Features and Benefits of Various Fume Hood Applications

Phoenix Controls Corporation

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Introduction

The Celeris® platform provides a complete control solution for fume hood laboratories and integrates seamlessly to the BACnet® capable Building Management Systems (BMS).

Constant Volume (CV) Applications

Constant Volume Approach

Phoenix Controls offers products to maximize performance in constant volume laboratories. The illustration below shows typical CV laboratory devices with Phoenix Controls components.

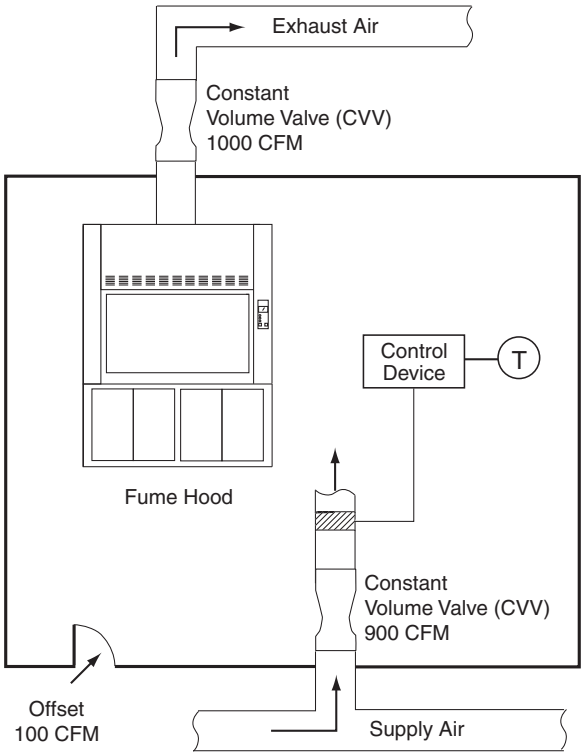
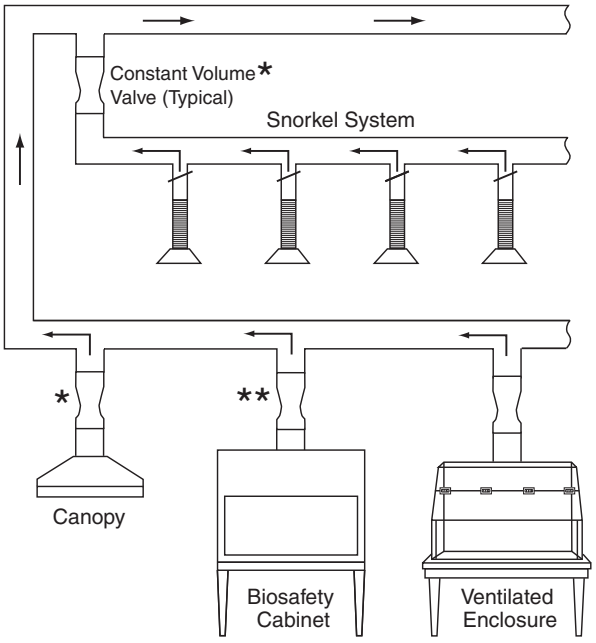


Figure 1 Constant volume laboratory with Phoenix Controls. Pressure-independent air valves (constant volume) maintain a constant volume at each location as system flow rates change. An optional monitor is available for continuous flow monitoring.

Benefits

- Accurate, stable flow control.
- Eliminates the need for re-balancing. System is pressure independent and maintains steady flow through system changes, filter loading, and HVAC degradation.
- Flexible monitoring. Use either a Phoenix monitor or the hood manufacturer's model.
- No wiring or tubing for control.

Additional constant volume control needs. The constant volume valves maintain precise flow and eliminate the need for future rebalancing at each lab device. The following illustration shows several constant volume laboratory exhaust devices controlled by pressure independent constant volume changes.



NOTES:
* Air valves used in this application can be two-position devices to conserve energy when these are not in use.
** Air valves for this application can be operated in two positions, shut-off and normal flow, to conserve energy when the cabinet is not in use.

Figure 2 Additional constant volume control needs. The constant volume valves maintain precise flow and eliminate the need for future rebalancing at each lab device.

Switched Two-state

The following illustration shows a sash control option for a two-state laboratory.

