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НАЦІОНАЛЬНА АКАДЕМІЯ НАУК УКРАЇНИ  
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# ЗБІРНИК НАУКОВИХ ПРАЦЬ XVII МІЖНАРОДНОЇ НАУКОВО-ПРАКТИЧНОЇ КОНФЕРЕНЦІЇ “АКАДЕМІЧНА Й УНІВЕРСИТЕТСЬКА НАУКА: РЕЗУЛЬТАТИ ТА ПЕРСПЕКТИВИ”



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IMPROVING THE ACCURACY OF FORECASTING OF OIL EXTRACTION  
TAKING INTO ACCOUNT THE LITHOLOGICAL FEATURES OF THE  
RESERVOIR

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At the current stage of development in the oil industry, a key objective is to enhance the accuracy of forecasting the oil recovery coefficient during flooding [1]. Existing calculation methods have various drawbacks that affect their reliability. For instance, the state standard of Ukraine, approved in 2000, defines oil recovery coefficient based on absolute permeability while neglecting essential factors such as relative permeability, lithological variations, and the influence of gravity. In contrast, the Buckley-Leverett method [2], a standard in international practice, allows for integrating these aspects. However, it also overlooks lithological distribution in its fundamental form [3].

The primary method established in Ukraine's state standard relies on absolute permeability, failing to account for fluid interactions in the reservoir. This oversight leads to unreliable forecasts, mainly when multiple fluids, lithological inhomogeneities, or significant formation slopes are present. The absence of relative permeability in the oil recovery coefficient calculation affects the assessment of flooding efficiency since it ignores critical filtration processes in multiphase systems. Similarly, the state standard method does not address the gravitational effects that influence oil displacement in inclined reservoir conditions.

The Buckley-Leverett method offers a more accurate calculation of the oil displacement process due to its use of relative permeability and fractional flow curves [4, 5]. However, in its classical application, this method does not consider lithological dismemberment, limiting its effectiveness for complex layers. To overcome this limitation, a technique was developed to integrate lithological distribution, allowing for considering reservoir heterogeneity at the analytical formula level.

For analysis, 100 cases of lithological distribution in the reservoir and 100 cases without lithological dissection were generated [6]. Calculations were performed for each scenario according to the Buckley-Leverett method and the state standard of Ukraine [7]. Theoretical graphs of the normal distribution of the obtained oil recovery coefficient values were constructed.

Integrating lithological dismemberment improved the reliability of the results. Specifically, the spread of oil recovery coefficient values decreased by 11% compared to scenarios that did not consider lithology. The inclusion of the gravitational component had little impact on the average oil recovery coefficient.

The method based on absolute permeability did not improve in accuracy, even when accounting for lithological variations. The oil recovery coefficient values obtained remained inconsistent. The inability to integrate the gravitational factor further limits the application of the state standard for inclined layers.

The results indicate that incorporating lithological dismemberment into the Buckley-Leverett method enhances the accuracy of oil recovery coefficient calculations, which are crucial for planning oil field development. Integrating these approaches allows for the following:

- reduced uncertainty in forecasts regarding oil production volumes;
- optimization of well placement and water injection volumes;
- increased efficiency in utilizing investments for field development.

For Ukraine's state standard, a vital step towards enhancing the methodology would be to introduce relative permeability into the calculation formula and incorporate lithological and gravitational factors. This change would enable it to achieve comparable accuracy with the Buckley-Leverett method.

A comparative analysis of the two methods revealed that the classical Buckley-Leverett method, when taking lithological distribution into account, is more accurate and reliable for predicting KVN in complex reservoir conditions. Conversely, Ukraine's state standard requires significant modernization to address the key factors that influence the flooding process.

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DEVELOPMENT OF APPROACHES TO IMPROVE THE PERFORMANCE  
OF CABLE SYSTEMS FOR ENHANCING THE PERCEPTION OF SOUND AND  
IMAGE QUALITY IN MUSIC AND CINEMATIC SYSTEMS

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**Relevance of the research.** In recent decades, the rapid development of audio and video technologies has opened new horizons for high-quality perception of music