

Nano-Enhanced In-Situ and Field Up-Gradation of Heavy Oil

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Abstract : The prime incentive behind up gradation of heavy oil is to increase its API gravity for ease of transportation to refineries, thus expanding the market access of bitumen-based crude to the refineries. There has always been a demand for an integrated approach that aims at simplifying the upgrading scheme, making it adaptable to the production site in terms of economics, environment, and personnel safety. Recent advances in nanotechnology have facilitated the development of two lines of heavy oil upgrading processes that make use of nano-catalysts for producing upgraded oil: In Situ Upgrading and Field Upgrading. The In-Situ upgrading scheme makes use of Hot Fluid Injection (HFI) technique where heavy fractions separated from produced oil are injected into the formations to reintroduce heat into the reservoir along with suspended nano-catalysts and hydrogen. In the presence of hydrogen, catalytic exothermic hydro-processing reactions occur that produce light gases and volatile hydrocarbons which contribute to increased oil detachment from the rock resulting in enhanced recovery. In this way the process is a combination of enhanced heavy oil recovery along with up gradation that effectively handles the heat load within the reservoirs, reduces hydrocarbon waste generation and minimizes the need for diluents. By eliminating most of the residual oil, the Synthetic Crude Oil (SCO) is much easier to transport and more amenable for processing in refineries. For heavy oil reservoirs seriously impacted by the presence of aquifers, the nano-catalytic technology can still be implemented on field though with some additional investments and reduced synergies; however still significantly serving the purpose of production of transportable oil with substantial benefits with respect to both large scale upgrading, and known commercial field upgrading technologies currently on the market. The paper aims to delve deeper into the technology discussed, and the future compatibility.

Keywords : upgrading, synthetic crude oil, nano-catalytic technology, compatibility

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