Measuring Airflow in the Cleanroom

Velocity can affect particle deposition in either a positive or negative way.

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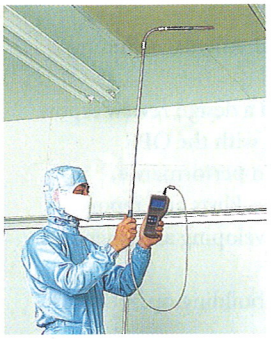
Maintaining appropriate air velocity in the cleanroom helps ensure a clean environment; correct system performance plays an important role. To make certain the system functions as expected, periodic checks using the proper instruments are recommended to measure velocity and uniformity in the clean space.

Room performance can be affected by room size, AHU capacity, length of duct run, as well as other factors. Methods used to check airflow within a cleanroom vary depending on the ventilation set-up—the two most common being laminar flow and turbulent airflow.

Ventilation set-up

In a laminar flow system, air flows through the cleanroom in one direction, either horizontal flow or top to bottom. Koji Miyasaka, with **Kanomax**, Andover, N.J., notes that, "To confirm that the system is working properly, it is necessary to check the airflow at the supply vents and also to check the distribution of airflow throughout the room. At the supply vents or fan filters the volumetric flow should be checked by using the following formula: Q = V x A. (V is the average or center air velocity and A is the area of the vent or fan filter.) To determine the total volumetric flow for the room, the procedure should be repeated at each vent or fan filter and then summed. This number should then be compared to the specifications for the cleanroom to find if it is in tolerance. Many modern anemometers come with this calculation function built in."



To confirm that the system is working properly, it is necessary to check the airflow at the supply vents and also to check the distribution of airflow throughout the room. *Image: Kanomax*

In a turbulent airflow system, the room is designed to dilute and remove contaminates based on a certain number of air exchange rates per hour. To check this type of system, measure the airflow at both the supply and the returns and then calculate the number of air exchanges that occur per hour."

Taking measure

"In unidirectional cleanrooms the airflow velocities are typically measured using either a thermal anemometer (mass flow devices) or an electronic micromanometer in conjunction with a multipoint sensor array (volumetric flow device)," says Cary Binder, **ENV Services Inc.**, Hatfield, Pa. Binder points to guidance from IEST-RP-CC 006.3 Section 6.1.1b.1 which states, "Divide the plane into a grid of equal area. Individual areas should not exceed approximately 0.4m^2 (4 ft^2)" while the probe is typically placed 6-in. from the filter face or diffuser.

Binder offers the following steps for measurement. "Calculate the effective media area of each filter and multiply the average velocity for each filter to determine the airflow volume (cfm). Add the calculated volumes for all the filters and the result is the total airflow volume for the room. Divide the total airflow volume for the room by the room volume and multiply by 60 to obtain the ACPH for the room. When a balometer is used, simply add the measured volumes for all the filters and the result is the total airflow volume for the room."

For more information

The contributors to this article have provided more detailed explanation and examples in articles that are hosted on the Controlled Environments website www.cemag.us. On the site, search "air velocity" to find expanded material on the topic of airflow measurement for cleanrooms and compounding pharmacies.