

# Engineered Solution Maximizes Drilling in Pre-Salt Carbonate Formation, Saving USD 833,000

## ADVANCED TURBINE DRILLING SOLUTION INCREASES ROP AND REDUCES WELL TIME IN HARSH, ABRASIVE ENVIRONMENT

OFFSHORE BRAZIL

### CHALLENGES

- » Surpass limitations of conventional drilling techniques
- » Drill to greater depth through the hard pre-salt carbonate section of an ultra-deepwater, vertical well
- » Increase ROP, while reducing well time and total bit cost

### SOLUTIONS

Combination drilling system, including:

- » Turbopower™ turbodrill
- » TurboForce™ diamond-impregnated bit

### RESULTS

- » Successfully drilled to total depth, doubling the drilling performance over previous attempts
- » Saved 40 hours of drilling time, and lowered costs by USD 833,000

### OVERVIEW

In an ultra-deepwater vertical well offshore Brazil, with a depth of 7,000 feet (2,134 meters), an operator needed to drill through the very hard, pre-salt carbonate section of an 8½-inch hole to depths greater than 16,404 feet (5,000 meters). After several attempts to drill the entire well using a third-party bit design with a conventional rotary bottomhole assembly (BHA), the operator sought an alternate solution – one that would reduce well time and total bit cost.

Thus, a requirement of the next solution was to be able to improve performance beyond the previous maximum rate of penetration (ROP) of 9.18 feet/hour (2.8 meters/hour) and drilling length interval of 416.6 feet (127 meters). Client goals were met by adopting a more powerful combination of rugged drilling tools to reach the total vertical depth in just one run, with a relatively unscathed bit in the end. Overall, the Turbopower™ turbine drilling technology solution provided by Sperry Drilling helped the operator maximize the value of its asset by doubling performance and lowering cost.

### ENGINEERED DIRECTIONAL DRILLING AND BIT DESIGN SOLUTION

It takes experience and know-how to design a solution that matches drilling technology with the appropriate bit for efficient drilling, especially in challenging formations. Halliburton Sperry Drilling was chosen for its ability to drill the vertical well to greater depths, and at a faster ROP than had been done before. Sperry Drilling engineers collaborated with the operator to thoroughly understand the challenges and complications it had experienced with similar wells. This led to a customized solution that could power through the pre-salt carbonate formation, combining the Turbopower turbodrill with a TurboForce™ diamond-impregnated bit.



The hybrid bit design (left) with conventional rotary drilling was severely worn down at the end of its run, resulting in more bit trips and slower ROP. The TurboForce™ diamond-impregnated bit design (right), used with the Turbopower™ turbodrill, was in excellent condition at the end of its run, thus improving drilling length intervals and ROP.

**POWERING THROUGH PRE-SALT CARBONATE**

Specifically, a 6¾-inch steerable Turbopower T172 turbodrill with a zero-degree-bend housing was matched with a diamond-impregnated bit, and assembled with an 8<sup>13</sup>/<sub>32</sub>-inch turbine power section stabilizer and an 8<sup>7</sup>/<sub>16</sub>-inch bearing section stabilizer. The Turbopower turbodrill spins the bit much faster than ordinary rotary drilling systems, enabling the directional driller to drill faster and easier through harder formations, like the pre-salt carbonate section in this case.

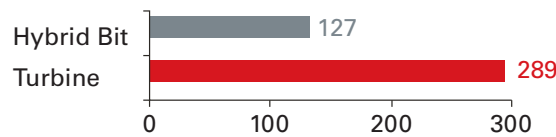


**ENGINEERED SOLUTION SAVES OPERATOR 40 HOURS RIG TIME**

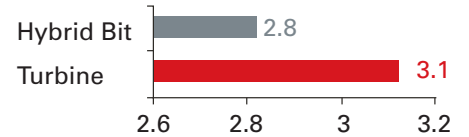
The Turbopower turbodrill used in conjunction with the TurboForce diamond-impregnated bit drilled 948 feet (289 meters) in just 93.2 drilling hours, achieving an ROP of 10.2 feet/hour (3.1 meters/hour). When compared to the previous “hybrid” method, this innovative turbine solution delivered 120 percent greater drilling length and 10 percent faster ROP.

Additionally, this engineered drilling solution from Sperry Drilling helped the operator maximize asset value by avoiding additional bits and an extra bit trip, reducing well time by 40 hours, for a total savings of approximately USD 833,000.

**Drilling Distance (meters)**



**ROP (meters/hour)**



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