affect the performance of the Parallel Particle Impactor. A performance comparison of the new samplers with other commercially available size-selective samplers indicates that the Parallel Particle Impactors match the entire respirable or thoracic curves more closely than other samplers available.

181.

AMBIENT AIR ASSESSMENT WITH CHANGED BERYLLIUM CONTENT IN ALUMINA FROM TWO POINTS IN TIME. C. Dion, S. Viau, Y. Cloutier, IRSST, Montreal, PQ, Canada; A. Dufresne, McGill University, Montreal, PQ, Canada; G. Perrault, Consultant, Montreal, PQ, Canada.

Two different assessments were done in an aluminum smelter during two clustered periods of three days in the work area where the task consists of cleaning the top of used anodes (anode butts), eliminating residues of solid electrolytic bath. Beryllium content in supplied alumina changed from near 3 ppm to < 1 ppm. The main objective of this study was to examine the effect of Be content in alumina on the airborne Be concentration. Sampling was performed according to total and inhalable sampling methods. Samples were analysed for gravimetric results and Be contents according to NIOSH methods 0600 and 7300. For total dust Geometric Means (GMs), there was no statistical difference between the two assessments: 4.1 mg/m^3 (n=14) and 3.9 mg/m^3 (n=5) (p=0.85) nor with inhalable dust: 5.9 mg/m^3 (n=10) and 6.8 mg/m^3 (n=7) (p=0.59). However, GM of total Be dust concentration in the first assessment, 0.34 µg/m^3 (n=14), was higher than in the second, 0.19 µg/m^3 (n=5) (p=0.05). The trend was similar for GM of inhalable Be dust with 0.49 µg/m^3 (n=10) versus 0.33 µg/m^3 (n=7) although not statistically significant (p=0.23). The ratio of Be to dust concentrations for total dust in the first assessment (0.009%) was different from the second (0.005%) (p=0.001) and the same ratios were observed for inhalable dust (p=0.034). Although we have a limited number of samples, airborne Be concentration from personal samples are in line with ambient samples. Be concentration in supplied alumina could be a determinant factor for airborne Be concentrations.

182.

A COMPARISON OF X-RAY FLUORESCENCE AND WET CHEMICAL ANALYSIS OF AIR FILTER SAMPLES FROM A LEAD/ZINC/SILVER ORE CONCENTRATOR MILL. B. Pacolay, NIOSH, Morgantown, WV.

Lead is mined in association with zinc and silver. The ore is concentrated on site by crushing and differential flotation before being sent to a primary smelter. Personal and area samples for airborne lead were taken at a lead mine concentrator mill. Zinc and iron were also present in all the airborne dusts. Samplers used included the closed-face 37mm filter cassette (the current U.S. standard method for lead sampling), the 37mm GSP or "cone" sampler, the 25mm Institute of Occupational Medicine (IOM) inhalable sampler, the 25mm button sampler, and the open-face 25mm cassette. The mixed cellulose-ester filters were analyzed after sampling for their content of various metals, particularly lead, using a portable x-ray fluorescence (XRF) analyzer, and then were extracted with acid and analyzed by inductively coupled plasma optical emission spectroscopy (ICP-OES). The 25-mm filters were analyzed using a single XRF reading, while three readings on different parts of the filter were taken from the 37-mm filters. For lead, all five samplers gave good correlations ($r^2 > 0.96$) between the two analytical methods over the entire range of found lead mass, which encompassed the PEL enforced by MSHA. Linear regression on the results from most samplers gave almost 1:1 correlations without additional correction, indicating an absence of matrix effects from the other metals. As in previous studies, the best results were obtained with the GSP sampler using the average of three readings, with all XRF results within 20% of the corresponding ICP values and a slope very close to 1 (0.99). Greater than 95% of XRF results were within 20% of the corresponding ICP values for the closed-face 37mm cassette using an algorithm developed by OSHA. A considerable portion of total particulate aspiration was found deposited the interior walls of all samplers that possessed a suitable internal surface.

183.

PERFORMANCE OF PORTABLE MICROBIAL SAMPLERS WHEN COLLECTING INHALABLE PARTICLES. G. Mainelis, M. Yao, Rutgers University, New Brunswick, NJ.

Portable microbial samplers are increasingly used for determining exposure to biological aerosols. However, only limited information is available about the performance characteristics of such samplers. Thus, the objective of this study was to investigate the physical collection efficiencies of several portable microbial samplers when collecting inhalable biological and nonbiological particles and to determine their conformity to inhalation convention.
The tested samplers included RCS HighFlow, BioCulture, Microflow, Microbiological Air Sampler, SMA MicroPortable, SAS Super 180, and Millipore Air Tester. All these samplers collect biological particles on agar media and their built-in sampling flow rates range from 30 to 180 L/min. The physical collection efficiencies of the samplers were determined using polystyrene latex particles ranging from 0.5 to 5.2 µm in aerodynamic size and six species of bacteria and fungi ranging in aerodynamic diameter from 0.6 to 3.2 µm. The collection efficiency was determined by isokinetically measuring particle concentrations upstream and downstream of the samplers and also separately determining particle losses inside the samplers due to air movers positioned behind the collection media. Experimental results have shown that all evaluated samplers collect less than 10% of 0.5im particles. The effective d_{50}, or cut-off sizes, of the investigated samplers depended on the sampler model and ranged from 1.2 µm for the RCS High Flow operating at 100 L/min to above 5.2 µm (SMA Microportable operating at 141.5 L/min, BioCulture operating at 120 L/min, and Microflow operating at 120 L/min). Comparison of the samplers' collection characteristics with the sampling convention for total inhalable particles revealed that relative to the inhalation convention most of the investigated portable microbial samplers would under-sample investigated particles including tested bacteria and fungi. The obtained results indicate that application of the tested portable bioaerosol samplers for biological exposure assessment may result in underestimation of the inhalable airborne microorganism concentrations.

184.

RECOGNITION AND EVALUATION OF (AND PRACTICAL CONTROL MEASURES FOR) AIRBORNE ENDOTOXIN IN THE BIOTECHNOLOGY INDUSTRY. K. Henry, C. Brossia, Amgen, Longmont, CO.

After conducting a process overview of the cell processing area of a biotechnology company and IH sampling, it was discovered that elevated levels of endotoxins were present in such processing area. Through sampling it was determined that the endotoxins were becoming airborne from several sources including open piping, which expelled debris into a floor drain, along with intermittent air pressure releases within a centrifuge. Research on endotoxins is limited, and the available data varied greatly in recommended exposure limits. Also, it was impossible to completely engineer out all releases of endotoxin due to the necessity of a pressure release for the centrifuge operation. Endotoxin exposures needed to be characterized in several areas (large scale manufacturing as well as pilot scale). As a result of outside consultation with an occupational physician specializing in endotoxins, an occupational exposure limit (OEL) was established. Initial engineering controls, which included piping modifications, were utilized to enclose open space between the biowaste pipe and the drain. While these engineering controls reduced airborne endotoxin concentrations levels, they did not decrease the endotoxin levels to the OEL. Accordingly, a mandatory respiratory program was implemented for employees working in the cell processing area. The program included medical surveillance consisting of PFT and physicals every six months to monitor lung capacity changes. Subsequent engineering modifications were successful in lowering exposures below the OEL and respirators were eliminated. Lessons learned were successfully implemented in a pilot plant. The case study provides an excellent example of many of the key steps in practical industrial hygiene, along with information regarding the assessment of endotoxins, a somewhat "new" occupational exposure outside agriculture settings.