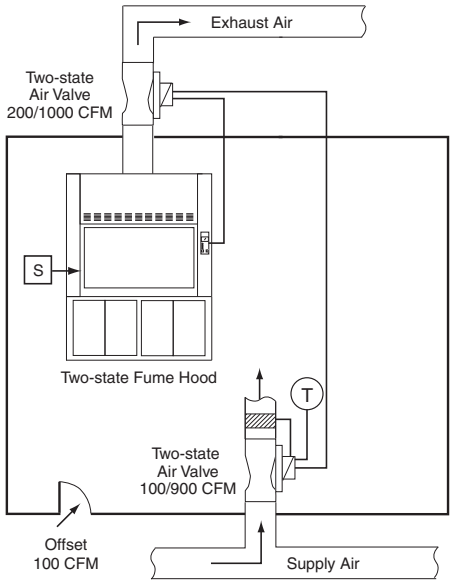


Figure 3 Two-state application with sash switch. Pressure independent air valves maintain proper flow at each of two flow rates. The sash switch (by others) changes hood flow between low-high flows. A two-state supply valve tracks flow changes of the hood.

Benefits

- Superior flow control with fast, stable adjustments.
- Low cost of controls compared to VAV.
- Eliminates the need for re-balancing. The pressure independent system maintains steady flow through system changes, filter loading, and HVAC degradation.
- Flexible monitoring. Use either a Phoenix monitor or the hood manufacturer's model.

Option B: Usage Based Controls (UBC)

Phoenix valves that are used in two-state systems controlled by sash or light switches provide the benefits listed above. However, the disadvantages of controlling flow with these switching mechanisms still remain. To address these concerns, Phoenix Controls offers a unique approach to two-state laboratory airflow control-Usage Based Controls (UBC).

Option C: Airflow Control in Classrooms

Airflow control in teaching classrooms may be implemented by switching the fume hoods and room airflows from lower to higher rates when the room is in use. The design can incorporate a local switch that allows the teacher to control the occupancy setting for the classroom. Additional safety factors may be included, such as sash switches or sash height alarms so that if any fume hood sash is open, the fume hood and room go into high flow mode. This application saves energy while giving users the schedule flexibility they need.

Variable Air Volume (VAV) Applications

Phoenix Controls offers sash sensing, pressure independent venturi air valves, and volumetric room flow controls for VAV applications. The following illustration shows a VAV lab with Phoenix Controls components.

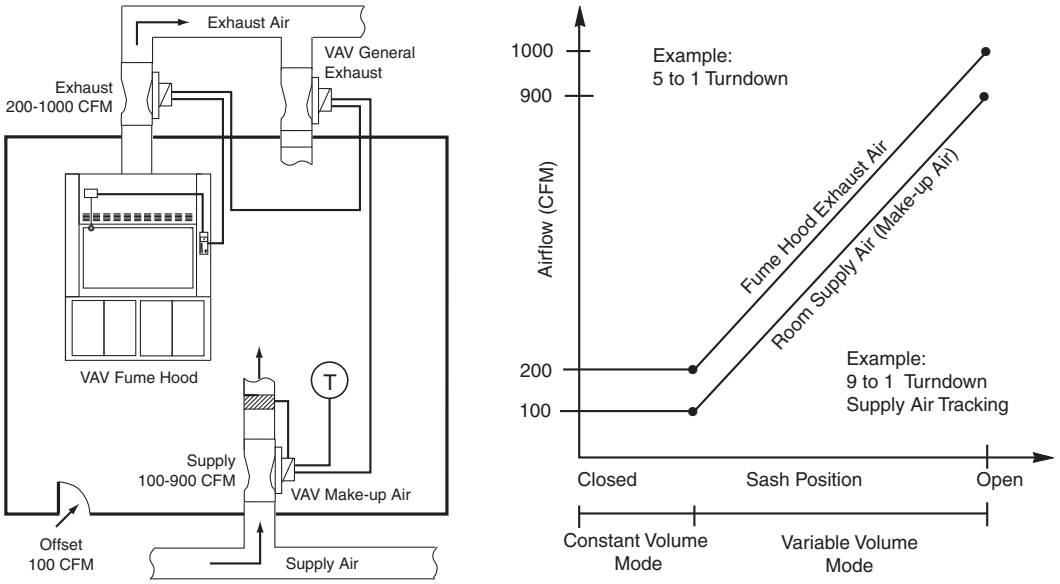


Figure 4 Variable air volume application with Phoenix Controls. Pressure-independent air valves maintain proper flows over the entire range of command. The sash opening determines flow requirements through the hood while the room make-up air adjusts to maintain pressurization. If additional air is needed due to thermal or ventilation requirements, the general exhaust and make-up air valves adjust accordingly. The fume hood monitor provides continuous monitoring, meeting regulatory requirements.

Benefits

- Superior flow control with fast, stable adjustments over large flow changes.
- Low maintenance devices.
- Eliminates the need for re-balancing. The pressure independent system maintains steady flow through system changes, filter loading, and HVAC degradation.
- Low sound power levels.

When Phoenix valves are used in variable volume systems they provide the benefits listed above. However, the disadvantages of not closing sashes still remain. To address these concerns, Phoenix Controls offers a unique approach to variable volume laboratory airflow control-Usage Based Controls (UBC).

