

Analysis of the Functioning of the Regional Oil and Gas Chemical Complex and the Formation of the Region's Resource Potential

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Abstract

The Russian economy as a material base of the ongoing social reorganization is a complex set of industries, among which a special place belongs to industry. Industry is the leading branch of material production. It has a decisive influence on the development of productive forces and production relations. The development of industry promotes the rational allocation of productive forces, the comprehensive development of the economy of regions and the country, the expedient use of natural resources. The regional oil and gas chemical complex (RNK) of the industry is understood as the aggregate of economic entities - enterprises, firms, organizations and industries associated with exploration, production, transportation, processing, storage and sale of hydrocarbon raw materials, mineral resources and products obtained as a result of their processing, united by one operational basis of activity - the region where they are located and operate. Economic entities as structural elements of the regional oil and gas chemical complex are the main forms of the territorial organization of the productive forces and, acting as subsystems of the regional petrochemical complex, together constitute a complex structure of the complex, ensuring its integrity and stability under various transformations of the system under the influence of market factors of the external and internal environment. The structure of the regional petrochemical complex is understood as the composition, the quantitative ratio and the forms of interconnection of enterprises producing hydrocarbon raw materials and mineral resources and producing oil and gas chemical products in the region. The complexity of the RNA structure is expressed not only and not so much by the multiplicity of constituent elements, as by the diversity of their interrelations and, what is especially important, by the difference in their role in the organization and functioning of the complex as a whole. 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.

Keywords: Regional economy; Oil and gas chemical complex; Resource intensity.



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1. Introduction

Within the framework of the system approach, the regional industrial complex as a form of territorial organization of productive forces is presented as a system combining economic entities (with their features and specific characteristics) with ordered interrelationships, which gives the combination new properties:

- Integrity - the presence of a single purpose for all the combination, a function that is absent from a separate constituent element of the system (Brusov *et al.*, 2015; Damodaran, 2012; Kaplan and Norton, 1992; Modigliani and Miller, 1958; Niven, 2002);

- Sustainability - the desire to preserve or to develop such a structure that ensures the implementation of the system by a single goal, function;

- Structural - possible dismemberment of the system to such elements, each of which will correspond to a certain function.

The economic essence of the complex is manifested in the fact that its effectiveness is higher than the total efficiency of its constituent elements, functioning in isolation.

The structure of the oil and gas chemical complex should be considered within the framework of approaches in accordance with which the structure of the petrochemical complex of the Republic of Tatarstan is analyzed.

The choice of this region is due to the fact that it has significant hydrocarbon and mineral resources (some deposits are unique and known at the world level) and a unique complex of producers that give the region the status of one of the leading oil and gas chemical and mining bases in Russia.

Regional-branch approach - determines the presence of certain elements that make up the oil and gas chemical complex in a certain territory. The territory of the Republic of Tatarstan has a significant mineral and resource potential, which is the basis for maintaining and developing the most mineral-raw materials complex and related sectors of the regional economy, primarily the oil and gas chemical cluster. Such a region has a significant attractiveness for medium-term and long-term investment programs with rather short payback periods and a great return on the financial resources invested in them (Altman and Hotchkiss, 2010; Ginter *et al.*, 2018; Kaplan and Norton, 1992; Sharpe, 1964).

2. Methods

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 (Ginter *et al.*, 2018; Jones, 2007; Niven, 2011).

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):

