INTERRELATIONS BETWEEN THE REGIONAL ECONOMIC SYSTEM AND THE DEVELOPMENT OF THE PETROCHEMICAL CLUSTER (ON THE EXAMPLE OF THE REPUBLIC OF TATARSTAN)

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Abstract: The development of the economy of the Russian Federation in modern conditions is based on the development of the economic systems of the regions. The decentralization of political power and the denationalization of the economy that take place in the process of reforms objectively lead to the shift of the center of gravity in making decisions on key economic and social problems of the territories directly to the regions. In the economic system of each country there are always branch blocks that play the most important role in shaping the trends of socio-economic development. In Russia, they include a complex of resource use sectors, electric power industry, as well as petrochemical industry. At present, they are the basis for the development of new industries and the basis for the modernization of traditional branches of the economy. The petrochemical complex of the country, representing one of the most complex complexes of the national economy, is a strategic branch of the Russian economy, since it is to a certain extent connected with national economic security, as well as with environmental protection and a number of other socio-economic indicators of the sustainable development of economic systems. One of the main features of the development of the petrochemical industry at the present time is a sharp increase in its scale. Over the past five years, the production of chemical and petrochemical products has grown more than 1.5 times. The petrochemical complex is the base segment of Russian industry, which lays the foundation for its long-term and stable development and has a significant impact on structural changes in the economy, which have a significant macroeconomic effect and affect the level of national competitiveness and the growth rate of the economy as a whole. In this regard, the task of developing methodological bases for the functioning of the petrochemical complex within the framework of effective resource use, identifying current trends in its development, is an actual scientific task, the solution of which has the most important organizational management significance for the development of the regional economy and the successful implementation of the program for Russia's transition to sustainable development. In the light of the above, a study of the issues of the influence of the petrochemical complex on the development of the region's economy is a particularly urgent and important task requiring close attention and solutions.

Keywords: regional economy, oil and gas chemical complex, network arrow diagram of precedence.

1 Introduction

The study of the theory and practice of the interrelation between the functioning of industries and complexes, including petrochemical, and the development of the economy of territorial systems began relatively recently. Certain aspects of the functioning of the petrochemical complex and related problems have been reflected in the work of domestic and foreign experts. However, the study of the problem under consideration remains insufficient for comprehending certain specific interrelationships between the functioning of the petrochemical complex and the development of the region's economy under market conditions and the limitations of rational natural and resource use.

The aim of the study is to substantiate theoretical provisions and develop practical recommendations for the development of a strategy for the development of the petrochemical complex within the region in which the hydrocarbon and mineral resources are extracted and processed. The goal was to solve the following problems:

- investigate the structure of the petrochemical complex and its role in the development of the territories;
- to identify the most significant interrelations between the development of the petrochemical complex and the regional socio-economic system; - to propose and substantiate the priority directions of the development strategy of the regional petrochemical complex;
- develop a methodical toolkit that allows to carry out a socio-economic assessment of the efficiency of the use of the region's resources and the substantiation of priority areas for the development of the petrochemical complex.

The object of the study are the enterprises of the petrochemical complex located on the territory of the Republic of Tatarstan. The subject of the study is the organizational and economic relations that arise in the process of functioning of the enterprises of the regional petrochemical complex. The theoretical and methodological basis of the research is the scientific works and developments of domestic and foreign experts on the problems of regulating regional development, organization and improvement of the functioning of the petrochemical complex, methodological materials, standards used in practice by the enterprises of the chemical and petrochemical industry, theoretical and practical recommendations of scientific conferences and seminars on the research topic. The main methodological approach of the study is a comprehensive approach that allows one to approach the development of the petrochemical complex with the greatest efficiency and determine its impact on the economy of the region under market conditions. To solve specific problems, methods of financial analysis, economic-mathematical modeling, and statistics were used.

2 Methodology

The critical path method assumes the calculation of a single deterministic schedule for the execution of the project. In this case, early and late start and end dates for the project's operations are defined, which means that the reserves are intervals for which operations can be shifted without violating the restrictions and the project completion date.

The main calculations for the application of the PERT method are carried out by the formulas (1 - 5).

