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Construction and Calibration of Fracture Tight Reservoir on a Mature Field

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Abstract

The Mogollon reservoir of Eocene age, located in Block X of the Talara Basin, has been developed since the 1950s by hydraulic stimulation of vertical wells. Given its low porosities (2-6%) and permeability (0.01-0.5md), there is tight reservoir behavior, recovering to date only 5% of the original oil in place. In turn, the Basin has high production variability, due primarily to the existence of sets of natural fractures, which contribute 80% of the cumulative production. These drained fractures show high degrees of depletion.

Due to the lack of understanding in the distribution of natural fractures in the reservoir and the poor information in the field, a characterization study was performed to construct a three-dimensional fracture model that allow us to understand and predict the productive performance of this reservoir.

This work focuses on the construction of the fracture model and its calibration with production history. To achieve this goal, an area within Block X was selected to generate a 3D fracture model, which was useful in understanding the behavior of the reservoir production. The characterization of this model was initiated by the identification and classification of natural fractures for each well based on information from conventional cores, well logs, and outcrops that allowed us to obtain the main attributes of the fractures, and then build the 3D fracture network model, which represents the distribution of open fractures within the reservoir.

The results of the simulation for this model show that there is a strong capillary water release from matrix. This water acts to displace the remaining oil from fractures. Thus, the recovery factor for fractures reaches a maximum of 60%. At the same time, it shows that there is still remnant oil has not been extracted efficiently, so there are sets of fractures that have not been drained. This leads to the possibility of drilling additional wells in order to obtain a larger contact area in these sets of fractures and to increase efficiency in the recovery within the reservoir.

Finally, the generation and calibration of this model served to understand the distribution of fracture sets (drained and undrained) and matrix-fracture behavior involving fluid flow system. Furthermore, this methodology is being extrapolated to the rest of the Block to identify possible areas where fractures have not been drained yet within the reservoir Mogollon.