

THE REPUBLIC OF AZERBAIJAN

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ABSTRACT

Of the dissertation for the degree of doctor of philosophy

**ECONOMIC ASSESSMENT OF THE USE OF THE
PRODUCTION AND RESOURCE POTENTIAL OF OIL AND
GAS PRODUCTION**

Specialty: 5312.01- Field economics

Field of science: Economic sciences

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GENERAL DESCRIPTION OF WORK

Actuality of the topic and the degree of development. The economic reforms carried out in Azerbaijan are aimed at intensifying production, the implementation of which necessitates increasing the productivity of industrial enterprises, increasing labor productivity, economical use of material resources, improving product quality and increasing the competitiveness of the economy as a whole. This issue is even more significant for the country's oil and gas industry, which acts an irreplaceable role in the country's economy, generates more than half of the budget revenue and brings foreign exchange inflows to the country.

Therefore, with the implementation of the "New Oil Strategy" established by the great leader National Leader Heydar Aliyev, which started with the "Contract of the Century" in 1994, dozens of oil agreements were signed in Azerbaijan. The realization of all these projects resulted in the export of Azerbaijani oil to world markets, which is of great economic and political importance.

There are many fields in Azerbaijan operated by the Azneft Production Union (PU). The vast majority of these areas are in the final stages of development. Such areas are characterized by reduced production, high irrigation, multiple repairs and high unit production costs. In this sense, intensification of production in such areas, maximum use of recoverable residual oil reserves, efficient use of resource production potentials (PRP).

The State Oil Company of the Republic of Azerbaijan (SOCAR) is a state-owned company according to the legislation of the country. The oil and gas production departments of the Azneft fields do not receive profit and, to some extent, do not participate in the price situation in the world market. This does not allow to adequately assess the efficiency of the use of production factors in the production process.

However, the relevance of the study lies in determining the resource and production potential of the fields operated by oil and gas production departments, identifying the factors influencing it, and finding ways to maximize the use of available recoverable reserves

and thereby conducting study to increase the production capacity of the oil and gas industry.

The urgency of the problem is also due to the fact that the assessment of the production and resource potential of various industries has been resolved to some extent. However, the study of the resource and production potential of oil and gas production, which benefits from various oil and gas fields and plays an unprecedented role in the development of the country's economy, has not been carried out at an appropriate level.

All this indicates the relevance of the study topic, which determines its structure, a basis for the author to identify and realize resources to increase the production and resource potential of oil and gas companies in Azerbaijan in solving the problem.

The theoretical and methodological aspects of the problem are reflected in the work of foreign scientists, studies of economics, production, resource-production, well potential. Therefore, the production potential has been studied in the work of VN Avdeenko [79], LB Vinnichuk [92], YY Donets [98] A, Z.Neberidze [112], IMMetrovich [115], production-resource potential V.A.Alekseyev [80], V.V.Idigova [101], E.S.Kuzmin [105], economic potential K.E.Andreyev [83], V.S.Artyomova [84], V.V.Ignatev [100], A.L.Pshenichnikov [121], A.F.Rudenko [124], V.S. Spirin [130], market potential E.A.Popov [119], E.V.Rokov [125] et al. and is interesting with a number of ideas.

The oil and gas industry, its role in the economy of the republic, the technical, technological and economic problems of this complex, the problems of the country's economy as a whole are reflected in the works of academicians A.V. Mirzajanzada [110], ZA, Samadzada [72,73], AA Nadirov [56], AH Nuriyev [57], AF Musayev [50], doctors of economic sciences, professors: MC Atakishiyev [4,5], N.A. Aliyev [19 , 22], T.N.Aliyev [20, 21, 23, 82], Sh.T.Aliyev [24], E.M.Hajizada [32,33], R.T.Hasanov [34], R.K.Isgandarov [37,38], Y.A.Kalbiyev [41], S.M. Gasimov [44], M.A. Mammadov [22], G.A. Safarov [62-67.126-129], R.Sultanova [134], Sh.A. Samadzada [71], G.S. Suleymanov [75].

However, there are a number of gaps in the study of production and resource potential in oil and gas production, its theoretical and methodological issues; characteristics of oil and gas production and PRP; the relationship between hydrocarbon resources and oil production as a key element of potential; use of production capacity and its component well stock as a key element of PRP in oil and gas production; organization of work in this industry and its impact on the cost of production and the organization of work in this industry and its impact on the cost of production and the dissertation is devoted to the solution of these problems, which determines the relevance of the topic.

Aims and objectives of the study. The purpose of the study is to analyze the components of production and resource potential; identification of resources for efficient use of factors of production on the basis of study; identification of opportunities to increase production through the efficient use of oil and gas resources; identification of opportunities to increase PRP with proper organization of work in oil and gas production; development of proposals to increase PRP by improving production cost management.

