

The Significance of the Resource Intensity of the Regional Economy the Development of the Oil and Gas Chemical Complex

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Abstract

Directions for the development of the regional petrochemical complex are directly dependent on the resource availability of the region's territory, the level of their development, the amount of explored reserves, the volumes of extraction and rationality of use. The development and justification of the priority areas for the development of the petrochemical complex of the region for individual industries, industries and enterprises, based on the assessment of the efficiency of the use of the territory's resources, is an important element in determining the development vector of the social and economic system of the region as a whole. The petrochemical complex of the Republic of Tatarstan includes enterprises of various petrochemical industries that produce virtually the entire range of petrochemical products. On the territory of the republic, a program has been developed and implemented that ensures sustainable reproduction and development of the mineral and raw materials base of the region, involving newly discovered minerals in the economic circulation. They allow replacing imported mineral raw materials or competing in the world market for the sale and consumption of mineral resources, products of their processing. The Republic of Tatarstan also possesses significant water and energy resources necessary for intensification of extraction and processing of raw materials by enterprises of petrochemicals. As a result of the analysis of the functioning of the petrochemical complex of this region, it was revealed that, based on the explored reserves of mineral resources, the most promising branches of the petrochemical industry are the production of organic synthesis products, which is the basis for the export of the Republic of Tatarstan. The petrochemical complex of this region is successful due to the situation on world commodity markets. The demand for mineral fertilizers and the production of organic synthesis chemistry demonstrates sustainable growth rates. The high degree of depreciation of fixed assets (more than 50%) and the insufficient level of investment are impeding the efficient functioning and dynamically developing of the petrochemical complex of the Republic of Tatarstan. In addition, the petrochemical industry is highly dependent on tariffs for the services of natural monopolies (gas, electricity), which will inevitably increase, including very significantly (to the level of European ones) due to the prevailing international situation and the natural process of the evolution of the world economy. All this can adversely affect the competitiveness of Tatarstan's petrochemical enterprises.

Keywords: Regional economy; Oil and gas chemical complex; Management of the economic system; Regional economic relations.



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1. Introduction

At this stage of development of the petrochemical complex of the Republic of Tatarstan and the achieved level of resource use, after identifying the resource potential and competitive advantages of the territory, it is expedient to determine the main directions for increasing the efficiency of its use and development of the petrochemical complex enterprises. Among the priorities, the most significant, according to the author, are the following:

- Reconstruction of granulation departments and warehouses, in order to increase the quality and output of granulated fertilizers, which are in greatest demand on the federal and world markets;
- Development of ore bases, through the construction of mines and quarries;- mastering of modern methods of extraction of resources, with the purpose of increase of efficiency of development of deposits;
- Introduction of advanced production technologies and deep processing of raw materials, including in the field of secondary processing recycling and waste recycling;
- Strengthening of interrelations within the petrochemical complex, involving new entities with the aim of providing the enterprises of the complex with the petrochemical complex, involving new entities with the aim of providing the enterprises of the complex with the necessary raw materials and resources for the development of

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production and the production of new types of products, and also for reducing the import of raw materials (for example, petrochemicals);

- Increased investment in the reproduction of the mineral and raw materials base of the region's territory, including at the expense of enterprises of subsoil users;
- Reduction of the negative impact of the petrochemical complex on the environment, both in terms of ensuring the environmental safety of the population and the social comfort of human life (Beilin and Arkhireev, 2009; Enright, 2003; Laptev, 2018).

2. Methods

The PERT method is often used in project management and process analysis. The PERT method is a tool that calculates the expected duration of a project or a single process. The PERT method and the critical path method are fundamentally different in their application. The critical path method is used to estimate the completion time of the entire project or groups of interrelated tasks, and the PERT method is used to estimate the duration of individual tasks (Beilin *et al.*, 2006; Beilin and Arkhireev, 2009; McDonald and Reitano, 2016; Porter, 1998).

