

Photo: Jennifer Jacula

Going Flat

Collin Morris, a former roughneck-turned-inventor, develops a radically different form of coiled tubing

It's hard to imagine a better argument for giving engineers a healthy dose of genuine field experience than the technical ingenuity of Collin Morris. Not that Morris is an engineer—his closest approach to higher education is a black belt in karate. Even so, this summer the president of CJS Coiled Tubing Supply Ltd. addressed a well-attended meeting in Oklahoma City (Society for Petroleum Engineers) and a wellbore deliquification conference in Groningen, Holland. His subject: A revolutionary method for encapsulating multiple conduits and electric wires within a single coiled tubing umbilical.

"CT [coiled tubing] was originally a flexible round pipe used to drill, complete, and produce shallow natural gas and oil wells," Morris explains. "Of course, a CT rig's ability to quickly and economically access the wellbore is also attractive for gas production. In that case, though, you often need multiple tubing strings rather than a single conduit." Well deliquification is a case in point. A hydraulic, submersible downhole pump typically requires two tubing strings to form its hydraulic drive circuit, plus a third string for conveying produced water to the surface. Gas is produced via the casing.

at Maidstone, a half-hour drive east of Lloydminster. As a teenager, Morris aspired to become an air force jet pilot but balked at the low military pay. Instead, the Grade 12 graduate went to work on service rigs right after leaving school, then switched over to CT rigs about a year later.

When he became a CT operator in 1994, the technology was still evolving rapidly. (Coiled tubing applications for the patch were first created in western Canada, during the mid- to late 1980s.) "You don't meet too many guys with 15 years' experience in this business," the Lloydminster resident says. For years, he worked winters in northern camps.

In 1998, the rig hand took his first step as a future entrepreneur. Scott Kiser, a friend and mentor, launched Caliber Industries, offering CT services in northeastern Alberta. "Scott persuaded Joe [Reck] and me to jump ship [from Canadian Fracmaster] in exchange for some sweat equity," Morris recounts. Although oil prices were abnormally low at the time, Caliber fared well due to good service and limited competition in the local CT market.

In 2003, Reck and Morris left the company on a friendly basis to form CJS Coiled

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CT umbilicals containing multiple conduits were first developed for offshore producers, whose high-volume wells generate enough cash to pay for high-cost equipment. "This product is manufactured in Texas, in a plant as big as a football field with giant drums," Morris says. "Basically, coiled tubing strings are braided and encased within a wrapping. The strings have to be braided to maintain uniform lengths when the tubing is spooled. Otherwise the outer strands would have to be longer than the inner strands. The CT braiding machines are very high with complicated arms—it's a pretty amazing operation."

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Tubing, providing CT parts and supplies to the region. A year later, BlackWatch Energy Services Trust acquired Caliber. Reck is now VP of CJS, while Kiser has joined his former employees as business development advisor. "I'm the main concept guy, Joe gets things done, and Scott brings in the customers," Morris says. "Without our being competent partners and good friends, CJS could not possibly have enjoyed the success that's come our way."

Beyond selling several million dollars' worth of CT pipe, CJS developed a reputation as a technical coiled tubing problem-solver. "Wells produce a lot of other stuff besides oil and methane—hydrogen sulfide, sulphur dioxide, nitrogen, butane, salt, paraffin, water, and solids, including rocks. Some wells produce two or three of those things; others, all of them—every >

Out

by Mike Byfield

well has its own personality and you learn to work with it," Morris says.

"One of the reasons that you find Albertans as oilfield consultants and specialists around the world is the unusually broad range of oil and gas wells that can be found here," the CJS president comments. "We've got high-pressure deep wells in the foothills, the shallowest wells, super-sour gas, very light liquids, the heaviest crudes. One problem we constantly face in low-pressure gas wells—whether they're coalbed methane [CBM], shale, or shallow conventional—is deliquification. If you don't remove the produced water, it will build up against that low-pressure until it kills the gas flow."

the umbilical," Morris says. Further, he adds, the CT rig's "skates" (chain clamps), which grip coiled tubing while it's being fed into or out of the wellbore, do not function nearly as well if the umbilical has an irregular twisted form.