To achieve this goal, the following tasks were set and solved in a logical sequence in the study:

- identification of methodological issues of approaches to the concept of production and resource potential;
- determine the production characteristics of oil and gas production, identify their impact on PRP and study the relationship of these characteristics with the formation of PRP;
- Analysis of hydrocarbon reserves, the main elements of the PRP in the production of oil and gas and oil production formed under its influence, their systematization;
- Analysis of the production capacity and the use of the component well stock, which is a main element in the formation of the PRP in oil and gas enterprises;
- the organization of this work and analysis of the cost of production in oil and gas production, as an important issue in the formation of the PRP;

- identification of opportunities for PRP to increase production through efficient use of oil and gas resources;
- identification of opportunities to increase PRP in oil and gas production with the appropriate organization of production;
- Improvement of production cost management in terms of improving PRP.

The purpose of the study is the fields belonging to the oil and gas production departments of SOCAR Azneft.

The subject of the study is the potential, production components and resource potential and instructions for improving their use, methodological support for their assessment.

Study methods: In the process of study, methods of comparison, grouping, analytics, generalization, systematic analysis, probability theory, graphics, mathematical and statistical modeling were used.

The main provisions of protection:

- determining whether the well stock, oil production and production capacity in terms of the PRP for oil and gas production are insufficient to characterize the production capacity of the enterprise;
- generalization of approaches to the potential, diversity, characteristics of oil and gas production, the correct interpretation of the concepts of "production potential" and "production and resource potential";
- identify certain features of the oil industry, determine their effect on the level of PRP, as well as show the features of the formation of the PRP;
- analysis of hydrocarbon reserves and oil production, which are the main elements in terms of PRP, the importance of classification of these reserves; verification of residual oil reserves, factors affecting oil production level;
- To examine the use of well stock, production capacity as an element of increasing PRP and to determine the relationship between well stock and production volume; modeling of fund return indicator; development of a methodological approach to measure the impact of working time losses on labor productivity and wage fund expenditures;

- To examine the production organization and unit cost in oil and gas production in terms of PRP and to prove the importance of using the analytical method for this purpose;

- Production costs in oil and gas production in terms of PRP, analysis and management of its composition, application of cost analysis and multi-factor study; Define cost reduction targets in terms of PRP.

Scientific novelty of the study. The main scientific innovation of the study is the development and validation of scientific and practical approaches to the identification and realization of PRP in oil and gas production, which are discussed in more depth, taking into account the peculiarities of the field. Other more significant scientific findings are as follows;

- It was proposed to designate the oil and gas production enterprise as “production potential”, oil and gas-condensate production, maximum use of the set of resources at its disposal for the production of accompanying products, the interaction of these resources, and their integration in a certain proportion, and the production capacity of the economic unit (1.1).

- It has been proposed to adopt the production of more oil and gas condensate at the lowest cost, using highly qualified personnel and modern digital information technologies envisaging the "production and resource potential" of oil and gas production, oil and gas condensate reserves, the characteristics of the oil and gas field, the use of innovative technologies to increase oil production; implementing effective impact methods on the well bottom zone; implementing the measures aimed at the proper use of time and productivity of wells, ensuring industrial and environmental safety of oil fields; complying with labor and subsoil protection norms (1.1).

- Taking into account that the oil and gas field is an object of purchase and sale, we proposed a geological and economic classification of oil resources and reserves, a "trend" model of residual oil reserves (3.1.).

- Giving importance to oil production in terms of PRP, the essence of the "repeatability" indicator, the "trend" model of daily oil production and the multifactorial mathematical-statistical model of oil

production are proposed, its adequacy was verified by statistical indicators and an economic interpretation of the resulting model was given (3.1).

- In terms of increasing PRP, we received a regression model between the newly drilled well stock and daily oil production, its performance was tested against statistical criteria and a well stock and production management scheme was proposed (3.2).

- A multivariate regression model was proposed to determine the flow rates of tubing, which are important in oil and gas production, and the results were analyzed by statistical indicators (3.2).

- As a key element of the RRP in oil and gas production, a multinational mathematical-statistical model of the capital productivity index characterizing the use of wells was proposed, the adequacy of the resulting model was confirmed by statistical criteria, an economic interpretation was given.

- The development of a methodological approach to measuring the impact of lost working hours on labor productivity and payroll costs the adequacy of the multidisciplinary mathematical and statistical model of labor responsibility proposed by us, which is an important element of the PRP, in this case, the model obtained by the “plant-year” method has been determined (3.2).

- in order to analyze the cost of a cost indicator that plays an important role in terms of PRP in oil and gas production, we proposed a methodological approach, as well as a cost management scheme and developed an algorithm for its implementation (3.3).

- The cost and factors influencing the formation of the PRP have been identified, its mathematical and statistical model has been obtained, the adequacy of this model to statistical criteria has been determined, and its economic interpretation has been given (3.3).

Theoretical and practical significance of the study. The study summarizes theoretical approaches to production and resource potential, and the use of its substantiated results and recommendations can be used to address issues related to oil and gas production. However, the results of the dissertation can be used in the analysis of indicators characterizing the production and economic activities of the Azneft Production Union and its oil and gas companies as well as

when teaching "Enterprise Economics", "Company Economics" and other subjects in universities.

Appobation and application. The main provisions of the dissertation were published in eleven scientific studies, including eight articles (three abroad) and three conference proceedings (one abroad) in scientific journals recommended by HAC.

