UNIVERSITY OF WISCONSIN–LA CROSSE
STUDENT ASSOCIATION
235 CARTWRIGHT CENTER 1725 STATE STREET LA CROSSE, WI 54601 (608) 785-8717

SA1516-058: Resolution Approving Spring 2016 Green Fund Request, variable frequency drives for the REC HVAC system.

DATE: April 20th, 2017
AUTHOR(S): Jeremy Ames
SPONSOR(S): Segregated University Fee Allocation Committee

WHEREAS; The Joint Committee on Environmental Sustainability believed this request fulfilled the requirements of the Green Fund, and;

WHEREAS; SUFAC is responsible for submitting recommendations to Student Senate, and;

WHEREAS; after discussion, SUFAC denied the request for funding, and;

WHEREAS; the Student Senate is required to approve all Green Fund Requests.

THEREFORE BE IT RESOLVED; that the Student Senate approve the variable frequency drive funding request at $11,510.

Molly Davies
President, Student Senate
Vice-President, Student Association

04-27-2016
Date

Kaylee Otterbacher
President, Student Association

04-27-2016
Date

- Green Fund -

University of Wisconsin - La Crosse
Application for Environmental Sustainably Reserve

Spring 2016

Application must be received by March 21, 2016

Please send completed applications to greenfund@uwlax.edu. You will be sent a confirmation e-mail verifying that the proposal was received.

For more information about the Green Fund or the application process please refer to the following; Green Fund Bylaws, Green Fund webpage or email us at greenfund@uwlax.edu.

Include the following with this application:

- At least 3 price comparisons of the item(s) or project.
- Budget Sheet
- Other supporting documentation

Contact Information

Name: Sue White

Phone: 785-6529

Email: swhite@uwlax.edu

Unit/Organization/Department: Recreational Sports (Recreational Eagle Center)

Please give a brief overview of the proposed items or project(s) you are requesting funding. What would be the approximate cost?

The Recreational Eagle Center (REC) is requesting funding to purchase 4 Variable Frequency Drives (VFD) for the HVAC (heating, ventilating, and air conditioning) units within the Recreational Eagle Center. This request is for 2 – 20 HP (Horse power) units and 2 - 7.5 HP VFD's. VFD is "a type of adjustable-speed drive used in electro-mechanical drive systems to control AC motor speed and torque by varying motor input frequency and voltage.

Total cost of the project estimated by Facilities and Management is $14,260.

What is the general timeline for the project? (When do you see this being on campus?)

The Variable Frequency Drives would be installed as soon as the installers are able fit this project into their work schedule.

Please give a detailed explanation on the environmental impact of proposed project? Will this project reduce UW-Ls Carbon Foot print, water usage or electricity consumption? If indirectly please explain how.

Focus on Energy states, "Variable frequency drives (VFD's) reduce electrical energy consumption by adjusting a motor's speed to match the required load. Many electric motors simply do not need to run at 100-percent capacity all of the time. VFD's typically control motors that power fans and pumps used in heating, ventilation, air conditioning and other systems were motor speeds can vary. Prior to VFD's, motor speed had only two options: on or off. Variable frequency drives allow us to adjust motor speed to save considerable amounts of energy." (See attached Fact Sheet from Focus on Energy)

The amount of energy saved with VFD's depends upon the application of the motor. Consider a 25 horsepower fan motor operating for 24 hours a day. It's unlikely the fan needs to run at full capacity for the full 24 hours. For example, if the unit runs at full capacity for two hours, 75-percent capacity for eight hours, 67 percent for eight hours and 50 percent for six hours, a VFD would reduce energy use by 32 percent.

During the academic year the REC is open 18 hours Monday-Friday, 14 hours Saturday and 11 hours on Sunday. During semester breaks, spring break and summer sessions our hours of operation are much less. In fact we are closed on every Sunday during the summer and university breaks. The installation of the VFD's would allow us to match the speed of the motor(s) to the needs of the building, thus saving significant electrical costs.

It is estimated that the installation of the 4 VFD's within the REC will reduce the electrical costs from $200 to $500/month or a yearly savings of $2,400 to $6,000 for the REC. The payback on this investment would be in 2-5 years.

