Activity Spurs Artificial Lift Innovation

By Danny Boyd

As oil and gas producers develop unconventional plays and explore ever-deeper waters, they are exposing artificial lift equipment to harsher downhole conditions. These conditions include not only higher temperatures and pressures but also higher viscosities and more deviated, longer laterals.

Artificial lift providers have responded by developing a host of systems with the strength of Popeye and the flexibility of Batman. One of the solutions include:

- Ultra-high temperature electric submersible pump systems for steam-assisted gravity drainage and geothermal applications.

Submersible Pump Systems

Schlumberger continues to log operating hours with its REDA HotlineSA3 ESP for steam-assisted heavy oil recovery operations and geothermal applications, says Andrey Fastovets, the product champion for pumping systems, hot line and gauges used in artificial lift.

“We have more than 150 SA3 systems installed between Canada and Oman, and we surpassed the 100th application mark in Canada at the beginning of April,” Fastovets says.

The third generation HotlineSA3 can operate at up to 257 horsepower at 60 hertz with a bottom-hole temperature of 482 degrees F, compared with 424 degrees F for the previous generation, he reports.

“We already have seen more than 550 days on one of the first field trials units, and it is still going,” Fastovets says.

“Since the system was only made commercial last year and had limited field exposure compared with previous generations, we cannot say yet how far it can go, but we definitely are looking forward to surpassing the 2,345-day record set by an earlier version of the Hotline ESP.”

In addition to increasing production, the new REDA HotlineSA3 is helping operators bring production on earlier and reduce downtime and associated workover costs, he says.

The SA3 comes from the factory completely preseeded and filled with a specially treated high-temperature oil, which eliminates the need to service the equipment at the well site and ensures the oil is free from moisture, dissolved gas or solid contaminants, Fastovets adds.

New Inventions Simplify Artificial Lift

Like the producers they serve, artificial lift companies are models of continuous improvement. From sucker rods to sensors, the industry’s artificial lift experts are coming up with ways to increase efficiency and reliability while providing higher production.

Medium Voltage Drive

Schlumberger has expanded its line of medium voltage drives (MVDs) designed to control ESPs and surface pumping systems.

The company’s new outdoor SpeedStar MVD complements its line of products that meet the National Electrical Manufacturers Association’s 3R rating, says Christos Salmas, product champion for surface power and control in the company’s artificial lift division.

“There is no other NEMA 3R MVD offering of this type on the market,” he says. “The only other available option is to take a NEMA 1 unit and put it in an air conditioned building. Our NEMA 3R solution eliminates the need to construct a building with air conditioning, and all the materials that go along with that.”

Eliminating the system’s dependence on heating, ventilation, and air conditioning (HVAC) units increases reliability while reducing operating costs, Salmas adds.

“HVAC systems cause a shorter mean

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time between failure because they are one of the weakest links in any system that requires them, and if they go offline, the MVD cannot operate,” he explains. “By removing the HVAC, the SpeedStar system increases its MTBF to that of the MVD rather than the HVAC system, which requires weekly to monthly routine maintenance to ensure operation.”

The SpeedStar MVD provides cost savings by eliminating the need for a utility step-down transformer, Salmas says. The drive’s input can be connected up to 34.5 kilovolts, which allows operators to tap into the main distribution in the field.

Removing one transformer can improve efficiency by as much as 2 percent, Salmas says. “Depending on horsepower rating, operators can save $10,000 to $14,000 a year in electrical costs on 1,000/1,500HP installations,” he reports. “This is especially valuable in fields where there are multiple installations.”

The SpeedStar MVD only has three wires in and three wires out, Salmas notes, adding that the system uses an oil-filled transformer in place of the dry type used on previous models.

The drive can be installed offshore and provides savings, depending on the configuration of the platform and whether operators are using a main distribution system set by a motor control center, Salmas says.

The cabling to the MVD utilizes smaller copper sizes, which helps reduce copper losses and installation costs, he continues. “Because the MVD operates at a higher voltage, it operates at lower current, which means it needs less copper,” Salmas says. “It still has a 36-pulse front end, so we still meet the Institute of Electrical and Electronics Engineers’ 519 standard. In fact, the SpeedStar MVD exceeds the requirement.”

With previous models, the transformer section and the power section were two units built together. In the new model, the sections are in separate units, which allows the high voltage section of the MVD to be physically installed in a controlled area to reduce the safety concerns associated with high voltage operations, Salmas says. He adds that all the safety features of the company’s standard N3R unit have been incorporated into the new MVD, including mechanical and electrical interlocks, a precharge circuit to prevent inrush currents during startup, and visible fusible disconnects.

![Graph showing harmonic spectrum](image-url)