

Official Magazine of the International Association of Drilling Contractors

MAR
APR
2009

DRILLING CONTRACTOR

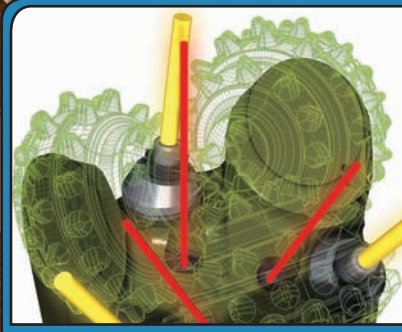
OFFICIAL MAGAZINE OF THE INTERNATIONAL ASSOCIATION OF DRILLING CONTRACTORS

MARCH/APRIL 2009

DRILLING CONTRACTOR

innovating while drilling IWD

Advances in MWD/LWD, drill pipes



DRILL BITS

Application-specific designs help set drilling records

HEALTH, SAFETY & ENVIRONMENT

Green rig project, corporate ocean responsibility, and more

ALL DRILLING, ALL COMPLETIONS, ALL THE TIME

New technologies make well intervention faster, more accurate, cost-efficient, more reliable

By Katie Mazerov, contributing editor

IN A DOWN market, at least one sector of the oil and gas industry is holding steady – the well intervention business. Some service providers even anticipate an uptick in business that could sustain for the next two years.

“Operators still need to maintain wells and keep production up as economically as possible,” said **Perry Courville**, group manager, coiled tubing and hydraulic workover for **Halliburton**. “We expect this year to stay relatively steady for intervention services, and in some places, we actually expect an uplift to mitigate the decline in rig activity.”

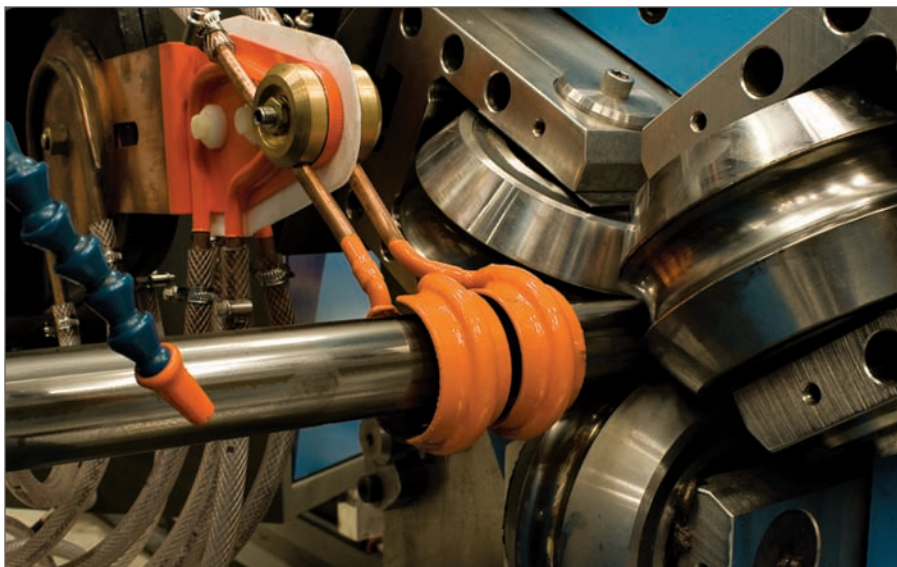
Supporting that trend is an array of new tools and technologies that have pushed well intervention to new levels. Advances in coiled tubing, such as increased diameter, better welding technology and new metallurgy to increase strength, have made it an increasingly important tool for a variety of intervention functions.

“Well intervention represents more than 75% of the overall coiled tubing market,” said **Robert Bunch**, CEO and chairman of **Global Tubing**, a Houston company launched in 2007. “Unlike jointed pipe, coiled tubing is a continuous string of pipe that can be run in and out of the well, and you can perform remediation services without the need of a workover rig,” he said. “And coiled tubing operations can be performed while the well is under pressure, so you don’t need to kill the well to perform the function, which reduces the risk of formation damage.”

