NEW TECHNOLOGY that helps oil and gas companies do business more effectively is front and centre for major international oilfield services companies, which have recently brought technologies to the market that are aimed at helping energy companies in their ongoing quest to increase efficiencies and impact the bottom line.

Baker Hughes Inc.’s MaxPerm 20A friction reducer has been designed to improve the efficiency of slickwater fracturing operations, minimizing surface horsepower requirements while improving permeability and viscosity. A high molecular weight synthetic polymer used for slickwater fracturing, linear gel replacement and foamed applications, MaxPerm 20A is designed to break more efficiently, minimizing formation damage. It’s been engineered with oxidizable linkages at regular intervals along the polymer’s backbone, resulting in a controlled breaking mechanism.

“This allows us to break the polymer efficiently and the result is a very, very clean system,” says Ron Plasier, Baker Hughes technical director for pressure pumping, Canada. “Because we can break it so efficiently, we can use it at higher loadings and not cause any damage to the formation. The main benefit of this polymer is its versatility, because it breaks so clean.

“What makes it unique, is that it allows us to increase concentrations of the polymer, ultimately increasing viscosity—and that gives us versatility in several applications, like slickwater hybrid fracs. You can continue to increase the volume of MaxPerm per cube of fluid, and that polymer concentration keeps getting higher and higher viscosities. This can replace how slickwater hybrid fracs are being pumped. You won’t need a hydration unit, because this product hydrates in seconds, whereas guar will hydrate in minutes. You can make the decision to go to the higher viscosity portion of a hybrid frac in a matter of seconds, because of that hydration time for the MaxPerm product.”

Kevin Cooney, Baker Hughes team lead, Fracture Design, describes MaxPerm 20A as the next generation of friction reducers. “When we break it, we can ramp up viscosity with the polymer, then break it to nothing,” he says. “The tangible benefits are that we can have more retained permeability in the formation once we’re done. The way it works is in a one-to-one relationship: every increment in permeability means a direct increment in production.”

Where MaxPerm 20A will show the most value to clients is in its ability to reduce friction, Cooney notes. “Ultimately, by reducing friction,
companies will be that much further ahead in their operations, because they’ll be able to stimulate more reservoir per fracturing event. It’s about having four sets of perforations per horizontal interval instead of three or drilling and completing a 4-1/2-inch well where they used to have a 5-1/2-inch—clients can finish their wells that much faster and that much cheaper. From an application perspective, you can use it to further reduce friction in addition to what a regular friction reducer can do. It’s like having a better mouse trap.”

Field trials conducted in western Canada in the past year showed that MaxPerm 20A reduced friction pressures by up to 85 per cent, decreasing surface horsepower requirements—with lower operational costs and a smaller environmental footprint as a result.

MaxPerm 20A acts as a linear gel replacement at higher loadings, allowing slickwater hybrid frac to be pumped without a hydration unit. Additionally, the technology is applicable to foamed applications, and its low pour point allows the friction reducer to be used in cold weather applications.

Since January, Baker Hughes has pumped more than 700,000 litres of MaxPerm 20A Friction Reducer in Canada, and Plasier expects that number will exceed one million litres by year-end. “Most of our clients love it—we’re getting a lot of repeat business,” Plasier says.

Add Cooney: “We haven’t experienced anyone who has used the product who has gone back once they’ve got a feel for it. When they see what it can do, they’re jumping in with both feet. They’ve taken this product and replaced all other friction reducers with it, except for the specialty ones.”

There is also an option to use MaxPerm 20A in tandem or as a replacement for visco-elastic surfactant.

**PUTTING ON THE PRESSURE**

Halliburton is another company that’s been seeing a warm welcome from the market for a new technology. Its RapidStart Initiator CT (Casing Test) sleeve is all about greater efficiency and effectiveness—which translates into reduced risk for operators, as well as more time and money.

The RapidStart Initiator CT sleeve is a new technology designed to improve multi-stage fracture horizontal well economics, by providing completion reliability and efficiency while allowing operators to verify casing integrity before fracturing operations occur.

With unconventional reservoirs, “anything you can do as a cost cutting measure is beneficial,” says Sean Canning, Halliburton frac sleeve systems product manager, who is based in Houston. “By reducing time, it allows operators to be more efficient and more effective, and still comply with government regulations. It translates further down the road to dollar savings, and operators see a quicker return on their investment.”

