

risk, samples must be prepared so as to identify the appropriate fraction(s) in a consistent and comparable manner before digestion and analysis.

This paper demonstrates the importance of using the appropriate particle size fraction for the determination of lead in soil and exterior bulk dust samples for use in health risk assessment. We evaluated four different preparation procedures currently recommended by various organizations for handling soil and dust samples before digestion and analysis: sieving to <2 mm (HUD), <500 μm (ASTM), <250 μm (research studies), and <125 μm (research studies).

This study also assessed whether there are differences in comparing these methods using soil and exterior dust samples from different residential sites around the country involved in the Evaluation of the HUD Lead Hazard Control Grant Program. These data demonstrate the statistically significant variability of results when analyzing portions of a sample containing large (>250 μm) particles. Inhomogeneity of the samples contributes to analytical variability and the level of lead found in the different fractions varies widely. Significant analytical differences exist, as well, between the two matrices of soil and dust.

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LIVING WITH OSHA'S LEAD STANDARD. J. Beemster, Richard Oliver International, Naperville, IL; T. Avendano, GNB Technologies, Los Angeles, CA

OSHA formally published Title 29, Part 1910.1025 in October of 1978. During the first year of the regulation, employees with a blood lead level of 80 $\mu\text{g}/100\text{ g}$ had to be removed from exposure to lead until their lead levels reached 60 $\mu\text{g}/100\text{ g}$. This was eventually ratcheted down in five years to a six-month average of 50 $\mu\text{g}/100\text{ g}$ with a return of 40 $\mu\text{g}/100\text{ g}$. In a lead industry and OSHA agreement, the MRP level is being reduced to 40 $\mu\text{g}/100\text{ g}$ with a return level of 35 $\mu\text{g}/100\text{ g}$.

In 1978, Gould was a manufacturer of lead acid batteries and operated two secondary lead smelters. It is estimated that 30%–40% of their employees had blood lead levels at 60 $\mu\text{g}/100\text{ g}$ or higher. In 1980, three years prior to the 50 $\mu\text{g}/100\text{ g}$ transfer, approximately 40% had blood lead levels at 50 $\mu\text{g}/100\text{ g}$ or higher. Today these employees, now working at GNB Technologies, maintain an average below 20 $\mu\text{g}/100\text{ g}$.

These levels have been achieved through numerous improvements in engineering controls, manufacturing processes, new hygiene facilities, and a close working relationship with our employees. This has included education, encouragement, personal counseling, and strict enforcement of the OSHA regulation. The cooperation we have received from our union representatives from the United Auto Workers, Teamsters, United Steel Workers, and the International Brotherhood of Electrical Workers has been instrumental in achieving levels that many once believed were impossible.

Today, GNB Technologies operates several lead acid battery manufacturing plants where only a few employees are required to wear respiratory protection. This accomplishment is the direct result of the good cooperation of our employees and OSHA, combined with engineering controls and comprehensive work practices.

GNB's goal continues to be achieving the lowest blood lead levels without having to rely on respiratory protection.

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EVALUATION OF A PORTABLE BLOOD LEAD ANALYZER WITH OCCUPATIONALLY EXPOSED POPULATIONS. L. Taylor, J. Deddens, K. Ashley, W. Sanderson, NIOSH, Cincinnati, OH; R. Jones, National Center for Environmental Health (NCEH), Atlanta, GA; L. Kwan, UCLA Jonsson Comprehensive Cancer Center, Los Angeles, CA

Although the U.S. national mean blood lead level has declined significantly in recent years, occupational exposures to lead are still common in the United States. Since the severity of symptoms associated with lead exposure correlates directly with increased blood lead levels, a blood lead sample is considered the main biological marker for lead exposure.

This project evaluated a portable electroanalytical instrument that rapidly analyzes blood lead levels in individuals using a fresh whole blood sample (venous or capillary). The instrument, which operates by means of anodic stripping voltammetry, was originally designed to provide a rapid, cost-effective technique to monitor lead exposures of pediatric populations. However, the instrument's ability to perform rapid analysis makes it potentially valuable to occupational health professionals for medical monitoring or on-site investigations. Therefore, this instrument was evaluated within a study population comprised of 206 employees from both a lead battery manufacturing facility and lead smelting facility.

