ble phermonal reactions. The subjective symptoms reported by individuals living near environmental odor sources often follow a consistent pattern. However, the ability to measure airborne ambient chemicals responsible for odors and to correlate their concentrations with reported symptoms has eluded researchers.

Environmental odor pollution can come from a variety of municipal, agricultural, and municipal sources. Although the nature of the complaints reported by the public are often very similar, each of these sources has unique chemical emissions associated with it. The development of a chemical "fingerprint" for specific ambient odors will assist in the identification odor source and will aid air pollution control districts in identifying odor sources, responding to complaints, and developing and implementing enforcement and abatement strategies. This presentation provides a summary and analysis of some of the methods available to assess environmental odor problems.

205.

EVALUATION OF ELEMENTAL MERCURY RELEASES ASSOCIATED WITH THE REMOVAL OF GAS PRESSURE REGULATORS IN HOMES. P. Williams, D. Paustenbach, Exponent, Menlo Park, CA; P. Sheehan, G. Brorby, Exponent, Oakland, CA

Gas pressure regulators containing about 3 to 10 milliliters of elemental mercury were installed, primarily in basements, in many homes prior to the mid-1960s. Over the last 40 years, these "old style" regulators were moved outdoors or replaced with a new regulator, sometimes resulting in accidental mercury releases in a small fraction of homes. Such releases produced elevated concentrations of elemental mercury vapors in various indoor locations, particularly in air immediately above the surface where the spill occurred. In this paper, we discuss the two-phase investigation initiated by Michigan Consolidated Gas Company to characterize mercury airborne concentrations in residences where a gas pressure regulator had previously been removed. In Phase I, about 4,500 air samples were collected in 32 houses where a known prior release and cleanup of mercury occurred. In Phase II, about 3,800 out of 15,000 homes where a regulator may have been removed were sampled based on a statistically based sampling protocol. Results from Phase I indicated that average breathing zone concentrations in the living space were less than the Agency for Toxic Substances and Disease Registry (ATSDR) residential action level of 1 ug/m3. In Phase II, initial measurements indicated that a spill may have occurred in 26 homes. More detailed sampling showed that average breathing zone concentrations in the living space were less than the recommended action level in all but three of these homes. Based on these results, which are similar to those obtained in a study conducted in Chicago last year by another utility company, it can be inferred that some mercury was spilled in about 0.7% of homes in which regulators were removed, and that the cleanups undertaken at the time of the spill were adequate to keep airborne concentrations generally well below 1 ug/m3 in these homes.

206.

RECOGNITION, EVALUATION, AND CLEAN-UP TECHNIQUES FOR MERCURY RELEASES IN NON-OCCUPATIONAL ENVIRONMENTS. D. Mummert, J. Joice, IT Corporation, Findlay, OH

Metallic mercury has been used for years in many scientific and industrial applications due to its dense, liquid nature and electrically conductive qualities. Human health studies, some dating back more than a thousand years, have described the toxicological significance of workplace exposures. Recently, greater attention has been focused on mercury releases in residential and public environments primarily due to mercury containing devices being broken or disturbed. Government agencies are now recommending mercury spill remediation practices that differ significantly from those used to control familiar residential contaminants such as lead and asbestos. Residential and non-occupational exposure limits have also been established to well below commonly used occupational exposure indices.

This presentation describes the common sources of mercury in residential settings and public facilities as well as the behavior of spilled mercury based on its physical properties. A case study is reviewed detailing remediation techniques in the residential environment utilizing non-traditional techniques such as ventilation and manipulation of indoor ambient temperatures. The discussion includes the use of very low detection-limit, direct-reading instruments as site survey tools and how these compliment fixed-media air sampling for multi-phase final clearance sampling based on governmental agency recommendations. Finally, a number of problematic areas are considered, such as dealing with old vs. new spills, porous surfaces, personal effects, and encapsulation vs. aggressive cleaning procedures.

207.

INVESTIGATION OF ASBESTOS EXPOSURES ASSOCIATED WITH VERMICULITE EXPANSION AND VERMICULITE USE IN PRODUCTION OF INDUSTRIAL AND HORTICULTURAL PRODUCTS. D. Hewett, NIOSH, Morgantown, WV

The former W.R. Grace mine in Libby, Montana was so contaminated by asbestos that the company eventually closed the mine. More recently, the Environmental Protection Agency (EPA) began exposure assessments to determine health risks associated with asbestos from vermiculite remaining in the area.

In light of the concern over the Libby Montana deposit, the Occupational Safety and Health Administration (OSHA) requested NIOSH investigate worker exposures to asbestos at plants where vermiculite is expanded and mixed and at horticultural operations where expanded vermiculite is mixed. Major sources of vermiculite were determined and users were identified. Exposure assessments were performed at numerous sites and samples were split between OSHA, NIOSH, and EPA to apply different analytical methods to the quantification of asbestos.

