

BERYLLIUM IN A357 ALLOY CASTINGS

BERYLLIUM HEALTH AND SAFETY COMMITTEE MEETING

WILLIAM FREDE

MARCH 2010

BACKGROUND INFORMATION

A357 aluminum alloy was used in the machining of castings for caster brackets.

A357 alloy contains 0.04 - 0.07% Be.

Alloys with less than 0.1% Be are exempt from 10 CFR 850.

CASTER ASSEMBLY



A357 ALLOY CASTING

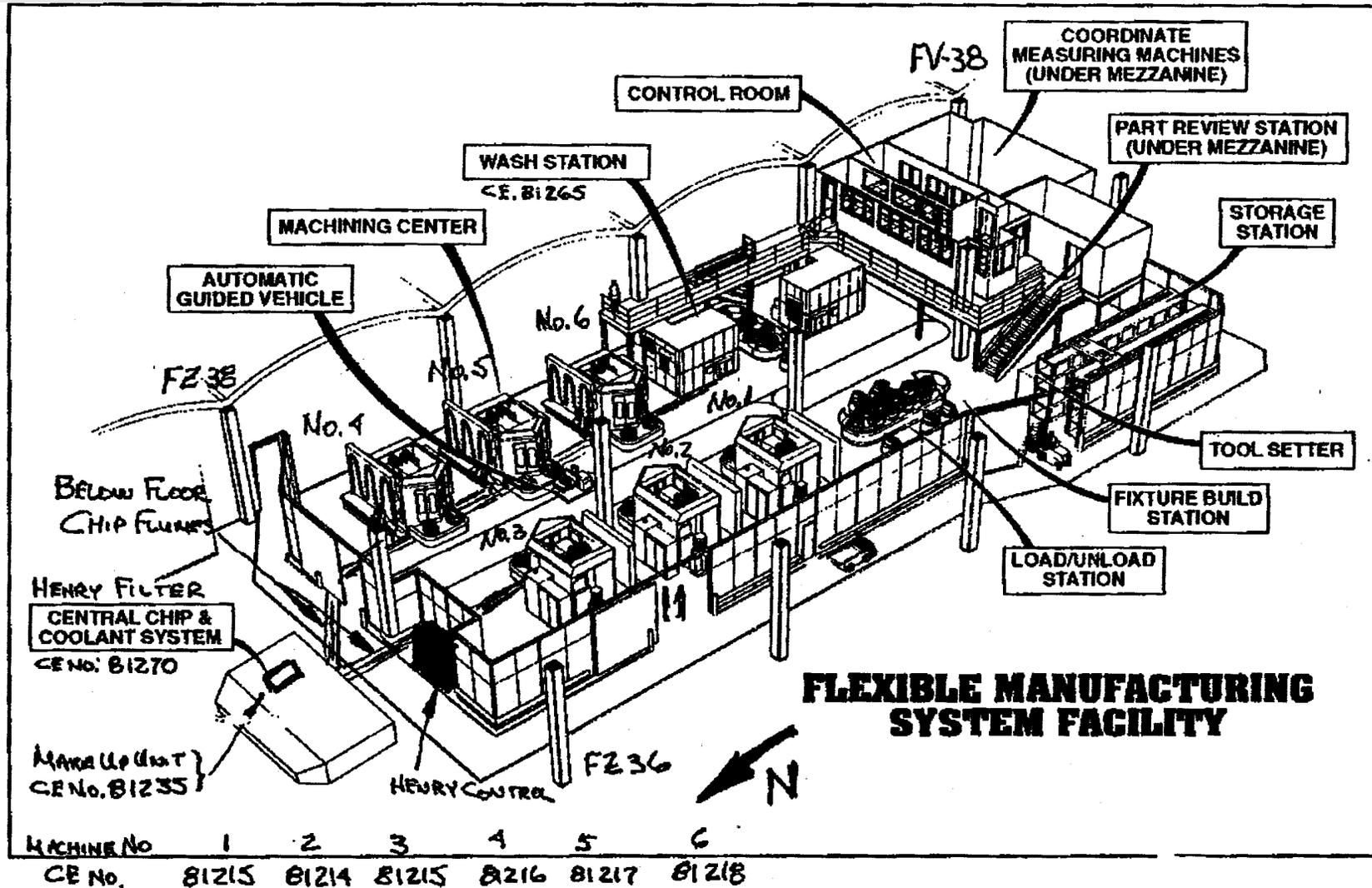


The Kansas City Plant is operated and managed by Honeywell Federal Manufacturing & Technologies, LLC, for the NNSA.

