HEPA FILTERED AIR FILTRATION EQUIPMENT MAY NOT BE HEPA FILTERED

I recently attended the EIA meeting in LV. During this meeting, there was a very interesting presentation on in field testing of HEPA filters that are used on mold, asbestos, lead and other abatement projects.

The first published article justifying the need for in-field testing of asbestos abatement HEPA filters was published in 1990 by the National Asbestos Council. Clearly, this 'historical' article was prophetic. For the past 3 years, the requirement for in-field testing of HEPA filtered air moving equipment has been written into project designs for asbestos abatement projects in northern California. This requirement was an outgrowth of the problems with naturally-occurring asbestos that was identified in California a number of years ago. After all, serpentine asbestos is the California State rock.

Rearch on the leakage of the HEPA filtered devices has been conducted by, Dr. Bob Brandys, of Occupational and Environmental Health Consulting Services for over 3 years. This research has shown that most HEPA filtered equipment does not perform at HEPA filter efficiency.

Brandys, Walsh and Baxter recently completed their most comprehensive research project in Las Vegas. This project not only measured particle filtering effectiveness, but also sampled the intake and discharge air and took photomicrographs of the particles leaking through the filters. This research clearly showed that the particles leaking past the filters and discharged into the air are not particles from carbon motor bushes as some people have claimed with absolutely no proof or research.

The pictures of the intake and discharge particles are shown……..

On the other side of the continent, Delano Lenard, an asbestos abatement consultant, has also been drawing attention to questionable performance efficiencies of HEPA filtered equipment on asbestos abatement projects. To prove his concerns were valid, Delano decided to test the discharge of asbestos from HEPA filtered Negative Air Machine (NAMs) equipment and to document actual leakage of particles and fibers through the device. Delano presented his findings at the Maine Indoor Air Quality Conference in 2009.

Delano tested the exhaust of 4 HEPA filtered NAMs using standard asbestos PCM filters and analysis by phase contrast microscopy. His findings are shown in Pictures 1 through 4.

Picture 1 shows a HEPA filtered NAM that appears to be functioning properly.
Picture 2 shows a HEPA filtered NAM with a little leakage.
Picture 3 shows a HEPA filtered NAM with some leakage.
Picture 4 shows a HEPA filtered NAM with worrisome leakage.

Why is this last picture worrisome? On close examination one can see a long fiber at 1 o'clock, and 2 short ones at 7 o'clock and at 8 o'clock (outside of the annular ring). Of more concern is that this was an Amosite asbestos abatement project. Amosite asbestos is a straight amphibole fibers that have been estimated to be up to 500 times more hazardous than serpentine Chrysotile asbestos fibers. If this unit is not exhausting to the outdoors or inside a containment, it is spreading fibers into the building.

Because of they get moved from site to site, these HEPA filtered NAMs often endure a lot more vibration and abuse during transport and use than fixed filters do, which can significantly compromise their effectiveness.

Another

Training on How to Measure HEPA filtered NAM Efficiency

OEHCS has been conducted training sessions in Chicago, Milwaukee, California and Las Vegas on how to test HEPA filtered NAMs using particle counters. During these training sessions, it is recommended that participants who own particle counters bring their particle counters to the hands-on training course.

During these information and training sessions, the first thing that we cover how to use laser particle counters and configure their settings as required in the standard. Participants have numerous questions on the difference between cumulative and differential sampling modes, metric versus US units, totalizing, minimum sampling time, 90% response time, significant figures, data storage, data retrieval and so on. Further, the settings menus vary by manufacturer and even by model number.

During the training sessions, we have local asbestos and mold contractors bring their equipment in for testing and training purposes. This equipment will include large NAMs, small NAMs, HEPA canister vacuums, etc.

The next item on the agenda is to demonstrate how to test HEPA filtered equipment. To demonstrate this testing a 3016 Lighthouse Particle counter is outfitted with a webcam, so that a live video of the particle counter display can be projected on the powerpoint screen. The whole room can see the actual particle counts as they happen. Next, we demonstrate the HEPA filtered testing protocol. This is a common sense testing method where the incoming particle concentration is compared to the discharge particle concentration.

