Integrity eXplorer Service Evaluated Cement Despite Microannulus in Casing Overlap Section

Results
• Detected presence of microannulus
• Evaluated cement despite microannuli and without an additional pressure run
• Evaluated cement distribution 360° around pipe
• Simplified future operations by detecting casing centralizers behind the pipe
• Saved 20 hours of rig time by providing on-site analysis of log

Challenges
• Determine whether a microannulus existed between cement and casing
• Evaluate cement quality and distribution despite microannulus
• Save rig time by expediting the interpretation of the log

BHGE solution
• Deployed Integrity eXplorer service in combination with SBT services
• Collected accurate shear, flexural, and compressional cement bond data along with a microannulus map

An operator in the Caspian region needed to evaluate 13,120-ft (4000 m) of cement behind a 7-in. liner within a 9 5/8-in. casing. Cement quality was especially critical in this well due to the complex lithology and irregular depletion of formations. The operator was concerned that cross-flow between permeable zones could create well integrity issues. Temperature logs and a conventional cement bond log were acquired soon after the cement job to determine the top of cement. But after performing a pressure test of the casing, the operator suspected there was a microannulus between the cement and casing and committed to investigate further to confirm zonal isolation. Microannuli are

The Integrity eXplorer service generated shear and flexural data, which enabled the team to build a microannulus map, revealing microannuli and poor cement bond in the well.
interpreted as bad cement-to-casing bond on cement bond logs. This causes operators to spend a great deal of time and money trying to remediate their cement.

Baker Hughes, a GE company (BHGE), recommended concurrently deploying the Integrity eXplorer™ cement evaluation service and Segmented Bond Tool™ (SBT™) services in order to evaluate the cement using three independent acoustic measurements: shear wave and flexural wave from the Integrity eXplorer service and compressional wave from the SBT service.

The combination of the shear and flexural data enabled the detection of a microannulus behind the casing, which confirmed the operator’s earlier assumption based on the prior pressure tests.

The flexural wave data verified continuous and homogeneous cement around the pipe, which confirmed the presence of hydraulic seals and, therefore, the required zonal isolation.

Additionally, the shear wave data from the Integrity eXplorer service corresponded with the compressional wave results, confirming the top of cement indicated by the temperature log the operator had recorded earlier.

The Integrity eXplorer data also indicated the location of centralizers behind the pipe, which provided valuable information in the event that sidetracking is required during the life cycle of the well. The combination of these three independent measurements provided an accurate cement evaluation despite the microannuli in casing overlap zones. The operator was able to avoid an additional pressure run, saving a costly and unnecessary remedial cement job. The services were deployed at the speed of 9 m/min (30 ft/min) throughout the logging interval and delivered the results at the well site, which saved 20 additional hours of rig time.