CONCERNS

- **KCP Experience.**
- **Machining was performed in FMS (Flexible Manufacturing System) which was not a beryllium operation area.**
- **Unique configuration of FMS.**
- **Castings were sandblasted prior to shipment to KCP (may have beryllium surface particles).**
- **Castings were handled in numerous departments within the KCP (Dock, Receiving Inspection, Machining, Heat Treating and Sandblasting, Plating Shop, Paint Shop).**

FMS COMPLEX



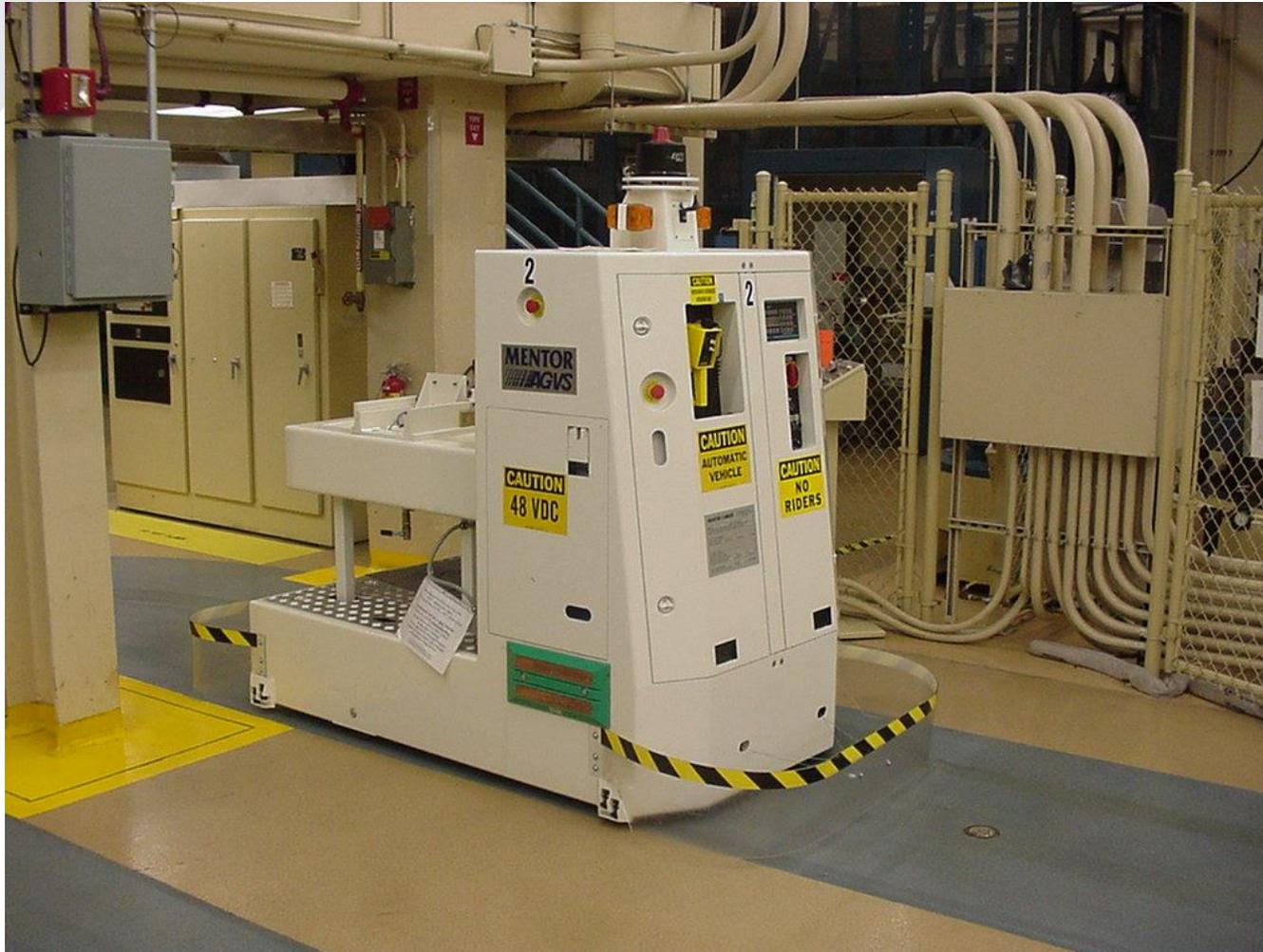
Flexible Manufacturing System



INSERT DATE INSERT INITIAL

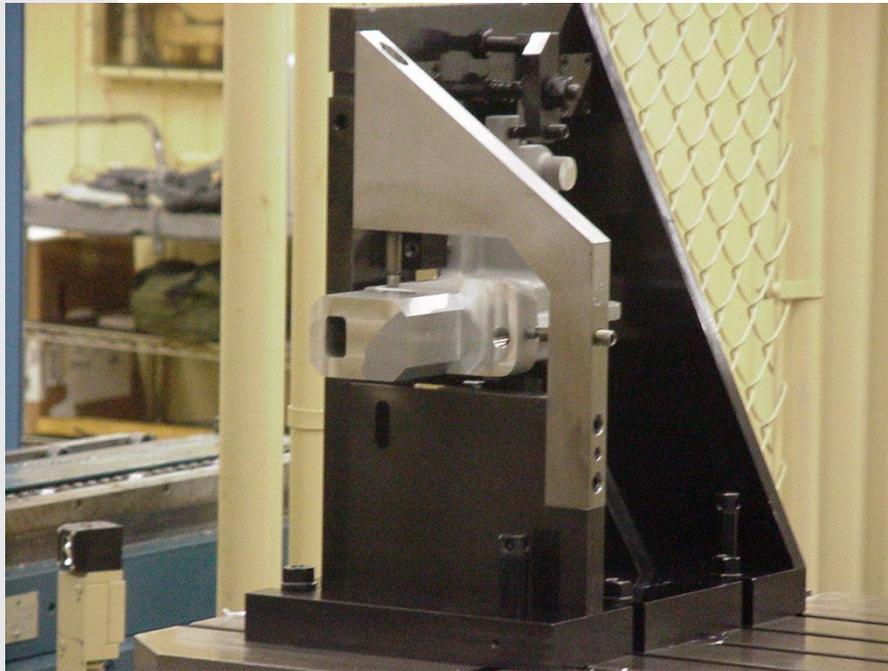


AUTOMATIC GUIDED VEHICLE



The Kansas City Plant is operated and managed by Honeywell Federal Manufacturing & Technologies, LLC, for the NNSA.

