Understanding Unconventional Reservoirs Through Data Integration

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Abstract

Many technologies used by the Oil and Gas Industry today are aimed at improving our understanding of the reservoir in order to optimize production. Multiple horizontal well and hydraulic fracture programs have become a normal method of completion in unconventional reservoirs. Therefore, to determine fracture and fluid design, well placement and stage spacing across an entire field requires an integration of data. Here, we utilize Geologic (e.g. logs), Geophysical (e.g. microseismic and seismic) and Engineering data (e.g. hydraulic fracture models, injection tests and production data) in order to understand subsurface geomechanical behavior.

The microseismic results considered in this case study are taken from a single horizontal well containing multiple hydraulic fracture stages. The fracture height and half-length obtained from the microseismic maps, rock properties obtained from log data, and diagnostic fracture injection testing (DFIT) are used as inputs to a calibrated fracture model. A match between the modeled and observed fracture geometries are obtained and correlated to production data. Given the match between the fracture model and production data, hydraulic fracture programs and fluid designs are optimized based on predicted production and net pressure value (NPV).

Seismic data allows us to view subsurface properties over a large region. If useful correlations exist between the microseismic event locations and certain attributes or elastic properties, then this enhances our understanding of the formation properties.

Ultimately, the goal is to increase production while reducing the cost associated with drilling and completing wells. By utilizing multiple data sets, different disciplines and a thorough understanding of the rock properties, optimal recovery and field development can be achieved.