

Case study: Deepwater Gulf of Mexico

PrimeStar HD fluid deployed in world's first 20,000 psi, single trip multizone frac-pack completion

An operator approached Baker Hughes to help develop and execute a completion operation for a deepwater discovery in the Gulf of Mexico (GOM) with a gross pay of 1,350 ft and a net pay of 400 ft. The well presented several development challenges, including a water depth of approximately ~5,000 ft (1,524 m), a formation true vertical depth (TVD) of ~32,500 ft (9,906 m), a bottomhole temperature of approximately 260°F (127°C), and a formation pressure ~26,000 psi.

The planned completion, which marked the first 20,000 psi completion in the world, required pumping a frac pack to improve connectivity between the wellbore and the reservoir.

Investigating the challenges

The operator wanted to complete the well across six stimulated zones in a single trip, which would require pumping 31,500 bbls of base fluid and approximately 3 million lbs of proppant. Baker Hughes planned to split the fracturing operation between two of its stimulation vessels, the Blue Dolphin™ and the Blue Tarpon™, and use its PrimeStar™ HD fracturing fluid system.

An analysis by Baker Hughes found that upgrading both stimulation vessels to accommodate the higher surface treating pressure would be very costly and take 1.5 years to complete.

Baker Hughes proposed a faster, lower-cost alternative: a new high density frac fluid, PrimeStar HD. This fluid not only has the desired rheological properties but also shows consistent performance. It would also bring surface treating pressures within the current stim vessel and frac equipment pressure ratings, mitigating HSE risk and avoiding the time and costs of upgrades to complete the project.

Deploying flawlessly in the field

Baker Hughes loaded out 31,500 bbls of base brine into the two stimulation vessels and two operator-supplied fluid vessels at the Baker Hughes dock in Port Fourchon, Louisiana. During load-out, the crews conducted constant QA/QC of the fluid in all vessels to ensure operator requirements for fluid consistency were met prior to leaving the dock.

Once on location, the first stimulation vessel rigged up and pumped PrimeStar HD and proppant into the first zone flawlessly. The maximum surface treating pressure never exceeded 12,000 psi. This result reassured the operator that they had made the right decision.

After each zone, the drill ship moved the single trip tool to the next zone over a 12-hour period while one of the supply vessels transferred additional brine to the stimulation vessel via an over-water transfer hose. Once transfer was

Challenges

- World's first 20,000 psi completion would surpass the pressure limits of conventional fracturing fluids, frac iron, and equipment
- Upgrading two stimulation vessels to handle >15,000 psi surface pressures would take about 1.5 years and be very costly
- A high-density frac fluid was required that would maintain the surface below 15,000 psi

Results

- Successfully completed first 20,000-psi completion across six zones in a single trip
- Maintained surface treating pressures below vessel and frac equipment threshold to avoid significant upgrade delays and costs
- Kept vessel and drilling rig crews safer by keeping pressures within normal operating limits
- Delivered a fracturing fluid system that expanded the safe operating envelope for completion operations in deeper water and higher reservoir pressures

complete, fluid samples were collected, and QA/QC performed –a process that can take 4 to 8 hours.

Successfully delivering a world-record completion

This deepwater multizone completion operation achieved several industry firsts. In addition to being the first 20,000 psi completion in the world, the operation marked the first application of the very high density PrimeStar HD system.

The PrimeStar HD system allowed for flawless pumping of the six-zone completion. It also maintained consistent rheological properties when transferred from the fluid supply vessel to the stimulation vessel for every zone.

The PrimeStar HD kept the surface treating pressure below 12,000 psi, well within the pressure limits of the existing stimulation vessels. As a result, the operator avoided the cost and time required to convert the stimulation vessels to 20,000 psi capability. The fluid also reduced the risks of exposing

work crews to pressures over the normal operating limits of the current systems on both the stimulation vessels and the rig.

For the operator, the successful development and deployment of the PrimeStar HD fracturing fluid provided a safe, reliable, and consistent completion option allowing them to proceed with confidence. For Baker Hughes, the PrimeStar HD fluid system opens the door to new high-pressure, deepwater completion operations where flawless performance and safe execution are critical.



Blue Dolphin Vessel.



PrimeStar HD high viscous fracturing fluid.



Blue Tarpon Vessel.