60 Stage Monobore Single-Trip Open-Hole Ball Drop System

Our industry-leading Voyager Frac system, URFC-II, and PureFlow Stage Cement Tool delivered reduced stimulation cost and industry-leading mill out times.

Background

An operator in Canada wanted to optimize their well completion in extended reach horizontal multistage fracturing applications. The goal of the operator was to improve overall performance in the deployment, installation and stimulation of each well. Additionally, the operator wanted to increase the stage count without tapered string in a true 4.5-in. system to accommodate the longer laterals drilled.

Solution

The operator selected our Voyager™ Open-Hole (OH) frac system, which uses the best-in-class Voyager OH packer combined with our Voyager frac sleeves. For this customer, our Voyager frac sleeves utilized an optimized seat design; enabling a full 4.5-in. 60 stage system deployment with the smallest seat being 1.9-in. Options are available enabling deployment of up to 75 stages with a 6,000 psi ball-on-seat rating.

Using the Voyager “G” seats, we have maintained our excellent ball-on-seat pressure ratings, while adding 12 additional stages to our 4.5-in. system.

To assist with deploying the longer casing string, our URFC-II was selected. Using a tempered glass barrier, air was trapped in the casing, thereby reducing the running friction of the string through buoyancy. This technology is now widely adopted by our customers, enabling customers to push the limits of casing lateral lengths. After rupturing the glass disc, debris from the URFC-II is small enough to avoid any interference with the Voyager system or float equipment. The URFC-II has saved many operators hours of rig time in thousands of extended reach applications.

The PureFlow™ stage cementing tool was selected to cement the system in place after rupturing the URFC-II, which allowed for cementing above the open hole system using an “off-bottom” cementing method. The PureFlow stage tool uses a reliable, hydraulically activated sleeve serving as a temporary flow path, allowing the upper section of the well to be isolated and cemented to surface. Prior to the stimulation operation, the internals are drilled out to allow full access to the completion below. The design has been optimized to minimize the amount of material required to be drilled out prior to stimulation.

Case study facts

Location: Canada

Formation: Montney

Products

- Voyager Open-Hole Ball Drop System
- PureFlow Stage Cementing Tool
- URFC-II Flotation Collar
- i-Opener SO (Single-Open) Toe Initiator

General Well Information

- Casing Size: 4.5-in. (114.3 mm)
- Casing Weight: 15.1 lb/ft (22.47 kg/m)
- Open Hole Size: 6.25-in. (158.8 mm)
- Frac Rate: 69.2 BPM (11 m3/min)
- Stage Count: 60

Results

- Benchmarked drill out times of Pureflow stage cement tool were the **fastest drill out times** when compared to our competitors; averaging 4 minutes
- Voyager Open Hole Ball Drop Frac system using “G” seats enabled full 4.5-in. 60 stage system deployment
- Larger seat ID **significantly reduced stimulation cost** through reduction in chemical additives per stage

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Results

The operator benchmarked the PureFlow drill out times and found them to be the **fastest drill out times** when compared to our competition. In some cases, our drill out times for our PureFlow were 1/20th of the drill out time of our competitor with the PureFlow stage tools drilled out in only 3.5 to 5 minutes and the debris sub ball seat separately drilled out in less than 5 minutes.

The operator found that when deploying the larger seats from the Voyager open hole ball drop frac system with new generation ball seats, they were able to significantly **reduce stimulation cost** by reducing chemical additives needed to pump each stage.

The i-Opener Single-Open (SO) toe initiators utilize redundant burst discs to protect the inner components from debris during installation. Our i-Opener SO has consistently opened at the nominal activation pressure ensuring reliable communication to the reservoir and enabling first-stage frac through the toe.

Through adoption of NOV completions techniques, the Montney operator was able to:

- Maximize lateral length in a single-trip monobore off-bottom cement completion (without use of a tapered string).
- Reach maximum stimulation rates faster in a high intensity stimulation program.
- Reduce cost and improve well delivery times while maximizing production.
- Enable first-stage frac through the i-Opener SO toe initiator.

URFC-II | **Pureflow stage cement tool** | **Voyager Open Hole Packer** | **Voyager Frac Sleeve** | **i-Opener SO**