The name of the institution where the dissertation work is done. The dissertation was completed at the Azerbaijan State Oil and Industry University.

The total volume of the dissertation with a sign indicating the volume of structural units of the dissertation separately.

The total volume of the dissertation is (310554 characters), including the title page and table of contents (1720 characters), introduction (12339 characters), Chapter I (65272 characters), Chapter II (80755 characters), Chapter III (95812 characters), conclusion (14714 characters) and list of references (19906 characters). The volume of the dissertation is 270612 characters, excluding figures, tables and list of references.

THE MAIN SCIENTIFIC PROVISIONS SUBMITTED FOR DEFENSE

1. According to the PRP indicators for oil and gas production, well stock, oil production and production capacities were determined to be insufficient to characterize the production capabilities of the enterprise.

- It is known that each sector differs in different characteristics: economic content of the (produced) product, access to various resources, wage forms of labor, raw materials and materials used, management and efficient use of the financial economy, and. s. All of the above characterizes the PRP of the enterprise;

- The PRP potential depends on the proper organization of economic activity at the enterprise, the identification of growth factors for economic activity, as well as the organization of labor. In general, it is necessary to consider the PRP potential at the micro and macro levels and lay the foundations for the country's economic development;

- The capacity category was used as an important tool to evaluate the performance of one or more enterprises in the former Soviet Union. However, in the conditions of market relations in our country, enterprises, including individual oil and gas fields, can become objects of trade. In this case, the production capacity does not fully reflect the PRP of the enterprise, as it is a feature of the production capacity;

- The capacity of a company with the same production potential also differs depending on the selected unit of measurement or product type. It has been established that a large well stockpile by an oil and gas company does not guarantee large oil production. This difference is also due to the reserves of the deposit, all other things being equal;

- From this point of view, the following resources are another direction for assessing the PRP potential in oil and gas exploration: fixed assets, including well stock, labor resources, finances, etc. includes resource estimation. However, the resources listed above characterize the company's activities only in aggregate.

2. The possibility of correct interpretation of the concepts of "production potential" and "production and resource potential" in oil and gas production, its types, characteristics, generalization of approaches to them.

- An analysis of the economic literature shows that "capacity" means methods, resources, sources, their mobilization can also be used to achieve a goal. This expression is used to describe the economic characteristics of a country, region, industry. However, in a number of literature "economic potential", "resource potential", "production potential", "entrepreneurial potential", "scientific and production potential", "production and economic potential", "natural resource potential", "oil potential". potential", "Well potential", etc. concepts are also used. According to some studyrs, economic potential is the sum of resources, others believe that it is the appropriation of resources at the disposal of an economic entity. All this testifies to the lack of consensus among studyrs regarding the concept of "potential of an industrial enterprise";

- In the economic literature, when characterizing the economic potential of oil and gas extraction, the following enlarged areas are noted: natural resource potential ($A+B+C_1$); production potential; scientific and technical potential; ecological potential; labor potential; export potential; economic (generalized) potential. The economic potential is influenced by both external and internal factors;

- Studies show that economists do not agree with the productive potential. The production potential includes scientific, technical, innovative organizational and personnel, information, environmental and even natural resource potential. The concept of production potential is more important for oil and gas extraction. In our opinion, oil and gas extraction includes the maximum use of the entire potential of the enterprise at its disposal in terms of production capacity, oil and gas condensate production and the production of related products.

- The problem is that oil and gas companies are not making a profit. Snow is formed at the level of azneft. Therefore, it is inappropriate to evaluate the production and economic activity of oil and gas enterprises in modern conditions by financial or market

indicators. Therefore, we propose to evaluate an oil and gas business based on its production potential.

Summarizing the above, let's give a plaintiff's approach to PRP.

When we say "production and resource potential" of oil and gas extraction, opportunities to produce more oil and gas condensate at the lowest cost using highly qualified personnel and modern digital information technologies, implementing effective methods of influencing the bottomhole zone of the well; ensuring the implementation of measures aimed at the targeted use of time and productivity of wells, industrial and environmental safety of oil fields; following the labor and subsoil protection standards; including oil and gas condensate reserves, features of an oil and gas field, the use of innovative technologies to increase oil production.

3. This is shown by determining the characteristics of the oil industry, their impact on the level of PRP, as well as the features of the formation of the PRP itself.

- The oil industry is distinguished by a number of specific features, which are reflected in the PRP. Therefore, oil fields in the development process go through a number of stages. It is known that the oil industry, unlike other industries, can only take place in areas where oil and gas reserves exist. All this is due to the size of these reserves, their geographical location, natural conditions, the level of development of various equipment and technologies, the transportation of finished products (oil-gas-condensate) and other factors. The diversity of the factors listed above also creates differences in the utilization efficiency of oil and gas fields;

- the size of the layer, the depth of the field, reserves and other factors determine the sequence of commissioning of any field. Thus, the development of large deposits usually requires less investment than small ones. Larger fields are more productive where unit costs are lower.

