annual aerosol mapping process was charted, and the process wastes were made visible. Problem solving tools uncovered the root cause and solutions for improvement. The cross-functional team envisioned an improved future state map and developed an implementation plan. Execution of the plan resulted in reduced lead time from 30 days to 14 days, improved first-time-quality from 22% to 70%, reduced labor by 40%, and reduced travel expenses by 30%.

156.

HAZARD CLASSIFICATION SYSTEMS: ARE WE CONFUSING THE WORKFORCE. A. Panepinto, P&G, Cincinnati, OH.

Regulatory agencies, companies, and other organizations throughout the world have developed systems for the classification and labeling of hazards associated with chemicals. Efforts to harmonize these systems such as the Globally Harmonized System for the Classification and Labeling of Chemicals (GHS) is the culmination of a decade of work by many and should be applauded. A more uniform system should enhance safety, improve the level of compliance, and reduce both real and activity based costs for companies involved in developing, manufacturing, distributing, and transporting chemicals both domestically and across international borders. Significant challenges remain for adequately communicating the risks to workers given cross-cultural differences in risk paradigms. General hazard warnings, pictograms, or brief descriptions of hazards can be misleading or confusing to the work force. These challenges are magnified in terms of dealing with complex mixtures where a paucity of toxicological data on the mixture exists and one in charge of assigning hazard classifications is left to interpret the available data on individual components.

157.

AN EMPLOYEE-BASED APPROACH TO HAZARD COMMUNICATION ASSISTS OTHER HEALTH AND SAFETY MANAGEMENT SYSTEMS. J. Haas, STAR Consultants, Inc., Orange Park, FL.

Problem: Poor hazard communication results in significant lack of appreciation of potential health effects in exposed persons. The author has evaluated the effectiveness of the training process for approximately 60 clients as part of an overall evaluation of occupational health and safety management systems. A routine question that is asked of some manufacturing employees is, "Do you use materials that are known to cause cancer in people or in animals?" One welder replied "No, but according to the label, that welding wire causes cancer to people in California." Usually, people just shrug. In most cases of poor comprehension, the hazard communication training involved a description of the OSHA standard; hazards covered, and referred employees to a binder of MSDSs for more information. Although almost all interviews indicated correctly where MSDSs were available, few actually had ever read any. This may lead to apathy toward maintaining or using workplace hazard controls, including PPE. However, for one client, the approach to hazard communication clearly was remarkable. The cancer question was asked of a worker, whose job consisted solely of weighing and mixing small quantities of more than a hundred different powdered organic and inorganic colors, including cadmium-based pigments. He opened a departmental binder of MSDSs, counted and said, "Seven. The MSDSs state that they can cause cancer in animals, but there is no evidence of that in people." He then demonstrated to the author the product of the systematic approach implemented by the hourly employees in his department and all across that site. Simple, straightforward, and yes, seven was correct. The author has since been recommending the approach to enhance hazard communication, and to be an opportunity for employee involvement. Its product is of use to the occupational medical service staff, industrial hygiene and environmental personnel too.

158.

WITHDRAWN

159.

A LOCAL HEALTH DEPARTMENT'S INNOVATIVE TRAINING AND EDUCATION PROGRAM FOR RESTAURANT WORKERS. C. Sadovnik, NYC Department of Health and Mental Hygiene, New York, NY.

The restaurant industry is a significant employer in New York City (NYC) accounting for over $8 billion of the city's revenues and with a large workforce of nearly 170,000. It is also one of the largest employers of foreign-born and young workers. A recent review by DOHMH of a sample of visits to NYC emergency departments found the food service/restaurant industry is the fourth most common industry represented in work-related visits to NYC emergency departments. A regional burn center in NYC has reported restaurant workers as the most common occupation seen for major burns. In response, the New York City Department of Health and Mental Hygiene (DOHMH) has developed and launched a restaurant worker health and safety training and education campaign. This program is innovative in that it capitalizes on the existing role of DOHMH in regulating the local restaurant industry, and targets the estimated 170,000 workers at over 22,000 foodservice establishments in New York City, including a high percentage of underserved, foreign-born, non-English speaking workers. The program combines classroom and onsite training, as well as widespread dissemination of newly developed educational materials to the target population. This program creates replicable, long-term capacity to positively impact the health and safety of this often underserved workforce. This talk provides an overview of key program activities, partners, and educational tools. Successes and challenges to date will be discussed.

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160.

TEMPERATURE CLASSES AND IP-RATINGS FOR PORTABLE GAS DETECTORS FOR INDUSTRIAL HYGIENE APPLICATIONS. W. May, E. Ligus, Draeger Safety Inc., Pittsburgh, PA.