The very idea of the method is very simple - in order to assess the time of the task or process, you need to know the optimistic, pessimistic and most probable estimate of the duration of this task. The PERT formula looks like this:

$$E = \frac{(O + 4M + P)}{6}$$

- O - an optimistic estimate of the duration of the task,
- M - the most probable estimate of the duration of the task,
- P - a pessimistic estimate of the duration of the task.

This equation is a weighted average, where the most probable estimate of duration has a weight four times greater than an optimistic and pessimistic estimate. This approach prevents too much distortion in one direction (Beilin and Arkhireev, 2005; Østergaard and Park, 2015).

In order to better analyze and predict the duration of tasks, it is possible to calculate the standard deviation and variance of the PERT estimate by adapting the usual formula for statistical dispersion:

$$D = \frac{(O - E)^2 + 4(M - E)^2 + (P - E)^2}{6}$$

$$STD = \sqrt{\frac{(O - E)^2 + 4(M - E)^2 + (P - E)^2}{6}}$$

Dispersion, in this case, speaks about the level of scatter of optimistic, pessimistic and most probable values from their average. To quickly calculate the standard deviation, a simpler but less precise formula is often used:

$$\text{Standard deviation} = (E - O) / 6$$

The smaller the standard deviation, the closer together optimistic, pessimistic and most probable estimates of the duration of the problem are grouped together (Beilin and Arkhireev, 2011).

3. Results and Discussions

In the conditions of Russia speech can and should go about the final holistic national economic effect from the development of territorial production complexes, including the regional petrochemical complex. At the core of their development are effective economic and technological territorial combinations of interrelated industries and industries that ensure a complete cycle of production of certain products using waste and associated products of the main production, and also including the maintenance of the population associated with this production complex. For this, an analysis of the functioning of the regional petrochemical complex is necessary, in part:

- Branch structure of the petrochemical complex;
- Commodity structure of production;
- The commodity structure of exports and imports, with an emphasis on the import of raw materials for the production of petrochemical products;
- Investment opportunities for enterprises to develop new production technologies and new processing products.

From here it becomes possible to form the passport of the oil and gas chemical complex with emphasis on:

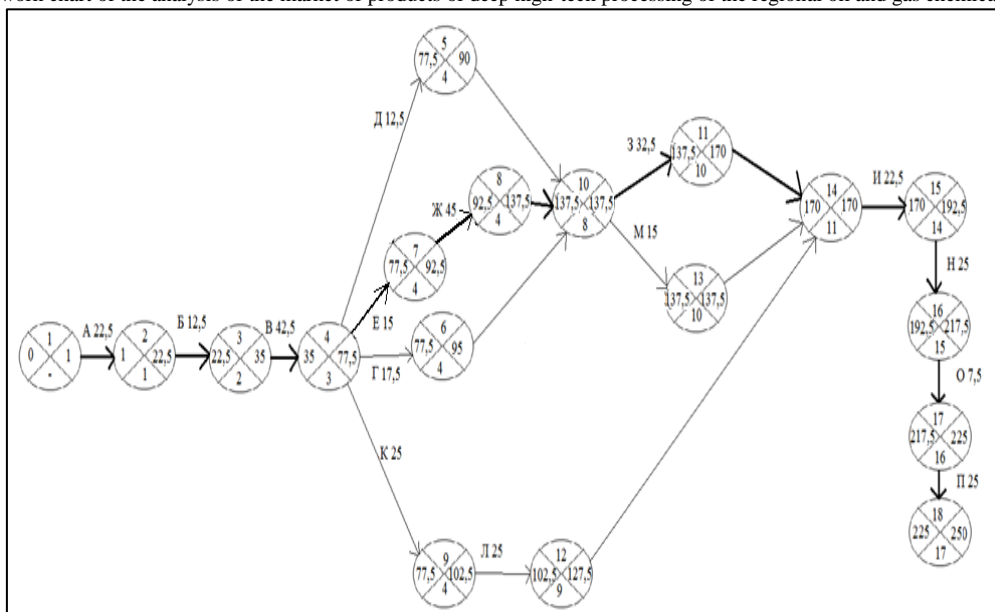
- Promising and most profitable industries and types of products;
- Ensuring the production of own production;
- Imported oil and gas products and raw materials;
- Improvement of the quality of the products.

