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Using Adjusted Geomechanics technique to Calibrate Rock Mechanics Parameters after Falloff Matched Curve

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ABSTRACT

Calculating and adjusting rock mechanics parameters to be applied in hydraulic fracturing operations is of great importance for engineers in the oil and gas industry. However, due to lack of resources, this process is usually difficult to accomplish. Sonic dipolar logs and laboratory surveys are frequently used for calculation of rock mechanics parameters. The lack of this data can be mitigated by using real time monitoring in the Step Rate test to calculate Mohr-Coulomb cycles as a function of time. Except for this process, the industry does not have a standard process and guidelines to follow to get the best calculations for rock mechanics parameters.

It is known that the industry developed calculations using fall off curves to predict values of horizontal minimum stresses. Recently, Suzart et al, in SPE 169273, demonstrated a hypothesis to predict formation rock mechanics using step rate test “Mohr-coulomb as a function of time” to predict geomechanics numbers.

In this paper, petrophysics curves are used as a first step to predict geomechanics parameters then log-log derivatives are applied to calculate horizontal minimum stress and adjust the petrophysics predictions. Predicted geomechanics numbers are applied to merge the fall off evaluated curves with calibrated petrophysical curves in order to calculate the rock mechanics values using net pressure curves. For optimum curve merging, the following parameters are measured: 1) minimum horizontal stress 2) permeability; and 3) elasticity modulus. The above steps are used to calibrate geomechanics curves with original field data and are later re-exported to a 3D fracture simulator to evaluate fracture geometry.

The main objective of this paper will be to provide a sequence of rock mechanics field calculations to predict Fracture Geometry. We will prove this methodology using field data to obtain the best rock mechanics calculations in lieu of laboratory data.