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Pump-Retrofit Project Cuts Electrical Consumption in Half, Projected to Deliver One-Year Payback for Vermont Motel

MORRISVILLE, VT — Kevin Amyot had serious qualms last spring when contractor Ed Friedrich first proposed a major pump-retrofit project at the Sunset Motor Inn, one of the properties Amyot manages for the H. A. Manosh Corporation in Morrisville. Friedrich's \$13,000 estimate called for the replacement of 18 fixed-speed circulating pumps in the heating system at the Sunset with 10 circulators from the Grundfos Pumps Corporation.

Six of the pumps would be conventional, fixed-speed circulators. But the remaining four replacement units would be energy-saving, variable-speed, "smart" circulators. This quartet coupled ECM (electronically commutated motor) technology with sophisticated electronics for matching pump output to changing system demand – automatically and without human intervention – delivering substantial energy savings in the process.

Amyot was impressed with the new technology, and not just in the abstract. Friedrich had already done a successful retrofit at the home of company president Howard Manosh, and the latter's downsized electric bills provided eloquent testimony of the energy-savings the new smart circulators could provide. (More on this initial project in a bit.)



Kevin Amyot of H.A. Manosh Corp. (left) with installer Ed Friedrich of County Plumbing & Heating in Morrisville, Vermont: "Ed is highly experienced," says Amyot, "one of the best boiler people in the area, in our opinion."

Still, \$13,000 was a hefty outlay to update a system that continued to function at an acceptable level most days of the week. “At the outset, I just couldn’t see how we’d recoup our investment any time soon,” says Amyot.

Not that the older circulators didn’t have performance “issues” of their own. Installed in the 1980s, the pumps generated a fair amount of mechanical noise while moving hot water from the 500,000 Btu per hour, coal-fired stoker and two backup, propane-fired boilers in the motel’s mechanical room through hundreds of feet of pipe to Sunset’s 59-unit guest quarters. (The property also includes three stand-alone houses that are not part of the heating and domestic hot water system.) All the humming and vibrating was a frequent target for guest complaints.

Further aggravating the situation, the system operated 24/7/365 – whether hot water was needed or not. Consequently, there wasn’t much opportunity for relief, even at night (thus, the guest complaints). Of course, that round-the-clock operation was also the most fertile ground for energy savings.

Then there were the maintenance headaches: Given the pumps’ age, repairs were many and often. Couplers inside the pumps would weaken and break, or their bearing assemblies would need rebuilding. And because a motel must never be without hot water, all such breakdowns were tantamount to emergencies. Amyot estimates he spent between \$1,000 and \$1,500 each year on parts alone. For the sake of speed, internal personnel handled most repairs; but if he expensed their labor as well, the total annual maintenance tab would have approached \$3,000.

One of the Best

In the end, the high regard Howard Manosh and Kevin Amyot have for the professional skills of Ed Friedrich trumped their worries over cost and payback. A 22-year veteran of the plumbing and heating industry, Friedrich worked with the tools for nearly 15 years before establishing County Plumbing & Heating with two other partners – Gina Lanpher and Tom Sheltra – in 2003. Today, the Morrisville-based, 14-employee firm has eight service vans covering a largely rural trading area and doing a variety of work: plumbing, heating and air conditioning, and drain- and sewer-cleaning.

“Ed is highly experienced,” says Amyot. “But he also stays abreast of the latest trends and keeps us informed of them. That’s what makes him one of the best boiler people in the area, in our opinion.”

So Amyot set aside his misgivings and green-lighted the retrofit project last summer. Following the successful three-day installation, validation of this decision came almost immediately in the form of a

sharply lower electrical bill. In fact, after only three months of operation, Amyot was projecting an astonishingly swift payback of one year.

Total electrical consumption at Sunset in August 2011, the final full month using the old pumps, was 12,760 kilowatt-hours (kWh). (See Exhibit I on final page of this article.) During September and October, consumption declined 34 percent and 42 percent, respectively. In November, the beginning of the heating season in what was a mild autumn in the Northeast, consumption finished at roughly 4,400 kWh, a two-thirds reduction from August. Translated into dollars, the hotel's November electric bill was \$840 versus \$2,400 three months earlier.

Amyot now expects the motel's electricity usage will drop by half over the course of an entire year. "With the savings on electricity alone, I can see a payback of between 18 to 24 months." But he also figures to need 20 percent less coal, since the stoker now fires strictly on demand, as opposed to 24/7. Meanwhile, maintenance has dropped to zero.

"Factoring in the savings on coal and no maintenance costs," says Amyot, "I anticipate getting our \$13,000 back some time next summer. I am amazed at all the energy we are saving: We are very happy that Ed persuaded us to do the retrofit."

Good Neighbors

Personal and professional relationships played a big role in this story. First, there is the 20-year friendship between Friedrich and local Grundfos sales agent Darron Desroches of Urell Inc. "I know Darron and the guys at Urell very well, and I trust their judgment and recommendations," he says.

Then there's the special relationship between Friedrich and Howard Manosh: "I've known Howard all my life," says Friedrich. "Ed is like another son to me," says the 77-year-old Manosh.