How will this project increase student understanding of environmental issues or actions?

This project is impossible for students to actually see. However, it is a cost savings project that will reduce the electrical consumption of the REC therefore reducing our carbon footprint. This project will show students that the university is constantly looking for ways (both visible and behind the scenes) to improve its efficiencies and save costs to students at UWL. As a reminder the REC is 100% student fee funded.

Do you plan to collaborate with other entities? This includes, planning, executing the project through student or community organizations and university departments/offices.

Yes, we will work closely with the Doug Pearson and Scott Schumacher from the Department of Facilities and Management. They will coordinate the purchase and installation of these drives.

Large and complex projects require UWL staff member(s) to be involved, please list designated personnel who are involved in the proposed project or have been contacted to verify project viability.

Name(s): Doug Pearson, Scott Schumacher
Email(s): dpearson@uwlax.edu, sschumacher@uwlax.edu

Are you receiving additional funding from other university or non-university entities?
YES: X NO:

If yes, please state the other sources of funding that you are receiving and the amount received.

There is $2,750 energy incentives available for this project. This incentive (rebate) will reduce the total project cost to $11,510.

Is there any other relevant information that you would like to add?

Attached are additional documentation supporting the benefits of the Variable Frequency Drives.

Thank you for your consideration and continual support in sustainable projects

Budget: (*There is only one vendor for this product)

*20 HP Variable Frequency Drives	2 @ $2,746 = $5,492
7.5 HP Variable Frequency Drives	2 @ $1,776 = $3,552
Installation of 20 HP VFD at $1,304 ea	2 @ $1,304 = $2,608
Installation of 7.5 HP VFD at $1,304 ea	2 @ $1,304 = $2,608
Total (parts & labor)	$14,260
Incentive (rebates)	($2,750)
Total Request	**$11,510**

HEATING/PIPING/AIR CONDITIONING
HPAC ENGINEERING

Energy Efficiency, the Environment, and VFDs

BILL GENAW, EATON CORP., MILWAUKEE, WIS
Sun, 2011-05-01 12:00

With advances in hardware and software, savings never have been greater

Green initiatives are more than the right thing to do. Given budgetary pressures and an emphasis on increased efficiency, they make good economic sense.

Strategically managing power can yield significant advantages—energy savings, improved sustainability, cost reductions. Among the technologies helping us to meet energy challenges while addressing efficiency and reliability concerns are variable-frequency drives (VFDs).

Driving Energy Efficiency, Delivering Savings

VFDs can achieve significant energy savings and extend the life of mechanical systems. By closely matching a motor's speed to output requirements, drives help you to use only the energy you need, yielding system energy savings of 10 to 50 percent. Further, drives can be used to gradually accelerate motors or pumps, helping to protect assets and extend equipment life. In terms of both hardware and software, today's VFDs are able to generate more energy savings than previously possible.

Hardware Advances Improve Efficiency

Advances in capacitor technology are yielding net energy savings while limiting toxins. Traditionally, drives have utilized electrolytic capacitors to store energy and act as a filter for current pulses. Electrolytic capacitors leak electrolytes into landfills, produce unnecessary heat, and are less efficient than newer technology. Today's advanced drives are constructed with thin metalized-film capacitors that are non-toxic and Restriction of Hazardous Substances-compliant. Additionally, metalized-film capacitors do not require recharging, even after years of sitting on a shelf. They are self-healing, preventing hot spots, extending shelf life, and decreasing heat loss.

New capacitors lose less power, are more efficient, and produce less heat within a drive package. Because heat can significantly limit drive life, drives utilizing thin-film technology tend to last longer.

Software Advancements Fuel Energy Savings

Significant changes in software functionality are contributing to the improved energy savings achievable with today's drives. Advanced algorithms, heat-management systems, and enhanced functionality are making drives more efficient.

Energy-Control Algorithms Deliver

With advanced algorithms, the operating point of a drive and motor system can be adjusted dynamically in response to load conditions, reducing motor losses and improving efficiency. As a result, energy savings in both variable-torque and constant-torque applications can be improved significantly; typically, energy savings would not be realized in constant-torque applications with a VFD.

