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QD2 in the III Tectonic Block of the Neft Dashlari Field Ways of Efficient Use of Residual Resources of the Usage Object

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Abstract

Like many other oil and gas fields in Azerbaijan, as well as we have faced the problem of efficient development of residual resources at the QD2 production facility in the III tectonic block of the Oil Rocks field. The article explores ways to solve this problem. The proposal is to increase the number of production wells and apply new methods to increase oil production. Using the field classification model, it was proposed to apply a physical and chemical method in accordance with the geological and technological parameters of the QD2 production facility in tectonic block III. The efficiency to be obtained after the application of the method has been calculated.

Keywords: tectonic block, exploitation object, injection, cracking analysis, classification model

Introduction

Offshore oil and gas fields have been intensively and rapidly exploited in our country more than 50 years. the volume of hard-to-recover residual resources in the balance of total resources is growing in Azerbaijan, as in the whole world. Efficient use of these residual resources remains as actual problem.

Most of the oil and gas fields in Azerbaijan are in the final stages of usage. In many of these fields, we face the problem of efficient use of residual resources. In IV stage of the usage, satisfactory results can be obtained by artificially influencing the layers (irrigation, new methods, etc.). In order to design the process of artificial impact to the layer, it is expedient to consider the issue of ensuring the compatibility of their geological and technological conditions.

The problem of efficient development of residual resources is also related to the QD2 production facility in the tectonic block III of the Neft Dashlari field. From this point of view, first of all, the distribution of residual resources of the facility in the field, etc. issues should be considered.

Determining the distribution of resources of the facility by field is associated with the collection, application and integrated use of multidimensional geological-geophysical and mining data. Mining and geophysical data for each well are collected, processed and the values of effective thickness, porosity and oil saturation parameters are determined. Determination of the distribution of linear resources in the field is carried out using a complex method of cracking and volume (Ahmadov, 2014; Bagirov, 2001; Nazarova, 1996). The methodology used is implemented on the basis of a special algorithm, program and the following maps are compiled:

- distribution maps of linear resources, taking into account the values of geological and geophysical parameters for wells;

- field distribution maps of accumulated oil production;

- Field distribution maps of residual (geological and extractable) oil resources.

Material and Methods

Using the cracking mapping method, a static geological model of the explored III tectonic block QD2 facility was constructed (Figure 1 a) and field differentiation maps were developed and analyzed (Figure 1 b, c, d, e, f). According to the maps of the first balance and distribution of the first recoverable resources of the QD2 production facility, the main resources are related to the bedrock areas of the field. However, in some limited areas, 23-25 thousand tons of oil was extracted around wells 1756, 1761, 2040, 1758 and 542 (Figure 1 d). Based on the distribution maps of the remaining reserves, it can be determined that there are 330-350 thousand tons of oil reserves around the wells in the arched areas of the III tectonic block (Figure 1 e and f).

In general, it was determined that the rate of development of recoverable oil reserves did not exceed about 20%. The optimal density of the well network has been determined for the efficient use of residual resources and the application of new methods has been considered. For this purpose, the fund of inactive wells in tectonic block III was investigated, injection wells were selected. Thus, the commissioning of wells 446, 711, 1754, 1766 in the stock of inactive wells and the commissioning

of wells 475, 526, 527, 1765 as injection wells should be based on economic indicators.

