

# GeoBalance® Barrier Spacer Prevents Commingling of Mud Cap and BARADRIL-N® System During Trips in Horizontal Wellbore

PERLA FIELD, OFFSHORE VENEZUELA

## CHALLENGE

While performing managed pressure drilling operations for the first time offshore Venezuela, the operator needed a mud cap to maintain bottomhole pressure during trips.

## SOLUTION

A high-gel-strength pill spotted between the mud cap and the active mud system was recommended to prevent commingling of fluids.

## RESULTS

- » The engineered GeoBalance® barrier spacer was used successfully twice, preventing contamination and minimizing volume requirements.
- » The barrier also prevented gas migration to surface during trips.

## OVERVIEW

CARDON IV, a Repsol and Eni joint venture, decided to use managed pressure drilling (MPD) for the first time in the Perla gas field, offshore Venezuela. The naturally fractured carbonate formation is the largest gas reservoir in Latin America, and lost circulation often occurs while drilling this section.

The operator installed an MPD system with a rotating control head and choke in order to maintain precise control of the wellbore pressure profile. To maintain consistent bottomhole pressure (BHP) during static conditions, such as tripping, the operator planned to place a 10.2-ppg mud cap in the wellbore above the 9.2-ppg BARADRIL-N® reservoir drilling fluid system. This would supply the necessary equivalent static density (ESD) when circulation stopped while tripping.

The wellbore angle was 86.7°, with a measured depth of 15,288 feet (4,660 meters). The heavy mud cap would be displaced to 8,500 feet (2,591 meters).

The challenge was to prevent the commingling of the two fluid volumes. If they were allowed to mix, eventually the entire system would become overbalanced and require extensive dilution or displacement.

## THIXOTROPIC BARRIER PILL PROVIDES EFFECTIVE SEPARATION

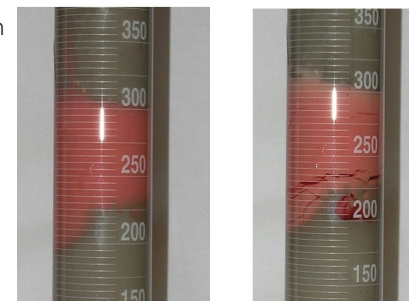
Baroid personnel recommended spotting a barrier spacer from the GeoBalance® MPD service between the mud cap and the BARADRIL-N system. The highly thixotropic GeoBalance spacer produces a strong gel structure, yet retains shear thinning properties for ease of placement. The gel strength of the pill provides good separation between fluids. Drill pipe, wireline, and coiled tubing can pass through the barrier without hindrance.

The water-based GeoBalance barrier can be used with both water- and oil- or synthetic-based drilling fluids. It can also provide a barrier to gas migration in the wellbore.

The Baroid team applied critical first-well criteria to this first-time operation, and a global technical field advisor (GTFA) was assigned to ensure that the testing, mixing, and pumping procedures were executed according to plan.



HAL38862



0 Hours

24 Hours

HAL37618

Before its use in the Perla field, the pill was tested to validate its ability to provide effective separation under well-specific conditions.

When lab testing was completed, a rigsite batch mixer was used to build the 35-bbl barrier pill. The pill was then spotted at 3 bbl/minute over a 500-foot section inside the 9-5/8 inch liner, using the pump-and-pull method.

The drillstring was pulled out of the hole to 20 feet (6 meters) above the top of the pill, at a running speed of  $\leq 45$  ft/min. The mud cap was successfully displaced to the surface on top of the barrier.

When the drillstring was run back in the hole and reached the top of the GeoBalance spacer, the driller was able to wash through with no issues. The pill was then separated at the surface to prevent mixing with the active drill-in fluid system.

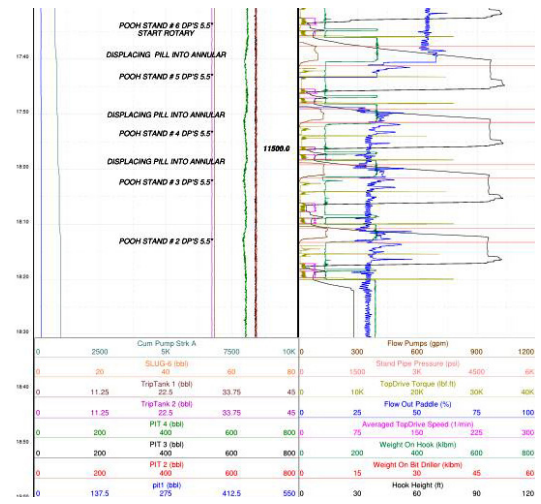
**BARRIER SPACER DEPLOYED TWICE, WITH PERFECT PERFORMANCE EACH TIME**

The Perla 9 well was the first MPD well in the field, and it was drilled from the world's first offshore facility to use the thixotropic GeoBalance pill to avoid the commingling of the fluids during tripping operations.

Two pills were pumped over the course of the drilling operation, and, each time, the effective separation helped the operator avoid mud contamination and unwanted density increases.

Overall, the GeoBalance barrier reduced the volume of high-density fluid needed during trips and therefore also minimized losses related to the interface between fluids. Trip time was decreased.

Further, the pill provided a barrier to gas migration during trips. After each pill removal, a significant amount of gas circulated to surface. CARDON IV representatives were impressed with this ability to enhance safety in MPD operations.



Pumping schedule log

The operator was closely engaged in preparing the rig crews to perform MPD operations for the first time. The Baroid team effort and the successful GeoBalance barrier applications helped promote collaboration and a productive learning environment for all personnel.