Using a drive for light-load conditions—typical of pumping and other variable-torque applications—can result in energy savings. For example, in a 50-hp application, $10,000 to $28,000 in energy savings can be achieved over the life of one of today's drives. By using drives with advanced efficiency algorithms, customers can save 0.5 to 10 percent more than they can with traditional drives.

Managing Heat to Increase Savings

Drives use internal fans to cool themselves. Traditionally, the fans are programed to run at full speed whenever a drive is energized. Newer drives monitor heat-sink temperature and control fans to receive only the amount of cooling that is necessary. Closely matching cooling requirements to fan speed can reduce the energy needed to control fans by 20 to 60 percent. Less loss means increased energy savings for drive users.

Saving Energy in Sleep Mode

In run mode, a drive consumes energy—even if a zero-speed reference is given. Some drive manufacturers offer an enhanced sleep function, which allows a drive to shut down when it is not needed. This can be useful in an application involving a fan or pump, in which a drive's internal proportional–integral–derivative (PID) loop controls speed.

A PID loop uses a set point and system feedback to determine speed. When feedback from a remote sensor indicates low or zero speed is required, a drive is able to turn off a motor by removing the run command. The drive returns to run mode when the system indicates a higher speed is required. Simply put, this functionality allows a drive to be better tuned to actual energy needs, tapering system requirements during off hours and on weekends and holidays, allowing customers to see significant savings on their energy bill.

Sustainability by Design

Drive technology continues to become smarter and more efficient with innovative motor-control developments. Significant incremental system savings can be achieved without hardware additions or advanced setup requirements.

According to the U.S. Department of Energy, motor-driven equipment, such as pumps, fans, and compressors, consumes about 16 percent of the energy used in U.S. industrial applications. This amounts to $30 billion annually. For variable-speed applications, installing a VFD with the latest motor-control technology is a simple and cost-effective way to yield significant energy savings.

Did you find this article useful? Send comments and suggestions to scott.arnold@penton.com.

Bill Genaw is a product manager for Eaton. An electrical engineer by training, he has extensive experience in the design and implementation of motor and control equipment. Eaton is a global company helping customers better utilize electrical, hydraulic, and mechanical power by focusing on energy-efficient solutions.

Source URL: http://hpac.com/archive/energy-efficiency-environment-and-vfds

BUSINESS PROGRAMS

Control your energy costs with variable-frequency drives

FACT SHEET

For more information, call **800.762.7077** or visit **focusonenergy.com.**

According to the U.S. Department of Energy, motor-driven equipment accounts for 64 percent of the electricity consumed by U.S. industry. As businesses come under increasing pressure to reduce energy use and operating costs, variable-speed drives (VFDs) are emerging as a popular solution.

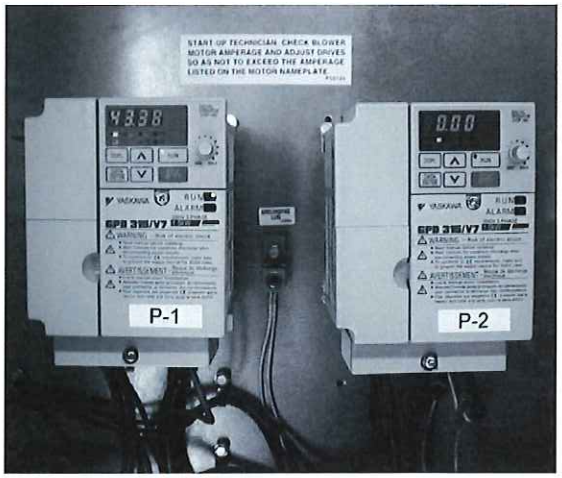
VFDs reduce electrical energy consumption by adjusting a motor's speed to match the required load. Many electric motors simply do not need to run at 100-percent capacity all of the time—such as those that power fans and pumps used in heating, ventilation, air-conditioning, and process-pumping applications. By outfitting these motors with VFDs, facilities can control the equipment's output to match the operation's needs, saving energy when full output is not required.