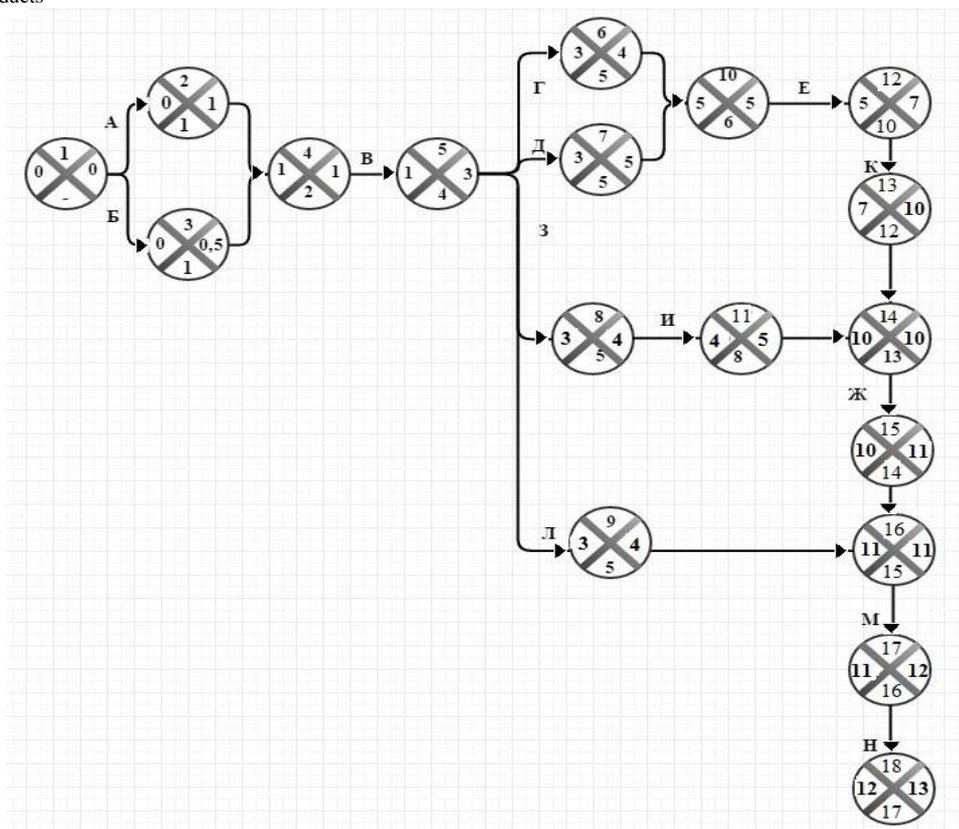
$$\text{Общий резерв времени} = \sum (P - T_e). \quad (5)$$

3. Results and Discussions

The branch structure of the regional oil and gas chemical complex is largely related to whether the region in question is producing, and if so, to what extent its domestic production is provided through own production. The branch structure of the oil and gas chemical complex in terms of ensuring the production of its own extraction of resources can be characterized by the commodity structure of exports and imports and the ratio of exports and imports of oil and gas products in the region (Bryant *et al.*, 2004; Hallinger and Heck, 2010; Morrison *et al.*, 2005; Niven, 2011). Possessing the richest mineral and resource potential, the oil and gas chemical complex of the Republic of Tatarstan has a significant competitive advantage; production of petrochemical products is provided by own extraction of raw materials and is export oriented.

The technological approach involves determining the degree of conformity of technology and production technology and oil and gas production at various stages to the current level of their development. Within the framework of this approach, the structure of the petrochemical complex can be characterized by the assortment of high-tech products produced by the enterprises of the petrochemical complex (Fig. 1).

Figure-1. The network schedule for the development of the structure of the regional oil and gas chemical complex, depending on the assortment of high-tech products



The chemical enterprises of the Republic of Tatarstan produce various types of products oriented to export. This is the result of the introduction and mastery of high technologies, the availability of specialized scientific centers and highly qualified personnel that provide leading positions in the petrochemical and petrochemical complex of the Republic of Tatarstan in the Russian production of petrochemical products (Chen *et al.*, 2006; Cobbold and Lawrie, 2002; Morrison *et al.*, 2005).

The organizational and economic approach is determined by the presence of certain types of enterprises, companies, organizational structures that occupy the so-called "natural monopoly" position. The financial approach consists in a comparative analysis of the effectiveness of various stages and technological stages in terms of profitability (profitability), both potential and actually observed. Within the framework of the financial approach, it is possible to cite the main performance indicators of the largest enterprises of the oil and gas chemical complex of the Republic of tatarstan as an element of the system and a rating assessment of the petrochemical complex in the industry structure of the region. It should be noted that depending on a particular country, the composition and structure of the oil and gas chemical complex can vary quite significantly from the system of adopted accounting standards at the level of the national economy, from the range of problems considered and analyzed.

