TORRENT MST Completion System Saved Up to USD 12 Million in IWS Ultra-Deepwater Well
Location: Lower Tertiary Formation, Gulf of Mexico

An operator with a deepwater field development in the Lower Tertiary formation in the Gulf of Mexico chose to use the Baker Hughes TORRENT™ multi-zone single trip (MST) completion system to execute three frac-pack treatments in one run. The TORRENT MST system efficiently treats 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 frac-pack treatment.

The well was drilled to 27,460-ft (8370-m) total depth (TD) in 8,149 ft (2484 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 TORRENT MST system, comprised of a 96-37 TORRENT service tool with dual shifter configuration, TORRENT MST screens with a patented screen communication system (SCS), TORRENT multi-service valve (MSV) sliding sleeves with selective profiles, and TORRENT isolation packers.

Results
- Saved operator 12 days rig time and an estimated USD 12 million
- Executed operation with zero HSE incidents
- Reduced risk through pre-job modeling
- Significantly increased expected production

Background and challenges
- Operator needed to efficiently stimulate three zones and produce via intelligent completion
- 27,460-ft TD deepwater well in 8,149 ft of water
- 19,000 psi reservoir pressures

Baker Hughes solution
- Deployed a TORRENT MST completion system with IWS, marking the first installation of its kind in the Gulf of Mexico
- Stimulated three zones in a single trip with more than 1 million lbm proppant
- Ran TORRENT MST screens and TORRENT MSV sliding sleeves to enhance production
- Established two selective production zones, using an X-AFV to produce the lower zone and intelligent completion technology to isolate and produce the upper zone
InQuest PayZonePro™ software was used to model downhole hydraulic forces acting on the service tool to ensure sufficient set-down weights for all stages of the operation. The TORRENT MST system has positive locating mechanisms that fit together to confirm service tool positioning downhole and features high set-down capabilities and designated seals to handle high pressure frac 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 TORRENT 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 reducing 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 frac-pack operation 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 over 1 million lbm of proppant, the service tool was inspected and confirmed to be in good condition.

The 5,000-ft (1524-m) isolation string—consisting of an SC-XP™ V0-rated intermediate isolation packer, selective shifting tools, a tubing isolation ball valve, and a recloseable annular flow valve (X-AFV)—was successfully deployed. The X-AFV is opened and closed using hydraulic input, and includes a contingency option for mechanical manipulation if needed. 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 isolation SC-XP packer was set and tested. The intelligent well system (IWS) upper completion—consisting of 4½-in., 12,000-psi InForce™ HCM-Plus hydraulic sliding sleeves, a 10,000-psi Premier™ packer, a Venturi flow meter, pressure and temperature gauges, and chemical injection valves—was installed to facilitate interventionless production of the two upper isolated zones. The well was successfully put into production by opening the tubing isolation valve for the upper section (included the two upper zones) and the X-AFV for the lower section (included the deepest zone).

The efficiencies gained through the use of the TORRENT MST system enabled the operator to start production 12 days sooner than would have been expected with a conventional frac-pack completion, saving an estimated USD 12 million considering rig time alone. Initial tests on the well confirmed significantly higher production rates than expected.