THE SOLUTION ASPECT OF PROBLEMS IN THE OIL FIELDS THAT HAVE BEEN WORKING FOR A LONG TIME IN THE AZERBAIJAN REPUBLIC

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Abstract

In the article, the analysis of the factors affecting the reduction of oil production in the hydrocarbon fields of the republic, which are in the last period of development, and the analysis of the existing problems in the exploitation of those fields are given. At the same time, referring to the scientific researches and actual oil field products, the sources of attracting investment in the production of residual oil reserves that can be extracted from the deposits, the importance of the development and application of innovative techniques and technologies, the use of the research work of scientists and specialists of scientific institutions in solving problems related to the intensification of oil production. ways and solutions of the state's problems were explained.

Keywords: deposit, oil, natural resource, production, investment, innovation, progressive methods

I. Introduction

It is known that the oil industry is the most important structural component of the country's economy, and thanks to it more than 50% of the state budget is formed, which is one of the main factors in ensuring the vital activity of the country's population.

As of 01.01.2023, 81 oil and gas fields have been discovered in the territory of the Republic of Azerbaijan. At present, hydrocarbons are produced from 58 fields, while 23 fields are not included in the development or their operation has been stopped due to objective and subjective reasons. 39 beds under development are located on land and 19 beds are located in the sea area. In 2023, the development of 28 fields (including 15 onshore and 13 offshore fields) was continued by "Azneft" PU.

Evaluating the prospects of oil production in the world, it can be said that the era of cheap and easily produced oil is over. At the same time, in Azerbaijan, as in the whole world, the share of hard-to-renew resources is increasing year by year and has exceeded 65% so far. Forecasts of the dynamics of the reserve structure do not create optimism, and by 2025, the share of hard-to-renew reserves in Azerbaijan will exceed 70%, and active reserves will be produced by 80%.

The British BP company's report published in the World Energy 2022 annual statistical overview lists oil-producing countries, and the oil reserves of our country are 7 billion barrels. Despite the fact that the republic has large hydrocarbon reserves, for more than 10 years, oil production and export of oil products have been decreasing every year. According to official information, Azerbaijan's income from the export of crude oil and oil products in 2023 decreased to slightly more than 16 billion dollars compared to 19.5 billion dollars in 2022. The statistics of the State Customs Committee show that the share of crude oil and oil products in the total volume of

Azerbaijan's exports decreased to 47.91 percent compared to 51.08 percent in 2022. This is directly related to the decrease in oil production (Fig. 1).

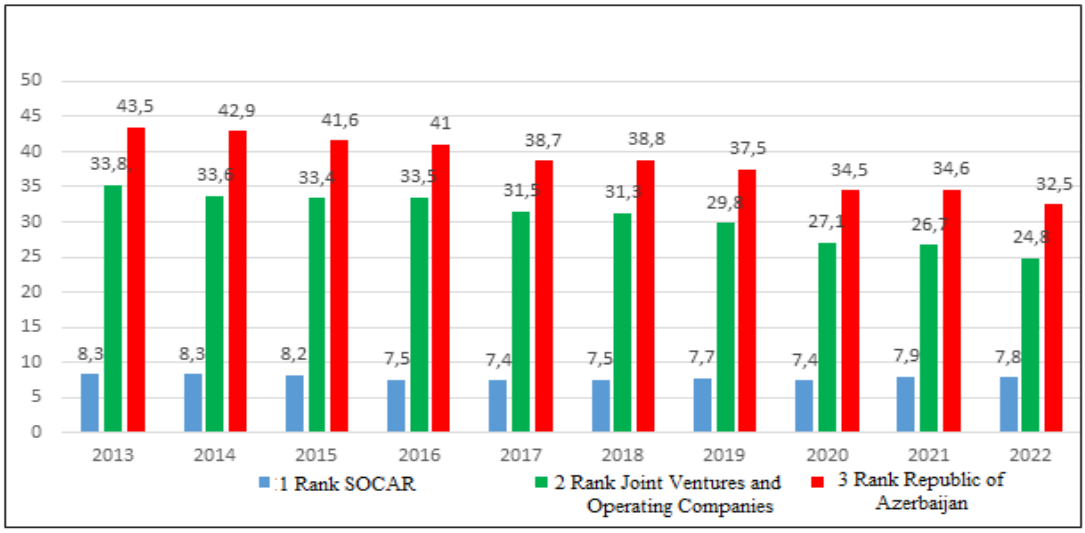

Figure l: *Dynamics of oil production in the Republic of Azerbaijan in 2013-2022 (million tons)*

