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OIL RECOVERY FACTOR PREDICTIONS WITH AN INCORPORATED LITHOLOGY

Existing methods for determining the 0il Recovery Coefficient (ORC) due to waterflooding, such as the Ukrainian and Buckley-Leverett methods, have significant drawbacks that lead to inaccurate forecasts of oil production volumes [1-2]. These shortcomings are associated with the neglect of crucial factors affecting the process of displacement of oil by water [3-4].

Rock and fluid properties such as permeability, porosity, clay, and oil saturation can be closely related to the heterogeneity of the formation of lithofacies and have a specific correlation. Ignoring this factor decreases the accuracy of determining the oil recovery coefficient [5].

The Ukrainian method does not fully consider such factors as wetting, capillary pressures, and relative permeability. That leads to simplifying the oil displacement process model, which reduces the accuracy of forecasts [6-7].

As a result of these shortcomings, the forecast indicators of ORC due to waterflooding may differ significantly from the actual values of production reserves. That can lead to significant economic losses.

The growing need for energy sources and the depletion of traditional deposits make increasing the efficiency of oil production urgent. Waterflooding is one of the most common secondary mining techniques, and accurately determining its effectiveness is a key factor in field development and exploitation decisions.

Improving the methods of determining the ORC due to waterflooding, considering the lithofacies distribution of the permeable part of the reservoir, can allow:

- to increase the accuracy of forecasts regarding the volumes of oil production;
- optimize the design and operation of waterflooding systems;
- to increase the economic efficiency of the development and exploitation of deposits.

This work proposes a method of improving the traditional methods of determining the ORC due to waterflooding, considering the facies distribution of the permeable part of the reservoir [8]. For this, the following we conducted:

1. Analysis of traditional methods: We investigated the shortcomings of conventional methods related to neglecting factors affecting ORC.
2. Development of a method based on facies distribution: A method that uses a three-dimensional model of the formation to determine the volume of the

permeable and impermeable zones of the formation, as well as the distribution of facies in the formation, is proposed.

3. Comparison of methods: In the data analysis, we compare the accuracy of traditional methods with methods that consider facial distribution. For the experimental histogram and a theoretical graph of the normal distribution of ORC, we used the analysis of data random variables.

The study results showed that considering the facies distribution in the Buckley-Leverett method gives comparable and even more precise forecasts of the volume of oil production compared to the Buckley-Leverett method, which did not consider the facies distribution. The Ukrainian method with and without facies showed utterly different results. That is because the Ukrainian method does not consider key factors, such as wetting, capillary pressures and relative permeabilities, which affect the oil displacement process by water.

The scientific novelty of the work consists of developing a method for determining the ORC due to waterflooding, considering the facies distribution of the permeable part of the formation. This method allows for more accurate forecasts of oil production volumes, which can have a significant practical impact on field development and operation efficiency.

The study results can improve the forecasting of oil production volumes in fields developed by the waterflooding method, optimize the design and operation of waterflooding systems, and evaluate the economic efficiency of field development and operation projects.

We recommend using the proposed method in ORC determination due to waterflooding in the waterflooding method of field development. That will make it possible to obtain more accurate forecasts regarding oil production volumes, which can increase the economic efficiency of the development and operation of fields.

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