

Case Study

Toe-XT Testable Hydraulic Sleeve enables high pressure casing test and sleeve opening below formation frac pressure

UNITED STATES, CARDIUM, EAGLE FORD
TOE-XT

An operator working in the Cardium formation of south-central Alberta required an efficient way to perform a casing integrity test at a high pressure, while subsequently opening the sleeve at a low pressure – below the frac gradient. This would allow the operator to initiate flow from the cemented multi-stage completion system without fracturing the reservoir until they were ready to proceed with stimulation operations. The operator chose to run the Packers Plus Toe-XT™ Testable Hydraulic Sleeve to achieve this benefit and the tool performed as designed.

Challenge

While the ability to perform a casing integrity test is a key feature of testable hydraulic toe sleeves, many providers have limitations on the maximum pressure test that can be conducted, as well as a relatively high sleeve opening pressure that can result in hydraulically fracturing the formation before stimulation operations are ready to begin. The setting pressure of other downhole tools being run as part of the completion can create further challenges in pressure testing a system and opening a testable hydraulic toe sleeve within its operational capabilities.

Solution

The Packers Plus Toe-XT Testable Hydraulic Sleeve is a hydraulically activated injection/production port for the first stage of cemented or open hole completions. Run as part of the completion tool string, the Toe-XT sleeve is designed to enable a single casing integrity test without opening the port. After pressure is bled off, the port is activated and is ready to be opened using a lower pressure to allow for either immediate injection into the formation or to simply initiate flow for later stimulation operations.

Results

The Toe-XT Testable Hydraulic Sleeve was part of a 45-stage cemented completion system that was run to a total depth of 3,394 m (11,135 ft) and anchored by the Packers Plus

PrimeSET™ Liner Hanger Packer. The high testing pressure capability of the Toe-XT sleeve provided the operator with plenty of room to perform cementing operations and pressure up the casing to set the PrimeSET Liner Hanger Packer.



The Toe-XT Testable Hydraulic Sleeve is specially designed to operate with a dual pressure cycle that enables a high pressure casing integrity test (pictured at left) and a low pressure sleeve opening that is independent of stimulation operations (pictured at right).

After the PrimeSET Liner Hanger was set, pressure was further increased to enable a casing pressure test at 62 MPa (8,992 psi) for ~15 minutes. Once the pressure test was completed and pressure was bled off to activate the Toe-XT sleeve, pressure was applied again and the sleeve was successfully opened as designed at 26.0 MPa (3,771 psi), approximately 500-1,000 psi below the formation fracture gradient.

Key to the confirmation of the Toe-XT sleeve functioning was leveraging the Packers Plus ePLUS® Retina Monitoring System to provide real-time visualization of the pressure test (Fig. 1) and opening (Fig. 2). Because the operator wanted to ensure the formation was not stimulated upon flow initiation, an additional benefit was that they were able to cut injection immediately upon verification of the opening shift.

The Toe-XT performed within specification and the operator was able to achieve its goals of performing a casing integrity test and initiating flow at a pressure that did not result in the formation being stimulated. Packers Plus has continued to provide innovative solutions for the completion industry's most difficult challenges since 2000. For more details about the Toe-XT Testable Hydraulic Sleeve or other Packers Plus technology, go to packersplus.com.

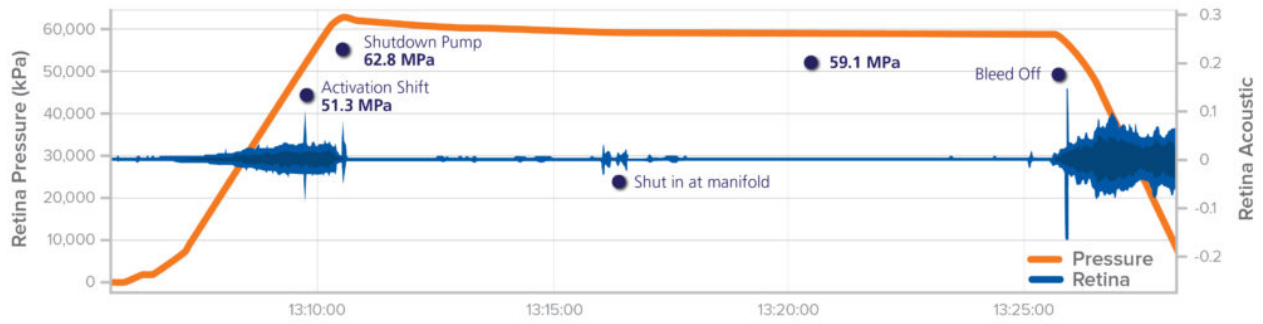


Figure 1. ePLUS Retina provided real-time confirmation of the Toe-XT activation and casing integrity test.

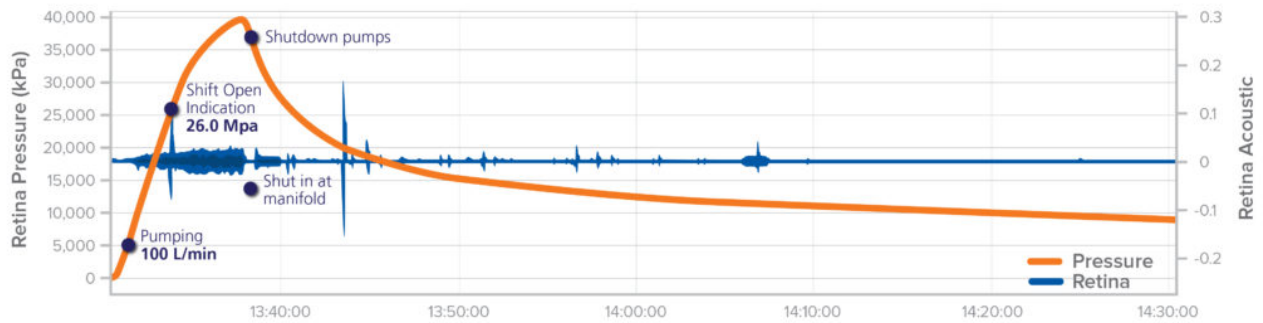


Figure 2. ePLUS Retina provided real-time confirmation of the Toe-XT opening at 26.0 MPa (3,771 psi), enabling the operator to shutdown the pumps before prematurely fracturing the formation.