As can be seen from the picture, oil production has decreased by 11 million tons or 25.3% over the last ten years, along with the projects implemented together with foreign companies. Thus, oil production for the mentioned activity in 2013 is 43.5 million. 32.5 million tons in 2022. down to a ton.

It should be noted that along with foreign companies, Joint Ventures and Operating Companies of the republic, oil will be produced from fields located in long-term operating onshore and offshore fields. The reduction of production in these fields continues every year (Fig. 2).

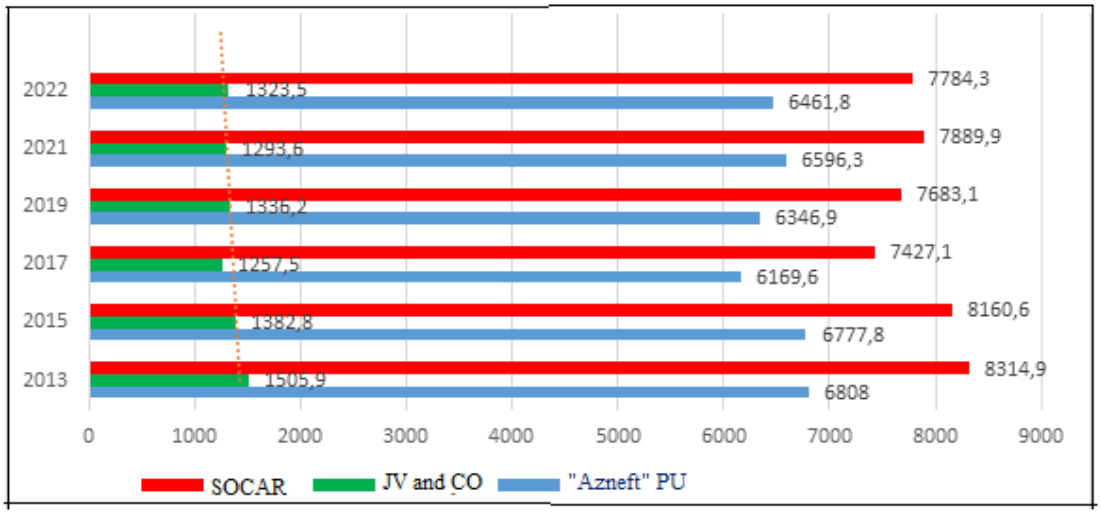

Figure 2: *Dynamics of oil production at SOCAR (2013-2022, million tons)*

According to SOCAR, oil production in the country's territories increased from 8,314.8 million tons in 2013 to 7,784.3 million tons in 2022, and the rate of decline in production in 10 years was 6.0%.

II. Methods

The problem of optimizing the development of oil fields involves a number of main problems, including the justification of the economic criterion of the efficiency of the exploitation of fields, the verification of the volume of natural resources by geological methods, the development and application of modern innovative technologies, the rationalization and application of effective methods, the acceleration of the application of scientifically based inventions and patents, etc. it is necessary to solve the issues. The issues of prevention and intensification of production decline in oil fields have been widely covered in the works and research works of many local and foreign scientists and experts.

Based on the results of our scientific research and actual oil fields, the following are the important factors that affect the reduction of production in the hydrocarbon fields located in the land and sea areas of our republic, which are in the final stage of development (the volume of reserves that can be extracted from these fields is close to 300 million tons). According to the assessment of the "De Golyer and MacNaughton" company, the total reserves of oil (proven, possible and probable) in the dry areas of the Republic of Azerbaijan are 2 billion barrels.