This is similar to the historic DOP filter challenge method, except that one does not generate an aerosol, but uses the background particle count in the room as the challenge concentration.

Step 1) is to collect three background particle readings of the air in the room. These are entered into a spreadsheet and an average is calculated for each of the 6 particle size ranges. This spreadsheet is also projected live in the front of the room on a second screen.

Step 2) is to turn on the HEPA filtered equipment and let it run for about 1 minute. During this start up and pressure equalization time, the HEPA filter on HEPA filtered equipment can flex and release particles affect the calculated efficiency. This is more common on used HEPA filters. You can see this effect if you start measuring the particle counts as soon as the device is turned on. This is phenomena is during the training session. After a minute or two, the particle counts reaches an equilibrium level and gives relatively consistent results from test to test.

Step 3) is to collect three particle counts of the discharge air coming out of the HEPA filter equipment exhaust. The particle counter should be as close to the exhaust port of the unit as possible. Sometimes a sampling tube is necessary on vacuums with small discharge ports. With the help of our live video stream, participants see the discharge particle counts as they are being measured. These readings are then put into the spreadsheet and participants watch as the averages are calculated. The spreadsheet also calculates the particle removal efficiency at each size range.

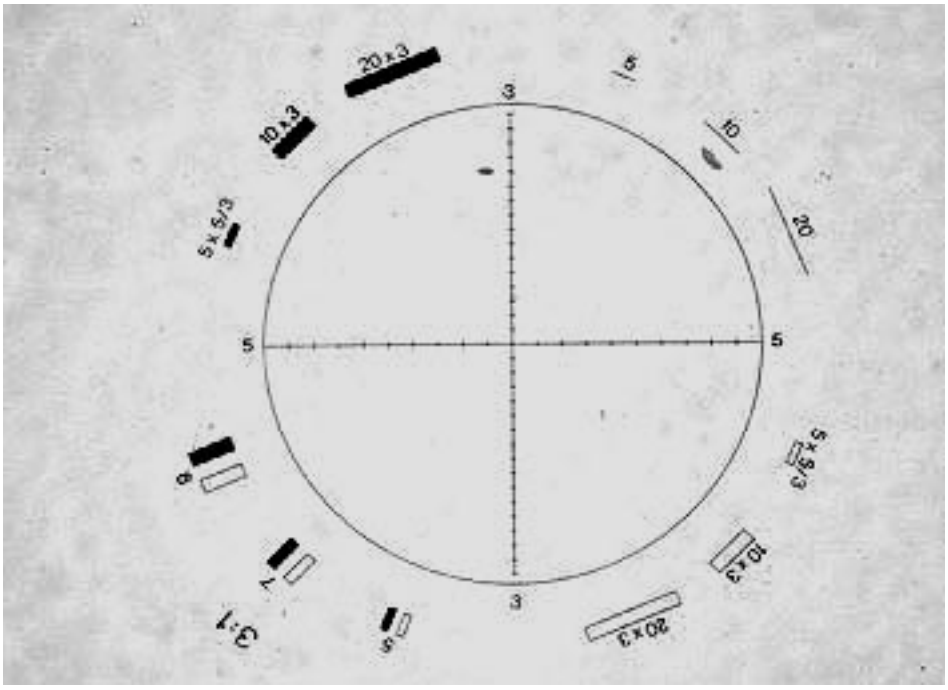
This procedure is repeated with four or five additional HEPA filtered pieces of equipment such as air scrubbers and vacuums from various manufacturers. During this demonstration, none of the HEPA filtered equipment actually calculates to HEPA efficiency?

