

695343 Thermal Simulation for a Shallow Limestone - Rubble Reservoir in Bahrain Field

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Rubble Limestone is the descriptive name given to a massive Limestone unit of the Mishrif formation, in middle Cretaceous in age. The zone consists of two layers are eroded in the crestal part of the structure. Large volumes of oil are trapped against the Blue shale at the up structure. The zone has both heavy & light oil. The amount of Heavy oil is estimated to be 90% of the initial oil in place. Currently only light oil is being produced. This paper highlights the studies to evaluate Heavy oil production potential.

Two separate studies were carried out, the first was to describe and characterize Rubble in order to map the light & heavy oil and the water bearing layers. Geostatistical methods were used to populate the 3D model of the reservoir with porosity & permeability values. After obtaining an estimate of the areas of heavy and light oil, a fresh study was initiated to review and evaluate the Heavy oil prospect and to prepare a suitable thermal EOR pilot plan for the heavy oil recovery. The study included numerical modeling and simulation of a pilot area and find out the suitable EOR process and design the pilot.

The study indicated that the reservoir has too low matrix permeability and very small fracture volumes to allow steam chamber formation. SAGD mechanism was therefore found not efficient for this reservoir. Cyclic Steam Stimulation (CSS) has been simulated using two wells in the pilot area and found attractive. Cold production from six different Horizontal wells were simulated and tested. They indicated that cold production followed by CSS will be efficient to recover the Heavy oil. The paper will describe the results of the study which led to drilling of the Horizontal pilot well for Cold production to be followed by CSS Thermal process.

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