- From the point of view of PRP, one of the most important factors in the development of an oil and gas field is the drilling depth of the well. Thus, with increasing depth, the technical and economic indicators of the well worsen, or rather, the transition speed decreases,

the construction time and the cost of the well and operating costs increase. This affects the level of PRP of the oil and gas department. On the other hand, the most important natural condition for the development of deposits is its multilayered nature. The presence of a number of productive horizons at the intersection of a multi-layer field reduces the cost of a well by up to 20%, creating conditions for drilling multi-row wells, which is very important in terms of PRP.

- The quality of oil and gas also plays an important role in the PRP. Therefore, oil, paraffin, sulfur, resin, etc. The light fractions in it determine their processing technology and also affect the PRP in terms of the value chain.

While operating the layer, artificial impact methods are used to maintain the reservoir pressure and the well is operated with a mechanized method (compressor, depth-pump). This means that during this time the well equipment changes and maintenance costs appear, which is reflected in the deterioration of technical and economic indicators and the level of PRP.

In the last stage of the operation, the amount of water extracted (product irrigation) increases, nanotechnology, biotechnology work is applied to the layer, the unit cost of the product increases, which is reflected in the PRP.

The specific features of oil and gas extraction and their impact on PRP are diverse, and these features are summarized in twelve points in the dissertation, and their impact on PRP is studied.

All of the above also conditions the formation of features of the PRP itself. Therefore, since the main task of the PRP is production, it must be constantly updated, a continuous, constantly renewed process. Another feature of PRP is complexity, which manifests itself in the presence of several constituent elements. Therefore, in oil and gas production, the PRP includes fixed assets. If we add to this the active parts of fixed assets: buildings (wells), machinery and equipment, it also forms the PRP of oil and gas production.

Another feature of PRP is the interchangeability and alternative of its elements. This can be seen as the saving of production resources through the application of new techniques, technologies, energy,

information resources, production and management organization methods.

Another feature of the PRP is its strength, which characterizes the productive capacity of the enterprise's potential.

4. Analysis of hydrocarbon reserves and oil production, which are the main elements, from the point of view of the PRP, the importance of classification of these reserves; proven residual oil reserves, factors affecting the level of oil production.

- The oil and gas reserves have a certain classification and this issue has been at the center of study for many years. The dissertation examines the evolution of the classification of sources in detail and gives a brief overview of the limitations in the volume of abstracts.

- In the period of the former union, such classification was developed in 1928, 1932, 1937, 1942, 1953, 1959, 1970, 1983, in the Russian Federation also in 2001, 2005 and reserves are recorded in the Republic of Azerbaijan according to the classification developed in 1983. Despite the fact that a new classification was developed in the Russian Federation in the years of independence in 2001 and 2005, the Republic of Azerbaijan still records reserves according to the classification developed in 1983. According to this classification, the concept of "source" was adopted for the first time and a single "A-D" series was created according to the degree of justification. It was noted that "sources" were less studied than sources because of the degree of justification.

The dissertation compares the RF and SPE (WPC, APPG) classifications. The American Association of Petroleum Geologists (AAPG) also joined the SPE (WPC) classification in 2000.

- The assessment of reserves in all areas of SOCAR owned by Azneft PU is carried out by Miller and Lents (M/L), a free-of-charge auditing company. M/L makes reserve estimates with reference to world-renowned SPE (WPC, APPG) standards. All this leads to different results in the assessment of field reserves. If the field is tradable, the difference in estimates will have a significant negative impact on the country's economy and reduce the PRP of Azneft PU and the related oil and gas production department.

In our opinion, it would be appropriate to evaluate the resource in the Republic of Azerbaijan with the globally accepted SPE (WPC, APPG) standards;

It is shown that the potential oil and gas reserves in the Caspian Sea are 7-28 billion tons, the proven reserves of the Republic are 500-173 million tons, the estimated 3.8 billion tons, and the total oil reserves are 4-6 billion tons. Initial balance oil reserves in Azneft PU 2.3 billion tons, about 1 billion tons recoverable, residual oil reserves: balance - 1.4 billion tons, recoverable 0.1 billion tons;

We have shown that the balance and residual reserves that can be extracted in our country are sufficient. Efficient use of these resources, among other things, contributes to the growth of PRP. To study the change in residual oil reserves (QNE) over time, its "trend" model was built and the following "polynomial" trend model was obtained.

$$QNE = - 2831T^2 + 13542T + 14397, R^2 = 0.562 \quad (1)$$

The value of the coefficient of determination (R^2) corresponds to the average level of dependence of recoverable oil reserves on time.

In terms of PRP, the Trend model of daily oil production (GH) was also obtained:

$$GH = 1.621T^2 - 8.278T + 2416, R^2 = 0.927 \quad (2)$$

As can be seen from the model, the coefficient of determination (R^2) characterizing the "trend" is quite high;

From the point of view of the PRP, the study of oil production, consideration of the factors that determine its level, is of particular importance. According to literature data and preliminary analysis, the factors affecting oil production (NH) were determined as follows: recoverable reserves (X_1), producing well stock (X_2), production factor (X_3). As a result of solving the first factual materials on a computer with the "statistics" program, the following model was obtained:

$$NH=38890.89-0.022857X_1-1.3352397X_2-26653.1719X_3 \quad (3)$$

The dissertation extensively comments on the statistical indicators of the model. The total correlation coefficient $R = 0.9865$. Analysis of both individual coefficients (t-Student) and the model as a whole (F-Fiser) and other statistical indicators showed the adequacy of the model. With a probability of 95%, both the result (NH) and the influencing factors (X_1 , X_2 , X_3) were determined as their lower and upper limits, and the adequacy of the model was accepted, since they satisfied the conditions.