From an industrial hygiene point of view it is very important to check portable gas detectors for their proper temperature class and overall ingress protection (IP) rating before use. The temperature class describes the maximum level to which any component of an instrument can heat up in the event of an electrical short circuit in the PCB or in the power supply. The temperature class is important because all combustible chemicals have an ignition temperature in air if the lower explosion level is exceeded. In refineries, for example, it is often not sufficient to have an instrument with a temperature class T3, as some hydrocarbons, especially those with a higher molecular weight, have ignition temperatures significantly lower than 200°C, so that a temperature class of T4 would be required. Another critical point is the ingress protection or IP rating, which consists of two numbers. The first number represents for the protection level against particles or dust ingress and the second number represents the protection level against water ingress. The greater the number, the higher the protection level for dust and water ingress. However, we now have to check whether the IP-rating describes the whole instrument, i.e. case and sensor inlet or if it only describes the protection level for the case, where the sensor inlet is somehow neglected.

There is the tendency of having modern instruments with a temperature class of at least T4 and an ingress protection-rating of ideally IP 67, where the whole instrument could be submerged in water down to a depth of 1.5 m without any impact to have a very universal instrument for the different ambient conditions.

161.

GUIDANCE FOR THE EVALUATION OF DIRECT-READING GAS AND VAPOR MONITORS. E. Kennedy, M. Woebkenberg, P. Schlecht, D. Bartley (retired), S. Shulman, H. Feng, NIOSH, Cincinnati, OH; R. Song, NCH-STP, Atlanta, GA; C. Cowherd, M. Grelinger, K. Bauer, Midwest Research Institute, Kansas City, MO.

As part of a NIOSH program for the development of monitoring methods, we have produced guideline information to help others with the evaluation of sampling and analysis technology. The first publication in this series was "Guidelines for Air Sampling and Analytical Method Development and Evaluation," published in 1995. It was developed primarily for methods relying on sampling media requiring sampling pumps. A similar approach to method evaluation has been taken for direct-reading gas

and vapor monitors. A document entitled "Guidelines for the Evaluation of Direct-Reading Monitors" has been produced along with an Addendum that specifically addresses the needs of the first responder community for direct-reading monitors. The new guidelines provide a summary description of the available types of direct-reading monitors and discuss the experimental work necessary for their evaluation in assessing occupational exposures. The experimentation includes evaluation of physical and operational characteristics, response time, calibration, linearity, drift, environmental effects, interferences, limit of measurement, and bias and precision. The guidelines document includes recommendations on data interpretation for accuracy, measurement uncertainty, bias and precision, and suggestions for the treatment of data from alarm-only monitors. The addendum further addresses special needs of the first responder community such as monitor ease-of-use in harsh environments. The addendum describes an ease-of-use test program for hands-on monitor evaluation by qualified first responder participants. These guidance documents will be made available on the NIOSH website in 2006.

162.

PROBLEMS WITH ARSENIC DETECTION: WHEN NIOSH AND EPA METHODS FAIL. K. Gunderson, C. Thoraval, JDSU, Santa Rosa, CA.

Very fine grained abrasive powders known as rouges are used to polish glass in industrial applications. These rouges primarily consist of oxides of rare earth elements (REE) such as lanthanum, cerium, neodymium, samarium, and praseodymium. Significant concentrations of arsenic (As) were detected in bulk, water, and air samples of a glass polishing rouge using EPA Methods 3050B/6010B and 3050/6020, as well as NIOSH Method 7300, despite the manufacturer's insistence that the material was As-free. No As was detected in the rouge when analyzed by furnace atomic absorption (EPA 3051/7060). The manufacturer claimed that false As detections were due to REE interferences when using Inductively Coupled Plasma (ICP) analytical techniques. An investigation was conducted to evaluate these potential interferences and to determine an appropriate technique to quantitate As in a REE-rich matrix. Standard samples of REE were analyzed via ICP/Atomic Emission Spectroscopy (AES) and ICP/Mass Spectroscopy (MS) to determine REE interferences. In addition, a sample of the rouge spiked with As oxide was analyzed by atomic absorption (AA) to determine if As would be detected in the REE oxide matrix. The 1000 ppm lanthanum standard was reported to contain 49 ppm arsenic via ICP/AES. The 1000 ppm neodymium standard was reported to contain 7.3 ppm arsenic via ICP/MS. The AA method did not detect arsenic (< 5 ppm) in a rouge sample spiked with 380 ppm arsenic (as As_2O_3). It was concluded that some REE oxides cause interferences that can be reported as As when using standard EPA and NIOSH ICP methods. It was also concluded that AA is an unreliable alternative because known quantities of arsenic were not detected when REE oxides were present. Alternate methods have been explored and to date we have found no reliable method for quantifying As in this REE oxide matrix.

163.

DETERMINATION OF AIRBORNE ISOCYANATES GENERATED DURING THE THERMAL DEGRADATION OF CAR PAINT IN BODY REPAIR SHOPS. A. Dufresne, M. Boutin, McGill University, Montréal, PQ, Canada; C. Ostiguy, J. Lesage, IRSST, Montréal, PQ, Canada.