But even beyond their close friendship, Manosh and Friedrich are also next-door neighbors, which is really how the latter came to introduce the concept of smart, variable-speed pumping to his friend. Late last winter, Friedrich approached Manosh about a new wet rotor circulator that Urell's Desroches had shown him: the Alpha.



Howard Manosh (left) with installer Ed Friedrich: "When Ed says he can do something, I'm inclined to believe him.," says the 77-year-old Manosh.

When equipped with ECM technology, a variable speed circulator like the Alpha can deliver the identical flow rate as an induction-type pump, yet consume only half the energy. This is true whether the circulator is operating in a constant-pressure or a proportional-pressure mode.

But the Alpha also offers a third mode, called AutoAdapt, which leverages an integrated logic board to “learn” a heating system’s ever-changing demand patterns over time. The circulator’s electronic “intelligence” automatically adjusts the factory set point to maintain performance while maximizing energy savings. Matching pump flow rate to actual heating demand will typically cut electrical consumption by 70 percent to 85 percent – maybe more, depending how badly the previous pumps were oversized.

Another key benefit of this type of smart circulator – distinguishing it from a conventional pump, even one with a separate variable speed drive – is its electronic diagnostics that track and report energy usage while displaying key data to speed troubleshooting in the field.

To combat noise reduction, the pump’s wet-rotor design circulates the media it is pumping around the rotor. This not only lubricates the rotor, but also cools it, eliminating the need for a fan – the component responsible for much of the noise generated by the old pumps at Sunset. The result is a whisper-quiet decibel level of 32 to 38 for the Alpha, depending on the model. (According to the Trace Center at the University of Wisconsin-Madison, a home dishwasher has a sound pressure level of approximately 50 decibels; normal human conversation, 60.)

Efficiency Begins at Home

Knowing that Manosh was less than thrilled with efficiency of his home’s hydronic baseboard and radiant floor heating system, Friedrich suggested this new circulator could lower his friend’s monthly electric bill. Manosh was game to try: “When Ed says he can do something, I’m inclined to believe him.”

“I removed the system’s existing eight circulators, replacing them with a single Alpha and eight zone valves,” recalls Friedrich, who would soon employ a similar less-is-more pumping strategy at Sunset. “Throughout the summer, when the system provided only domestic hot water, Howard was saving about \$50 per month on his electricity.”

Manosh was impressed enough with these results to contemplate similar retrofits for his many business holdings. Founded in 1959 as a one-man, excavating-contracting company, H.A. Manosh diversified into well drilling, pump sales and service, and water treatment over the next decade.

Manosh also now operates a five-location aggregate business, manufacturing various types of sand, stone, gravel and rock. Total corporate employment is now approximately 75.

Manosh also owns and manages approximately 500,000 square feet of retail and industrial space in the Morrisville area, including a shopping plaza, a car wash, a fuel oil distributor, a number of incubator facilities for fledgling industrial startups — and, of course, the Sunset Motor Lodge. Here is where he saw the biggest potential for Friedrich's energy-saving pumps.

"Howard knew that the motel had several pumps that operated round-the-clock, just like at home," says Amyot, "so he asked that I develop a plan and a budget." Once Amyot felt reassured about his cost concerns, Friedrich went to work overhauling all the pumps used in Sunset's heating system.

Intelligent Design at Work

Friedrich installed four variable speed circulators to move hot water from the main header to the four main heating zones and the various subzones throughout the L-shaped hotel structure. One of these circulators is an Alpha (maximum flow rate of 25 gallons per minute), similar to the one Friedrich used in Manosh's home and serving five guest rooms in one small section of the hotel. The remaining three are the more powerful

Magna 32-100 circulators (maximum flow rate: 180 gpm), each handling 12 guest rooms. Also made by Grundfos, the Magna features the same intelligent design as the Alpha, adjusting flow rates to changing system demand automatically.

"I set all four circulators on AutoAdapt," says Friedrich, "because I knew that the load-matching feature along with the design of the motor itself would deliver the major reductions in electrical consumption."

Friedrich's system overhaul did not include replacing larger equipment: Not only did the stoker and two back-up propane-fired boilers remain in place, but so did the zone valves for the four main heating zones. The function of a zone valve in a hot-water system is to permit hot water from the primary piping loop to enter its zone to provide heat through baseboard or a radiator. Once a thermostat,



Installer Ed Friedrich with two of the MAGNA units and the one ALPHA unit he installed at Sunset: "I set all four circulators on AutoAdapt," says Friedrich, "because I knew that the load-matching feature along with the design of the motor itself would deliver the major reductions in electrical consumption."

either integral to the valve or a separate device, indicates the zone has reached a preset temperature, it signals the valve to close, thus halting the hot-water flow into the zone.

But at Sunset, the thermostats and zone valves were not connected with the old circulators, which were therefore allowed to run nonstop, even when no hot water was needed. As part of the system redesign, Friedrich had an electrician run a wire from the end switch for each zone valve to the appropriate Magna or Alpha circulator. Now, when a zone no longer needs hot water, the valve closes and – through a pump relay switch – signals the circulator to shut off as well. “Having those circulators running all the time is like idling your car 24/7, because you just might take it for a drive,” says Friedrich. “But that’s the way commercial systems were built when energy costs weren’t a factor.”