Air samples were analyzed by EPA with NIOSH Manual of Analytical Methods (NMAM) 7400 Asbestos and Other Fibers by PCM, ASTM D 5755-95 Microvacuum Sampling and Indirect Analysis of Dust by TEM for Asbestos Structure Number Concentrations and International Standard ISO 10312 Ambient air—Determination of asbestos fibres—Direct-transfer transmission electron microscopy method. Air samples were analyzed by OSHA with ID 160 Asbestos in Air, and analyzed by NIOSH by NMAM 7400, 7402 Asbestos by TEM and 7402 (modified) where fibers less than 0.25 microns are counted.

Bulk samples were analyzed by EPA with EPA/600/R_93/116 Method for the Determination of Asbestos Building Materials, by OSHA with ID 191 Polarized Light Microscopy of Asbestos, and by NIOSH by NMAM 9002 Asbestos (bulk) by PLM.

This presentation describes the approach that was taken to identify facilities for investigation, and sampling and analytical issues that arose from the investigation.

208.

ASSESSMENT OF A PROACTIVE IAQ/PREVENTATIVE MAINTENANCE PROGRAM IN A PUBLIC SCHOOL SYSTEM. B. Hemler, Montgomery County Public Schools, Rockville, MD

Although research in the link between the indoor environment, health, and occupant performance has been largely antidotal, Montgomery County Public Schools (MCPS) is moving forward in the effort to provide a high quality indoor environment through our IAQ Program and the establishment of an IAQ/Preventive Maintenance Team.

This proactive team is designed to address environmental issues before complaints are initiated. An IAQ assessment of the facility followed by ventilation cleaning, preventative maintenance, housekeeping evaluation, identifying contaminants, and developing long-term strategies for identified issues is organized through a written site-specific building maintenance plan. The plan includes IAQ and OSHA mandated training and the EPA *Tools for Schools* action kit. Schools then receive annual preventative maintenance visits and evaluations.

Four main performance measures are used to track the program: 1) Indicators of Air Quality, 2) Implementation of the Program, 3) Effectiveness of Continuing Program, and 4) Customer Satisfaction.

In summary, team activities improved 51% of indicators on the first set of initial visit schools and 41% on the second set, meeting 46% and 45% of goals, respectively. On the

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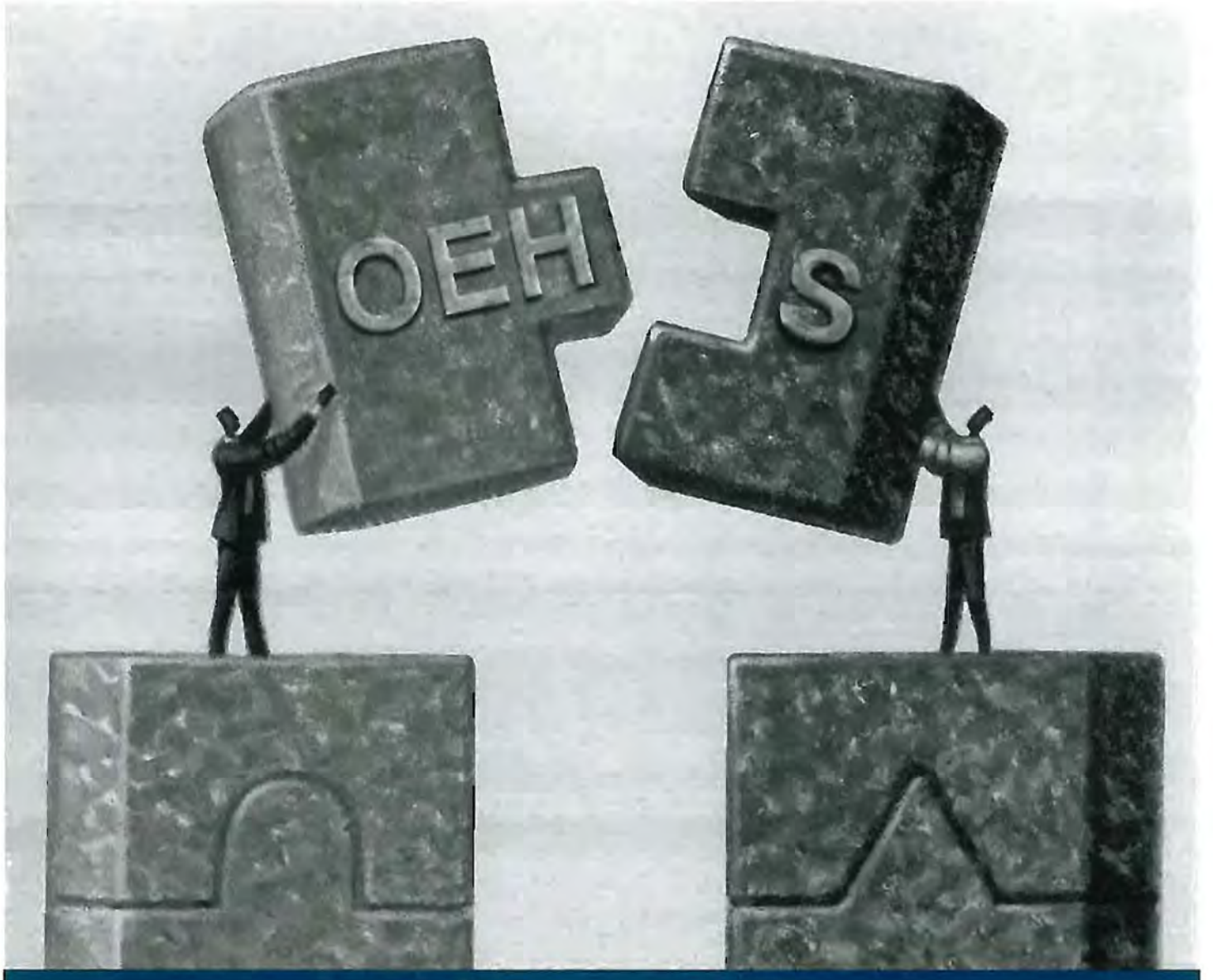

