



THE CHALLENGE:

With the growing trend toward wells with long, challenging horizontal segments requiring multistage hydraulic-fracture stimulation treatments, completion operations play a critical role in the production of the well. Horizontal legs account for the majority of wells drilled in Western Canada; over 70% of all wells drilled in 2013 in the WCSB were horizontal. The number of stages isolated during the fracturing process can exceed 30, depending on reservoir and wellbore dynamics.

Multistage hydraulic-fracturing has necessitated the advent of two primary completion techniques; plug-and-perf and sliding sleeve systems such as ball and seat. The plug-and-perf system requires milling intervention to remove all flow restrictions after the fracturing operation is complete. Ball and seat technology, despite restricting the internal diameter of the wellbore, was designed to reduce costs by increasing the speed of the frac process.

However, many operators are unaware of the potential production gains and future cost savings of restoring full drift wellbore regardless of the isolation system used during the fracturing process. Choosing not to mill frac sleeves can have negative implications on the post fracture production and future accessibility of a wellbore.

- STEP's experience indicates that on a significant percentage of wells, operators do not recover all frac balls during the flowback phase of the operation. This creates the possibility that the remaining frac balls block production of the well from some or all of the stages below.
- Leaving frac sleeves in the wellbore restricts the inner diameter of the well and limits future access to the well. If full drift wellbore tools are required for post-production well interventions, more capital may be required to perform the task due to reservoir depletion.
- More and more operators are experiencing issues with interwellbore communication as well density increases. If significant formation and fracture solids enter an offset wellbore, there is a high potential for production decrease. Coiled tubing wellbore clean out is the only way to reliably remove solids/proppant. The cost and complexity of this operation increases significantly if ball seats are left in the wellbore.

THE SOLUTION:

Simply put, removing the frac sleeves and remaining frac balls not recovered during the flowback phase of the operation will eliminate downhole restrictions and prevent them from becoming an impediment to the flow of oil and gas.

Milling restores full-bore access from toe to heel so operators can ensure maximum production and future access to the wellbore.

Some operators may choose to delay the milling operations to reduce up-front capital costs. This practice potentially limits the initial production of the well and may allow the reservoir pressure to decline to the point where an intervention program is more problematic and costly.

The overall objective of a post-frac coiled tubing intervention program is to safely and cost efficiently restore the wellbore to full drift. By doing so, not only do operators remove any possible obstacle in the wellbore thereby guaranteeing 100% production of their well, but they ensure future access to the well in the event recompletion or work-over operations are necessary.



THE STEP WAY:

Well Information:

(based on sample well in NE British Columbia)

Total Measured Depth: 4,500 m (14,700 ft)

Total Vertical Depth: 2,200 m (7,215 ft)

Casing: 114.3 mm (4.5 in) , 17.26 kg/m (11.6 lb/ft)

Completion System: 15 frac ports

Scenario 1:

- Immediate milling post-frac

Scenario 2:

- Milling 3-6 months post-frac
- Steep initial production decline
- Slower milling due to debris build up

Scenario 3:

- Milling over twelve months post-frac
- Limited production, low pressure= significant N₂ required

The table below shows a pricing summary which highlights cost efficiencies operators will gain when choosing to mill immediately post-fracturing operations:

Cost Category	Scenario 1	Scenario 2	Scenario 3
CT Services & Associated Costs	\$60,000	\$75,000	\$108,000+
Percent Increase:		25%	80%

So ask yourself, is the nominal, upfront capital expenditure of restoring a full drift wellbore worth the guarantee of maximizing well production and future access for recompletion or work-over operations? STEP thinks so.

STEP has developed a fleet of fit-for purpose, coiled tubing and associated pumping equipment which has helped clients ensure maximum well production on numerous, multi-well, high-profile projects for clients northern British Columbia, Alberta and Saskatchewan.

STEP's deep capacity coiled tubing units offer a wide range of tubing sizes from 44.5 mm to 73.0 mm (1-3/4" to 2-7/8") for a variety of applications such as the deployment of down hole tools, well clean out treatments, drilling/milling operations, and coiled tubing fracturing. Recent advancements in equipment design enable STEP to offer clients over 6,800 m (22,300 ft) of 73.0 mm (2-7/8") diameter coiled tubing; no other coiled tubing provider in the WCSB has the depth capacity offered by STEP.

STEP's team of skilled and competent operations professionals and technical specialists transform this equipment into reliable, customized solutions designed specifically to increase operational efficiencies and reduce current and future well intervention costs.

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