

Waterflood Management of a Giant Oil Field by Integrating Detailed Sedimentological and Dynamic Data of the Mishrif Carbonate Reservoir, Rumaila Field, Iraq

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ABSTRACT

The Rumaila Field, South East Iraq, is a mature supergiant oil field with both carbonate and clastic reservoirs. The Mishrif Formation carbonate reservoir has been on production since 1973. Until recently the Mishrif reservoir was developed under depletion and reservoir pressure had fallen in the areas of production. In the last three years a waterflood was implemented in order to maintain reservoir pressure and to ramp up production. Detailed core description, petrographic and bio-/chemo-stratigraphic data have been integrated to establish robust sequence stratigraphic and depositional models for the Mishrif platform carbonates. These geological models were also integrated with newly acquired 3D seismic data. Detailed maps of the reservoir facies distribution and key diagenetic features within chronostratigraphic units were created in order to better understand the dynamic reservoir performance. Reservoir surveillance is key to understanding and predicting the evolution of sweep and water breakthrough in the Mishrif carbonates, to mitigate the major subsurface risks associated with poor sweep efficiency. A suite of surveillance data have been collected, including: saturation logs, SGS, PBU/PFO, well tests and ILT/PLT data, establishing baselines and continually monitoring the reservoir pressure and water breakthrough. Careful integration of the static and dynamic data have resulted in the mapping of vuggy layers where early water breakthrough might occur, This has enabled the subsurface team to effectively monitor the flood front and reservoir pressure and has helped in the construction of 2D models of water movement. Ongoing integration of the static and dynamic data sets with the geological models enables regular updating of reservoir architecture, improved reservoir management strategies and refining of the static and dynamic models. The static and dynamic products are used to inform the waterflood management. This intergrated approach helps to: predict water cut trends, allocate water within the field, reactivate wells, identify workover opportunities, mitigate for high water cut, and plan new wells and completions. Through diligent waterflood management of the complex Mishrif carbonates the reservoir has been kept above the operating pressure limits. More than 70 producers have been reactivated and a 100% production increase has been achieved since the waterflood start-up.