



Utilizing the APR Control in a VAV/VVT System

As you know, the concept of using Single Zone VAV systems is not new. ASHRAE regularly offers new standards regarding: energy consumption, noise levels and occupant comfort conditions that are deemed acceptable. As the focus on reducing energy use and improving indoor air quality increases, single-zone VAVs are being applied more frequently due to the fact that the systems are economical to install and operate. Over the years, many contractors, engineers and facilities personnel have used the APR Control® modulating valve to improve the performance of all types of VAV/VVT systems while achieving ASHRAE compliance. When it comes to value engineering a project, the APR Control can be seen as the better choice compared to other part-load technologies. We continue to see an influx of specifications calling for the APR Control over many secondary options, including digital scroll compressors.

Traditionally, single-zone VAV systems were strictly used for larger equipment with fully occupied zones with varying cooling loads; such as, gymnasiums, auditoriums, churches and large conference rooms. Now the popularity of VAV systems is increasing for smaller equipment serving smaller zones. We are now seeing VAV/VVT systems in school classrooms, retail stores and smaller commercial office spaces.

The struggle has always been meeting the extremes of heating and cooling needs in different building environments with zones that could be as small as a single room or as large as a building wing. Considering the construction parameters and uses of the different spaces, each space will likely have differing heat loss and heat gain characteristics.

When you think about a commercial office space, for example, it can be challenging to satisfy the cooling load throughout the office as a result of the many different factors. With fluctuating occupancy, a wide variety of uses, ventilation, lighting loads and the building envelope; there are an overwhelming number of factors to take into account. Modulating dampers and VAV boxes are used to vary the volume of air to each zone based on the cooling needs as controlled by space demand, in turn, the supply fan varies its output accordingly to meet those changing demands. Yet even with all of this control, it is still a big challenge to design, install and operate HVAC systems that will deliver an accurate volume of the same temperature air to satisfy zone demands. The APR Control serves as an excellent solution for these exact challenges.

With the APR Control® valve, as it helps modulate air conditioning system's capacity to match changing load conditions, you will also have the ability to reduce system capacity to *match the changing load conditions within any zone*. When you are modulating airflow, it is as important to modulate the

refrigerant flow to keep the coil from frosting as you close off zone dampers reducing airflow across the direct expansion (DX) coils.

In any VAV or VVT system, when you have a continuously varying airflow, you are likely to run into rapid short cycling, coil frosting, inconsistent discharge air temperatures and a potential rise in space humidity.

At design load conditions, the VAV system will deliver the maximum amount of airflow at the system design discharge temperature for comfort cooling. As the load in the space decreases, the supply fan reduces the amount of airflow, causing the evaporator temperature to drop. Eventually, the space load will continue to decrease to a point where the compressor(s) cycle off as a result of a satisfied thermostat.

In a VVT system, unlike a VAV system, the fan speed remains constant and the air is bypassed from supply air ductwork directly into the return air, significantly reducing the cooling load on the dx coil. During low load conditions, the air-conditioning unit may also short cycle and the DX coils could potentially ice up as return air temperature continues to drop.

In both VAV and VVT systems, the constant cycling will cause equipment fatigue, increased use of zoned reheat and an increase in space humidity leading to uncomfortable occupants.

An APR Control® enhanced system can decrease the amount of air to each zone while preventing the evaporator from freezing up. The APR Control increases your load matching capabilities as you modulate airflow while still maintaining a low dew point. It will allow you to maintain a consistent discharge air temperature without cycling. In other words, you will have a better ability to control each zone to prevent overcooling and reduce the reheat requirements.

The APR Control is a proven simple enhancement to the refrigeration circuit that will improve the functionality of VAV and VVT systems through its ability to provide continuous capacity modulation and enhanced dehumidification.

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