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Evaluating the Effectiveness of Tight Oil Development

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Introduction

As a crucial component of unconventional resources, the efficient production of shale oil has become a focus of petroleum engineering study in recent years. The evaluation of air injection in shale reservoirs is an attractive topic to research given the large availability and inexpensive cost of air. This research evaluates the production performance of several air injection development techniques in the shale reservoir, including air flooding and air huff and puff, based on full-diameter core air injection tests. Meanwhile, a method for systematic evaluation that combines nuclear magnetic resonance, laser scanning confocal microscopy, and gas chromatographic examination reveals the characteristics of produced oil and residual oil. According to the data, early gas breakthrough and a long oil production are traits of air flooding development [1].

Description

Although the cumulative recovery of three rounds of air HnP is less than that of air flooding the replacement efficiency of the first round of air HnP is much higher compared to air flooding, suggesting greater feasibility of air HnP in the early phases of development. The air injection recovery comes predominantly from the large pores, whilst the leftover oil is mostly concentrated in the medium pores. The leftover oil contains more heavy components due to the increased recovery factor for light components in air injection development. The feasibility, development efficiency, and development features of air injection in shale oil reservoirs are examined in this research [2].

According to multiple prior articles, gas injection has emerged as one of the most efficient methods for the efficient development of tight reservoirs as conventional oil and gas production has gradually given way to unconventional oil and gas development in recent years. Due to its affordability, quality injection, and ease of availability, air injection development in particular has drawn attention. The impacts of water injection and air injection on development have been contrasted in Buffalo Oilfield. [3].

The thermal expansion of the oil and the bond-breaking process of the oil are both triggered by the heat generated during air flooding from the oxidation reaction, which leads to the creation of a flue gas front and better displacement effects in low permeability reservoirs. In spite of this, due to the low air injectivity of shale oil reservoirs, the thermal effect of air injection appears to be insignificant. et al. summarised prior cases for a thorough discussion on the viability and potential of gas injection in shale reservoirs, concluding that elements like microfractures, high-temperature and high-pressure environments, and low water content in shale oil reservoirs are conducive to air flooding, which has a high potential to cause damage.

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Compared to gas flooding, which is constrained by injectivity and gas channelling in tight reservoirs, gas HnP demonstrates more consistent and long-lasting IOR performance. In general, and air are the two most often utilised injection gases; nevertheless, because to higher solubility and diffusivity, it performs substantially better than air HnP. Air is cost-effective and non-corrosive, in contrast to, which has high production costs, significant corrosion issues, and transportation issues, making air HnP a feasible strategy for accomplishing successful shale oil development. High production efficiency and low cost are two benefits of air HnP in the early stages. Additionally, air HnP would create some large-contact-area gas chambers in the near-well zone, which might increase the efficiency of other expensive solvents. [4,5].

Conclusion

In this study, the Lucaogou Formation shale oil reservoir in the Jimsar region was examined for its shale oil development characteristics under two alternative air injection development methods flooding and HnP. NMR technology, LSCM, and GC analysis were used to quantitatively analyse the produced oil and residual oil from air injection development in shale oil. This study looked carefully at the effectiveness of air injection development in shale oil and can help us understand how air injection affects the composition of oil. In conclusion, extracting oil from small pores is challenging when using air injection development. Large pores are the primary target, followed by medium pores. Air HnP would be a more effective method in the early phases of developing shale oil.

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