

Determination of Cost-Effectiveness of CO₂-EOR and CO₂ Utilization Factor as Feasibility Indicators for Permanent CO₂ Storage

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Abstract

Carbon Capture Utilization and Storage (CCUS) is an effective technology for achieving climate change goals. As part of CCUS, CO₂ - enhanced oil recovery results with permanent storage of significant amounts of CO₂ and is an attractive technique for oil companies, with the main goal to maximize oil production, and minimize the injected CO₂. For this investigation, oil production and retention were observed and compared in 72 reservoir simulation cases with an economic evaluation considering Utilization Factor (UF) and Net Present Value (NPV) which was assessed with different scenarios of CO₂ and oil prices (32 scenarios, which, with observed simulation results totals in 1728 cases for economical evaluation). The cases were generated with three different WAG ratios, three permeabilities, two well distances and three depths, each with its specific pressure and temperature conditions. This was set to see the impact of the miscibility on oil production and CO₂ sequestration and therefore finding the most optimal case. It was observed that well distances have a significant impact on retention and NPV, being the smaller distance arrange the most favourable for retention in observed period (15 years of CO₂-EOR) and considering all aspects, the greatest benefit comes from cases that are at 1545 m with WAG ratio of 1:2 and permeability of 50 mD. Optimum (cost-effective) CO₂ EOR cases all result with higher amount of CO₂ stored, with 1.8 to 6.7 times CO₂ storage capacity increase, compared to the respective cases without CO₂-EOR.