The analysis of the market for oil and gas chemical products of deep high-tech processing can be divided into the following parts (Figure 1):

- Regional, federal and global structure of consumers of raw materials for petrochemical production and products;
- Commodity structure of consumption;
- Changes in consumers' requirements for ecology and product quality;
- Demand for new types of products, semi-finished products and raw materials and improved products with new characteristics;

- Trends in the development of the petrochemical complex and its subjects at the regional, federal and world levels (Beilin and Arkhireev, 2011; Sölvell *et al.*, 2008).

Figure-1. Network chart of the analysis of the market of products of deep high-tech processing of the regional oil and gas chemical cluster

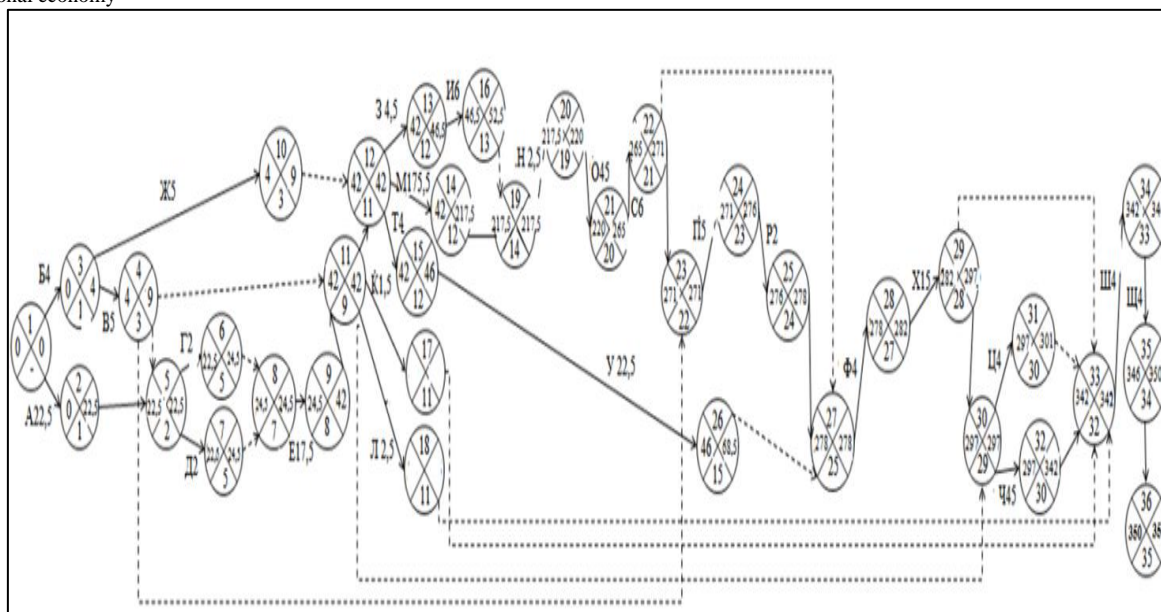


Based on the analysis of the resource intensity of the regional economic system, it is possible to single out the development of oil and gas chemistry as one of the real directions of structural restructuring of all Russian industry. The Ministry of Energy of the Russian Federation has developed a plan for the development of petrochemicals (including gas chemistry) for the period up to 2030. The main tasks for the development of domestic oil and gas chemistry in this period are:

- 1) Elimination of disproportions in the production of final products, basic semi-products and raw materials;
- 2) Saturation of domestic demand and the search for new export niches;
- 3) Use of competitive advantages of Russia, first of all abundant and relatively cheap raw materials base;
- 4) Mastering the art of investment management due to the high capital intensity of petrochemical industries and the presence of multiple risks;
- 5) Rejection of mutually exclusive and unjustified projects, coordination of activities of industry enterprises, establishment of interaction between the state and business, etc.;
- 6) Changing product standards, obsolete building codes and regulations;
- 7) Cluster organization of production.