The expected time is calculated by the formula (1):

$$\text{Expected time} = (O+4\times M+P)/6, \quad (1)$$

where O is the minimum (optimistic) duration of work, that is, an estimate of the duration of work under the assumption of the most favorable coincidence of circumstances;

M - the most probable estimate of the duration of work - an estimate of the duration under the most frequently encountered conditions for the performance of work;

P is the maximum (pessimistic) duration of work, that is, the duration of work under the assumption of the most unfavorable combination of circumstances.

Dispersion of the critical path is calculated by the formula (2):

$$\sigma^2 = ((P-O)/6)^2. \quad (2)$$

The standard deviation is calculated by formula (3):

$$\sigma = (P-O)/6 \quad (3)$$

Private reserve work time is calculated by the formula (4):

$$B = P- T_e. \quad (4)$$

After calculating the total time reserve by the formula (5):

$$\text{Total time reserve} = \sum (P - T_e). \quad (5)$$

3 Results and Discussion

The place of the regional petrochemical complex in the development of territories is determined by its entry into the national economic system as an element of the regional production system (Table 1).

Table 1. The location of the regional petrochemical complex in the national economic system

Macro level	National economic system
Meso level	Regional economic system
	Regional Production System
	Regional industrial complex
	Regional petrochemical complex
Microlevel	Economic entities (enterprises, firms, organizations)

The regional petrochemical complex is a subsystem of a higher order system - a regional economic system - of the entire social system of the region, functioning for the production of material and non-material goods, and meeting public needs (Khmeleva & Bulavko, 2016; Khmeleva, et al, 2005; Villalobos Antúnez, 2016). At the same time, RNA is an industrial component of the regional economic system that characterizes the spatial structure of the region's petrochemical production, as well as production-technological, material-material, information, economic, institutional, infrastructural links between individual economic entities in the region's production system (Fig 1).

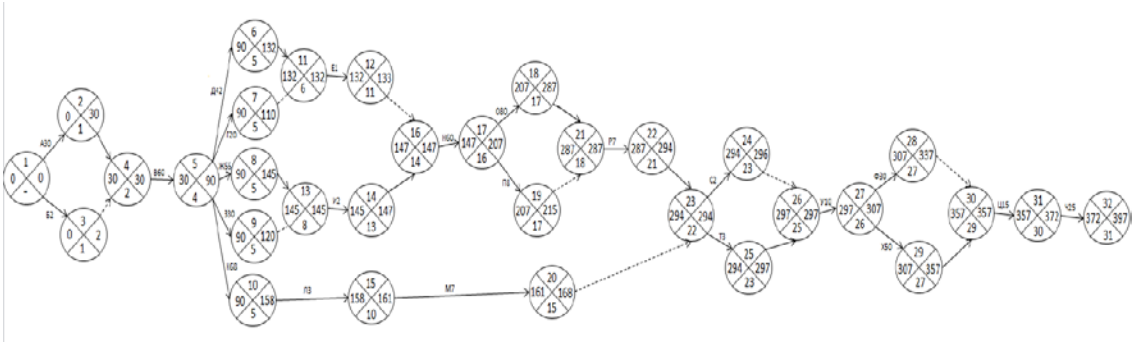

Fig 1. Industrial-technological, material-material, information, economic, institutional, infrastructural connections between individual economic entities of the production system of the region.

The role of the petrochemical complex in the development of the regional economy is determined by the functions performed and the following provisions:

1. The potential importance of the petrochemical complex of the Republic of Tatarstan is determined by the unique deposits and reserves of hydrocarbon and mineral resources located on its territory and a complex of producers unique not only for Russia but also on a global scale (Ostergaard & Park, 2015; Beilin, 2016; Beilin, 2017; Okriashvili, 2017). In this regard, the main function of the petrochemical complex of the Republic of Tatarstan is the involvement of the natural and resource potential of the territory in the system of social reproduction and its transformation into social, infrastructural and financial regional capital.

2. Due to natural features and territorial distribution of resources, most of the economic entities of the petrochemical complex of the Republic of Tatarstan are the city-forming and budget-forming enterprises of large and medium-sized cities (Deberdieva & Vechkasova, 2015; Khazova, 2015 ; Deberdieva & Shterbova, 2015). Thus, the petrochemical complex fulfills an institutional function - ensuring the development of industrial infrastructure and social institutions in the region (Beilin & Arkhireev, 2006; Beilin & Arkhireev, 2009; Beilin & Arkhireev, 2005). the formation and development of competition, the formation of a favorable investment climate.

