
Sampling Implications of Reduced Beryllium Action Levels

Beryllium Health & Safety Committee Spring Webinar
April 16, 2014

Gary E Whitney, CIH
Industrial Hygiene & Safety Division
Los Alamos National Laboratory

Disclaimer

Any reference to products, companies, persons, or organizations is for information purposes only and does not represent any form of endorsement or criticism.

Opinions expressed are those of the author only and do not represent those of Los Alamos National Laboratory or the National Nuclear Security Administration.

Change is on the way. No Question!

- The Department of Energy (DOE) is in the process of revising the beryllium rule (10 CFR 850):
 - The DOE cannot say what the specific revisions will be, but they have stated the action level will go down.
- The Occupational Safety & Health Administration (OSHA) is developing a beryllium standard:
 - There is no doubt that the exposure limit will be reduced from the current 2.0 ug/m³.
- DOE incorporated the 2005 TLVs in the Worker Safety and Health Program (10 CFR 851):
 - Any revision of 851 will likely incorporate the latest TLV, which is currently an inhalable fraction at 0.05 ug/m³.

How low will it go?

- The United Steelworkers and Materion Brush presented a recommended beryllium standard to OSHA that included a PEL of 0.2 ug/m^3 and an action level of 0.1 ug/m^3 . It would be reasonable for OSHA to adopt these limits in its standard.
- The beryllium rule currently refers to the OSHA PEL for the exposure limit. The DOE may choose to retain that reference and follow OSHA for both the PEL and action level.
- The DOE could also push it down a bit with an exposure limit of 0.1 ug/m^3 and an action level of 0.05 ug/m^3 .
- If the DOE adopts the current TLV of 0.05 ug/m^3 , we could be looking at an action level 0.025 ug/m^3 . This would be the extreme case and very difficult to reliably measure.

Are there problems with low action levels?

- The method of analysis can affect choice of sampler and the choice of sampler can affect the method of analysis.
- Industrial hygienists generally desire an analytical quantification limit ten fold lower than the exposure limit.
- An action level near the quantification limit does not allow for adequate statistical analysis of sample distribution or trends.
- No “comfort zone” for industrial hygienists or managers.
- Fixed flow rate limits sample volume.
- Samplers may not be designed for very low sample mass.
- Costs of implementing new sampling or analytical methods.

What are you going to do?

All this leaves the industrial hygienist with a number of questions and decision points on beryllium sampling.

- What method?
- What flow rates?
- What sampler?
- In-house or commercial analysis?
- Are samplers re-used? Who cleans and re-loads?
- What goes to the lab; sampler or filter?
- Are wall deposits an issue?
- Is QA adequate?
- Will sampling plans and protocols need to be revised?
- Will operations need to be re-characterized?
- Who has the money?

Can accuracy requirements be met?

10 CFR 850.24(e) requires:

“...an accuracy of not less than plus or minus 25 percent, with a confidence level of 95 percent, for airborne concentrations of beryllium at the action level.”

Will current recognized methods be accurate enough at the lower action level? May not be clear.

- NIOSH 7300 was validated using 0.31 and 1.29 ug beryllium spiked filters.
- OSHA ID-125G was validated from 0.12 to 0.48 ug.
- Methods may or may not have the required accuracy and precision at lower levels.

Are current methods adequate?

10 CFR 851.21(a)(2) requires:

“...using recognized exposure assessment and testing methodologies and using of accredited and certified laboratories;”

Will current recognized methods be useable to sample without deviating from method parameters?

- NIOSH 7300 and 7303 specify sampling flow rates of 1 to 4 liters per minute. OSHA ID-125G recommends 2 lpm.
- Inhalable samplers must be run at specific flow rates.
- May not be able to significantly improve sensitivity by increasing sample volume with current methods.

What if an inhalable sampler is required?



