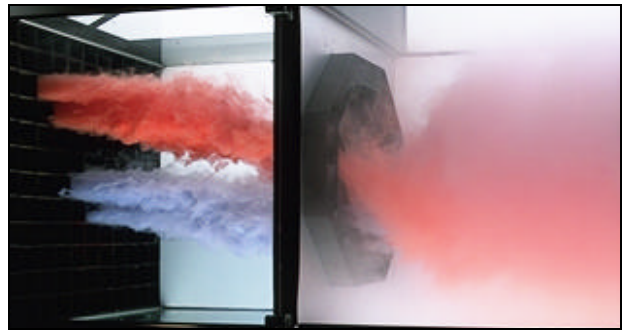


HVAC MIXING UPDATE



Mixing for Outdoor Air Distribution

Mixing for Outdoor Air Distribution

ASHRAE Standard 62-1989 requires a minimum amount of outdoor air to be delivered to each area in a building. Indoor Air Quality standards indicate that the amount of outdoor air introduced into an air handling system should be known to within $\pm 10\%$, i.e. if the desired outdoor air flow rate is 10000 CFM then the uncertainty would be ± 1000 CFM. This requirement can be used to develop a curve showing the minimum acceptable mixing to insure that this level of uncertainty exists through all spaces within a building.

If stratification exists in an air-handling unit, the outdoor air is not mixed with the return air. As a result, there is no way to know how much outdoor air is being received by each space. Specifying a mixing system capable of adequately mixing the outdoor and return air will increase confidence that each space is receiving an adequate supply of outdoor air.

One benefit air handling units provide is that the supply fan creates some additional mixing between the two air streams. However, no fan manufacturer publishes data that indicates how well a fan mixes. In addition, the mixing depends upon the type of fan and how the air enters the fan. As a result, relying upon the supply fan to provide all of the mixing within an air-handling unit can be risky. The best way to reduce this uncertainty is to specify a mixing box and/or static air mixer in the air-handling unit that provides a majority of the required mixing.

Figure 1: Required Mixing Effectiveness to achieve different levels of Outdoor Air distribution.

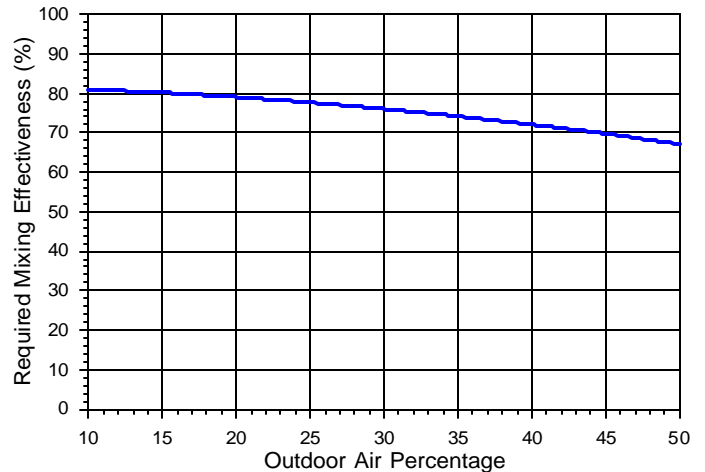


Figure 1 presents the Mixing Effectiveness required to achieve good outdoor air distribution assuming that the supply fan provides some additional mixing between the return and the outdoor air streams. This figure indicates that the Mixing Effectiveness of the air-handling unit mixing system needs to be at least 67% with an outdoor air percentage of 50% in order to achieve acceptable outdoor air distribution. With an outdoor air ratio of 20%, the required Mixing Effectiveness increases to 79%.

Example Selection & Specifications

Constant Volume System

A 15,000 CFM constant volume air handling unit is located in an area with a winter design temperature of 5°F. The minimum amount of outdoor air will be 4,500 CFM. What Mixing Effectiveness is required to insure that the outdoor air distribution within the supply air stream is acceptable?

The minimum amount of outdoor air for this system is 30% (4,500 CFM/15,000 CFM). Draw a vertical line from the horizontal axis at 30% until it intersects the required Mixing Effectiveness curve. Draw a horizontal line to the vertical axis to find the required Mixing Effectiveness of 76%.

Specification: Air handling unit mixing system shall have a Mixing Effectiveness of 76% when system is operating with an outdoor air percentage of 30%. This specified Mixing Effectiveness will insure that the uncertainty in the Outdoor Air distribution will be no more than $\pm 3\%$.