Participating employees donated two 2 mL venous blood samples collected into "lead-free" evacuated tubes. One blood sample was analyzed on site using the portable field instrument, while the second sample was analyzed by the blood lead laboratory at the Centers for Disease Control and Prevention (CDC) using graphite furnace atomic absorption spectrometry.

Within the study population, venous blood lead levels ranged from 1 mg/dL to 42 mg/dL. A preliminary analysis indicates that the field instrument results have a slight positive bias overall, with less bias for blood levels above 10 mg/dL. The absolute mean difference between the field instrument and the laboratory results was less than 1 mg/dL. Age, smoking status, and gender had no effect on the field instrument performance relative to the laboratory-based analytical results.

This tool can provide valuable rapid blood lead information for occupational health professionals in the field.

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EVALUATION OF WORKER LEAD EXPOSURES DURING ROTARY BRUSH CLEANING OF FUME HOOD DUCTWORK IN A PETROLEUM RESEARCH LABORATORY. P. Sherwood, D. Johnson, T. Hall, R. Lynch, University of Oklahoma Health Sciences Center, Oklahoma City, OK

Exhaust ventilation systems in teaching, research, analytical, and quality control laboratories may become contaminated with lead dust and fume when working with lead-containing materials. Such systems may require decontamination during facility renovation or decommissioning in order to protect workers and/or the environment.

In this paper, we evaluated the airborne lead exposures of remediation workers during decommissioning of a petroleum research and analytical laboratory that had been in continuous service for more than 40 years. Personal and area dust samples were collected on 0.8- μm MCE filters according to the NIOSH Method 7300. Breathing zone and area sam-

ples were collected over a 6-day period during which 37 pairs of ducts and associated fans were cleaned by rotary brushing and compressed air scouring.

A total of approximately 2500 linear feet of ductwork was cleaned. Five workers were sampled during three tasks: cleaning ductwork, cleaning fans, and final cleaning of the HEPA-filtered exhaust unit. All 8-hour time-weighted average (TWA) exposures were below 10 $\mu\text{g}/\text{m}^3$, which was well below the 50 $\mu\text{g}/\text{m}^3$ OSHA PEL. The highest 8-hour TWA exposures (6.71 $\mu\text{g}/\text{m}^3$ and 9.66 $\mu\text{g}/\text{m}^3$) resulted from 60-minute exposures during final cleaning of the HEPA filtration unit at project end, at which time no dust control ventilation was available. The 8-hour TWA exposures were in the range of 1–5 $\mu\text{g}/\text{m}^3$ during ductwork cleaning, but <1 $\mu\text{g}/\text{m}^3$ during fan cleaning for exposures up to 8.5 hours.

Exposure was shown to be related to worker position during two-person work tasks as well as to the type of task performed. The low exposures were attributed to effective use of HEPA exhaust ventilation and good work practices, as well as to the short duration of some tasks.

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A NEW PROGRAM FOR PARTICULATES MONITORING DURING *IN SITU* BURNING OPERATIONS. N. Barnea, NOAA-OR&R, Seattle, WA; R. Laferriere, U.S. Coast Guard, Washington, DC

Purpose: *In situ* burning, an efficient oil spill response method, also generates a large plume of black smoke containing soot particulates that might pose a hazard to sensitive populations downwind. To protect public health, a program called Special Monitoring of Advanced Response Technologies (SMART) was cooperatively developed by several U.S. government agencies to monitor particulate levels at sensitive locations and provide real-time data to the Incident Command to assist with decision making during the burn.

Experimental Procedures: Small teams equipped with sensitive, real-time particulate monitors, deploy near population centers downwind of the burn and begin data collection before the burn begins, to establish background readings. After the burn starts, the teams continue sampling, logging the data both manually in a recorder log and automatically in the instrument's data logger. After the burn ends, the teams continue collecting data for 30 minutes to determine post-burn ambient readings.

During the burn, the teams report elevated readings to the Unified Command. Particulate concentrations exceeding the level of concern may trigger either public health protection measures or modification or termination of the burn.

Application: SMART was successfully tested in several test burns near Mobile, Alabama. Lessons learned were captured, the program improved, and a sampling protocol developed. During the burning of the ship *New Carissa* on the Oregon coast in February of 1999, the program was implemented. Monitoring teams deployed to nearby towns, collected particulate concentration readings throughout the burn, and provided this data in a real-time manner to the Incident Command and public health officials.

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