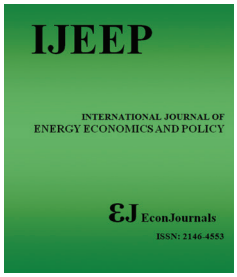

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Development of the Methodological Approach to the Assessment of the Innovation Position of Oil and Gas Machine-building Enterprises in the Market

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ABSTRACT

Oil and gas machine building plays a significant role in the development of the Russian oil and gas sector. The innovation position of the oil and gas machine-building enterprises depends on the conditions for the development of the external and internal market and the existing potential of enterprises. The development of innovation programs for the production of new equipment and technology is substantiated by the companies' market strategy and target indicators for the implementation of innovation projects. The article analyzes methodological approaches to the assessment of the innovation potential of enterprises and the innovation climate and identifies their main strengths and weaknesses. The authors substantiate the use of a comprehensive methodological approach to the assessment of the innovation position of the oil and gas machine-building enterprise. The system of estimated indicators of the innovation position of one of the largest Russian oil and gas machine-building enterprises in three areas is presented: Level of competitiveness, state of the external environment, and innovation potential. The key indicators of innovation-driven growth of the enterprise are substantiated, and the efficiency of innovation investment projects is estimated. The program of the innovation-driven growth of the oil and gas machine-building enterprise is developed and the forecast indicators of economic efficiency of its implementation are defined. The use of the comprehensive system of assessing the innovation position of enterprises allows to formulate the justified areas of development of their innovation potential in the market. Making informed decisions on the implementation of the innovation program in the context of a highly competitive target market will ensure the efficient development of the enterprise and increase the production potential of oil and gas producing companies.

Keywords: Innovation Potential, Innovation Climate, Innovation Position, Oil and Gas Machine Building, Innovation-driven Growth
JEL Classifications: O30, O31, O32

1. INTRODUCTION

As the main component of the Russia's fuel and energy complex, the oil and gas sector is the foundation of the national economy. Oil and gas machine building is a supporting branch of the oil and gas complex, as it produces the equipment required for drilling, geophysical and geological works, well servicing, extraction, etc. In the context of the increase in the share of reserves in complex, low-permeability reservoirs and significant fluctuations in the world oil prices, an objective need emerges to reduce production costs by using the own innovative technology in the oil and gas industry (Zavalny, 2017).

Establishment of the efficient program of the innovation-driven growth is one of the most important factors for increasing the competitiveness of Russian enterprises (Concerning the Innovation Activities and State Innovation Policy, 1999). Saturation of the oil and gas equipment market by representatives of foreign companies in the context of sanctions for imported goods creates special prerequisites for the development of oil and gas machine building by Russian producers. Favorable prerequisites for the development of the market of Russian machine-building industry is the state policy aimed at maintaining and developing the domestic market for manufacturers of equipment for the oil and gas industry (Guidance materials for

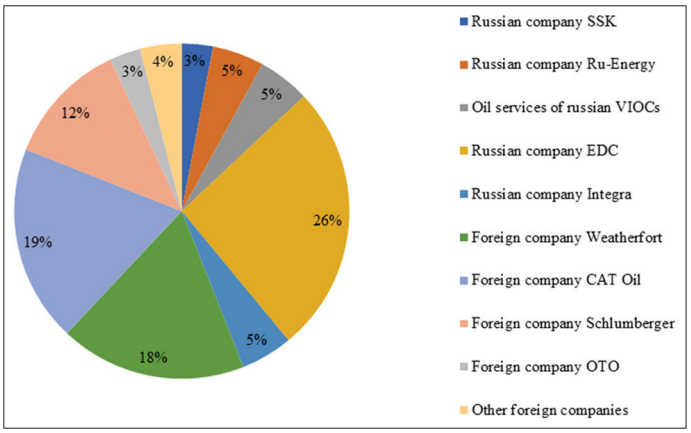
the development of programs for innovation-driven growth for joint-stock companies with state participation, state corporations and federal state unitary enterprises, 2011; Recommendations on the Development of Programs for Innovation-driven Growth for Joint-stock Companies with State Participation, State Corporations and Federal State Unitary Enterprises, 2010). The core attention with regard to the establishment of sanctions by the Russian government was paid to the equipment for extraction of hydrocarbon raw materials. However, the market is saturated with imported equipment for the technological operations of exploration, drilling, transportation and refining of oil and gas (Figure 1). The current situation has defined the key area of increasing the competitiveness of Russian companies – production of innovative equipment and technology that ensure the best performance of producers in the oil and gas industry. Due to this, the lack of proper substantiation for the development and implementation of innovation programs is one of the key systemic problems of the machine-building development (Semenov, 2011).

The economic crisis in 2009 and in 2015 significantly influenced the development of the oil and gas engineering market: The market capacity reduced by 14%, the level of expenses for the development of oil and gas deposits increased, etc.

