AMS/MS
Nr. 83 - 08
26. mars 2008

Statens arbeidsmiljøinstitutt


# Eksponeringskartlegging ved norske aluminiumverk

-

## Samlerapport for prosjektet: ”Kartlegging av yrkeseksponering av betydning for utvikling av hallastma ved produksjon av primæraluminium” (HAPPA)

Nils Petter Skaugset
Hilde Notø
Lars Jordbekken
Elianne Seberg
Dag G. Ellingsen
Yngvar Thomassen

**Serie:** STAMI-rapport Årg. 9, nr.9 (2008) **ISSN**: 1502-0932 **Dato:** 14/04/2008

## 2. Abstract (på engelsk)

In 2003 the HAPPA-project started with collection of personal exposure measurements in 6 of the 7 Norwegian Aluminum smelters. To better understand the complex workroom air composition in smelter potrooms and the spatial and temporal variability in worker's exposure, new air monitoring strategies with the use of aerosol samplers for the health related aerosol fractions were required. Personal exposure of 1037 personal shift measurements were monitored. For HF and $SO_2$ both 854 samples, for Respicon 1032, for the IOM-sampler 864, for thoracic cyclone 156 and for respirabel cyclone 88 samples were colleted.

The monitoring strategy in this project has focused on the measurements of total and water-soluble fluorides in respirable/thoracic/inhalable fractions, HF and $SO_2$, and the use of direct reading instruments for $SO_2$ and aerosols for obtaining information about exposure variability.

The personal exposure in Prebake potrooms were significantly ($p<0,05$) higher than the mean exposure in Søderberg potrooms, with the only exception being HF, were the highest mean levels were found in Søderberg. Results are showing that total fluorides are mainly particulate fluorides, with only a small contribution of gaseous HF (less than 12% of the total fluorides in prebake and less than 20% in Søderberg).

For both Prebake and Søderberg, the main contribution to the occupational exposure in this industry is caused by episodes, typically short timed and with high concentrations. Traditional sampling procedures using time weight averages completely suppress this information. Continuous monitoring of $SO_2$ during 597 work shifts showed that 90% of the cumulative exposure was in average reached within 6% of the work hour. For aerosols (n=43) 90% of the cumulative exposure was on average reached within 49%, 44 % or 36 % of the working hour for the respirable, thoracic and inhalable fractions, respectively. Most of the exposure during a work shift is due to these peaks. It is therefore of great importance to identify the connection between working operation parameters and working procedure in order to obtain the best work practice.

A test of personal protection masks showed more than 95 % efficiency of the masks classified as P3 (the most used types) compared to the inhalable aerosol measured outside the masks.

Ultrafine particles were investigated during anode change, and during this work task the number of ultrafine particles increased from $1*10^5/cm^3$ to $1*10^7/cm^3$.

In the future the industry should focus on the aerosol fraction penetrating below the larynx; i.e. the thoracic aerosol fraction. For routine measurements the use of a thoracic cyclone with additional collection of $HF/SO_2$ should be satisfactory. In order to investigate the nature of the high concentration episodes the use of direct reading instruments and PIMEX (Picture Mixed Exposure) with video recording of the worker could to be a good way to address the challenge of episode exposure.