3. Petrochemical complex of the Republic of Tatarstan is one of the most dynamically developing sectors of the region's economy (Beilin & Arkhireev, 2011). Petrochemicals make up a significant share in the GRP of the republic, it makes a significant contribution to the republican and federal budgets, in particular, the share of foreign exchange earnings from exports of products prevails, provides employment for the population, which is especially important for small republican cities.

4. Forms and maintains the image of the Republic of Tatarstan, both at the Russian and global levels, as a national center for high-technology petrochemical products (Beilin & Arkhireev, 2011; Alfares & Al-Amer, 2002). The regional petrochemical complex assumes a certain objective economic unity of the economic entities that constitute it and the economic community of the territory that arise and develops on the basis of objective endogenous and exogenous factors that determine the time, pace, scale and direction of development of both the complex and its individual elements and the regional economy as a whole. (Beilin, 2017).

The development of the system of training and retraining of personnel for the chemical and petrochemical industry includes (Figure 2):

- Improving the training of highly qualified personnel and the re-establishment of an industry-specific system for upgrading the skills of specialists for chemical and petrochemical enterprises (A);
- Development of human resources in the scientific and research field (Б).

The subjects of management in the petrochemical complex are the mass of joint-stock companies. Their interaction with authorities is carried out in accordance with the current legislation in the tax, tariff-customs, investment and other spheres. Imperfection of the regulatory and legal framework governing the activities of petrochemical enterprises significantly hampers their development.

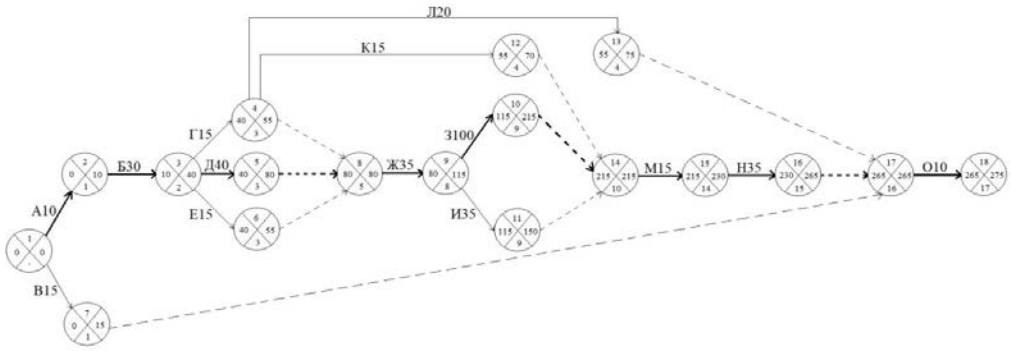

Fig 2. Development of the system of training and retraining of personnel for the chemical and petrochemical industry.

4 Summary

The petrochemical complex, being an organic part of the national economy of the region, in the process of its development fulfills the following economic functions that contribute to the development of the social and economic system of the region:

1. Resource. Provides the economic complex of the region (country) with the appropriate resources and products.
2. Economic. It makes a significant contribution to the formation of regional and state revenues (including payments for the use of the territory's resources), the development of enterprises of the complex and the increase in production and production, naturally contributes to the development of the entire economic system of the region.
3. Social. Enterprises of the petrochemical complex play a significant role in the development of the life support systems and social sphere in the region, developing, mastering new technologies, establishing and expanding the production of RNA enterprises ensure employment and efficient use of labor resources in the region, social security of personnel.
4. Foreign economic. The growth in exports of petrochemical products, contributes to the increase in foreign exchange earnings in the economy of the region.
5. Investment. The development of the petrochemical complex helps to increase the interest of domestic and foreign investors and, accordingly, to attract additional funds to the region.

5 Conclusions

Thus, it is necessary to take into account the negative consequences of the development of the petrochemical complex for the social and economic system of the region. First of all, these are the results of increasing the share of geological exploration, leading to the transfer of land to industrial land, the activation of subsoil use processes, the consequences of which are depletion of subsoil with low efficiency of field development, the environmental consequences of environmental pollution. The consideration of positive and, primarily, negative effects of the relationship between the development of the petrochemical complex and the regional socio-economic system will allow predicting and timely preventing the occurrence of negative consequences, coordinating the development of the regional petrochemical complex and socio-economic system of the region.

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