The following problems of a systemic nature are also identified in the strategy of the development of heavy engineering for the period through to 2030:

1. Unsatisfactory structure of production capacities of enterprises, high wear of production assets and low technological level of production;
2. Acute shortage of creation of new models of equipment due to the low level of investment in R and D;
3. Underdevelopment of the market for key components, lack of production of certain types of high-tech components;
4. Problem with human resources - shortage of prospective talent pool;
5. Strong competitive pressure from foreign producers, often based on state support (The Energy Strategy of Russia for the Period Through to 2030, approved by the decree of the Government of the Russian Federation, dated November 13, 2009).

Figure 1: Structure of the market for oil and gas equipment used for horizontal drilling of oil wells (Kaznacheev, 2014)



It should also be noted that oil and gas machine-building enterprises depend on the state policy in the field of foreign trade, on the adopted systems of the products certification, as well as direct financial support and other factors.

In this regard, the most important innovation priority for machine-building enterprises should be the change in the equipment that ensures the growth in labor productivity and the reduction of resource consumption in the geological exploration, production and transportation of hydrocarbons aimed at a radical reduction in the energy intensity of equipment used in the oil and gas industry (Gumerova and Shaimieva, 2009). The development of equipment goes hand in hand with the development of technology, which allows to obtain effects from innovations measured as the increase in the results of oil and gas production by hundreds or even thousands of percent. At the same time, innovation passivity of many Russian enterprises can be noted, in particular: A small share of the output of new products in industrial manufacturing (0.4%), insignificant number of Russian industrial enterprises that actively participate in innovation developments (5-7%), low indicators of exports of high-tech products manufactured by Russian producers, low patent activity, etc.

The costs of manufacturers for R and D make up negligible shares from total investment - about one percent, while the leaders of the world machine-building industry allocate 7-9% of revenue for R and D and development of new products (Strategy for the Development of Heavy Engineering for the Period Through to 2020, 2010). Overall, the developed countries that carry out approximately 90% of the world's R and D annually spend 2-2.5% of gross domestic product (GDP) on research and development in engineering; China has been spending almost 1.5% of GDP for these purposes over the past 3 years.

Despite this, experts predict the growth of the oil and gas machine-building market in the medium term with growth rates over 15%, which is due to the following objective reasons (Oil and Gas Engineering has the Development Potential, 2010):

1. Increase in the amount of drilling works in the development new complex deposits, which generates the demand for new modern drilling equipment;
2. High level of wear of a significant share of industrial equipment that requires replacement, which creates the prerequisites for its replacement with more advanced equipment that meets today's requirements;
3. Specific mining, geological and climatic conditions require specialized modern drilling rigs that meet the newest technology for the development of new deposits;
4. Application of new drilling technology with more perfect and efficient systems of control, management, cleaning and other processes;
5. Growth of the developed deposits in new areas (shelves of the northern seas, the Far East, etc.), which leads to an increase in the need for geological exploration, drilling and field development.

The following important factors relate to the external reasons preventing the establishment of an innovative production structure: The first is that many market-based business management tools in the rapidly developing Russian economy

still yield significantly higher incomes at significantly lower costs of their use, in comparison with the implementation of innovations (Loginova, 2007). Therefore, many manufacturers are unlikely to prefer replacing marketing funding with investing in the creation and implementation of innovations. The second most important external reason, which forms a rather indifferent attitude of enterprises to the idea of innovation-driven growth, is the possibility of guaranteed sales of their products in the competitive environment, which is 5-6 times less strained by the number of sales entities than in the markets of developed countries, according to experts (Engine for the Innovative Machine, 2007). The implementation of innovations allows to receive goods with higher consumer qualities or with highly competitive price parameters, while such a business model contains real market risks of rejection of the proposed innovative products. This is why most of the machine-building enterprises prefer not to take risks in the situation of lack of critical competition at all and produce products that have long won a stable demand in the market. However, the machine-building markets for Russian producers, especially for oil and gas equipment, have turned out to be "in the crosshairs" of the world's largest centers of machine building recently.

The third external negative obstacle for the innovation activities of machine-building enterprises is the lack or low capacity of centers of competence - the subdivisions of the branch science, developed network of engineering companies in the machine building area, design and engineering centers and development bureaus, developed infrastructure of technology parks, venture funds, etc. that are capable of carrying out the development of innovations and their preparation for implementation in the industry (Imamutdinov and Medovnikov, 2009). High fluctuations in prices for oil and gas raw materials create special conditions that require radical measures for the innovative transformation of the economy.

