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Modeling Recovery of Next Generation Extreme Heavy Oil Tar-Mat <5 API Unconventional in Kuwait

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SUMMARY

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Abstract

Tar-mat exists in large quantities in Kuwaiti fields and around the globe. Tar-mat unconventional tight oil is considered a future giant petroleum reservoir with a distinctive production mobility handicap that marks a unique new-generation extreme heavy <5 °API oil reserves. These immobile quantities of oils are abundant in great amounts yet extremely difficult to produce due to its rich and large molecules of type III heavy oil and type IV NSO's. Eventually, the world will consider unlocking these types of oils since the conventional volatile and smaller-molecule conventional oils are continuously depleting. The study will examine the efficiency recovery yields through both CHNSO geochemistry fingerprinting and conventional recovery methods exerted on solid-like unconventional oil available in tight pore spaces carbonate rocks. Conventional recovery methods will include Toluene solvent, steam and steam augmented with surfactant. All recovery treatments will include several selected temperatures. All recovery agents considered for this study are bench-scale laboratory physical experiments with industrial toluene, de-ionized water and de-ionized water aided surfactant augmented with 25℃, 135℃, 225℃ and 315℃ heat treatments. This study presents novel modelling discoveries regarding tar-mat qualitative in-situ API upgrade as well as efficiency quantitative recoveries.

The main challenge in this research is finding the best EOR efficiency method to extract tar-mat oil in an optimum economic scenario considering current competitive low crude oil price impact. The first model will investigate independently the effect of recovery efficiency from using industrial toluene, hot water, and water surfactant under different temperatures on tar-mat's rock sample is independently modeled. A neural network artificial intelligence approach called multiple layer forward feed (MLFF) logic will be designed, tested, validated, and then constructed. The optimum recovery model is then selected for quantity future prediction. The second model will determine the efficiency quality of oil density upgraded throughout each recovery treatment. A second MLLF neural network logic will be constructed for predicting the quality API that has been successfully upgraded. Experimental recovery will follow CHNSO Pergl-Dumas approach. Novel observations such as: insoluble compounds (NSO) have impacted the fingerprinting as well as the total recoveries. Moreover, °API gravity classification and hence the net present value.