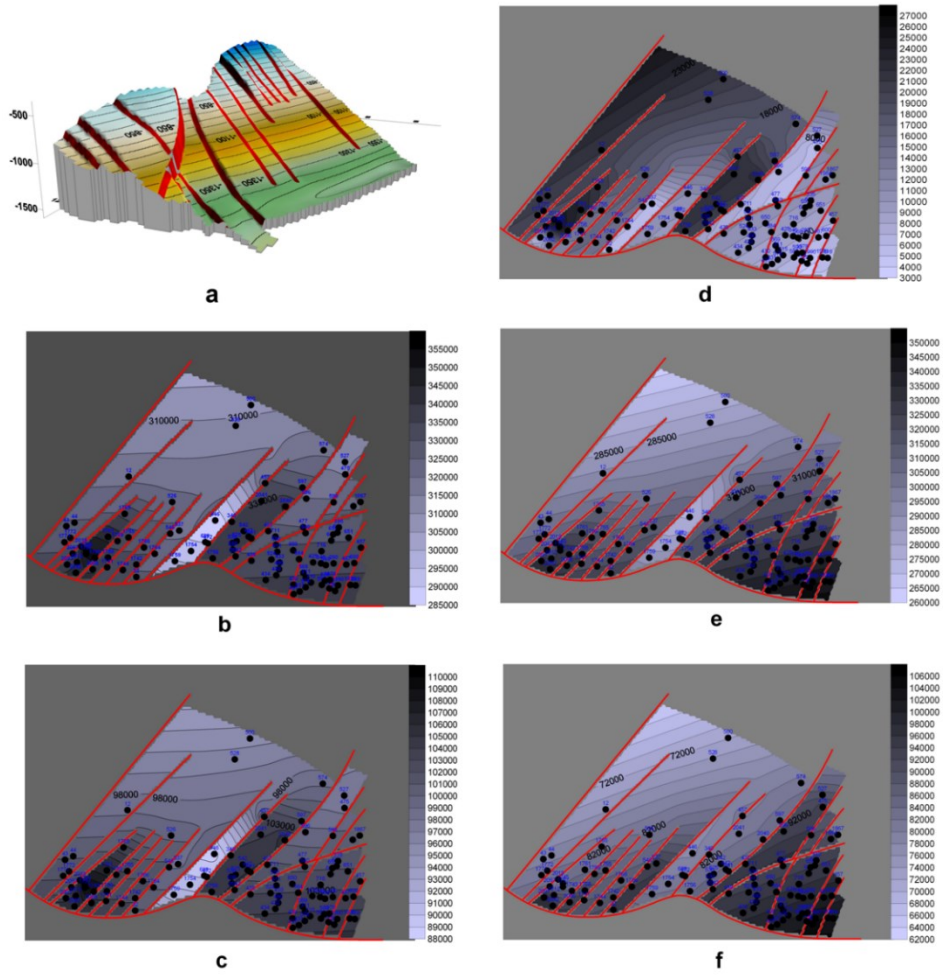

Figure 1. Cracking maps of the III tectonic block QD2 exploitation object: three-dimensional model of the "a"-III block (according to the ceiling of the QD2 exploitation object); "b"-initial balance reserve; "c"-first removable reserve; "d"- accumulated production; "e"-balance balance reserve; "f"-residual removable resource.

The results of the research show that one of the ways to efficient usage the residual resources of the objects is to apply new methods that increase the oil production of

the layers. These methods include physical and chemical, heating, thermic, microbiological and etc. methods apply (Salmanov et al., 2012; Surguchev, 1991). These methods have been widely used in various production objects of the world's oil fields and have been highly effective. Their geological and technological conditions have been identified for the effective application of each of these methods (Bagirov, 2001). It is noted in the classification model of Baghirov (2001) that geological-technological characteristics of the effective application of impact methods that increase the oil production of layers (Figure 2).

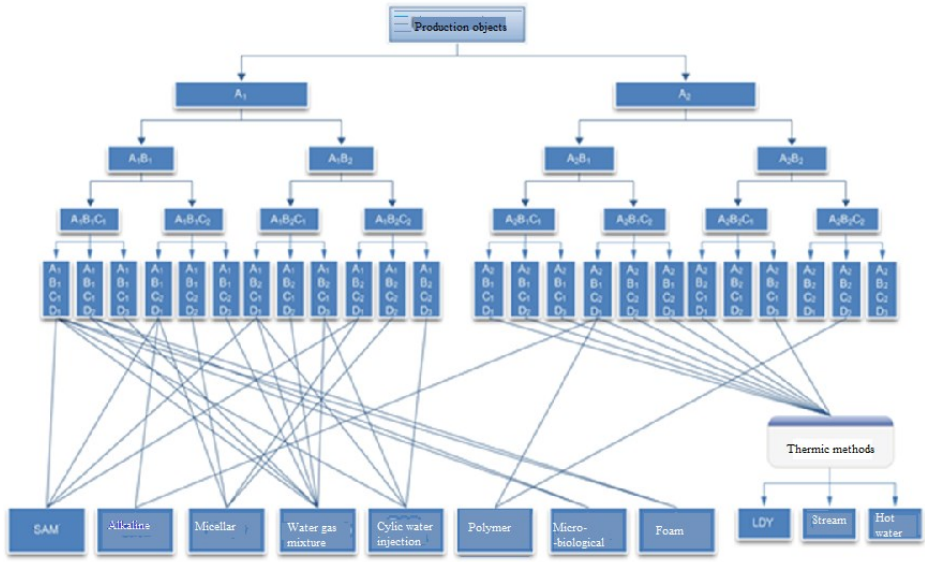

Figure 2. Classification model of methods to increase oil production (according to Baghirov B.A.) A- viscosity of oil, A1 <10m Pas, A2> 10m Pas; Depth of bed of B-layer, B1 <2000m, B2> 2000m; C- conductivity of rocks, C1 <0.1m km2, C2> 0.1m km2; Rate of use of D-resources, D1 <20%, D2 = 20-40%, D3> 40%.

