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ASBESTOS

# Industrial hygiene news report

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## NEW TOOLS AND OLD TRICKS FOR NOISE CONTROL

Personal computers, electronic spread sheets and computer models can be used for much more cost effective noise control analysis than was possible 15 years ago. Howard K. Pelton of PMI Acoustics, Inc. (14901 Quorum Dr., Dallas, TX 75240), speaking at the American Industrial Hygiene Association annual meeting in Dallas, May 18-23, explained how personal computers can be used to predict the result of a noise evaluation prior to the construction of a facility, based on available or calculated data:

> The use of the personal computer as a design tool for noise control can be best illustrated in two ways. First, the advent of an electronic spread sheet is a perfect match for noise control work since there are eight or nine octave bands and thirty-two 1/3 octave bands to be considered. This allows the calculation of sound power levels for fans by the ASHRAE methods, using an electronic spread sheet, that allows immediate use of the data. The LOTUS 1-2-3 spread sheet is one that can be used as a base program for day-to-day calculations. The features of this spread sheet allow programming to be performed by the use of macros and one can virtually model a noise control problem without writing a detailed program. The calculation of plenums, barriers, room acoustics, duct attenuation, and silencer attenuation can all be performed by this method. Another computer program is used to model the room acoustics of a space which will provide information about how sounds will react within a space and the effect of various types of acoustical treatment for absorption or enhancement depending upon the application.

Larger and more complicated spaces are modeled with programs that are called "NOIZ" and "RAYTR." They are available through a service bureau that can be accessed through a modem and communications software on a personal computer. The NOIZ program allows one to input all of the sound power levels of the noise sources, either with or without control and the absorption coefficients of the building. The calculated result is the dBA levels in a grid coordinate pattern. With this information, one can then go back and change the sound power level of various noise sources by the amount of noise reduction that would be expected and recalculate the results. The computer model called RAYTR looks at the noise source and receiver locations and traces out the sound rays for the first three reflections from the source to the receiver within a space. If desired, the model can be set up to look at barriers outdoors.

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## DUCT MATERIALS AND THEIR APPLICATIONS

One important aspect in the proper design of duct work is the material selected which is usually dictated by the contaminant being handled. At the 28th annual Industrial Ventilation Conference in Raleigh, N.C., Apr. 14-18, Robert K. Bryant of Exxon Research and

Engineering Co. (Clinton Township, Route 22 East, Annandale, NJ 08801) said that galvanized material of various gauges is most widely used due to its low cost, workability and structural strength. In addition to stainless steel and aluminum which are used for special materials, Mr. Bryant listed the following materials and their particular applications

* Black steel: For conveying high temperature air or gases.
* Copper or lead-coated copper: Where moisture is present, and permanency is required (does not require painting).
* Galbestos ducts: Good to a maximum temperature of 160° F. The asphalt asbestos coating is applied to both sides and is 6-8 mils thick. Normally available in 3 x 8 ft sheets. Friction losses may be 2 to 2-1/2 times the value for standard round galvanized ducts as determined from friction charts.
* Transite or Asbestos Board: Essentially inert materials good for high temperature and many laboratory fumes. Use may be limited since health hazards exist during drilling and cutting operations.
* Plastic - Solid Polyvinyl Chloride (PVC): Duct material from 1/8 to 3/16 inch thick; hoods, 1/4 inch thick; and joints, flanged or solvent cemented. Standard friction charts for round galvanized ducts may be used.
* Flexible Ducts (fabric and metal wire type): Widely used in air conditioning work as well as industrial ventilation and material handling situations. Fabrics available include butyl coated cotton, cotton fabrics, neoprene coated glass fabric, vinyl-coated cotton, nylon, and solid PVC. Generally good for temperatures from -40° F to 250° F, with the exception of the PVC duct which has a temperature range of -20° F to 180° F. The diameter of the PVC flexible duct can be changed 25% by twisting the duct. Flexible duct is good for a working pressure of 40# for 1-1/2 inch diameter and 3# for the 18 inch diameter. For other diameters, interpolate to obtain working pressures.
* PVC-Coated Galvanized: Galvanized sheet is given a 4 mil coating of PVC. The PVC is sprayed on over a primer and then baked to a tough highly scrape-resistant coating. It is available in 3 x 8 foot and 4 x 10 foot sheets. It is readily available in 22 or in 24 gauge. It has a useful temperature range of -40° F to 220° F. Connections are made air tight with a brushed on epoxy sealant and duct tape. PVC coated sheet has a flame spread rating of 22.5.

