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Placement of Horizontal Wells and Fractures in the Optimum Location and Sequence in Shale Plays

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ABSTRACT

Numerous authors have developed a variety of indices to define areas of fracturability in a shale play. While useful for approximating future locations of planned fractures, such approaches tend to focus on a single area of technology. No previously developed technique considers all the possible parameters that may affect fracture placement and propagation. Optimization methodologies have been developed for quick and effective determination of the number of fractures and the number of effective horizontal wells in shale plays. The sequencing of well and fracture placement is key to achieving economical utilization of shale assets in North America. The computational methods used for optimization of placement are critically important. This paper introduces a new design and validation of an integrated Fracturability Index correlation. Ultra-low formation permeability has dictated the creation of a large number of fractures from a single horizontal well. It is not uncommon to design a horizontal well with more than one hundred hydraulic fractures transversely intersecting a horizontal well. The large number of fractures is driven by the short exploitation distance resulting from nano-darcy formations. The fracturing of horizontal wells results in creation of a larger volume of improved reservoir quality. The technology takes into account various elements such as size, time, and number. In contrast to current thought in the industry, which posits that it is preferable to have more fractures, we are developing a technology that prioritizes the effective fractures that target brittle zones in the shale basin, resulting in branched fractures and deeper encroachment into virgin parts of the reservoir.