- As a result of over 100-150 years of working of the deposits, the percentage of wetted layers is 90-95%
- Lower formation pressure and temperature makes it difficult for oil to flow to the bottom of the well, allowing "dead" oil to remain in the formations.
- As a result of the increase in the viscosity of oil in the layers, the flow rate of oil decreases and the surface tension increases
- Failure to apply advanced methods for oil reserves that are difficult to extract;
- Formation of sand plug in wells
- The construction of well structures in oil and gas fields and the failure to take into account the geological and physical characteristics of the fields in the project materials related to the drilling of wells creates conditions for the occurrence of accidents in the processes of well drilling.
- Mistakes made in designing the development of oil and gas fields
- Non-intermittent operation of small production wells
- In the development of oil and gas fields, not investigating the issues of increasing the oil yield coefficient of the fields and not applying progressive methods in the production of oil and gas from the fields
- Non-involvement of scientists and non-specialists of scientific research and higher institutions in solving existing problems, etc.

III. Results

Determining the extent of residual oil and gas reserves in the fields based on 4D cartography technologies is one of the main aspects of solving the problems of hydrocarbon deposits. Resource assessment with geophysical methods plays a fundamental role. Thus, the volume of hydrocarbon reserves is one of the main components of the oil company's activity. Volume assessment In modern times, the importance of investments in the oil industry has increased to such an extent that they have already begun to have a political character. In this regard, it will allow the application of new advanced techniques and technologies in the stabilization of oil production in fields that are in the final stage of development. It is important to provide state support for investment in the development of the oil sector. The purpose of investment projects from this approach is to make the operation of the oil and gas extraction enterprise necessary to solve the following issues:

- ♦ identification of new resource sources;
- ♦ replacement of capital funds;

♦ reconstruction of capital funds;
♦ modernization of capital funds;
♦ commissioning of new construction facilities;
♦ purchase and installation of new advanced equipment, machinery and equipment.

The demand for oil in the industry is increasing day by day. For this reason, geophysical control in exploited oil and gas fields should be organized in such a way that it meets the requirements of the day. During the control of the deposits by geophysical methods, numerous petrophysical-geological operational issues should be studied to allow timely implementation of various measures in the wells. In addition to increasing the service life of the field, this should enable maximum hydrocarbon production from it. Analyzing the current state of development of Azerbaijan's oil and gas fields and monitoring them with well geophysical research methods, we will determine the following development directions:

* selection of optimal complexes for increasing the efficiency of control over the development of oil and gas fields with geophysical methods;

*development of more effective new interpretation methods for the assessment of the energy of oil and gas fields, the operating regimes applied to the formations that make up it, the collector properties of the formations and formation pressure;

*determining the technology and sequence of developing a satisfactory model of oil and gas field development control with QGT methods;

* selection of effective methods of influence to maximize productivity in oil and gas fields.

At present, solving the problems of the development of economic systems based on the methods of integrated assessment and management of the level of innovative development potential in the oil industry makes the development of new scientific approaches more and more urgent. In order to solve these issues, first of all, it is necessary to theoretically justify the essence and content of the structural components of the innovative potential in industries, and the methodological bases of the integral assessment of the interaction of their internal and external environmental factors. Thus, the analysis of scientific sources dedicated to the assessment and management of innovative technologies shows that there are practically very few theoretical and methodological provisions related to the development of models and methods for the integrated assessment and management of the level of innovative potential. In order to achieve the strategic goals of innovative development, the integral assessment of the development of economic systems at the micro and macro levels is a very urgent issue.

When determining the degree of efficiency of innovative activity in comparison with developed countries, it is clear that the overall level of innovative activity is only 4.3% according to the data of 2020. For comparison, let us show that the level of this indicator in Germany, Brazil, Canada, Israel and other countries is 30-35 times higher than ours (Figure 3).

