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Abstract

Fracturability Index (FI) is a recently developed concept for identifying sweet spots in shale reservoirs. It is used for designing well and fracture placements. The current industry trend is to place wells in a uniform manner and to also place the fractures in an equally spaced distribution along the wellbore.

A new Fracturability Index based on geomechanical principles has been developed to optimize the placement of fractures along horizontal and deviated wells in unconventional reservoirs. A developed algorithm based on the index prioritizes the brittle and high in-situ stress zones along the well path, then suggests the order of possible fracture locations for future resource development in a single or multiple wells. The algorithm also considers the effect of stress shadowing in designing the fracture spacing.

The optimum production of a hydraulically fractured horizontal well is a function of spacing, stress shadowing and the mechanical properties of the shale formations. As a result the treatment size and timing as well as the number of stages and clusters per stage are the key to optimize the outcome of the fracturing process. In this algorithm, both the timing of placement and the selective spacing of the fractures along the wellbore are designed.

A new fracturing methodology called Cascade Fracturing Technology has been developed. This methodology starts by dividing the well path into segments, identifying the order of fracture locations along the well path and ordering the fractures from production point of view. This methodology is followed for all wells in the reservoir, thus prioritizing the completion strategy.

Results from the cascade fracturing methodology show that shale reservoirs may be produced more effectively by using this new methodology. In addition the number of fracture stages designed using the new fracturability index is lower than the one designed using conventional techniques, thus reducing the cost of fracturing. Timing of fractures, number of fracture stages, and clusters for each stage, and number of wells may be determined based on reservoir and fluid properties rather than by trial and error approaches.

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