Experience shows that four parameters play an important role in the application of these methods. These parameters include the viscosity of the oil in the formation conditions, the depth of the production object, the conductivity of collector rocks and the degree of use of oil resources. Based on the values of these parameters, a classification model has been developed, which allows to identify the scope of impact methods that increase the oil production of objects.

1) Oil viscosity under layer conditions (A) A1 <10m Pas, A2> 10m Pas;

Here, in the conditions of A1-layer, the layers are characterized by light oil with viscosity of less than 10m Pas and heavy oil with A2-10m Pas. The value of this parameter is considered very important because it determines beforehand the possibility of applying physical and chemical, and thermal methods in the layers. Thus, more effect can be achieved by using physical and chemical methods in facilities with low viscosity of oils. In this regard, it is proposed to divide all operating facilities into two groups: the first group of physical and chemical facilities, and the second group of objects which are suitable for the application of thermal methods.

2) Depth of exploitation objects bedding (B) B1 <2000 m, B2> 2000 m;

Here B1 and B2 are bedding depth according to the 2,000 m and more than 2,000 m, exploitation objects.

It should be noted that the application of thermal methods that increase the oil production of the layers is more effective in the layers up to 2000 m depth. However, the application of physical and chemical methods is not limited by the depth of deposition of objects.

3) Conductivity of collector rocks (C) C1 <0.1 μm2, C2> 0.1 μm2;

As can be seen, according to the values of these parameters, the development objects are divided into weak and high-quality collectors.

4) Rate of resource use (D) D1 <20%, D2 = 20-40%, D3> 40%;

The value of this parameter is very important to determine the sequence of application of methods that increase the oil production of layers.

The classification model, consisting of 24 homogeneous groups reflects all the possible application conditions of the methods that increase the oil production of the layers according to the values of the four selected parameters (Figure 2). The values of the relevant parameters of the QD2 operating facility have been determined and given in the table below (Table1).

The benefit of applying the method is calculated as follows:

$$Qs = \frac{Qqbe}{100} \times E\,ef$$

Here Qs is the efficiency obtained after the application of the method, Qqbe is the residual balance resource, Eef is the efficiency of the method.

Table 1. The values of the relevant parameters of the QD2 operating facility

Object of operation Additional,	Oil viscosity, m Pas (A)	Depth of bedding, m (B)	Conductivity of rocks, m km2 (C)	Rate of resource use,% (D)	Belonged grade	Applied Method,	Effect of the method %	Gained extra oil production thousand tones
QD2	5.7	1300	0.105	20	A1B1C2D1	SAM	3-5	77-129
	5.7	1300	0.105	20	A1B1C2D1	Alkaline	5-10	129-257
	5.7	1300	0.105	20	A1B1C2D1	micellar	8-15	206-386

It was determined that according to the classification scheme, the QD2 object is more suitable for the application of physical and chemical (SAM, alkaline and micellar) methods. The table gives the forecast estimates of the growth of additional oil reserves calculated for the QD2 production object. In tectonic block III, the value of this indicator is 77-386 thousand tons. The choice of the appropriate development option should be based on economic indicators.

Results and discussion

Ways of efficient development of residual resources of QD2 exploitation object in tectonic block III of Neft Dashlari field have been studied. With the help of cracking analysis, resource distribution maps were compiled and layer differentiation of residual resource was determined.

Residual resource in tectonic block III have been identified mainly in the bedrock areas of the field. From this point of view, it is important to cover the QD2 production object in these areas with a network of wells for the efficient use of residual resources. Therefore, the commissioning of wells 446, 711, 1754, 1766 in the stock

of inactive wells and the commissioning of wells 475, 526, 527, 1765 as injection wells should be based on economic indicators.

In addition, the application of methods to increase oil production has been identified as a main solution for the efficient use of residual resources.

As a result of the research, it was found that as a result of the application of physical chemical (SAM, alkaline and micellar) methods in accordance with the geological and technological parameters of the QD2 production object, it is possible to increase 77-386 thousand tones of residual oil resource.

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