

Just How Stable is a Horizontal Well in Coal? Early Learnings From Wellbore Stability Investigations in Western Canada

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ABSTRACT

Horizontal wells provide the advantage of better drainage in coal seams, especially when optimally oriented with respect to the most permeable cleats and natural fractures, and the in-situ stresses that controls their permeability. They also reduce surface disturbance and eliminate the risk of out-of-zone hydraulic fracture growth into potable water supplies or other hydrocarbon resources. Horizontal wells may therefore have distinct advantages over vertical wells, particularly in deep, tighter coals such as those found in the Mannville Group at depths in excess of 1000 metres in the WCSB.

There have been numerous successful applications of horizontal well technology in parts of the USA and Australia, albeit the depths and/or coal rank are typically more favourable. Experience to date in the WCSB is limited with mixed drilling and production performance, e.g., there have been several incidents of stuck or lost drill pipe, and related cost overruns.

This poster illustrates the key destabilizing mechanisms that affect a horizontal well in coal. Several unique aspects of wellbore stability analysis for coal are described, including: non-linear failure behaviour, the effects of cleats, mudstone interbeds, elastoplastic yielding, drilling fluid penetration, depth and well trajectory. Numerical modeling with AGI's STABView software, and large-scale laboratory experiments are used to illustrate the influence of several controllable and uncontrollable or natural factors on coal stability. The importance of using high quality rock mechanical data, obtained from cores and logs, is demonstrated.

Several example analyses are described and the practical implications for planning horizontal wells in the WCSB are highlighted.