Confidence in completions

Schlumberger’s broad offering for cased hole sand control provides multiple options and gives you a wide range of choices for each scenario that you face. From simple, conventional completions to complex multizone wells, you can be confident of meeting your sand control objectives anywhere, every time.
Unconsolidated environments create challenges related to sand control that can make meeting completion objectives difficult. Effectively managing these challenges requires a diversified, broad portfolio of products and services with a wide range of technology options. Our integrated offering is unmatched in the industry.

The selection of one solution over the other is generally driven by reservoir properties and production objectives. Schlumberger’s sand control experts will work with you to choose the most appropriate solution for your reservoir, whether for conventional single-zone completions, for long or highly laminated intervals, or for multiple zones.

Schlumberger Portfolio of Sand Control Solutions for Cased Hole Wells

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<th>Zones</th>
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The QUANTUM and QUANTUM MAX systems form the platform on which all other systems are based. Pumping treatment means gravel packing, frac packing, or both. NA means not applicable.

Case Study

QUANTUM PERFPAC SYSTEM SAVES TIME AND MATERIAL COSTS

An operator in Nigeria had developed an offshore field in two phases. The depth of the water ranged from 3,000 to 3,500 ft. During the first phase, a conventional two-trip frac-pack system had been used, but fluid loss was high after perforating because of the formation’s high permeability. Placing the fluid loss pill had resulted in excessive formation damage.

Single-trip perforating and frac packing

During the second phase, three wells were completed with the conventional system, and a fourth, an injector well, with the QUANTUM PERFPAC single-trip perforating and frac-packing system. This system allowed tubing-conveyed perforating guns to be run inhole along with the frac-pack and testing tool subassemblies—in just one trip.

Less rig time and formation damage

By eliminating the need to pull out the guns and make a second trip for frac packing, the QUANTUM PERFPAC single-trip system saved 1.5 days of rig time, which amounted to a savings of USD 1.5 million. This method also reduced completion fluid losses by more than 1,000 bbl and saved an estimated USD 70,000 in material costs, in addition to the rig time that would have been spent pumping lost circulation material. Moreover, eliminating the need for a postperforation fluid loss pill reduced formation damage and enhanced injectivity because of reduced skin at the sandface.
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Single-Zone Completions

Traditionally, unconsolidated reservoirs have been completed with single-zone sand control completions. A variety of applicable solutions is available for these types of completions, from the conventional system that requires multiple trips to the more efficient system that can be deployed in a single trip.

Conventional gravel-pack system

With conventional single-zone sand control completions, multiple trips are made into and out of the well to run the sump packer, perforate, and deploy the screen and gravel-pack assembly. This technology—proven, reliable, and very common—is in many cases the most practical.

Schlumberger has two such systems to choose from based on reservoir conditions: the QUANTUM and QUANTUM MAX gravel-pack systems. QUANTUM and QUANTUM MAX systems

The Schlumberger QUANTUM gravel-pack system and high-pressure, high-temperature QUANTUM MAX system provide reliable placement of gravel-pack treatments in a wide range of downhole environments, including low temperatures, pressure-depleted reservoirs, and applications in which high pump rates, pressures, temperatures, and proppant quantities are required. The flexible modular design allows these systems to be operated in multiple configurations.

These high-performance gravel-pack systems, used successfully in more than 10,000 completions worldwide, enhance wellbore reliability because of their rugged, simple, field-proven design. This design prevents the service tool from sticking and allows it to remain in a fixed position when exposed to extreme changes in flow rate, pressure, and temperature.

Conventional gravel-pack system with Alternate Path technology

With increased downhole reservoir complexity—long intervals and highly variable formations—effectively stimulating the formation and packing the annulus become increasingly difficult, though critical to the success and longevity of a completion. In these cases, the conventional single-zone completion approach may not be the most practical solution for achieving a complete annular pack and may add risk and impair production.

For these applications, the QUANTUM and QUANTUM MAX systems can be used with Alternate Path technology. Alternate Path technology

Alternate Path shunt tube technology is exclusively licensed to Schlumberger by ExxonMobil. In nonhomogeneous reservoirs, bridges can form prematurely when high leakoff occurs from the wellbore to the formation, leaving voids in the annulus below the bridge. This premature bridging increases the risk of early screenout and leads to potential completion failure.

Alternate Path technology uses shunt tubes with nozzles on the outside of screens to create an alternate flow path that allows slurry to bypass the bridges and fill the voids below them. Use of the shunt tubes reduces the risks of screen failure and deterioration in well productivity, lowers the risk of gravel-pack failure, increases completion longevity, and enhances completion reliability.

Single-trip perforating and gravel-packing system

For single-zone completions in which greater efficiency is a primary objective because of depth, pressures, costs, or risks, the Schlumberger QUANTUM PERFPAC system allows perforating and gravel packing to be performed in a single trip.

Whether your goal is to increase efficiency or successfully complete longer, more complex reservoirs, we can help you meet your objectives through the use of one or more of our highly reliable gravel-pack systems.

QUANTUM PERFPAC system

The QUANTUM PERFPAC system combines the multiple trips required to run a sump packer, perforate, and run the gravel-pack assembly, allowing perforating and gravel packing to be performed during a single trip into the well. The perforating guns are dropped into the rat hole after the perforating operation, and the gravel-pack assembly is moved into position. By eliminating multiple trips, this system minimizes rig time, completion fluid losses, the need for fluid loss pills, and costs.