CASTING MOUNTED IN FIXTURE AND IN MACHINING CENTER



WASH HOUSE



Wash House & Pallet Pool



INSERT DATE INSERT INITIAL

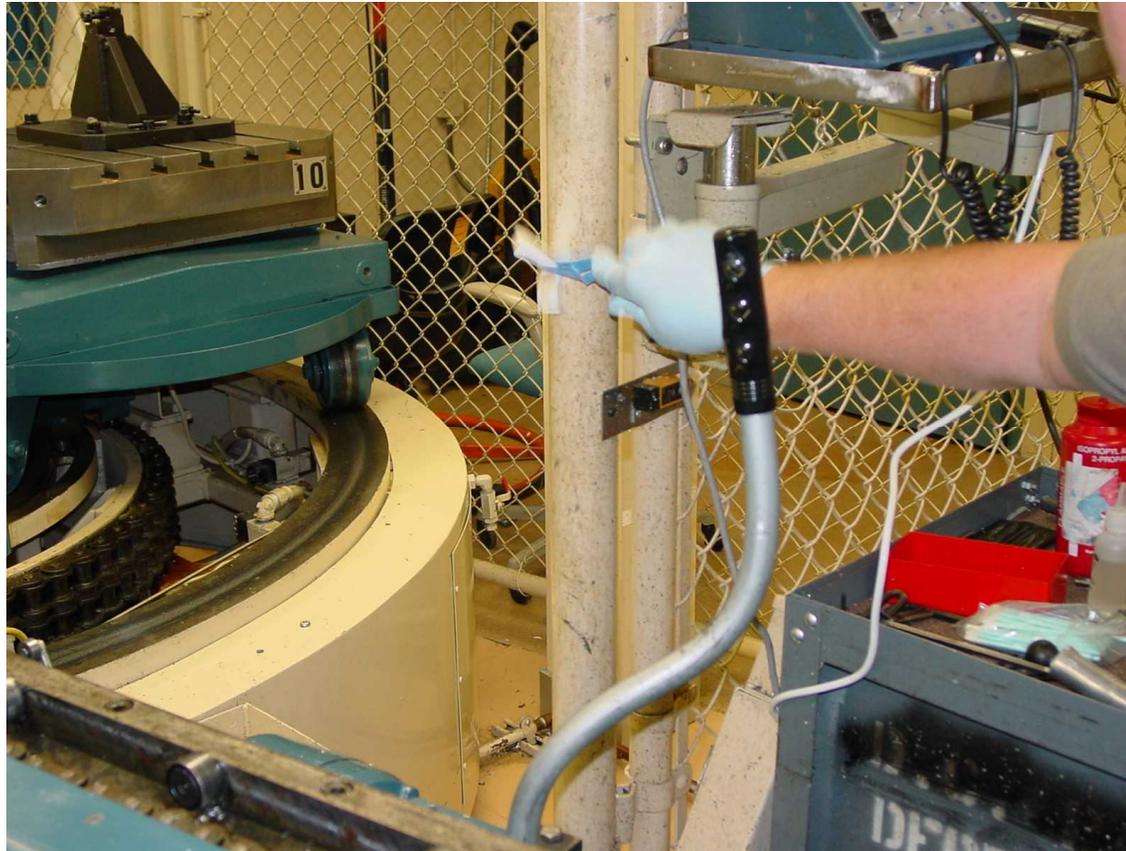
PLAN OF ACTION

- **Evaluate concern to determine if exposure potential exists [Collect: surface samples in FMS and