Recirculation Options

Demand Control Options Save Energy

High Outdoor Air Systems (HOAS)

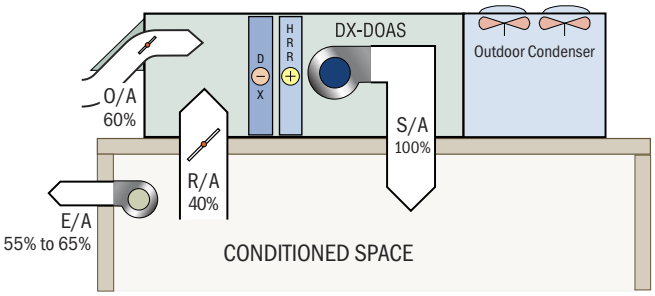

Figure 1 - High Outside Air System schematic with example of 60% outside air

There are many applications that require a single air handler to function as both the outside air source in addition to its function of providing the appropriate sensible cooling and heating. This occurs in many renovation projects that are attempting to bring a building up to the current recommended ASHRAE 62.1 ventilation code but do not have room for a dedicated outside air system and a conventional unitary device. This requires outside air volumes as a percentage of supply air volume greater that 50%. The HOAS system during occupied times provides the desired volume of code ventilation with the remainder of the supply air requirements being made up with recirculated air from the zone.

The system must be designed to remove the outdoor air's moisture, but also incorporate a specialized sequence of operation to provide heating and cooling to the space. Most conventional rooftop unitary equipment cannot handle outside air volumes above 30% and specialty equipment such as the Aura Series are required. In addition, the building must have an exhaust air system that is balanced with the volume of outside air to provide the desired pressurization in the space

Night Setback Strategy

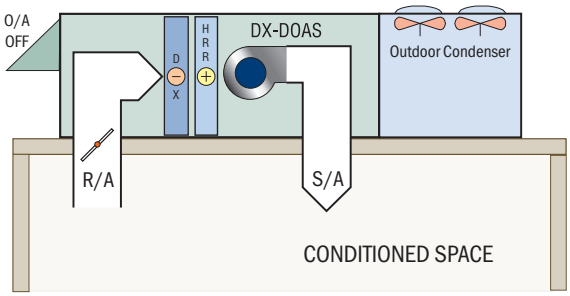

Figure 2 - Diagram of an Aura™ Series unit in night setback mode.

During the unoccupied mode, the basic night setback strategy is too close the outdoor air damper and turn off the blower to save energy. However, in some humid environments, there is still a high infiltration rate of moist outdoor air into buildings during unoccupied times creating excessive humidity levels.

In these instances, it is desirable to add a recirculation damper to the system and turn on the blower and compressors to remove the unwanted moisture during unoccupied times. This capability is available on Desert Aire's Aura™ series by adding the following components to the system:

- **Supply fan VFD**
- **Differential pressure transmitter with sensors factory installed across reheat coil**
- **Modulating damper (w/ spring return) & actuator for outside air**
- **Modulating damper & actuator for recirculation air**

The Zone Reset of Supply Air Temperature Control package must be ordered to receive the zone sensors.

NIGHTTIME SETBACK

CO_2 Control Strategy

As engineers continue to meet ASHRAE 62 ventilation code air flow rates, they also are trying to minimize energy costs where ASHRAE 90.1, LEED programs, GSA P100, or other codes and standards are required. Using additional sophistication in the controls can be an excellent way to minimize energy cost while maintaining proper indoor air quality and building pressurization.

The Ventilation Rate procedure of ASHRAE 62 is a prescriptive procedure that indicates the outdoor air intake flow rate based on the level and type of occupancy as well as the floor area. The Ventilation Rate procedure allows for a dynamic reset of the outdoor air intake flow as operating conditions change. Although the floor area in any building is fixed, the level and type of occupancy may change from day to day or even throughout a single day.

One of the most effective methods of dynamically changing the flow rate based on occupancy is the utilization of CO_2 sensors. Although expected concentrations of CO_2 are not considered a direct contaminant, it is an excellent measurable "tracer gas" that indicates the number of occupants present and their activity level. CO_2 sensors are also relatively inexpensive and durable devices.

This non-wheeled system has been designed to save energy by introducing outside air at a rate that addresses the occupancy level of the zone based on the CO_2 level in the zone which is measured and calculated by the building management system. The addition of two CO_2 sensors and variable frequency drives work together to maintain constant total system air flow by recirculating zone air and introducing varying outdoor air flow rates. The BMS provides a signal that represents 0 to 100% OSA damper opening. It should be noted that the minimum outside air setting value for occupied times is determined by the test and balance commissioning contractor and is provided to the controls contractor for entry into the BMS.

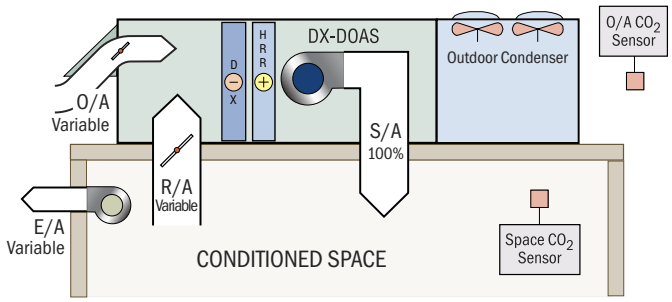

Figure 3 - DOAS CO_2 Control

When a change in CO_2 is sensed due to occupants entering or exiting the breathing zone, the outdoor air dampers account for this change in occupancy. The outdoor air flow rate will vary between the minimum flow rate programmed and 100% outdoor air as needed, always optimizing the indoor air quality and energy use. The return air is used to maintain the supply air flow rate while the outdoor air flow rate varies. The constant supply air flow rate ensures that the duct system operates as intended. It also ensures that diffusers are able to deliver ventilation air at the correct velocity so that it reaches the breathing zone at all times as required by ASHRAE 62.1.

Several components are added to maintain a constant supply air volume. The exhaust air fan (supplied by others) is controlled by the BMS in order to maintain building pressurization. The DOAS includes the following components:

- **Supply VFD**
- **Modulating damper & actuator for outside air**
- **Modulating damper & actuator for recirculation air**
- **Differential pressure transmitter with sensors factory installed across reheat coil**

CO2 MODULATION CONTROL