



YASKAWA

Hospital Experiences \$17,000/Yr Savings with AC Drive Install

Like most providers in today's competitive health care market, the Barnes Jewish Christian Health System (BJC) constantly strives to maintain low operating costs and improve efficiency throughout its numerous facilities.

Steadily escalating energy costs provided sufficient incentive for BJC to initiate studies aimed at achieving an effective HVAC system upgrade. Goals were to achieve maximum utility cost savings through efficient energy use and to lower operating costs through installation of a state-of-the-art energy management system.

As the first step in its program BJC solicited proposals for an HVAC system upgrade for its Christian Northeast Hospital. In response, Siemens Building Technologies (SBT), was able to provide a "turnkey" solution which in the first year of use has saved more than \$17,000 in BJC's Christian Northeast facility.

SBT's solution was based on a state-of-the-art Siemens Apogee' Building Automation System and centered on installation of two dozen Yaskawa variable frequency drives on the facility's air handling units.

Christian Hospital's HVAC system, like many installed in the 1970s and 80s, utilized a "constant air volume" approach. In a constant air volume system, fans and motors are sized to meet maximum load demand. Both run at constant maximum speed while air volume is modified by a variety of mechanical devices, including dampers and vanes which throttle flow to various portions of the facility.

In a typical building, however, maximum capacity is required about 10 % of the time. Ninety percent of fan operating time requires only 40-70 % of maximum volume.

At Christian Northeast, consistently applying 30 to 60 % more energy to fan operation than was necessary was producing a significant waste of electricity and inflated utility bills.

variable frequency drives, on the other hand, regulate fan speed and air volume to match flow requirements, significantly reducing fan/motor energy consumption.

The variable frequency drive delivers its savings by controlling the motor and spinning the fan only fast enough to maintain the desired air volume.

The drive's ability to adjust system air volume by changing fan and motor speed and, therefore, power consumption, produces significant energy savings, typically ranging from 10-75 %.

The savings are produced as a function of universally-accepted centrifugal fan laws:

System volume varies directly with fan speed.

System pressure varies with the square of fan speed.

Power consumption, however, varies with the cube of fan speed.

Therefore, a small reduction in speed produces a significant reduction in power consumption.

In other words, the same system that requires 100 % of full power to produce 100 % of volume needs only 28 % of full power to deliver 60 % of volume. Obviously, significant savings are achieved by the drive's ability to reduce fan speed during 90 % of the day when full system capability is not required.



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As in most facilities, the vast majority of fan units at Christian Northeast are required to operate at only 60 to 80 % of max. speed most of the time.

With the installation of the Yaskawa variable frequency drives, regulation of fan speed and air volume is now regulated to match flow requirements, as opposed to the constant air volume system previously used. This has resulted in significantly reducing energy consumption.

Jim Nelson, Siemens project manager, has reported more than \$17,000 a year in energy savings from the drive installations alone. These savings are based on the local electrical cost basis of \$0.05 per kilowatt hour and does not factor in any potential impact of reduced utility demand charges.

The 24 Yaskawa ac drives ranged in size from 7.5 to 75hp. All were configured for fan/motor operation and installed to control power to both supply and return air fans. All drives were built with integrally mounted bypass options to switch directly to "line" power in emergency situations and integrally mounted three-phase input line reactors to smooth line current fluctuations.

Each drive also incorporated advanced transistor technology to reduce system noise and harmonics and lower motor and blower noise levels for a quiet hospital environment.

Installation of the turnkey system required that all energy saving components be compatible with the Siemens high speed Floor Level Network (FLN) serial communication system. Yaskawa achieved this by incorporating an FLN serial communication option card into each drive so that the maintenance staff could access all drives and other intelligent system devices from any location to modify and monitor settings.

This high speed network control system utilizes two-way communication via a PC and provides the ability to monitor, change and record drive parameters including current, kW, speed reference, fault/alarm codes and many other settings.

According to Nelson, "installation of the drives as part of our upgrade was a given." The drives were easy to justify through projected energy savings and short payback cycles alone"

"The drives have provided other advantages, including more accurate temperature control and the ability to easily reduce peak demand and usage charges," Nelson said. "We've also realized significantly reduced maintenance costs because of the drives' ability to accelerate and decelerate the motors and mechanical equipment smoothly. This soft start capability cuts down on mechanical stress that occurs when you have to simply apply line power. Additional savings are also realized since maintenance formerly required on vane and damper installations is completely eliminated."

"The drives themselves have proven to be virtually trouble-free," Nelson said. "Our next step is to explore the advantages of installations in the rest of our St. Louis area facilities."