Multilateral Solutions

Advanced Reservoir Drainage Services

Through industry-leading multilateral technology, Halliburton has become the world’s leading provider of innovative and flexible multilateral systems. Introduced in 1993, this system is designed specifically to provide a robust means of access to both laterals and mainbore with the ability to install a range of completion systems for either commingled or separated production requirements.

For today’s more challenging environments, Halliburton offers a broad range of multilateral solutions that can be integrated with the Completion Tools product line and are geared specifically to meet and complement reservoir engineering demands to enhance the total asset value.

Multilateral Drainage Architecture

To access additional reservoir targets that would not have been economically feasible using single bore technology, multilateral drainage architecture connects a lateral wellbore, or a number of lateral wellbores, via a junction constructed in the main borehole. From the lateral bore, further laterals, branches, or splayed can be added to increase the advantage already gained. The main and lateral wellbore designs can be vertical, directional, or horizontal with multilateral system selection based on the individual reservoir requirements.

Advanced drainage architecture has been developed to increase reservoir exposure but can reduce overall field development costs for the increase in production. Constraints on platform slot/surface, subsea locations, and production equipment can leave some areas of a reservoir under-developed, often leaving significant quantities of oil in place. Enhanced hydrocarbon recovery, where there is declining production from traditional single vertical or horizontal wells, can also employ multilateral technology as a remedial solution to revitalize many fields.

Multilateral technology, used for both new and re-entry wells, offers the ability to drain reservoirs more efficiently and drain multiple reservoirs simultaneously, notwithstanding different pressure regimes. Furthermore, using multilateral architecture can reduce the number of surface locations, which in addition to reducing overall project cost, mitigates environmental impact.

The drive to keep costs down and minimize risk on a well-by-well basis in a field development can result in higher well construction costs to deliver production targets. Halliburton’s unsurpassed expertise in delivering innovative multilateral technology meets the challenge of improving production, increasing the longevity of a field while reducing the customer’s cost base to deliver greater profitability and a higher return on investment.

Latch Coupling

At the heart of the Halliburton multilateral system is the latch coupling, which provides an anchoring mechanism for accurate placement of the window aperture. The latch coupling enables fullbore drift to the mainbore and forms part of the mainbore casing. It becomes a permanent feature, permitting an accurate and repeatable method of locating Halliburton multilateral tools at the precise depth and orientation for exit from the window.
Multilateral Pre-Milled Window Systems

Junction construction in new well applications incorporates a pre-milled casing joint and latch coupling. The casing joint window is pre-milled axially in line with a high side reference on the latch coupling to help ensure anchoring orientation is precisely aligned with the aperture. The aperture is enclosed in an aluminum sleeve, which means once installed downhole, milling is extremely easy as it is only necessary to open the window in the aluminum sleeve. Debris management is no longer an issue because it involves no steel cuttings, and lengthy milling and cleanout trips are eliminated.

**LatchRite® Pre-Milled Window Multilateral System (TAML Level 2 or 4)**

A high-strength TAML level 4 junction with sand control and full gauge access to the lateral and mainbore is provided by this multilateral system via a pre-milled window. It uses an industry-proven, protected multilateral washover operation that dresses off the lateral liner and recovers the whipstock in one efficient operation, achieving zonal isolation using cement. The LatchRite® system can also be used to construct a TAML level 2 junction that helps eliminate the disadvantages of conventional milling.

**LatchRite All-Aluminum Casing Joint Assembly**

The LatchRite all-aluminum casing joint assembly allows for window orientation after cementing with no rotation of the window required during the casing run or while landing the casing string in a wellhead scenario. During running and landing of casing strings, especially in subsea applications, timing of landing string and rotating to orient a pre-milled window may not be compatible. The LatchRite-AL system helps eliminate this concern. The unified, heavy-walled, one-piece joint can be coupled with either casing connection crossovers or a Halliburton latch coupling and provides high pressure, tensile, and torsional rating. Constructed of high-strength aluminum, the system helps eliminate steel debris in the wellbore following milling operations. Two versions are available: one with an integrated latch coupling attached at the bottom of the aluminum joint and one with VAM TOP® connections at the top and bottom of the assembly.

*VAM TOP is a registered trademark of Vallourec Mannesmann Oil & Gas France.*
FlexRite® Isolated Tieback Multilateral System (TAML Level 5)

The FlexRite® system provides a hydraulically isolated TAML level 5 high-strength junction with sand control. It is designed for use in new wells and incorporates the aluminum wrapped pre-milled window and latch coupling. It uses a flexible junction with two semi-circular sections, maximizing cross-sectional flow area and load carrying capability to access the mainbore and lateral simultaneously. This system offers through-tubing intervention and lateral re-entry with separate workover capabilities and has the added ability to accommodate intelligent completions via an interface to permit separate or commingled production. Operations such as production logs, stimulation, cleanout, water and gas isolation, and water and gas shutoff can be performed on both the lower mainbore and lateral liners.

