First Use of Electromagnetic Telemetry in Offshore Environment Optimizes Drilling Operations and Saves Time

Location: Offshore Field, Republic of Congo

**OPERATOR’S CHALLENGE** – An operator wanted to use an aphron-based mud system to help prevent fluid losses while drilling in a depleted, low-pressure reservoir. Acquiring data using conventional positive or negative mud pulse measurement-while-drilling (MWD) tools would have been difficult or impossible.

**HALLIBURTON’S SOLUTION** – Halliburton’s Sperry Drilling services deployed the Mercury™ electromagnetic telemetry (EMT) system.

**ECONOMIC VALUE CREATED** – Sperry successfully delivered 13 wells while saving the client 195 hours of operational time.

**DEPLETED, LOW-PRESSURE RESERVOIR** – The heavy oil field lies offshore Republic of Congo in a water depth of 60 meters (197 feet). The reservoir is shallow, ranging from 250 to 400 meters (820 to 1,312 feet) below the sea floor. Although major hydrocarbon accumulations still exist, the reservoir is considered depleted and requires steam injection to increase recovery. Sperry was contracted to drill 13 wells (nine producers and four steam injection wells) from which the reservoir response under steam drive would be monitored and assessed.

Low reservoir pressure, viscous oil and significant water entering into oil layers significantly increase the complexity of production operations. The operator elected to use up-to-date directional drilling techniques to optimize drainage areas and overcome some of the technological challenges faced in drilling the wells.

One such newer technique, aphron-based mud, is a specialized invasion-control drilling fluid developed to drill reservoirs prone to lost circulation. It contains encapsulated micro-bubbles to help control mud loss while drilling through lower-pressure zones, however, using this fluid results in unreliable data acquisition from conventional mud pulse telemetry.

**SOLUTION: ELECTROMAGNETIC TELEMETRY** – Sperry Drilling’s Mercury electromagnetic telemetry system allows data transmission without a continuous fluid column, providing an alternative to negative and positive pulse systems. The Mercury system establishes two-way communication achieved via electromagnetic waves transmitted through the formation and the drill pipe. Using low frequency electromagnetic wave propagation, the EMT system facilitates high-speed data transmission to and from the surface through any formation.
The ability to use electromagnetic telemetry in offshore applications provides both a technical and a financial advantage over conventional mud pulse telemetry systems. One of the reasons is electromagnetic telemetry’s independence from the drilling fluid. From a technical standpoint, this allows the operator to select from a wide range of fluid weights, flow rates, lost circulation material volumes and fluid types, including air. Financially, independence from the drilling fluid enables surveying of the wellbore during connections. This means zero nonproductive time (NPT) attributed to surveying, which translates into huge savings when considering the operational costs of offshore drilling.

**FIRST OFFSHORE EMT OPERATION** – This drilling campaign was Sperry’s first commercial offshore EMT operation. The logistics and considerations associated with running EMT offshore made it a big challenge, but Sperry successfully delivered 13 wells at 375 meters (1,230 feet) true vertical depth and 450 meters (1,476 feet) measured depth.

The average drilling time, estimated by the operator, was reduced by approximately 15 hours per well, or 195 hours in total. This time savings resulted from reducing the required survey time to almost zero due to the high-speed formation evaluation data transmission and the ability to take surveys during connections, all benefits provided by the Mercury EMT system.