other processing areas, castings (as entering the plant and after machining); air samples].**
- **Implement handling procedures.**
- **Share information and adjust requirements accordingly.**

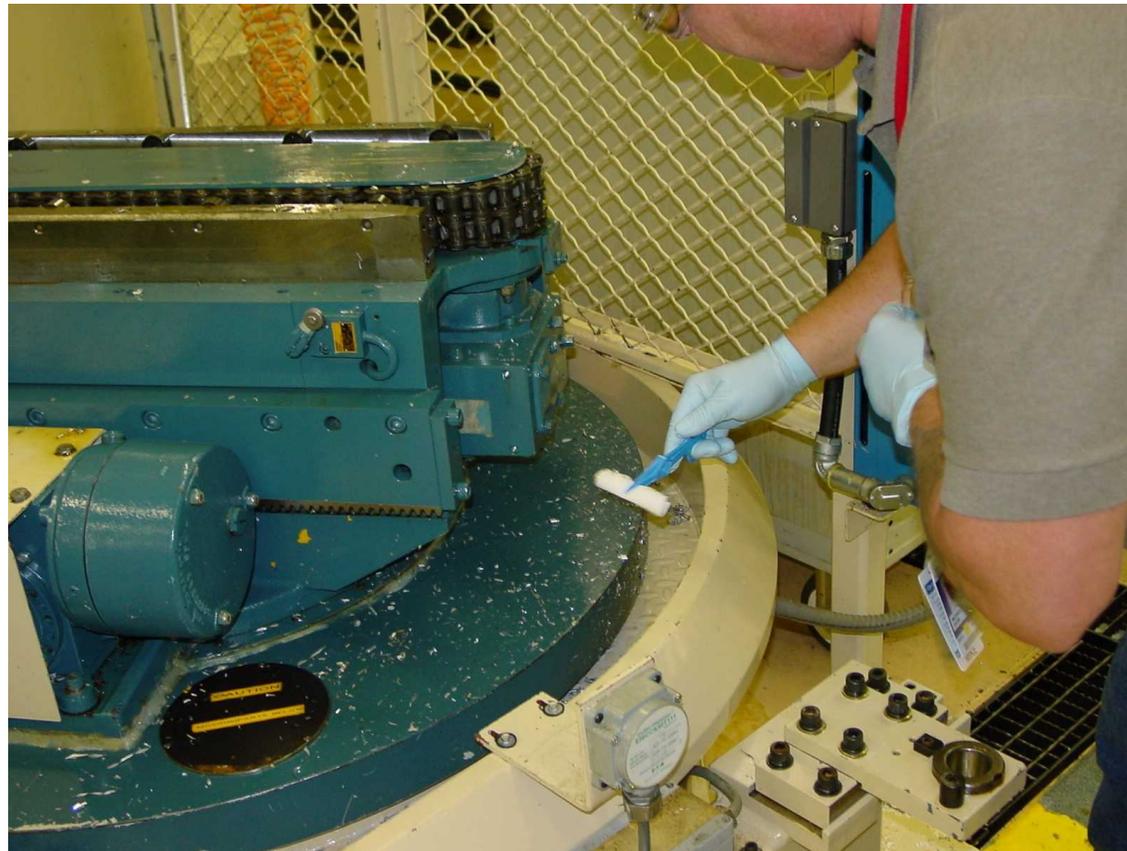
INITIAL SURFACE SAMPLING RESULTS - JULY 2002

