MAIN DIRECTIONS OF DEVELOPMENT OF MARGINAL OIL FIELDS OF THE CASPIAN SECTOR OF AZERBAIJAN

Zulfiyya Mammedova, Natavan Ibrahimova, Emiliya Shakhverenova
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Azerbaijan State Oil and Industry University
zulfiya.mammadova.75@mail.ru
natavan.ibrahimova@asoiu.edu.az
emiliyashahverenova@gmail.com

Abstract

The article discusses the problems of developing and justifying a strategy for the geological study and preparation of oil reserves from marginal oil and gas fields in the Caspian sector of Azerbaijan. The scientific works of domestic and foreign scientists studying issues related to the use of subsoil containing volumes of recoverable reserves, located in difficult geological and field conditions and located in remote, inaccessible areas with poorly developed infrastructure, are presented in detail. In addition, unclaimed oil reserves have been scientifically analyzed to determine the industrial significance of the objects and to determine the conditions for the profitable development of marginal offshore fields.

Keywords: fields, marginal, development, strategy, model, oil reserves, category

I. Introduction

The energy strategy of Azerbaijan for the period until 2035 determines that the Caspian sector of the republic will remain the main subsoil use areas that ensure an increase in oil and gas reserves. Solving the assigned tasks will require SOCAR (Azerbaijan Republican State Oil Company) to develop and justify a strategy for geological study and preparation of subsoil reserves. At the same time, the modern oil industry of Azerbaijan is characterized by a decrease in the quality of the natural characteristics of explored offshore fields. In these conditions, SOCAR faces the question of the need to prepare low-profit oil reserves that fall into the category of so-called marginal fields [1].

The calculation results show that the share of proven reserves in the offshore structure of the oil and gas sector is extremely high and comparable to the oil resources currently under development. Maintaining advantageous positions and dynamic development of the extractive sector based on marginal oil fields (MOR) will obviously require oil companies to introduce fundamentally new technological solutions and financial schemes for their development. In addition, at the level of government management of the industry, it is necessary to provide for the creation of a favorable taxation regime and measures to increase the investment attractiveness of MMN projects.

Solving these problems requires the formation of strategic priorities for the involvement in the development of a new cluster of low-profit offshore oil fields and the substantiation of an organizational and economic mechanism (OEM), which provides for a system for stimulating the processes of development of the international oil production complex based on interaction with SOCAR with the participation of scientific, technical and educational centers.

Providing the needs of the republican economy with hydrocarbon raw materials in the long term and maintaining the country's position in the global hydrocarbon raw materials market is state policy.

As world experience shows, consumption of fuel and energy raw materials in individual countries depends on the level of economic development of the countries [2]. As economic potential grows, scientific and technological progress increases, and the needs of the population increase, the volumes of mineral resources used expand. According to foreign experts, over the past 40-50 years, 70-80% of the oil, about 40% of the coal and iron ores mined by mankind throughout history have been sold. According to many scientists and experts, by 2050 the demand for energy and its production will more than double.

The above necessitates the consolidation of all energy sources to meet the expected growth in its demand; competition between various energy sources (natural gas, oil, coal, hydropower, nuclear energy, and in the future – solar, wind, geothermal, etc.) is especially inevitable.

It should be noted that the existing mechanisms for regulating the global energy market do not work in the global energy sector. It is increasingly obvious that competition between consumers is becoming more intense due to the emergence of such powerful players as China and India in the market. While the main consumers of oil are highly developed countries, the bulk of the world's hydrocarbon reserves are concentrated in a relatively small group of developing countries and countries with economies in transition. Large consumers such as the United States and the European Union are concentrating economic and political resources to expand into markets, which leads to increased competition.

II. Methods

In the specialized scientific literature of both domestic and foreign scientists studying subsoil issues, the terms "marginal deposit" or "marginal object" lack a unified interpretation. It is often used to classify groups of fields containing small volumes of recoverable reserves, located in difficult geological and field conditions and located in remote, inaccessible areas with poorly developed infrastructure. In contrast to our approach, foreign countries extensively study and develop marginal oil fields. This is due to the fact that in countries with a developed mining industry, but with limited hydrocarbon reserves, some types of marginal oil deposits have been developed quite successfully for a long time. This includes the positive experience of Canadian companies that have ensured the cost-effective development of high-viscosity oils and oil sands [3,4,5]. A classic example of the development of marginal deposits is the emergence of a new sub-industry of the US oil industry, focused on the integrated development of so-called shale oil deposits [6,7]. The term "marginal oil reserves" is spelled out in regulatory documents and laws, which indicates that the issues of studying and developing these fields have been addressed at the state level. For example, in the countries of North America (USA, Canada), a special preferential tax regime has been developed for companies developing such deposits [6].