ABSTRACTS

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2002 Abstract Index by Session Topic

PF 101 Agricultural Health and Safety

Papers 1–6

1.

RELATIONSHIPS BETWEEN WORK EXPOSURE AND RESPIRATORY OUTCOMES IN POULTRY WORKERS.

S. Kirychuk, J. Dosman, P. Willson, L. Dwernychuk, University of Saskatchewan, Saskatoon, SK, Canada; J. Feddes, A. Senthilselvan, C. Ouellette, University of Alberta, Edmonton, AB, Canada

A pilot study was conducted on 74 poultry barn workers in Western Canada during the winters of 1998–2000. General respiratory health, current, chronic and work related respiratory symptoms; general work duties, and work-site factors were ascertained, pre-exposure, by questionnaire. Personal airborne exposure levels and changes in symptoms and lung function were measured across the work-shift for all workers. Workers were classified according to the type of poultry operation (floor based, n=53; cage based, n=13) in which they worked. There was no significant difference in daily hours spent in the barn between those who worked with caged poultry (5.41±2.35 hours) and those who worked with floor-based poultry (4.42±2.48 hours). Age of birds was 47.10±58.36 days for floor based versus 155.91±63.01 days for cage based facilities. There were no significant differences in personal environmental measurements between cage-based and floor-based facilities (ammonia 13.22±13.70 ppm, 17.34±16.35 ppm; total dust 5.74±4.85mg/m^3, 10.01 ±8.84 mg/m^3; endotoxin 6046±6089 EU/m^3, 5457±5934 EU/m^3 respectively). There were no significant differences in across work-shift change in pulmonary function indices between workers from cage and floor-based operations. For the entire sample total dust dose (work hours/day x total dust) significantly correlated with across-shift change in FEV_1, whereas endotoxin dose and ammonia dose did not. Stocking density was significantly correlated with average ammonia (ppm, p=0.002) and ammonia dose (ppm x work hours/day; p=0.004) in floor based operations and with total dust (particles/ml, p=0.002) in cage based populations. Stocking density was also significantly correlated with chronic cough (p=0.003) and across work-shift cough (p=0.05) and chest tightness (p=0.06) for workers from floor based operations; and with phlegm when working (p=0.018) and chest tightness across the work-shift (p=0.004) for workers from cage based operations. Type of poultry production operation and therefore type of work exposures appear to significantly impact symptoms experienced by workers exposed to these atmospheres.

2.

DUST GENERATION SYSTEM FOR AGRICULTURAL SOIL DUST.

K. Lee, R. Domingo-Neumann, R. Southard, UC Davis, Davis, CA

Agricultural workers are prone to exposure to mixed dust of inorganic and organic compounds. Diverse working conditions and operations in agriculture make direct measurements of the mixed dust exposure difficult. This study was conducted to develop a new dust generation system to determine possible exposure potency indicators of soil samples. The dust generator consists of a blower, a rotating chamber and a settling chamber. The rotating chamber has inner baffles to provide sufficient agitation of the samples while the chamber is rotating. A blower provides air into the rotating chamber, and the suspended dust is moved to the settling chamber through a perforated pipe. A small fan inside the settling chamber helps maintain suspension of the dust. Various size fractions of dust are sampled on filters suspended in the chamber via outlet ports and attached pumps. Air pressure is released through a filter plate mounted on the wall of the settling chamber. Various operating conditions were evaluated: air intake from blower, speed of rotation, soil mass and sampling time. To evaluate the characteristics of dust from the system, we collected dust samples from agricultural fields while the soil was prepared for