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Wired Pipe-Enabled Logging While Drilling Applications

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Abstract

Wired pipe provides high speed, real-time, two-way communication between downhole actuators and sensors, and uphole data acquisition and control systems. Advanced formation evaluation (FE) processing in the past has been done using data after the BHA has been retrieved to surface and the LWD tool's memory has been dumped, thus limiting real-time value. Similarly in the past, drilling dynamics data was partially processed downhole and only a subset of data and severity flags were transmitted realtime. In near realtime with wired pipe, a nearly complete set of data written to memory for retrieval after the bit run is available globally on replicated data servers in service company and operator geoscience center sites. The technology accompanying wired pipe is increasingly ready to enable game-changing applications and much added value.

Drilling dynamics and formation evaluation data, on receipt at surface via wired pipe systems, are processed and stored in a database which is periodically replicated from the wellsite to a secure data center, and again mirrored in WITSML form to client computer systems. Downhole drilling dynamics data can be instantly displayed on the rig, in field headquarters, and in off-site collaboration centers. Weight on bit and rotary RPMs can be adjusted with nearly instantaneous feedback. For advanced FE, processing is applied to the LWD data after it is replicated, so that real-time processing becomes a function of the database update rates, processing times, and the time convenience of qualified analysts. The ability to tightly couple traditional post-acquisition processing in real-time with wired pipe telemetry optimizes the full value from the logging tools in the drilling assembly.

The first application enabled by wired pipe is successful drilling to the target in the most challenging environments such as: hard rock with high stress conditions, unpredictable distributions of calcite inclusions within porous sandstones, or very narrow pore pressure windows. An adjunct to this application is the extension of the target to longer and longer horizontal reaches while reducing bit and BHA failures and using FE data to refine wellbore positioning en route.

The second application goal is overall costs savings achieved by a variety of means including time savings, drilling better holes for FE and better holes for completions, and reducing risks.

A third application is making better decisions while drilling by more quickly understanding the geological, geophysical, and petrophysical properties of the formations encountered.