To implement the planned program for the development of oil and gas chemistry for the period up to 2030, a number of mechanisms of economic, legal and organizational nature are proposed in the plan (Figure 2).

Figure-2. The network schedule of the program for the development of oil and gas chemistry, taking into account the resource intensity of the regional economy



Economic mechanisms are subsidizing rates on loans and supporting loans with government guarantees; introduction of tax holidays for reconstructed, operating and new production facilities; the creation of special economic zones within the recommended for the implementation of clusters, the introduction of rules for accelerated depreciation. Legal - the conclusion of long-term contracts for the supply of hydrocarbon raw materials for large facilities for the production of basic petrochemical intermediates, ensuring non-discriminatory access to hydrocarbon resources and the legal consolidation of this provision in long-term contracts for the supply of raw materials for large installations (Hogenraad *et al.*, 2003; Olesnyk and Belous, 2012; Qing, 2007; Stewart, 1983).

Organizational - the introduction of special railway tariffs for the transportation of raw materials. The plan also noted the role of public-private partnership in the implementation of large-scale construction (Hirsch, 2014; Levidow *et al.*, 2016).

In terms of development of petrochemicals for the period up to 2030, it is expected to achieve such consumption of petrochemical products that took place in European countries in 2010. It seems that the goal should be not only to reduce a significant backlog in the scale of output of the petrochemical complex. Regional oil and gas chemical centers of world level should be established, based on a huge resource base, its relative cheapness,

large-capacity installations and innovative technological developments. Due to this, it is possible to achieve a sustainable long-term competitiveness of Russian petrochemicals and to reach a higher level in a number of positions (Ahmed, 2015; Shatilova *et al.*, 2018).

In the recommended structure of the resource base of oil and gas chemistry in the period up to 2030, emphasis was placed on deep processing of associated petroleum gas and gas condensate as petrochemical raw materials. And this is absolutely correct. However, in the long term, the potential of valuable hydrocarbons of natural (ethane-rich) gas can be used to a greater extent. One should take into account the fact that in the growth of gas production in the Russian Federation, scheduled for the period up to 2030, a significant part of the gas will represent the so-called fatty gas, i.e. gas with a high content of valuable hydrocarbons (ethane, propane, butanes).

4. Summary

The recommendations proposed in the article on the development of the region's petrochemical complex are aimed at effective and rational involvement of the resource base of the territory in economic circulation, with the aim of obtaining additional effects from the development of the region's social and economic system. The interconnection of the petrochemical complex and the regional economy will contribute to the formation of a competitive, socially-oriented economic system with a developed petrochemical complex. Such a system can have an effective production structure and management system, mutually beneficial long-term relationships with Russian and foreign partners. Formed sales markets of products are able to ensure the reproduction of significant added value, employment of the population, growth of the level and quality of life in the region. Providing the regions of Russia with such strategic resources as hydrocarbon and mineral raw materials and the development of an oil and gas chemical complex on their basis is a significant competitive advantage of the country as a whole in the world economic space.

5. Conclusions

In terms of development of Russian oil and gas chemistry for the period, the growth rates of the Russian plastics market and products from them at the level of growth rates of gross domestic product (GDP) have been adopted. Analysis of the development of world oil and gas chemistry over the past 50 years has shown that almost all the years of this 50-year period both in the world as a whole and in individual producer countries, the growth rates of petrochemicals (including plastics and their products) were higher than GDP growth rates. Preservation of outstripping growth rates of petrochemicals in Russia is especially important, since our country has lagged far behind not only developed but also from a number of developing countries in terms of average per capita production and consumption of petrochemical products. In addition, it should be taken into account that the growth in the production of polymers is an increase in the opportunities for growth in the volume of processing and production of products, i.e. for more active functioning of the small and medium business sector.

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