



Phone Forum Discussion Summary

July 26, 2004

THIS DOCUMENT summarizes the discussion during the Labs21 phone forum, "Practical Design Approaches for Efficient Cleanroom Fan Systems."

- Q.** *In slide 28 of the presentation, are the exhaust air ducts at floor level mounted vertically?*
- A.** The cleanroom in the photograph on slide 28 was actually used to put together the Mars Land Rover. The photo was used as a sample for this slide, so the configuration of the cleanroom in the photo is not known. Industry cleanrooms would not allow photographs.
- Q.** *I am currently getting involved in a Level 3 lab and am looking at different ways to deal with a Level 3 facility. Is there a way to reduce energy while still achieving a high level of cleanliness?*
- A.** If you can reduce the volume of space needed to be kept clean, you will be able to use smaller fans, thus allowing you to use less energy.
- Q.** *Slide 15 promotes the concept of pressurized plenum. Various consultants talk about the difficulty in balancing and maintaining consistent air flow from pressurized plenum. What are your thoughts?*
- A.** There are disadvantages of pressurized plenum. If plenum depth is deep enough, 3.5 to 4 feet deep, you will be able to achieve equal to or less than 15 percent flow on all filters. Design and pressure drop and the distribution of fans are not that big of an issue but do need to be considered. If there is a strict requirement for even flow, pressurized plenum might not be the appropriate solution.
- Q.** *I saw a 15 percent variant between all fan filter units. Is it consistent throughout the use of a cleanroom that there will be different loading as air travels?*
- A.** That depends on the cleanroom and the particles generated in it. If a cleanroom is filtered well, the particles will not load up as much, and, therefore, a dramatic drop in airflow will not occur.
- Q.** *I work with underfloor ventilation systems. The method I have adopted is to put duct work in to take air to certain areas to equalize pressure.*
- A.** There is another system type known as a plenum box that I have seen in a couple of instances. It is a brief circulation air handler with 15 or 16 filters with different configurations. Each box is its own area. The low-pressure drop system is more modular than a large pressurized plenum and allows you to adjust fan speed.
- Q.** *Does an underflow plenum introduce issues of dust accumulation? Is there something I can do to mitigate those problems? I am putting in an underflow plenum but have not done the underfloor yet. If the underflow plenum is installed in a cleanroom, there needs to be a way to access it to alleviate problems with dust accumulation. It is typically done with a removable floor*



panel system. How does the removable floor panel work?

A. Most cleanrooms push air down and return it through the floor. In large facilities where staff are working with satellites, such as the Mars Lander Rover, air flows sideways from one wall to the other. I have not seen a cleanroom where air flows from top to bottom. If there are particles being generated, it is better to push them down than to push them up.

Q. *In regard to the pressurized plenum concept, and the significant reduction in energy based on little to no distribution, does stuffing the make-up air of plenum expose you to uneven temperature problems?*

A. Make-up air distribution in pressurized plenum does need to be distributed evenly. In this case, if the air was dumped into the pressurized plenum, more room would have dumped it into the chase, which is more common, evenly distributing the make-up air.

Q. *Referring to slide 31 on Taiwanese Performance Comparisons of FFUs, are you aware of published data that correlates this back to manufacturers?*

A. Only anonymous data is available. The Taiwanese developed a standard way of testing performance. Lawrence Berkeley National Laboratory is trying to get California utilities or other public-good entities to fund testing of units so they can get a jumpstart on benchmark data. Right now, there is no way to make a comparison; that is why they are doing the standard test procedure.

Q. *Are there any guidelines or resources available to enable a quantitative approach to calculating required air change rates?*

A. Personally, I have not seen not seen quantitative methods. The next best thing is measurement-based methods similar to demand control filtration as described on slide 28 of

the presentation. Benchmarking shows that you can operate on the low-end of the ranges.

Q. *For demand control filtration, my lab will change from a constant variable system to a variable volume system. Will the change in the complexity of air flow cause problems?*

A. Pressurization of the cleanroom should be controlled by make-up air, not by difference in air pressure. Do tests before launching to ensure that pressurization is okay. It is possible that slowing flow could change pressure in ducts slightly, therefore, resulting in different flows. The change will not be dramatic unless the ducts are undersized. A normal, low-pressure drop should be okay.

Q. *Fan filter units are becoming popular. Are there any drawbacks to using these units to pull air from large building envelopes?*

A. Any system has its disadvantages. Fan filter units tend to be more expensive to fill. There are also maintenance issues to consider, including the facts that certain units have noise problems and certain units use too much energy.