

# the NEWS

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## Lowering Commercial Operating Costs With Variable-Speed Drives

BY CHARLIE PUTZ  
For The News

Facility managers across North America face many challenges in staying ahead of operating costs. One constant challenge is the rising cost of electricity.

Commercial electricity prices are as high as 15 cents per kilowatt-hour (kWh) in some regions, with a 2003 average retail price of nearly 8 cents.

This constitutes an 8.4-percent climb during the past three years. Industrial customers are slightly better off, with a high of 12.2 cents per kWh, an average of 5.13 cents per kWh, representing a 12.3-percent climb over the past 3 years.

The constant rise in electricity prices has driven variable-speed drive (VSD) manufacturers to create ever more flexible, compact, and easy-to-install drives to help control electricity consumption. If your facilities customer has been putting off investing in drives, the constant upward slope of electricity prices and the improvement in VSD technology makes this a good time to invest in future savings.

In a typical hospital, over 65 percent of the facility's energy is consumed by HVACR equipment. This is good news for VSD-capable HVACR contractors — you have the ability to make a dramatic impact on your customer's energy bill.

### Calculating Value

To calculate the value of a VSD retrofit for your customer, start with an evaluation of your customer's energy consumption and price. In this case, the chiller is a 1,300-ton system with chiller, air handler, and pumps.

If we break down motor horsepower (hp) within a typical large facility with an applied HVAC system, the chillers represent 55 percent of the hp in the system, air handlers around half that, and pumps and cooling towers represent the balance of the hp.

Many VSD manufacturers have tools to help calculate energy savings delivered by use of their products. Carrier Commercial Service uses a homegrown program called VSD ChillerCalc to derive the economic benefits of a retrofit application of a VSD to a centrifugal chiller.

The program takes into account compressor design, number of stages, and refrigerant type. Similar calculators exist for deriving savings for fans and pumps. Air handlers with inlet guide vane controls can also be modified for use with VSDs.

General modeling parameters include the number of operating hours, the cost of electricity, the efficiency of the motor, and a histogram of operating hours by percent total load. In this example, we used 5,600 annual operating hours and 6 cents per kWh electricity cost. Our 1,300-ton system derived the following benefit by changing from constant speed to variable speed:

#### Annual Energy Cost

Constant Speed:  
\$ 364,063

VSD Operation:  
\$ 197,105

Energy Cost Reduction/Savings  
\$ 166,958

In this example, the VSD retrofit provided 45.9-percent savings to the customer.

A rough estimate of the installation price provides a 2.1-year payback and a 47-percent return on investment (ROI) for the customer. It's a great example of a win-win project for the contractor and the customer.

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Again, the value proposition changes with the customer's cost of electricity, run hours, and capacity. New York City has very high energy costs, yet an Oklahoma City facility may run the chiller for twice as many months out of the year, yielding a similar ROI on the VSD investment.

In addition, local utilities may offer incentives that further enhance the benefit to the customer.

## Case Study

As part of his effort to control energy costs, Vince Scoccia, director of facilities management at John Muir Medical Center, engaged Carrier Commercial Service to retrofit his chillers with VSDs.

At John Muir, the compressor motors in the chillers total approximately 1,500 hp. By matching the speed on these motors with cooling demand, substantial reductions in energy consumption were possible. Carrier used John Muir's expertise on its patient comfort needs to develop a cooling load profile, and delivered a project with calculated savings of \$71,443 per year.

Carrier worked with John Muir and the local utility (Pacific Gas and Electric) to

qualify the project for a rebate of \$65,000. The payback for this project was 3.4 years, and had an attractive 29.8-percent ROI.

According to Scoccia and Bob Foster, supervisor of operations, the benefits of the VSD project extend beyond financial ROI. "The lights don't dim anymore when chillers come on, the chillers seem to operate better, and mechanical troubles seem to have gone away," said Foster.

Scoccia noted that as the director of facilities, one of his main responsibilities is to manage the medical center's facilities money efficiently. The VSD project has gone a long way toward reducing his biggest expense item.

"Each dollar saved equates to 20 dollars of revenue," he said. "What finance officer

wouldn't like that outcome?"

It's worth noting that the electrical system in a building should be reviewed to determine if a VSD should be supplied with a harmonic filter. Depending upon the transformer sizing of the building, its impedance, percent kilovolt amperes (kVA) loaded and other items, a drive may or may not produce harmonics that could interfere with computers, electronic light ballasts, or other equipment.

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