



ACTIVATESM Refracturing Service

Halliburton helps Bakken operator lower costs per BOE by 64%

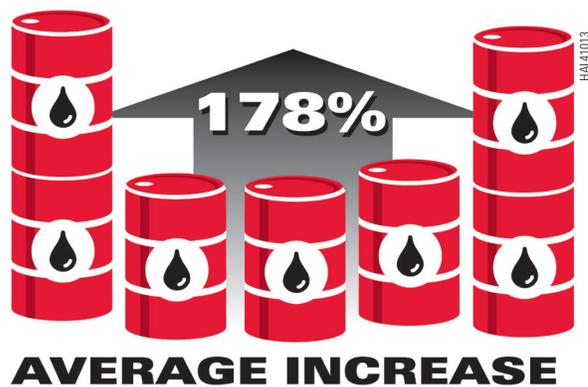
Location: Bakken Shale Play, Williston Basin

Overview

In the Bakken formation of the Williston Basin, an operator sought to increase production in wells that had underperformed compared to the true reserve potential. Halliburton engaged its ACTIVATESM refracturing service to select the best candidate wells located in highly productive areas of the reservoir, and provided a solution to produce additional reserves.

Halliburton and the operator collaborated to assemble a four-well pilot program, each with different unconventional well challenges. Wells were identified through production analysis and characterized based on their reservoir quality, as well as benchmarked by completion quality. Well 1 had a suboptimal completion design, Well 2 had a modern completion design that lost connectivity to the reservoir after high initial production, Well 3 required new perforations to access bypassed pay, and Well 4 exposed a concern of negative well interference during infill drilling. Based on the respective well challenges, each well required a specific refracturing design to achieve incremental production in its second life.

When the refracturing project was completed, all of the refractured wells experienced significant production uplift compared with a baseline forecast. In a 12-month period, the incremental production added in the field was 112 Thousand Stock Tank Barrels (MSTB), with production uplifts from all four wells achieving an average 178% production increase with ACTIVATE refracturing service.



Average production increase with ACTIVATE refracturing service.

DID YOU KNOW

The ACTIVATESM service involves four steps:

01
SCREEN

SCREEN the best candidate wells based on reservoir and completion quality

02
DESIGN

DESIGN the optimal refrac treatment to connect existing fractures and place new fractures with the FracInsight[®] service and proprietary Pressure Sink Mitigation[™] process

03
EXECUTE

EXECUTE the refrac treatment for full lateral coverage with AccessFrac[®] stimulation service

04
DIAGNOSE

DIAGNOSE refrac efficacy and optimize refrac design for future pads with the Integrated Sensor Diagnostics service and FiberCoil[™] tubing

HAL41015

Predictable refrac wells can enable operators to build a balanced portfolio of new wells, infills, and Refracs, and to reduce the cost per BOE break-even point of their specific acreage. Refracs also allow operators to book incremental reserves.

In basins where we have delivered the ACTIVATE service, operators have seen up to:

- **80% increase in estimated ultimate recovery (EUR)** per well
- **25% increase in oil recovery factor** with balanced portfolio
- **66% reduced cost per BOE** compared to new drills

CHALLENGES	SOLUTIONS	RESULTS
<ul style="list-style-type: none"> Well 1: Suboptimal completion design in vintage wellbore. 	<ul style="list-style-type: none"> AccessFrac® stimulation service enhances fracture surface area and lateral contribution to production. 	<ul style="list-style-type: none"> 180-day production rate of 87 BOPD compared to 46 BOPD prior to refrac – uptick of 89%.
<ul style="list-style-type: none"> Well 2: Modern completion with high initial production and steep decline rates. 	<ul style="list-style-type: none"> Proprietary well preparation process (the Pressure Sink Mitigation™ solution), combined with AccessFrac service enhances fracture surface area. 	<ul style="list-style-type: none"> 180-day production rate of 152 BOPD compared to 51 BOPD prior to refrac – uptick of 198%.
<ul style="list-style-type: none"> Well 3: Original completion had less number of clusters, leaving bypassed reserves. 	<ul style="list-style-type: none"> FracInsight™ service helped place perforations strategically in bypassed pay; AccessFrac service provided refracture treatment. 	<ul style="list-style-type: none"> 180-day production rate of 229 BOPD compared to 57 BOPD prior to refrac – uptick of 302%.
<ul style="list-style-type: none"> Well 4: Parent well experienced negative interference during infill well stimulation. 	<ul style="list-style-type: none"> AccessFrac® service used to refracture parent well prior to infill well fracture treatment, mitigating well bashing and asymmetrical fracture growth in infill well. 	<ul style="list-style-type: none"> Uptick of 124% in parent well.

As shown in Figure 1, deploying AccessFrac® stimulation service enabled Halliburton to arrest the decline curves and increase long-term production rates. The production type curves exhibit shallower decline rates after the refracturing treatment compared to the original fracturing treatment. As a result, the refracturing pilot project incremental cost of production was \$17,435/BOE per day compared to the operator’s reported average development cost of \$48,480/BOE* per day (64% lower than the original cost, as shown in Figure 2).

* Source: JPMorgan. 2015. North American Equity Research, January 2015. <http://www.jpmorganmarkets.com>

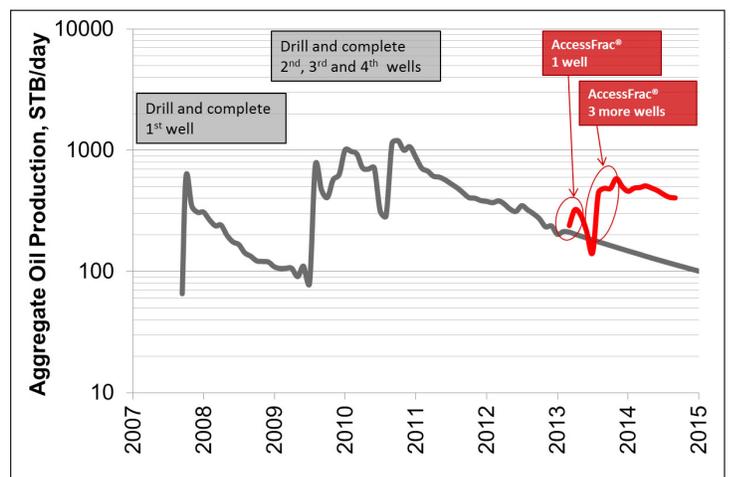


Figure 1. Deploying ACTIVATE™ service helped Halliburton arrest the decline curves in all the refractured wells.

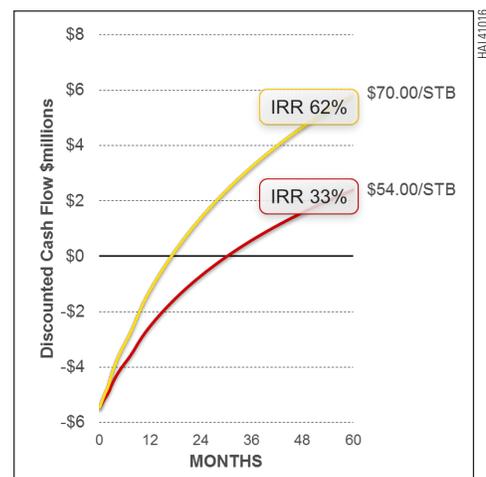


Figure 2. With ACTIVATE™ service, BOE per day costs dropped from \$48,480 to \$17,435.

Contact Halliburton to see how the ACTIVATE service can help you build a balanced portfolio, and recover bypassed reserves predictively and repeatedly.

www.halliburton.com/ACTIVATE

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