5. Studying the use of the well stock and production capacities as an element of increasing the PRP and identifying the relationship between the well stock and production volume; modeling the return on shares; development of a methodological approach to measuring the impact of working time losses on labor productivity and wage fund spending:

- One of the features of the structure of fixed assets in oil and gas production is the high share of their active part (more than 90%). The elements of this active part, as well as the elements of the PRP, are directly involved in the production process, affects the volume of output, determining the production capacity of the enterprise. An increase in the share of fixed assets, including through an increase in the technical equipment of labor in oil and gas production, is a factor in increasing the productivity and efficiency of the PRP.

The share of construction wells in fixed assets is very high. Wells, on the other hand, act as a source of increasing production efficiency, affecting the production capacity of the enterprise and the level of PRP, all other things being equal, oil and gas production;

- The analysis shows that offshore facilities account for 84.1%, onshore 65.4%, including wells 57.4% and 57.9% respectively. 9.7% offshore and 15.8% onshore; mechanisms and equipment: 5.2%

offshore and 14.2% on land, including power machinery and equipment 4.6% and 10.8% respectively. The large weight of offshore deposits in the group of buildings is due to the presence of hydraulic structures there.

The use of fixed assets in oil and gas production also depends on natural factors, as discussed above. These factors determine the life of wells. For this reason, wells are often decommissioned not because of physical deterioration, but because of the depletion of the areas and resources in which they are located. Wells with the same design and quality equipment, but as a precaution located in different parts of the field, will not have the same life;

- Taking into account all this, in the dissertation, the report on the loss of oil production due to the total operating well stock in the Azneft Production Unit, dynamics of the operating well stock, the number of newly drilled wells and their daily production, coefficient of production and water cut per well, coefficient of current and final oil recovery, oil and gas production unit operating factor, distribution of wells operated onshore and offshore, distribution of onshore and offshore wells by debit intervals, dynamics of idle well stock onshore and offshore, the inactivity of wells onshore and offshore has been analyzed and studied, but is not provided in detail here due to the limitation of the abstract;

- It is known that for some reason hundreds of wells fall into the inaction fund every year. The repair work to be performed on these wells, their complexity, the necessary equipment and materials, the cost of funds for the implementation of these works, etc. differs by. All this also makes it necessary to study the relationship between the stock of newly drilled wells (NDW) and daily oil production (X).

With this in mind, we have proposed a mathematical-statistical model with a computer application.

$$NDW=87,64133754-0,958122234X \quad (4)$$

The dissertation extensively explores the statistical criteria and indicators of the resulting model.

Here the term "blocked group of wells" is used. In wells belonging to this group, the unit cost of production is higher than the average cost of oil and gas production, so it is called "cut-off".

- PRP in oil and gas production is also due to the efficient use of Pump Compressor Pipes (PCP). Thus, in connection with the transition of deposits to the final stage of development, the question arises of replacing worn-out PCP. At the same time, the determination of the PCP consumption rate is solved by two approaches: creation of a multivariate regression model and determination of the service life of the PCP. In our study, we preferred the first approach, which uses a multivariate correlation-regression method.

Model in general:

$$PCP_{sn} = F(X_i), (i = \overline{1, N}) \quad (5)$$

Here NKB_{sn} is an indicator of the level of the dependent factor (consumption rate of PCP). X_i - factor influencing the dependent value argument. As a result of the analysis, it was found that the following factors influence the PCP consumption rate: product irrigation, % (X_1); The specific gravity of extraction by a sucker rod pump (SRP), % (X_2), the specific gravity of extraction by an electric submersible pump (ESP), % (X_3), Well drilled with SDN - month, % (X_4); Well-month treated with ESP, % (X_5), The average depth of the PCP suspension, meter (X_6). Analysis of the correlation coefficients showed that

$$r_{x_2, x_3} = -0,9512, r_{x_2, x_5} = -0,9483, r_{x_3, x_5} = 0,9719, r_{x_3, x_4} = -0,8991$$

In this regard, some factors were excluded from the study, and with the implementation of a computer, we obtained the following model:

$$PCP_{sn} = -170.050 + 2.290X_1 + 10.940X_3 + 0.030X_6 \quad (6)$$

The adequacy of the model was checked according to statistical criteria, such models were also obtained for oil and gas production units operating on land;

- one of the most important indicators of the PRP in oil and gas production is the profitability of the reserve. To model the fund's rate of return (DF), the "factory year" method was used, the indicators for the last five years for the OGEP were summarized, the number of observations was $n = 40$, that, this satisfies the condition that it is 3-4 times greater than the number of factors influencing the original trait.

