New Enhanced Single-Trip Multizone (ESTMZ™) completion system sets industry records and improves economics of ultra-deepwater development.

**OVERVIEW**

Chevron became interested in the Gulf of Mexico (GoM) Lower Tertiary Formation in the early 2000s, but production economics were challenging. Wells can reach depths of 29,000 feet and require stimulation before they produce. Single-trip, multizone completion systems would cost less than conventional stacked pack completions, but single-trip systems at the time were not robust enough to be cost-effective.

Halliburton deployed the next-generation Enhanced Single-Trip Multizone (ESTMZ™) system in 2012 on three ultra-deepwater Chevron-operated wells in the GoM. Compared to conventional completions, Chevron estimates the ESTMZ system saved an average of 18 days per well. The system set two industry records in the process. The first well of the three tested in excess of 13,000 BOPD.

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**CHALLENGE**

**SOLUTION**

**Making wells profitable**

Traditional stacked, multizone completions with multiple stimulations negatively impacted economics of these ultra-deepwater projects. But historically, single-trip multizone completions have not delivered the differential pressure and proppant volumes to effectively stimulate such wells.

New single-trip completion technology saves rig time

Halliburton, in cooperation with Chevron, developed an enhanced single-trip, multizone completion system. This powerful, ruggedized system has been enhanced in many ways. It can match the stimulation results of traditional, stacked completions.

**Adequate stimulation**

These reservoirs require stimulation to produce. But the pump ratings for older single-trip systems were only 8 barrels per minute. Considering the stimulation requirements, this pumping rate was prohibitively slow. It tipped deepwater economics away from single-trip systems.

Enhanced system has much higher pump ratings

The ESTMZ system can pump at rates up to 45 barrels per minute. That’s more than five times the rate of older systems. The differential pressure rating also increased – from 6,000 to 10,000 psi. These factors help tip deepwater economics back toward single-trip systems.

**Short length of individual zones**

Longer zones would reduce the number of trips needed with older single-trip systems. But unfortunately, the old systems could only deliver 300,000 pounds of proppant per well. This volume was not sufficient to allow operators to increase the length of zones enough to dramatically reduce trips.

New system can place 10X more proppant

Thicker, stronger, special alloys in the enhanced system can withstand the erosive forces of large volumes of proppant. ESTMZ system can pump up to 3.75 million pounds per well, or 750,000 pounds per zone – at maximum pump rates (45 BPM). This allows considerable lengthening of zones.
Chevron used the ESTMZ™ (Enhanced Single-Trip, Multizone) FracPac™ system to complete three deepwater wells in the Gulf of Mexico’s Lower Tertiary Wilcox Sands. This formation requires fracturing to produce at economic levels. Chevron estimates that it saved an average of 18 days of deepwater rig time per well by using the ESTMZ system.

Halliburton’s ESTMZ™ FracPac™ system allows stimulation and gravel packing of multiple zones in a single trip of the workstring. Single-trip completions on a five-zone well save 11 trips per well. This reduces both cost and safety risk.

While none of the three wells have yet been brought on production, the first well treated with the ESTMZ system tested in excess of 13,000 barrels of oil per day.

The ESTMZ system’s capabilities greatly exceed those of previous single-trip completion systems. ESTMZ system can deliver the proppant and pressures associated with stacked operations, but in a fraction of the time.

Solving challenges™
Lower Tertiary Formation attractive, but poses huge challenges

The Wilcox Sands in the Lower Tertiary Formation of the Gulf of Mexico have attracted Chevron's interest since 2001. While resources are substantial, so are the hurdles of developing them. Reaching and drilling thick reservoir sections below a thick salt canopy involves complex drilling programs using high-cost rigs.

Existing completion alternatives too expensive or inadequate

Each well had multiple zones requiring fracturing. Conventional stacked completions would work, but were costly. One of the wells, for instance, had five zones. Conventional fracturing procedures would have required 14 trips to plug, perforate and fracture. Rig time for that was cost prohibitive.

But the single-trip multizone completion systems available when Chevron began planning this field were inadequate. They simply could not pump enough proppant at a high enough rate to effectively treat the formation.

Collaboration fills a market need

When Chevron described its need, Halliburton suggested using its new ESTMZ™ system. The two companies collaborated to customize the system to meet Chevron's Lower Tertiary needs. Key objectives: increasing maximum pump rate, pumping pressure differential, and volume of proppant that the system could deliver.

New ESTMZ system deployed in challenging deepwater formation

Development and field trials of the new system took place between 2006 and 2011. The first commercial deployment in the Gulf of Mexico, for Chevron, occurred in 2012. The system allows the highest treating rates with the greatest volume of proppant in the industry.

Record-setting performance

Halliburton successfully completed the first well ahead of schedule; Chevron well-tested it at a rate in excess of 13,000 BOPD.

The enhanced capabilities of ESTMZ™ system allow more reservoir to be stimulated in a shorter amount of time, thus increasing both production and efficiency. Additionally, ESTMZ system can economically stimulate shorter zones that would normally be bypassed, thus further increasing production.

Chevron saved an average of 18 days per well on three ultra-deepwater GoM wells using the Halliburton Enhanced Single-trip Multizone completion system.
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**Order-of-magnitude improvement in proppant delivery capability**

Halliburton's previous single-trip multizone system could only deliver 300,000 pounds of proppant per well, or 100,000 pounds in each of three zones. Halliburton designed the ESTMZ™ system, however, with special alloys that have greater erosion resistance. The ESTMZ system can deliver up to 3.75 million pounds of proppant at 45 barrels per minute in a well with up to five zones. The pressure rating has increased from 6,000 to 10,000 PSI, increasing the operating envelope for deepwater wells and allowing better frac design optimization. Furthermore, the ESTMZ system has the largest internal diameter (ID) available in a system rated to 10,000 PSI. Its 4.75-inch ID for 9 5/8-inch casing maximizes frac, reverse and production rates. Halliburton continues to improve ESTMZ system components to meet even greater challenges.

**Safety and completion risks reduced**

In addition to saving time, the ESTMZ system also helped reduce safety risk. Running pipe is the most dangerous activity on a rig. The ESTMZ system can reduce the number of runs by two thirds. In the case of these three wells, the ESTMZ system eliminated a total of 24 round trips to more than 25,000 feet, each of which would have taken at least 24 hours. The ESTMZ system also helped reduce completion risk by allowing all zones to be perforated at once; eliminating temporary packer plugs from the program.

**System proves its reliability and value elsewhere in world, too**

The ESTMZ system makes deepwater economics more favorable by reducing the number of trips needed to complete a well. This is true anywhere in the world. Beyond the Gulf of Mexico, Halliburton has successfully deployed the ESTMZ system in Indonesia, Brunei and elsewhere. While savings directly relate to the depth of the well, the system has repeatedly proven its reliability and cost-effectiveness in shallow, deepwater and ultra-deepwater applications.