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Coupled Reservoir Geomechanics Modeling for Optimal Field Development Planning and Life of Field

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SUMMARY

Coupled geomechanics modeling is required for investigating and quantifying the full 3-D nature of the in-situ stresses, pore pressure and rock properties, and their spatial variation. This enables the complex subsurface conditions and properties through the overburden and reservoir to be modeled and evaluated, and then used in subsequent geomechanics analyses, well planning and reservoir management. Pore pressure and stress changes (which may occur in both the overburden and reservoir) due to injection, production and depletion can be quantified and forward modeled, and the coupling of the petrophysics to the geomechanics means that dynamic reservoir behaviour can also be modeled and investigated. Applications of such 3-D modeling and fully coupled analyses include pre-production and infill well planning, wellbore stability, completion design, stimulation, injection, waste and CO₂ disposal, reservoir engineering, 4-D seismic, reservoir compaction, subsidence, fault activation and induced seismicity. The presentation will introduce geomechanics and consequences of depletion and injection, reservoir compaction, overburden movement, subsidence, caprock integrity and fault re-activation. Case studies utilizing coupled reservoir geomechanics implementation and applications of this technology to optimal field development planning for life of field will be presented and discussed.