From our perspective, the category of 'marginal development object' primarily pertains to the economic aspect and combines objects that have a marginal degree of profitable development. For marginal oil reserves, the most important criteria for their development by oil producing enterprises are net present value (NPV), internal rate of return (IRR), and increase in reserves for each manat of invested funds. The main task of this stage is to determine the best available technologies for studying and developing a marginal object, as well as the investments required for its implementation.

At the same time, projects for the development of marginal reserves of offshore oil fields, such as Oil Rocks, Divanny, Khara-Zira, Peschanny and others, which are at the stage of geological study or industrial development, are presented with a high degree of detail. In order to develop deposits for investing in such projects, the company has a complete understanding of the technological scheme of their development, which can be obtained during their implementation [8].

The organizational model for the study and development of marginal oil fields can be implemented by creating a sustainable oil industry complex that can ensure cost-effective exploration, production, and transportation of raw materials by integrating innovative technologies into production.

It should be noted that the development and implementation of optimal projects will allow obtaining the following economic effects:

- increase in oil production volumes due to the exploitation of previously unclaimed resources;
- attracting additional volumes of domestic and foreign investments;
- stimulating the introduction of innovative technologies;
- reducing the payback period of investments;
- increase in oil recovery factor.

Based on the study and generalization of the works of Academician A.Kh. Mirzajanzadeh, B.A. Sudeimanova, A. A. Gerta, V. I. Nazarova, Yu. P. Ampilova, A. G. Zdotnikova, R. S. Khirsanova and others in the field of geological and economic assessment of oil and gas reserves and resources, we have introduced three criteria (marginally profitable, conditionally profitable, unprofitable) marginal reserves according to the economic efficiency of their development.

We believe that the development and commissioning of marginal offshore oil fields can contribute to the rational use of subsoil in Azerbaijan. At the same time, the creation of a flexible system by SOCAR will have a positive effect on oil production. However, there is little to no action in this direction from both the state and SOCAR's subsoil management.

Based on well-known domestic and foreign definitions of MOR, these include the following categories of promising hydrocarbon objects: unclaimed, unconventional and hard-to-recover. Unclaimed reserves may include hard-to-recover and unconventional reserves, and hard-to-recover reserves may include unclaimed and unconventional reserves (Fig. 1).

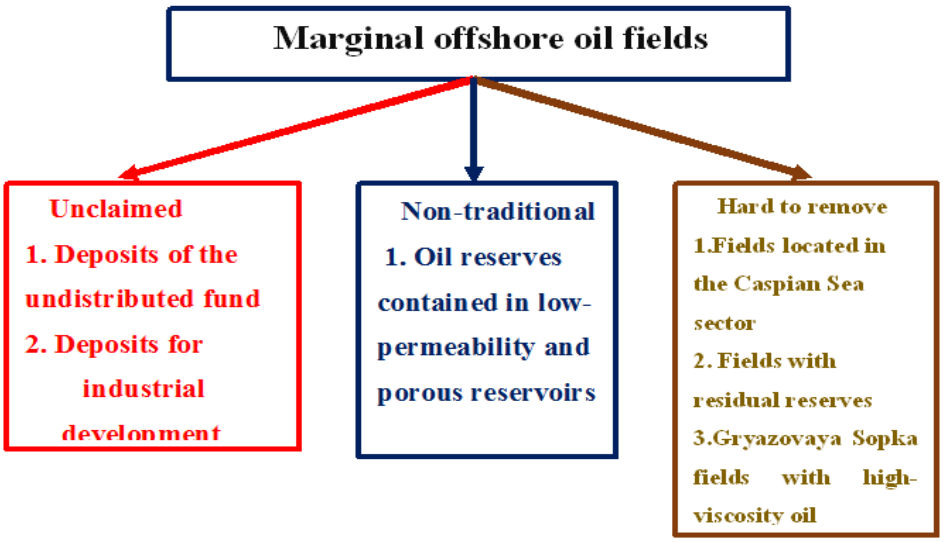

Figure 1: *Classification of marginal offshore oil fields of SOCAR*

III. Results

As can be seen from the figure, unclaimed oil reserves include those resources whose development from a technical and economic point of view is not feasible given the current situation in the global oil market. These reserves belong to the distributed and undistributed subsoil fund and are located in undeveloped layers. In addition, it is proposed to classify unappraised deposits within local objects as unclaimed. Unconventional oil reserves include those

located in low-permeability and low-pore reservoirs. When developing unclaimed oil reserves, the following factors determine the industrial significance of the objects:

- complexity of the geological structure;
- lack of modern equipment and production technologies;
- remoteness from industrial infrastructure deposits;
- low prices for crude oil in the domestic markets.