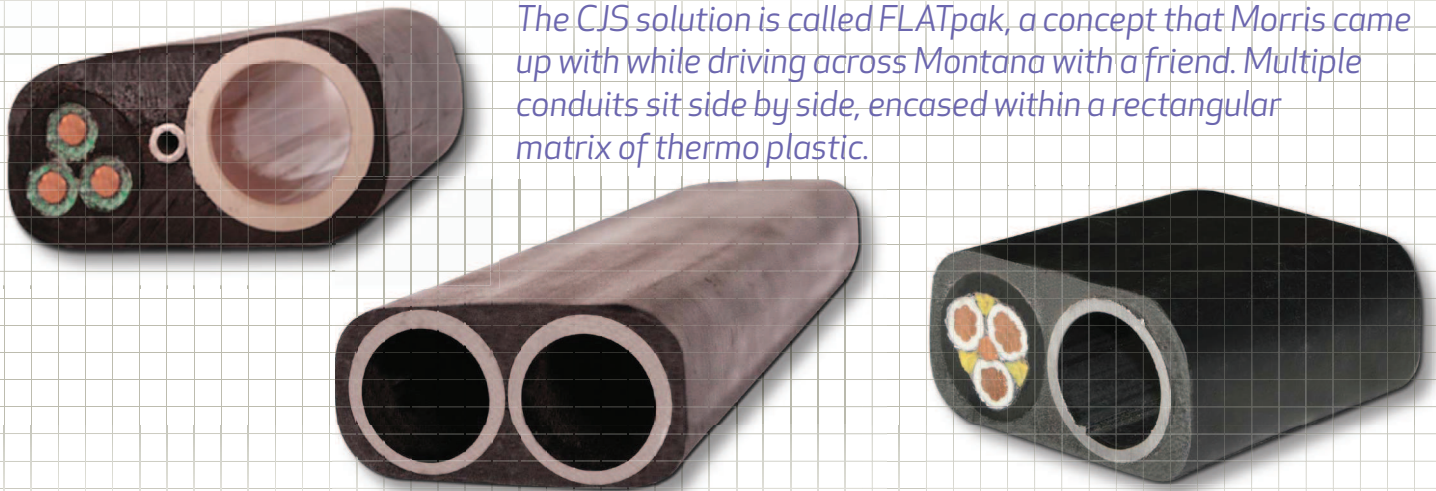
The CJS solution is called FLATpak, a concept that Morris came up with while driving across Montana with a friend. Multiple conduits sit side by side, encased within a rectangular matrix of thermo plastic. "At first I thought about a square shape, but a rectangle is more adaptable," the CJS boss recalls. Many configurations of conduit are possible, including various diameters, different electric wire, and more. In terms of manufacturing, FLATpak

a matter of changing one piece in the BOP assembly. That sort of logic carried through downhole tools, fishing equipment, well-head assemblies, and the rest."

Last October, CJS began commercializing FLATpak. "Our timing could hardly have been worse," Morris acknowledges. "The gas industry was collapsing. However, many producers recognize the urgent need for an innovation that enables them to deploy artificial lift systems in low-rate gas wells. They're moving to hydraulic and electric submersible pumps and jet pumps, and to rigless operation. CT is especially well-suited to horizontal wells, including CBM."

The company has installed 30 permanent FLATpak systems in Canada, more

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Low-volume gas wells must be managed economically or they'll lose money. CT rigs, where they can be applied, are often quicker and therefore cheaper operationally than conventional service rigs. However, deliquification with CT rigs requires submersible pumps, which in turn require CT umbilicals with multiple conduits. The more Morris pondered this challenge, the more he realized that traditional round coiled tubing would not likely provide a solution.

Round pipe is especially difficult to braid if the various conduits are of different sizes and materials—for instance, one strand may be used for fibre optics, not fluids. Even if the CT conduits are of uniform size, the braided umbilical is lumpy rather than smooth, like a thick rope. "The gaps between the twisted strands can allow gas to migrate unpredictably within

is pressure-extruded as a single piece. The rectangular product coils tighter on a CT spool than round pipe, reducing transportation costs.

"I thought the major difficulty would be operational—working with rigs that were designed for traditional CT," Morris says. "We were almost literally trying to fit a square peg into a round hole. Could we deploy it safely? How hard would it be to adapt the equipment? It seemed really daunting at first."

At that point, his intimate familiarity with CT proved crucial. "We all dug in and realized that well control systems and running gear are easily modifiable for this product. Much of their sealing is rubber. And as long as the rectangular form is solid and indexed [rounded at the corners], steel BOP [blowout preventer] rams can be switched easily to the new shape—it's only

than 10 in the United States, and is adding four or five more per month. "Two service companies in Canada have performed hundreds of well stimulations and clean-outs using FLATpak with hydraulic submersible and jet pumps. Financially, CJS is doing fine, especially considering that we're a five-person company caught in a severe activity downturn," Morris reports.

When engineers see the FLATpak concept, the former rig-hand-turned-inventor says, "they often see new ways to apply it, which is wonderful. For example, people are dusting off old pump prototypes to see if they will operate commercially with this new type of CT." CJS itself is working to proof its umbilicals for higher pressures and temperatures. "I think there's offshore potential," Morris says. "For sure, this development is going to have worldwide significance for our industry." ●