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Can nitrogen injection make a significant impact on crude oil recovery?

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Miscible nitrogen gas injection as a mean of EOR becomes very attractive to many operators of petroleum reservoirs. Many studies have been conducted to investigate feasibility of implementation of nitrogen gas injection to enhance oil recovery. In addition, seven carbonate reservoirs and five sandstone reservoirs have been the subject of N_2 /EOR injection of different scales and suggest that there is a great potential of utilizing N_2 as a mean of increasing oil recovery. When N_2 gas is injected into a reservoir at high pressure, it forms a miscible zone which helps to recover oil from the reservoir. Nitrogen is an economic alternative for being absolutely inert (non-corrosive), can be manufactured on site at relatively low cost by extraction from air by cryogenic separation, can be produced directly or as a by-product from the downstream plants and has low compressibility (able to occupy large reservoir volume). In addition, N_2 has the least volume required to achieve the same hydrocarbon displacement in comparison to natural gas.

Maybe the only concern about this approach is the fact that N_2 content will increase the MMP of the injected stream as it becomes intact with the reservoir fluid. An economic study showed that there is a feasibility of tolerance of high MMP by utilizing $N_2/CO_2/HC$ gas injection to recover substantial amounts of condensate and light crude oils. The economics of miscible flooding can be improved by minimizing the cost of injectant or injectant mixtures. This can be accomplished by identifying the economically optimum combination of injectant enrichment and pressure level (near miscibility).

Biography

Hadi Belhaj is a faculty member with the Petroleum Institute teaching varieties of petroleum engineering courses. He has over 30 years of combined petroleum industrial and academic experience with key qualifications in drilling engineering, well completion, reservoir engineering, reservoir simulation, modeling fractured reservoirs, well stimulation, sand production control technology, and petroleum economics and risk analysis. Geographically, his experience is spread over North America, Europe, North Africa, Asia and the Middle-East. He has contributed a number of consortium research proposals dealt with petroleum engineering and energy exploitation challenging issues. He has presented over 100 guest speaker lectures, seminars and workshops for both industry and academia covering different aspects of petroleum engineering. He has co-authored two books on Reservoir Simulation Technologies and has published over 100 articles.

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