Tom Shenk (left) and Larry Dillon (Myers Brothers Drilling, Landisville, Pa.) install a submersible pump system.

Smart Submersibles:

The Pressure Is On – Part 1

by John Vastyan

In an industry that hasn't really changed in decades, well pumps have just chugged along, doing their duty in a world that hasn't demanded a lot from them.

But recently, sleek, powerful and highly intelligent life forms have entered the subterranean world of the submersible pump.

Today, with advances in miniaturized electronics and state-of-the-art components, new variable-speed, constant-pressure submersible pumping systems are lighter, leaner and smart as a whip. These intelligent systems now have apparatus above and below the ground. They so handily outperform their older siblings that many new uses and expectations have resulted – including remote monitoring, control and diagnostics from a PC within a home or facility, or 5,000 miles away.

Though, with new technology in the driver's seat, broader use of these systems is spurred by a simpler need. It's called consumer demand. No doubt all of us have seen and been affected by some facet of the astounding push for bigger, better homes. It began with the call for more space, a higher level of luxury and comfort, and amenities like elegant tile flooring, radiant heat, granite counter tops, sophisticated home automation systems, whirlpool tubs, walk-in showers and more "generous" plumbing fixtures. You know the ones I'm talking about – the hanging showerhead that delivers an August thunderstorm on demand, or multiple heads that abundantly massage and saturate bathers from every angle, complete with floating clouds of steam.

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That's where you come in. Builders and remodelers can arrange for many of the bells and whistles easily enough. But for those homes not served by municipal water systems? Who's going to provide the water – and the water pressure – to satisfy that consumer demand? Well, you are.

Enter the new generation of smart submersible pump systems. To give you some insight into how these systems are installed and applied, I spent a week on the road with several experts in Pennsylvania who've developed a well-honed method for new and retrofit installations.

I met with Chris Myers, and three of his key installers at Myers Brothers Drilling, based in Landisville, Pa. Also, Dave Heikes of Morris Industries Inc., one of the largest privately held suppliers of water well equipment and environmental products, based in Pompton Plaines, N.J. And – not to neglect commercial application of this technology – I also spoke on a few occasions with Tim Myers (curiously, no relation to the pros in Pennsylvania) of

(Continued on Next Page)

(Vastyan - Continued)

Chris Myers (left) and Tom Shenk (right) prepare the pump manifold as Dave Heikes looks on.

Myers Brothers Drilling in Gainesville, Fla. They recently completed a classy, two-pump, constant pressure submersible system for a Dannon bottled water plant in High Springs, Fla.

Though admitting they still install plenty of the traditional, single-speed submersible pumps, Chris Myers says that, just a few years ago, he had to be in a "sales mode" to move a homeowner or builder toward constant-pressure, variable-speed or VFD (variable frequency drive) technology. That's changed. More frequently today, the need is asked for, or simply required by the nature of a home's or commercial system's call for higher volumes of water, or the need for steady water pressure.

"As installers, our needs are pretty simple," says Chris Myers. "We want highly reliable systems and the ability to install them quickly. Over the past decade, the pace of our business – in response to the building industry boom, and the need to provide new or improved well systems at existing homes and businesses – has been running at full tilt. None of us like the late night or New Year's Eve 'no-water' call. That's why we developed a recipe that works, with components that we know will last a long time."

On the right is a new pressure transducer; on the left is an old on/off pressure switch.

These new, ⅓- to 1½-HP submersible pump systems – such as the SQE system by Grundfos, the pump of choice by both Myers Brothers firms – are designed to provide constant pressure by varying the speed of the pump motor. When there's a demand for more water, the pump's control operates it at a higher speed. When the demand for water lessens, RPMs are reduced. The technology is not new; VFDs have been used for years for a broad range of industrial applications.

In the water well business, a key advantage to variable speed systems is the reduced wear and tear on the electric motor. Gone is the furious, high-revolution starting – operation – stop cycle. The traditional well pump, still sold in great quantities today, bears the brunt of that punishment day in and day out, jumping from zero to 3,500 rpms in a flash. The motor is hit with a start-up torque demand that harasses every component in the impeller assembly.

With variable speed pumps, that brutal cycle is replaced with a gentler, soft start, slower-to-higher rpm rhythm that ramps-up smoothly, and winds-down just as gently when the need for water is satisfied. Mechanical torque and in-rush currents are eliminated.

