Near-Wellbore Black Oil Simulation to Evaluate Fracture Flow Potential in a Tight Reservoir in Kuwait

Sefer B. Coskun[1], *H. J. Lewandowski*[2], *S. Ismail Ozkaya*[3], *and Ricardo Oosthuizen*[2]. *(1) Baker Atlas Geoscience, Baker Hughes, PO BOX 8786, Abu Dhabi, United Arab Emirates, phone: 971506410949, sefer.coskun@bakerhughes.com, (2) Kuwait Oil Company, Kuwait City, (3) Baker Hughes, Bahrain*

A horizontal well was drilled to evaluate fracture flow potential of a tight reservoir, which intersected top three units of the reservoir. Borehole image logs show that the uppermost unit has 3-5 ft thick brittle highly fractured layers. The other two units are ductile with 3-5 inch thin brittle fractured beds. The middle unit has good porosity, but matrix permeability is low in all units.

A single well dual porosity simulation was performed to validate findings from borehole image logs regarding flow potential of fracture corridors, faults and layer-bound fractures. The basic geological model is taken from the work on borehole image logs. The geological interpretation shows one major and a few minor fracture corridors. These were explicitly represented in the simulation models.

The fundamental conclusion from the simulation study is that without fractures it is not possible to achieve history match for the observed matrix permeability values. One or two major fracture corridors are sufficient for history match. The rate of pressure and production decline is much steeper for the simulation model than the observed decline rates. This suggests that some additional agents of high permeability are required, such as high matrix permeability or fractured layers with interconnected fractures. The stochastic fracture model shows that fractures are within sub-percolation range and fractures occur as clusters but not as a totally interconnected network of infinite extent. It is also possible that the fractured layers have lenticular shapes with finite lateral extension.