

260. ANTHROPOMETRIC PROFILE OF A SAMPLE POPULATION OF NUCLEAR GLOVEBOX WORKERS. J. Hollander, Los Alamos National Laboratory, Los Alamos, NM.

The newest specifications for nuclear gloveboxes at the Los Alamos National Laboratory are more than twenty years old. The oldest still in use are over forty years old. Variations

in the design and combinations of the gloveboxes as diversity is a stated institutional goal.

An anthropometric profile of a current sample glovebox worker population was prepared

to determine the range of physical characteristics of the workers. This profile is being used to design new gloveboxes that will accommodate the physical characteristics of the current population.

261. STUDY OF THE BIOLOGICAL AGENTS AND ERGONOMIC CONSTRAINTS INVOLVED IN THE USE OF TRUCKS WITH ARTICULATED ARMS FOR HOUSEHOLD WASTE COLLECTION. J. Lavoie, IRSST, Montréal, PQ, Canada; S. Guertin, Ergo Norme Inc., St-Ignace-de-Loyola, PQ, Canada.

According to the Danes, the health problems encountered with garbage collection industry workers such as lung, gastrointestinal, and skin problems, are related in a statistically significant way to bioaerosol exposure. Also, the relative risk of musculoskeletal problems and accidents is significantly higher. Unnecessary exposure to sources should therefore be avoided by modifying the type of collection, among other things. One of these changes consists of using a truck with an articulated arm. The aim of this study is to evaluate whether worker exposure to bioaerosols, in this new type of collection, complies with the guidelines, and to identify the potential ergonomic constraints.

Personal exposure to bioaerosols (total bacteria, endotoxins, and molds) was measured with garbage collectors using five different types of collection (mixed, recyclable, and biowaste in city and in country). The IRSST's standard measurement methods were used. The Scandinavian guideline for total bacteria of 10^4 colony forming units per cubic metre of air (CFU/m³) for eight hours was reached only in the collection of mixed waste. Endotoxin exposure is below 50% of the ACGIH's relative exposure limit. The average concentrations of molds are similar to those reported in other studies. At equal tonnage, compost collection is a statistically significant source of molds.

The ergonomic study shows that the main constraints identified in previous studies, taking into account the tonnage collected, the distance covered, the number of collection points,

the incidents, the length of the route, and the garbage density, were greatly reduced. However, problems associated with the physical layout of the truck were shown to exist.

262. RECOGNIZING THE POTENTIAL FOR ARSENIC EXPOSURES FROM PETROLEUM REFINING SPENT HYDROTREATING CATALYST. P. Owens, Shell Oil Products US, Martinez Refinery, Martinez, CA.

Some petroleum crude oils and refinery process streams have been found to contain trace (parts per billion) concentrations of arsenic. After many months of processing these streams, petroleum hydrotreating catalyst has been found to accumulate the arsenic. This spent catalyst is removed from the reactor and replaced with fresh catalyst. Bulk spent catalyst has contained up to 1–2% arsenic at the inlet of the reactor. These arsenic concentrations lower to none-detect at some point through the catalyst bed. Personnel exposure to arsenic may occur when the spent (used) catalyst is removed from the reactor inlet. Personnel who handle spent catalyst control their exposures with specialized catalyst-handling vacuum systems, respiratory protection, decontamination steps, and other hygiene work practices. Area air samples for arsenic have been collected and show a potential for exceeding the PEL. Some surface wipe samples have been taken to evaluate hygiene controls. Spent catalyst handling personnel urinary inorganic arsenic results were all below the ACGIH Biological Exposure Index.

263. AN INVESTIGATION OF FACTORS INVOLVED IN DERMAL IRRITATION AT A PRODUCE PACKAGING FACILITY. M. Methner, M. Kawamoto, NIOSH, Cincinnati, OH.

Workers who re-pack tomatoes (and other produce) for distribution to grocery stores reported skin rashes. Workers initially associated skin irritation with handling either produce or ink-coated cardboard boxes. NIOSH investigators collected bulk samples of cardboard as well as dust from the surface of the cardboard. Cardboard samples were analyzed for 30 elemental metals and organic compounds via Inductively Coupled Plasma-Atomic Absorption and Gas Chromatography/Mass Spectrometry, respectively. Polarized light microscopy (PLM) of the bulk dust sample was performed to determine the morphology of the particulate. The relative abundance of the dominant metals contained within the ink matrix were: sodium, magnesium, potassium, copper, and iron. Additionally, di(propyleneglycol) propyl ether was the dominant organic compound found in the ink. The particulate matter was composed primarily of 85% fibrous material. The majority of the fiber shapes were in the sub-angular to sub-rounded category. NIOSH physicians interviewed and examined 40 workers and found

that 13% had mild lesions that were possibly related to work activities while 7.5% exhibited mild skin conditions that were possibly aggravated by work activities. An additional 15% reported symptoms but had no visible lesions. All but 3 workers' lesions or symptoms appeared related to handling tomatoes. Two workers reported cilantro allergy. Only one worker had a lesion possibly related to handling boxes, but more than half the workers (58%) reported the use of gloves when folding boxes. All of the substances found in the ink, either singly or in combination, could produce or exacerbate skin symptoms and lesions. In conclusion, all workers handling produce and/or boxes should wear protective gloves to prevent skin contact with tomatoes, cilantro, or ink as well as increase the frequency of hand/arm washing during the workday.

