

VAV System: Fan Pressure Optimization
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ASHRAE Standard 90.1-1999, *Energy Standard for Buildings, Except Low-Rise Residential Buildings*, is the current industry standard for commercial building compliance. This standard is being adopted to replace Standard 90.1-1989 by many state code enforcement agencies as well as the International Energy Conservation Code (IECC).

One prescriptive element of this new standard applies to pressure-independent VAV systems. In the section pertaining to Air System Design and Control is the following requirement:

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Set Point Reset. For systems with direct digital control (DDC) of individual zoned boxes reporting to the central control panel, static pressure set point shall be reset based on the *zone* requiring the most pressure; i.e. the set point is reset lower until one *zone* damper is nearly wide open.

The control strategy described is also referred to as “fan pressure optimization.” It is not only a very energy-efficient means of controlling static pressure in a variable air volume (VAV) system under part-load conditions, but also a reliable method of individual VAV box control.

For the purpose of this discussion, a VAV system with the following equipment and control capabilities is considered:

- Air handling unit (AHU) utilizing a variable frequency drive (VFD) for volume control.
- VAV terminal units with DDC controllers (pressure independent).
- Integrated building automation system (BAS) capable of communicating with both the AHU controller/VFD and the individual VAV controllers (including VAV damper position).

It should be noted that the controls required for fan pressure optimization are largely standard, factory-installed controls. Therefore, no additional equipment costs are incurred when specifying this control strategy.

The fan optimization control strategy delivers the maximum potential operating cost savings of the VAV system. Energy efficiency in this system is optimized continuously as the BAS polls individual VAV controllers and resets the static pressure set point so that at least one VAV controller is wide open (85-95%). Under part-load conditions, this reset can be considerably lower than the full capacity static pressure set point of the system.

The energy savings aspect of fan optimization does not come at the expense of comfort. In fact, reliable VAV controller operation is inherent to the fan optimization and control

strategy. The continuous polling of the VAV controllers ensures that zones cannot be starved for air. Furthermore, acoustic performance of the HVAC system is improved by maintaining the minimum static pressure required at all times.