Global Tubing is just entering the market with a patent-pending technology that Mr Bunch believes could be a “step change in the bias weld technology. We have, for the first time, successfully adapted a technique called friction-stir welding to the manufacture of high-strength, low alloy steel tubing.”

“We believe that with this new technology applied to the coiled tubing bias weld, we should see better fatigue life for the tubing, as well as have a product that is more resistant to corrosion.”

The company’s milling technology features a **Thermatool Weldscan** product that includes a digital camera component allowing operators to more pre-



Global Tubing believes that it can bring a step-change to bias weld technology with its friction-stir welding technique. Above is the company’s ERW seam welding system.

cisely monitor and record the weld temperature profile at the weld seam. The **Thermatool HAZControl** feature maintains weld characteristics over a wide range of steel thicknesses and grades.

“We’re confident we’re not only bringing to the market the latest in tube milling technologies, but also some very innovative and revolutionary technology with regard to the strip weld,” Mr Bunch said.

Among Halliburton’s new technologies using coiled tubing is **PropStop** service, in which a chemical is applied in fractured wells where proppant has begun to move into the wellbore. “Until now, operators have had to do frequent clean-outs, losing production time,” Mr Courville said. The process involves a resin-based technology that coats proppant grains in the fracture to stop the proppant from spilling into the wellbore. The resin is applied through coiled tubing using a pulsing tool that enables better distribution in the fracture and optimizes the pumping process, he explained.

In highly deviated and extended-reach wells, the new **CoilGlide** service can be used in place of expensive downhole tractors. It uses a proprietary gel that increases lubricity, enabling the coiled tubing to move farther into the wellbore.

A new technology also can modify the relative permeability of the formation to water versus oil. “It makes it so that

water doesn’t flow easily into or out of the formation, but it doesn’t detract from the flow of the hydrocarbons,” said Halliburton’s **Walt Glover**, communication manager for well intervention. The relative permeability modifier (RPM) technology is proving successful in helping control unwanted water production and helping control water loss to the formation.

In mechanical wireline service, Halliburton’s **Downhole Power Unit (DPU)** technology is a non-explosive, electromechanical tool that provides a reliable alternative to conventional hydraulic or explosive tools to set and retrieve packers or other wellbore devices on a slickline, electric line or coiled tubing.

“The DPU is ideal in areas where transporting explosives is hazardous or costly,” said **David Larimore**, global operations and product manager. “And with the new **DPU Intelligent Series** tool, we can measure the force and control the stroke length required to set the packers or plugs in real time. With these features, you have reassurance in the quality of setting wellbore devices.”

In wireline interventions, Halliburton is developing discrete technologies and integrated solutions that are independent of conveyance, whether in real time on electric line or in memory on slickline. “This is advantageous because, in

certain situations, particularly offshore environments, limited deck space can't accommodate multiple service packages and associated personnel providing different services," said Mr Larimore.

Advanced solutions for fracture stimulation, zonal isolation and milling are also emerging in the marketplace.

Weatherford's WidePak One Trip Straddle is used for remedial applications such as tubing integrity and shutting off water-producing perforations. The system is conveyed through tubing by either wireline or coiled tubing.

"We use this for tubing remediation for a corroded pipe area, where there is a hole in the tubing or a washed-out gas-lift mandrel to re-establish tubing integrity," said **Bob Murphy**, global business unit manager, thru-tubing products. "We're also using it to shut off a section of perforation that is producing water or gas. Traditionally, when a straddle was used, you made a trip in the well to set one packer, and then a second trip with a seal assembly, a spacer pipe and an upper packer. Now it can be done all in one trip."