2. METHODS

Innovation position of an enterprise includes innovation potential and innovation climate of the enterprise. Innovation potential is a combination of scientific, technical, technological, infrastructural, financial, legal, sociocultural and other opportunities to ensure the perception and implementation of novelties, i.e., the receipt of innovations (Fatkhutdinov, 2008). In addition, innovation potential means a measure of readiness to perform tasks that ensure the achievement of the set innovation goal, i.e., a measure of readiness to implement a project or a program of innovation transformations and the implementation of innovation (Gunin, 1999).

At the moment, there are several methodological approaches to assessing the structure of innovation potential. The authors consider approaches in the article that consider the innovation potential of an enterprise in terms of:

1. Blocks that form the production and economic system of the enterprise;
2. Functional zones of the internal environment of the enterprise;
3. Financial stability of the enterprise;
4. Resources required for the implementation of innovation activities.

Various authors propose various methods to assess the innovation potential, depending on its structure. The most common is the assessment of innovation potential by blocks that form the production and economic system of the enterprise: Product, functional, resource, organizational and management. Within the framework of this approach, the innovation potential is assessed according to the following scheme: Resource - function - project. A project or a program refers to the output and implementation of a new product (service), the area of activities. Within the framework of this methodological approach, there are two schemes for analyzing the internal environment and assessing the innovation potential: Detailed and diagnostic. A detailed analysis of the internal environment and assessment of the innovation potential of the organization is carried out mainly at the stage of justification of innovation and preparation of the project for its introduction and implementation. Being highly labor-intensive, it generates systemic and useful information.

Time constraints, lack of specialists capable of conducting the systemic analysis and lack or inaccessibility of information about the organization (especially in the analysis of the innovation potential of competitors) force using diagnostic approaches to assessing the innovation potential of the organization.

A methodological approach that involves the assessment of innovation potential within the financial sustainability of the enterprise includes analysis of indicators such as surplus (or shortage) of the own working capital, surplus (or shortage) of the long-term borrowed sources of stock and cost formation, surplus (or shortage) of the total number of main sources to form stocks and costs.

According to the following methodological approach, innovation potential is a combination of various resources. In this regard, the potential is assessed for different types of enterprise resources. Comparison of methodological approaches to the assessment of innovation potential allowed to identify differences in the structural elements of the used assessments of the innovation potential (Table 1) (Ponomareva, 2011a).

Analysis of existing methodological approaches to the assessment of the company's innovation potential allowed to identify the core advantages and disadvantages of each of them (Table 2) (Ponomareva, 2011b).

Innovation climate is the second most important component of the innovation position of the enterprise. Innovation climate is the state of the external environment of the organization that facilitates or undermines the achievement of the innovation goal (24). There are a macro environment (environment of indirect impact) and a micro environment (environment of direct impact) in the structure of the external environment of the organization.

Macro environment establishes the general conditions of the firm functioning. In most cases, the macro environment is not specific to a particular firm. However, the degree of influence of its state on the innovation activities of firms varies due to differences in both their areas of activities and internal potential.

Table 1: Comparative characteristics of methodological approaches to the assessment of innovation potential by structural elements

Methodological approach			
Assessment of the blocks that form the production and economic system of the enterprise	**Identification of functional zones of the internal environment of the enterprise**	**Assessment of the financial stability of the enterprise**	**Identification of resources required for the implementation of innovation activities**
Product	-	-	-
Functional	Production	-	-
	Marketing	-	-
Element			
Resource			
Material and equipment	-	-	Material resources
Labor	Personnel	-	Human resources
Informational	-	-	Intellectual resources
Financial	Finance	Financial stability	Financial resources
Organizational			
Organizational structure	-	-	Infrastructure resources
Process technology	-	-	-
Organizational culture	Organizational culture	-	-
Management	-	-	

Table 2: Advantages and disadvantages of methodological approaches to the assessment of innovation potential

Approach	Advantages	Disadvantages
Assessment of the blocks that form the production and economic system of the enterprise	Comprehensive assessment of the potential through the analysis of all the elements of the internal environment of the enterprise	The need to use expert judgment, which is often subjective; Indicators relating to other components of the overall potential of the enterprise are often misrepresented as characteristics of innovation potential
Identification of functional zones of the internal environment of the enterprise	Takes into consideration the impact of such critical elements as personnel, finance, state of production and marketing in the enterprise, as well as the overall organizational culture	Does not take into consideration the impact of informational and material resources, the state of the organizational structure, technology and enterprise management system; The need to use expert judgment, which is often subjective
Assessment of the financial stability of the enterprise	Availability of quantitative estimation of indicators; Simplicity of calculations; Based on the assessment of financial resources that play a crucial role in the implementation of innovation activities	Innovation potential is only assessed from the financial part and does not cover other aspects of the internal environment of the enterprise
Identification of resources required for the implementation of innovation activities	Based on the analysis of the crucial resources required for the implementation of innovation activities; Infrastructure is assessed in terms of innovation-driven growth of the enterprise	Based on the analysis of a predominantly resource block and almost does not cover other elements of the internal environment of the enterprise (except for the infrastructure); Lack of a unified system of indicators to assess each type of resources

There are several approaches to the structure of the external macro environment of the enterprise. In the first approach, four strategic areas are identified in the macro environment: Social, technological, economic and political, which are described by a number of indicators. There areas of external environment are analyzed using PEST analysis or STEP analysis.

