

agencies.

**Lessons Learned:** Taking a 40-hour course that is typically done in one week and making it a 13 week course was very challenging. Lessons learned revolved around ensuring effective organization logistics, communications, and scheduling, locating equipment, obtaining donations, working around adverse weather, finding space for simulated work activities, ensuring the university community was informed, etc. This program was a huge success and it is now a fixture in the university curriculum for the Spring semester. Instructing students was a very enjoyable and rewarding experience and I would highly recommend that all IH/OEHS pros look at give back to their alma maters.

### SR-104-03

#### Creating a Mathematical Noise Model

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**Objective:** To create a mathematical for noise that can be used to predict Sound Pressure Levels at different locations within a space as well as determine the Sound Pressure Levels produced by sources within the space.

**Methods:** Shows how a mathematical model using Microsoft Excel can be created to accomplish the objective.

**Results:** Model, when validated with existing sound level measurements, produces the desired results.

**Conclusions:** As the supplier could not know where or how we were going to use their equipment / tool, they could not provide a Sound Pressure Level that is specific to our use of their product. Instead, they will provide a Sound Pressure Level that is most favorable to their getting the contract. In either case, what we need to know is how the equipment / tool will function when installed in our environment. It is possible, with a “tuned” working model of our environment, to determine the actual performance of purchased equipment. This should be the ultimate goal of any buy quiet program.

### SR-104-04

#### Contribution of Non-HEPA Preliminary Filters to the Efficiency and Life-span of HEPA Filters in Reducing Cadmium Contaminated Emissions and Respirable Particles

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**Objective:** Pre-filtering media, such as non-HEPA filters, are often installed in front of HEPA filters with the expectation that they will improve efficiency of particle removal, expand the life cycle of the HEPA filters and reduce the cost of filtration. This study was conducted in four manufacturing processes to examine these expectations.

**Methods:** The concentration of cadmium contaminated emission (Cd) as well as size distribution of these particles were determined in five locations: area in the shop immediately in front of air intake to the process (Intake); the inlet of the ventilation system to establish the uncontrolled emission levels from the process before pre (primary)-filter (Inlet); between the pre-filter and HEPA filter to quantify the effectiveness of the primary filtration (Between); immediately after the HEPA filter (Outlet) to determine overall effectiveness; and, in the shop area in front of air discharge to the

shop (Discharge). The respirable particles were only sampled at Inlet, Between and Outlet locations. The particles were also monitored using a five-stage dust impactor, a particle counter and a ventilation airflow meter. Experiment continued over days until the HEPA filters became technically inefficient. The air samples were collected multiple times at each location.

**Results:** The mean (SD) of Cd contaminated emission at the five monitoring locations were as follow: Intake 0.49 (0.16)  $\mu\text{g}/\text{m}^3$ ; Inlet (after process) 62.6 (158)  $\mu\text{g}/\text{m}^3$ ; Between 4.9 (14.1)  $\mu\text{g}/\text{m}^3$ ; Outlet 0.01 (0.03)  $\mu\text{g}/\text{m}^3$ ; and, Discharge 0.20 (0.08)  $\mu\text{g}/\text{m}^3$ . The mean (SD) of respirable particles were measured as follow: Inlet 556 (1085)  $\mu\text{g}/\text{m}^3$ ; Between 26.9 (68.8)  $\mu\text{g}/\text{m}^3$ ; Outlet 0.55 (0.83)  $\mu\text{g}/\text{m}^3$ . On average, efficiency of the pre-filter was 92.2 percent for Cd and 95.2 percent for respirable particles, leaving 7.8 percent of Cd and 4.8 percent of respirable particles to be captured by the HEPA filter. The size distribution of particle were almost even at the five size ( $\mu\text{m}$ ) channels of  $>2.5$ , 1.0 - 2.5, 0.5 - 1.0, 0.25 - 0.5, and  $<0.25$ , with higher levels at 1-2.5  $\mu\text{m}$  size.

**Conclusions:** This study indicates that though the capture efficiency of a pre-filter is not remarkably high (92.2 percent for Cd), but it has a fundamental support in increasing the life expectancy of HEPA filter, reducing the cost and increasing operational efficiency of the ventilation system which leads to less downtime of the process.

#### CS-104-05

#### EPA Guidance for Determining Organic Vapor Cartridge Service Life for NIOSH-Approved Respirators

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**Situation/Problem:** Under the 1976 Toxic Substances Control Act, EPA may allow the use of NIOSH-approved air-purifying respirators for inhalation protection against a Premanufacture Notification chemical if a cartridge change-out schedule is supported by breakthrough time testing results. However, cartridge manufacturers don't have breakthrough time data available for new or unusual chemicals. Therefore, experimental confirmation via breakthrough time testing is necessary to develop cartridge change-out schedules for new chemicals. EPA's previous guidance containing interim recommendations for cartridge testing was sorely in need of updating to incorporate current science and methodologies.

**Resolution:** EPA has developed an updated document entitled "EPA Guidance for Determining Organic Vapor Cartridge Service Life for NIOSH-Approved Respirators." Rather than specify a one-size-fits-all set of testing conditions, this document provides new chemical submitters with options available for developing a testing protocol and the benefits and limits of each option.

**Results:** The updated document has expanded testing guidance to include: 1) removal mechanisms other than physical adsorption; 2) mathematical and computer model based screening; 3) laboratory testing reduction option based on workplace environmental conditions; 4) field testing option; 5) the presence of interfering covapors, and 6) surrogate vapor testing. Workplace environment and testing information and data that EPA needs to review a submission are also described. A companion document containing guidelines for evaluating air-purifying respirator cartridge test data was also developed to assist EPA in evaluating the submitted test data.



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