Button
4 lpm
25 mm



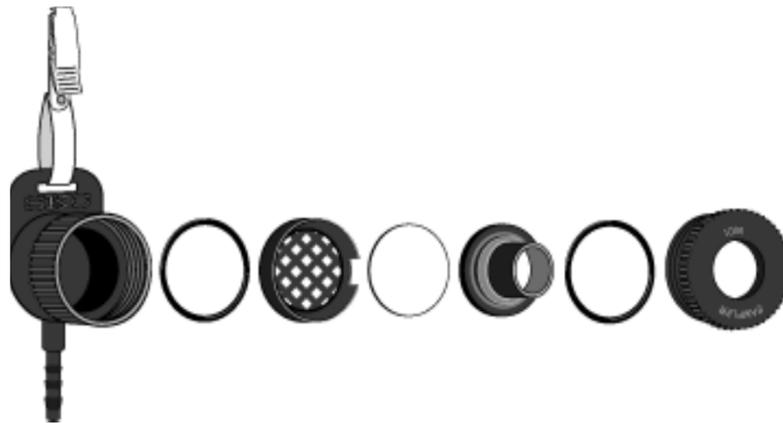
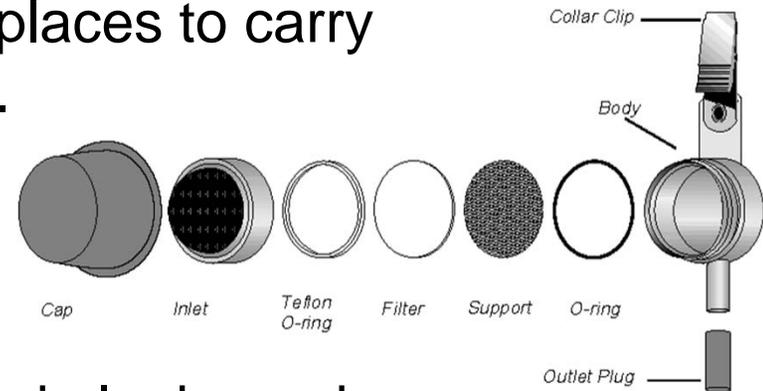
IOM
2 lpm
25 mm



CIS
3.5 lpm
37 mm

Can you reliably handle samplers?

- Processing of samplers a significant issue.
- Samplers have a lot of parts and places to carry contamination to the next sample.
- Must be assembled with care.
- MCE filters are easily damaged.
- Slight miss-alignments can results in leaks and bypass.



Have you thought about QA?

- No matter what inhalable sampler is selected or who does the analysis, sampler cleaning will be required.
- The low exposure limit makes the potential for residual contamination in the sampler a serious concern.
(0.05 ug \approx a single 37 um particle)
- Stringent adherence to validated cleaning and re-loading procedures required.
- Strict adherence to a quality assurance program will be required.
- May need to sample the samplers.

Can your lab do what you think they can?

- DOE sites may have to negotiate processes, procedures, responsibilities and costs for analyzing inhalable samples.
 - Little current demand for inhalable sampler analysis.
 - Majority of inhalable samples are for gravimetric analysis.
 - IOM is sampler of choice by commercial analytical labs.
 - Some labs want to receive the whole sampler. Others want to receive just the filter.
 - If analytical lab processes, cleans, and re-loads; the cost for analysis may go up significantly.
- In general, analytical laboratories are not prepared for large-scale analysis of beryllium samples collected using inhalable samplers.

What will it cost you?

- Samplers. (How many? \$80 to \$300 each.)
- Spare parts and replacements.
- New or upgraded personal sampling pumps.
- Additional equipment and materials for cleaning.
- Consumables and supplies.
- Increased analytical cost. (Could be major.)
- Additional facility space and associated costs.
- Additional technician time to handle and process.
- Staff time to implement and maintain.

What do you wish for?

- New generation of personal sampling pumps.
 - **Standard Flow:** Light weight and quiet; 2 to 4 liters per minute for 12 or more hours.
 - **High Flow:** A bit larger and heavier, but capable of pulling 10 to 15 liters per minute for up to 10 hours.
- Pre-loaded disposable samplers for each ISO 7708 fraction.
 - Handle like current closed faced cassettes.
 - Color coded to reduce field selection errors.
 - Standard and high flow series (total of 6 samplers).
 - Designed for ease of handling during analysis.
 - Capable of sample digestion within the cassette.

Any questions on the questions?



Gary Whitney, CIH
Los Alamos National Laboratory
P.O. Box 1663, Mail Stop K494
Los Alamos, NM 87545

whitney_gary@lanl.gov
(505) 665-8459