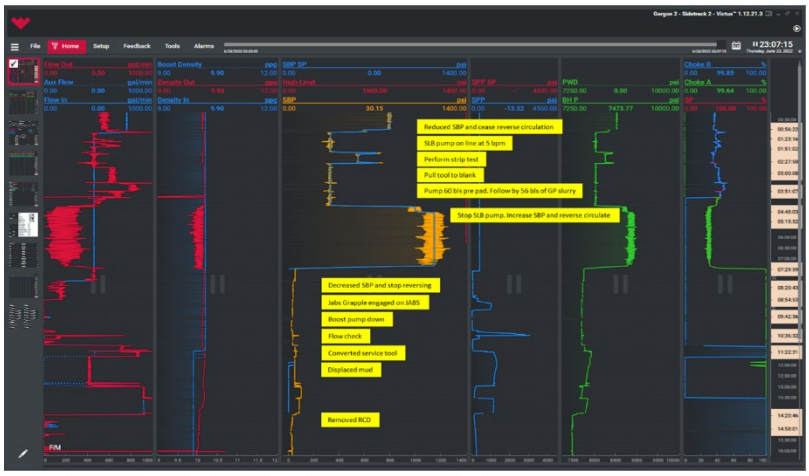
# First Deepwater Gravel Pack Operation Using Annular Backpressure MPD System Mitigated Losses and Reservoir Damage, Saved $4.9 Million




The gravel pack operation with MPD, as displayed in the Victus software, indicating the various phases of the job.

## Objectives

- Manage pressure during the entire well construction operation, including drilling, tripping, coring, running lower completion, and conducting a gravel packing operation.
- Run a lower completion with a hydrostatically underbalanced mud column using a BTR, annular backpressure, managed pressure drilling (MPD) system to maintain overbalance levels relative to the stability line, managing surge to prevent losses, and maintaining bottomhole pressure (BHP) target effectively during different stages of the gravel packing job.
- Optimize rig time, well construction operations, well architecture, and fluid management via precise surface pressure management with MPD surface equipment.

## Our Approach

- Multiple engineering teams—including customer drilling and completion teams, gravel packing service, and Weatherford's MPD professionals—collaborated with great synergy in developing an optimized and safe plan in less than two weeks to run the lower completion and execute the gravel pack job with a hydrostatically underbalanced drill-in fluid (DIF).
- Based on the initial subsurface prognosis, a 10.2 ppg DIF completion fluid was engineered, tested, and made available on location. However, data obtained during the drilling phase indicated that a 10.8 ppg density was required to prevent tectonically stressed shales to deteriorate and close the hole. Re-engineering the DIF fluid to increase its density to 10.8 ppg and meeting production screen test (PST) criteria would have led to significant nonproductive time (NPT).

**LOCATION**
Offshore Colombia

**WELL TYPE**
Deepwater appraisal

**HOLE SIZE AND ANGLE**
8-1/2 in., deviated

**DEPTH**
14,737 ft (4,492 m)

**PRODUCTS/SERVICES**
- Managed pressure drilling
- Victus™ simulation and control software
- SeaShield® Model 7875 below-tension-ring (BTR) rotating control device (RCD)
- MPD Engineering Services

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## Our Approach (continued)

- The main challenges for this operation included the landing string isolation configuration, reverse circulation while on MPD, and risks associated to accurately maintain proper downhole pressures throughout the entire process of running the lower completion and performing the gravel packing job.
- Weatherford's engineering team worked extensively to predict the surface pressure requirements to maintain a target equivalent circulating density/equivalent static density (ECD/ESD) of 10.8 ppg utilizing the available 10.2 ppg DIF system, determine conditions required and the process to guarantee complying with Well Control standards, and execute safely all the steps involved in the gravel packing job and overcoming the identified challenges.
- The operation was executed with a mud column hydrostatically overbalanced to the pore pressure and underbalanced to the shale stability. Static surface backpressure (SBP) was planned to be between 330 and 1,200 psi (2.2 to 8.2 MPa). Swab and surge schedules were designed to maintain the target as needed based on running speeds. The operation required maintaining the BHP within a specific window throughout all stages to prevent shales deterioration and/or losses.
- The final plan for running the lower completion and gravel packing with MPD included the following: displacing the well in a constant BHP to the completion DIF fluid, conducting the PST test, pulling the drilling BHA out of the wellbore, running the screens to bottom with MPD, bursting the PVT disk isolating the string, setting and testing the packer with MPD, reverse circulating the string, adjusting pressures as needed while maneuvering with the service tool, pumping the gravel pack job, and reverse circulating the remaining gravel pack inside the work string.

## Value to Customer

- By adapting wellbore pressures to the higher stability curve using MPD, the customer was able to optimize the operation and available resources, preventing significant NPT related to completion fluids management, logistics, materials, and testing.
- The synergy between the customer and service partners during planning and execution permitted successfully running the lower completion to total depth (TD) and spot the gravel pack job accurately while managing BHPs throughout all stages of the operation without influx, wellbore stability issues, or losses.
- The application of MPD techniques during all phases of the operation saved approximately 7 days of rig time, equivalent to $4.9 million USD.

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