

Converting Dual Duct Constant Volume Systems To Variable Volume Systems Without Retrofitting the Terminal Boxes

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Converting dual duct constant air volume systems (DDCV) to variable air volume systems (VAV) is one of the most attractive energy retrofit measures. To convert a dual duct constant volume system to a VAV system, the following system modifications are customary: (1) install a fan modulation system, which often includes a variable frequency driver (VFD) and a static pressure sensor device; and (2) install new terminal boxes or convert existing constant volume terminal boxes into variable volume boxes. Terminal box conversion often accounts for over 70% of the total project costs. The overall pay-back varies from 3 years to 5 years with an average of 4 years in one large retrofit program. Eliminating the terminal box conversions greatly improves the cost effectiveness of the VAV conversion.

In 1994, the negative impact of high hot air static pressure on whole building energy consumption was documented in one building. A hot air damper was then installed to control the hot air static pressure. This method has since been tested and implemented in 22 buildings as part of Continuous Commissioning ♦ work in these buildings. Significant energy savings and improved indoor comfort conditions have been measured.

Dual duct constant volume systems can be converted to single duct VAV systems for summer operation by installing hot air dampers without converting terminal boxes. Winter operating efficiency can typically be improved by implementing, different cold and hot air static pressure set-points.

The conversion was implemented in a 170,000 ft² building by installing a 50 hp VFD on a hot air fan in June 1996. The measured annual savings were \$62,550/yr (52% of the pre-conversion heating, cooling and fan power consumption).