Shell Saves USD 8.5 Million During Gulf of Mexico Salt Drilling Project

Optimized BHA incorporates PowerDrive Orbit RSS with AxeBlade bit to achieve 311-ft/h net ROP in salt interval

**CHALLENGE**
- Outperform previous benchmark in salt drilling while maximizing penetration rates and reducing operating costs.

**SOLUTION**
- Use PowerDrive Orbit* RSS to maintain directional control at increased rpm.
- Incorporate the AxeBlade* ridged diamond element bit for lower reactive torque and higher ROP.

**RESULTS**
- Drilled salt interval with a record-breaking net ROP of 311 ft/h, beating the operator’s worldwide benchmarks.
- Saved USD 8.5 million compared with the expected well plan.

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**Improve drilling speed and efficiency in salt drilling**
Shell wanted to design an optimized drilling system and identify best practices that would set a new standard for Gulf of Mexico salt drilling. This required a joint effort between Shell and Schlumberger to identify best practices.

**Use an optimized BHA design to achieve footage and ROP increases**
Based on the analysis, a “drill on torque” approach was recommended to maximize ROP in the salt. This would require increasing the torque limit to 65,000 ft.lbf while drilling salt. Consequently, it was suggested that the salt drilling BHAs be designed with higher torsional stiffness to enable higher torque and rpm without inducing harmful vibrations.

For the 16½-in build-and-hold section, a combination of the PowerDrive Orbit RSS from Schlumberger and the AxeBlade bit from Smith Bits, a Schlumberger company, was recommended to enhance the drilling performance and to widen the operating envelope, as compared with conventional PDC bits and RSS systems.

**Achieved new salt drilling benchmarks**
The 18¼-in × 21-in section was drilled at 200 rpm with 65,000-lbf surface WOB, resulting in 200-ft/h [61-m/h] net ROP, and a maximum instantaneous ROP of 300 ft/h [91 m/h]. This represents a 20% increase in ROP, as compared with the best offset of 160 ft/h [49 m/h].

Drilling performance on the 16½-in salt section outperformed the historical benchmark of 275 ft/h [84 m/h] by achieving a 311-ft/h [95-m/h] net ROP, while building from vertical to 42° inclination. A maximum instantaneous ROP of 479 ft/h [146 m/h] was achieved during the run. The operation drilled 5,353 ft [1,632 m] in a 24-hour period and the entire 13,674-ft [4,168-m] interval was drilled in a single run. ROP increased by 20% and 13% for the 18¼-in × 21-in and 16½-in sections, respectively, as compared with the best offset well. This resulted in a savings of USD 8.5 million under the AFE for the 16½-in TD.