Another methodological approach, proposed by Barancheyev, identifies six areas of the external macro environment: Economic and financial, scientific and technological, sociopolitical, geographical and communicational, management and organizational, and regulatory (Guidance materials for the development of programs for innovation-driven growth for joint-stock companies with state participation, state corporations and federal state unitary enterprises). Approved by the Ministry of Economic Development of Russia, 2011; Recommendations on the Development of Programs for Innovation-driven Growth for Joint-stock Companies with State Participation, State Corporations and Federal State Unitary Enterprises, 2010). The key distinguishing feature of Barancheyev's methodological approach is that it takes into consideration the impact of the geographical, communicational, management and organizational areas. However, according to the authors, when analyzing the innovation macroclimate of the oil and gas machine-building enterprise, it is necessary to take into account the state of the fuel and energy complex of the country, which will allow to

conduct the most qualitative and reliable assessment of the macro environment of the enterprise.

The micro environment of the organization is considered as a combination of strategic zones of the nearest environment as the composition of the entities directly interacting with it and having a direct impact on the state of innovation potential. Suppliers, consumers, marketing intermediaries, competitors and contact audiences are usually identified in the structure of the external micro environment of the enterprise.

Porter five forces analysis is one of the methods for assessing the external micro environment of the enterprise, which includes analysis of competitors within the industry, potential (new) competitors, producers of substitute products, suppliers and consumers. Each of the identified blocks is assessed by a group of indicators that determine the strength of the influence of the external micro environment on the enterprise.

The following methodological approach to the assessment of the innovation microclimate offers an analysis of six strategic zones:

1. Economic zone, the market segment: Level of competition, relations with consumers and partners;
2. Zone of capital formation - investment;
3. Zone of new technology and scientific information resources;
4. Zone of raw materials, fuel, energy, material and equipment resources;
5. Zone of labor resources - the labor market of specialists, managers, workers;
6. Groups of strategic influence (at the level of the industry, city region, district).

These strategic zones are assessed using an expert judgment due to the complexity of applying quantitative measures of the assessment of the innovation climate. This leads to a discrepancy in the expert judgments and assessments, which reduces the confidence and reliability of such a method.

The authors suggest to assess the innovation position of the oil and gas machine-building enterprise by adjusting the system of indicators that takes into consideration specifics of the scientific and innovation focus, specifics of the industry and availability of quantitative measurement (Table 3).

It is suggested to assess the innovation position in three main areas: Innovation potential, state of the external environment and level of competitiveness (Yagudin, 2011). Adjustment of indicators is made on the basis of the resource approach, which allows to assess the capabilities of the enterprise and to highlight the specificity of the sectoral demand.

As such, each type of resources is represented by objective measurable indicators: Intellectual (the number of patents and the ratio of their use), material (depreciation of fixed assets and production capacity utilization), financial (equity ratio), personnel (share of personnel with higher professional education) and infrastructure resources, which are described through the share of personnel employed in the R and D department, since this indicator reflects the availability and scope of this business unit.

The state of the external environment is described through objective, measurable quantitative indicators that reflect the favorable nature of the external environment from the point of implementation of innovation projects. The level of competitiveness is described through a set of indicators that reflect the position of the enterprise relative to competitors.

3. RESULTS

The level of innovation-driven growth of domestic enterprises of oil and gas machine building was analyzed by the example of one of the leading enterprises of this industry in Western Siberia. The enterprise occupies about 25-30% of the market of packaged modular equipment for oil and gas fields development. The mission of the enterprise is: "To ensure efficient solution of the Customer's tasks by developing and producing modern

Table 3: Proposed comprehensive system of indicators of the innovation position of the oil and gas machine-building enterprise

	Areas of assessment		
Criterion	**Level of competitiveness**	**State of the external environment**	**Innovation potential**
1	2	3	4
Indicators	Relative market share	Level of taxation (income tax rate)	Share of personnel with higher professional education
	Consumer satisfaction	Dynamics of demand for products (by sales volume)	Ratio of equipment use
	Share of R and D costs in comparison with the industry average	Availability of lending, interest rate	Number of valid patents (relative to the industry leader)
	Expenses for 1 rub. of the marketable output (relative to the industry leader)	Inflation rate	Ratio of patent use
	Participation in the industry exhibitions (relative to the industry leader)	Share of imported machinery products in the domestic market	Share of personnel involved in the development and implementation of innovation in the enterprise
	-	Dynamics of income levels of oil extracting companies	Level of financial capacity (equity ratio)
	-	-	Depreciation of fixed assets

equipment that complies with Russian and international standards" (Lenkova, 2013). The core objective of the enterprise is to produce high-quality, competitive products that meet customer's requirements (Osinovskaya and Lenkova, 2015). The objectives of the second level include: Constant work on improving the quality of the equipment produced and the quality management system, improvement of its efficiency and performance, identification and promotion of the processes leading to the improvement of the enterprise performance.