264. REDUCTION OF METHYLENE CHLORIDE AND WOOD DUST EXPOSURES AT A KITCHEN CABINET MANUFACTURER. S. Brueck, NIOSH, Cincinnati, OH.

A kitchen cabinet manufacturer in Georgia requested assistance from the OSHA Consultation Program to measure employees' exposures to air contaminants. Monitoring results revealed that an employee using a hand-held plunge router to cut out openings in counter tops was exposed to an eight-hour time-weighted average wood dust air concentration in excess of OSHA's PEL of 15.0 mg/m³ for particulates not otherwise classified and three times greater than the ACGIH TLV[®] for wood dust. An employee's exposure to methylene chloride, which was a component of an adhesive spray used for the counter tops, exceeded the OSHA Action Level of 12.5 ppm, and approached the PEL of 25 ppm. Additionally, protective measures were not used by employees to prevent skin and eye contact with methylene chloride and other organic solvents. Both OSHA and NIOSH consider methylene chloride to be a potential human carcinogen.

Concerned about the cost of compliance with OSHA's methylene chloride standard and the cost of purchasing an exhaust ventilation system, the company discontinued the use of adhesives containing methylene chloride and constructed their own downdraft table for use with the plunge router. Follow-up air monitoring revealed that the employee's wood dust exposure while using the new downdraft table was negligible. However, a wood dust concentration greater than 5 mg/m³ was measured during use of a hand-held belt sander, which directed a plume of wood dust into the employee's face. The company was advised to implement dust control measures for the belt sander.

These results demonstrate that a small business can cost effectively reduce or eliminate employees' exposures to hazardous air contaminants through substitution of less haz-

ardous chemicals or by careful in-house design of exhaust ventilation systems. The results also stress the need for employers to routinely monitor employees' exposures and implement control measures when necessary.

265.

A HAZARD EVALUATION OF *CRYPTOCOCCUS NEOFORMANS* AND *HISTOPLASMA CAPSULATUM* EXPOSURE AT A SILICA PLANT IN RESPONSE TO A CASE OF CRYPTOCOCCAL MENINGITIS.

B. King, D. Trout, S. Lenhart, NIOSH, Cincinnati, OH.

NIOSH researchers conducted a health hazard evaluation (HHE) at a facility that produces ground silica for paints, glass, and various other sand products. The evaluation was in response to a request made by the company management regarding potential employee exposures to the fungi *Cryptococcus neoformans* and *Histoplasma capsulatum* associated with large accumulations of bird manure. An employee who had worked at the plant had been diagnosed with cryptococcal meningitis. These concerns centered around an old screen tower at the plant. The screen tower, built in 1937, is a seven-story building, which the plant had used infrequently after a new tower was built in the 1950s. Due to holes in the walls and ceiling used as entry points, the old screen tower had become a roosting site for pigeons and other birds. The result was the build-up of several inches to a foot of guano on the top floors of the building. During the evaluation, the NIOSH investigators performed a walk-through of that building and others of concern at the plant. Additionally, meetings were held with employees, union officials, and management to answer questions and address concerns. Informational material, including the NIOSH-produced CDC guidelines, "Histoplasmosis: Protecting Workers at Risk," was distributed. The NIOSH investigators concluded a potential health hazard existed in the old screen tower, although it was impossible to directly relate the current illness of the employee with a specific occupational exposure at the site. Recommendations were provided for both immediate and long term measures which the company could implement for prevention of employee exposure to these fungi. These included the use of personal protective equipment such as full facepiece, powered air-purifying respirators (PAPRs), disposable coveralls and gloves during work in the screen tower, re-evaluation of current work duties in the building, and removal or isolation of the guano.

266.

A FOLLOW-UP STUDY OF VISION DISTURBANCES AMONG WORKERS AT A PRINTING COMPANY.

