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HVAC Startup Troubleshooting

Part I—It's All in the Direction...Variable Frequency Drives

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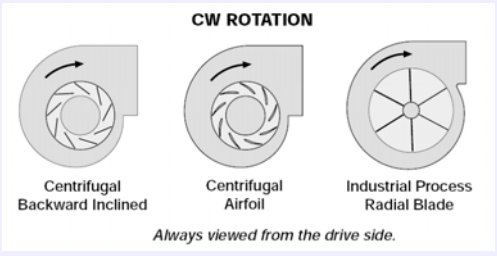
It's All in the Direction...

On a recent project, we encountered two different startup issues related to variable frequency drives (VFD's). Luckily both issues were easily rectified, but highlight some important things to remember when commissioning such systems.

The project in question was an air handler retro-fit in a high-rise office building. Due to the importance of not interrupting the tenant, the entire retro-fit occurred over a single weekend, including demolition and startup. A new return fan and air handler with VFD's for each motor had been designed and installed. On Sunday evening, the contractors, owner and engineer were all on hand to assist. The startup of the VFD's was carefully orchestrated by the manufacturer's representative and included checks such as:

- Verification that wiring met the installation requirements,
- Review of Drive programming and diagnostics,
- Confirmation of temperature control system signals,
- Check for proper fan rotations, etc.

Since the return fan access door was inconvenient to reach, someone had drawn the fan wheel blade configuration on the ductwork so we could compare it to the motor rotation and avoid an awkward ladder climb. The supply fan tested out perfectly, however the return fan was exceeding the design amperage slightly. On Monday morning the final balance was being performed when it was discovered that the return fan was spinning backwards! It turned out that the sketch on the ductwork was incorrect. Despite the fact that a half dozen people were looking at the motor, none of us had checked to make sure that the reference sketch was correct.



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As it turned out, with the return air damper opened, we could stand in the mixing section of the air handler and see the wheel – something that could have been done on Sunday night, and simply wasn't noticed. Care was taken to actually change the phase rotation on the power wiring, and the fan operated as expected. Luckily, no damage or additional costs were incurred to the owner as a result of this item.

While it would be tempting to use the VFD program to reverse the fan, this could create problems for future maintenance personnel if they did not know that rotation direction for the VFD and motor were opposite of each other.

Lessons learned in this installment?

Know your sources. Assuming that the fan wheel sketch was correct was understandable, but the opportunity for start-up personnel to double-check the rotation existed.

Shortcuts often have a price. Re-wiring of the leads required more work since an electrician needed to be involved. If the VFD vendor had just fixed the rotation with programming, it would have been easy, but would have been incorrect.

Motor rotation should always be verified. Improper rotation of pump and fan motors is a surprisingly frequent occurrence, yet it can usually be easily corrected if the right parties are on hand at startup. This is vital to proper system performance.

Next time – Part II "No Whining"

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