SPECulations

A Periodic Newsletter for Design Professionals
About Innovative Products and Ideas Worthy of Specification Consideration

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(E1)

This Issue

TRIATEK®

Does Your Laboratory Smell? Do You Know Your Fume Hood Face Velocity?

If you answer yes to the first and no to the second, there is a problem!

The fume hood is the primary containment device in the laboratory. The smell of chemicals is a clear warning that it is not containing properly. The quick way to tell whether the fume hood is working properly is to check the face velocity. What was the certified safe face velocity? What is the face velocity now? If you don't know, or can't verify, how do you know it's safe?

The secondary containment is the lab itself. What is the room pressure? It takes a difference in air pressure to cause air to move from one place to another, whether it's through a duct, into a fume hood or from a corridor into a lab. If the room pressure isn't known, how do you know the contaminants are being contained in the lab?

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A chemical fume hood is an enclosure with an exhaust duct and a moveable sash on the front. As the sash is raised for equipment loading and lowered to the working height, the open area changes which changes the velocity into the hood. Each hood must be tested to achieve a specific velocity, usually 80 to 120 fpm as dictated by the laboratory safety officer. The hood position is marked where it achieved the safe operating velocity. When the sash is raised above that point the velocity drops off and when the sash is lowered, the velocity increases. Equipment in the hood and the operator in front of the hood also affect the velocity into the hood.

A fume hood monitor is a continuous indicator of fume hood performance and is now required for every chemical fume hood. This became law January 31, 1990 in the Federal Register "Occupational Exposures to Hazardous Chemicals in Laboratories; Final Rule". There are many hood monitoring devices available but to be assured of safety at all times, the hood monitoring must continuously measure airflow.

This ability to continuously measure airflow is critical. It is the only way to know that the working environment is safe. It is also the only way to know that the fume hood is capturing and containing the fumes.

Some fume hood controllers do not measure and display the actual face velocity of the hood they are controlling which can lead to a false sense of security and safety. This is because they assume a particular face velocity based on a particular sash position. When the fume hood face velocity is to be controlled, only a system that continuously measures the airflow can accurately react to changes in face velocity and maintain the setpoint.

Fume Hood Monitoring & Control

The TRIATEK Fume Hood Monitor and Control (HMS-1600) as pictured to the right uses an airflow sensor that senses air movement through a small hole in the liner of the hood. Air velocity is the same at this point as it is through the face of the hood.

The sensor is a micro-machined device utilizing a recessed design to minimize dust infiltration or sensor damage. The sensor has a repeatable accuracy of 50 – 200 FPM, +/- 2 FPM. Housed in a sheet metal enclosure, it mounts in the utility chase between the hood liner and the outer, sheet metal hood side panel.

The airflow sensor is connected to the controller, which is usually placed on top of the fume hood. The controller requires 24-volt AC power and is supplied with a step-down transformer. The analog signal from the sensor is processed by the controller using 12-bit conversion resulting in resolution to one part in 4,096. True floating-point math is used to process the digitized signals, assuring maximum accuracy.

The HMS display unit is mounted on the front of the hood. It is connected to the controller with a common computer cable supplied with the system. The usage of readily available cables is an indication of the simplicity and ease-of-use of TRIATEK controls. Should the cable be accidentally cut or damaged by lab activity, a replacement cable can be quickly sourced at any local computer store.

The HMS display unit features two methods of information display; an LCD display showing the actual face velocity of the hood and three LED indicator lights reflecting conditions – NORMAL, CAUTION and ALARM. With TRIATEK's system, the digital readout displays actual fume hood face velocity, not an assumed velocity based on sash position. The lights are tied to true velocity profile ranges – not airflow switches.

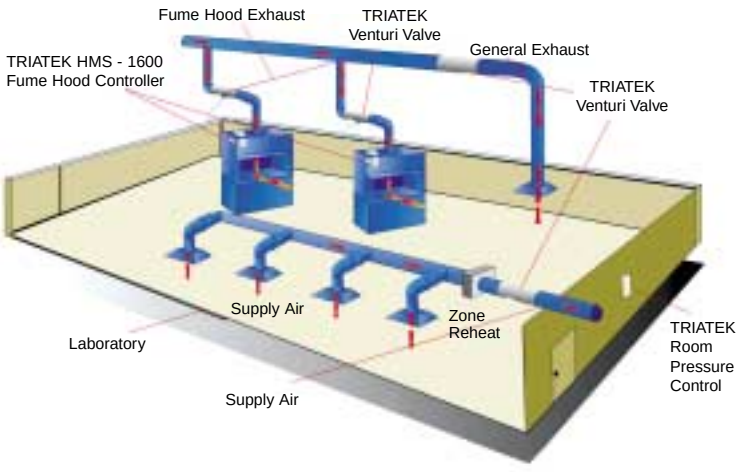
Alarm status for out-of-range face velocity is annunciated locally using the visible displays and an audible alarm. In addition to the LED status indicators, the LCD display shows a blinking alarm indicator. Dual alarm relays provide dry contacts for remote transmission of any alarm condition to a central location. Alarm setpoints for local annunciation and for both relay outputs are fully adjustable in the field by the owner's chemical hygiene officer.