Hard-to-recover oil reserves are characterized by unfavorable geological conditions and are highly viscous.

The main difference between traditional and unconventional reserves and resources from an economic point of view is that the development of the latter requires the use of significantly more investment-intensive technologies.

When studying the category of marginal development objects, the fundamental question is to determine their role in ensuring the sustainability of the development of the country's oil and gas complex. The basis for such development is the processes of reproduction of the mineral resource base of the country's oil and gas resources as the reserves of the developed fields are depleted [9,10].

We have defined the role of marginal deposits as follows: when highly profitable reserves are reduced, the process of industrial development and development involves deposits and extraction of reserves, which are characterized by a lower degree of profitability. At the final stage of development of offshore fields, low-profit fields are introduced into the process of industrial development.

Assessing the industrial significance of marginal deposits requires evaluating various factors such as geological, mining, and economic conditions. These factors, which vary among enterprises and change over time, collectively determine the effectiveness of marginal oil facilities.

The problem of assessing the limiting parameters of marginal objects is associated with the lack of sufficient methodological and practical experience in their development. In addition, promising objects containing marginal oil reserves have been little studied and do not have approved project documents by SOCAR. But for oil producing enterprises, it is important to have projects at the initial stage of geological exploration or industrial development of objects.

Currently, one of the few methods for conducting economic assessment is the construction of an economic-mathematical model for assessing acceptable parameters for the development of marginal objects. At the same time, in order to assess the economic efficiency of developing marginal oil reserves, it is necessary to justify prices for crude oil on the domestic market, and calculate the volume of capital and operating costs.

A change in the direction of decreasing or increasing the volume of recoverable marginal oil reserves, subject to changes in their depth and oil production rate of wells, is calculated based on an assessment of the capital and operating costs required for field development. With the definition, it is possible to calculate the minimum technological and economic initial data acceptable for development. The amount of capital costs associated with the construction of production and injection wells, and, accordingly, the costs of their operation, depends on the depth of the formations.

With an increase in the price of oil on the world market, revenues from the implementation of a project for the development of marginal oil reserves increase. At the same time, the volume of tax revenues to the State Budget increases. If world oil prices decline, the opposite situation occurs.

Conclusion

1. Sustainable development of the oil production complex of marginal offshore oil fields directly depends on SOCAR's technological capabilities to ensure cost-effective development and development of low-profit deposits.

2. In all the leading oil companies of foreign countries, there are many solutions that differ from each other in the methods and technologies used for the development of marginal oil fields. However, SOCAR has few methods for increasing oil recovery are used mainly in depleted oil fields for the purpose of conducting pilot tests.

3. Currently, the main strategic directions of development of SOCAR-BP cooperation in the field of studying and developing marginal oil reserves of the Caspian sector of Azerbaijan are the development of joint projects in the field of creating highly effective technological solutions aimed at increasing oil recovery, since their implementation in the oil and gas producing enterprises of the republic will lead to to reduce costs and will allow such facilities to be brought to a profitable level.

References

[1] Masteranov A. M. Reality and prospects for sustainable development of energy supply in Russia // Economics of the fuel and energy complex of Russia. M., 1994. No. 2.

[2] Belenkiy V., Lukatsky A. Methods for studying the mutual influence of economics and energy // Izvestiya RAS. Series: Energy. 1995. No. 6. pp. 45–52. 19.

[3] Danilova E. Heavy oils of Russia // The Chemical Journal. 2008. December. pp. 36–37.

[4] Johnston J. Economic methods. M.: Statistics, 1990. 344 p.

[5] Fan Tingting. Development of Russian-Chinese energy cooperation // Ethnosocium. 2011. No. 7.

[6] New aspects in the taxation system of capitalist countries. M., 1990

[7] Tutoshkin A. Americans looked into every well // Kommersant-DAILY. 1996. March 26. No. 49.

[8] Development and operation of Caspian offshore fields. M., Nedra, 2016. 123-126p.

[9] Dolan E. Lzh., Lindsay D. Market: microeconomic model. St. Petersburg, 1992. 235 p.

[10] Methodological recommendations for the application of the Classification of reserves and forecast resources, approved by order of the Ministry of Natural Resources and Ecology of the Russian Federation, dated November 1, 2005 No. 298.