

Response Time

Application Note LC-102

Response Time

The response time of a VAV fume hood is a critical safety issue. The response time must be adequate to provide containment of hazardous chemicals during disturbances such as a sash movement. The parameter most associated with containment and safety is face velocity. When the sash is moved, the VAV fume hood controller must respond fast enough to minimize the reduction in face velocity, thus providing containment.

Response Time Defined by Sash Position and Exhaust Flow

One confusing and unconventional method of defining response time ($T_2 - T_1$) in the laboratory control market is from 90% sash movement to 90% hood exhaust as shown in Figure 1. This definition really considers only the sash position and the hood exhaust (CFM). The control parameter of interest is containment and face velocity is most commonly associated with containment. Also, this method of specifying response time tells us little about the performance of the controller from the start of the sash movement to 90% sash movement; a large, critical period of time where the dynamics of a VAV controller have huge effects on a fume hood's ability to contain.

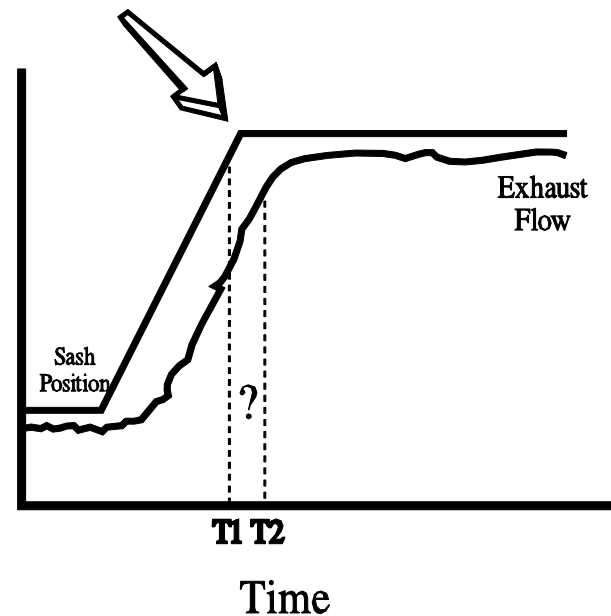


Figure 1. Response time defined by sash position and exhaust flow



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Response Time Using Face Velocity

Figure 2 shows the same graph adding the variable of face velocity. In this figure, the response time ($T2-T1$) starts shortly after the sash has started to move ($T1$) and ends when the face velocity has reached nominal setpoint ($T2$). By measuring face velocity throughout the entire sash movement, it is easy to see what response time is needed to maintain a sufficient face velocity for containment.

Summary

The response time ($T2-T1$) in the two figures are not comparing the same parameter making it difficult to compare different VAV fume hood controllers. The goal of these controllers is to provide containment, and the manufacturers of VAV fume hood controllers should have containment and response time tests to show the performance of their system.

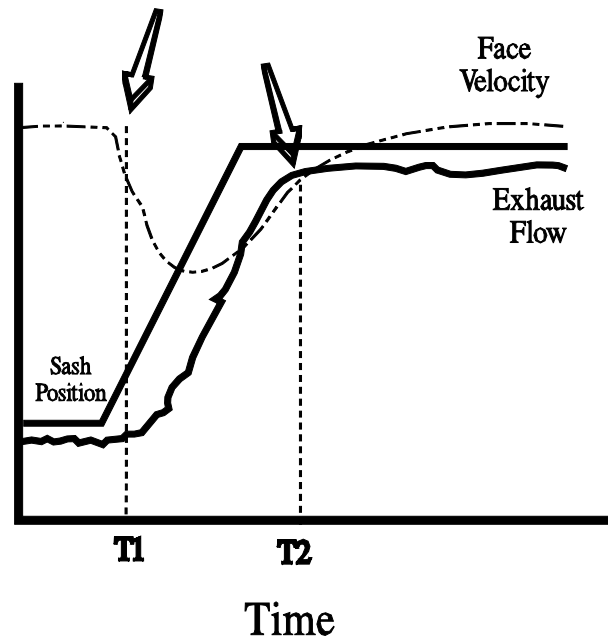


Figure 2. Response time using face velocity.

The TSI SUREFLOW Face Velocity Controllers are safe VAV fume hood controllers, and we have the data to prove it. For a better understanding of response time, containment, and laboratory control design applications, contact your local TSI Manufacturer's Representative or contact TSI directly.

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