Multilateral Milled Exit Systems

Used in both new and re-entry well applications, multilateral milled exit systems are junction construction systems in which all lateral exits are geometrically milled downhole to emulate the pre-milled window system. These systems utilize latch coupling installed in the casing string of new wells or via an anchor packer with an integral latch coupling in the case of re-entry into existing wells.

MillRite® Milled Exit Multilateral System (TAML Level 2 or 4)

The junction is constructed using a track-guided milling system, creating a consistent geometrically defined window aperture to form a high-strength TAML level 4 junction. This construction process eliminates “rolloff” and dogleg severity problems associated with conventionally milled windows and allows repeatable lateral re-entry for the life of the well. It utilizes the successful multilateral washover operation and achieves hydraulic integrity using cement. The MillRite system can also be used to construct a TAML level 2 junction.

ReFlexRite® Milled Exit Isolated Tieback Multilateral System (TAML Level 5)

This system is a hydraulically isolated TAML level 5 mechanically high-strength junction that provides sand control. It is a re-entry multilateral solution, designed for use in existing wells where no original preparations had been made to accommodate a multilateral junction. The solution combines technological aspects from the FlexRite® and MillRite® systems. The ReFlexRite® system incorporates a flexible junction and two semi-circular sections, maximizing cross-sectional flow area and load carrying capability, to access the mainbore and lateral simultaneously.

The ReFlexRite system offers through-tubing intervention and lateral re-entry with separate workover. It has the added ability to accommodate intelligent completions via an interface to permit separate or commingled production. Operations such as production logs, stimulation, cleanout, water and gas isolation, and water and gas shutoff can be performed on both the lower mainbore and lateral liners.
**Multilateral Completions Systems**

These unique completion systems are designed specifically for multilateral applications and allow re-entry access into the laterals and lower mainbore, enabling isolation and flow control from each. These completion systems can be used in pre-milled or milled junctions and conventionally milled windows.

**FloRite® Multi-String Multilateral Completion System**

This multilateral completion system is specifically designed for wells that require complete junction pressure isolation. The system also provides re-entry capability to access the laterals through the completion for the life of the well, eliminating the need to pull the upper completion should access be required for cleanup, stimulation, or data acquisition. Prime candidates are injection wells, gas wells, or wells with reservoir horizons with different pressure regimes. Production from each lateral can either be completely segregated to surface with the installation of a dual completion or commingled with the use of the optional vector block; a single string completion can be installed while allowing selective access to either the lateral or mainbore. Latch coupling allows installation at the optimum depth and orientation of the system.

**IsoRite® Isolated Multilateral Completion System**

Installed in the mainbore of a TAML level 2, 3, or 4 junction and aligned to the original window exit, the IsoRite® system incorporates a completion window arrangement equipped with integral landing profiles and sealbores that enable the setting of deflectors for lateral access or isolation sleeves for lateral control. Latch coupling allows installation at the optimum system depth and orientation for lateral re-entry operations.

**LocRite® Self-Locating Isolated Multilateral Completion System**

The LocRite® system is equipped with a self-locating key that allows installation in a conventionally milled window at the required azimuth and depth for a lateral completion operation. With the addition of the self-locating key, this system incorporates all of the advantages of the IsoRite system for a multilateral well with a conventionally milled exit.
Multilateral Intelligent Completions Systems

**FlexRite® MultiBranch Inflow Control System (TAML Level 5)**

The FlexRite® MultiBranch Inflow Control (MIC) system provides individual, intelligent branch control of multilateral wells with three or more stacked legs and enables an unlimited number of MIC junctions to be installed into a given well.

This system offers an advantage over other multizone intelligent well completions, which are limited to installation of only two remotely operated inflow control valves (ICV) for separate flow control of two or more zones. This can be a “life of well” issue should one of the zones be more prolific or become a lost or watered-out zone. This is a common limitation relevant to either single wells that pass through multiple zones or to multilateral wells drilled into a number of zones. FlexRite MIC systems help reduce that risk by providing individual branch control of each lateral. The system features a 6 5/8-in. casing mainbore pass-through ID that enables installation of a 3.5-in. completion with multiple remotely controlled ICVs, each isolated at each junction. Now production or injection can be managed and controlled at each individual lateral completely independent of the other lateral legs.

**FlexRite Openhole Gravel Pack System**

This FlexRite system integrates openhole gravel pack (OHGP) installations with multilateral junction technology for sand control in MLT completions up to TAML level 5. Another intelligent completions option, the FlexRite OHGP system can withstand higher screenout and reverse out pressures up to 3,000 psi in openhole gravel pack operations where higher pressure-rated systems are required. A seamless junction-to-lateral screen tieback is accomplished with a shrouded openhole stinger assembly, and the system allows planned intervention into either lateral or mainbore. If required, fluid loss valves are easily accommodated in the sandface completions.

The system junction currently accommodates up to 6 5/8-in. liner-conveyed gravel pack assemblies, allowing multilateral middle and/or upper completions ranging from standard up to the most complex of intelligent completions.