Smart Circulators

The new generation of intelligent pumps

At this year's AHR Expo, engineer attendees from all over the world saw a wealth of new technology that included one of the true breakthroughs to enter the hydronic realm: smart circulators or, you could say, *intelligent*, pumps. No doubt, some of you might say that it's about time.

Fortunately, leading manufacturers in our industry tend toward conservativism. That is, they place great value in knowing — before products are introduced — that the technology will work reliably. But the hue and cry for this technology has been heard in the United States for a few years, especially at the encouragement of hydronics experts Dan Holohan and John Siegenthaler. News of this technology, already well established in Germany and Asia, has sharpened our interest.

The future is here, and the newest technology has already found its place in a wide range of mechanical installations. In a sense, multi-speed circulators led the way to more sophisticated constant pressure systems with variable frequency drives (VFDs). These then led to the more advanced proportional pressure control — availing pressure loss that's proportionate to flow demand within the piped system. VFDs were then integrated into the pumps and, from these, a whole new generation of intelligent pumps has sprung up. Even more recent advancements have entered the "gene pool" now, giving some pumps the ability to automatically adjust their own performance, based on the needs of the environment, or system, they're placed in.

Manufacturers introduced some very exciting new pumps at this year's AHR Expo. One of the newest and most innovative circulators to enter this rapidly evolving arena is Grundfos's MAGNA pump, a variable speed commercial circulator with a unique capability. The installer, system engineer or end user can choose, with the simple push of its "Autoadapt" button, to activate the pump's ability to read system need, calibrating function to meet system demand at the lowest possible control curve, maximizing energy savings.

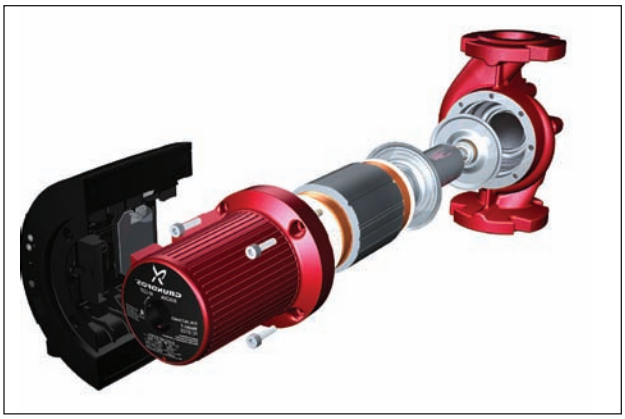
Variable speed circulators — Grundfos offers them — provide a broad range of capability, making them an ideal choice for retrofit situations where there may be little known information about what the system's original design spec was, or whether the pump was oversized.

"I spent a lot of time looking into the capabilities of the new MAGNA pump," said Dave Yates, president of F. W. Behler Inc., a full service mechanical contracting firm based in York, Pa. "It's an answer to every service man's or maintenance engineer's dream. When a pump fails, we rarely know its operating parameters. And it's common that, when a pump goes down, there's a loss of heat or no circulation as part of some important process. If a new pump could be installed quickly, and a button on it could be pushed so that the circulator calibrates its operation entirely on the system's demand and responds to changes in need, that's ideal, an answer to dreams.

"A pump like that offers a speedy replacement, with reliability built in like never before," added Yates. "Variable speed operation, based on system demand, will lengthen the life of the pump and save enormous amounts of energy for the end user. It will reduce the installation cost substantially, as well, because the installer won't have to reverse-engineer the system to gauge exactly what it calls for."

"We respond to what the market calls for. When design engineers and mechanical contractors ask for new technology to meet specific needs like those Dave Yates has mentioned — and especially when recognized experts like John Siegenthaler champion the cause — we've got to be on our toes," said Joe Rice, product specialist for Grundfos Pumps.

"In a heating system, the primary variable is flow to carry and deliver the requisite Btu," added Rice. "When compared to a basic constant speed pump, or even constant pressure control, proportional pressure controlled pumps seamlessly



The MAGNA features a programmed mode that continuously alters pump performance based on real-time system need.

deliver higher flow at times of higher Btu demand. At lower heat demand and lower flow a proportional pressure pump can reduce head without any detriment; this allows for much greater energy savings. Essentially, proportional pressure control provides friction loss compensation. This is most advantageous in closed loop systems, where friction loss is