VFD BENEFITS

With advances in microelectronics and control technology over the past 10 years, VFDs have become an efficient and reliable means of controlling motor speed. Facilities that install VFDs will use less energy, cut operating costs, and even improve process precision.

VFDs eliminate the need for expensive and energy-wasting throttling mechanisms such as control valves and outlet dampers. In addition to lowering electricity costs, VFDs reduce wear and tear on motors and related components—decreasing maintenance costs and prolonging equipment life.

A motor without a VFD operates at a constant speed. When full power isn't needed, the motor can cycle on and off frequently in an attempt to match the load. This creates unnecessary wear and reduces equipment life.



A major benefit of VFDs is their "soft-start" capability that gradually ramps up a motor's operating speed at startup and greatly reduces the stress on components. On typical startup, a constant-speed motor is subject to high torque and electrical surges that can reach up to 10 times the full current load.

VFDs can improve process efficiency and occupant comfort. For example, VFDs allow greater control of machine tool drives and processes such as water distribution, aeration, and chemical feed. In wastewater treatment plants, VFDs on aeration blowers can maintain consistent concentrations of dissolved oxygen. In heating, cooling, and ventilation (HVAC) applications, VFDs can improve occupant comfort by modulating the flow of air throughout a building.

VFDs further improve occupant comfort by reducing the noise output of fans and pumps.

COMMON APPLICATIONS

Facilities of all kinds can benefit from VFDs—universities, hospitals, office buildings, food-processing and industrial manufacturing facilities. Virtually any application that uses motors to drive fans and pumps can find significant savings in the use of VFDs.

Some of the most common applications for VFDs are found in the pumps and fans used for HVAC systems such as chiller-condenser water pumps, domestic-water booster pumps, air-handling fans, and cooling tower fans.

VFDs can operate on motors ranging in size from one-third horsepower (hp) up to several thousand horsepower. Energy savings are highest when VFDs are used with variable-torque loads, such as fans and pumps for HVAC purposes. The best applications are large motors that can operate for many hours at reduced speeds, such as fans for cooling towers, where loads vary from season to season and from day to night.

VFDs are not recommended for use with motors that continually operate at or near full speed, as their benefits are minimized and the VFDs themselves add a small increase to the electrical load.

POTENTIAL SAVINGS

The steady decline in VFD cost, combined with the increase in energy savings, makes VFDs a solid long-term investment. Due to the basic nature of fan and pump operation, even a small reduction in motor speed can lead to a large reduction in horsepower and electricity consumption.

Paybacks for VFD installations are especially attractive for larger motors because the cost per horsepower often decreases with size. As a rule of thumb, adding a VFD to an applicable system costs approximately $200 to $500 per horsepower installed.

How much can VFDs save? Consider a 25-hp fan motor operating for 23 hours a day. It's unlikely the fan operates at 100-percent capacity for the full 23 hours. If the unit actually runs at full capacity for only two hours, 75-percent capacity for eight hours, 67 percent for eight hours, and 50 percent for five hours, a VFD will reduce energy use by 32 percent compared to an outlet damper.

Recently, a hospital in the Milwaukee metropolitan area retrofitted several air-handling units of its HVAC system with VFDs that replaced inlet guide vanes. A total of 330 hp of supply-air and return-air fans were updated with VFDs. The new systems, which operate 24 hours a day, are expected to save approximately $36,800 each year (cutting annual costs from $61,800 to about $25,000) based on an energy cost of $0.05 per kilowatt-hour (kWh). With the total cost of the retrofit at $108,990, Focus on Energy estimates the project will pay for itself in less than three years.

VFD installation costs depend on the size and complexity of the project and in some cases may equal or exceed the cost of the drive itself. When retrofitting, check with the motor manufacturer to ensure the motor is rated for use with a VFD. Exact savings will vary depending on the load profile.

FIND OUT HOW YOU CAN BENEFIT

How much energy and money could VFDs save your business, school, or government facility? Contact Focus on Energy to find out. Our professional energy advisors can help you learn more about the operational, economic, and environmental benefits of these practical energy savers. Call 800.762.7077 to learn more, or visit focusonenergy.com/vfd.