Liberty Utilities®

Variable Speed Control Drives Energy Savings

KEY POINTS

- **VFDs save energy by adjusting motor speed to match load requirements**
- **Motors that drive variable loads, such pumps and fans, are ideal candidates for VFDs**
- **VFDs have limitations that make them unsuitable for certain applications**

Find out what incentives are available for your home or business.
Energy Efficiency 603-216-3698
NHSaves@LibertyUtilities.com
or visit NHSaves.com

Motors are designed to operate at a constant speed. However, the devices they operate frequently run at less than their rated load. Allowing a motor to run at a higher rate wastes energy. Variable frequency drives (VFD) adjust motor speed to match load fluctuations, reducing energy costs. VFDs also provide soft starting, which extends equipment life by reducing mechanical stress and voltage sags.

How variable frequency drives work

VFDs convert alternating current (AC) to direct current (DC), and then they convert the DC back to AC at a frequency that will drive the motor at the desired speed. Although this makes the motor run less efficiently, the ability to respond to load variations reduces overall energy use..

Applications and energy savings

VFDs are ideal for facilities with long operating hours and frequently changing load requirements. Typical applications include:

- Pumps in industrial processes
- Conveyors in warehouses or manufacturing facilities
- Fans in heating, ventilation and air conditioning (HVAC) systems
- Industrial equipment, such as machine tools, mixers, washers and saws
- Any process or machine that can be improved by varying speed or flow

VFDs offer the greatest opportunity for energy savings when driving these loads, because horsepower varies as the cube of speed, and torque varies as the square of speed for these loads. For example, if the motor speed is reduced by 20 percent, motor horsepower is theoretically reduced by 51 percent. The actual energy savings may be less because of drive conversion losses.

Constant torque and horsepower loads are also candidates for VFDs, but the advantages are not as great. Constant torque loads represent 90 percent of all general industrial machines (other than pumps and fans). When operated at full load continuously, a motor is up to 6 percent less efficient with a VFD than with a standard drive. Look at the motor

operating curve to determine the number of hours the motor is expected to operate at full load..

Are VFDs right for your application?

VFDs offer a number of cost-saving benefits, but they come with limitations that may make them difficult to apply in certain situations.

Benefits:

- Energy savings
- Increased equipment life
- Practical to use in a variety of applications
- Low maintenance; no moving parts other than push-buttons
- Easy to install and retrofit

Limitations:

- Waste more energy as heat, particularly when there is a significant speed reduction
- Increase losses in the transformers that feed them because the input waveform becomes distorted
- May cause motors to run hotter
- Cannot be used with conventional AC motors where high torque must be maintained
- Motors need to have cooling independent of motor speed, which is typically a special requirement
- Overall system efficiency of modern DC drive systems and variable-pulley drives can be higher than the system efficiency of VFDs on induction or synchronous motors

Evaluate your needs carefully before installing VFDs, then talk with your product supplier or a facility engineer about the feasibility of using VFDs in your application..

ENERGY SAVINGS HIGHLIGHT

VFDs are ideal for facilities with long operating hours and frequently changing load requirements

Liberty Utilities

- may fund a portion of the cost of an energy audit study
- provides incentives on energy savings improvements
- may require pre-approval of the audit and incentives

NHSAVES we all win

SIGN UP FOR OUR NEWSLETTER AT bit.ly/ElecBusMyEnergyTips