Variable Air Volume with UBC

Phoenix UBC provides an intelligent form of variable volume control for fume hoods. UBC eliminates the disadvantages of not closing sashes, yet maintains safe face velocity levels while minimizing the HVAC burden. The concept is quite simple: use a higher face velocity (e.g., 100 fpm) when an operator is in front of the hood creating turbulence, but reduce the flow to a safe level (e.g., 60 fpm) when no operator is present. The illustration below represents a typical UBC system. Room pressurization is maintained by adjusting the make up air at a slightly lower rate than the exhaust. Minimum ventilation and proper temperature control may require the use of a general exhaust valve -where the exhaust air rate is increased to overcome the added supply requirements.

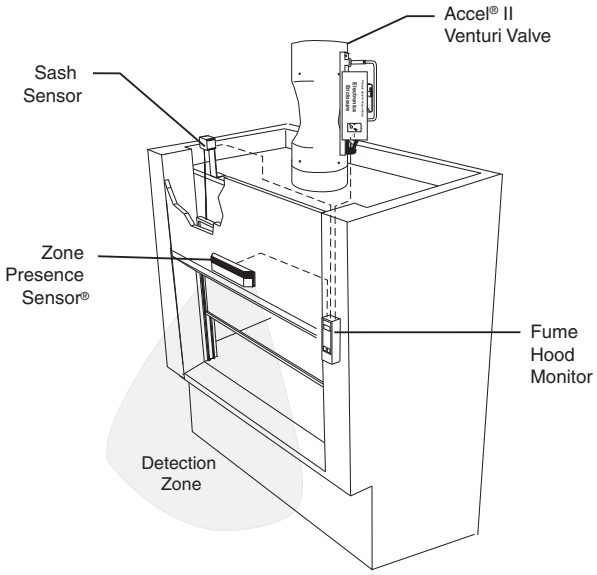


Figure 5 The system determines usage by sensing the presence of a person in a well-defined detection zone in front of the hood. When no one is present, the system sets the airflow face velocity to a safe “standby” level—typically 60 fpm. When the operator enters the detection zone, the system instantaneously (within one second) increases the face velocity to a higher level—typically 100 fpm.

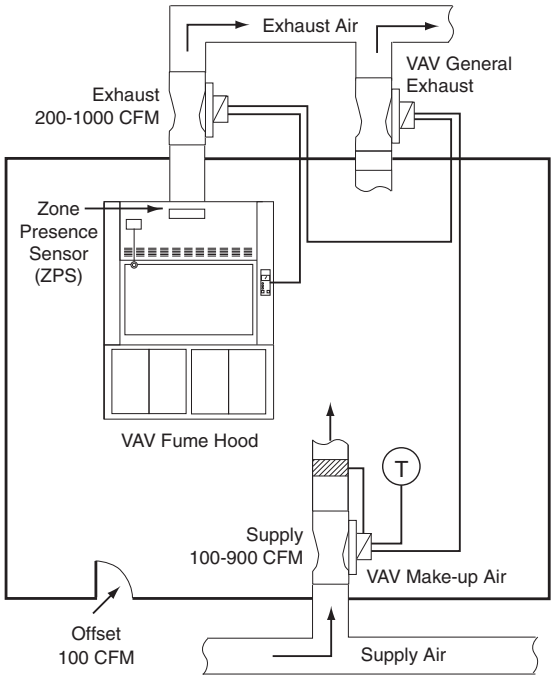


Figure 6 Variable volume application with Usage Based Controls. The hood is operated as a standard variable air volume application. The hood operates at the lowest flow possible to maintain safe face velocities. When an operator approaches the hood, the Zone Presence Sensor increases the flow to provide proper containment. As the operator leaves the hood, the flow resets itself to the lower, yet safe, flow. The fume hood monitor provides continuous monitoring, thereby meeting regulatory requirements.

Benefits

- Diversity-the sizing of mechanical equipment based on partial load-is dramatically improved.
- Reduce HVAC capital costs by assuring reductions in airflow, even when sashes are left open.
- Lower and more predictable energy costs.
- Increase lab safety due to the reduction in supply air currents that often affect fume hood containment.*

* Caplan, Knowlton. P.E.; Knutson, Gerard W., "The effect of Room Air Challenge on the Efficiency of Laboratory Fume Hoods," ASHRAE Article No. 2438.

With Celeris and the Accel II venturi valve, Phoenix Controls offers the safest most flexible solutions for all fume hood lab needs from the most basic constant volume system to the ultra energy efficient VAV control with UBC.

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For additional information and a listing of our global offices, please visit our Web site at www.phoenixcontrols.com or call (800) 340-0007.

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