

# Refracturing With a Cup-to-Cup Tool

## Background

Multistage fracturing (MSF) has been widely used in Russia over the past several years with thousands of MSF wells drilled and completed. Sleeve systems using ball-drop sleeves or Burst Port Subs (BPS™) are the main technologies used for completing MSF wells in this region. As with most MSF wells, there can be a significant production decline within two to three years of the initial fracturing operations. Operators can rejuvenate these wells by refracturing which requires isolation of the sleeves used in the original completion.

## Solution

NOV provides a method for refracturing MSF wells using our Cup-to-Cup tool to provide isolation of the frac sleeves used in the original completion.

## Challenges

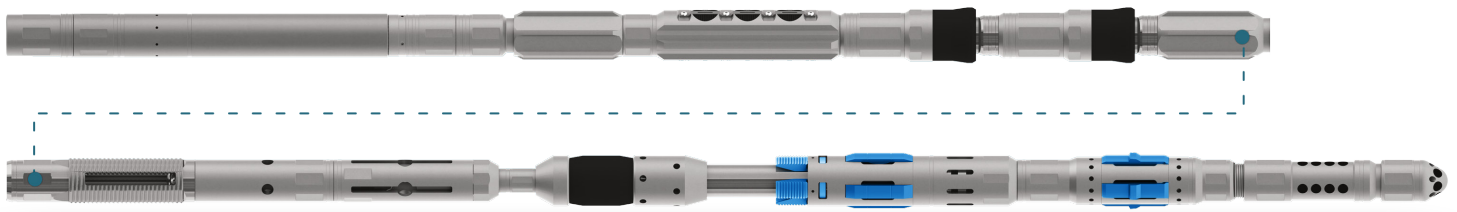
- Initial clean out – All wells, whether using ball-drop sleeves or BPS, require clean-out to ensure the hole is clean and without restriction prior to running the Cup-to-Cup tool. In ball-drop applications, the seats must also be milled to allow tools to pass.
- Cost optimization – The use of coiled tubing is not cost effective in this region, therefore all operations, including mill-out and running the Cup-to-Cup tool, utilize a workover rig and jointed pipe.
- Refracturing screen outs – Refracturing stimulations tend to have a larger number of screen-outs than during the initial completion. A reliable method of removing proppant after screen-out is critical to the success of the operation.

## Features

- Can be conveyed on 2<sup>7</sup>/<sub>8</sub>-in. (73-mm) or 3<sup>1</sup>/<sub>2</sub>-in. (89-mm) jointed tubing or 2<sup>3</sup>/<sub>8</sub>-in. (60.3-mm) or larger coiled tubing.
- Allows for reverse circulation in case of screen-out
- Mechanical anchor activated by simple up and down (axial) movement
- Gauges can be installed in tool to record downhole pressures during stimulation
- Can operate in vertical, deviated, or horizontal wells

## Benefits

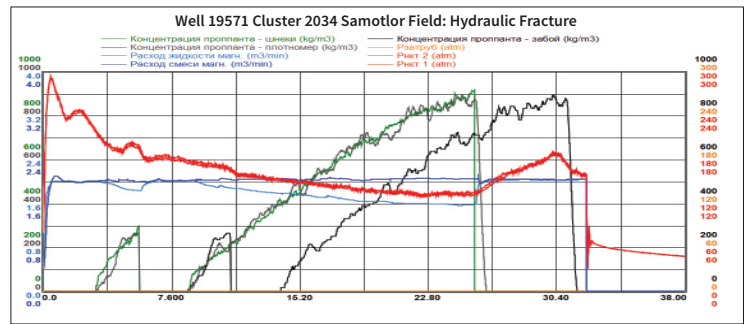
- Ability to run system on jointed pipe eliminates need for coiled tubing
- Ability to reverse circulate and simple axial movement to activate tool increases reliability and retrievability
- Recording pressure allows evaluation of stimulation treatments and verification of placement in the target interval



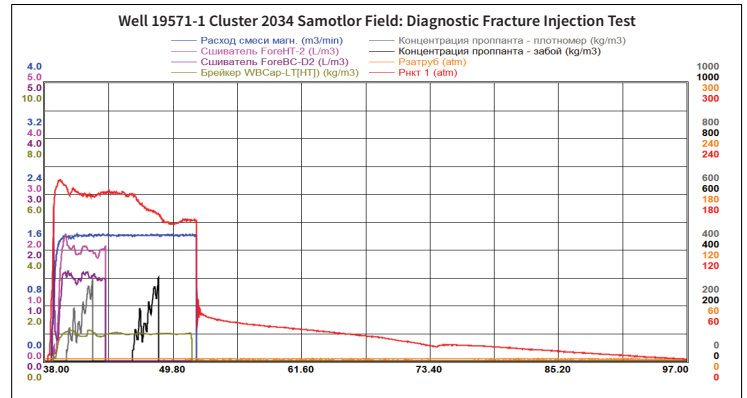
# Results of trial job using the Cup-to-Cup assembly

## Results

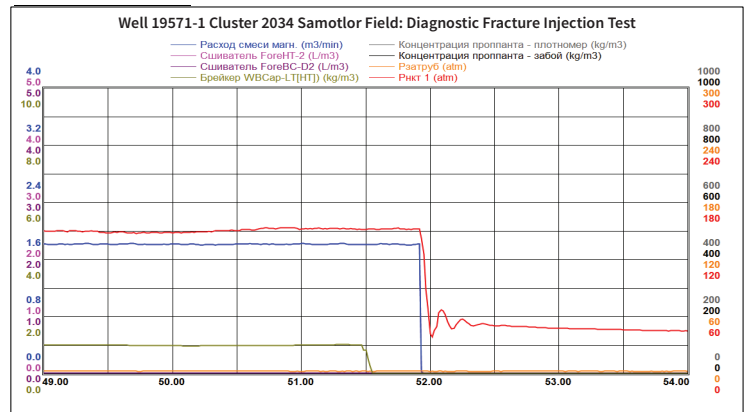
- In initial trials a four-zone ball drop completion and a five-zone BPS completion were successfully recompleted, with all stages being refractured. An additional 56 stages have been refractured to date using NOV's proprietary BPS subs.
- The ability to run the Cup-to-Cup tool on jointed pipe using a workover rig eliminated the need for coiled tubing.
- All refracturing jobs were carried out in one trip saving the customer valuable time.
- The operator saw an average three-fold increase in production after refracturing operations, making the jobs economically successful.



Mini-frac Mini-frac, (extended)



Main frac chart, 17 t pumped from surface: 1t - 20/40 BorProp, 16t - 16/20 BorProp, in wellbore - 0t.



## Specifications

Proppants	Planned	Actual	Intro formation
20/40 BorProp	1 t	1 t	1 t
16/20 BorProp	16 t	16 t	16 t
<b>Total</b>	<b>17 t</b>	<b>17 t</b>	<b>17 t</b>