The continuous circulation of hot water in the old system wasted energy in one other important way: heat loss through all the piping that runs through the structure. Load-matching smart circulators operating less frequently have also reduced that wasted energy.

Additional Circulators

The Sunset project also included the installation of six additional, induction motor-type circulators made by Grundfos. Here is how Friedrich positioned them in the redesigned system:

- A cast-iron, three-speed, UPS43-44FC circulator (“SuperBrute”) moves hot water from the stoker to the main header through the two backup boilers in a reverse-return manner. The 500,000 Btu/h stoker generates sufficient hot water for both space heating and domestic hot water the majority of the time, especially in the summer, according to Friedrich. “But if the stoker cannot handle the load, one or both of the propane-fired boilers will activate to boost the water temperature to the set point.”

The main header feeds both the four space heating zones, controlled by the three Magna circulators and the Alpha; as well as the two domestic hot water lines for the motel’s recirculation system. Here is how this system is configured:

- For each of the two lines, another cast iron, three-speed Super Brute (UPS26-99) moves hot water from the main header to an Everhot Heat Exchanger Water Converter, which transfers heat to the potable water that ultimately circulates to the guest rooms.
- Once the water moves through the converter, a bronze UPS26-99BFC circulator pumps it to a 400-gallon storage tank.

- Hot water is then circulated by a stainless steel UPS15-35SFC circulator from the two storage tanks to any of six recirculation lines looping the entire motel. This single pump now does the work of six different pumps that were removed by Friedrich during the retrofit.

The six recirc lines are essential because of the long water-supply lines that are inevitable in a hospitality structure like the Sunset, notes Friedrich: “The runs are laid out so that the distance between a recirc loop and any hot-water outlet is relatively short – eight or ten feet, typically – minimizing the wait. Without this type of setup, guests would be standing around an uncomfortable amount of time, waiting for showers, and a lot of potable water would be wasted down the drain.”

To recap the new pump count at Sunset: four ECM circulators and six induction-motor circulators replacing 18 older and, for the most part, seriously oversized pumps. Amyot also bought two additional smart circulators to bring the final tally to 12: an Alpha and a Magna. But these were immediately put on the shelf to serve as spares “just in case,” he says. “No matter what the quality of the product, this motel cannot afford to be without hot water. The extras were purely for security.”

Get Smart

One successful project generates another at Manosh. Since the Sunset installation, the company has upgraded its 20,000-square-foot (sf) headquarters with a new boiler and all new smart pumps, as well as a 15,000 sf restaurant on the Sunset property that received new pumps as well. “We burn No. 2 fuel oil there, and the price is rising all the time,” says Amyot. “We needed to do something at that facility.”

The Manosh experience is part of a larger trend in the hydronics field. Until relatively recently, conventional wisdom insisted that variable-speed technology be confined to pumps of 50 horsepower or more that ran nonstop or very close to it. Fuel and equipment costs simply didn’t justify applying this sophisticated technology to smaller pumps,

especially the fractional-horsepower variety. With energy costs being so low, the economic penalty for oversizing the pumps was easy to ignore or dismiss.

But attitudes have changed with energy prices and environmental awareness over the past decade, especially since the downturn that began in 2008. Today, facility owners and managers are relentlessly



Buildings manager Kevin Amyot:
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searching for ways to cut the cost of ownership in every facet of operations, large and small and in between, including pumps. With the latter, the energy needed to operate one represents 85 percent of its life-cycle costs, hastening the drive for higher efficiency.

“To recoup our \$13,000 investment in only one year is better than I could have anticipated,” says Amyot. “Frankly, I would’ve happily taken a five-year payback.

“Best of all, my maintenance headaches are at zero,” he continues. “I can go home every evening and not worry about having to dispatch a tech to a property to fix a broken pump overnight, to make sure we have enough hot water in the morning. It’s tough to measure in dollars, but that kind of peace of mind is huge for me, too.”

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ABOUT GRUNDFOS PUMPS

Grundfos Pumps Corporation, 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 Olathe, Kan.

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: <http://grundfos.oreilly-depalma.com/2012/cs-sunset-motor-inn.shtml>

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EXHIBIT I:

Sunset Motor Inn Electricity Consumption and Payments January – November 2011

MONTH	ELECTRICITY CONSUMED (kWh)	PAYMENT (\$)	PERCENT CHANGE FROM PEAK (%)
JANUARY	8,800	1,500.11	N/A
FEBRUARY	7,280	1,308.11	N/A
MARCH	7,680	1,329.40	N/A
APRIL	6,800	1178.60	N/A
MAY	7,000	1,246.97	N/A
JUNE	8,040	1,495.37	N/A
JULY	11,360	2,274.37	N/A
AUGUST	12,760	2,404.17	N/A
SEPTEMBER	8,440	1,570.14	-33.9
OCTOBER	7,360	1,377.14	-42.3
NOVEMBER	4,400	839.51	-65.5

Note: **Boldfaced data in red indicates post-installation consumption and payments.**

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