

# TECHNICAL NOTE

## GUIDELINES FOR DETECTING BROKEN BELTS AND COUPLINGS

When specifying and installing NK sensors on jobs where they are to monitor status of blowers, chillers and pumps, the suggestions below can be helpful.

Broken-belt detection is an under-current situation. If a sensor is to detect this condition reliably, the belt-off amperes and minimum belt-on amperes must be known.

It is usually inconvenient to determine belt-off amperes on a motor once it is installed, with covers in place. However, an installer could take motor current readings before and after installing belts or couplings. It is particularly important, in VAV systems, that the belt-on reading be taken with the system at known minimum load (with vanes closed, or with a variable-speed drive running at lowest operating speed).

The minimum benefit of knowing the two pieces of data above is that it becomes obvious at once if the minimum load current and the belt-off current are too close together for reliable detection. Occasionally, we see a motor oversized for its load, drawing belt-on load current quite close to the belt-off current. Our experience recommends that the difference must be at least 15% for reliable detection, and preferably more. This minimum separation is required because of:

1. Line voltage variations (often 5 to 10% over the day)
2. Motor temperature variations
3. Motor aging and frictional variations
4. Belt condition and slippage
5. Outside air pressure and wind conditions.

Thus, a motor drawing 4.0 Amps at minimum load and 3.6 Amps with belt-off (10% difference) would not qualify for our suggested 15%. However, if the no-belt current was 3.4 Amps, it would have a minimum but comfortable distance between the two critical currents.

This is not a sensor problem. If you look at the hysteresis (dead-band) spec's on any of the sensors available for this purpose, you find that they respond reliably to very small changes in current. The uncontrollable variables noted above cause significant variations in current which force us to provide adequate margins between belt-on and belt-off currents for reliable sensor operation.

To achieve greater separation between belt-on and belt-off currents, consider the following:

1. Use a motor sized closer to the actual load
2. Use a lower voltage motor of the same horsepower. These draw proportionately heavier current, but provide a greater separation between belt-on and belt-off currents.

It's important to realize that if you try to detect broken belts/couplings with insufficient margins, you'll find yourself coming back repeatedly for readjustment, with neither you, your customer, nor your supplier being happy.

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