

Smart technology means more efficient operations

DIAGNOSTICS WHILE DRILLING

This paper presents the rationale for and development of a system that transmits high-rate, real-time data from near the bit to the surface. It includes a detailed description of the downhole measurement sub, the commercial wet-connect wireline system and the surface display hardware and software. The paper also presents a summary of modal analysis and laboratory vibration testing for the measurement sub, as well as laboratory drilling testing and field drilling for the complete system. Results of the laboratory and field drilling are examined with particular attention to defining the surface data that appear to indicate bit whirl and other bit-performance dysfunctions. Finally, there is a summary of the development plan for the next-generation tool.

Development of a System for Diagnostics-While-Drilling (DWD) (SPE/IADC 79884) by **J T Finger, A J Mansure, S D Knudsen, R D Jacobsen, Sandia National Laboratories.**

TELEMETRY DRILL PIPE

Drill pipe capable of transmitting high-bandwidth downhole data and surface control signals has been developed and successfully tested. The system incorporates a high-speed data cable protected in a high-pressure conduit that runs the length of the joint. The cable terminates at induction coils that are installed in protecting grooves machined in the secondary torque shoulders of double-shoulder tool joints at each end of the pipe. The coils are recessed in ferrite troughs that focus the magnetic field and are designed to facilitate refacing and re-machining of the connections through easy removal and reinstallation of the coils.

Telemetry Drill Pipe: Enabling Technology for the Downhole Internet (SPE/IADC 79885) by **M J Jellison, R B Chandler, Grant Prideco; D R Hall, H T Hall, D S Pixton, IntelliServ; D C Howard, BP; R C Long, DOE National Energy Technology Laboratory.**

ELECTRIC DRILLPIPE

This paper presents the results to date of developing an electric drillstring that

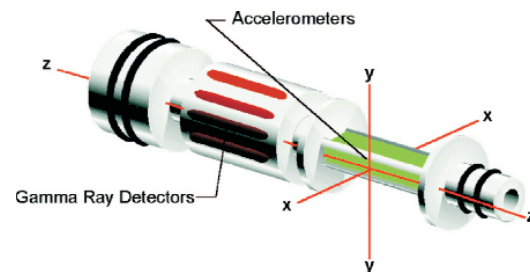
will enable significant amounts of electric power to be transmitted down the drillpipe, while simultaneously multiplexing data back to surface from the downhole drilling system. This will allow a range of improvements to the drilling process and hence optimize well placement for maximum productivity.

The heart of the system is a reliable electrical connector integral with a premium drill pipe connector, combined with electrical conductors sandwiched behind a metal inner layer and the drill pipe body.

Smart Drilling with Electric Drillpipe (SPE/IADC 79886) by **P G Lurie, BP; P Head, XL Technology; J Smith, Weatherford International.**

MULTILATERAL TECHNOLOGY

Exploiting proven technology, improving functionality and adding intelligent completions creates an intelligent Level 4 multilateral junction ideal for offering commingled, isolated, or deferred production. The junction offers re-entry access to the lateral and a low risk installation.



Halliburton will discuss its newly developed intelligent system designed to avoid resonance and to reduce vibrations. The system consists of real-time BHA dynamics software using the finite element method and data supplied from a downhole vibration sensor.

This intelligent multilateral installation should pay for the completion and drilling of a lateral to new target zones in estimated saved revenue from the main bore, which is normally lost in a traditional sidetrack.

Multilateral Technology Coupled with an Intelligent Completion System Provides Increased Recovery in a

Mature Field at BP Wytch Farm, UK (SPE/IADC 79887) by **T M Redlinger, G Makin, M Glaser, Weatherford International; CJ Brown, D Cook BP; A Dawson, Weatherford.**

DRILLSTRING DYNAMICS

BHA and bit whirl is the major cause of MWD/LWD drillstring failures, excessive bit wear, and poor hole quality. What few people realize is that whirl is often initiated from resonance in which the rotary speed is close to one of the critical speeds (natural frequencies) of the drillstring. This paper presents a newly developed "intelligent" system designed to avoid resonance and to reduce vibrations. The system consists of real-time BHA dynamics software using the finite element method and data supplied from a downhole vibration sensor.

Integrated Drillstring Dynamics System Closes the Model-Measure-Optimize Loop in Real Time (SPE/IADC 79888 - Alternate) by **C D Chen, M Smith, S LaPierre, Halliburton.**

MOTION ACQUISITION SYSTEM

Borehole drilling efficiency is affected by many parameters such as the bit selection, mud weight, rotation speed and weight on bit in a complex and often unpredictable manner. A clear understanding of the forces and motion of the bottomhole assembly can help to decipher the variables affecting drilling efficiency.

The paper describes a high-speed accelerometer-based motion acquisition system package in a new logging while drilling tool and a force- and motion-sensing system package in a near-bit sub that can be used to accurately measure the bottomhole assembly motion.

Application of a High Speed Accelerometer-Based Motion Acquisition System to Optimize the Drilling Process (SPE/IADC 79889-Alternate) by **R J Meehan, M Boucher, R Heidler, J S Morley, J A Kovats, C N Woodburn, J W Smits, Schlumberger.** ■