

Improve Production With Optimum Fracture Design in Real Time

Case study: StimMAP services provide hydraulic fracture monitoring and interpretation for enhanced stimulation optimization in Barnett Shale reservoir

Challenge

Create optimum fracture design in a complex and unconventional reservoir to optimize recovery.

Solution

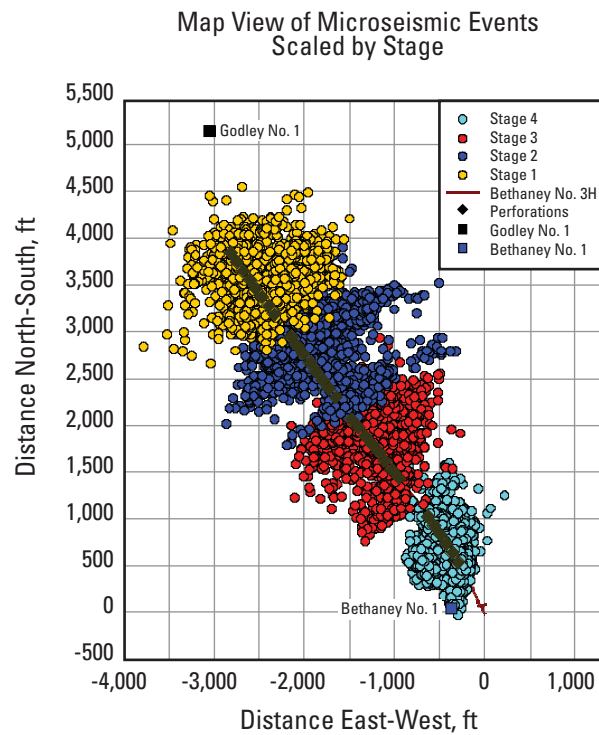
Use StimMAP* services to generate a 3D map of micro-seismic events. Create a model to enable optimization of horizontal completions.

Results

Refined hydraulic fracturing in real time for improved control, operational cost savings, and future design optimization.

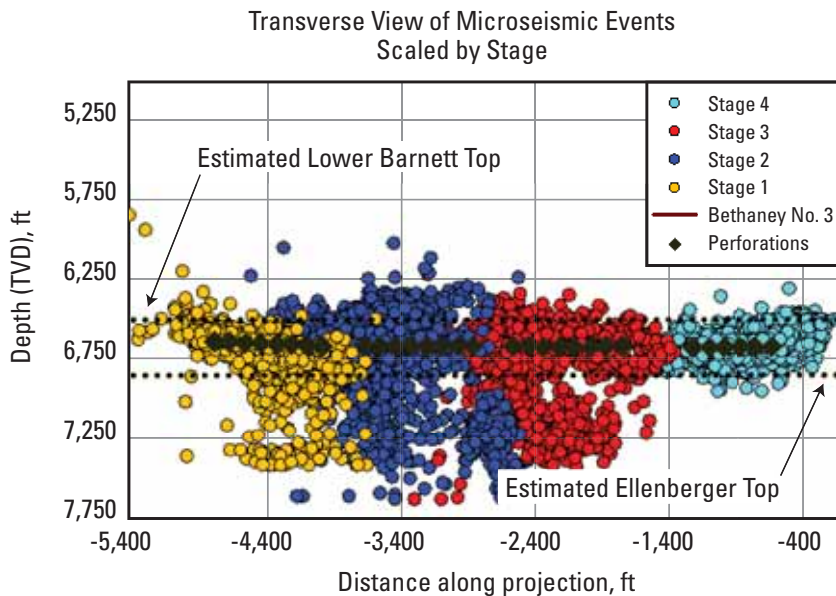
Refine fracture design

An increasing number of wells require fracture stimulation to be economically productive. For wells in the complex Barnett Shale region, it is difficult to develop an optimal fracture design. An Oklahoma operator wanted to refine fracture design for greater efficiency in this unconventional gas reservoir, which had previously been bypassed as too difficult to model. Real-time answers were needed to determine the number of stages in the fracture and enable updates at each stage. It was essential to stay within the producing zone, using ball sealers at the right time to move to the next stage and avoiding growth into the water-bearing zone. With real-time answers, stimulation optimization recommendations could be made for the well and for future horizontal completions in the reservoir.



Map view of microseismic locations from a four-stage slickwater stimulation treatment.

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StimMAP services, which had proven their value in previous wells, were chosen to create an optimum fracture design using accurate image geometry of the hydraulic fracture.

Transverse view of microseismic locations from four-stage slickwater stimulation treatment orthogonal to the preferred fracture orientation.

Make adjustments in real time

StimMAP services, which had proven their value in previous wells, were chosen to create an optimum fracture design using accurate image geometry of the hydraulic fracture. StimMAP hydraulic fracture stimulation diagnostics is the first and only service able to monitor the fracture development in real time or after the event. In the past, operators had relied on pressure gauge readings and temperature changes to determine whether the fracture was complete. Microseismic data for StimMAP services were acquired with the multishuttle VSI* Versatile Seismic Imager and processed on location to generate a 3D computer image of the fracture system, enabling the stimulation treatment of subsequent stages to be reengineered.

From the 3D map of acoustically determined microseismic events (height, length, and width) a model incorporating the fracture parameters was created. Using the model to interpret the fracture geometry and azimuth, changes were made in real time. The ability to observe the growth of the acoustic fracture fairway in real time allowed for modifications on location to the completion design in perforation strategy, treatment volumes, and injection rate to stay out of the water-bearing zone.

Improve efficiency and save costs

Accurate image geometry of the hydraulic fracture in real time refined and improved control. A complete reservoir model was developed and measurement of the production contribution of each stage was used to evaluate the effectiveness of the stimulation treatment. Overlapping fractures were prevented by increasing the distance between zones, fracturing efficiency was improved by using ball sealers, and the water-bearing zone was avoided thanks to real-time decisions. More efficient fractures saved operating costs, improved production, and optimized future horizontal completion designs.

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