of the use of biocides (mainly triazine) and enclosures of machines on workers' exposure to microbes, bacterial endotoxins and formaldehyde in the use of metal-working fluids (MWF). Concentrations of triazine and microbial contaminants were monitored in bulk samples of MWF in three machines of one workplace. The method used for triazine was developed in the study. Air sampling was used to estimate workers' exposure to biological agents at 18 workplaces near enclosed and open machines. Airborne concentrations of formaldehyde were also measured in the workplaces. The concentrations of endotoxins and microbes in the MWF were rapidly increased when the biocide levels decreased below 0.05%. Airborne concentrations of microbial contaminants were significantly lower near enclosed machines than near open machines. Concentrations of formaldehyde measured in the air were low. The results showed that the biocide levels in MWF should continuously be kept high enough to control workers' exposure to endotoxins and microbes. Triazine levels in MWF can be followed by the method developed in the study. The exposure can substantially be reduced by enclosing the machines and equipping them with local exhausts.

## 118

REDUCING BAG STACKER'S RESPIRABLE DUST EXPOSURE WITH SEMI-AUTOMATED PALLETIZING SYSTEMS. A. Cecala, NIOSH, Pittsburgh, PA; B. Smith, Malvern Minerals Company, Hot Springs, AR.

Silica exposure levels in the metal/nonmetal mining industry indicate that the bag stacker is one of the highest exposure job functions for the entire industry. Malvern Minerals Company implemented two major components at their silica sand operation in an effort to lower their bag stacker's respirable dust exposure. The first component was a semi-automated palletizing system. This system used an air slide to more easily allow the worker to position bags of product material, thus significantly reducing the bag stacker's back strain and fatigue while performing the pallet loading process. The second improvement was the installation of a dust filtering unit that was positioned over the bag stacker to provide an envelop of clean filtered air down over the worker. However, even after the implementation of this new equipment, the bag stacker's respirable dust exposure remained at unacceptable levels. Malvern Minerals Company requested the assistance of the National Institute for Occupational Safety and Health (NIOSH) which performed an analysis to determine factors impacting the bag stacker's dust exposure. Through a cooperative effort between Malvern Minerals Company, NIOSH, and the Mine Safety and Health Administration (MSHA), a number of modifications were designed and implemented to create a more effective dust control system for the bag stacker. The primary contaminant source was dust being blown off of bags from the air slide on the semi-automated palletizing unit. Initially, the air slide was turned off to lower the bag stacker's dust exposure. By implementing a number of other changes to the system, the air slide was able to be operated without any increased dust exposure to the bag stacker. This research provides techniques to lower the bag stacker's respirable dust exposure, especially in operations using semi-automated palletizing systems.

## 119

AN AIR-MONITORING AND SURFACE CONTAMINATION METHOD FOR LACTOSE AS A SURROGATE FOR PHARMACEUTICAL PROCESS CONTROL EVALUATION. K. Rader, M. Meiners, NATLSCO Laboratory, Lake Zurich, IL.

Lactose, a carbohydrate that does not pose serious health or product contamination concerns, is an ideal surrogate for process control evaluation of more hazardous materials. An air sampling and analytical method has been developed and validated which is both very sensitive, and accurate. The particle size of lactose can be adjusted through micronization to that of the material that is being modeled, and containment and exposure control measures can be evaluated and adjusted before the more hazardous materials are introduced into the process. After adequate process control has been demonstrated through lactose modeling, pilot runs can be performed using the more hazardous active materials. The air-monitoring and surface contamination method presented in this study utilizes a High Performance Liquid Chromatography (HPLC) system with an electrochemical detector. It is necessary to use a gold electrochemical cell with a mobile phase that induces oxidation. 100 mN NaOH is used as the mobile phase. The gold electrode reacts with the sodium to oxidize the cell. Lactose can be determined by plating the analyte onto the gold electrode and measuring. To prevent fouling of the electrode, three different voltages are pulsed across the electrode to first measure lactose and then to clean the cell without reducing sensitivity. The method was validated with a limit of quantitation of 20 nanograms per sample. The analytical method validation evaluated sensitivity, linearity, precision, standard stability in solution, and desorption efficiency. The sampling method validation evaluated sample stability and recovery from the media relative to time, air sampling parameters and storage conditions. Samples were found to collect efficiently at a 2 liter/minute sampling rate, and are stable for at least 14 days under refrigeration.

## 120

A COMPARISON OF UNPLANNED AND PLANNED LEAD EXPOSURES. S. Lee, T. Martinez, T. Martinez, M. Cournoyer, Los Alamos National Laboratory, Los Alamos, NM.

