

QuickFRAC mitigates risk of screen-out in mature reservoirs

[Canada, Boundary Lake QuickFRAC System](#)

Background

The Triassic Boundary Lake formation is located in northern Alberta approximately 750 km northwest of Calgary. This mature reservoir is a carbonate sand and is a member of the Charlie Lake formation. Porosity and permeability are 20% and 30 mD, respectively. Horizontal drilling and multi-stage fracturing have unlocked resource plays across Alberta. As operators continue to target mature reservoirs and produce resources once thought to be uneconomical to recover, they rely on advances in technology that are operationally efficient and economically viable.



Challenge

An operator was seeking an effective method to complete their open hole wells in the Boundary Lake formation. Low bottom hole pressure (BHP) in the reservoir, due to depletion, and a high risk of screenout required the operator to find an efficient completion method. Mitigation of screen-outs is essential in depleted reservoirs as flowing back the well is not an option due to low BHP. In addition, coiled tubing clean-outs can substantially increase completion costs.

Designing an efficient completion was also challenged by the presence of hydrogen sulfide (H₂S) in the formation which can cause metallurgical issues, such as stress cracking. Downhole conditions presented a 3.5% H₂S sour gas environment and a bottom hole temperature of 65°C.

Solution

The operator had extensive experience in horizontal drilling and multistage fracturing completion methods and decided to meet this challenge with the Packers Plus QuickFRAC® system. The QuickFRAC system is an open hole, multi-stage fracturing completion which uses limited entry to selectively fracture multiple stages using one stimulation treatment from surface. The system uses a configuration of RockSEAL® II packers and QuickPORT™ sleeves, which groups multiple, individually isolated stages into a single treatment zone.

All QuickPORT sleeves within each treatment zone are activated using a single actuation ball engineered to specific operational requirements. Stimulation fluid is then distributed, according to the prescribed pumping plan, through each QuickPORT sleeve in the treatment zone to initiate multiple fractures. If a screen-out occurs in an isolated stage within the zone during stimulation, the remaining stages can continue to be stimulated. Calculating a detailed,

per-zone pumping plan prior to stimulation allows for consistent rates during treatment and mitigates the potential of a screen-out.



Results

A 15-stage QuickFRAC system was installed targeting the Boundary Lake formation. A 114.3 mm L-80 liner and 139.7mm longstring to surface reduced friction and thus the surface pressure required for the prescribed pumping plan. In addition, all tools incorporated C-110 and L-80 materials in order to execute the stimulation in the sour gas environment. Five treatments were pumped from surface using a total of 300 tonnes of proppant, 770 m³ of water and 136 m³ of nitrogen.

During stimulation, stage two screened out; however, due to the efficiency of the QuickFRAC system and the per-zone pumping plan, the screen-out did not interrupt the operation and the treatment was able to continue. The entire treatment zone, which included three stages, was stimulated in just 21 minutes. In addition, the well was successfully stimulated in less than three hours.

Completion challenges in mature reservoirs, which have a high potential for screen-out, require technical solutions that can successfully mitigate risk and increase efficiencies. The QuickFRAC system helped the operator avoid a substantial increase in completion costs by preventing the interruption of stimulation operations. Packers Plus is the innovator of open hole multi-stage completions and adapts to changing industry demand for specific applications in technically challenging formations.