



## A Design Guide for Energy - Efficient Research Laboratories

### Room Pressure Control

#### Energy Efficiency and Laboratory Pressure Control

By insuring that the laboratory is safely and correctly isolated from adjacent spaces, the air pressure control system contributes to the overall energy efficiency of the laboratory facility. An energy-efficient VAV supply and exhaust can be used to control this pressure. The techniques to provide laboratory pressure control include differential pressure sensing, air-flow tracking, and combination pressure sensing/tracking.

The advantages and drawbacks of these techniques make clear that the best choice for safe and energy-efficient laboratory operation is a combination of pressure sensing and air-flow tracking. The pressure control system's efficient maintenance of laboratory conditions has a large effect on heating, cooling, and air moving expenses. According to Grossman (1995), "Depending on the technology used, each laboratory air-flow control system may require a different maximum volume of air measured in cfm, to do the job properly. At an average cost of \$3/cfm [to \$7/cfm] each year, the differences between the energy costs associated with systems can often be quite dramatic."

#### Combined pressure sensing and air-flow tracking

Vendors may recommend one type of laboratory pressure control as superior to the other. However, many experiences with the application of both technologies show that the most energy-efficient arrangement capitalizes on the best features of the two systems together. An active pressurization system dynamically measures and adjusts the amount of "offset" provided by the HVAC system to account for varying pressure differential. [Coogan, 1996]

The combined arrangement uses the differential pressure measurement from the pressure sensor to fine tune the air-flow tracking value, which is normally fixed. The air-flow tracking value is varied as required during laboratory operation to maintain precise, energy-efficient pressure control. If the required differential pressure modulates because of wind forces, outside temperature variations, or adjacent air conditioning system effects, the combined system responds accordingly. An additional energy-efficiency benefit of the combined system is the ability to remotely monitor the laboratory and adjacent areas and make air flow and temperature adjustments, for example, because of laboratory occupancy. [Coogan, 1996] [DeLuga, 1995; Laboratory Control and Safety Solutions Application Guide, 1994]