CASE HISTORY – In a gas condensate development well in the UK central North Sea, an operator needed to drill through the hard Upper Cretaceous Chalk Group of formations with the highest rate of penetration (ROP) possible while performing constant directional work.

Consisting of the Ekofisk, Tor and Hod formations, the Chalk Group contains hard limestones characterized by their clay content, and traditionally has been drilled as a tangent with motor assemblies, achieving penetration rates of 20 to 40 ft (6 to 12 m) per hour. However as the field has matured, rotary steerable assemblies have been introduced to drill increasingly complex trajectories that require large amounts of directional work through these hard formations. The result has been a reduction in ROP. Therefore, the objective of this run was to use a rotary steerable assembly to drill a constant 4 degree turn while matching the established ROP as a minimum.

HALLIBURTON’S SOLUTION – To provide the required rate of penetration without compromising directional control, Sperry Drilling services used the Geo-Pilot® GXT 9600 series rotary steerable system, which combines the Geo-Pilot rotary steerable tool with a through-wired 9 5/8-inch GeoForce® enhanced performance motor.

Integrating a GeoForce next-generation motor that produces more than twice the horsepower of conventional power sections, the Geo-Pilot GXT system delivers increased horsepower and revolutions per minute directly to the bit, overcoming the most challenging formations while reducing the occurrence of stick-slip. The system provides the ability to achieve higher penetration rates while minimizing casing wear by decoupling the bit speed from the drill string speed.

In this case, the assembly was used first to drill out the window with reduced surface RPM to prevent logging-while-drilling tool failure, and the second run was to performance drill the latter half of the 12 ¼-inch section in the Chalk. In the Chalk Group, the Geo-Pilot GXT system drilled from 12,087 ft (3,684 m) MD to 13,244 ft (4,037 m) MD in 18.8 hours. Even with ROP restricted to 60 ft (18.2 m) per hour for the first 400 ft (122 m) until directional capabilities were established, the Geo-Pilot GXT system delivered an overall average ROP of 61.5 ft (18.75 m) per
hour. Specifically, in the Tor formation, a weight-on-bit of 25,000-30,000 pounds produced ROP of 80 to 100 ft (24 to 30 m) per hour. In addition, the differential was raised to 300 psi for a short period to test the full potential of the Geo-Pilot GXT assembly, and produced an ROP of 120 ft (36.6 m) per hour – triple that of offset wells.

**ECONOMIC VALUE CREATED** – The Geo-Pilot GXT system successfully delivered 1,157 ft (353 m) of the Upper Cretaceous Chalk Group while following a complex trajectory. The assembly produced average penetration rates more than double those seen in offset wells, and achieved a dogleg capability of over 4 deg/100 ft (30.5 m).

The operator estimated that as a result of improved ROP, use of the Geo-Pilot GXT system helped to save 17 hours of rig time. This success not only improved customer confidence in the system and demonstrated the potential for improving ROP, but has already led to requests for the Geo-Pilot GXT system as a primary BHA for future wells.