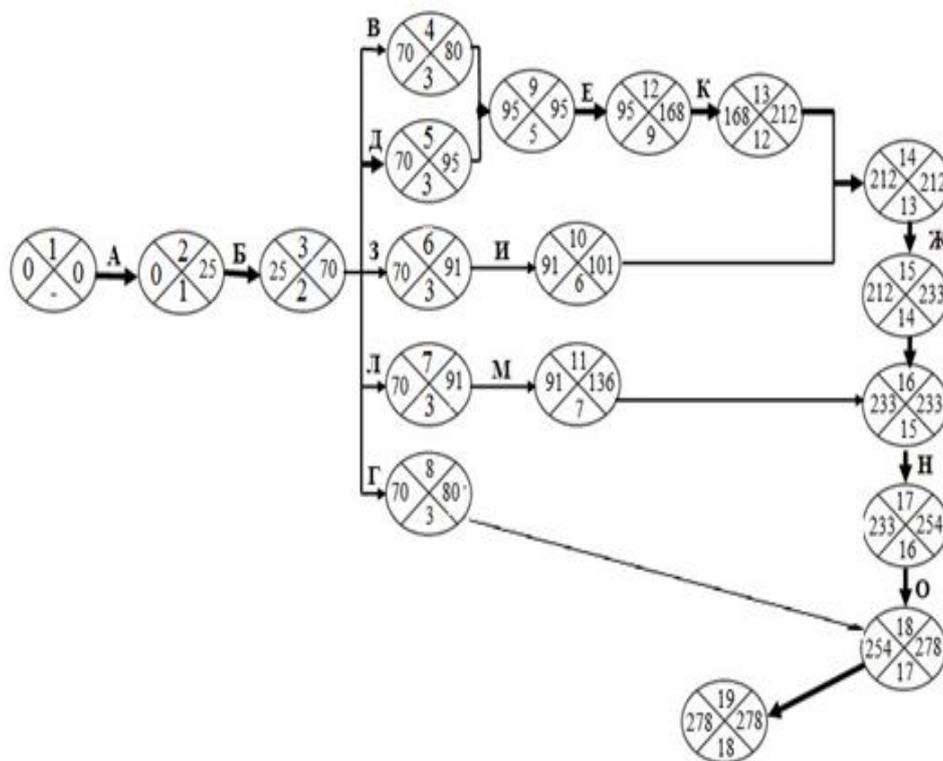
Direct determination of the efficiency of the oil and gas chemical complex within the boundaries of a certain territory is an extremely difficult task:

- In view of the many resource and economic factors affecting the complex effect;
- Because of the great mobility, dynamism of the initial conditions of production and its final results;
- Because of the multistage relationship of the direct effect of the development of a particular production with an associated effect in other industries of the same complex;
- Because of the large amount of necessary background information.

In this regard, in view of the close relationship between the development of the oil and gas chemical complex and the regional economy, it is expedient to determine the priority directions for the development of the oil and gas chemical complex based on the resource potential of the territory and the effectiveness of its use.

Accordingly, it is possible to propose a scheme for assessing the efficiency of the use of regional resources, which may be the first step towards justifying the priority areas for the development of the petrochemical complex (Figure 2).

Figure-2. Network timetable for assessing the economic efficiency of the use of regional resources of the oil and gas chemical complex



For the adoption of a definitive decision on the choice of a specific direction of development, the proposed methodology should be supplemented by detailed technical and economic calculations typical for the design stage, taking into account the relevant features of each individual development direction. The main attention in terms of the development of oil and gas chemistry of Russia was paid to the growth of production of basic semi-finished products and large-tonnage final products, which is the basis for creating opportunities for the industry breakthrough. However, we should mention at least a few projects for the production of relatively small but high-tech production of specialty polymers. Insufficient presence in the plan of projects for the production of high-conversion petrochemical products was the result of this approach that a resource-rich Russia should focus on the production of large-tonnage base products of oil and gas chemistry. The release of high-conversion products is not competitive, and its market has long been divided by leading companies of foreign countries (Chen *et al.*, 2006; Shih *et al.*, 2010; Von Krogh *et al.*, 2012). In the opinion of the author, it is advisable to focus on building chains of increasing added value (product lines) and justifying their effectiveness by comparing costs and results.

In terms of long-term development of oil and gas chemistry, there is no separation of the industry's development. In the author's opinion, the primary direction of development of the petrochemical industry in Russia should be considered the preservation and expansion of demand for the industry's products from the domestic market. At the same time, it is necessary to highlight the specificity of strategic actions for both export-oriented enterprises and enterprises whose products have already been targeted at the domestic market.

4. Summary

In the process of research, the author analyzed the natural resource potential of the Republic of Tatarstan and analyzed the functioning of the regional oil and gas chemical complex in the part of:

- Assortment of the resource base;
- The availability of the petrochemical complex by types of resources;
- Volumes of extraction of minerals by the enterprises of the region;
- Volumes of conducting geological exploration work and increase of resources as a result of their conduct;
- The volume of investment in the development of new deposits.

On the basis of the conducted research it becomes possible to form the passport of the resource potential of the region with an emphasis on attention:

- On available unique resources and their reserves;
- On resources that determine the specific commercial value of the subsoil of the region and their reserves;
- On prospective resources for the development and production of new products.

5. Conclusions

The main competitive advantages of the Republic of Tatarstan in terms of increasing the efficiency of using the regional resource base are unique reserves of hydrocarbon and mineral resources. The proposed methodology is necessary and useful at the first stages of planning, in the project period when justifying the general economic feasibility of setting and solving a particular problem of the development of the petrochemical complex. They are also necessary for a general assessment of the effectiveness of the existing situation in the petrochemical complex

with a view to the subsequent detailed analysis of possible reasons for reducing or improving its efficiency (Yee-Loong Chong *et al.*, 2009).

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