A group of criteria is proposed to assess the first area of "Innovation potential," which reflect the enterprise's willingness to implement innovation projects. They include the level of financial capacity of the enterprise, which is estimated by the value of the ratio of equity concentration (autonomy). It is also proposed to pay attention to the number of valid patents compared with the number of patents of the industry leader. The ratio of equipment use is estimated from the standpoint of the possibility of producing new types of products and increasing production volumes (Maffin and Braiden, 2005).

It is proposed to analyze indicators reflecting the favorable nature of the external environment from the perspective of implemented innovation projects when assessing the state of the external environment. They include the level of taxation, which is defined based on the income tax rates. The criterion of the dynamics of demand for products is estimated through the forecast of the volume of its realization. The maximum value of the indicator on the scale is taken as the ratio of the total sales volume of the industry leader's products to the sales volume of the previous year of the analyzed enterprise - 181.35%, i.e., an increase in the sales volume that secured the position of a market leader for the enterprise. On the scale for inflation, the average inflation rate for the EU countries is taken as the minimum value, and the maximum inflation rate in Russia over the past 10 years is taken as the maximum. The dynamics of the income level of oil extracting enterprises is described by the ratio of the total net profit of the leading oil extracting enterprises of the reporting year to the profit of the previous year. The largest change in net profit for the year among all the largest enterprises is taken as the maximum value of the indicator, and the smallest value is taken as the minimum.

It is proposed to analyze the indicators describing the efficiency of the enterprise's activity in comparison with competitors to assess the last area "Level of competitiveness" (Glukhova and Ponomareva, 2010). Consumer satisfaction is calculated according to the method used in the enterprise, using formula (Deberdieva, 2015).

$$U=100-\left(\frac{k1}{s}+\frac{k2}{d}+\frac{k3}{s1}\right)\times 100 \quad (1)$$

Where,

- U is consumer satisfaction with the products of the enterprise, %;
- k1 is a number of claims made by the customer during the year against the equipment supplied by the enterprise, pcs;
- s is a number of products delivered to the customer during the year, pcs;
- k2 is a number of agreements to contracts for the supply of products where deadline for the manufacture of products was broken due to the fault of the enterprise, pcs;
- d is a number of contracts concluded for the supply of products, pcs;
- k3 is a number of applications (contracts) not concluded with the customer because the products are not manufactured, pcs;
- s1 is a total number of applications filed during the year, pcs.

The best value of the indicator is 100%, the worst value is 0. Costs per 1 ruble of the marketable output relative to the industry leader are found as the ratio of costs per 1 ruble of the marketable output of the analyzed enterprise to the costs per 1 ruble of the marketable output of the industry leader. The best result is 1 or less, i.e., the enterprise's costs are the same as those of the industry leader or less; the worst result is the ratio of the highest level of costs of the analyzed enterprise to the best level of leader's costs −1.15.

The proposed method for assessing the innovation position takes into consideration the most priority areas of the enterprise's development, including the level of innovation potential, also focusing on the position of the industry leader and the state of the external environment (Ponomareva, 2011a; Ponomareva, 2011b).

The analysis was carried out for 4 years: 2013, 2014, 2015 and 2016. For this, the quantitative values of the system indicators were first defined and then translated into score (Table 4).

The enterprise increased its competitiveness level in 2016, which was primarily thanks to an increase in the relative market share, as well as an increase in the number of participations in industry exhibitions relative to the industry leader. The level of innovation potential in 2016 remains at an average level, well below the pre-crisis level. This is largely due to a constant increase in depreciation of fixed assets and a lack of their renewal at the enterprise, as well as to an annually declining level of financial opportunities, which is also caused by the consequences of the recent crisis.

After choosing the assessment of the innovation position, the authors developed the program of innovation activities of the oil and gas machine-building enterprise, which assumed specification of the general strategic provisions of innovation activities. The purpose of developing the program of the innovation-driven growth of the enterprise is to identify and systematize the main areas and objectives of the company's activities in the field of innovation, covering all stages of the innovation cycle, optimize available resources and establish the development indicators for the planned period. The key performance indicators of the program of the innovation-driven growth are provided in accordance with the core objective of the enterprise (Table 5).

Let's analyze the structure of the enterprise output in order to determine priority investment projects for product innovations (Figure 2).

