Interventionless Toe Prep Solutions

INCREASING OPERATIONAL EFFICIENCY
WHILE REDUCING RISK EXPOSURE
Halliburton has consistently led the industry by developing technologies that improve efficiency, reliability, and risk mitigation for completion operations. This history of successful innovation is why so many customers choose Halliburton – the global leader in completions – as a partner for their most challenging projects.

<table>
<thead>
<tr>
<th>CUSTOMER CHALLENGE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensuring operational reliability</td>
<td>Halliburton interventionless toe prep solutions use highly reliable and field-proven equipment.</td>
</tr>
<tr>
<td>Complying with regulatory requirements</td>
<td>Multiple offerings allow for true casing pressure tests while minimizing lease line stand off requirements.</td>
</tr>
<tr>
<td>Reliable well control and wellbore connectivity</td>
<td>Halliburton cemented solutions provide a means for reliable well control while allowing an additional frac treatment through the toe.</td>
</tr>
<tr>
<td>Minimizing risk exposure</td>
<td>Interventionless solutions require less equipment and personnel near the wellhead, inherently reducing risk exposure.</td>
</tr>
<tr>
<td>Tailored solutions</td>
<td>Multiple offerings allow customers to choose an appropriate solution for their application to avoid unnecessary costs.</td>
</tr>
</tbody>
</table>

Interventionless Toe Prep Solutions

Traditional toe solutions require coiled tubing, bridge plugs, pressure tests and perforations. While these operations can be performed in a single run, the complexity of the operation carries relatively high risks, especially in extended horizontal laterals.

Halliburton interventionless toe solutions streamline the operation by using cutting-edge solutions specifically designed for unconventional resources. This can help to both improve efficiency and reduce risk thanks to reliable, field-proven equipment.
APPLICATION #1:
WET SHOE
Installing the final production casing or liner and pumping a wet shoe is as economical as it gets for upfront well construction costs. This process requires minimal investment in float equipment and plugs, and provides the finished wellbore with a reliable flow path which is important for testing the casing prior to fracturing operations.

KEY TECHNOLOGY:
IsoLatch™ Cement Wiper Plugs with Burst Disk
The Halliburton IsoLatch™ cement wiper plug’s main purpose is to land and latch the top wiper plug to prevent interference with the Halliburton suite of toe sleeves at the end of a cement job. However, by incorporating a rupture disk into the top wiper plug, Halliburton has an economical solution for wet shoe cementing applications. The top plug rupture disk provides a flow-through capability combined with a latching seal on the top plug to ensure pressure integrity for eventual casing tests, dependent upon the rupture disk rating. This top plug lands, latches, and seals into an integral landing collar and Super Seal™ II float collar. Unlike competitors’ two-plug latching and sealing solutions, this method requires only a single plug to latch and provide a seal, greatly reducing the risk of pressure loss prior to disc rupture between two plug systems. This minimalist design provides wiping efficiency, is highly reliable, and helps manage the cost of materials and inventory.

APPLICATION #2:
CEMENT ISOLATED SHOE TRACK
A fully cemented shoe track provides a high-integrity barrier and closed system for pressure testing the casing. It also ensures proper annular isolation for the first stimulation treatment. To create a flow path for pump-down operations without an interventionless solution, perforation guns have to be run into the wellbore via a tractor or coiled tubing. When an interventionless sleeve is used, an economical and reliable method to establish a flow path can be achieved. In either case, the established flow path is used as the first stimulated zone, ensuring maximum lateral stimulation.

KEY TECHNOLOGY:
RapidStart® Initiator Sleeve
The RapidStart® Initiator sleeve is an economical solution to generate a flow path without intervention. It features a large flow area which is available immediately upon opening, allowing operators to pump an entire frac treatment through the sleeve without any flow restrictions. If a casing pressure test is required, then a bridge plug can be pumped down and a hot test performed with perforating guns in the hole prior to shooting the first set of perforations. The use of dissolvable SoluPort® plugs to help eliminate cement intrusion makes it an ideal option for cemented applications in long horizontals where reliability is critical.

KEY TECHNOLOGY:
RapidStart® Initiator Sleeve with a Dissolving Ball
Combining the RapidStart® Initiator sleeve with dissolvable RapidBall™ technology opens up new possibilities for operators. By landing a ball immediately above the toe sleeve, customers can now perform a casing pressure test without needing to run a bridge plug. The ball will dissolve after completion of the test, opening the flow path through the toe sleeve and allowing the operator to begin frac treatments and pump-down operations.
APPLICATION #3:
INTERVENTIONLESS CASING PRESSURE TEST

Internal customer requirements or governmental regulations may require operators to perform a true casing pressure test. In this situation, the operator must not exceed the test pressure in order to open the fluid flow path. Advances in technologies allow Halliburton to offer interventionless solutions to achieve true casing tests.

KEY TECHNOLOGY:
RapidStart® Initiator CT (Casing Test) Sleeve

The RapidStart® Initiator CT sleeve enables a true casing pressure test by remaining closed for sufficient time to complete the casing test. It also features a start and stop function, giving operators the ability to find and remediate any leaks and still get a casing test after remediation. This is the first technology of its kind, and has provided industry-leading reliability and efficiency gains in thousands of wells in North America and around the globe.

APPLICATION #4:
OPERATION PRESSURE INDEPENDENCE

When running a standard toe prep solution, operators must account for multiple operational pressures, including pressures encountered when running in hole, during fluid displacement, or while setting other completion equipment such as liner hangers or packers. Halliburton technology creates an opportunity to eliminate the need to account for these operational pressures. In addition, this application requires very low opening pressures, reducing the equipment footprint necessary to complete the wellbore.

KEY TECHNOLOGY:
Elect® Toe Sleeve

The Halliburton Elect® toe sleeve is a programmable electronic solution that allows many possibilities for interventionless operations. The sleeve performs as a piece of casing in the wellbore until the programmed amount of time has elapsed. Then, after a pre-programmed time, the sleeve will open when a predetermined pressure is achieved.
Sales of Halliburton products and services will be in accord solely with the terms and conditions contained in the contract between Halliburton and the customer that is applicable to the sale.

H013119

03/19 © 2019 Halliburton. All Rights Reserved.