplash technology).

Based on the trends in the global development of machinery and technology, it can be expected that more than 60% of forest machines will be manufactured on wheels and distributed mainly in three standard sizes:

- light class vehicles (from 5 to 10 tons);
- middle-class cars (from 10 to 13 tons);
- heavy class vehicles (from 15 tons).

These types of machines will meet the needs of large companies as well as small and small businesses.

The demand for forestry equipment in Russia in the near future should be provided by domestic manufacturers. They will have to develop and enter the domestic market with a new generation of equipment with a wide range of mass capacities and geometric parameters, competitive in terms of price / quality [9].

In order to create and produce domestic forest machines of a high technical level and ensure their competitiveness in the market, it is necessary to develop a new guiding document, which will present a system of technologies and machines for the integrated mechanization of logging production, taking into account regional characteristics in terms of natural and production conditions.

In the future, the forest industry of our country should become one of the priorities of economic development, and this task can be achieved through the development of forestry engineering.

Of course, in order to budge the Russian engineering and machine tool industry for the forestry sector of the economy, one cannot do without the adoption of a number of regulatory legal acts. A big step in this direction has already been made: the Strategy for the Development of the Forestry Complex until 2030 for the first time included a section dedicated to the provision of machinery and equipment. But it is impossible to put an end to this. It is necessary to approve the document “Fundamentals of the state policy of the Russian Federation in forestry engineering”, in which it is necessary to designate the terminology for more productive further work. If earlier forestry engineering was understood mainly as logging equipment, today it makes sense to talk about the totality of enterprises and organizations producing products, products and services in the field of technological equipment for forestry, forest management, logging, timber processing, timber transportation and timber monitoring, warning and extinguishing forest fires [10].

The second separate document may be the Strategy for the Development of Forest Engineering. In 2020, the Strategy for the Development of the Machine Tool Industry for the period up to 2035 was adopted, but, unfortunately, it did not include equipment for timber processing. In this case, the industry needs its own similar document, which will take into account the causes of the crisis in forestry engineering:

- physical and moral depreciation of equipment and technologies of forestry engineering;

- aggressive market intervention by Western forestry engineering firms (John Deere, Ponsse and others);
- the collapse of branch science;
- lack of financial resources;
- shortage and aging of professional staff.

The document should reflect the following:

- in-depth study of internal and external market conditions,
- restoration of sectoral science on the basis of the State Scientific Center;
- financial support for enterprises in the production of new technologies and machines;
- grant support for the creation of innovative technologies corresponding to the world level;
- foreign economic integration of the creation of joint ventures;
- solution of the emerging problem of utilization of forestry equipment.

In addition, it is necessary to develop an intersectoral program for the development of production and import substitution based on research: it is necessary to study, with the involvement of science and with the participation of all interested departments and organizations, what kind of equipment is imported to Russia and what kind of equipment could be produced by ourselves, taking into account our own capabilities [11].

There is also a need for a joint program with the Ministry of Industry and Trade to support the domestic machine tool industry and draw up a list of the most popular wood processing machines that consumers will probably buy.

In addition to proposals for regulatory and legal support, it is also possible to implement such an idea to support the industry as the purchase of samples of imported equipment in order to study and independently manufacture in the future a similar, and ideally better, product. And clearly, the stake in the further development of the industry should be placed on resource-saving technologies and "green" technologies for waste processing and the circular economy [12].

Obviously, the time has come for the Union of Mechanical Engineers of Russia, the Association of Forestry Engineering, with the support of the Ministry of Industry and Trade, to initiate the development and adoption of an appropriate Government program to support and develop the forestry segment of engineering.

Developments and their implementation into reality, or, in other words, research and development work, is another facet of the domestic machine tool industry, which is closely related to both "forest" education and the personnel issue [13].

It is necessary to talk about scientific developments exclusively in connection with forest education. As practice has shown, separate research institutes are not viable: as long as there are orders, they work, if not, they are retrained or closed. Without orders and funding, young cadres leave them, and without their opinion, even taking into account the willingness to engage in scientific work of experienced and aged specialists, it will be difficult to make a breakthrough. The strategy for the development of the forest complex until 2030 provides for the creation of at least 3 research consortiums - innovation and technical centers corresponding to the world level, on the basis of which the issues of coordinating scientific research, creating technologies and training personnel should be combined. And it is necessary now to create such centers, at least one, on the basis of forest universities with mandatory financial support, since educational institutions do not have the opportunity to independently finance such activities. There should be a single center for coordinating all research and development with the possibility of testing them in practice. Here, research and educational centers in Germany serve as a good example: all engineering centers there are based on leading universities [14].

