

Borehole Microseismic Services Help Operator Improve Formation Pressure Program in Mature Field, Resulting in Production Boost

Objectives

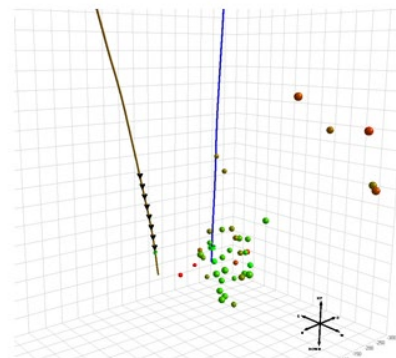
- Determine the direction of fluid-injection pathways to improve hydrodynamic models and develop future strategies for a formation pressure-maintenance (FPM) program in a mature field.

Our Approach

- Weatherford seismic experts met with the operator to review waterflood objectives for a carbonate reservoir. To track fracture growth and breakthroughs in the target formation, the Weatherford team proposed borehole microseismic monitoring.
- At the wellsite, the team deployed three-component geophone arrays in the nearest well adjacent to the injector well. The three-component geophones render the recorded acoustic energy into vector components to create a three-dimensional map of the acoustic environment.
- The proximity and depth of the monitoring well enabled placement of the geophone arrays above the formation that the injector well was targeting.
- The borehole seismic crew recorded acoustic waveforms during every stage of the injection process, and obtained good-quality data despite relatively low injection rates. The data was processed to generate a 3D map of microseismic events.

Value to Customer

- The Weatherford borehole seismic team presented the 3D map of microseismic events to the customer, who used it to determine the geometry of fractures generated during different injection modes. This work enabled the customer to recognize fracture-growth zones below the target formation and to identify multiple breakthroughs in overlying formations resulting from increased injection pressure. Using this information, the customer refined the FPM program by optimizing injection modes to increase production.
- The information gained through this borehole microseismic survey enabled the operator to significantly improve the quality of hydrodynamic models in the carbonate reservoir and stop injection into the breakthrough zones. These measures helped the customer to improve the forecast reliability of the waterflooding when developing future strategies for formation pressure-maintenance in the mature field.



Geophone arrays placed in the monitoring well (at left), measured microseismic events in the vicinity of the injection well (at right).

LOCATION

Orenburg region, Russia

WELL TYPE

Onshore oil producer

FORMATION

Carbonate

HOLE SIZE AND ANGLE

4.48-in., 30°

TOTAL DEPTH

4,508 ft (1,374 m)

PRODUCTS/SERVICES

Wireline services
Borehole seismic services
Microseismic services