G. Burr, M. Methner, E. Page, NIOSH, Cincinnati, OH.

Background. NIOSH received a request for a health hazard evaluation from a label printing company where employees in the Line

Division of the plant were experiencing intermittent blurred vision, but workers in an adjacent area (the Prime Division) were not experiencing visual disturbances. In 2001, following medical questionnaires, eye exams, and extensive industrial hygiene monitoring for two types of tertiary amine compounds, dimethylaminoethanol (DMAE) and dimethylisopropanolamine (DMIPA), NIOSH investigators associated amine exposure with visual and ocular changes. In 2002, following various production changes by the company, NIOSH investigators conducted a follow-up survey to collect additional air samples and to interview employees on the extent of any visual problems. **Methods.** A total of 108 and 125 full-shift personal breathing-zone air samples for these amines were collected in the initial and follow-up studies, respectively. Air samples were collected on XAD-7 sorbent tubes and analyzed by gas chromatography/flame ionization detection. **Results.** In the Line Division, while mean time-weighted average (TWA) concentrations of DMAE declined from 2.3 to 0.76 mg/m³ between the initial and follow-up surveys, mean TWA DMIPA concentrations declined sharply from 7.8 mg/m³ to trace amounts (<0.36 mg/m³). In the Prime Division, between the initial and follow-up surveys, mean TWA concentrations of DMAE remained essentially unchanged (3.2 vs. 3.1 mg/m³) while concentrations of DMIPA declined from 1.9 mg/m³ to trace levels. In contrast to the initial survey, none of the employees reported visual disturbances during the follow-up study. **Conclusions.** Exposure to both the tertiary amines DMAE and DMIPA was initially associated with visual and ocular changes. Following production changes by management in an effort to lower amine concentrations, NIOSH investigators, in a follow-up survey which included additional air samples and employee interviews, concluded that DMIPA had been responsible for these visual disturbances.

267.

WORKERS' EXPOSURES TO HEXAVALENT CHROMIUM, AND OBSERVED EXPOSURE-CONTROL TECHNOLOGIES, IN A LARGE INDUSTRIAL BOILER-REFURBISHING OPERATION USING ATOMIZED ALLOY-SPRAY "METALLIZATION" COATING PROCESS.

L. Blade, NIOSH, Cincinnati, OH; J. Catalano, Battelle, Seattle, WA.

The National Institute for Occupational Safety and Health (NIOSH) conducted 21 field surveys in selected industries, to characterize workers' exposures to hexavalent chromium-containing airborne particulate and evaluate existing exposure-control technologies. Hexavalent chromium (Cr[VI]) is a respiratory irritant, and chronic inhalation may cause lung cancer. Primary evaluation methods included collection of full-shift, personal breathing-zone (PBZ) air samples for Cr(VI), measurement of

ventilation-system performance parameters, and recording of descriptive information about processes, work practices, and personal protective equipment. One field survey evaluated the refurbishment of a large industrial boiler at a paper mill. Inside the multi-story combustion chamber of the boiler, abrasive blasting was used to remove corrosion from the surfaces of the steam tubing surrounding the chamber and prepare the surfaces for the application of a metal-alloy protective coating. The application of this coating was performed with a "metallization" process, which uses an electric arc to melt the metal alloy, provided as a wire feed to a hand-held spray-application unit, and compressed air to atomize the molten alloy and propel it onto the surface. Process conditions oxidize some of the metallic chromium in the alloy to Cr(VI), and generate fumes, creating a potential for inhalation exposures to workers. Workers' PBZ exposures during 300-minute spray-application periods, measured outside their respirators, exceeded 1100 micrograms of Cr(VI) per cubic meter of air (µg/m³), far exceeding the 1 µg/m³ NIOSH recommended exposure limit (REL). The NIOSH assigned protection factor of the painting-type supplied-air respirator hoods used is only 25. Full-shift PBZ exposures to workers who remained outside the chamber during spraying, and did not wear respirators, ranged up to 47 µg/m³, exceeding the REL. NIOSH researchers believe that both better ventilation and more-protective respirators are needed to improve worker protection.

268.

GUIDELINES FOR TROUBLE-SHOOTING HIGH LEAD EXPOSURE PROBLEMS IN INDOOR FIRING RANGE.

A. Khan, NIOSH, Cincinnati, OH.

The National Institute for Occupational Safety and Health (NIOSH) was contacted by a federal agency regarding concerns about potential lead exposures to its officers in its newly designed indoor firing range. NIOSH researchers investigated the lead exposure problems and narrow down the causes for the lead exposures in the range to two problems. Range overhead garage door was a major source of leakage into the facility, and the downrange airflow velocity at the firing line was inadequate. A smoke generation machine confirmed that lanes closest to the overhead door had more eddies and back-flow, causing turbulence near the shooters and flow of lead contaminated air back to the shooter. Upon the recommendation of NIOSH researchers, the overhead door was removed and the wall was completely sealed with concrete blocks. The airflow velocity measured at the firing line when the system was operating under maximum capacity was inadequate. NIOSH researchers recommended upgrading the ventilation of the range by replacing the existing 30HP with 50HP electrical motors. The air velocity measured at the firing line with the upgraded ventilation was found to be much

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