Application Solution

Limitations of using drive outputs for proof of flow

PROOF OF FLOW ON VFDS USING CURRENT SENSORS

Using drive outputs for status or for proof of flow seems like a good idea particularly when the drive comes standard with relay outputs for Drive Run. If all you are looking for is status (is my motor running or not?) then this is an option. But if proof of flow is required (is the motor running and flowing air or fluid) then using Drive Run has severe limitations may leave you not incompliance with industry standards.

If using the drive to indicate true proof of flow, the drive must have the option to program proof of flow feature based on motor demand or level control. This varies by manufacturer and is generally only available on high end drives. It's often the same feature used in water well pumping, typically referred to as 'dry run'.

Let's dive deeper into the applications for monitoring drives and compare the pros and cons of using internal drive reporting vs. external proof of flow with Senva VFD current sensors.

STATUS USING DRIVE RUN RELAY OUTPUT

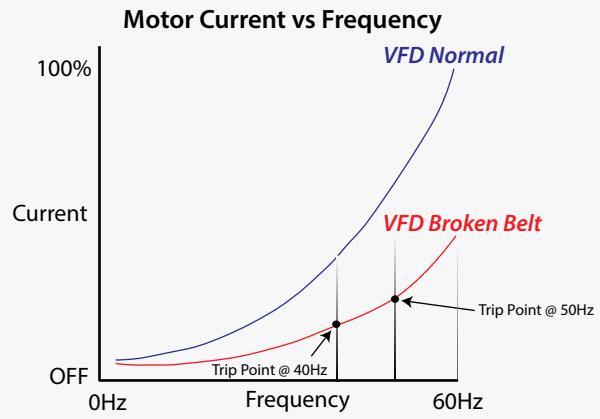
A simple solution for status is to utilize the Drive Run relay available on most drives without any programming. This relay is ON when the drive output is ON, sending voltage to the motor. This is for the full operating range of the VFD, from starting frequency to maximum frequency. It doesn't indicate anything about the motor, just that there is a drive output. Current doesn't really enter into the Drive Run feature on most drives. The negative is that the status signal for Drive Run could in fact be false if the motor is somehow not connected and the drive doesn't have features built in to detect a disconnected motor or this feature is programmed off. This is common on drives with a bypass cabinet, so you can have a false positive. When the drive is bypassed (utility directly feeds the motor) the motor is running, while the VFD Drive Run signal falsely signals the status is "off"- a false negative.

Pros

- Simple to use, almost all drives default a relay output to Drive Run

Cons

- Not every drive uses drive run the same way it may be programmed off, and the relay option may be programmed to another feature.
- The output may be used for other purposes requiring an interposing relay.
- A decoupled motor may still result in Drive Run- a false positive.
- A VFD with Bypass can provide a false positive or negative using the drive run signal.



In order to detect belt loss/coupling shear on variable frequency drives, the current sensor trip point is set when the current deviates from the learned Amp/Hz curve above a minimum VFD operating frequency, either 40 or 50 Hz (customer selectable).

STATUS USING SENVA VFD CURRENT SENSOR

With Senva's new VFD current sensor the setup for Status is simple and easy. No calibration is necessary, once set to Go/NO GO mode, the VFD sensor will monitor the output of the drive and provide status when the drive current rises above the minimum threshold (1 to 3 amps) depending on drive starting frequency. And, because it is monitoring the motor current, if the VFD has a bypass you know the true status whether the motor is fed from the drive or from bypass.

Pros

- Isolated digital alarm- no interposing relays.
- Simple and easy to set up and install- no calibration
- True status, no chance of false positives or negatives.
- The 2350VFD current sensor utilizing a microprocessor measures and learns the VFD variable frequency to current ratio- or Amp/Frequency curve. Once learned, the 2350VFD current sensor alarms when the actual Amp/Frequency relationship is outside the normal operating range, such as a belt loss.

Cons

- Small additional costs

Application Solution

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CONTINUED.....

PROOF OF FLOW USING DRIVE OUTPUT

Advanced HVAC Fan and Pump VFD's may include a feature for detecting a broken belt or coupling sheer. This feature is used to protect pumps from running without liquid and damaging bearings- often referred to as 'dry run'. Typically, there are quite a few adjustments to make to enable this feature, including alarm and trip levels, delays and motor trip points. Rarely is this feature available without in depth programming and it is almost never defaulted to an alarm or relay output, so that will need to be programmed as well. Once programmed, VFD dry run will provide true status motor status while the VFD is operational. However, if the drive is part of a bypass package, this status output can possibly be a false trip signal while the drive is on bypass.

Pros

- True status based on coupling shear or belt loss Not every drive uses drive run the same way it may be programmed off, and the relay option may be programmed to another feature.

Cons

- Will require in depth programming and a free relay or alarm channel output
- Does not take into consideration bypass operation (false negative)

PROOF OF FLOW USING SENVA VFD CURRENT SENSOR

Senva's unique VFD current sensor is designed to provide true proof of flow of your fan or pump while on VFD operation or if equipped, on Bypass. The Senva VFD current sensor automatically calibrates to the VFD output volt/Hz curve, memorizes it and trips whenever there is a coupling or belt loss. If there is a bypass package with the drive, the VFD current sensor will still provide status monitoring- no false negatives.

Pros

- True status based on coupling shear or belt loss.
- Status while on VFD and in Bypass if included- no false negatives.
- Quick and easy installation, automatic calibration. Save time and money programming VFD settings.
- Isolated digital alarm- no interposing relays.

Cons

- Small additional cost which could be more than covered by the savings in drive setup costs.

2350VFD Autoset current sensor self-learns for positive proof of flow on both VFD and constant volume fans and pumps

GO/NO STATUS	Install Time	Set-up	Reliability	Cost
VFD RUN OUTPUT	Low	Low	False positives and negative status; in particular with bypasses	Low
VFD CURRENT SENSOR	Low	Low	True Status	Low
PROOF OF FLOW	**Install Time**	**Set-up**	**Reliability**	**Cost**
VFD "DRY RUN" OUTPUT	Low	High programing	False negatives possible with bypasses	High
VFD CURRENT SENSOR	Low	Low	Absolute proof of flow	Low