On the basis of educational institutions or as independent organizations, it is necessary to create research, research and production centers of the industry. With the involvement of

private capital and with the support of the state. It is not possible to make a breakthrough in the forest industry without personnel, without research institutes, without scientific and experimental forestries and bases, without forest machine building.

4 Discussion

Domestic forest engineering is the economic base of the forest industry. The sanctions announced to Russia are a challenge of the times, contributing to the development of domestic science and forestry engineering. Right now it is necessary to develop the economic base of the forest industry and forestry [15].

It is necessary to highlight several synergistic effects that a developed domestic engineering industry provides. First, it allows you to reduce the cost of equipment for business. Imported equipment is more expensive due to import duties and transportation costs. Reducing the cost of equipment will increase the efficiency of investments, which will affect the cost of the final product. The competitiveness of forest products in the world market is determined by the price, while one of the essential components of pricing is the depreciation of technological equipment. Secondly, the reduction in the cost of equipment will make it more accessible to a wide range of businesses, which will increase the output of forest products and increase the capital- labor ratio of Russian enterprises. Thirdly, a developed industrial engineering will contribute to the national economy and industry, not to mention the creation of additional sources of tax revenues and jobs. Thus, the presence of a developed domestic industry of mechanical engineering makes it possible to increase the efficiency of the timber industry complex and its sustainability [9].

The development of new models of equipment should be carried out taking into account the peculiarities of the natural and production conditions of the forest fund of Russia, while focusing on the developments made in domestic scientific and educational institutions. For example, at the Faculty of Forestry Engineering of St. Petersburg State Forestry University, within the framework of the scientific school “Innovative developments in the field of logging industry and forestry”, in recent years alone, more than 50 new technical and technological solutions have been developed at the level of inventions and utility models that allow significantly increase the efficiency of forestry and logging, woodworking operations [16].

Thus, it cannot be said that over the past decades there have been no attempts to create new models of equipment and machine tools, but they have not become widespread in the domestic timber industry. There are two reasons why Russian industry machine-building companies have not been able to take a dominant position in the market: either the products do not meet modern requirements, or Russian manufacturers have not been able to build a sales and after-sales service system for their equipment. In practice, the latter is the most common.

Unfortunately, Russian equipment manufacturers do not know how to promote their products on the market and are greatly outperformed in this area by foreign manufacturers who have significant advertising budgets and a proven technology for working with the target audience.

This problem is complex for Russian equipment manufacturers and is associated with a low level of training of sales personnel, with unclear positioning of equipment on the market, and with insufficient advertising budgets. Ultimately, Russian equipment manufacturers often lose out to foreign competitors even with lower product prices and better quality [17].

The support program for the timber industry machine building should include elements of stimulating purchases in the form of affordable loans for the purchase of domestic equipment. This form of support will be a serious incentive for enterprises in the forest sector of the economy.

When bringing new domestic machines to the market, the state, as the owner of the forest resource, should act as a customer for the development and production of the machines and equipment necessary for the industry. The Ministry of Industry and Trade does not understand that timber enterprises will not buy unfinished machines, in fact, prototypes, and engage in their further development. That is why they are now buying imported machinery and equipment, which immediately give a clear and understandable return. Therefore, if state-owned enterprises start ordering and working on domestic cars, then business will be able to evaluate them in work. It should also be noted that, for example, in Finland, any innovation goes from university to production. In Russia, these ties are severed. A real program of scientific research should be created in Rosleskhoz and the Ministry of Industry and Trade, in which leading branch universities and scientific schools should be involved.

5 Conclusions

The aggressive policy of foreign manufacturers of forestry equipment to conquer the Russian market exacerbates the task of restoring the competitiveness of forestry engineering on innovative principles and increasing its role in the Russian timber industry.

All this, in turn, is possible only with a sufficiently high level of development of forestry engineering enterprises.

It is forest machine building that can give the forest complex of Russia a new impetus for development, and there are all prerequisites for this.

The main task of the development of domestic forestry engineering is due to the fact that without its solution, the problems of effective development of the colossal forest resources of the country cannot be successfully resolved. Developed forestry engineering is an indicator of the development of the forest complex of any country. High mechanization of labor is the key to the growth of volumes and quality of products. At the same time, the lack of supply of the industry with the necessary amount of equipment is serious.

Thus, the development of the forest sector of the economy must be considered in conjunction with the development of forest engineering and forest science. The acuteness of the task of developing domestic forestry engineering is due to the fact that without its solution, the problems of effective development of the country's forest resources cannot be successfully solved.

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