Utilizing Measured Drilling Parameters to Optimize Completions Design

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ABSTRACT

Current best practices in North America's shale basins deliver inconsistent production results due to a lack of reservoir understanding in the laterals. Reservoir data is difficult and expensive to attain in laterals and therefore most completions are designed geometrically, with little or no concern for reservoir heterogeneity along the lateral. This leads to dramatic variability in productivity between neighboring wells, typically described as the statistical nature of the play.

In this study we demonstrate a reliable, cost effective methodology that empowers shale operators with reservoir data on every well. This technique will enable operators to engineer their designs using reservoir-based data on every completion, resulting in improved productivity on every well. This productivity improvement will be realized without any significant cost or inconvenience.

This methodology leverages commonly available drilling measurements (ROP, WOB, RPM, D) and mud motor parameters (Q, □P, Kn, □Tmax, □Pmax) to derive Mechanical Specific Energy (MSE), using well established algorithms. The MSE parameter is then shown to be a good proxy for Unconfined Compressive Strength (UCS), a valuable reservoir parameter commonly used in hydraulic fracture designs. The MSE drives a facies-based answer product that allows the operator to position perforation clusters so that they breakdown at a common treating pressure, resulting in uniform fracture treatment within each hydraulic fracture stage.

This technique has been applied successfully on over 400 wells to date. It is validated through comparison to OH wireline logs, production logs and by comparing productivity to offsetting wells. The technique is shown to be superior to similar attempts done using OH wireline logs and production data confirms its' accuracy and reliability. This study demonstrates that drilling data can be effectively used to derive reservoir parameters that lead to completion designs that produce superior production results.