In addition to the dedicated face velocity flow sensor input, the TRIATEK HMS-1600 has a second input that can be digitally monitored and displayed on the LCD display along with face velocity. Almost any hood parameter or process variable such as flow, pressure, humidity, temperature, etc., can be displayed.

Typical Fume Hood

As furnished and described above, the TRIATEK HMS-1600 meets and exceeds requirements for continuous fume hood monitoring. A standard feature of the HMS-1600 is the ability to control the face velocity with the addition of a venturi valve and actuator on the exhaust duct from the fume hood. This means that as the sash is moved and the face velocity changes, the HMS-1600 measures the new velocity, compares it to the setpoint and **repositions the valve in less than .066 seconds**, to bring the velocity back to the setpoint. Since the equipment load and operators in front of the hood affect the face velocity, the HMS-1600 will modulate the valve to compensate for those changes as they occur.

Laboratory Control Diagram



Another perSPECtive...

By Dave McIntyre

Riddle for today: If your laboratory smells but your airflow control system never alarms, does that mean you have a safe laboratory? Or a perfect airflow control system? Maybe it's neither.

Sadly, this scenario is being played out in many modern laboratories in use today. In many instances, it actually means that your laboratory is unsafe. Even more frightening is the fact that not only is your laboratory unsafe, but you don't know it because your airflow control system, supposedly your last line of defense from toxic fumes, is telling you that you are safe and providing a false sense of security.

What is the reason? The simple explanation is this: if your airflow control system is not measuring airflow, by definition it can't provide an accurate reading to assure your laboratory personnel that safe airflows into the lab and into the fume hood are being maintained.

Further, if it can't measure airflow, don't expect it to be able to react to changes in airflow that occur in your lab. Don't expect it to maintain the desired pressure setpoint in your lab. And, don't expect it to maintain the desired setpoints for safe face velocity into your fume hoods.

If safety is your first concern, as it should be in critical room environments such as a laboratory or medical isolation room, demand a closed loop control system like TRIATEK that measures airflow and can adjust to changing conditions in the lab to restore safe airflow. Remember, no airflow measurement = no safety.

The TRIATEK Venturi Valve

The TRIATEK Venturi Valve is an integral part of the fume hood exhaust control system. It is available in spun aluminum (with or without Heresite coating) or fabricated entirely of 304 or 316 stainless steel. A stainless steel shaft with composite Teflon bushings is standard on all valves. The internal spring of the valves reacts instantly to changes in static pressure to maintain a constant volume by moving the inner cone to increase or decrease the annular area between the cone and the valve body. The TRIATEK Venturi Valve maintains linear air volume control over 90% of its control range. The addition of a fast-acting electric actuator repositions the valve to a new volume setting in response to the HMS-1600. The actuator can be programmed to fail open or closed on power failure.

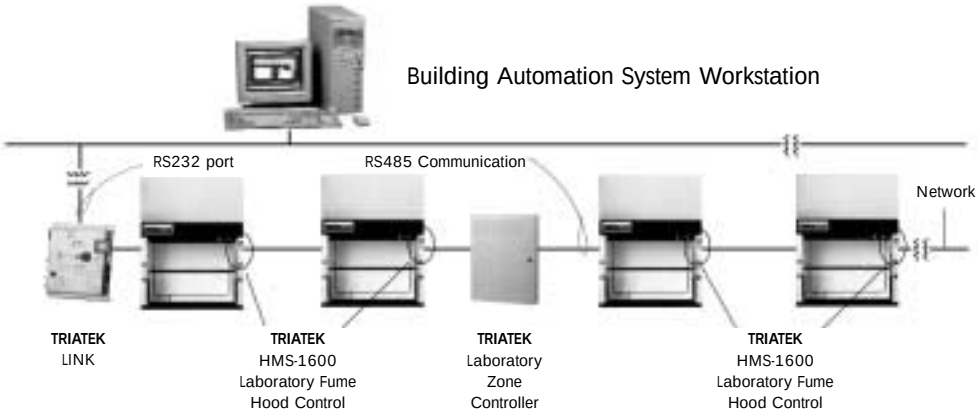
STANDARD DESIGN

INSULATED DESIGN

TRIATEK System Features

- True Closed Loop digital control technology
- Real-time measurement and display of fume hood face velocity
- Pressure independent aluminum or stainless steel Venturi Valves
- Standard fast acting electric or optional pneumatic actuation
- 0.3 ~ 3.0 second setpoint restoration time after sash movement
- 1.0 second valve response to duct pressure changes
- Programmable alpha / numeric display with adjustable alarm setpoints
- Network ready: Johnson Metasys, BACnet, Modbus

TRIATEK Integration Architecture



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