The system can straddle up to 35 feet in one trip and can operate at a higher differential than previous systems, Mr Murphy continued. "What makes this different is the boosting seal system, where we have a 5,000-psi differential rating both inside and out on the straddle," he said. "We're up to a 300° operating range with standard elastomers."

Weatherford's Surge Frac coiled tubing system offers an improved technology for selectively sealing off perforation sections in long horizontal or deviated wells to inject acid, particularly in cases where poor permeability, porosity and pressure along the length of the horizontal sections cause reduced production.

Surge Frac, which can set multiple times at a low differential pressure in one trip, yields more uniform treatment and better drainage. Selectively stimulating producing zones that exhibit a variety of formation pressures, permeability and porosity leads to more effective stimulation of every zone. "We have well-documented improvement in zones that we normally would consider brownfields," Mr Murphy said.

For milling, Weatherford has enhanced underreaming technology to enlarge the hole size for casing and cementing operations and to set cement plugs and enlarge zones for gravel packing. The

Jaws downhole underreamer, combined with a MacDrill motor, can "pass restrictions in the wellbore and open up a drill or milling face below these restrictions to clean out debris and cement," explained **Mike Rossing**, global business unit manager for thru-tubing fishing and milling services.

"We recently used this technique in Asia Pacific to successfully remove cement from a well in a dual-string completion, in an underbalanced operation with large amounts of nitrogen needing to be used as the drive fluid to ensure the underbalanced characteristics were met," he added.

BJ Services recently introduced two rigless intervention techniques specifically for wells having surface-controlled subsurface safety valves (SCSSV), which have prevented the use of traditional techniques for providing artificial lift or chemical inhibition.

The valves, which are installed in production tubing, are kept open by hydraulic pressure from the surface, except in the event of maintenance or a failure. The valves can be wireline retrievable or tubing retrievable, and are operated by an annular control line installed at completion or during a workover.

The InjectSafe system inserts a wireline-retrievable safety valve into an existing tubing retrievable safety valve, with capillary tubing suspended below and above the safety valve. This provides a continuous path for injecting de-liquefaction or other chemicals, effectively bypassing the safety valves, explained **Jeff Bolding**, product line manager for BJ Services' InjectSafe Systems.

Regulations stipulate that all tubing retrievable safety valves must have the ability to receive a secondary, wireline valve.

"With InjectSafe systems, we can go in with a wireline tool and permanently lock the valve in an open position, whether there is hydraulic pressure going through it on the control line or not," Mr Bolding said. "Then we can run a communication tool on the wireline, and when we make a hole into the side wall of the tubing retrievable safety valve, we're communicating with the hydraulic piston chambers. The hydraulic control line on the back side is now communicating to the interior of the production pipe. When we come out of the hole with that tool, we can run the wireline retrievable safety valve. And because of the newly



