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Minnesota Campus Circulating Pump Retrofit Improves Efficiency During Record-Cold Winter

BY JULIE REYNOLDS

COLLEGEVILLE, MINN. — Minnesotans have a well-earned reputation for toughing out the snow and cold each winter, but even this hardy state was tested over the harsh 2013-2014 edition. With at or near record lows, heating systems across Minnesota were put to the test. And while many commercial buildings required more energy to keep occupants comfortable with consistently below-freezing temperatures, one private school in the south-central region actually *saved* money this winter.

Dave Schlumpberger, HVAC Service Technician at St. John's University, with three of the four Grundfos MAGNA3 circulators he installed.

St. John's University, an all-male, Benedictine school in the town of Collegeville, undertook a heating system retrofit just in time. Campus HVAC Service Technician David Schlumpberger oversaw the project:

"We were approached by our local wholesaler, Ferguson Enterprises, with the suggestion that we consider replacing the pumps in the Peter Engel Science Center with Grundfos MAGNA3 smart circulator pumps," he says. "I wasn't aware of them before, but the existing pumps were nearing the end of their lives, so we decided — Why don't we do something more efficient?"

Energy efficiency is important on every campus, but environmental stewardship is a core Benedictine tradition at St. John's, which boasts an Office of Sustainability and sits on 2,700 acres that range from wetlands to lakes and prairies to forests. "The MAGNA3 smart technology is a really good fit for a school that teaches students a respect for the land," Schlumpberger explains.

Schlumpberger and his team opted for the MAGNA3 circulators due in large part to the products' sophisticated electronic technology and demonstrated energy efficiency. Although the MAGNA3 has a higher up-front cost than most conventional circulators, its powerful performance produces fast payback on that investment, post-installation.

A Logical Solution

The MAGNA3 is an energy-optimized, variable-speed, wet rotor circulator that features a permanent magnet motor design that will cut power consumption up to 85 percent — the highest energy efficiency rating as compared with other circulators in its class. "These pumps adapt to existing situations and can be adjusted accordingly," says Brian Soderholm, a Grundfos sales representative in Ramsey, Minn., who worked on the St. John's project.

Grundfos sales rep Brian Sooderholm: ""With the MAGNA3s, we were able to get the necessary flow rates at much fewer feet of head. Over time, I think they'll be able to slash their energy use even further."

"Grundfos is the only manufacturer that offers a pump that has an integrated logic algorithm to 'learn' the varying energy-usage patterns of any application. This was a huge improvement over the Science Center's antiquated pumps," Soderholm adds.

Replacing the four older pumps with the MAGNA3s updated the system, increased efficiency and improved building comfort. Its signature feature is the AUTOADAPT function, which saves energy and money by continuously fine-tuning power consumption, discharge head, and flow rates to meet the dynamic needs of the system.

MAGNA3 Installation

Laid out in four wings, the Peter Engel Science Center is used primarily during the school year, running heat from fall through spring. It was built in the 1960s of concrete, typical of that era and of the construction style found throughout the rural campus. "We had a feeling the old pumps were oversized, but there was no way to tell — until we did the replacement," Schlumpberger says.

The building contains two primary circulators, pumping hot water supplied by a steam-to-hot-water convertor, with the steam coming from a central plant. There are four pumps on the secondary loops – each serving a different wing – feeding baseboard heating that uses pneumatic, three-way mixing valves to help regulate the temperatures.

Initially, Schlumpberger and his team thought the outdated pumps were on a variable flow system. "But after the pumps were installed and we started it up, we realized that the system was not variable; it was a fixed flow," he says.

Since the building wasn't zoned and no VFDs (variable frequency drives) were installed, the entire system was operating full-bore throughout the heating season. The team performed an audit of the

existing pumps and found the North wing was originally designed for 41.5 gallons per minute (gpm) at 20 ft. of head; the south — 24.1 gpm at 21 ft.; the east — 23.7 gpm at 21 ft. and the west — 17.4 gpm at 21 ft.