Polyurethanes are widely used in car paint formulations. During thermal degradation, such polymeric systems can generate powerful asthmatic sensitizing agents named isocyanates. In body repair shops, the thermal degradation of car paint can occur during abrasive processes that generate enough heat to involve isocyanates release in air. An environmental monitoring study was performed in two body repair training schools and in a body repair shop to evaluate the workers' exposure to isocyanates during cutting, grinding and orbital sanding operations. Cassettes containing two 1-(2-methoxyphenyl)piperazine (MOPIP)-coated glass fibre filters (MFs) (≈5 mg of MOPIP per filter) and bubblers containing 15 mL of MOPIP solution in toluene (1.0 mg mL^{-1}) backed at the outlet with cassettes containing two MFs were used. Tandem mass spectrometry was used to analyse the MOPIP derivatives of isocyanic acid (HNCO), all the linear aliphatic isocyanates ranging from methyl isocyanate (Me-i) to hexyl isocyanate (Hex-i), all the alkenyl isocyanates ranging from propylene isocyanate (Propylene-i) to hexylene isocyanate (Hexylene-i), 1,6-hexamethylene diisocyanate (HDI), *trans*- and *cis*-isophorone diisocyanate (IPDI), 2,4- and 2,6-toluene diisocyanate (TDI), 2,4'-; 2,2'- and 4,4'- methylenediphenyl diisocyanate (MDI), phenyl isocyanate (Ph-i), and *p*-toluene isocyanate (*p*-Tol-i). The instrumental detection limits (LOD) were in the 0.13–0.75 μg(NCO) m^{-3} range for 15 L air samples converted into 3 mL liquid samples. The isocyanate concentrations detected in the workers' breathing zone during a 15-minute sampling period were in the 1.07–9.80 μg(NCO) m^{-3} range for cutting, 0.63–3.62 μg(NCO) m^{-3} range for grinding, and 0–1.29 μg(NCO) m^{-3} range for orbital sanding. Among the isocyanates detected the most abundant were the monomers (MDI, HDI, TDI, and IPDI) and Me-i. The highest isocyanate concentration measured in the worker's breathing zone corresponds approximately to half the HSE's MEL set at 20 μg(NCO) m^{-3}.

164.

METHAMPHETAMINE AND BEYOND. R. DiRienzo, R. Wade, J. Reynolds, DataChem Laboratories, Inc., Salt Lake City, UT.

Newsweek magazine (August 8, 2005) calls methamphetamine America's most dangerous drug. "It creates a potent, long-lasting high until the user crashes and too often, literally burns." *Newsweek* calls attention to the dramatic surge in methamphetamine use which is no longer geographically isolated to the West but is used all across the United States. Methamphetamine use has also spread across the socioeconomic ladder and is no longer used primarily by the poor. Health and safety concerns for illicit drug labs extend beyond methamphetamine. Contamination and exposure may be from a number of other drugs, precursors, contaminants or adulterants. Identification and analysis of these compounds may be important depending on the information needed for the sampling site. It may be desirable to identify precursors used for the process of drug synthesis. As various drugs become harder to manufacture from certain precursors due to tighter restrictions, new synthetic procedures, new precursors, and new drugs appear in order to meet demand. Adulterants are substances intentionally or unintentionally added to illicit drugs in the process of production or distribution. Adulterants may exist as "impurities" which are unintentional by-products from manufacture or from impure starting material. Such impurities may help identify the nature or source of the starting material or the process being used to create the illicit drug. The identification of starting material may be important in obtaining convictions and in shutting down such sources.To protect human health and safety, and to assist the industrial hygienist to identify contamination and monitor cleanup of clandestine drug labs, methods for analysis of methamphetamine and other illicit drugs have been developed for this rapidly growing concern.

165.

PERMEATION PASSIVE SAMPLING IN AIR ANALYSIS. S. Seethapathy, T. Gorecki, University of Waterloo, Waterloo, ON, Canada; B. Zabiegala, J. Namiesnik, Gdansk University of Technology, Gdansk, Poland.

Passive samplers are increasingly often used for indoor and outdoor exposure monitoring owing to the simplicity of operation and low unit sample cost. The devices are based on either diffusion (diffusive passive sampling) or permeation of the analytes through a membrane (permeation passive sampling). Even though permeation passive samplers are advantageous because of their insensitivity to humidity and temperature variations, the major disadvantage thus far has been the requirement for the permeation passive samplers to be calibrated for each individual analyte prior to field deployment. This, in turn, requires the identity of the compounds to be known at the time of deployment. However, this is often not the case. In the research presented, attempts were made to estimate the uptake rates of permeation passive samplers equipped with polydimethyl siloxane (PDMS) membranes from the physico-chemical properties of the analytes rather than determine them by the time consuming laboratory method. Linear temperature-programmed retention indices (LTPRI) of the analytes determined in gas chromatographic columns coated with pure PDMS stationary phases were thought to have a potential application for the estimation of the calibration constants. This is because LTPRIs determined using such columns depend on the partitioning coefficients of the analyte molecules between the carrier gas and the sta-

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