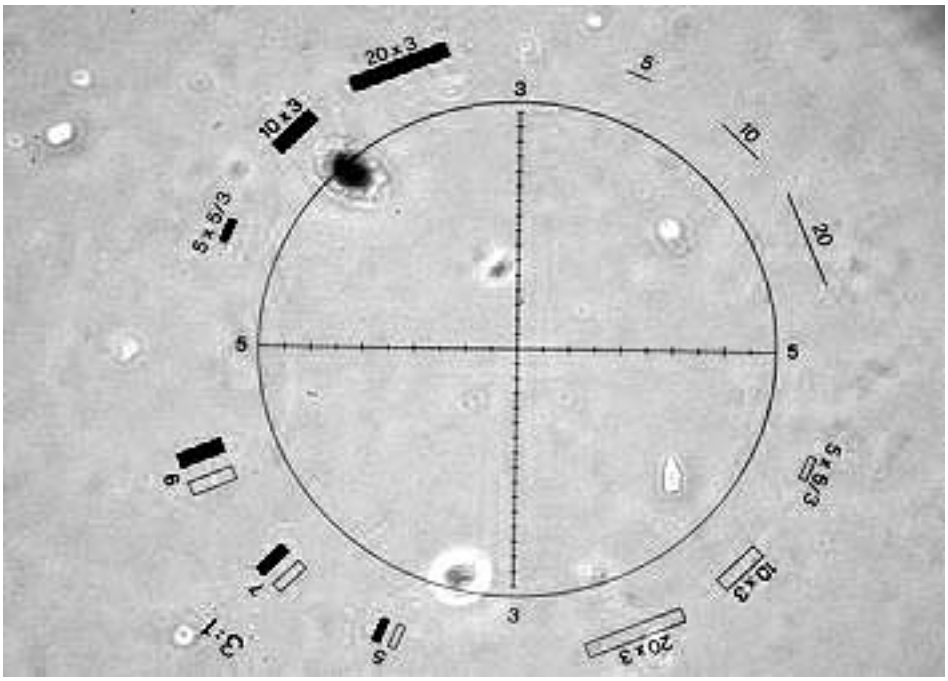
Then the fun begins. We roll the next device in front of the class, take the background readings again and turn on the another HEPA filtered piece of equipment. The particle counter is placed into the exhaust air stream and turned on. But the display reads all zeros. No particle counts were measured. All zeros. Is the particle counter malfunctioning? No! This is a HEPA filtered piece of equipment that really works and calculates to HEPA efficiency at 0.3 microns! *The audience is stunned.*

Needless to say, when you see a HEPA equipped piece of equipment that exhaust air with zero particle counts, the importance of testing these pieces of equipment and the validity of this simple testing method is confirmed. In all three training sessions, this “all zero” result was measured from an Abatement Technology “Predator.”

But wait. The fun is not over yet. One more HEPA filtered piece of equipment is rolled in front of the class for testing. In order to understand the significance of this last test of a HEPA filter equipment, you need to know that the average background particle count in the room at the 0.3 micron particle size was approximately 20,000 particles per cubic foot. The last piece of HEPA filtered equipment is turn on and the exhaust air stream concentration - something smells funky and the particle counter’s readings go off the charts! With the air scrubber in operation, the particle level at 0.3 microns in the exhaust air shoots up to 400,000 particles per cubic foot, more than 20 times the background particle level! The audience yells, “TURN IT OFF!” Needless to say, we don’t do three 20 second tests on this devices. It is very clear to that this is not an air filtration device; it is a “particle pump.” This is a term we coined for a device that adds more particles to the air than it removes!

“Particle pumps” are not that uncommon in used HEPA filtered equipment. In each seminar, we have found 1 or 2 of pieces of HEPA filtered equipment. Considering how many HEPA equipment are used on asbestos, lead and mold jobs, “particle pumps” are worrisome. Exactly what are they discharging - especially at this 0.3 micron particle range? Are these respirable particles hazardous? Are they asbestos, lead or mold, when used on those projects?

