Milling Guarantees a Full Drift Wellbore

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.

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 fracturing 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 fracturing 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 fracturing balls block production of the well from some or all of the stages below.
- Leaving fracturing 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 inter-wellbore communication as well as 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 and proppant. The cost and complexity of this operation increases significantly if ball seats are left in the wellbore.

Solution:

Simply put, removing the fracturing sleeves and remaining fracturing 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-fracturing 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 workover operations are necessary.

Results:

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 helped clients ensure maximum well production on numerous, multi-well, high-profile projects for clients throughout North America. STEP's team of skilled and competent operations professionals and technical specialists deliver customized solutions designed specifically to increase operational efficiencies and reduce current and future well intervention costs.

The following example shows the efficiencies operators will gain when choosing to mill immediately post-fracturing operations in three different scenarios:

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-fracturing
- $60,000

Scenario 2:

- Milling three to six months post-fracturing
- Steep initial production decline
- Slower milling due to debris build up
- $75,000 or a 25% increase compared to immediately milling post-fracturing

Scenario 3:

- Milling over twelve months post-fracturing
- Limited production, low pressure= significant N2 required
- $108,000+ or a 80% increase compared to immediately milling post-fracturing