New High-Resolution Oil-Base Mud Borehole Imaging for Improved Interpretation of Deepwater Sediments

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ABSTRACT

The use of non-conductive muds (NCMs) in the operationally challenging deepwater environment creates tough challenges for the acquisition of microresistivity borehole images. Legacy technologies developed for acquisition of high resolution images in these mud systems have not been able to match the high level of image definition and geological interpretability that is standard in wells drilled with water-base fluids.

This paper details the application of new high-resolution, high-coverage borehole images for geological interpretation in deepwater wells drilled with NCMs, using a newly-engineered wireline imaging tool. The tool employs new physics of measurement to produce high-definition microresistivity images from an array of 192 sensors of 3 mm width and 5 mm height. The images, thus produced, have a circumferential coverage of 98% in a borehole of eight-inch diameter. The new images allow clear distinction of deposition types; thinly-bedded sands are discriminated from irregularly-bedded or chaotic sands; channel scours and rip-up clasts are now clearly observed. Even in the shales, where previous imagers have been seriously challenged, the new images crisply delineate the laminations and bedding to permit accurate structural dip determination. The high resolution and coverage afforded by the new images allow imaging of high apparent dip events, such as fractures and faults, which are often a very important piece of the geological puzzle to decipher, and have been a challenge to observe in legacy technology.

In the deepwater Gulf of Mexico, where drilling a well costs hundreds of millions of dollars, it is crucial to have very accurate geological interpretation. The new images help the asset geologist make a wellbore interpretation that is much closer to reality than ever before.