

Startups Offer Innovative Technology

By Colter Cookson

For many startups, the path to success depends on anticipating future demand, maneuvering to meet it and hiring people with the skill and attitude to offer exceptional service. But for a few, success depends not on understanding business trends but on turning sound concepts into field-proven technologies.

The oil and gas industry is a case in point. Recently-formed startups have introduced a drilling fluid technology designed to drastically mitigate the negative effects of friction and extend rigs' technical limits, enabling them to drill faster and further; a transmission that allows pump and compressor motors to run at their most efficient speeds while expanding opportunities for casing gas engines; and downhole sand and gas separators that boost rod pumps' efficiency and extend useful lifetimes.

These innovative technologies come not from sudden bursts of inspiration, but from seasoned professionals with a knack for identifying needs, gathering data and thinking outside the box.

Efficient Transmission

Turbo Trac Systems offers a transmission that company Chief Executive Officer Allen Swenson says will increase the efficiency of the motors used to power pumpjacks and compressors, optimize productivity and reduce operating costs. This infinitely variable transmission accomplishes that by reducing motor size and enabling them to operate at a constant speed.

To explain the implications, Swenson points out that each motor has an ideal

operating speed. However, in most oil and gas operations, the driven device—and therefore the motor—must change speeds. To make those changes possible, operators rely on variable frequency drives, which also operate best at a specific speed.

"As the VFD and the motor move away from their ideal speeds, their efficiency drops rapidly," Swenson says. "In a typical pumpjack application, a 25 percent decrease in the driven device's speed can cause the system's overall power efficiency to drop from 90-92 percent to 72-74 percent, which translates into higher costs."

Enter infinitely variable transmissions. "IVTs have been around for a long time—in fact, they were conceived by Leonardo

Da Vinci—but our IVT is the first to support the high horsepower and torque required for oil and gas applications," Swenson notes. "Because the IVT has an infinite number of gear ratios, it can convert a given power input speed into a wide range of output speeds. So by using the IVT to transfer power from the motor to the pump or compressor, operators can run the motor at its most efficient speed without sacrificing the ability to optimize the driven device."

Maintaining constant motor speed allows operators to buy less expensive but more efficient motors, Swenson says. "Because the IVT allows the motor to be sized for operating load and not start-up



By using Turbo Trac Systems' infinitely variable transmission to connect motors to pumpjacks or compressors, operators can run the motor at a constant speed, but vary the amount of power that reaches the driven device. The company says this eliminates the need for a variable frequency drive while boosting the motor's efficiency and run life.



load, operators can buy smaller motors that cost less and offer lower power consumption," he says.

Swenson acknowledges that like a VFD, an IVT will lose efficiency outside its ideal gear range. However, he says the loss is less noticeable. "With the same 25 percent reduction in the driven device's speed, the motor still would be at its optimum speed and the IVT would fall to 90 percent efficiency, which would put the overall system's efficiency in the upper 80s," he relates. "That is a 15-18 percent increase compared with a VFD."

Other Benefits

In addition to increasing efficiency, the infinitely variable transmission cuts electricity costs by allowing motors to start with no load. "That keeps the motor from drawing a huge surge of power when it turns on, which reduces the operator's peak demand and therefore his utility fees," Swenson says. "While peak demand charges are often small, they accumulate with several wells."

Swenson adds that unlike a VFD, an

IVT can run safely on the low-quality power operators often receive from utilities as those utilities face ever-growing demand. "That means operators no longer need a power conditioner, which can cost as much as the motor and VFD combined," he says.

If necessary, an IVT can eliminate the need to buy power by making casing gas engines an option. Because they allow those engines to run at a constant speed, IVTs reduce emissions to acceptable levels, Swenson mentions. He adds that IVTs can start, stop and restart the pump simply by changing internal ratios. Since this process leaves the engine on, operators no longer need to worry about clutching and declutching, making casing gas engines viable even in applications that require remote or automated starts and stops.

Swenson describes casing gas engines as ideal for many applications. "The cost of electricity is rising, and operators in new fields often need to install power lines to access it," he observes. "Casing gas engines reduce power costs and eliminate the need for power lines, which in some scenarios would cost more than \$200,000."

IVTs can increase pump and compressor reliability through two mechanisms, Swenson reports. First, the transmission allows the motor to start in neutral—which places less strain on the pump and rod—and run at its ideal speed. Second, the transmission provides more precise pump control than a variable frequency drive, reducing the chance of pump-off conditions.

Swenson says that in conjunction with a rod pump controller, that precision can lead to greater production. "The rod pump controller can monitor the pump fill rate, then slowly increase or decrease speed until the fill rate stabilizes or improves," he relates.

To put the IVT's benefits in perspective, Swenson offers a field evaluation involving a large pump connected to a 100-horsepower motor. "We significantly reduced electricity and capital costs by switching to a 75 horsepower motor and increased liquid production 17 percent and natural gas production 100 percent," he reports. "The extra production alone was worth \$15,000 a month." □