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Skolkovo Institute of Science and Technology

Energy Colloquium

On the Irrational Resistance to Air Injection EOR

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ABSTRACT:

Operating companies appear to select and implement EOR processes based on internal competencies or prevailing process popularity rather than technical, strategic or economic merit. For example, chemical EOR requires injection of complex, unpredictable reservoir specific formulations that can result in produced emulsions that are essentially untreatable. The chemicals also have to be sourced, transported and stored, and significant financial burdens are often incurred due to adsorption losses in the reservoir. Carbon dioxide flooding requires alternate injection with water for a reasonable mobility ratio, and this combination results in the formation of carbonic acid which is highly corrosive. Steam injection operations require a fresh water supply, generate carbon dioxide emissions and often require treatment of produced gases for sulphur. The operational challenges associated with these processes: emulsion formation, corrosion, carbon dioxide emission, appear to be quite palatable and readily accepted. Yet, air injection EOR has and continues to be anathema for these very issues. Contrary to (outdated) published screening criteria, application of air injection is not constrained by reservoir depth, pressure, temperature, salinity, permeability or oil viscosity. Unit displacement efficiency is on average the highest of the EOR processes. It has been shown to be very effective in prolonging the lives of steam and water flooded reservoirs, boosting oil recovery under cyclic operation, and in eliminating sand production in unconsolidated reservoirs. The process is more energy efficient than steam injection and has approximately the same carbon dioxide emission intensity. What continues to be mystifying is that although air is the only EOR injectant that costs nothing, the process is manifestly the most versatile, and there are no associated supply, transportation, and storage issues, operators have not generally embraced this technology. Irrational? Indeed!

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