The pressure-actuated toe sleeve—which enables operators to complete a casing test on the system and establish injection into the formation—eliminates additional steps and mitigates the risk created by standard toe sleeves, while allowing for the creation of the initial fluid flow path in both plug and perforate, and multi-stage fracture applications.

It can be used on both horizontal and vertical oil and gas wells, although the primary driver is horizontal unconventional completions.

“In many instances, when you run horizontal you end up with a closed system. You can apply pressure, but there is no flow by applying pressure,” Canning says.

The RapidStart Initiator CT sleeve allows operators to achieve flow at the toe of the well while in a closed system. How it works: An operator applies pressure from the surface to the completion string to start the sleeve opening process. On activation, the tool begins the metering process. Fluid transfers from one side of the chamber to the other through micro-hydraulics “metering,” until fluid bypass is allowed around the metering chamber. On completion of the metering process, the sleeve slams open.

The tool’s main differentiator lies in its micro-hydraulics, Canning says. In the event of a leak, the sleeve allows the operator to shut down and bleed off pressure at surface. Once the operator has corrected any issues topside, they can once again apply pressure and the tool will start metering again.

“We give operators a second chance.”

An additional benefit comes in the regulatory area, Canning notes, where government regulations come into play. “If you are compliant or exceed compliance, it allows more...
opportunities down the road, because you are building confidence in the company.”

Halliburton’s RapidStart Initiator CT sleeve allows operators to conduct a casing integrity test before stimulation, and achieve compliance with Directive 83, an Alberta Energy Regulator requirement that companies validate casing integrity prior to stimulating the wellbore. Similar regulations exist in the U.S., where compliance requirements vary, depending on the state.

“We identified a need and developed a tool that will allow operators to meet or exceed those requirements, and be proactive instead of reactive,” Canning says, noting that the RapidStart Initiator CT sleeve allows operators to conduct a 30-minute test at maximum total pressure.

Halliburton designed its tool to give operators the ability to achieve a true casing integrity test, by evaluating the casing string’s mechanical integrity without exceeding the test pressure.

The RapidStart Initiator CT sleeve helps operators eliminate the need to exceed casing test pressures to open the tool, while conducting pressure testing of the casing and establishing a fluid flow path, without intervention. “This saves time and the cost of the intervention to achieve the same goal,” Canning says. “It can reduce the completions cycle time, and it reduces quite a bit of the risk associated with the standard methods of performing the same task.”

The RapidStart Initiator CT sleeve can be used with cement or open hole isolation packers, in plug and perforate applications, or in frac sleeve completions.

Commercially available since 2013, the RapidStart Initiator CT sleeves have been used in the Montney in Canada and throughout the U.S., in the Eagle Ford, Permian, Granite Wash, Mississippi Lime, Marcellus, Utica, DJ Basin and the Bakken, as well as in California.

“We’ve had great success with the tool,” Canning says. “Several operators have standardized using the tool when it meets their well requirements.”

As it expands internationally with the RapidStart Initiator CT sleeve, Halliburton is fielding requests for the tool from companies that are active in areas where there are unconventional shale plays, including Argentina, Australia, China and Europe.

**OPTIMIZING RESERVOIR CONTACT**

As horizontal drilling and fracking technology advances, the market is becoming constrained by long wellbores and the time intensive nature of hydraulic fracturing. This constraint leads to compromises in production that favour lower cost and shorter time frames over effectively stimulating the reservoir to maximize production, according to Schlumberger Ltd.

As illustrated by production logs, these compromises lead to the majority of perforation clusters not contributing to production and a high variability of results. The lack of a viable technique to effectively re-fracture these long wells to capture previously passed up reserves creates additional challenges.

Schlumberger’s solution is its BroadBand Sequence fracturing technique, which uses a new diverting technique made of fully degradable fibres and particles. BroadBand Sequence uses a small concentrated diverting pill to temporarily shut off fractures, allowing for isolation on demand. This temporary isolation ensures effective reservoir stimulation by shutting off injection to existing fractures and diverting fluid to generate new fractures, thus increasing production potential.

Increased operational efficiency can be achieved as bridge plugs can also be replaced by this technique. BroadBand Sequence also presents potential solutions for problematic wells where existing techniques fall short, including collapsed pipe, casing integrity problems, openhole sections left due to stuck casing and wellbores that already have multiple open perforations (a re-fracturing scenario). The technology, now available in Canada, has proven successful in over 50 applications with low risk of complication to surface or downhole operations as the material is fully degradable, says Schlumberger.