According to the results of the April analysis, the following factors influence the profitability of reserves (FV): average daily production rate of an oil well (t/day- X_1); average cost of a production well (thousand people - X_2); service factor (part of the unit - X_3).

As a result of the computer implementation of the data, we obtained the following model:

$$FV=0.267216146-0.000514948X_1-0.0001201199X_2+1.899316295X_3 \quad (7)$$

The dissertation analyzes the statistical indicators of the model;

- to measure the impact of time lost during oil and gas production on labor productivity and payroll costs in terms of PRP, we propose the following methodological approach;

- we obtain the number of unused conditional workers for the analyzed period by dividing the amount of unplanned losses of working time that occurred during the month (quarter, year) by the duration of the working period by the planned duration;

- the cost of the lost product is determined by multiplying this number of workers by the planned productivity of one worker;

- the size of the decrease in labor productivity of an employee is determined by dividing the volume of unearned output by the actual average number of employees.

- It is known that the growth of labor productivity affects the cost of production and the level of PRP. Therefore, we proposed a model for determining the mathematical and statistical relationship

between the factors affecting labor productivity in oil and gas production and its level.

Factors affecting labor productivity (LP): well flow rate (X_2 -t/day); share of mechanized oil production (X_2 - %); Irrigation of the product (X_3 -%) was adopted. The natural expression of this indicator (tons/person) was used, where the “plant-year” problem was solved, the number of observations $n = 27$. As a result of solving the problem on a computer, we got the following model of labor productivity:

As a result of solving the problem on a computer, we got the following model of labor productivity:

$$LP = -493.4764754 + 23.02090765X_1 + 1.04757749X_2 + 11.98265579X_3 \quad (8)$$

In the dissertation, the statistical indicators of the model are widely commented and its adequacy is noted.

6. In terms of PRP, the importance of examining the organization of production and unit production cost in oil and gas production and using the analytical method for this purpose is justified.

- One of the important elements for the PRP in oil and gas production is the staff of the OGEP. Therefore, the organization of work as a whole, the effective use of new equipment and technology directly depend on the intellectual level, competence, education, ability to use information and communication technology.

Efficient use of personnel in the conditions of PRP, work in oil and gas production also serves to organize the workforce and, on this basis, increase labor productivity;

- In terms of PRP, the correct organization of labor in the oil and gas industry, with the maximum use of materialized labor in the means of production, is understood as ensuring social production at low costs of living labor. Oil and gas industry enterprises are machine production based on collective labor, where the effective organization

of collective labor is based primarily on the efficient division of labor between team members through a rational division of labor.

The fact is that the products of an oil and gas enterprise are the result of the joint work of the main, auxiliary and auxiliary categories of workers working there. However, a high share of the last two categories in itself reduces the level of labor productivity. That is why a number of measures should be taken to optimize the ratio of the main and auxiliary workers for the PRP;

With them, the form of organization of labor in oil and gas extraction is developed in connection with equipment, technology and organization of production. All this is one of the main problems facing the PRP in the organization of production and labor in the oil and gas industry in general.

In oil and gas production, the transition from one well to another is necessary to organize well maintenance, which is one of the main elements of the design and survey. This is aimed at ensuring the uninterrupted operation of wells.

- The wells are serviced by oil and gas operators. Their effective work characterizes the use of both personnel and production capacities in oil and gas production;

The growth of labor productivity occurs *ceteris paribus* in terms of the PRP, also reduces unit cost which ultimately leads to higher profits. Living and embodied costs are reflected in the cost of a unit of production, or rather, the level of management, staffing and use of fixed assets characterizes the PRP in oil and gas production, determining the level of cost.

Increasing competitiveness in imperfect market conditions depends, among other things, on the level of production costs. This indicates that the management of production costs per unit of output, the determination of reserves for its reduction is of particular importance;

- Analysis of the cost of commercial oil production by OGEP "Azneft" PU is carried out in two stages: at the first stage, the implementation of the plan at cost as a whole and for individual costing items; at the second stage, cost deviations by factors are calculated. The latter include: norms and prices of energy used for

artificial lift of oil; average production rate per developed well per month; number of wells drilled; change in the share of production by operating methods.

This requires a more detailed analysis of each cost item within the factors. In this regard, we proposed a methodological approach to a detailed analysis of the cost as part of the factors that were widely commented on in the dissertation, and were content to mention here only the name due to the limitations of the abstract.

7. Production costs in oil and gas production, analysis and management of their composition, cost analysis and their multivariate study in terms of PRP; Cost reduction targets are defined in terms of PRPs.

- It is known that the operating well stock must be renewed annually to stabilize and increase production. In this case, the expected flow of the wells to be commissioned in the projects should be economically justified. However, the analysis shows that the newly commissioned new wells at Azneft PU have a small debt, the cost is very high, the payback period of the investment is long. This is reflected in the increase in production costs. This trend is generally seen in terrestrial areas. Therefore, irrigation of the product in wells on land is high, due to the high energy costs for the extraction of the product, the high costs of in-mine transportation and technological preparation of the liquid:

On the other hand, there are not enough operating wells in Azneft PU OGEP, which requires a lot of time and money for commissioning and is reflected in the cost of production;

- In terms of the mechanism for managing the cost of production, highlight the following areas for effective management of the cost of oil and gas extraction and its structural divisions: calculation, budgeting and selection of responsibility centers.