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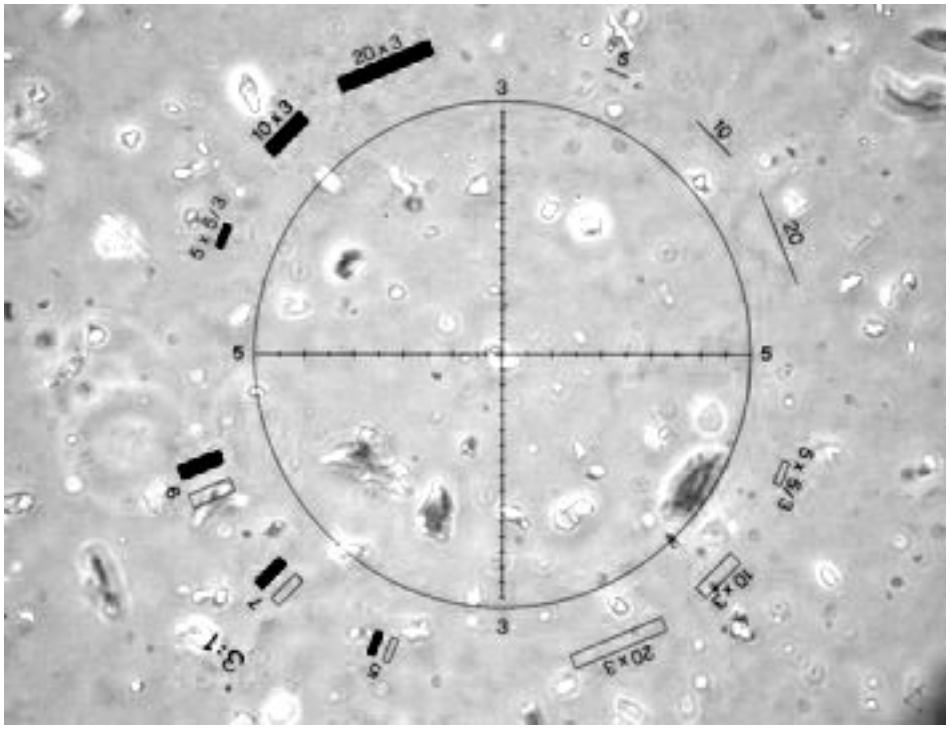
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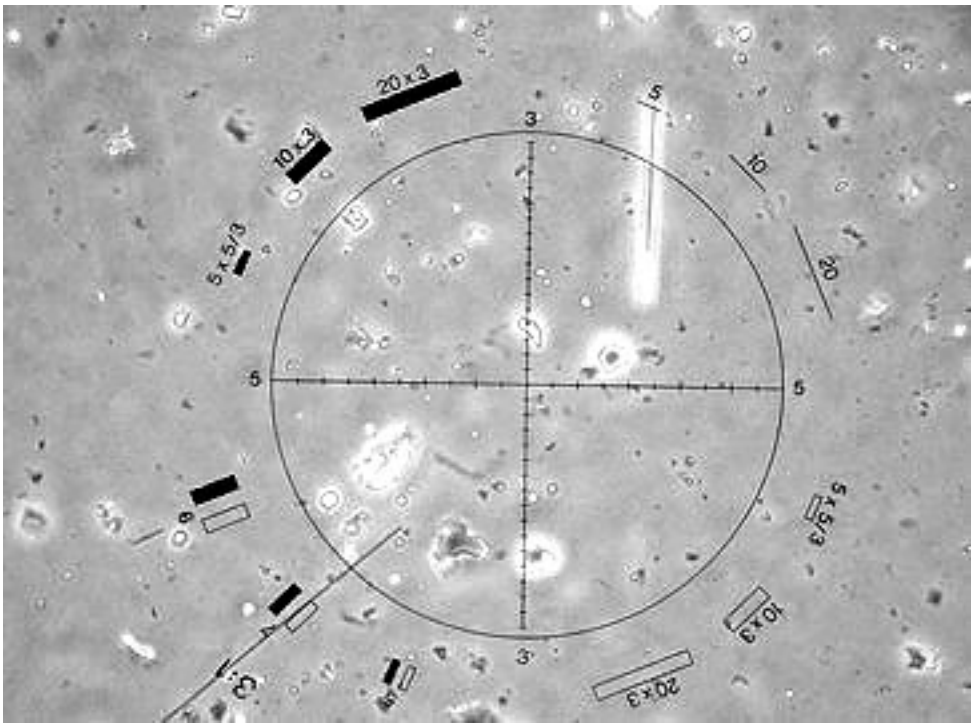
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