- **Machines in FMS**
 - None detected - 8.68 $\mu\text{g}/100\text{cm}^2$
- **Deburr bench**
 - None detected - 6.12 $\mu\text{g}/100\text{cm}^2$
- **Castings in FMS**
 - None detected - 0.611 $\mu\text{g}/100\text{cm}^2$
- **Machined caster bracket in FMS**
 - None detected

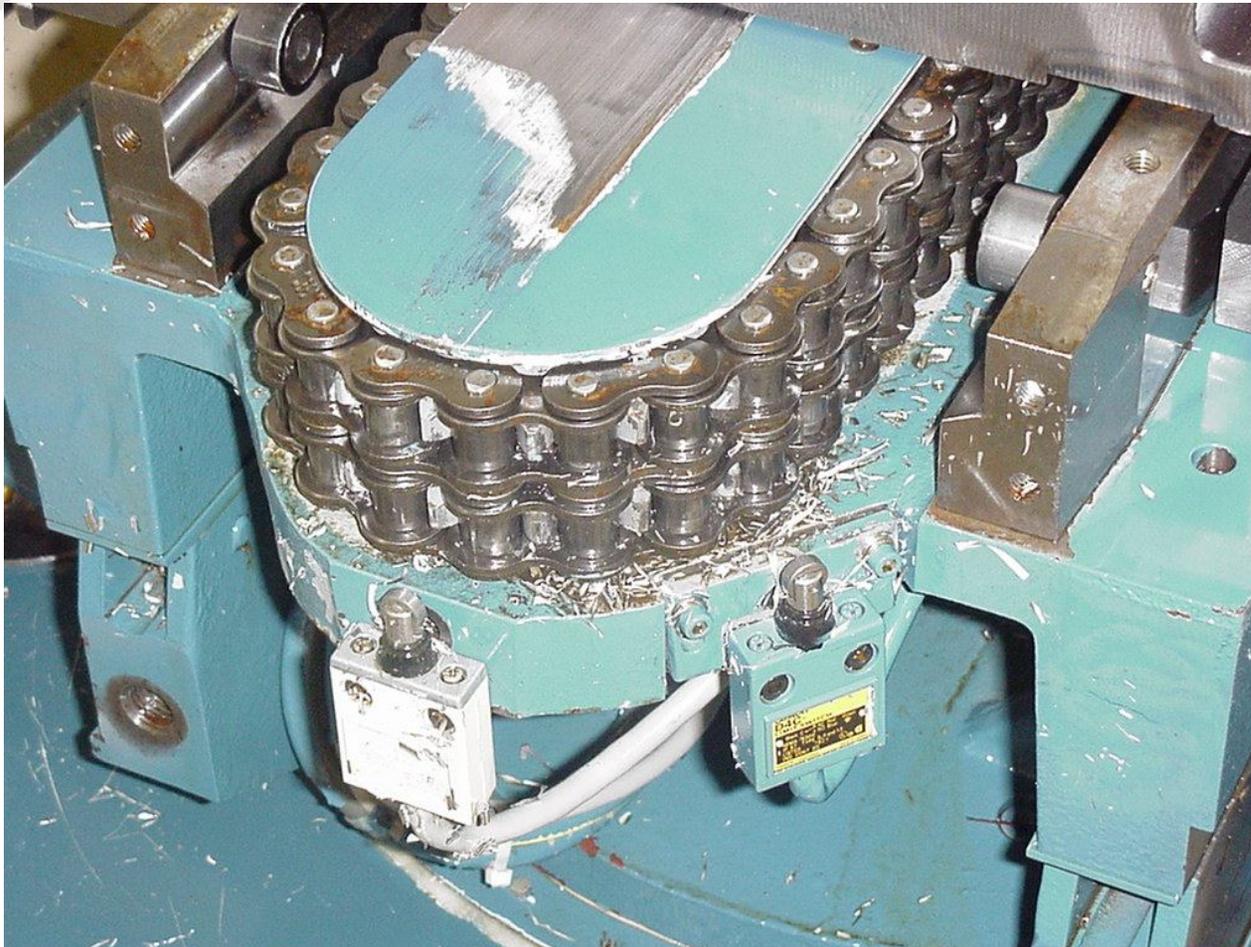
FMS SAMPLING



FMS SAMPLING



MACHINING CENTER



The Kansas City Plant is operated and managed by Honeywell Federal Manufacturing & Technologies, LLC, for the NNSA.

AIR SAMPLING RESULTS AUGUST AND SEPTEMBER 2002

- **Machining in FMS**
–None Detected
- **Deburring**
–None Detected

ACTIONS TAKEN AFTER INITIAL EVALUATION

- **Process change - Castings cleaned upon delivery to KCP.**
- **In FMS: Posting, Machine cleaning schedule, Contamination migration controls, Cutting fluid controls.**
- **Material change - unsuccessful.**
- **Deburr area - Workstation cleaned; relocated to exhausted workbench.**
- **General controls - Dermal protection.**

Additional Actions Taken

- **Started to centrifuge MWF to remove beryllium contamination**
- **Decreased change interval of machine tools cartridge filters**
- **Added wash nozzles to remove chips from bottom of pallets.**
- **Added commercial size 8, 100 micron Bag Filter to continuously filter MWF in heat exchanger line.**
- **Swipe sampled all fixtures leaving department**
- **Decontaminated all gages before returned to the gage crib.**

CONCERNS WITH FMS COOLANT SYSTEM

- **A common coolant system supports all machines in the FMS - contaminating one machine could contaminate all machines.**
- **The coolant system contains 6500 gallons - expensive to replace.**
- **Frequent cleaning of the system creates FMS down time and creates 15,000 gallons of waste fluid.**

BERYLLIUM CONTAMINATION OF FMS COOLANT SYSTEM

- **July 2002 sample (after ~30 parts)**
 - None detected
- **September 2002**