Calculation is the monetary expression of the cost of producing or selling a product. It is based on the correct distribution of all production costs between products and the identification of resources to reduce the cost of each process. In the former Soviet Union, there

was budgeting in management accounting, which was closer to planning. Planning is to make a decision that covers the activities of the enterprise. It allows to discover both domestic reserves and increase the PRP of oil and gas production.

As responsibility centers, individual divisions of the enterprise act as sources of costs in the production process;

- In terms of PRP, cost management is an important factor in improving the economic results of the business as a whole. The cost management process includes the expectation of an effective amount of costs as well as the possibility of reducing them.

Cost management also recognizes the potential to increase the economic impact of oil and gas production activities and increase market competitiveness.

- The formation of the cost of oil and gas production is a multifactorial process. That is why it is important to carry out mathematical and statistical, in particular, correlation and regression analysis when studying this indicator. It also plays an important role in managing unit cost and the factors that affect it in terms of PRP.

Complying with indicator modeling rules using correlation-regression method, Economic analysis among the influencing factors, a multi-factor, linear mathematical-statistical Cost control production was proposed and an analysis of its statistical indicators was carried out;

- Based on the selection, pre-assessment of the factors affecting the unit cost (UC) of the product and the existing study in this field.

The following factors influence the specific cost of production: irrigation coefficient (X_1 , %), well flow rate (X_2 , t/day), operating coefficient (X_3 , units). As a result of the implementation of the computer, we acquired the following model:

$$MD = -403.4764754 + 23.02090765X_1 + 1.04757749X_2 + 11.98265579X_3 \quad (9)$$

The model obtained in the dissertation is widely analyzed and its adequacy was determined by statistical criteria and indicators.

- Summing up the above, we note that, the formation and expansion of the PRP in oil and gas production, and from these opportunities the subject of sales and purchases of the enterprise, allows us to give an idea of production and resource potential and draw the following conclusions.

Conclusions:

This scientific innovation is discussed as follows:

- Assessment of the state of an industrial enterprise depends on the specifics of the use of its fixed assets, labor and financial resources.

Although the fixed assets characterize the production capabilities of the enterprise, they by themselves cannot fully demonstrate their production capabilities as a whole, and this applies to all resources separately. At the same time, production capacity acts as an element of the production capabilities of the enterprise, that is, the production capacity of an enterprise with a fixed production potential will vary depending on the unit of measure of output. To a greater extent, this is manifested in the oil industry: a large number of wells does not guarantee high oil production;

- the production (economic) potential of oil and gas production is highly dependent on natural and market conditions. Therefore, natural factors play an important role in the formation of oil and gas production, and in this sense, when characterizing the production (economic) potential of this industry, it is recommended to choose the "production-finance-market" chain.

It should be able to reproduce the PRP, the directions for the implementation of this ability are indicated: repair, modernization and reconstruction of the enterprise's fixed assets. In this sense, the inclusion of hydrocarbon resources, technical and technological innovations, labor, organizational and information potential in the PRP was noted.

- revenue, comparative, cost, approaches to enterprise valuation were considered, their disadvantages and advantages were indicated, as well as the directions in which they can be used.

It has been determined that the income method in oil and gas production is more acceptable in terms of PRP and this situation is justified in the study. It has been shown that the income approach allows you to predict possible future income in order to summarize the results of operations.

- The remaining oil reserves in our country are sufficient for extraction, and the efficient use of these reserves is of great importance for the PRP. The change in residual oil reserves over time is one of the

important conditions in determining the possibility of PRP. With this in mind, a "trend" model of residual oil reserves was obtained and it was shown that the value of the coefficient of "determination" (R) of the model corresponds to the average dependence of recoverable oil reserves on time.

- Determining the effective relationship between developed oil reserves and production levels determines the possibility of increasing the PRP, and this issue has not yet been fully resolved. It has been found that there is practically no clearly defined relationship between supply and production that characterizes the "multiplicity" indicator. In our opinion, the "multiplicity" indicator expresses the ratio of oil and gas reserves and production, the change curve resembles a parabola, and the minimum value characterizes the maximum oil production.

It is shown that when trading in an oil and gas field, "multiplicity" can become an indicator of competitiveness, advantage, oil pricing, as well as a manipulation tool to achieve certain negative goals.

The fact that the volume of production is influenced by various, many factors, determines the complexity of determining its level. Given this, to study the level of oil production, it is necessary to use the mathematical and statistical method of probability theory. In this study, correlations between factors affecting oil production were considered, a multivariate regression equation was proposed by selecting the most important of them, and its adequacy was checked using the total correlation, Student's t-Fisher, and other criteria.

