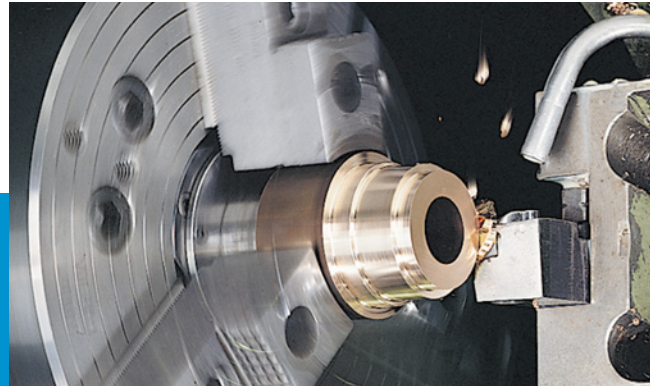


⁴Be Responsible

Beryllium Product Stewardship

BERYLLIUM-CONTAINING MATERIALS CNC MILLING AND LATHE MACHINING GUIDE



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BERYLLIUM (BE) – CONTAINING ALLOYS

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

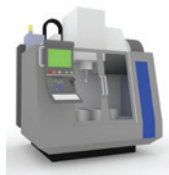


However, some manufacturing operations are known to generate airborne particulate. Like many industrial materials CNC Milling and CNC Lathe machining of beryllium-containing alloys present a health risk if effective controls are not implemented.

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.

CNC Milling and CNC Lathe machining operations involve digitally automated machining of a rotating part mounted onto a chuck. CNC machining operations are typically performed in enclosed machining centers with a flood of lubricating fluid or coolant. These machining centers allow for a variety of complex machining operations such as boring, turning, cutting, drilling and routing. Coolants are used to lubricate and cool the cut and to flush away the resulting chips. This containment and flooding of chips in the enclosed machining centers helps minimize the release of airborne particulate.



The enclosed work center using a flood of coolant is generally adequate to maintain exposures to reliably below the REG.

WET METHODS

The proper use of machining fluids is usually an effective method for controlling the airborne generation of beryllium containing particles. Care should be given to coolant containment and to prevent splashing onto the floor areas or operators' clothing.

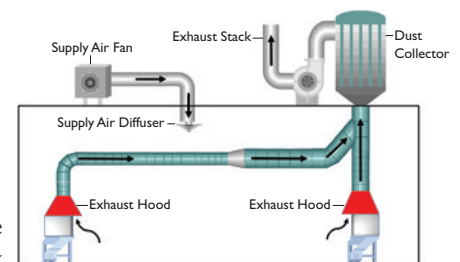


Inadequate coolant flow and higher tooling speeds may require additional containment and ventilation controls. The recycling of coolants containing finely divided beryllium particles in suspension can result in the buildup to a point where particles may become airborne during use. Coolants should be filtered or changed regularly to reduce the accumulation of beryllium-containing particulate.

EXHAUST VENTILATION

Process ventilation is required when coolants or lubricants are not being used or are not effective in controlling the release of airborne particulate and where there is potential for worker exposure. 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.

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. Be sure to follow all applicable regulations for ambient discharge.

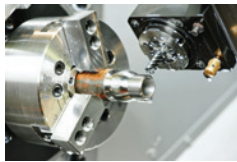


As part of the ventilation equipment, process exhaust air should be directed through a High Efficiency Particulate Air (HEPA) filtering device to the outdoors where it will not be recirculated back to the work area. Be sure to follow all applicable regulations for ambient discharge.

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.

SPEEDS / FEEDS / TOOLING

These machining variables must be considered when determining work practice and engineering controls. Feed stock rates can be an important factor in determining whether a process will generate airborne particles. Sharp-tooled machining processes generally produce only large chips, while dull tooling may produce a mixture of large and small chips. Strict control of process speeds / feeds and tooling condition will assist in reducing airborne particle generation.



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 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 vacuums, ventilation and appropriate PPE to prevent exposures to airborne particles.



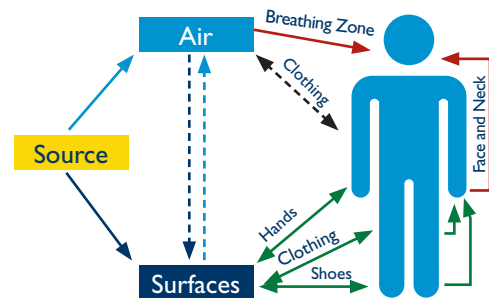
HOUSEKEEPING

Good work practices and the implementation of procedures for keeping the CNC machining center work area and floors clean and free of beryllium-containing alloy chip accumulations 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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