Deeper. Hotter. Lower cost. That’s what Alberta-based CJS Production Technologies is offering as it begins to commercialize its ArmorPak umbilical that it describes as “next generation artificial lift deployment technology.”

“We wanted to get deeper, we wanted to get hotter and we wanted to bring down the cost,” says Scott Kiser, president of the privately held company. “We are running pumps less expensively which increase production so as not only to increase revenue but to reduce costs.”

Patent pending under international application, the new technology is the next generation of CJS’s FlatPak umbilical, a multiple-tube umbilical surrounded by thermoplastic resin that the company rolled out in 2008. That technology is now patented in the U.S. and patent pending in Canada.

The ArmorPak’s all-metal banded umbilical coiled tubing (UCT) is designed to facilitate the installation of low-maintenance hydraulic and electric submersible pumps at greater true vertical depths and higher reservoir pressure and temperature in challenging horizontal and deviated wells.

Conveyed with a coiled tubing unit, it contains tubes to deploy, actuate and receive production from the downhole pumps. Additional items associated with the ArmorPak include a specialized stripper and blowout prevention system to facilitate its installation in live wells.

For hydraulic service, CJS installs a third tube into one side of the ArmorPak to permit injection and receipt of hydraulic fluid through the concentric side to power the pump.

For electric drive pumps, including electric submersible pumps (ESPs), the 1.5-inch dual banded coiled tubing is loaded with an encapsulated three-phase copper cable and includes braided aircraft cable for support. This combination is preloaded into one side.
of the ArmorPak, leaving the other side open to carry production fluids from the downhole pump to surface.

The custom power cable used in the ArmorPak ESP is manufactured and installed into the power side of the ArmorPak by company partner Petrospec Engineering of Sherwood Park, Alta.

“We have been working with Petrospec for years, and this relationship has facilitated CJS’s ability to create products like ArmorPak ESP while also facilitating other unique ArmorPak-supported well services which require components installed inside coiled tubing, such as well pump off automation,” Kiser says.

CJS relies heavily on Petrospec’s expertise due to its in-depth engineering, optimization system design and manufacturing capabilities, he adds. “Petrospec is a master at installation of pretty much any smart technology into coiled tubing, having performed this service for years at its assembly facility in Edmonton,” he says. “When it comes to designing and installing custom ESP power cable, capillary tube, thermocouple, fibre optic for distributed temperature, pressure and acoustic measurement, data conductors or pretty much anything to support CT-conveyed smart technology, Petrospec is a Canadian leader.”

CJS has developed all the custom running equipment including injector assemblies, stripper heads and blowout preventers to allow most-industry-available coiled tubing units to run UCT products. It also carries a line of sub-surface hydraulic equipment specifically designed to work in connection with the umbilical technology to power hydraulic progressive cavity pumps. These UCT-deployed systems support ESPs, hydraulic reciprocating piston pumps and hydraulic progressive cavity pumps.

“We wanted the whole suite,” says Kiser of his company’s technology, noting that ESP, reciprocating and progressive cavity pumps account for 90 per cent of the market by units. “Light, heavy, oil, gas—it hits all areas of the spectrum,” he says. “That’s why it took us eight years.

“We have relevant pumps that will fit in all areas: Canada, the U.S., parts of South America, Middle East, China and Australia,” Kiser adds.

The ArmorPak technology has a number of benefits, he says. Those include rigless “live well” operations in which a coiled tubing unit replaces a service or workover rig and rodless technology that reduces well downtime, service frequency and the costs associated with tubing and rod failure.

Conveying the artificial lift via coiled tubing eliminates the need for a workover rig, saving money for the operator and relying on fewer persons on location, reducing the environmental footprint and increasing safety, says Kiser. “Our operation is very smooth,” he says. “We show up with a truck and three guys.” That enables CJS to do in a day a job that in some other areas might take a service rig up to three or four days. The lower cost is a major reason why customers prefer a rigless technology, Kiser suggests.

The ArmorPak can also help to increase production in a horizontal well as a result of optimum pump placement at the true vertical depth of the producing reservoir, says Kiser. “Otherwise, the hydrostatic weight of the fluid column below the pump intake is pushing against the formation and can restrict production, often in lower pressure wells,” he says. “Generally, in more mature wells you will get the benefit of optimal pump placement.”

In 2014, CJS initiated and completed development of the first ArmorPak deployed electric submersible pump, the ArmorPak ESP, for higher production wells (more than 200 bbls/d). The system was installed for an Alaskan operator in the summer of 2015.

Although the company can sell its system with an ESP provided by any vendor, it plans to partner with Summit ESP based in Tulsa, Okla., enabling CJS to offer a combined package. “We have the rigless deployment system; they have the ESP,” says Kiser.

Over the past four years, Summit has installed more than 5,000 ESPs, becoming the second largest ESP manufacturer in the U.S., providing superior technology and exemplary customer service, he says. Summit offers a wide range of products and services including application engineering, equipment design, reliability engineering and equipment service, testing and repair.

“Because Summit’s mandate parallels CJS’s regarding customer well optimization and operating cost reductions, the two companies are a perfect fit,” says Kiser. “This partnership brings CJS the professional support it requires to deliver a fully integrated riglessly conveyed ESP solution. It’s with relationships like Petrospec Engineering and Summit that CJS is confident in its ability to tackle the company’s fully vertically integrated business mandate.”

Kiser also believes that this is a good time for the ArmorPak to be coming on the market. “Even though it’s tough times in the oil industry, those [operators] who still have a budget are looking to be saving money wherever they possibly can in a low [commodity] priced market, and our technology is exactly what they are looking for.”

In Alberta, the FlatPak has been used to deploy artificial lift systems in both coalbed methane and heavy oil wells. Ember Energy has 25 hydraulic submersible pumps in place in central Alberta, using them as permanent dewatering solutions for Belly River coalbed methane, says Duke Laye, superintendent of optimization and maintenance. It is run on the FlatPak triple string coiled tubing, which he says makes it easier to deploy.

“The best part that I like about it is the reliability,” says Laye. “We have had many in the ground for close to 10 years.” While the CJS pumps are more expensive, they are less costly over the long term because Ember hasn’t had to spend money on costly repairs and pulling out pumps, he says. “Longevity for us is key—and the low maintenance costs.”

In the Lloydminster, Alta., area, CJS installed its first two hydraulic progressive cavity pumps in Husky Energy horizontal heavy oil wells where the company was worried about rod and tubing wear, says Dustin Newman, a production engineer there at the time.

With the FlatPak, Husky was able to do a couple of things it couldn’t do on traditional set-ups, he says. It ran a pressure sensor downhole and also ran a bubble tube so that it could inject chemical downhole at the pump. “It just gave us some options you really can’t do in traditional setups,” according to Newman.

The FlatPak was used in two wells, and the company had success with both of them, although in the first well CJS had to go back and make some modifications when there were problems with the driver.

Laye also appreciated the time-saving with the coiled tubing. “The set-up and pull-out and run back in was a lot quicker with coil compared to a service rig, because coil can set up way quicker,” he says.

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