The largest share in the production structure is taken by: Equipment for measuring the production rate of oil wells, cluster pump

Table 4: Assessment of the innovation position of the oil and gas machine building enterprise

Indicator	Unit of measurement	2013		2014		2015		2016	
		Value	Score	Value	Score	Value	Score	Value	Score
1	2	3	4	5	6	7	8	9	10
Innovation potential									
Talent pool (proportion of personnel with higher professional education)	%	24	3	27	4	28	4	30	4
Technical potential (wear of fixed assets)	%	35	4	39	4	46	3	49	3
Number of valid patents (relative to the industry leader)	%	283	5	350	5	383	5	329	5
Ratio of patents use	%	65	4	71	4	74	4	78	4
Share of personnel involved in the development and implementation of innovations at the enterprise	%	0.36	2	0.45	2	0.44	2	0.52	2
Level of financial capacity (ratio of equity concentration (autonomy))	Share	0.5	3	0.31	2	0.19	1	0.17	1
Ratio of equipment use	%	37.4	4	25.7	4	47.4	3	47.9	3
Average value	-	-	3.6	-	3.6	-	3.1	-	3.1
State of the external environment									
Level of taxation (income tax rate)	%	20	2	20	2	20	3	20	3
Dynamics of demand for products (by sales volume)	%	131	4	116.9	4	133.1	4	112.7	4
Loan availability, annual interest rate	%	10.9	4	12	4	18.5	3	13	4
Inflation index	%	11.9	3	13.3	2	8.8	4	9.1	3
Share of imported machine-building products in the domestic market	%	85.6	1	66.9	2	64.9	2	63	2
Dynamics of income levels of oil extracting companies	%	154.4	2	102.7	1	70.7	1	132.1	2
Average value	-	-	2.7	-	2.5	-	2.8	-	3.0
Level of competitiveness									
Relative market share	%	60	3	71	4	73	4	93	5
Consumer satisfaction	%	73.4	4	73	4	68	4	66	4
Share of expenditures on R and D in comparison with the industry average	%	61	4	53	3	81	5	86	5
Costs per 1 ruble of the marketable output (relative to the industry leader)	Share	1.09	3	1.05	4	1.00	5	1.03	5
Participation in industry exhibitions (relative to the industry leader)	%	57.1	3	57.1	3	37.5	2	57.1	3
Average value	-	-	3.4	-	3.6	-	4.0	-	4.4

Table 5: Key performance indicators of the program of the innovation-driven growth of the oil and gas machine-building enterprise

Indicator purpose	Indicators, unit of measurement
Performance indicators of interaction with external sources of development and innovation	Number of innovation projects implemented in cooperation with scientific institutes, pcs. Number of innovation projects implemented in cooperation with partner universities, pcs.
Indicators of technological leadership	Number of valid patents at the year-end, pcs. Ratio of patents use, %
Assessment of the company's innovation activities in general. Indicators of R and D funding and efficiency	Profitability of innovative products, % Share of costs for R and D in revenue, % Share of personnel involved in the development and implementation of innovations at the enterprise, %
Assessment of fixed assets	Coefficient of equipment use, % Wear of fixed assets, %
Performance indicators of the enterprise	Revenue, million rub. Return on sales, %

stations and other pump stations of various purposes. To maintain the competitiveness of these types of manufactured equipment, it is necessary to modernize and introduce innovations in their production.

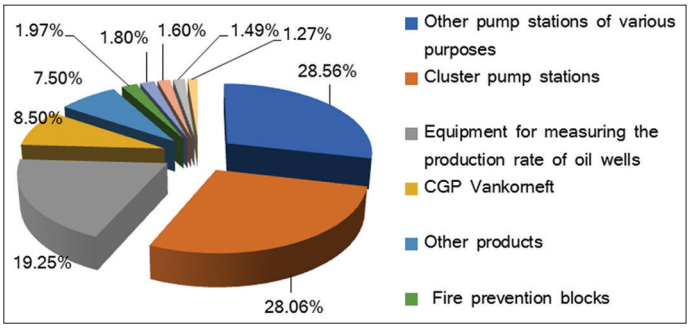
According to the algorithm of selection of innovative projects for the program of the innovation-driven growth, during the pre-selection phase the projects were selected for product innovations related to the types of products manufactured at the enterprise that were most in demand and occupied the largest share in the sales structure. As such, after the first stage, innovation projects were selected and an economic evaluation of their efficiency was carried out using dynamic indicators (Guidance Recommendations on the Assessment of the Efficiency of Investment Projects, 1999) (Table 6).