"As suspected, the engineers had oversized that older system," says Soderholm. "Oversizing wastes energy and is hard on the pipes. In fact, we saw evidence of that in some copper piping that Dave's staff removed. The insides of the piping were lined with ridges, indicating damage from excess velocity." (Photo right.)

Insides of copper piping at St. John's were lined with ridges, indicating the damage caused by the older, oversized pumps.

The intelligent technology of the four new MAGNA3 minimizes energy costs. The pump has a built-in energy meter and a flow-limiting function. Even at reduced loads, these circulators save energy compared with conventional circulators. They're also an all-in-one option for building owners, eliminating the need for costly installation of a companion flow meter, pressure and temperature gauges, throttling valve, constant-speed pump or BTU meter.

Dave Schlumpberger (left), shown with Brian Soderholm in a Peter Engel Science Center classroom: "We just had the coldest winter in 30 years," comments Schlumpberger,"and we were running pumps at 25% of the head that the old pumps had, while keeping the building warm."

With this circulator, Grundfos makes it easier to right-size the duty point. Getting the flow rate is important, obviously, because with too little you don't get the heat you need. But if it's too high, you waste energy.

"With the MAGNA3s, we were able to get the necessary flow rates at much fewer feet of head [lower pressure]," Soderholm says. "Over time, I think they'll be able to slash their energy use even further. Even though this was not a system with variable-flow characteristics, the payback numbers are still really impressive."

Encouraging Payback Results

When looking at the premium of going with the four MAGNA3 units versus another brand in its class, the payback for the Science Center will be under three years for three of the new circulators and just slightly longer for the fourth. “We sized the pumps to match the old pumps, not knowing what their true system requirements were,” Soderholm says, explaining they had only the rating plates to go by, since their analysis was conducted during summer.

“Even though the Grundfos pumps are larger than necessary for this building,” he continues, “it’s not wasteful, because we were able to dial them down with impressive results,” Now the North wing is at 39.6 gpm at 14.8 ft.; the south — 25.5 gpm at 9.2 ft.; the east — 21.1 gpm at 8.53 ft.; and the west — 12.8 gpm at 7.2 ft. (See chart.)

What that translates into is an estimated yearly savings of $693. “The bottom line is that The MAGNA3 is sophisticated and capable of doing everything the old pumps did, only better because it’s smart,” says Schlumpberger. “It can tell itself to slow down or speed up, based on current demand. Another benefit is that now we can get data off the pumps’ readout and learn more about the building’s needs.”

Schlumpberger adds: “We just had the coldest winter in 30 years and we were running pumps at 25% of the head that the old pumps had, while keeping the building warm. In other words, we’re actually able to run the system at the original designed flow rate, using less power, less energy and at less cost.”

With measurable retrofit results this significant and evidence of other older heating systems on campus needing replacement, Schlumpberger is considering additional MAGNA3 installations.

“The Science Center project is a good barometer of the payback potential,” he says. “We will decide on a case-by-case basis, but it’s a very likely a possibility down the line.”

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St. John's Pump Retrofit: Comfort in the Bitter Cold, with Less Head and Lower Energy Consumption							
SCIENCE CENTER BUILDING WING	OLD PUMPS			NEW MAGNA 3 CIRCULATORS			
	FLOW (GPM)	HEAD (FEET)	POWER CONSUMPTION (Watts)	FLOW (GPM)	HEAD (FEET)	POWER CONSUMPTION (Watts)	PCT. SAVINGS
North	41.5	20.0	400	39.6	14.8	166	58.5
East	23.7	21.0	350	21.1	8.5	56	84.0
South	24.1	21.0	350	25.5	9.2	68	80.6
West	17.4	21.0	150	12.8	7.2	30	80.0

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Grundfos North America, part of the Grundfos Group, is a global pumps and pumping systems leader serving the residential, commercial-building and process-industry markets, as well as being a major supplier to the water-supply and water-treatment industries. Founded in 1945 in Bjerringbro, Denmark, The Grundfos Group is a worldwide enterprise that employs more than 18,000 people in 81 countries with North American headquarters in Downers Grove, Ill.

For more information, visit the website at www.grundfos.us

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Hi-res images shown in this case study are available for immediate download in .tif format by using this link: [**TO COME**]

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