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# 气液两相分离器数值模拟

## 摘要

气液分离是指气体、油和水三者进行分离的过程，该过程的质量好坏对原油的脱水效果和污水处理影响显著，同时对于选择设备、材料以及提高其寿命周期有着至关重要的作用。由于  $\text{CO}_2$  本身固有的化学性质，在进行驱油的过程中，会产生很多泡沫，因此，我们很有必要去研究油气集输过程中利用  $\text{CO}_2$  驱采出液进行油气分离的效果和过程中存在的问题。本文主要针对以下内容进行展开研究：一是对于采出液的基本物理性质和表现特性；二是利用大型流体动力学设计软件 Fluent 数值模拟的方法对气液分离过程中的气液分离设备结构进行分析，本文的数值分析基于混合模型研究四种不同放置角度的导流板对气液分离器在分离过程中的影响。

本文通过研究得出，分离过程中，液相流体的密度逐渐增大，而其粘度表现出降低的特征。导流板的设置角度在一定范围内不断增大的过程中，气液分离的效果是越好的，可以通过增大导流板的设置角度提高气液分离的效果，然而，通过分析气相出口流出的液相含量可以看出，其液相含量是不断减小的，但是这种趋势呈现出逐渐减小的趋势，对比导流板设置为  $45^\circ$  和  $60^\circ$  时的分离效果不难发现，两者几乎没有任何区别，分离器后段的气液分离效果会因为导流板放置的角度过大而变差。可以看出，当导流板设置为  $60^\circ$  时和  $45^\circ$  相比，导流板的使用寿命会减少，分离过程也不稳定，其原因是，导流板和流体的接触面积减小，在同样的冲击力下承受的压强显著增大。

**关键词：**卧式分离器；二氧化碳驱油；数值模拟

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## Abstract

Gas-liquid separation refers to the separation process of gas, oil and water. The quality of this process has a significant impact on the dehydration effect of crude oil and sewage treatment, and plays an important role in selecting equipment, materials and improving its life cycle. Due to the inherent chemical properties of CO<sub>2</sub>, there will be many bubbles in the process of oil displacement. Therefore, it is necessary for us to study the effect and problems in the process of oil separation by using CO<sub>2</sub> flooding fluid. This paper mainly focuses on the following contents: first, the basic physical properties and performance characteristics of the produced liquid; second, the structure of gas-liquid separation equipment in the process of gas-liquid separation is analyzed by using the method of fluent numerical simulation, a large-scale hydrodynamic design software. The numerical analysis of this paper is based on the mixture model to study four kinds of guide plates placed at different angles to the gas-liquid separator In the separation process.

In this paper, the results show that the Secretary of the liquid phase fluid increases gradually, while its viscosity shows the characteristics of decreasing. In the process of increasing the setting angle of the guide plate in a certain range, the effect of gas-liquid separation is better. You can improve the effect of gas-liquid separation by increasing the setting angle of the guide plate. However, by analyzing the liquid content of the gas-phase outlet, it can be seen that the liquid content is decreasing, but this trend shows a decreasing trend. Compare with the guide plate When the plates are set at 45 ° and 60 °, the separation effect is not difficult to find, and there is almost no difference between the two. The gas-liquid separation effect in the rear section of the separator will become worse because the angle of the guide plate is too large. It can be seen that when the deflector is set to 60 ° and compared with 45 °, the service life of the deflector will be reduced and the separation process will be unstable. The reason is that the contact area between the deflector and the fluid will be reduced and the pressure under the same impact force will be significantly increased.

**Key words:** horizontal separator; CO<sub>2</sub> flooding; Numerical Simulation

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