It has commonly been thought that the risk of exposure to lead from shielding material is very low during normal operations, that only non-routine activities can increase airborne lead levels. Six entries in the Occurrence Reporting and Processing System (ORPS) during 1991-99 indicate that the simple movement of lead bricks can result in workers receiving an exposure to lead above the PEL. These unplanned exposures to airborne lead suggest that the handling of lead be added to the list of increased-risk operations. As part of an ongoing hazardous material elimination program, 200 uncoated lead bricks in Nuclear Material Technology (NMT) Division were replace with a non-hazardous replacement, bismuth. The removal process presented an opportunity to carry out planned exposures to airborne lead under controlled conditions. Proper controls including training, work control documents, butyl nitrile gloves, and respirators with HEPA cartridges were used. The operations were monitored using breathing zone (Method 7300), surface swipes (Method 9100), and Field Portable XRF (Method 7702). In addition, blood sampling and analysis that included a zinc protoporphyrin test was conducted. The results of these monitoring programs yielded quantities of lead near background levels. An independent blood monitoring study lends further validity to these results. The results of this study demonstrate that a clearer picture of airborne lead exposure is given when more than one set of monitoring is used. In conclusion, simple lead brick handling operations do not generate elevated levels of lead in the air and should not be added to the list of increased-risk operations that require respirator use. Nevertheless, gloves should be worn with uncoated bricks to prevent skin contamination.

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## 121

LABORATORY CHEMICAL INVENTORY TRACKING, MANAGEMENT AND REPORTING AT A LARGE RESEARCH INSTITUTION. L. Gibbs, P. Burnes, Stanford University, Stanford, CA.

Tracking chemical inventory is increasingly necessary for all businesses that use chemicals and is especially challenging for research organizations. Laboratory safety, waste minimization, emergency preparedness, and facility planning all benefit from knowing what chemicals are on-site, who is responsible for them, and where they are located. Local, State, and Federal regulations are increasingly driving compliance requirements for chemical inventory management systems as well. Stanford University has developed a web-based application to facilitate collection of chemical inventory information throughout its research and service support operations. This application also includes extensive reference hazard data that is matched to the specific chemicals in the inventory. The output includes detailed reports that can be generated on regulated carcinogens and other toxins of interest, local hazardous materials plan submittals, and fire and building code classification reports for compliance management and construction project submittals for permitting, as well as ad hoc reporting for EH&S management purposes. Learn how this application addresses many of the chemical information management challenges at a large, complex research organization. Advantages of this approach include eliminating redundant work processes, distribution of the workload, provision of more flexibility for inventory updating, increasing the value of the data through accessibility, and improved data quality. An over-arching outcome of implementation of this system has been a significant increase in efficiency and effectiveness of the chemical information management program. To achieve this outcome Stanford University conducted a thorough business process assessment of its chemical management and information program and operations. Review of the evaluation techniques used, lessons learned and other potentially valuable strategies being planned, such as the use of electronic data interchange (EDI) invoice data and automated chemical hazard evaluation strategies will be presented.

## 122

EFFECTIVE USE OF CONTINUOUS INDOOR AIR QUALITY MONITORING BY THE INDUSTRIAL HYGIENE PROFESSIONAL. C. Robertson, Phoenix Controls, Newton, MA.

The concept of a cost-effective means for continuous monitoring of building indoor air was intro-

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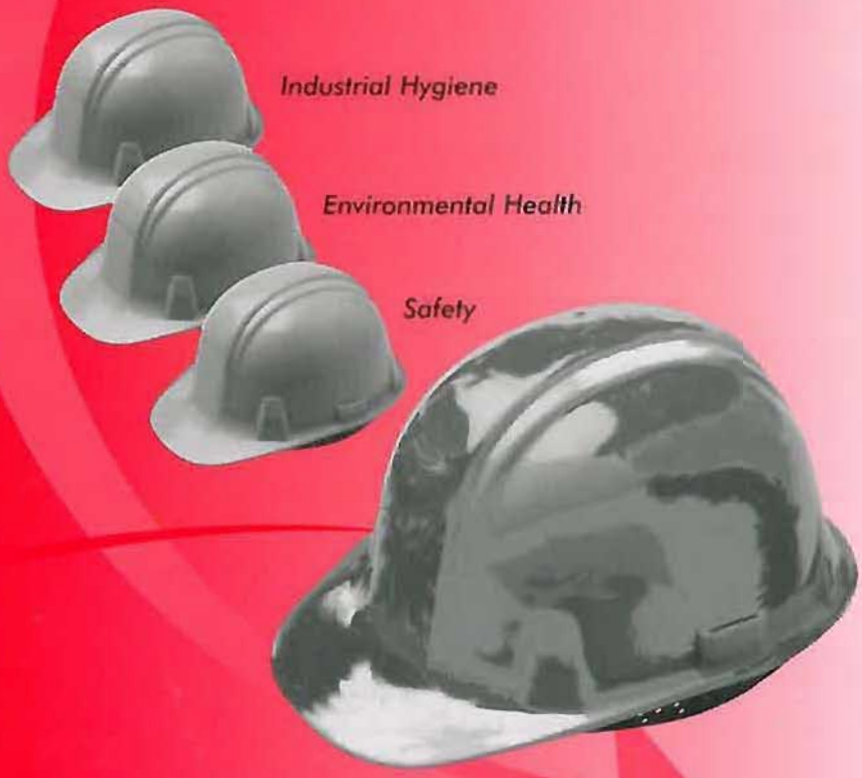




# ABSTRACTS