FMI Microimager Identifies Fracture Attributes and Distribution to Target Lateral Sweet Spots

UltraTRAC all-terrain wireline tractor conveys FMI microimager 4,300 ft in carbonate reservoir lateral in only 7 h, New Mexico

**CHALLENGE**
Efficiently identify fracture attributes and distribution to better understand textural properties of the carbonate reservoir and guide completion of the lateral.

**SOLUTION**
Obtain high-resolution images in real time from the horizontal section with the FMI* fullbore formation microimager conveyed on the high-output-force UltraTRAC* all-terrain wireline tractor.

**RESULTS**
Conducted a detailed analysis of textural conditions and the state of stress in the carbonate reservoir to confirm the best intervals for completion and effectively focus the stimulation design.

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**Focusing the completion strategy**
A New Mexico operator wanted to better characterize a fractured carbonate reservoir and in turn target the interval for completion and determine how to best stimulate it. High-resolution images of the fractures along the lateral were needed to identify their attributes and distribution and determine the reservoir’s stress condition.

**Acquiring high-resolution images with UltraTRAC tractor conveyance**
The FMI fullbore formation microimager provides microresistivity images of the formation in the borehole and dip data in real time to enable operators to readily visualize sedimentary and structural features. Image resolution at 0.2 in makes it much easier to identify fractures and their attributes over conventional-resolution imaging, especially in typically complex and heterogeneous carbonate reservoirs.

The UltraTRAC all-terrain wireline tractor was selected to convey the FMI microimager in the lateral and return the real-time images, which would not have been possible with memory logging on drillpipe. The UltraTRAC tractor combines low sensitivity to well conditions with the highest output force available in the industry to reliably convey wireline toolstrings even in challenging wellbore conditions. Active traction control and reverse tractoring improve maneuverability and minimize slippage to significantly reduce rig time for logging operations.

**Identifying the sweet spot**
The UltraTRAC tractor efficiently conveyed the FMI microimager over 4,300 ft in only 7 h from rig-up to rig-down. The real-time high-resolution images revealed a wealth of information about the reservoir to support detailed analysis. The textural features are diverse, including dissolution along bedding planes, secondary porosity enhancement, and the development of vugs with some interconnectivity.

The FMI microimager captured the development of interconnected vugs (left), which were studied along with numerous dissolution planes in 3D (above) to identify the best interval for completion.
Drilling-induced fractures are easily differentiated from natural open and cemented fractures for analysis of the reservoir’s state of stress.

Transverse drilling-induced fractures (red) that were identified in the images were used to determine the maximum stress orientation. The low number of these features suggests that the in situ stress field is weak.

Image interpretation using the Techlog® wellbore software platform confirmed the presence of a secondary porosity system in a certain interval. Structural features were not found to be a concern, with dip analysis showing only gently dipping beds. With this detailed information, the operator was able to pick the most promising interval for completion and design the optimal stimulation treatment.

Dip events are easily picked, categorized, and displayed by using the Techlog wellbore software platform with the data from the FMI microimager for easy visualization and interpretation of horizontal wells.