

coalbed methane drilling. When Atlas Copco acquired Drilling Solutions, it recognized wells were becoming deeper and more complex, and it set out to design a rig to capture more of this market, and also reduce non-drilling time and cost.

The resulting Predator system combines the mobile rig, the substructure and the pipe-handling skate into a three-load package. To reduce rig weight and improve mobility, the table, master bushing, hydraulic slips and iron roughneck are part of the substructure and travel with it. The rig has a working hook load capacity of 200,000 pounds, or about 91,000 kilograms. Buell says this translates to a nominal depth capacity of 8,000 to 10,000 feet (roughly 2,450 to 3,050 metres).

The rig is mounted on a single-engine hydraulic powered carrier with three powered axles in the rear and two steering axles in the front. While a typical oilpatch carrier has one engine for the drilling rig and another for its carrier, Predator has one engine — a 950-horsepower Caterpillar C-27 — for both functions.

To improve manoeuvrability, Atlas Copco developed “creep mode,” which enables the carrier to move at between zero and four miles an hour. This is a high-torque mode for crossing extremely rough ground, plowing through mud or backing up onto the substructure.

“You never have to shift or ride the clutch,” says Buell. “You put it into creep mode [and] as you apply your foot to the accelerator, it’ll just start moving.... The only time you use the clutch [in creep mode] is to go from forward to reverse.”

As on other highly automated single rigs, hydraulic controls allow hands-free pipe handling. But where Predator is different from conventional hydraulic rigs, says Buell, is in the way the drillpipe is brought to the top drive. Many loading systems on conventional hydraulic rigs pick

up a joint of drillpipe and swing it onto the rig floor until it is underneath the top drive in a vertical position.

Predator, however, has a tip-out top drive. The pipe skate lifts a joint of drillpipe, then the top drive tips out and threads into the pipe. So when the pipe is lifted over the rig floor, it is already firmly connected to the top drive. “We did this to enhance pipe-handling safety,” says Buell. “We don’t have any pipe swinging in through the work floor on a hoist line or clamped to a pipe loading arm.”

Predator also has a telescoping mast. As two hydraulic cylinders lift the carriage, or telescoped inner mast, by one metre, the top drive moves up two metres. The rig can handle range 3 (45-foot) and range 2 (31-foot) lengths of drillpipe.

Since every joint of drillpipe is unscrewed each time it comes out of the hole, Predator — like other single-joint rigs — obviously can’t move pipe in and out of the hole as fast as triple rigs, which break only every third connection. Triple rigs stand the pipe in the derrick in 93-foot lengths, ready to go back into the hole. But there’s another measure where Atlas Copco expects its new rig to shine.

“Our timeframe comparison is basically spud-to-spud, or from the start of one well to the start of the next well. And we have vastly reduced time there,” says Buell. “Your average triple, it probably takes 48-plus hours — double crew, double shift — to just rig it up. We come in and rig up completely on a location in four, 4 ½ hours.” Since the rig was only built just before this article went to press, Atlas Copco is now looking forward to proving Predator in the field as it drills its first wells.

• Pat Roche

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## DRILLING

# Umbilical Accord

*New CT umbilical technology may solve production challenges in unconventional gas*

THE NEED FOR SMALL-SCALE DE-WATERING IN NORTH America’s fast-expanding unconventional gas sector, even in “dry” plays like Alberta’s Horseshoe Canyon coalbed methane (CBM) play or the Barnett Shale in Texas, bodes well for some new coiled tubing technology from CJS Coiled Tubing Services, a division of Lloydminster-based CJS Coiled Tubing Supply Ltd.

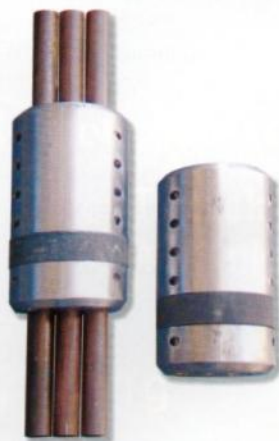
The CJS FlatPak umbilical, as it is called, involves a conveyance system for multiple strings of coiled tubing and a downhole pump. A commonly deployed version right now includes three carbon steel coiled tubing strings encapsulated in a high-strength thermo plastic jacket. Typically, two tubing strings provide a hydraulic circuit to power a hydraulic submersible pump (HSP), a third conveys produced water to the surface, while gas is produced via the casing.

A key aspect of the FlatPak umbilical is that multiple strings are not configured in a circle, but, instead, sit side-by-side in a rectangular matrix of thermo plastic.

Scott Kiser, business development adviser at CJS, says the FlatPak is currently being used for both service jobs and permanent installations. Since it became commercially available last fall, CJS has sold the FlatPak umbilical for several applications, but, so far, mostly for low pressure wells in Alberta, Texas, Montana and Michigan.

