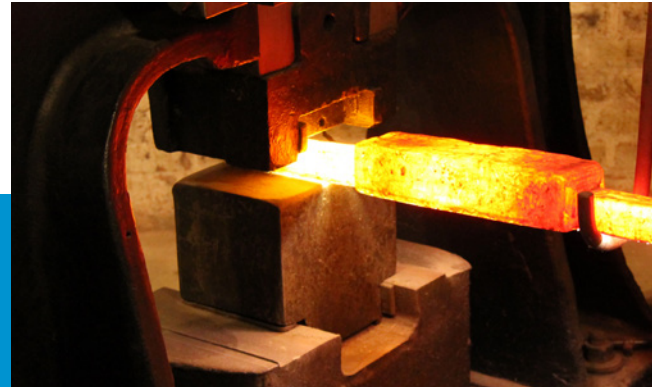


⁴Be Responsible

Beryllium Product Stewardship

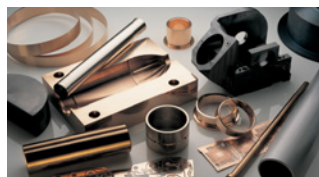
BERYLLIUM-CONTAINING MATERIALS FORGING EXPOSURE CONTROL GUIDE



Rue Belliard 40, 1040 Brussels
Tel: +32 (0)2 213 74 20 Email:
info@beryllium.eu
www.beryllium.eu

BERYLLIUM (BE) – CONTAINING ALLOYS

Beryllium-containing alloys, in solid form and as contained in finished products present no special health risks.



However, some manufacturing operations are known to generate airborne particulate and like many industrial processes, forging (e.g. open & closed die forging, seamless rolled forging and ring rolled forging) of beryllium-containing alloys present a health risk if effective controls are not implemented.

The inhalation of beryllium-containing dust, mist or fume can cause a serious lung condition in some individuals. The degree of hazard varies depending on the form of the product and how the material is processed and handled. You must read the product specific Safety Data Sheet (SDS) for additional environmental, health and safety information before working with any beryllium-containing alloys.

The use of engineering and work practice controls are the preferred methods of controlling exposure to beryllium-containing particulate reliably below the BeST Recommended Exposure Guideline (REG) of 0.6 microgram of beryllium per cubic meter of air ($\mu\text{g}/\text{m}^3$) (Inhalable), measured as an 8-hour time weighted average (TWA) or the occupational exposure limit (OEL) applicable to the Member State for airborne beryllium.



While beryllium-containing alloy forging operations do not generate beryllium-containing fume, the spalling of surface oxide during subsequent handling steps can cause potential exposures.

High temperature heating operations in air produces scale that can easily dislodge from the surface. This scale can contain beryllium oxide in higher proportion than that found in the base metal.

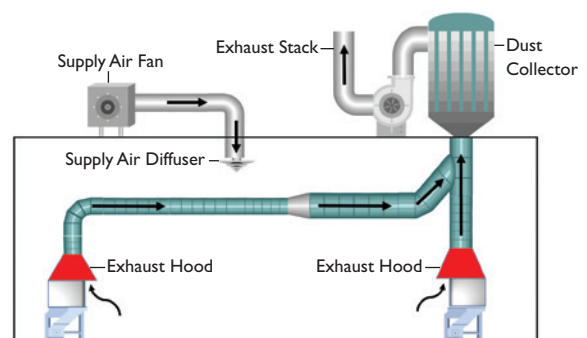
The surface scale of beryllium-containing alloy parts should be safely handled and promptly cleaned up. Mechanical surface conditioning, such as grinding, sawing and grit blasting must be performed with local exhaust ventilation or in an enclosed ventilated hood to prevent airborne exposure. Keeping the scale moist will help control generation of airborne particulate during handling and disposal; however, ventilation is the preferred method to control airborne generation of particulate.



The repair of the dies and hammers by grinding, needle gun cleaning, shot blasting, welding, and machining has the potential to generate exposures to beryllium. The dies and hammers should be HEPA vacuumed and wet wiped to remove residual beryllium-containing material and reduce the potential for generating airborne beryllium-containing particulate during the repair process.

