Geomechanics Considerations for Hydraulic Fracturing Stimulation in Unconventional Shale Reservoirs

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Abstract

Geomechanics has become an important tool for engineers and geologists, with classical applications on wellbore stability, sand management and hydraulic fracturing. However, unconventional shale reservoirs cannot be evaluated with traditional models, or based on simple relationships between elastic properties, far field stresses, reservoir and mechanical properties. These plays have strong geologic complexity and heterogeneous nature.

Geomechanics model for unconventionals requires a strong understanding of the variability in rock facies, driven by diagenetic changes in texture and composition. Shale is characterized by thin laminate or parallel layering or bedding, and exhibit transversely isotropic properties with symmetric axes perpendicular to the bedding. Wells need to be hydraulically fractured for stimulation, and both, material fabric and in situ stress strongly influences this process. Completion strategy requires understanding of reservoir quality and completion quality properties, including organic content, rock fluid interactions, hydrocarbon types (liquid and gas), stress distribution (magnitudes and direction), and other complex properties for defining volumetric reserves and regions with production potential. This presentation will discuss geomechanical challenges in unconventional shale reservoirs, and developments to address these issues.