 - 6 ppb

ACTIONS TAKEN TO ALLEVIATE COOLANT SYSTEM CONTAMINATION

- **Monitor coolant for beryllium contamination - 50 ppb limit established.**
- **Centrifuge coolant to remove suspended particle in addition to Henry Filter System.**
- **Disassemble and clean the system at 18-month intervals.**
- **Replace coolant after cleaning.**

Note: These actions resulted in ~\$150,000/year savings over the anticipated 3-month interval for cleaning and coolant replacement.

CENTRIFUGE COOLANT TO REMOVE FINE, SUSPENDED BERYLLIUM PARTICLES



Sludge contains 300 - 400 ppm beryllium

HENRY FILTER SYSTEM



Drum and Frame Assembly

HENRY FILTER SYSTEM



Drum and Scraper Assembly

HENRY FILTER SYSTEM



WIRE DRUM ASSEMBLY WITH CHIPS

Total Decontamination Project Costs

After the project was complete, the entire system was cleaned. This included dismantling and cleaning the machining station, wash house, and the entire coolant system.

Material Costs	\$ 32,664
Labor Costs	\$ 201,271
Waste Costs	\$ 17,982
Respirator & Sampling Costs	\$ 35,425
Total	\$ 287,342

ADDITIONAL ACTIONS

- **Investigate other alloys used at the KCP**
No others discovered
- **Lessons Learned to alert others of potential concern**
- 2002-KCP-FMT-KC-0003
- **Process change**
Paint bracket cavity
- **Continue to monitor activities**

SUMMARY

- **Beryllium <0.1% is not addressed in the DOE CBDPP, 10 CFR 850**
- **Hazard Assessment (10 CFR 850.21)**
 - Consider the material including low level alloys
 - Consider the process
 - Evaluate potential for exposure
 - Evaluate potential for contamination

A large, stylized version of the 'KCP' logo. The 'K' and 'P' are blue with a gradient, and the 'C' is a blue ring. A yellow sphere is at the top of the 'C'. Below the logo, the text 'KANSAS CITY PLANT' is written in a bold, italicized, black serif font.

KANSAS CITY PLANT

INSERT DATE INSERT INITIAL

