Single-Duct Constant Air Volume System Supply Air Temperature Reset: Using Return Air Temperature or Outside Air Temperature?

G. Wei, W. Turner, D. Claridge, and M. Liu

In order to reduce simultaneous cooling and heating energy consumption, the supply air temperature set point for a single-duct constant air volume AHU is often reset based on system load conditions. Variables such as return air temperature and outdoor air temperature are frequently used as indications of load conditions. The supply air temperature set point is reset based on either return air temperature or outside air temperature. As the return air temperature or outside air temperature increases, the AHU supply air temperature set point decreases to meet the increased cooling load. Although typical single-duct VAV systems are often designed for a constant supply air temperature set point, they are also good candidates for supply air temperature reset, especially when the total supply air flow approaches the minimum setting and the heating energy savings outweigh the fan power penalties. Significant amount of energy savings are achievable through supply air temperature reset for VAV systems.

Zone requirements are direct indications of system load conditions and they are also used for supply air temperature reset. Normally, the supply air temperature set point is set at the highest value that will keep the zone requiring the most cooling at its set points and zone humidity within acceptable limits. The drawback of this reset scheme is that it can potentially have one or two hot spots dictating the supply air temperature set point. This scheme can be seen as one variation of return air temperature based reset.

The energy savings implications of choosing one reset scheme over another can be very different in real systems due to the impacts from control system characteristics, load patterns, and occupant interventions.