NFR15

Keynote Speaker: Fractured Reservoirs Modeling with Pressure Transient Test Interpretation

F.J. Kuchuk* (Schlumberger), D. Biryukov (Schlumberger), K. Morton (Schlumberger), T. Fitzpatrick (Schlumberger) & R. Booth (Schlumberger)

SUMMARY

Naturally fractured reservoirs consist of fractures in igneous, metamorphic, and sedimentary rocks (matrix). Faults in many naturally fractured carbonate reservoirs often have high-permeability zones and are connected to numerous fractures with varying conductivities. In many naturally fractured reservoirs, faults and fractures can be discrete (rather than a connected network dual-porosity system). To accurately model pressure transient behavior of fractured reservoirs is important to gas and oil reservoirs.

There are six important factors that dominate the pressure transient test flow regime behavior of fractured reservoirs those are fractures: 1) intersect the wellbore parallel to its axis; 2) intersect the wellbore with dipping angles from 0 to less than 90°; 3) are in the vicinity of the wellbore; 4) have extremely high- or low-fracture and fault conductivities; 5) have various lengths and distributions; and 6) have high and low matrix block permeabilities. All flow regimes associated with these factors will be demonstrated for continuously and discretely fractured reservoirs by using semi-analytical solutions.

We employ principal component analysis to explore the model parameterization as pre-screening steps. Global sensitivity analysis methodology is employed to determine how the uncertainty of each parameter influences the uncertainty in the output from the reservoir model.

Naturally fractured reservoirs consist of fractures in igneous, metamorphic, and sedimentary rocks (matrix). Faults in many naturally fractured carbonate reservoirs often have high-permeability zones and are connected to numerous fractures with varying conductivities. In many naturally fractured reservoirs, faults and fractures can be discrete (rather than a connected network dual-porosity system). To accurately model pressure transient behavior of fractured reservoirs is important to gas and oil reservoirs.

There are six important factors that dominate the pressure transient test flow regime behavior of fractured reservoirs those are fractures: 1) intersect the wellbore parallel to its axis; 2) intersect the wellbore with dipping angles from 0 to less than 90°; 3) are in the vicinity of the wellbore; 4) have extremely high- or low-fracture and fault conductivities; 5) have various lengths and distributions; and 6) have high and low matrix block permeabilities. All flow regimes associated with these factors will be demonstrated for continuously and discretely fractured reservoirs by using semi-analytical solutions.

We employ principal component analysis to explore the model parameterization as pre-screening steps. Global sensitivity analysis methodology is employed to determine how the uncertainty of each parameter influences the uncertainty in the output from the reservoir model.