

Modelling of Some Practical Aspects of Heavy Oil Recovery

Christophe Preux and Gérard Renard, IFP Energies nouvelles, France

The objectives of this presentation is to present a review of research advances in the domain reservoir modeling of heavy oil recovery. The presentation will be illustrated with various production processes including [Steam-Assisted Gravity Drainage](#) and Chemical EOR.

For the SAGD process, we will present a workflow from geological to reservoir modeling to study the **heavy oil recovery by thermal EOR in a meander belt. The geomechanical effects are studied, by coupling** both the thermal fluid flow simulation and the geomechanical model, in order to take into account variations of permeability and porosity inside the reservoir due to stress changes. A numerical procedure that performs thermo-hydro-mechanical simulations in an efficient way is presented. **The capability of** using Adaptive Mesh Refinement (AMR) to better capture the extension of the steam chamber is also demonstrated.

The second effect of SAGD illustrated in this presentation is H₂S production by aquathermolysis. The prediction of H₂S production is a crucial issue to assess the risks of H₂S production in operations of steam injection for heavy oil recovery. A simulation model is presented, calibrated from laboratory aquathermolysis experiments performed on oil sands. A matching of the kinetic model at the lab scale is presented as well as reservoir simulations at the field scale.

A third example will focus on chemical EOR for heavy oil production. The presentation will be illustrated with a modeling case of polymer flooding in the Pelican Lake heavy oil field, located in Northern Alberta (Canada). A successful history matching of the pilot is performed, to investigate the influence on oil recovery of reservoir parameters and evaluate the additional recovery compared to primary recovery or waterflooding.