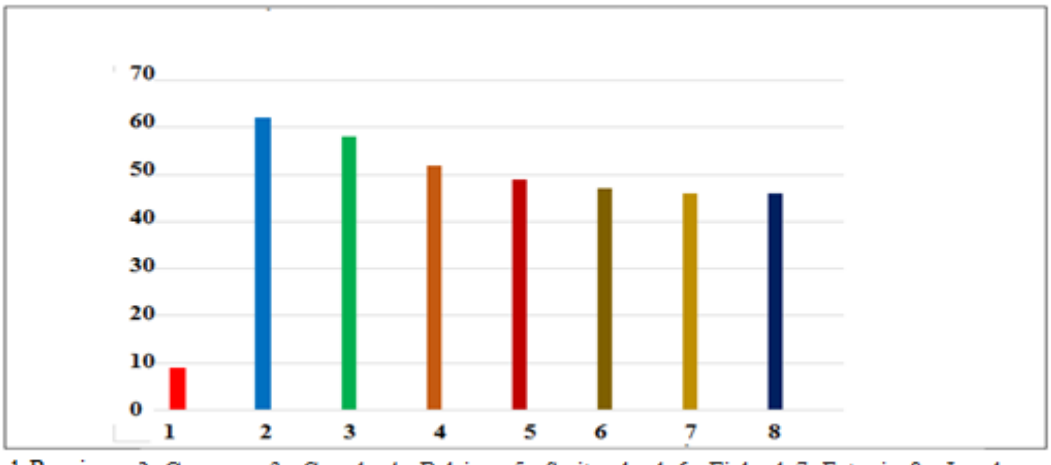

Figure 3: *The level of innovation in industrial sectors of developed countries,%*

From the analysis of the picture, it can be concluded that the following issues should be resolved in order to eliminate the low innovative activity of the republic's oil mining enterprises and the insufficient use of their innovative potential:

1. To support the involvement of small and medium businesses in oil production areas.

2. Solving issues related to classification criteria of enterprises according to the level of innovative activity.

3. To adapt the solution of problems of oil production of scientific research works.

4. Provision of concessional loans for the innovative development of enterprises.

Since the beginning of the 20th century, most US and Western oil companies have begun to pay attention to the extensive development of new information technologies. For this purpose, they mainly strengthened control over the development of the following areas:

- investment in digital technologies is not in expansion of the office equipment park, but in software;
- determining the impact of digital technologies on management processes in general;
- creation of unified information services for companies;
- development of new organizational forms of management;
- transfer of the automation management process almost from the level of operations to the level of tactical management;
- development of information systems mainly to support the decision-making process by company management.

It is clear from the experience of foreign oil companies that a special place in the digitization of management systems is related to the improvement of methods and forms of using digital technologies. In modern conditions, digitization and the development of "smart technology" guarantee, first of all, the creation and application of technical tools for personnel management, data analysis and transmission in enterprises, and the provision of economic infrastructure areas with new communication tools. Thus, the process of personnel management has a systemic nature, it involves the creation of an appropriate management mechanism, the determination of ways to solve this or that problem, the control of mutual relations between individual subdivisions, the comprehensive planning and organization of the activity of the entire system as a whole.

Scientific studies show that developed countries allocate significant financial resources to reveal the intellectual potential of the new generation and to create their world-class highly competitive technological industries and technological products. In these countries, economic "advancement" based on the end product strategy has become a tradition in higher institutions. In order to ensure the participation of students of higher schools in "unified technology" processes, companies and companies sign agreements with universities to solve the problems of innovative technologies before them and monitor their implementation. Due to the involvement of the new generation in these processes, they apply a preferential tax system to state financing companies. This experience is used in Japan, USA, Singapore, Norway, Germany, England, etc. widely distributed in countries. Thus, the main directions of the innovative development of the economy in foreign countries and the role of assessing the value of the right to a single technology are analyzed, directed and formed as a combined scientific and technical result of the interaction of identifiable and non-identifiable intangible assets of a scientific enterprise.

It should be noted that "Unit technology" is the result of scientific and technical activity of intellectual activity, which in one way or another includes inventions, useful models, industrial samples, computer programs or rules and can be the technological basis for a certain thing. In our country, in contrast to foreign higher institutions in this field, there are problems with the funding of scientific work contributions of students. Unfortunately, this field of activity remains problematic in the oil and gas sector of Azerbaijan. If the cost of scientific research, creation and application of innovative technologies in the world oil and gas sector is on average 1.5-2 dollars per ton of oil, it is 10-12 cents in Azerbaijan. Azerbaijan's oil companies lag far behind foreign oil companies in terms of the number and application of inventions and patents. For example, the Norwegian company Statoil's Patent portfolio includes about 800 inventions and 3.5 thousand

patents. More than a third of these innovations are new solutions in the field of field development, and another third are solutions used in the production and sales chain. The American company Chevron, one of the world leaders in innovation, has 37,475 patents. Shell, another leader in innovation, has more than 14,000 patents.

