

Case study: Lower Tertiary formation, Gulf of Mexico

MST completion system saved up to \$7.9 million USD in ultra-deepwater well

An operator with a deepwater field development in the Lower Tertiary formation in the Gulf of Mexico chose to use the Baker Hughes multi-zone single-trip (MST) completion system to execute three frac-pack treatments in one run. The MST system has been systematically designed to efficiently treat multiple zones in one trip, providing significant cost savings and reducing nonproductive time (NPT) compared with conventional technology, which requires at least one trip for each treatment.

The well was drilled to 27,200 ft (8291 m) total depth (TD) in 8,832 ft (2692 m) of water, and 10 1/8-in. casing was installed. The well intersected three pay zones. After perforating, the operator ran the Baker Hughes MST system, comprised of a 96-37 service tool with dual shifter configuration, MST screens with a patented screen communication system (SCS), multi-service valve (MSV) sliding sleeves with selective profiles, and isolation packers.

InQuest PayZonePro™ software was used to model downhole hydraulic forces acting on the service tool and to ensure sufficient set down weights for all stages of the operation. The MST system has positive locating mechanisms that fit together to confirm service tool positioning downhole, and it features high set-down capabilities and designated seals to handle high-pressure frac-pack operations. The service tool is engineered to endure high pressures and high treatment rates at varied concentrations. It is also designed to pump the large proppant volumes associated with multiple zone stimulations.

After the zonal isolation packers were simultaneously set and tested, the service tool was positioned at the lowermost zone to perform the frac-pack stimulation. Upon completion of the treatment, the

service tool was repositioned to close the monitoring sleeve and the frac sleeve in one upward movement. The dual shifter configuration optimizes the operation by reducing rig time, while also minimizing the risk associated with excessive tool manipulation. The zone was pressure tested to confirm well integrity and the same process was followed for the second and third zones.

The three frac-pack operations used 8 PPA of high-strength proppant pumped at 32 bpm with a surface treatment pressure of 13,000 psi (896 bar). After all three zones were successfully treated with almost 1 million lbm of proppant, the service tool was inspected and confirmed to be in good condition.

The 3,500 ft (1067 m) isolation string—consisting of an **SC-XP™ V0-rated intermediate isolation packer, selective shifting tools, and a tubing isolation ball valve**—was successfully deployed.

The SC-XP packer features our proven **ZX™ seal element** which resists swab-off, and is designed for use in deepwater HP/HT environments.

The production sleeves were opened and the SC-XP isolation packer was set and tested. The upper completion was then installed and the tubing isolation valve opened to start production.

The efficiencies gained through the use of the MST system enabled the operator to start production eight days sooner than would have been expected with a conventional frac-pack completion, saving an estimated \$7.9 million USD considering rig time alone. Initial tests on the well confirmed significantly higher production rates than expected.

Challenges

- Operator needed to stimulate multiple zones
- 27,200-ft TD deepwater well in 8,832 ft of water
- 19,000 psi reservoir pressures

Results

- Saved operator eight days rig time and an estimated \$7.9 million USD compared to a conventional stack-pack completion
- Executed operation with zero HSE incidents
- Reduced risk through pre-job modeling
- Significantly increased expected production