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Benefits and Applications of VFDs

Introduction

A VFD, or variable frequency drive, is a type of motor controller that powers an electric motor by controlling the supply frequency and voltage. In HVAC usage, this directly translates to control over the motor RPM and unit CFM.

The most immediate benefit to using a VFD is energy savings. By matching system capacity to the actual load throughout the entire year (accounting for seasonal fluctuations), major savings in system motor energy use are achieved. Applications with intermittent exhaust loads are similarly well served by VFD control.

Another benefit of the units is reduced wear and tear on the motors. When a motor is started, it draws a much higher current than during normal operation. This surge of current can be three to ten times the full-load operating current for the motor, generating both heat and stress in the motor's windings and other components. In motors that start and stop frequently, this contributes to early motor failures.

In contrast, when a motor connected to a VFD is started, the VFD applies a very low frequency and low voltage to the motor. The motor is then gradually brought up at a controlled rate to normal operating conditions, extending motor life.

The ability of the VFD to adjust a motor's operation also lends itself to greater flexibility in the field. When balancing a VFD-equipped unit, rather than changing the belts and pulleys, one simply adjusts the motor frequency.

Due to these benefits, in addition to reduced VFD costs, VFD's are now being used more than ever before.

Options

Static pressure control: Building static pressure control allows automatic control of the VFD in order to maintain a desired building static pressure. This controller will sense the difference between pressure inside the building and outside the building and will automatically adjust the blower speed by varying the hertz output of the VFD. A photohelic pressure gauge and sensor kit are included with this option.

Manual potentiometer: Potentiometers allow individuals to control the VFD remotely using manual adjustment to match the building ventilation requirements.

Preset speed control: The VFD can be controlled at a remote location by contacts or switches that will change between programmed hertz outputs for the VFD. This option allows for customer interlocks to control multiple fixed make-up air speed settings for matching corresponding exhaust loads in order to balance the system.

Analog input control: This option allows for external control of the VFD by use of an input signal, either 4-20 mA or 0-10 VDC. This option is excellent for when a building management system is present.

Conclusion

VFD's are heavily recommended for use on all jobs; whether to provide VAV capability or for soft start and balancing. The VFD will pay for itself the first time the unit needs to be balanced (vs. the cost of new belts and pulleys), in addition to providing enhanced ease of use and extended motor life. ThermoTek offers factory wired and programmed VFD's to further simplify the installation process.