Companies want not only to reduce costs and gain additional profits, but also to ensure the progressive development of their business in the future.

IV. Conclusion

It is especially important to create and develop new technologies and new technical means that allow to solve the existing problems in the oil industry of the Republic due to the increase of the resource base. Apparently, it is to create a whole system of pilot landfills in the extraction of "high viscosity" and "non-potential" hydrocarbons in oil fields. Such pilot projects should be planned in separate areas. It is not only a matter of separate program documents related to the creation of new technologies and the production of the technical means necessary for this, but also issues related to the process of field development and exploitation should be carried out with the sole participation of educated specialists and scientists. Thus, the issues of application of modern technologies in the development of oil and gas fields should be put in a timely manner and measures should be taken. However, in the above list of necessary solutions, the issues of who will do it and how, and from what sources of funding, should be resolved.

Famous oil industry scientists A.Kh. Mirzazanzade., V. N. Shelkachev., R. Kh. Muslumov and E. M. Khalimov, despite all the difficulties and limitations related to the operation and development characteristics of the oil industry, have repeatedly emphasized the importance of increasing attention to the issues of increasing the scientific and technical level and the efficiency of the industry in their research. The opinion of scientists that the application of methods of increasing oil production is not only a scientific and engineering task is gaining more and more understanding in the oil industry of many countries. However, it seems to us that the recommendations given in this regard are mainly based on the previously applied "linear" approach to solving scientific-technical, production, technical and organizational-economic problems. The approach of "innovative design of oil field development" proposed by R. Kh. Muslimov deserves serious attention. According to his definition, an innovative project is a scientific-research work in a certain field, which is carried out in the process of designing development. At this stage, the details of the geological structure of the object are studied, and on this basis, development technologies are selected that should fully take into account the features of the geological structure. It is to create and develop the environment that will help us to develop oil and gas potential based on a more fundamental and in some sense more realistic approach. The analysis based on the characteristics of the application of new technologies in Azerbaijan shows the following:

First priority:

- debates about what belongs to innovative technologies and what does not should not be ineffective and unnecessary in terms of evaluation for economic stimulus today.

- based on the natural dynamics of depletion of fields with large oil reserves, the transition to the organization of production from fields with more complex natural conditions should lead to changes in not only technological, but also economic norms and rules, including state regulatory methods.

- the evolution of the organizational structure of the oil industry in the direction of the gradual weakening of the monopoly role of large and integrated companies is, first of all, the selection of state policy priorities in the field of licensing, taxation, stimulation and crediting of oil companies and companies in Azerbaijan.

- the first and foremost priority for state politicians should be recognized as a comprehensive promotion of drilling new and inclined wells in all existing fields.

Second priority:

- the comprehensive promotion of the exploitation of small productive and high dilution wells is a new source of production. These wells are already a reality, they can provide the required oil production and their contribution to the total production will not be less than the contribution of all the latest technologies.

Third priority:

- compilation of national programs. These are innovative technologies programs based on individual feasibility studies and development programs for special field development projects, and programs for the development of heavy oil and bitumen resources.

The fourth priority, which is important for the implementation of the first three, is the improvement of the legal basis of oil production. First of all, it is necessary to create an open and affordable market for re-licensing and to allow the division of initial licenses both in terms of territory and object.

In order to ensure the active participation of the Azerbaijan National Academy of Sciences in the "science-education-production" chain, the High Technologies Park was established by the order of President Ilham Aliyev dated November 8, 2016. The purpose of creating the ANAS High Technology Park is the sustainable development of the economy, increasing competitiveness, innovation based on modern scientific and technological achievements, expansion of high technology areas, science, technology and innovation.

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