The discount rate was calculated using the buildup method. The impact of risks on projects was assessed by an expert judgment. The risk-free interest rate amounted to 8%, and the amount of premiums for all types of risks was 3.9%. As such, the discount rate for the calculated innovation investment projects was 11.9%. As can be seen from Table 6, three out of the four projects considered for inclusion in the program are cost-effective. Following the results of the assessment, the project for the modernization of the dosing unit for chemical reagents is eliminated at the second stage of the project selection by adding the function of preparing the reagents, since it is not cost-effective. As such, following the results of selection of innovation projects, it is recommended to include a project for the modernization of equipment for measuring the production rate of oil wells, development of equipment of high mobility and density, and the modernization of pump stations by installing a high-tech pump as product innovations in the program of the innovation-driven growth of the enterprise.

Aside from product innovations, it is recommended to include innovations in business processes, measures for the commercialization of technology, personnel development, equipment modernization and interaction with universities and scientific institutes in the program of the innovation-driven growth of the enterprise (Table 7).

The target values of the key performance indicators for the implementation of the developed program of the innovation-driven growth of the oil and gas machine-building enterprise were defined using the Delphi method. The forecast for the implementation of the proposed program of the innovation-driven growth was planned and the economic effect was determined based on the conducted assessment (Table 8).

Figure 2: Structure of production by the oil and gas machine-building enterprise



Results of the assessment indicate the viability of implementing the proposed program of the innovation-driven growth of the oil and gas machine-building enterprise. The presented indicators of cost-effectiveness confirm the validity of the proposed methodological approach to the assessment of the innovation position of the enterprise.

The comprehensive assessment allowed to expand the choice of managerial decisions, which allow to take various specifics of the strategic position of the enterprise in the industry into consideration to a fuller extent. Another advantage of this method is the use of quantitative indicators in the assessment, which ensures greater objectivity of the results obtained.

4. DISCUSSION

The methodological approach to the assessment of the innovation potential of oil and gas machine-building enterprises proposed by the authors allowed to expand the choice of managerial decisions on the formation of the program of the innovation-driven growth and improve the justification of the formation of strategic decisions. The implementation of the authors' approach ensures:

- Formation of justified criteria for assessing the innovation potential and the innovation climate at the oil and gas machine-building enterprise;
- Development of the quality of innovation management at the oil and gas machine-building enterprises;
- Possibility of achieving high values of the enterprise's competitiveness in the industry.

The proposed methodological approach includes a set of indicators that reflect both external opportunities for development in the market and internal innovation potential. The developed set of indicators can be expanded and supplemented by special criteria reflecting the specifics of the enterprise's activities in the market (Deberdieva, 2015).

The authors see the areas of further research in the study of processes of formation of competitive strategies based on the innovation-driven growth of the oil and gas machine-building

Table 6: Indicators of efficiency of innovation investment projects of the oil and gas machine-building enterprise

Name of innovation project	Project success criteria			
	NPV	Internal rate of return	Profitability index	Payback period
Modernization of equipment for measuring the production rate of oil wells by installing a system of total oil metering during its transportation	220,389.8	0.53	1.08	2.9
Development of equipment for measuring the production rate of oil wells of high mobility and density	47,624.6	0.28	1.06	3.9
Modernization of the dosing unit for chemical reagents by adding the function of reagents preparation	−58,630.2	-	0.79	-
Modernization of pump stations by installing a high-tech innovative pump	261,803.0	0.47	1.07	3.1

NPV: Net present value

Table 7: Program of the innovation-driven growth of the oil and gas machine-building enterprise (fragment)

Area of development	Measure	Target year of implementation, years	Amount of funding, thousand rub	Performance indicators
1	2	3	4	5
Innovations in business processes	Adjustment of the system of intrafirm planning taking the innovation activities of the enterprise into consideration	2017	12.0	Number of commercially viable innovation projects implemented Share of personnel involved in the development and implementation of innovations at the enterprise
	Arrangement of the system of continuous monitoring of new technology in the domestic and foreign markets	2017	183.5	
	…	…	…	
Product innovations	Modernization of equipment for measuring the production rate of oil wells by installing a system of total oil metering during its transportation	2018	4,187,042.1	Profitability of innovative products Share of costs for R and D in revenue Revenue Number of valid patents NPV Payback period Internal rate of return Profitability index
	Development of equipment for measuring the production rate of oil wells of high mobility and density	2018	1,169,051.1	
	Modernization of cluster pump stations by installing a high-tech innovative pump	2018	5,532,533.1	
Technology commercialization	Development of procedures for improving the incentive system for creating intellectual property	2019	3.0	Number of valid patents Ratio of patents use Share of personnel involved in the development and implementation of innovations at the enterprise
	…	…	…	
Personnel development	Performance reviews taking innovation activities of the enterprise into consideration	2017	180.0	Share of personnel involved in the development and implementation of innovations at the enterprise Labor productivity Number of commercially viable innovation projects implemented
	…	…	…	
Equipment modernization	Modernization of existing equipment for the production of new types of innovative products	2017	730.0	Ratio of equipment use Wear of fixed assets Share of R and D costs in revenue
	…	…	…	
Cooperation with universities, scientific institutes	Development of procedures for cooperation with partner universities	2017	5.0	Number of innovation projects implemented in cooperation with partner universities Number of innovation projects implemented in cooperation with scientific institutes Number of valid patents Number of commercially viable innovation projects implemented
	Conclusion of contracts/agreements on cooperation with new core universities and partner universities	2017	72.0	
	Monitoring and selection of promising R and D applicable for the enterprise in profile universities and scientific institutes	2017	252.0	