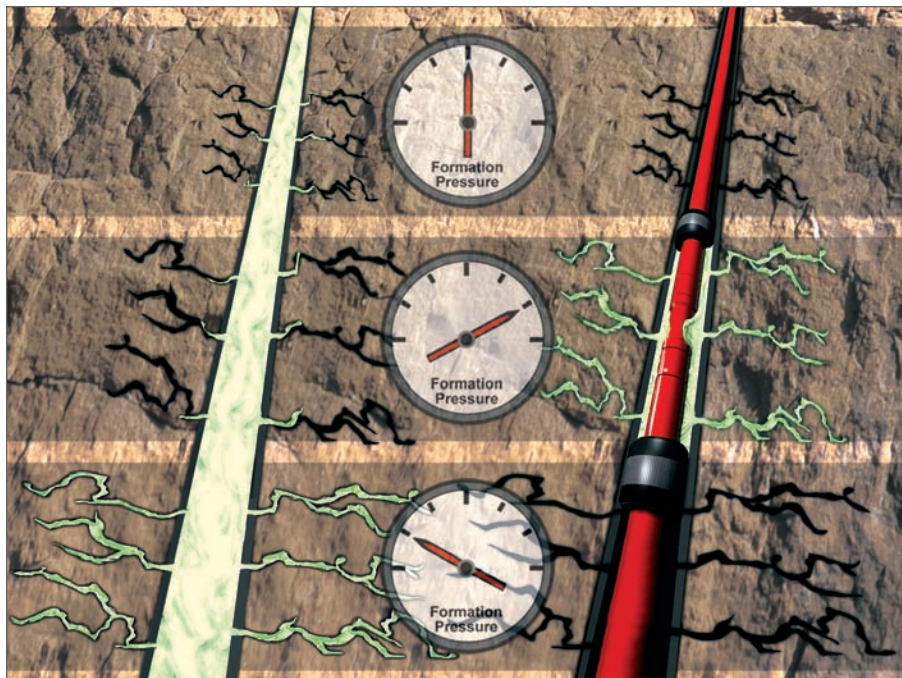
Halliburton's Downhole Power Unit technology provides an alternative to conventional hydraulic or explosive tools to set and retrieve packers or other wellbore devices on a slickline, electric line or coiled tubing. It can be ideal in areas where transporting explosives is hazardous or costly.

created hole, the control line on the back side will now be in communication with the wireline retrievable valve, and it will open and close the valve."

The company's Reconnect system is a thru-tubing retrofit solution used when the control line that operates the safety valves is broken. It is a safer, cost-efficient alternative to an expensive workover, and more reliable than a storm choke, velocity valve, vacuums or sealants.

"The problem involves getting a surface-controlled valve into a well when the control line is broken," Mr Bolding explained. "We build the safety valve with the polish-bore receptacle, which receives a stinger that is deployed by the new control line, thru-tubing. When it stings, instead of communication being oriented to get chemicals down and around to the capillary long string, we have ported that flow path directly to the piston chamber or wireline valve that opens and closes the safety valve itself."

The wellhead is then adapted so that the new control line is able to exit the wellhead without any disruption or loss



The wellbore on the left demonstrates the use of conventional bullhead stimulation. The zone with the lowest pressure is stimulated while other zones are not. The wellbore image on the right demonstrates Weatherford's selective stimulation system that enables the ability to isolate and effectively stimulate each zone.



BJ Services crew members prepare to run a capillary string for an InjectSafe system installation in the Gulf of Mexico.

of function. "If we're going to introduce a control line inside the tubing, it needs to be terminated somewhere at the wellhead," Mr Bolding said. "We need to bring it out and put pressure on it so it can operate the safety valve. So we terminate it at 90° with an adaptor at the base of the wellhead."

For re-stimulating old wells, BJ Services has introduced the StimTunnel process, which uses coiled tubing for applying hydrochloric acid into carbonate rock using an articulated, jointed jetting tool. "Traditionally, we used acid fracturing or pumped hydrochloric acid into a carbonate formation blind, and hoped for the best," said Lance Portman, director of BJ Services' coiled tubing research and engineering. "Or, we would pump a mixture of acid and blocking agents to try and control where the acid went.

"With the StimTunnel process, we actually control where the acid goes because we make a new tunnel in the wellbore, and that's where the acid is going because that's where the tool is going," he continued. "We keep the acid away from water zones, where we don't want it to go, and we push the acid where we do want it to go."

Baker Oil Tools (BOT) recently completed its fifth casing exit using the new Longbow casing exit system. Key to the new system is a high-performance bottomhole milling assembly that incorporates several unique design features. And, new cutting inserts are the result of more than six years of research, development and testing at Baker Hughes' new Center for Technology Innovation.

"Today, many of our customers are demanding windows of improved quality and greater length, completed in half the time," said Mark McGurk, director of wellbore intervention. "These new assemblies truly deliver exceptional performance and value, with high reliability."

