zones based on noise and temperature levels, as well as a fall protection plan. From an environmental perspective, ACDs are accepted as a preferred form of open burning, although there is no evidence that ACDs result in lower emissions. Additionally, ash management requirements vary widely, with options including in-situ disposal, transfer to a regulated solid waste facility, land application as a soil amendment, and recycling. This field evaluation assessed ACD emissions levels and ash management options. The conclusions of this evaluation provide the means to maximize ACD operations while minimizing occupational, emissions, and waste impacts.

332.

AN EVALUATION OF CARBON MONOXIDE (CO) CONCENTRATIONS ASSOCIATED WITH THE OPERATION OF HOUSEBOATS EQUIPPED WITH GASOLINE POWERED GENERATORS. R. Hall, R. McCleery, S. Earnest, K. Dunn, NIOSH, Cincinnati, OH; J. McCammon, NIOSH, Denver, CO

Investigations performed by National Institute for Occupational Safety and Health (NIOSH) industrial hygienists have characterized the circumstances of boat related carbon monoxide (CO) poisonings. Incident reports provided by the National Park Service have revealed 130 cases of CO poisoning and 11 known boat-related CO poisoning deaths on Lake Powell since 1994. Several CO surveys have been conducted on houseboats with gasoline powered generators and engines. When gasoline generators are in operation, the area under the swim deck and around the back of the swim platform (near water level) on houseboats that exhaust the combustion gases in the space below or directly behind the back deck are extremely hazardous. The area under the swim deck and around the back of the swim platform (approximately 6-12 inches above the water where individuals could likely be swimming) indicated CO concentrations well above the NIOSH immediately dangerous to life and health (IDLH) value of 1,200 ppm (CO concentrations were measured up to 10,000 ppm in these areas). These hazardous conditions also exist when the engines are in operation on the boats. Individuals swimming or working in the area under the swim platform, or around the area directly behind the swim platform (with the gasoline generator in operation on houseboats that exhaust the combustion gases in the space below the back deck, or out the back of the deck) could be exposed to extremely high CO concentrations resulting in CO poisoning or death within a short period of time. Engineering controls (i.e., stack exhaust systems and emission control devices) are currently being evaluated. CO concentration results from the engineering control studies indicate reductions greater than 99%.

333.

AN EXPOSURE EVALUATION OF HEAT STRESS AMONG WORKERS IN A TELEVISION PANEL PRODUCTION FACILITY. B. King, J. McCullough, NIOSH, Cincinnati, OH

NIOSH conducted a health hazard evaluation in response to a request regarding heat stress concerns at a television glass panel production facility. Workers were stationed at three forming lines, each served by its own furnace producing molten glass. Furnace temperatures can exceed 2100° Fahrenheit (F) and temperatures of the formed glass panels can reach 300-400°F. Environmental temperatures were recorded in work areas using Wet-Bulb Globe Temperature (WBGT) monitors. To assess workers' physical effects, personal monitoring was performed, including continuous monitoring of workers' core body temperature (CBT) and heart rate. Workers' pre- and post-shift weights were recorded. During breaks, workers were interviewed regarding possibly related health symptoms. Recorded WBGT readings reached highs of 94.2°, 95.4°, and 102.8°F in areas of the three forming lines, with average readings of 91.2°, 91.5°, and 98.8°F, respectively. Average CBTs were 99.9°, 100.2°, 98.8°, and 100.1°F for four monitored workers. No monitored workers had a sustained heart rate in excess of the evaluation criteria (180 beats per minute minus the individual's age in years.) Two of five workers monitored exceeded 1.5% loss of body weight during their shift. 82% of interviewed workers reported experiencing dehydration while at work. Other reported symptoms included fatigue, lightheadedness, nausea, and near-syncope. While three workers spent parts of their shifts at or above 100.4°F CBT, a measure the American Conference of Governmental Industrial Hygienists (ACGIH) uses to mark excessive heat strain in medically unselected, unacclimatized workers, none reached 101.3°F , the ACGIH criteria for medically selected, acclimatized workers. Additionally, heart rate monitoring did not reveal excessive rates. Despite the fact that these heat stress criteria were not exceeded, the fact that some workers had significant weight loss over their shift and had reported heat-related health symptoms reveals the need for continued attention, awareness, and measures to prevent potentially serious heat-related effects.

334.

PRACTICAL APPROACH TO HEAT STRESS MANAGEMENT. P. Russo, ExxonMobil Corp., Baytown, TX; J. Silkowski, R. Espree, J. Urban, ExxonMobil Chemical, Baytown, TX

Heat Stress is very difficult to address effectively in the Gulf Coast Region of the U.S. The challenge was to develop a prescriptive and pro-active Heat Stress program to prevent Heat Stress illnesses.

The new program utilizes a Flow Diagram with three Heat Stress Advisory Levels triggered by air temperature. Each Advisory Level provides specific guidance or mitigation steps to help employees plan work activities.

The Heat Stress Advisory Guide uses air temperature (assuming typical Gulf Coast conditions of 80+ % R.H.) as the trigger point. Experience indicated employee confusion using Heat Stress Index and other terms to quantify the daily weather conditions. Assuming the worst case, the Advisory Levels for this tool are comprehensive, using air temperature only. Also, air temperature can be easily measured in the field; all employees have access to and can interpret temperature readings from a thermometer. No advance training, education, or data interpretation is needed to plan work during the "dog days of summer".

