Process Specific Control Summary

Computer Numerically Controlled (CNC) Lathe on Copper Beryllium Alloys

Purpose
This document has been developed to communicate the results of case studies performed on specific operations where copper beryllium (CuBe) alloys are processed and to provide the reader with information on exposure and exposure control options such as work practice, administrative and engineering controls.

Introduction
An airborne beryllium exposure assessment was conducted during operation of a CNC Lathe while machining CuBe. The intent of the study was to characterize worker exposure to airborne beryllium and identify work practice and local exhaust ventilation (LEV) controls necessary to maintain exposures to consistently below the industry's Recommended Exposure Guideline (REG).

CNC Lathe
CNC Lathe involves digitally automated machining of a rotating part mounted onto a chuck. In this study the CNC Lathe operations were performed in enclosed machining centers with a flooding of machining fluids. These machining centers allow for a variety of complex machining operations such as boring, turning, cutting, drilling and routing. The water soluble machining fluids are used to lubricate and cool the cut and to flush away the resulting swarf. This containment and flooding of swarf in the enclosed machining centers minimizes the release of particulate.

Read the MSDS specific to the products in use at your facility for detailed information on the health effects of exposure to beryllium.

CNC Lathe/Machining Center

Airborne Exposure Standards

- BeST utilizes a Recommended Exposure Guideline (REG) of 0.2 µg/m3 which has proven effective when used in concert with the remaining elements of the Beryllium Worker Protection Model.

Baseline Exposure Evaluation
Eight (8) full shift exposure samples were collected in the breathing zone of operators machining CuBe Alloy with a CNC Lathe.

Personal Sample Results

Number of Samples	Range μg/m³	Percent Exceedance[1] at 0.2 μg/m³	$UTL_{(95/95)}$[2] μg/m³
8	<0.007 – 0.009	<0.1	0.015

[1]Percentage of exposures expected to exceed 0.2 μg/m³. A percent exceedance of < 5% is considered to be "Well Controlled".
[2]Upper Tolerance Limit – one can be ninety-five-percent confidence that fewer than 5% of measurements are above the UTL(95/95)

Operating Conditions
Coolant management - Chips are removed by a separation screen, supplied as original equipment by the manufacturer. Coolant is filtered by a filtration system utilizing a 100 μm rated, string wound filter recirculation loop and a 5 μm pleated cartridge filter in line with the coolant feed to the tooling head. The coolant rate at the tool ranges from 1-3 gallons per minute (gpm) and 15 gpm for the chip flusher. The range of sizes for the cutting tools is 0.132" – 2.0" and the range of spindle speeds is 500-4,000 revolutions per minute (rpm). Single cut depths range from 1/8" to 0.0001".

Exposure Controls in use during Baseline Characterization
No special ventilation controls were installed on CNC Lathes processing CuBe alloys during this study.

Exposure Characterization Summary - Evaluation Interpretations

- The operator's personal exposure results were reliably below the Materion Brush Inc. REG for airborne beryllium.
- The enclosed work center using a flood of coolant is adequate to maintain exposures to reliably below the Materion Brush Inc. REG for airborne beryllium.

Recommendations

- Instruct operators to wear gloves when handling parts that are not visibly clean or are wet with coolant.
- Implement the remaining elements of the Beryllium Worker Protection Model. Please review the "Interactive Guide for Working Safely with Beryllium and Beryllium Containing Materials" at www.berylliumsafety.com.

SUMMARY

OPERATIONS
Good work practices such as avoiding activities that result in airborne dust creation (dry cleaning or use of compressed air to remove particulate) and implementation of procedures for keeping the Lathe machining center and floors clean and free of CuBe chip accumulations are important methods for maintaining exposures reliably below the REG.

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.

ADDITIONAL INFORMATION

The information contained in this document applies only to the subject referenced in the title. Read the MSDS specific to the products in use at your facility for more detailed environmental, health and safety guidance.

The Interactive Guide for Working Safely with Beryllium and Beryllium-containing Materials can be viewed at www.berylliumsafety.com

The foregoing is provided solely for informational purposes, based upon data believed to be correct and up to date, and is not to be construed as a warranty, express or implied, of any kind. The information above may not apply to a user's manufacturing operations; it is the responsibility of the user to determine safe conditions for the use of beryllium-containing products in its own operations and to comply with all applicable health and safety laws. Users should not rely solely on this information to make decisions about exposure control, but should consult with experts who can evaluate the users' operations and make specific recommendations tailored to those operations.

Additional information may also be available by contacting:
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