

MPD System Enables Drilling and Cementing in Tight Window, Controls Kicks in Hours Instead of Weeks



Used for the first time in an onshore well in Egypt, the Weatherford MPD control system enabled managed pressure drilling and managed pressure cementing operations.

Objectives

- Detect and control kicks and losses to enable drilling of an 8 1/2-in. hole section to the planned depth, running of a 7-in. liner, and cementing in a challenging high-pressure, high-temperature (HPHT) formation with a narrow operating window.
- Maintain constant bottomhole pressure (CBHP) and manage equivalent circulating density (ECD) in drilling, liner-running, and cementing operations to mitigate formation-pressure hazards.
- Minimize nonproductive time (NPT) compared to an offset well that the operator had drilled conventionally in the same field.

Our Approach

- Weatherford carried out an initial engineering evaluation of the operator's well data and determined the project was feasible using managed pressure drilling (MPD) techniques.
- The Weatherford team deployed the MPD control system and the SafeShield® 7100 series rotating control device (RCD) to perform MPD and managed pressure cementing, proactively manage ECD, respond early to influxes and losses, and automatically control them.
- The team conducted a dynamic pore-pressure test and a dynamic formation integrity test (FIT) to define the drilling window and select the optimal drilling mud weight. The tests determined that the drilling margin was as low as 0.2 to 0.5 lb/gal (24 to 60 kg/m³).

LOCATION

Egypt

WELL TYPE

Onshore, HPHT, vertical, exploratory

FORMATION

Abu Roach and Bahariva (limestone, sandstone, shale, and siltstone)

HOLE SIZE

8-1/2 in.

CASING SIZE

9-5/8 in. until the casing shoe at 13,205 ft (4,025 m)

LINER SIZE

7 in.

TEMPERATURE

322°F (161°C)

PRESSURE

11,445 psi at 15,693 ft (78.9 MPa at 4,783 m)

SECTION DEPTH

16,457 ft (5,016 m)

PRODUCTS/SERVICES

- Managed pressure drilling
 - MPD control system
 - SafeShield Model 7100 RCD



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Our Approach (continued)

- The team started drilling with a 12.0-lb/gal (1,438 kg/m³) mud weight from the casing shoe and applied surface backpressure (SBP) to maintain an ECD of 13.19 lb/gal (1,581 kg/m³). Because of an expected rise in pore pressure, the team gradually increased the mud weight to 12.7 lb/gal (1,522 kg/m³) to maintain an ECD of 13.7 lb/gal (1,642 kg/m³).
- During drilling, the MPD system detected a kick of less than 1 bbl (0.16 m³) and automatically applied SBP to control it. After 10 to 12 hours, the team resumed drilling until reaching the planned depth.
- After drilling, the team observed losses during liner running followed by an influx in the wellbore. The MPD system helped to safely circulate out the influx, maintain well integrity, and run the liner to the desired depth.
- Using the MPD system, the team managed pressures during cementing, and the liner was cemented with no issues.

Value to Customer

- The Weatherford MPD control system with the RCD 7100 enabled the operator to drill, run a liner, and cement the liner to the planned depth in a challenging HPHT formation with a narrow operating window.
- The MPD control system minimized NPT by quickly and automatically detecting and controlling kicks during drilling and liner-running operations, with drilling resuming just 10 to 12 hours after the influx. By comparison, using conventional equipment to circulate the two kicks out during the operations would have taken 1 to 2 weeks.
- Use of the MPD system to manage pressures during cementing enabled the operator to complete cementing operations with no downhole losses.