Additionally, the Guide accommodates for PPE usage (respirators, body-covering, etc.), since PPE has a major effect on the body's ability to regulate heat. Communication/education have been an important part of the program's success. The Heat Stress Advisory flow charts are posted throughout the facility, pocket cards are distributed all employees and visitors.

Heat Stress PPE is provided for all employees on request: cool vests/collars, portable A/C units, water mist fans, umbrellas, etc. Fluids in the form of sport drinks, water, and ice pops are available through out the facility.

Heat Stress is an issue that will not go away, the challenge for Industrial Hygienist is to provide employees with the tools to ensure the effects of Heat Stress can be effectively mitigated.

335.

INDUSTRIAL HYGIENE SPECIALIST. W. McDowell, M. Stenzel, Occidental Chemical Corp., Dallas, TX; K. Beckner, Occidental Chemical Corp., Houston, TX

The purpose of this poster is to outline the appropriate steps to follow in order to assess potential exposures within a ventilated confined space while materials are being applied to the interior of the space. Specific applications would include painting, coating and chemically cleaning the interior of process tanks with mixtures of known concentration. The components of the mixture, however, will vary in their ability to exceed their occupational exposure limits as determined by the application of Raoult's Law.

The methodology is defined by a ten-step process, beginning with collecting the following information: size of the confined space, composition (weight percent) of the material being applied, application rate (quantity of material used within a given time period), and ventilation rate (volume of fresh air being delivered to the confined space by the air mover). Required constants are given for making the necessary calculations. Steps two through nine detail the various calculations needed to arrive at the potential contaminant concentrations using the application of an epoxy coating to the interior of a 10,000 gallon process tank as an example. The approach also

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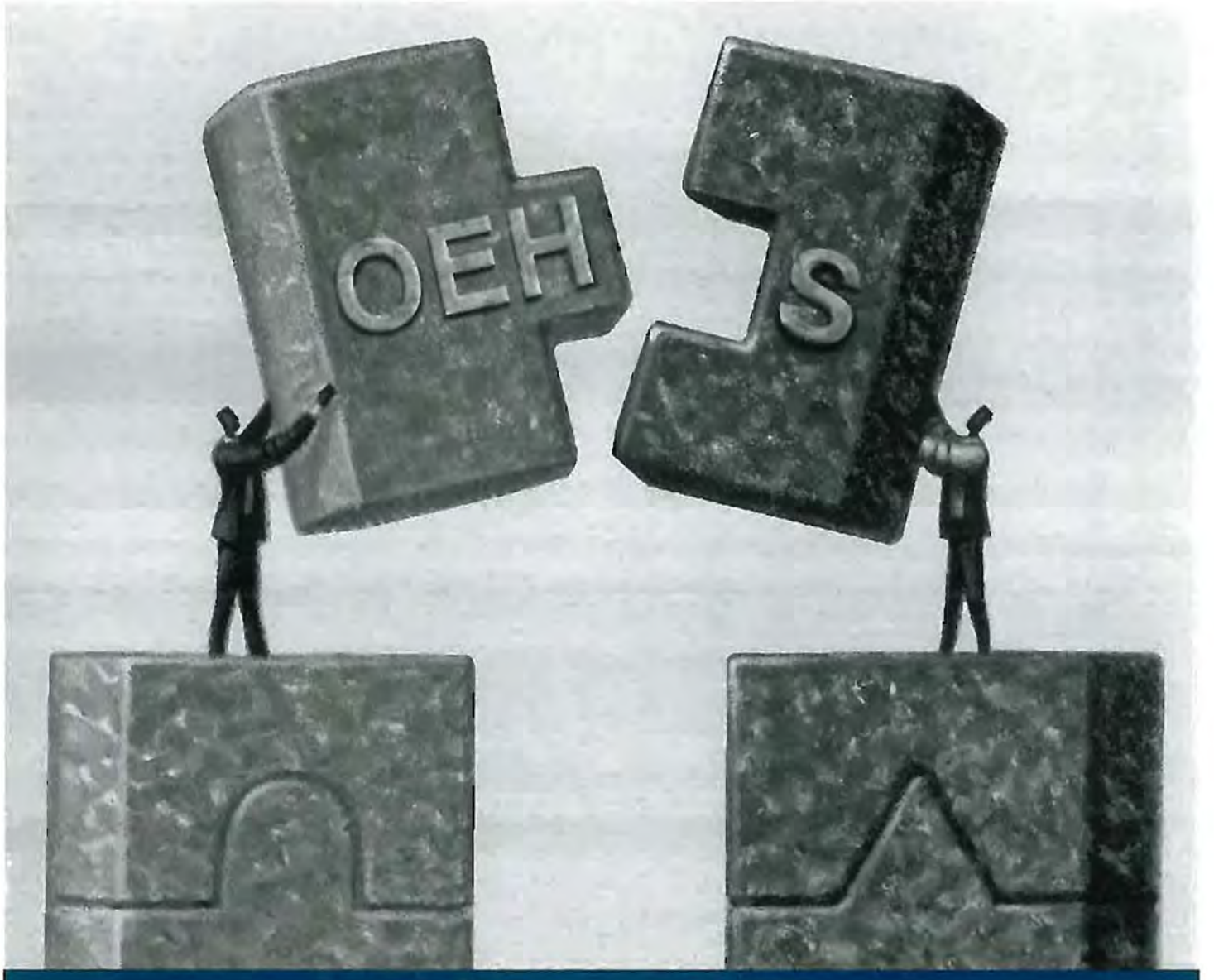

ABSTRACTS

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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