It is important to examine the relationship between new wells and daily oil production, and for this, this relationship was examined by establishing a correlation-regression equation. The resulting model was tested against criteria known in mathematical statistics: the overall correlation coefficient (R), the F-Fisher and t-Student coefficients, and its adequacy was not confirmed.

- It was shown that the decrease in oil production from new wells is due to the fact that wells drilled in separate fields were carried out in small productive areas, instead of the depth provided for in the

project, for one reason or another, drilling was carried out in a shallower place, thus small flow wells were put into operation, also, the number of days of operation of new wells provided for in the project was not followed.

- It was found that an important reason for the decline in production both onshore and offshore fields of the "Azneft" PU, among other conditions is the renewal of the well stock in relatively new fields and the unsatisfactory use of the existing well stock in fields that have been in operation for a long time.

The analysis shows that NCB consumption rates can be estimated in two ways: by creating a regression model and by determining the service life. In our study, it was shown that NCB consumption is a random variable and its level is affected by many factors. Considering these, a mathematical-statistical multi-factor regression model was constructed to determine the consumption rate of NCB, the result of which was validated using indicators of correlation coefficient, relative error (%).

- the study examined various factors influencing it, showing the impact of charity on the level of PRP. It was revealed that the modeling of capital productivity in oil and gas production as a capital-intensive industry is of great importance and is a very important indicator in terms of increasing the possibilities of PRP. In order to make the analysis of this indicator more accurate, the number of observations was increased to 40 using the plant-year method. According to the results of special literature and a priori analysis in this area, three factors were retained when constructing a mathematical-statistical model and a multifactorial regression model was proposed. The resulting model was tested according to statistical criteria (95% confidence factor, etc.) and economically interpreted.

However, the level of labor productivity in oil and gas production is determined by geological factors, technical and technological factors of well operation, the efficiency of the use of fixed assets, the organization of labor and production.

Considering these, we proposed a multifactorial regression model of labor responsibility in production, tested the reliability

coefficient of the resulting model against statistical criteria, etc.) and determined its adequacy.

The fact that the factors affecting the price are random values also makes it necessary to use the mathematical-statistical correlation-regression method in the analysis of this indicator. By a priori evaluation and generalization of studies, the factors influencing the cost were determined, and we proposed a mathematical and statistical model.

The resulting model was tested by statistical criteria, its adequacy was determined, and an economic interpretation was given.\

- Decreasing the cost of oil and gas production is of paramount importance and includes the following objectives in oil and gas production:

- To develop underground repair techniques and technology,
- Commissioning of inactive wells,
- Correct selection of well operating equipment according to its parameters,
- Increasing the time between repairs by preventing accidents, speeding up repairs,
- Material, fuel and energy savings by switching to a less energy-intensive working method,
- The application of broad impact methods in the downhole region to increase the oil yield coefficient of the layers, the application of mechanization and automation in oil fields.

The main content of the study is reflected in the following works published by the author:

1. *Gunay Vagif*. Trends in the development of oil production // International conference “The Caspian Region: Peculiarities of the geology (the offshore and adjacent oil and gas areas)”. Abstract book, Baku, Azerbaijan, 1-3 november, - 2017, pp. 25-26.
2. *Gunay Vagif*. Management of increasing oil production // Proceedings of the international conference: "Economic security: the state and prospects". – Sumgait: Sumgait State University, 02-03 May, 2018, pp. 239-241.
3. *Gunay Vagif*. Features of the economic activity of oil producing enterprises // - Baku: scientific and practical journal "Cooperation", - 2018, No. 2 (49), pp. 150-155.
4. *Gunay Vagif*. Instructions for improving the use of material resources in the oil industry // - Baku: Economy and construction management, - 2019, No. 2 pp. 94-100.
5. *Gunay Vagif*. Using human capital in oil and gas production and reducing production costs // - Baku: Construction economy and management, 2019, № 3, pp. 115-119.
6. *Gunay Vagif*. Some issues of competitiveness // Prospects for the development of the non-oil sector of Azerbaijan. Materials of the republican scientific conference. - Sumgait: Sumgait State University, April 25-26, - 2019, pp. 228-231.
7. Safarov G.A., *Gunay Vagif gizi*. Methodical approach to the analysis of the cost of oil production // - Moscow: Business Economics, 2018, No. 2 pp. 1068-1071.
8. *Safarov G.A., Gunay Vagif*. Economic cost of resource production potential in oil production // - Baku: Azerbaijan oil economy, - 2019, № 11, pp. 66-70.
9. Safarov G.A., *Gunay Vagif*. Methodical approach to the analysis of the cost of oil production // - Moscow: Business Economics, 2018, No. 2 pp. 1068-1071.

10. *Gunay Vagif*. Multifactorial mathematical-statistical modeling of oil production // Poland, Warsaw: RS Global World science, - №2(63), February 2021, -pp.48-52.
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A handwritten signature in black ink, appearing to read 'Vagif Gunay', with a horizontal line underneath.

The defense of the dissertation will take place at the meeting of the ED 2.46 Joint Dissertation Council of the Higher Attestation Commission under the President of the Republic of Azerbaijan at Azerbaijan Cooperation University and Baku Business University 31 May 2023 at 14:00.

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