N-, R-, and P-series filters were exposed to saturated organic vapors for varying amounts of time to determine a worst-case degradation profile. Isopropanol, ethyl acetate, acetone and pentane vapors were used because of their prevalence in the workplace. The electrostatic filters were also tested in a flow-through configuration against isopropanol vapor at Immediately Dangerous to Life and Health (IDLH) concentrations (2000 ppm) over an 8-hour shift. The IDLH concentration is the highest concentration in which these respirators could be used. Filters loaded with sodium chloride aerosol and silica dust were also exposed in the flow-through system to determine if aerosol loading has an impact on filter efficiency degradation. After vapor exposure, the filters were tested on a TSI 8130 against NaCl aerosol (N-series filters) or a TSI 8110 against DOP aerosol (R- and P-series filters) for aerosol penetration. Aerosol penetration was used as a surrogate for filter efficiency degradation because there is currently no way of measuring the electrostatic charge distribution on the filters. Electrostatic N-, R-, and P-series filters show filter efficiency degradation resulting in aerosol penetrations of over 70 percent when exposed to saturated isopropanol vapor. Filters were degraded by the other saturated vapors, but not to the extent of the saturated isopropanol. The filters tested using the flow-through system showed very little, if any, efficiency degradation, even when aerosol loading on the filter was present. This research shows that electrostatic respirator filters can be degraded by these organic vapors at saturation concentrations. However this degradation is not a concern because workplace concentrations will be much lower than saturation.

410

PERFORMANCE OF SELECTED N95 AND P100 RESPIRATOR FILTERS TO PLANT AEROSOLS AT A SNACK FOOD PRODUCTION FACILITY. S. Berardinelli, R. Lawrence, C. Coffey, E. Moyer, G. Kullman, NIOSH, Morgantown, WV.

The National Institute for Occupational Safety and Health (NIOSH) conducted a workplace respirator filter performance study at a plant that produces snack foods. A main ingredient of the products is finely grounded salt. This study was conducted to determine the workplace performance of particulate respirator filters. In laboratory tests, salt has been shown to have a degrading effect on respirator filter media. Selected N95 and P100 filters were tested against plant aerosols during normal production. The N95 filters were exposed for two- and three-work shifts (16 and 24 hours). P100 filters were exposed for an entire work week (40 hours). Workplace air was drawn through each respirator filter at a flow rate of approximately 45-50 L/min. This flow rate was chosen to load a reasonable amount of particulate on the filter and is comparable to a worker's breathing rate doing moderate work. Paired samples were exposed in two plant locations, to collect duplicate samples. The field exposed filters were returned for laboratory evaluation of test aerosol penetration. Control filters with no workplace exposure were also tested for penetration. The P100 filters tested all performed above 99.97% efficiency. Initial penetration values were identical to controls after exposure to plant aerosols. Several N95 filters exceeded 5% penetration after three-work shifts, even though average particulate concentrations at the plant were low (<0.30 mg/m3). These data demonstrate that these plant aerosols can significantly affect the filter efficiency of N95 respirators.

411.

COMPARISON OF FIVE METHODS FOR FIT-TESTING N95 FILTERING-FACEPIECE RESPIRATORS-ALTERNATE APPROACHES. R. Lawrence, C. Coffey, D. Campbell, P. Jensen, NIOSH, Morgantown, WV; W. Myers, West Virginia University, Morgantown, WV

A previous study had determined the ability of five fit-test methods (Bitrex, saccharin, PortaCount Plus corrected for filter penetration, PortaCount Plus/N95-Companion, and generated aerosol) to screen out poorly fitting N95 filtering-facepiece respirators. The results were compared to the 5th percentile of the simulated workplace protection factor (SWPF). No fit-test method met the American National Standards Institute (ANSI) Z88.10 standard of less than 50 percent for the alpha error (probability of rejecting an adequately fitting respirator) and less than 5 percent for the beta error (probability of accepting an inadequately fitting respirator). The correlation between the PortaCount's SWPF value and actual exposure is not one to one, but can be expressed with a quadratic equation, based on available data. The equation can be used to adjust PortaCount data to reflect this non-linearity. In this study, the original analysis was repeated using five alternatives to the 5th percentile as the reference test: (1) the mean of the SWPF, (2) the individual SWPF values, (3) the 5th percentile adjusted to account for possible bias in fit-test instrument, (4) the bias-adjusted mean SWPF, and (5) the bias-adjusted individual SWPF values. With these alternative reference tests, the range of alpha errors for the Bitrex, generated aerosol, saccharin, PortaCount Plus, and N95-Companion fit tests were, 41 to 59 percent, 67 to 86 percent, 38 to 67 percent, 51 to 79 percent, and 38 to 87 percent, respectively. The corresponding beta errors were 6 to 25 percent, 0 to 3 percent, 9 to 16 percent, 2 to 6 percent, and 0 to 19 percent, respectively. Use of the alternate methods of determining respirator performance did not result in any fit-test method meeting both error goals of the ANSI Z88.10 standard.

412.

CHARACTERIZATION OF FOUNDRY PARTICLE SIZES AND SELECTION OF AGENTS FOR WORKPLACE PROTECTION FACTOR MEASUREMENT. Z. Zhuang, D. Viscusi, NIOSH, Pittsburgh, PA; P. Jensen, S. Berardinelli, Jr., C. Coffey, P. Hewett, NIOSH, Morgantown, WV.

