

Simulation Study for Potential Identification of Light Oil Air Injection in Malaysian Reservoirs

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Abstract

Malaysian forecast of oil production is expected to decline from 2007 and projections of domestic consumption indicate that the country might become a net oil importer by the end of this decade. Nevertheless, some of the existing reservoirs still contain large volumes of oil, which has not been effectively recovered. Therefore, Enhanced Oil Recovery (EOR) techniques are inevitably required to recover the remaining oil from these matured reservoirs. This paper highlights the simulation work carried out to identify the potential of Light Oil Air Injection (LOAI) to recover the remaining oil from Malaysian depleting oil reservoirs. The research work involves simulations of suitable oil reservoir(s) to evaluate the future performance of LOAI. The project starts with the screening of 22 Malaysian oil reservoirs using a set of criteria, which had been developed after evaluating successful LOAI projects around the world and consulting industry experts. In principle, the screening criteria entailed major reservoir properties such as the reservoir temperature, reservoir pressure, oil viscosity, formation depth and reservoir permeability. E12/13 and 14 reservoirs of Dulang field were selected based on the screening criteria for the LOAI simulation project. The simulation work used black oil simulations to eliminate complex thermal reaction scheme. Furthermore, the simulation work evaluates nitrogen effects in place of air to simplify the complex reaction mechanisms of the combustion process in the reservoir. The present simulation studies used history matched model of year 2003 which was upgraded for nitrogen injection from year 2006. Incremental recovery obtained from nitrogen injection was then compared with water injection (WI) and water alternating gas (WAG) base cases. The simulation results indicated that the LOAI significantly increased the oil recovery factor from the Dulang E12/13 and 14 light-oil reservoirs.

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