

VERSAPRO System Maintains Clean, Uniform Filtercake and Minimizes Formation Damage Offshore Gabon

Invert-emulsion and filtercake breaker systems restrict filtercake contamination and prevent pay zone damage in the Gonelle field

CHALLENGE

Reduce filtercake deposition during drilling to minimize formation damage and achieve productivity index goal.

SOLUTION

Use the VERSAPRO* invert-emulsion reservoir drill-in fluid system and VERSA-OUT* water-base filtercake breaker system to decrease the mud invasion contamination and minimize formation damage.

RESULTS

Maintained relatively clean, uniform filtercake across the producing interval, minimized formation damage, and achieved planned productivity index.

“Excellent field trial and the results are very positive. Total will reuse the reservoir drill-in fluid VERSAPRO system and VERSA-OUT system for the future drilling campaign in the Gonelle field.”

Pierre Donnat
 Head of Fluids Engineering
 Total Gabon



Restrict filtercake contamination and minimize formation and pay zone damage

Total designed Well GNM1-021 in the Gonelle offshore field for an openhole stand-alone screen completion. The challenge in drilling this well was maintaining a relatively clean, uniform filtercake across the producing sands. The main restriction to obtaining the planned productivity index was the filtercake deposition while drilling the formation; therefore, formation damage had to be minimized. Because of the natural reservoir depletion, the overbalance on the formation must also be closely monitored. Bridging particles, initially used to reduce the internal filtercake formation, are known to potentially plug the stand-alone completion screens while running in the hole. To avoid this problem, the drilling mud must therefore be sieved prior to completion operations. The uncertainties in actual fluid invasion in the near-wellbore region support the breaker usage prior to placing the well on production.

Deploy VERSAPRO system to maintain clean, uniform filtercake throughout the production interval

To obtain a clean, uniform filtercake across the production interval, M-I SWACO proposed using the VERSAPRO invert-emulsion reservoir drill-in fluid system for drilling the GNM1-021 reservoir section. The VIRTUAL COMPLETION SOLUTIONS* completion fluid modeling software package and the VIRTUAL HYDRAULICS* drilling fluid simulation software were also recommended by M-I SWACO for use in the project.

Additional mud laboratory equipment was provided for particle size analysis and particle plugging analysis. To optimize the concentration of bridging particles while drilling the reservoir section, a simulation using the OPTIBRIDGE* bridging agent selection software was included in the plan. While drilling, the concentration of bridging agents was to be monitored and adjusted according to the particle size distribution. Particle size analysis was also run routinely to assess the particle size of the solids contained in the drilling fluids.



M-I SWACO mud laboratory analysis.

Combine drill-in fluid and filtercake breaker system for enhanced results

The 9⁵/₈-in casing had been set at 6,119-ft [1,865-m] MD with a 90.57° inclination, and the production interval drilled with an 8¹/₂-in [21.6-cm] bit to TD at 9,039-ft [2,755-m] MD. At TD, the 1.10-relative-density [9.6-lbm/galUS] VERSAPRO system was sieved through an API 325 screen mesh until it passed the particle size test, and the slotted liner was then run to TD.

A 212.5-bbl [34-m³] volume of the VERSA-OUT system consisting of drill water, calcium chloride, SAFE-VIS* polymer fluid loss control additive, D-SOLVER* brine-soluble chelating agent, DEEPCLEAN* single-stage spacer pill additive, and D-STRUCTOR* organic acid precursor breaker was mixed and pumped according to the M-I SWACO recommended procedure. The VERSA-OUT system was pumped to dissolve the calcium carbonate-base filtercake and displace the brine in the casing. This volume of the VERSA-OUT system was sufficient to reach 318 ft [100 m] above the flapper valve.

The cased hole was then displaced with 1.10-relative-density seawater-base sodium chloride and potassium chloride brine inhibited with corrosion and scale inhibitors until total specifications were reached (nephelometric turbidity unit in/out of 55/90) and total suspended solids less than 0.05%.

Once the flapper valve opened, the well instantaneously gave a positive indication of the breaker efficiency with a production level near 100% of the planned goal. Because of the positive results of this field trial, Total Gabon plans to continue using this fluid system and breaker combination for future drilling in the Gonelle field.

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