A recent study was conducted to investigate the effect of good- and poor-fitting half-mask, non-powered, air-purifying respirators on protection under actual workplace environments at a steel foundry. The purpose of this companion study was to characterize particle size distributions and elemental composition of exposures arising from two tasks at the steel foundry in order to determine what aspects were appropriate for use in measuring protection factors using half-mask elastomeric respirators. Eight personal impactor samples were collected on burners/welders (4) and chippers/grinders (4). Seventeen area impactor samples were collected near these workers. The personal impactor sample filters and ten area impactor sample filters were analyzed for chromium, copper, iron, and manganese by inductively coupled plasma (ICP) method. The other seven area impactor samples were analyzed for total mass by gravimetry. The particle size data for each task (by elements or by total mass) are generally well-fitted with two mode distribution models. The mean size for the first mode was about 0.5 μm and it ranged from 7.3 to 12.6 μm for the second mode. In general, the area under the curve for the first mode for burners was larger than that for chippers indicating burners were exposed to more smaller particles than chippers. Mean respirable fractions of 0.468 and 0.174 for iron were determined from the personal samples for the burners and chippers, respectively. The respirable fractions for personal samples were generally larger than those for area samples. The distributions for elemental iron and total mass were similar. The authors conclude that iron is an appropriate agent for measuring actual protection factors in foundry operations.

413.

FOCUS GROUPS ON RESPIRATOR USE AMONG THE SOCIETY FOR PROTECTIVE COATINGS (SSPC) MEMBERS CONDUCTED BY NIOSH. B. Doney, B. Day, NIOSH, Morgantown, WV; D. Groce, U.S.PHS (retired), Mount Morris, PA

The National Institute for Occupational Safety and Health (NIOSH) conducted six focus group meetings with contractor members of the Society for Protective Coatings (SSPC) from May through November 2000. The meetings allowed NIOSH to learn more about difficulties with respirator use previously reported by construction contractors. The participants conducted abrasive blasting and coatings applications, with extensive use of respirators that ranged from filtering facepieces to supplied-air respirators. The groups discussed painter and abrasive blaster exposures to air-

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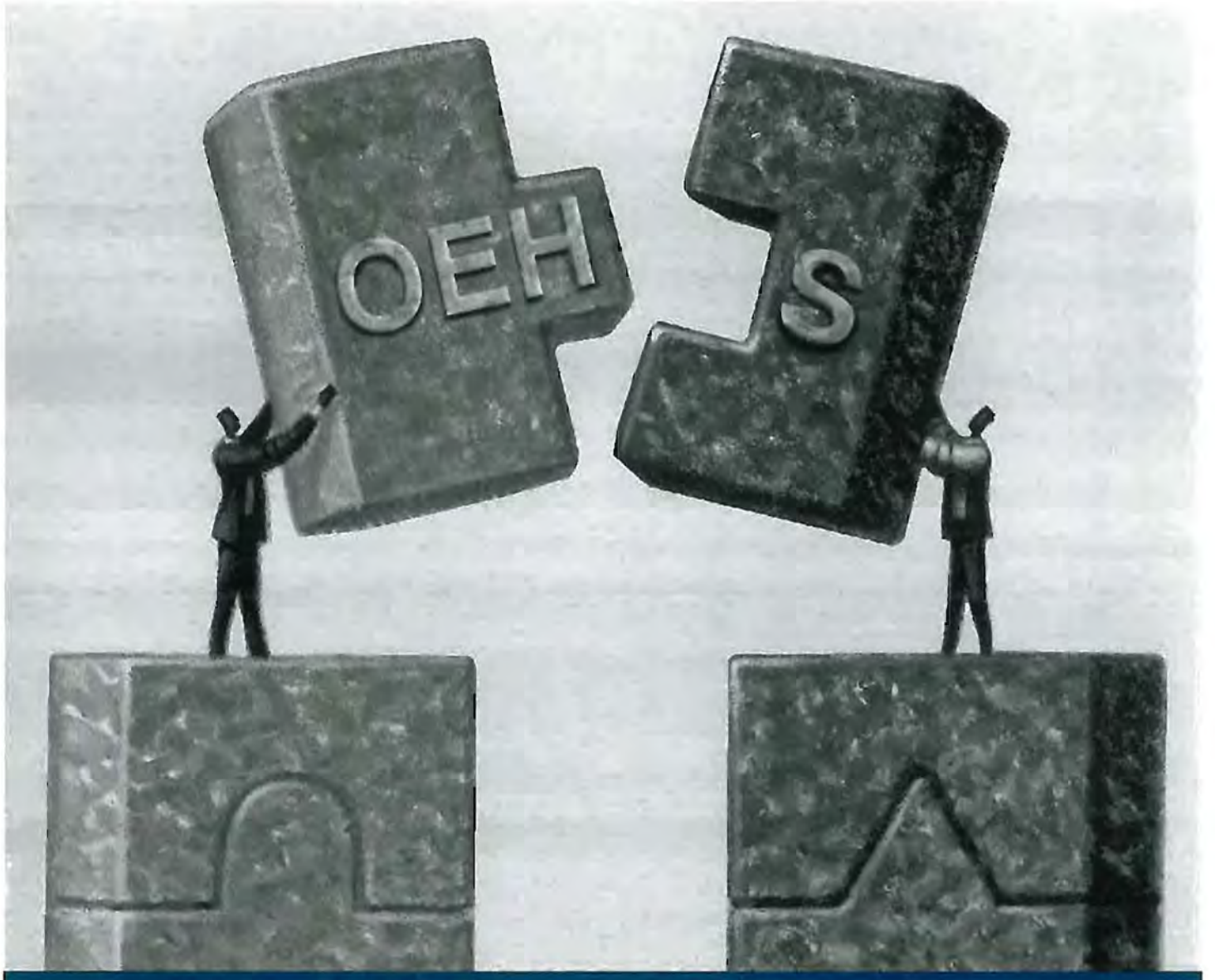

ABSTRACTS

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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