He anticipates a range of pumping systems and applications for the FlatPak. It was first successfully tested and applied in the spring of 2008 when a parallel tubing configuration of gas injection, production and capillary strings was used in a FlatPak to enable a gas lift operation in Montana. The FlatPak was, however, initially developed to support an HSP. It has already been used for jet pumps.

“Jet pumps are better for some CBM cleanouts. They can be more



#### HANG TIME

For hanging gear, CJS uses a modified split dog nut system that can accommodate a tubular assembly of dual, triple or other numbers of conduits.



#### TAKE YOUR PICK

CJS's lineup of unique FlatPak umbilicals include a wide range of dual and triple FlatPak options tailored to specific installation needs.

efficient and faster," says Kiser. In May, a prototype FlatPak was used for the deployment of an electrical submersible pump (ESP) in the Michigan Basin. For this, ESP-specific wiring was set beside a 1 1/4-inch string of coiled tubing. Kiser anticipates that the FlatPak will also be used for centrifugal pumps and as an electrical bundle conveyance for some in-situ bitumen production. Also, for wells with extensive laterals and requiring progressive cavity pumps for production, the FlatPak umbilical is likely to provide lower-maintenance power and control than a conventional rod and pumpjack system, says Kiser.

The material that comprises the FlatPak is a proven corrosion-resister. It is a thermo plastic vulcanizate (TPV) that has seen years of service in oil and gas applications, including sub-surface control valves, downhole chemical injection and completions.



The FlatPak is designed to resolve a couple of problems associated with multiple strings that have been around for a while. First, multiple CT strings are unwieldy and can present a safety hazard. Second, the traditional circular umbilicals that were built to handle multiple strings are limited in application and often costly.

Collin Morris, president of CJS, says the encapsulated tubulars within a round umbilical had to be interwoven like the strands of a rope to avoid uneven stresses. But, if the umbilical was complex or included a large string, it could become cost-prohibitive. "Mechanically, the circular umbilical has issues that can often make it uneconomical. It can also have handling and hanging problems," says Morris.

Development of the FlatPak began when a contact at Calgary-based Global Energy Services Ltd. approached him with a conveyance problem involving an HSP and three tubular strings. Morris, who had been in the coiled tubing business for 12 years before starting CJS with a partner five years ago, researched the market to see what products were available and soon began drawing diagrams "of how you might get multiple conduits into the hole."

He concluded that with the strings on the same plane, "it allows you to have multiple tubulars. Then the question was: how do you control and run it?" So injector chains and running gear were

designed and built to accommodate a rectangular form.

The FlatPak uses a Canadian Class #1 blowout preventer (BOP) system. Stripper and annular BOPs for Class #1 are compatible with every type of FlatPak coiled tubing unit (CTU). Morris expects that CJS will have a Class #2 BOP system in the near future. For hanging gear, CJS uses a modified split dog nut system that can accommodate a tubular assembly of dual, triple or other numbers of conduits.

Multiple and larger tubulars of varying size are easily accommodated because they are on the same plane. A conventional shallow CTU with standard injector, says Morris, can handle tubular bundles up to 4 1/4-inches wide and 2 1/8-inches thick.

So far, CJS has sold about 40,000 metres of FlatPak umbilical, with depth of subject wells ranging from 400 to 2,200 metres.

Several big producers have tried the FlatPak in recent months. Stephen DuBois, an asset manager at Chesapeake Energy Corporation, is in charge of about 800 wells. Recently, a crew of his was struggling with a service job on a well in Arkansas. "We were trying to install a rod pump, but we were having a lot of problems. I heard about the FlatPak being presented at a conference. It took just one truck with a spool to inject the FlatPak. In Oklahoma, we had been looking at a rod pump for some CBM, and thought the FlatPak might be a fit. We deployed the system on two wells last week. Because of a reservoir issue, one is not responding, but the other is doing great. As a deployment system, it's working great," he says.

The FlatPak is also being used on shallow gas wells in southern Alberta. "We've got three wells that we ran it with. It makes it really easy to pump out a well," says Clarence Dyck, pilot projects co-ordinator at EnCana Corporation. Commenting that changing a downhole pump with a FlatPak can be done in a matter of hours, he compares it to a PCP with a rod and pumpjack system. "It takes at least two days from start to finish," he says.

Darrell Eagles, a production engineer at Devon Energy Corporation, has used the FlatPak as a permanent installation on wells in the Horseshoe Canyon. "It takes very little water to kill the well in CBM," he says. Two FlatPaks have been installed and each HSP is removing about 25 to 50 litres per day. "I like the product. Running the FlatPak is simple, like running one string, not three. It's cheap and easy and non-complicated," says Eagles. • **Godfrey Budd**

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#### SIMPLE SOLUTION

FlatPak can be run with a conventional coiled tubing unit for both permanent installation or service applications. Right: FlatPak can be suspended from a specially designed wellhead for hanging the system in the wellbore, including this ESP installation.