Schlumberger

Real-Time Look Ahead While Drilling Eliminates Risk of Unplanned Section and Related Costs

Operator uses IriSphere service to accurately detect formation top 10 m ahead of the bit to pinpoint casing-set location

IriSphere* look-ahead-while-drilling service enables placing well to optimize coring, openhole wireline logging, and a well testing program for accurate reservoir delineation, reserve calculation, and future field development.

The operator needed accurate casing-set location

An operator wanted to drill an appraisal well for a gas reef carbonate buildup formation to delineate the structure and reservoir while overcoming several challenges. In drilling the prior exploratory well, there were no correlation markers in the thick shale above the reservoir. Resulting low-resolution seismic data caused a ±40-m margin of error for the location of the formation's top. Although limestone stringers were observed in offset wells, conventional drilling equipment and correlation techniques could misinterpret the stringers as the main carbonate formation. This could cause a 9⅝-in casing to be set too shallow, leading to an unplanned additional 6-in hole section—a minimum USD 1.35 million additional cost for the operator.

On this appraisal well, the operator needed optimal reservoir delineation to set up for accurate reserve calculation and future field development. Thus the 9⅝-in casing had to be accurately set 5 m above the top of the target formation to enable complete coverage for the subsequent coring, openhole wireline logging, and well testing program.

What was tried first

When the exploratory well was drilled, conventional correlation and sampling techniques failed to determine the top of the formation. As a result, the conventional BHA drilled completely through the first 20 m of the upper carbonate formation when setting the 9⅝-in casing. This prevented openhole logging and well testing data to optimally delineate the target formation.

Schlumberger proposes look-ahead-while drilling technology

Schlumberger suggested drilling an S-type well using IriSphere service. IriSphere service provides a real-time look ahead of the bit and advanced automated inversion to accurately detect formation features before contact with crucial boundaries. It also detects top of formation at least 10 m ahead of the bit and enables increased ROP and fewer BHA trips out of hole.

IriSphere services pinpoints ideal casing set to optimize well operations

IriSphere service first verified that the conventional indication of top of formation at 1,535-m MD was invalid. Then it enabled normal drilling ROP to 176 m deeper than the previously assumed formation top, avoiding time-wasting conventional spot samples at 5- to 10-m intervals because it also distinguished several thin limestone stringers from the target carbonate. At 1,703-m MD, IriSphere service detected the formation top 10 m ahead of the bit, enabling a 9⅝-in casing to be set at 1,706-m MD, approximately 4–5 m above the top of formation.

IriSphere service enabled placing the well to optimize coring, openhole wireline logging, and a well testing program for accurate reservoir delineation, reserve calculation, and future field development. This confirmed the top of formation at 1,711-m MD. Thus, IriSphere service also avoided drilling an unplanned 6-in hole.
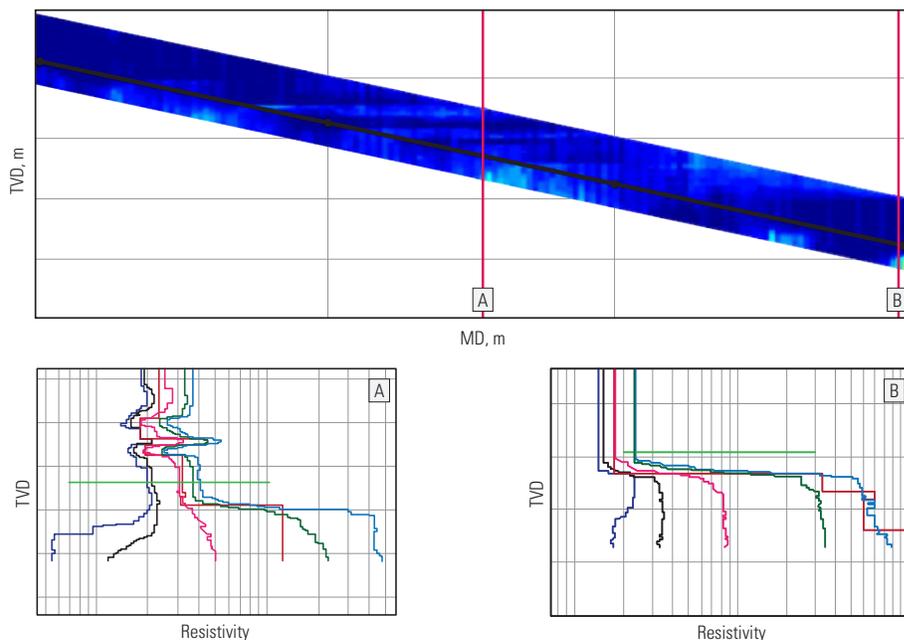
IriSphere service differentiated between stringers and the expected target carbonate in real time. Model distribution shows clear differentiation between stringers (left) and massive target (right). Identified stringers are less than 3 m thick.

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