Schlumberger proprietary components used in the QUANTUM PERFPAC system enhance operational reliability by minimizing gun shock, preventing premature packer setting, and eliminating the U-tubing effect. All of these can jeopardize the success of the gravel pack. The QUANTUM PERFPAC system is compatible with Alternate Path technology, which can be used for long intervals and complex reservoirs to eliminate the risks associated with incomplete annular packs.

Case Study

ALTERNATE PATH TECHNOLOGY SAVES TIME AND ELIMINATES SAND PRODUCTION

An operator was developing a field in deep-water Gulf of Mexico. To maximize well productivity with minimum solids production, the wells were to be completed with cased hole frac packs. The completion design had to take into account the long intervals of the producing reservoirs and the large variations in both sand grain size and permeability.

Frac packing with shunt tube technology

To reduce the high costs associated with stacked frac packs in multiple zones, the operator chose to complete these long intervals in a single stage. To help ensure optimal proppant placement in the screen and casing annulus over the entire interval, Alternate Path shunt tubes were used. These tubes provide alternate gravel-pack pathways that allow slurry to bypass bridges and fill any voids in the gravel pack. The operator’s goal was to propagate a fracture across most or all of the reservoir height with high pump rates and to use the shunt tubes to ensure a complete gravel pack of the entire screen and casing annulus.

Less rig time, higher production

Use of Alternate Path technology successfully eliminated sand production in all eight wells and enabled the wells to produce with near-zero to negative skin, exceeding the preproject estimate of a skin value of five. Frac packing multiple zones in a single stage and covering intervals up to 517 feet long in one of the completed wells saved an estimated 5 days of rig time per well and allowed the operator to produce additional reserves that might otherwise have been bypassed using conventional stacked completions.
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Since 1990, more than 300 wells have been successfully completed with the QUANTUM PERFPAC single-trip perforating and gravel-pack system.
Multiple-Zone Completions

In complex reservoirs with multiple zones, single-zone completion techniques may not allow completion and production objectives to be met. The alternative is to isolate and treat multiple zones independently. This option allows for either commingled or selective production.

Stacked completions
The most common approach in the industry for multizone completions is to stack a series of single-zone completions and treat each zone separately. These stacked completions require multiple trips for each zone to deploy the perforating and sand control tools and to clean up the well. This approach uses proven technologies and deployment methods that can be easily integrated with intelligent completion systems. Alternate Path technology can be used to expand the capabilities of stacked completions.

Single-trip completions
When the objective is to treat and produce even more efficiently from multiple zones, conducting more operations in fewer trips downhole reduces completion time and lowers costs. Our unique, diversified portfolio provides the widest range of multizone single-trip sand control completion technologies in the industry, including the MZ-Xpress and MZ Alternate Path systems.

MZ-Xpress system
The MZ-Xpress completion system allows multizone gravel and frac packing in a single trip with multiple pumping treatments after a well has been perforated. Individual zones are isolated and treated independently. By eliminating multiple trips into and out of the well, both rig time and the standby time for surface pumping equipment are reduced. With the MZ-Xpress system, production can be either commingled or selectively produced. Intelligent completion components can be integrated into the system. The MZ-Xpress completions are compatible with the MZ Xpress and Alternate Path systems.

MZ Alternate Path system
The MZ Alternate Path system allows gravel packing and frac packing in multiple, closely spaced zones. The operation is done in a single trip and with a single pumping treatment after a well has been perforated. Cup-type packers provide the isolation between reservoir intervals and delay water encroachment when they are equipped with a nipple profile. This reliable system reduces rig time and costs while maintaining production flexibility.

MZ Alternate Path system with QUANTUM PERFPAC system
The MZ Alternate Path and QUANTUM PERFPAC systems are compatible. This combination of technologies is unique in the industry in that it allows multiple zones to be perforated and gravel and frac packed in a single trip with a single pumping treatment.

Case Study

COMBINED TECHNOLOGIES INCREASE PROJECTED REVENUE

An operator was producing a field offshore Indonesia from two separate areas with three gas-bearing intervals. One well was drilled to efficiently drain the subsea complex and to maximize the deliverability and longevity of the field. This well presented numerous technical challenges, including high downhole temperatures, high well angles, and a 400-ft-long gross interval with thick shale intervals separating the three sand lobes.

Customized solution
Schlumberger engineers customized the completion technologies to meet these challenges. The design combined the QUANTUM PERFPAC single-trip perforating and gravel-pack system, the MZ multizone Alternate Path system, which allowed all three zones to be completed in a single trip, and a single pumping operation with ClearFRAC® HT high-temperature viscoelastic surfactant fracturing fluid. The shut off tube configuration allowed the middle and upper zones to be frac packed and the flow diverted to the lower zone for a gravel pack only after the upper and middle lobes had screened out.

Increased projected revenue
Pressure data showed that the treatment had been placed as designed in all three targeted sand lobes. The well produced gas without condensate or sand at an initial rate higher than that of the predrill estimates. The project, completed under budget, added USD 20 million in projected revenue and operational savings from a 3-day reduction in rig time.
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