One of the fastest growing segments of BOT's wellbore intervention business is in wellbore cleaning, where problems related to debris in the wellbore are a major financial risk. Wellbore cleaning systems deployed during the transition from drilling to production phases provide an efficient means of managing that risk. The Wellbore Cleaning system combines several high-performance tools to seek out debris, collect it and eliminate it, all in a single trip.



Baker Oil Tools' Vectored Annular Cleaning System can be ideal in situations where it's not desirable to circulate debris, cuttings or junk up to surface. It captures debris downhole by means of circulating through a flow path and sequence of jets that create a vacuum effect at the bottom of the tool string.

"In many cases it is not desirable to circulate debris, cuttings or junk up to surface. This is where our Vectored Annular Cleaning System (VACS) becomes an ideal option," Mr McGurk said. VACS captures debris downhole by means of circulating through a flow path and sequence of jets that create a vacuum effect at the bottom of the tool string. The system offers the flexibility of carrying capacity chambers that can be customized according to the size and amount of debris to be recovered.

Looking toward the future, Mr McGurk says that BOT is continuing to invest in development of their SMART Intervention System. "The system incorporates the SENTIO downhole real-time data acquisition and transmission system for wellbore intervention operations," he explained. "Experience to date has been primarily in fishing and de-completion of wells and optimizing casing exit systems. We are now planning to deploy thru-tubing sizes of the SENTIO tool in addition to our recent investment in more powerful surface based transmission and display units.

"We feel that the proliferation of this real-time service into a broader array of intervention applications, and also several of BOT's other major product lines, is only a matter of time."

Fiber-optic technology combined with coiled tubing is the centerpiece of the new **Schlumberger** ACTIVE family of live downhole CT services.

"Our ACTIVE platform of services gives us the ability to measure critical parameters like downhole temperature, downhole pressure and downhole depth correlation in real time, hence allowing us to make changes, as required, to our job design as we are in the well," said **Teoman Altinkopru**, coiled tubing services marketing manager.

"In pumping stimulation fluids with coiled tubing, for example, knowing the bottomhole temperature and pressure both within and outside of the coil gives us the tremendous advantage of being able to fine-tune the execution of the pumping job on the fly," he said. "Instead of basing our decisions on calculations done prior to the job, we are now using downhole pressure and downhole depth measurements in real time to maximize coverage."

For wellbore clean-out and matrix acidizing jobs, ACTIVE Cleanout uses downhole pressure readings to avoid formation damage and reduce the number of trips into the wellbore. "On these type of treatments, being able to read the downhole true measurements allows us to stay below the frac pressure of the well," Mr Altinkopru said.

In depth-sensitive coiled tubing operations such as perforation, ACTIVE Perf results in greater accuracy by providing accurate depth control and target coverage in one run while maintaining downhole pressure balance.



Schlumberger's ACTIVE family of live downhole coiled tubing services combines CT with fiber-optic technology.

ACTIVE Isolation sets isolation devices, while controlling downhole pressure across the sealing elements.

Schlumberger program manager **Rex Burgos** notes that the surveillance technique of the fiber optics, Distributed Temperature Survey (DTS), can determine the temperature along the length of the fiber itself. "ACTIVE allows us to utilize that technology while using coiled tubing," Mr Burgos said. "The value here is that with the fluids, we're able to tell from the effects of temperature, where exactly those fluids are being placed. We can determine if we are delivering fluids to the zones we want, and we can divert the flow if necessary."

ACTIVE Profiling enhances all ACTIVE service with DTS profiling to provide a 3D temperature profile of the wellbore to monitor treatment fluid placement and well production performance.

The greatest beneficiary of real-time technology is the customer, Mr Altinkopru said. "We are eliminating surprises on the job because we are basing our decisions on real-time downhole information, not pre-calculated information," he said. "And getting the job right the first time reduces the exposure of the crews, saves time and delivers more value to the customer."

Animations and videos demonstrating these well intervention technologies are available online at www.drillingcontractor.org.