Well Engineers Deserve a Seat at the Exploration Table: The Role of Mechanical Earth Modeling in the Early Exploration Process

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Consideration of the full cycle asset development plan from appraisal through abandonment reduces the risk of missed future opportunities due to well systems design constraints. For example, reservoir pressure depletion and subsidence can impact borehole stability to the extent that complex well designs are necessary to fully exploit the asset. Well placement not only depends on the subsiding reservoir section, but also on the reaction of the overlying geological section that must be drilled through to reach the reservoir. For land based operations, the consequences of well complexity may be more easily addressed, the downside being a poor estimate of field recovery that can either rob opportunities for outlying prospects or, in the worst case, cause the asset to be uneconomic. For major capital projects (MCPs) such as deepwater subsalt fields, the capital outlays are immense, with single wells costing up to $100,000,000 US. For these deepwater MCPs, fewer wells are required to produce reliably for longer periods of time.

The capability to characterize rock mechanical properties from the standard P-wave acoustic data sets, either seismic or open hole log derived, enables well planners to link the Explorationist and Well Engineer's visions using mechanical earth modeling technology. The accurate assessment of formation rheology, or stiffness, and architecture (distribution and structure), allows the asset team to optimize well systems design, considering placement and production management practices over time.

The presentation will introduce acoustics based rock mechanics concepts, describe the acoustics based rock property prediction technique, and present field applications that demonstrate the impact of the subsurface model to the corresponding well systems design.