VFDs use only the amount of power that's needed. This also adds to the life expectancy of the pump. Typically, traditional pumps tend to last five to 10 years or more. A variable speed system should last substantially longer. And because these systems are rarely running full-tilt, meeting the demand at slower speeds, there are considerable energy savings for the home or building owner – a benefit that shouldn't be ignored.

With the variable speed, three-inch pumps, you can set limits of 10,700 rpm at the high end and 3,000 rpm at the low end. For higher demand appli-

(Continued on Next Page)

(Vastyan - Continued)

cations, you can set them up in parallel format to operate in a lead-lag fashion. This way, if a single pump meets the desired pressure, that's the way it'll go. But if the demand increases, pushing the need beyond the first pump's ability, the second pump jumps in to run at whatever RPM is needed to hold the pressure within the system.

That's what Tim Myers did at the Dannon bottling works in Florida. Two variable-speed SQE pumps take turns meeting the demands of the bottling facility. Together, they pump fresh water up from deep wells and into a large storage tank, and from there, the water moves through twin, 6-inch stainless steel lines that run three-quarters of a mile to the facility, handling the plant's need of up to 550 gallons a minute.

Removal of the old – and large – pressure tank.

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Another advantage to the new, low-horsepower constant-pressure systems is exactly that – they're systems; they come with many more of the components you need to get the job done. For those of you who learned how to do these jobs piece by piece – and naturally have some pride in knowing what to choose, and how best to assemble them – this may take a little getting used to.

"We found it pretty easy to let go of the old way of doing it," adds Chris Myers. "Before, we'd have to assemble and connect low water and voltage spike protection devices. That's now included in these pumps. There are many other safety devices built in as well, such as dry run and under-voltage protection."

But according to Heikes – a supplier whose job security rests on his familiarity with well water, drilling and environmental monitoring technology – one of the best devices, part of these new systems, is the pressure transducer. "Gone is the old, stupid, on-or-off pressure switch," he says with a chuckle. "The pressure transducer assures that constant pressure is maintained." It does this by giving the controller a pressure signal that's used to increase or decrease the speed of the pump to sustain the constant, preset pressure. "It operates the pump in its range of 3,000 rpms to 10,700 rpms, permitting gradual build-up or slowing-down of the motor for continuous maintenance of, say, 60 psi or 70 psi, plus or minus 3 psi. This is one of the reasons Chris doesn't have to go into his "selling mode" quite so often. Homeowners usually are pretty happy about not having the wild swings in pressure you can get with basic well pump systems.

"The motor accomplishes the soft start because it's permanently magnetized," continues Heikes. "This is a huge benefit because there isn't a big amp draw to kick-start the motor. This type of operation replaces the old, 40- or 50-pound system with a differential of 20 pounds that ramped up fast to add volume into a much larger holding tank … then died … to start the cycle all over again."

Heikes referred to another advantage of the constant-pressure systems. At one of the Pennsylvania homes we visited with Myers Brothers, they replaced an old, single-speed pump with one of the new variable-speed systems. A much smaller, 2-gallon tank that was hung on the wall replaced a freestanding, 20-gallon storage tank. This was quite a space saver in the basement mechanical room. Eliminating the much larger pressure tank also translates to a substantial cost savings on the front end, certainly helping to offset the higher cost of the more sophisticated constant pressure system.

Chris Myers communicates with the pump system's control unit using an infrared remote.

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Another change made at the home where an old, single-phase pump was removed was the need to shorten the depth of the pump. The well was 450 feet deep, and the pump rested at 425 feet. Chris Myers explained that he could have lowered the new, 1½-HP submersible depth, but to avoid a voltage drop that would have required a heavier gauge power cable, bumping-up the romex to a #8 wire, something he and the homeowner chose not to do. Because the well source was quite strong, delivering 21 gallons per minute, with a stream that entered the well at about the 430-foot mark, there was no concern about raising the pump 50 feet, conceivably reducing the amount of water that could be pumped from the well.

Chris Myers also took into consideration the 80-foot distance between the wellhead and the basement. The water and electric lines were trenched, about 5 feet deep, straight to the house, entering the basement wall where they mounted the new control box and manifold. ND

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