Matched Drilling System Helps Deliver Record Horizontal and Save Operator US$ 1.2 Million

Location: Peninsular Malaysia

**OPERATOR’S CHALLENGE** – The operator required precise wellbore placement within the target sand at a proposed target depth of 1,168 meters (3,382 feet) true vertical depth (TVD). Enlarging the lateral to maximize drainage along the extended length of the planned horizontal was also required.

**HALLIBURTON’S SOLUTION** – Working with the customer to define and achieve specified objectives of the well plan, Halliburton’s integrated solution included a SperryDrill® conventional motor, Geo-Pilot® 9600 series rotary steerable system and logging-while-drilling (LWD) triple combo for the top section. Once in the horizontal, the Geo-Pilot 7600 system was deployed with a FMF3553ZR PDC bit and XR™ 800 Reamer borehole enlargement tool.

By measuring, modeling and optimizing the range in which critical BHA components should operate, systems including the rotary steerable system, drill bit and hole enlargement tool can work in unison to improve performance. The result is improved steerability, increased efficiency and wellbore stability.

**TOP HOLE COLLISION RISK** – Due to tight collision issues, the well was initiated by safely nudging and kicking off using the SperryDrill motor, then setting casing at 641 meters (2,103 feet) measured depth (MD). This was followed with the 12-¼-inch hole section, delivered using the Geo-Pilot 9600 series rotary steerable system, combined with the LWD suite consisting of

Halliburton’s matched drilling system helped to deliver 2,010 meters of lateral hole precisely in the targeted sand reservoir. By measuring, modeling and optimizing the range in which critical BHA components operate, systems including the Geo-Pilot® rotary steerable system, FMF3553ZR drill bit and XR™ Reamer hole enlargement tool worked in unison to improve performance.

AGR™ azimuthal gamma ray sensor, EWR™-PHASE 4™ electromagnetic wave resistivity sensor, pressure-while-drilling sensor, ALD™ azimuthal lithodensity sensor, CTN™ compensated thermal neutron sensor and AcoustiCaliper™ sensor.

Using point-the-bit technology, the Geo-Pilot rotary steerable system precisely steers the wellbore while rotating the drillstring to increase ROP and reduce drilling days. The Geo-Pilot® service provides real-time, continuous at-bit steering and formation evaluation to provide an accurate assessment of wellbore position.

The curve was drilled to 1,676.92 meters MD/1,167.48 meters TVD (5,501.71 feet MD/3,830.31 feet TVD) in a single run, just 0.38 meters (1.25 feet) below, and 2.02 meters (6.63 feet) to the right of the proposed trajectory.

**HOLE ENLARGEMENT WHILE DRILLING THE LATERAL** – For drilling and enlarging the horizontal section, a Geo-Pilot extended-gauge FMF3553ZR PDC bit was matched to the Geo-Pilot 7600 series rotary steerable system with a lower stabilized housing. The matched system enhances stability,
helping to eliminate hole spiraling and minimize wellbore tortuositities. The five-bladed FMF3553ZR bit design features a dual-row cutting structure of highly abrasion-resistant Z3® cutters backed by R1™ PDC backup cutters to limit depth of cut, delivering a more constant, controlled rate of penetration (ROP) that yields a higher average penetration. An 8-1/2-inch LWD suite and the XR reamer tool completed the matched drilling solution.

The XR reamer tool provides concentric and simultaneous hole enlargement with on demand activation/deactivation systems and is the only tool that can be deactivated after enlarging for drilling ahead and allowing full flow circulation while tripping out. Currently, the only tool capable of enlargement to 50 percent over the pilot hole or drift diameter, the XR reamer minimizes BHA vibration, macro-doglegs at formation transition interfaces and the tendency to initiate “whirl”.

Halliburton's matched drilling system demonstrated excellent performance, drilling and enlarging the lateral in a single run.

**MATCHED SYSTEM EXCEEDS EXPECTATIONS**

The combined efforts of offshore and onshore personnel resulted in drilling the longest horizontal section ever achieved for this operator, extending to a total of 2,010 meters (6,594 feet) into a very good layer of sand reservoir. The optimized drilling performance and accurate formation evaluation contributed to increased ROP and helped to ensure the well remained precisely positioned within the sand reservoir. The trajectory was on target for every TVD specified by the operator's wellsite geologist.

**ECONOMIC VALUE CREATED**

The record-setting performance is not only the longest horizontal section, but also the fastest for the operator. The well was delivered from spud to total depth of 3,692 meters (12,113 feet) MD saving approximately five days of rig time, equivalent to an estimated total savings for the operator of US$1.2 million.