ImageTrak service provided high-res imaging for hydraulic fracture optimization

The presence or absence of natural fractures in unconventional shale reservoirs, along with stimulations required to enhance production, can have a large impact on production results. Fracture variation across a reservoir and throughout a lateral can be substantial, leading to large production variations, even in adjacent wells. Gaining insight about the natural fracture system can often help determine economic success.

A major operator in the Marcellus shale play wanted to characterize a long lateral section of reservoir to optimize production based on fracture-driven performance. Several wells had been drilled in this acreage and the operator knew that large production variances existed across the field. In addition, a high ROP/RPM drilling environment using oil-based mud (OBM) has historically limited borehole imaging quality.

To get better insight and understanding of the geological environment of the field, the customer contacted Baker Hughes, a GE company (BHGE).

BHGE Drilling Services recommended a solution pairing the ImageTrak™ high-resolution ultrasonic borehole imaging service with the AutoTrak™ Curve rotary steerable system to characterize the field’s natural fracture system.

The ImageTrak service acquires clear, high-resolution images in water- and oil-based mud systems while drilling. Three ultrasonic transducers operating in a pulse-echo mode measure both amplitude and travel time, generating an optimal 256-sector borehole image of the wellbore at high RPM and up to 400 ft/hr (122 m/hr) ROP. The AutoTrak Curve RSS delivers high ROP and responsive geosteering, plus the best quality wellbore in the industry, which is necessary for ultrasonic imaging.

For this operation, BHGE ran the ImageTrak service in memory mode with battery power. The system performed flawlessly, acquiring 15,000 ft (4572 m) of 100% coverage of high-quality images in 12.5 lb/gal OBM in one run with zero impact on drilling performance.

BHGE’s Geoscience and Petroleum Engineering experts used this quality data, in combination with the Volatiles Analysis Service (VAS), to deliver a fit-for-purpose FracFit™ fracturing optimization solution to the customer. The VAS is a lab-based advisory service that evaluates fluid, petrophysical and geomechanical properties of the formation using cuttings and core plugs.

The insight gained about the fracture system will be used for an engineered stimulation program for the well in addition to enhancing field and reservoir development. The clear and oriented borehole geometry image will enable geomechanic-based drilling program refinements on future wells.

This was the first commercial run of the ImageTrak service in combination with AutoTrak Curve in a high-ROP unconventional lateral hole section.

**Challenges**

- Characterize extended-reach lateral for production optimization with zero impact on drilling performance
- Acquire high quality borehole images at high ROP/RPM while drilling in oil-based mud

**Results**

- Acquired continuous 15,000 ft of high-quality borehole images in lateral section in one run while drilling in OBM
- Exceeded 400 ft/hr ROP in some intervals
- Identified incipient wellbore breakouts of varying width
- Identified the orientation of formation beds, fractures and breakouts
- Delivered an engineered stimulation program with insights derived from the combination of VAS with ImageTrak service
ImageTrak image interpretation plot showing bed orientation along with fracture identification

FracFit completion optimization design based off VAS results

ImageTrak image revealing borehole geometry

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