## HEALTH ASPECTS OF FIBER GLASS; COMPARISON WITH ASBESTOS

There is no consistent evidence to link malignant or non-malignant disease to workers who either make or install man-made glass fiber products, according to Lawrence J. Mellon, M. D., of CertainTeed Corp. (P. O. Box 860, Valley Forge, PA 19482). Speaking at the 14th annual Air Pollution/Contamination Control Seminar held in Valley Forge, Pa., May 22, Dr. Mellon stated that fiber exposure does not cause the same kind of health effects as those associated with asbestos exposure. Some other information given follows:

While asbestos and glass fibers are non-organic, the similarities end there. Glass fibers differ from asbestos fibers in origin, chemical composition, physical structure, diameter, and durability. Asbestos is a naturally-occurring mineral fiber that is mined and separated from a host rock. Glass fibers, on the other hand, are man-made fibers manufactured under controlled conditions from molten glass. Asbestos fibers are crystalline in structure and can break into thinner and thinner filaments. Glass fibers, however, are comprised of monofilaments which cannot be separated into thinner strands. Asbestos usually splits lengthwise, but glass fibers only break crosswise, without reducing their diameters. Fiber diameter is important since fibers less than 3.5 microns are capable of being inhaled. Experimental data suggest that fine glass fibers may be more easily broken down by body fluids than asbestos which may explain why fibrous glass has not demonstrated disease potential.

Extensive sampling conducted both in manufacturing plants and in the field where glass fiber insulation is being applied have found airborne concentrations of glass fibers to be quite low. Samples taken by industrial hygienists within manufacturing facilities revealed concentrations that were generally less than 1 fiber/ml and ususlly less than 0.1/ml. Although workers with up to 40 years of exposure to various types of glass fibers have shown no consistent evidence of long-term health effects, exposure to glass fibers can cause temporary irritation of the skin and, less frequently, irritation of the eyes, nose, and throat. Good personal and industrial hygiene practices coupled with the use of loose fitting, long-sleeved clothing, and eye protection minimize the discomfort experienced. If upper respiratory irritation or very dusty conditions are encountered and ventilation cannot be used to control the exposure, a nuisance dust respirator will minimize the transitory effects.

## NEW SAMPLER FOR ACTIVE AND PASSIVE SAMPLING OF ORGANIC SOLVENT VAPORS

The versatility of the passive sampler ORSA 5 that can also be used for active sample-taking was extolled by Karl-Heinz Pannwitz of Drägerwerk AG (Postfach 1339, D-2400 Lübeck 1, Germany F.R.) at the American Chemical Society national meeting held Apr. 18-22 in New York City. Some details and testing results follow:

> When connected to a pump, the ORSA 5 can be used as an active sampler, while at a flow rate of 200 ml/min it is suited for sampling over a 15 minute period to determine short-term exposures. A much higher substance mass is absorbed in this way than is sampled by diffusion. The higher mass uptake yields analyses results that show better reproducibility and smaller standard deviations. On the other hand, the active sampling with ORSA 5 at lower rates over the period of a work shift can be used as reference for the passive sampling. This makes it easy to determine unknown diffusion coefficients of compounds empirically. The results of comparison measurements with active/passive ORSA 5 show agreement within 10%.

To verify the suitability of ORSA 5 as an active sample-taking device, a series of tests have been carried out under defined conditions in the laboratory as well as in the field:

* Active and passive air samples of pulsating toluene and 2-butanone concentrations have been taken over a period of 15 minutes. The sampling rate of toluene for the passive sampler has been calculated from Fick's law of diffusion to be 6.5 ml/min, while by the active sampling, 200 ml/min have been sucked through the ORSA tube by the personal pump. Corresponding to that, the mass uptake of the active sampling (508 µg toluene) is more than 30 times higher than the passive sampling (14 µg toluene). Also, a smaller relative standard deviation has been determined for the active sampled ORSA 5.
* To determine the maximum adsorption capacity of ORSA 5 as an active sampler, sample volumes of up to 144 liters of test atmospheres (toluene concentration: 1150 mg/m$^3$) have been sucked through two ORSA 5 sampling tubes connected in series with a flow of 200 ml/min. The evaluations show that more than 100 mg toluene can be adsorbed by an ORSA 5 sampler without any breakthrough.
* Both active and passive sampling with ORSA 5 have been conducted in the field as well as in the laboratory. The measurements have been carried out as area air monitoring in a print shop. The measured compound was toluene, the sample-taking time was 30 minutes. Toluene concentrations have been analyzed in the range of 240 to 540 mg/m$^3$. The results of the active and passive sampling show a good correlation.