EXHAUST VENTILATION

Local exhaust ventilation (LEV) is the preferred control technology. Where utilized, exhaust inlets to the ventilation system are generally positioned as close as possible to the source of generated airborne particulate. The type and capacity of the LEV will depend on the speed of the particle generation.



EXHAUST VENTILATION *Continued*

As part of the ventilation equipment, process exhaust air should be directed through a High Efficiency Particulate Air (HEPA) filtering device to the outdoors where it will not be recirculated back to the work area.

Ventilation equipment must be inspected regularly to ensure it is functioning properly. Provide training on the use, operation and maintenance of ventilation systems to all users.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

When engineering and/or work practice controls are not practical or effective, personal protective equipment (PPE) must be used to prevent skin contact and inhalation of beryllium-containing particulate. Instruct operators to wear gloves when handling parts that are not visibly clean.



Ensure that work clothing, e.g. pants and shirts, are maintained in a visibly clean condition when there is potential for contact with beryllium-containing particulate or solutions.

When airborne exposures exceed or have the potential to exceed REG or OEL, approved respirators must be used as specified by an industrial hygienist or other qualified professional.

MAINTENANCE

Under certain conditions the repair or maintenance of equipment (e.g. dies, pre-heat furnaces) can generate airborne particles. Protecting workers can require the use of specific work practices or procedures involving the combined use of ventilation, wet and vacuum cleaning methods, respiratory protection, decontamination, special protective clothing and when necessary, restricted work zones. Detailed procedures for safely maintaining the process equipment and ventilation systems should be developed. All operators and maintenance personnel need to be trained in the established procedures prior to performing maintenance or service activities. The procedures should detail the use of wet methods or HEPA vacuuming, ventilation and appropriate PPE to prevent exposures to airborne particles.



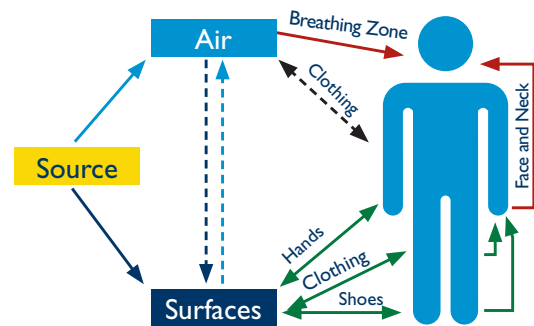
HOUSEKEEPING

Good work practices and implementation of procedures for keeping the forging work area and floors clean and free of beryllium-containing alloy scale are important methods for maintaining exposures reliably below the REG or applicable OEL. The use of compressed air or brooms for cleaning should be prohibited. Wet cleaning and HEPA vacuuming are effective methods for cleaning. Disposable rags, towels or wipes should be used to wet clean, not be allowed to dry out and must be kept in a closed container. Rags and towels should not be reused.



WORKPLACE EXPOSURE CHARACTERIZATION

In accordance with good industrial hygiene practice, a characterization of worker exposure, including air monitoring, should be conducted for operations where a potential for beryllium exposure exists.



RECYCLING / DISPOSAL

Beryllium-containing scrap is a valuable material and should be recycled whenever possible. Beryllium-containing scrap should be kept segregated from other metals to retain its higher value as a recyclable material.



If not recyclable, materials containing beryllium are considered waste and must be disposed in accordance with applicable EU and Member State regulations. Beryllium-containing wastes should be maintained in a moist condition during collection, storage and disposal, double bagged in plastic and sealed in an appropriate container to minimize the potential for release and exposure.

ADDITIONAL INFORMATION

Additional worker protection guidance can be obtained online at www.beryllium.eu or by contacting the Beryllium Science & Technology Association (BeST) at: Rue Belliard 40, 1040 Brussels, Tel: +32 (0)2 213 74 20 | Email: info@beryllium.eu

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