ENGINEERING BULLETIN

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PRODUCT: Terminal Units
SUBJECT: Fun Facts about VAV Terminal Unit Leakage – Part II
ISSUED BY: Gus Faris

When balancing the airflow from VAV terminal units (ATU's), there are three places in the duct system from the ATU's to the room where significant leakage can be found. All three should be examined when leakage is suspected. All parallel ATU's leak, and the leakage amount cannot be easily predicted. The backdraft dampers are the primary point of leakage, but because the mixing chamber is under positive pressure, the seams in the casing also leak. The amount of leakage will vary from unit to unit due to wear at the backdraft damper, but it has been found to be greater than 10% of the primary air in many cases. This not only costs money, but it makes the return air plenum cold and precludes the opportunity for heat reclaim in the deadband and heating modes. The parallel terminal unit could be fitted with a low leakage control damper rather than the backdraft damper, and the seams could be sealed. However, the control damper would cause the unit's price to increase significantly. It would no longer be competitive.

The duct connections to the room diffusers are a common source of leakage, especially if flex duct is used or if the diffuser inlets are flat ovals rather than round. The third common leakage point is where the diffuser fits into the T-bar grid. If the diffuser is not properly seated, significant amounts of air will be sent back into the ceiling plenum rather than entering the occupied space. This has the same cost as duct or casing leakage. These two examples of the BIG 3 are installation issues and cannot be controlled by the terminal unit manufacturers. New motor and control technologies significantly improve the series unit's efficiency, but do little or nothing for the parallel unit. The higher static pressure required at the air handler further denigrates the performance ability of the parallel unit. So, fixing the backdraft damper leakage may not be a reasonable alternative when considering the overall operation of the mechanical system.

Series ATU's have a negative mixing chamber, which encompasses the entire unit casing. Leakage through the joints is infiltration into that plenum when air is being induced. Since the induction port path is much less restrictive, very little air enters through the casing seams. Additionally, since the very small amount of casing leakage mixes with the same air entering through the through induction port, there is no cost associated with this leakage.

Last June, the TC 5.3 Design Guide was turned in to ASHRAE. It is available in the book store since the January meeting in Chicago. We have included the information above in the VAV Air Terminal Unit Design Guide. I would suggest that the ASHRAE Design Guide for Air Terminal Units is an excellent source for all information on Air Terminal Units including leakage. You might also want to consider the ATU Design Guide as a text book on terminal units in general. It is very complete.