Table 8: Projected effect of the implementation of program of the innovation-driven growth of the oil and gas machine-building enterprise

Indicators	Unit of measurement	Current year	Target year	Growth rate, %
Number of innovation projects implemented in cooperation with scientific institutes	pcs.	9	19	114.6
Number of innovation projects implemented in cooperation with partner universities	pcs.	0	7	-
Number of valid patents at the year-end	pcs.	24	32	33.3
Ratio of patents use	%	78	91	16.0
Profitability of innovative products	%	5.6	15.3	173.2
Share of costs for R and D in revenue	%	3.5	8.2	135.5
Share of personnel involved in the development and implementation of innovations at the enterprise	%	0.54	2.30	322.2
Ratio of equipment use	%	44.5	65.2	46.5
Wear of fixed assets	%	53	35	-33.6
Revenue	Million rub	4013	6,102.4	52.1
Return on sales	%	4.21	14.2	237.3

enterprises, in-depth analysis and detailed study of the influence of various factors on the company's innovation potential, and building the adapted models for developing managerial decisions for the development of the innovation climate in the industry.

5. CONCLUSION

The Russian machine-building market for the oil and gas industry has significant potential for sustainable development and growth (Gunin, 1999; Loginova, 2007). Corporate service continues to develop at a number of large oil and gas machine-building enterprises. However, experts define that the key area of the oil and gas machine building development is the development and implementation of innovation equipment and technology that is in demand by oil and gas industry enterprises worldwide (Imamutdinov and Medovnikov, 2009).

In the context of the increasing role of innovations as a factor of economic growth and enterprise competitiveness, the status of innovation management is increasing (Grocheva et al., 2015). An innovation component is one of the main components at all levels of enterprise management, which means that innovation management at the current stage of economic development turns into the leading element of enterprise development in the market.

Identification of innovation opportunities and shortcomings in the innovation-driven growth of the enterprise allows to assess its market potential and identify the expected threats from the external environment. Assessment of the innovation position of the enterprise allows to anticipate changes in the cost-effectiveness of the enterprise's production activities during its innovation planning (Borisov and Pochukaeva, 2009). It must be noted that the authors consider the innovation opportunity as an area of the enterprise efforts, through which it can achieve a customized, quite often leading position in the markets of certain products. In turn, the threat in the innovation area of activity can be defined as complications arising from an unfavorable trend or specific events that can lead to the product being squeezed out of the market or its access to the market being restricted in the absence of purposeful innovation efforts (Osinovskaya et al., 2015). In this regard, the development of the program of the innovation-driven growth of the enterprise should be scientifically grounded and practically applicable.

At the moment, the existing methods of the company's innovation position in the market can be divided into 2 groups: Assessment of innovation potential and assessment of the innovation climate. Each of these methods offers a set of multipurpose assessment indicators and various approaches to their measurement. Each of the methods under study has advantages and disadvantages. The authors proposed a combination of set of assessment indicators for both internal innovation potential and external innovation climate.

Methodological approaches to measuring the indicators of the innovation position can also be divided into two groups: An expert approach and application of mathematical models to measure the assessment criteria. The expert approach is the most justified in measuring the quality indicators and in the absence of complete and reliable information. Mathematical models most often give the most reliable estimate of quantitative criteria of innovation-driven growth of the enterprise. Recommendations of the authors are aimed at the use of two approaches that allow to expand the range of the assessed indicators (qualitative and quantitative), as well as to improve the reliability of measuring the criteria that serve as the basis for the formation of the program of the innovation-driven growth of the oil and gas machine-building enterprise.

The methodological approach to the assessment of the innovation position of the oil and gas machine-building enterprise in the market recommended by the authors will allow to:

1. Expand the range of criteria for assessing the innovation potential of the oil and gas machine-building enterprise;
2. Improve justification of the assessment of the influence of the external environment on the innovative capabilities and threats to the enterprise in the market;
3. Reasonably define the target indicators of the innovation-driven growth of the enterprise in the industry;

4. Improve the quality of development of programs for innovation-driven growth of the oil and gas machine-building enterprise.

Improving the innovation-driven growth in the field of equipment for oil and gas enterprises will improve the competitiveness of Russian enterprises, on the one hand, and ensure the efficiency of hydrocarbon extraction and production of petroleum products in the world market, on the other hand.

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