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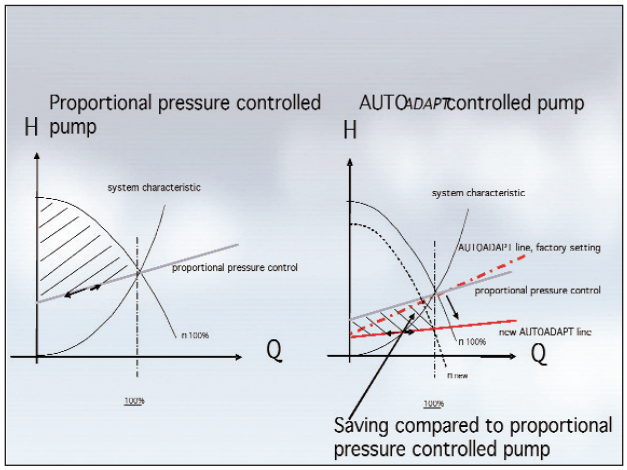
the primary component of total head."

According to Rice, Grundfos's new MAGNA has an even more advanced form of proportional pressure — a programmed mode that continuously alters pump performance based on real-time system need. New pumps "know" their own pump and power characteristics and have the capability to continuously monitor their own performance, with no transducers or external sensors. They are designed to collect and use this information, altering performance instantaneously. With that sort of intelligence on the front end, a built-in VFD then drives variable speed



The circulator's patented Autoadapt control function automatically adjusts performance to meet demand and save energy.

performance based on the real-time system need.

Say, for instance, that the pump was installed as the main hydronic circulator at a warehouse facility that feeds 10 radiant heat zones inside and two snowmelt zones outside — an access ramp and a driveway-sidewalk area. When the pump was installed, only the interior radiant heat zones were operational. But, weeks later, a storm front moves in, and the snowmelt system is activated.

Suddenly, the system calls for the movement of a large volume of fluid that it had not "known about." Yet, the circulator's range of performance easily covers the new ground and welcomes the need to move warmed fluids into the snowmelt loops. Mission accomplished — and with no human interaction.

When the storm leaves, leaving behind only gently steaming concrete surfaces above the snowmelt tubing, controls deactivate the snowmelt zones, and the pump resumes its role as a supplier of inside radiant heat.

How does it work? The new Autoadapt function immediately defaults to a proportional pressure curve at a point on the curve at 50 percent of head capability. The built-in control then seeks out the need for greater or lesser need for flow within the piped system. This starts a mode of continuous monitoring so that, as the system opens more zones and the need for more flow, creating the need for more heat and more head loss, it eventually hits its maximum speed curve.

But it also recognizes that system demand does not match the original (50%) setpoint. As pump operation falls down that curve, with lower head, it calculates a new proportional pressure control line to meet the new setpoint, charting a path quickly along that new line of operation.

"Which, again, further reduces head pressure and, in doing so, saves more energy. These new generation circulators have energy savings of 55%, compared to non-controlled pumps and 35%, compared to existing controlled circulators," said Rice. "We see this new family of pumps as the best solution for the replacement market. New, smaller residential and light commercial circs are on the way, adding greater breadth to what system designers and installers will have at their disposal to solve a broader range of challenges." ■

The Grundfos MAGNA automatically adapts to system needs

Magna, the newest wet rotor circulator by Grundfos, now enters North America after years of duty in Europe, where it won all A ratings for energy conservation and reliability. MAGNA's broad performance range, with three cast iron and three stainless steel models now available, covers flows from 10 to 170 gpm, making it an ideal choice for a wide range of commercial retrofit applications and for many hydronic, radiant heat and snowmelt uses.

The circulator's patented Autoadapt control function automatically adjusts performance to meet demand and save energy. It "learns" what works best for the system, continually changing its settings to provide the temperature and comfort required. This translates to substantial savings on running costs.

MAGNA pumps exceed the performance of simpler, proportional-pressure circulators. Though proportional pressure pumps operate with a higher minimum head (pressure), the MAGNA retains a very low "foot point" at 5 feet. The factory-set curve already saves more energy than an ordinary proportional pressure setting. As flow demand increases, the pump pressure follows the Autoadapt performance setting until the pump operates on the maximum curve. At that point it continues downwards

until it reaches the required flow. When flow is reduced, the MAGNA learns what the system needs and sets a new, lower pump speed. It analyzes system conditions and adjusts its performance accordingly.

MAGNA pumps are virtually maintenance free. The pump is oilless and sealless and does not require a fan, because it's cooled and lubricated by the water it pumps. Flange connections are designed for easy replacements.

Also, bus communication permits use of the pumps with building management systems or with data collection features offered by GENIBus and LONWorks.

For more information, visit www.grundfos.com/Magna.