JSC Metal Finishing Waste Minimization Methods

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JSC Metal Finishing Facility Overview

- Johnson Space Center (JSC) has achieved VPP Star status and is ISO 9001 compliant
- The Structural Engineering Division in the Engineering Directorate is responsible for operating the metal finishing facility at JSC
- The Engineering Directorate is responsible for $71.4 million of space flight hardware design, fabrication and testing
JSC Metal Finishing Facility Overview

- The JSC Metal Finishing Facility processes flight hardware to support the programs in particular schedule and mission critical flight hardware
- The JSC Metal Finishing Facility is operated by Rothe Joint Venture
- The Facility provides following processes
  - Anodizing
  - Alodining
  - Passivation
  - Pickling
JSC Metal Finishing Facility Overview

- JSC Metal Finishing Facility completely rebuilt in 1998
  - Total cost of $366,000.
- All new tanks, electrical, plumbing, and ventilation installed
- Designed to meet modern safety, environmental, and quality requirements
- Designed to minimize contamination and provide the highest quality finishes
Quality In-House Metal Finishing

- In-house metal finishing has significant quality benefits:
  - Better process control
    - Eliminate cross-contamination that causes process variability
    - Metal buildup in process solutions can be verified by JSC laboratories
  - Better process performance
    - Process chemistry can be adjusted to specific requirements for aerospace materials
    - Performance verified through periodic salt spray testing
    - Process improvements can be overseen by engineers firsthand
  - Achieve consistent color and appearance on flight hardware
    - Hardware viewed by millions on international television
  - Immediate troubleshooting
    - Metal finishing process problems can be diagnosed in real time and quickly corrected
Metal Finishing Facility
Safety Facility Features

- Process tanks and main floor are completely non-metallic to prevent corrosion
- Sub-floor sealed and seamless polypropylene liner installed that extends 36 inches up the wall
- Open walkways and work areas
- Independent audit by Fuss and O Neil Consulting Engineers found facility met all OSHA safety requirements
Safety Facility Features

- Fumes pulled to back of tank and away from workers

- Hexavalent chromium used only in conversion coating process
  - No agitation or heating of tank
  - Short duration of any potential worker exposure
  - Workers are protected from hexavalent chromium
Safety Multiple Levels of Containment

1" polypropylene process tank
1/2" polypropylene containment tray
Fiberglass grated floor
Double-walled discharge lines
1/2" Polypropylene Liner
Chemical Resistant Plastisol Coating
3" Acid Resistant Bricks
6" of Neutralizing Membranes

primary
secondary
tertiary
Environmental Wastewater Minimization

• A dragout rinse tank is used to capture hexavalent chromium from treated parts after conversion coating
  – Resin bed removes chromium from dragout tank
  – Counterflow rinsing is used to minimize volume of rinse water

• Conductivity of rinses are continuous monitored
  – Will detect any contamination before pretreatment
Environmental Compliance

- The JSC Environmental Office oversees the disposal practices of JSC Metal Finishing Facility
- Process chemicals are tanked and trucked to certified disposal facility
- Rinse water is treated and released to sanitary sewer
- Exhaust air is scrubbed and treated
- Zero release of hazardous metals to local environment
- JSC Metal Finishing already meets the *proposed* EPA Metal Products & Machinery (MP&M) Limits for metals in wastewater
- The Federal EPA inspected the JSC Facility in 1998
  - EPA refers third parties to JSC for compliance benchmarking
# Environmental Past Initiatives

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<thead>
<tr>
<th>WAS</th>
<th>CHANGED TO</th>
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<tbody>
<tr>
<td>Chromic Deoxidizer</td>
<td>Non-Chromic Deoxidizer</td>
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<tr>
<td>Ferrocyanide Conversion Coatings</td>
<td>Ferrocyanide-Free Conversion Coatings</td>
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<tr>
<td>Chromated Pickles/Strippers</td>
<td>Non-Chromated Pickles</td>
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<td>Chromic Acid Anodize</td>
<td>Sulfuric Acid Anodize</td>
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<td>Chromated Anodize Seal</td>
<td>Non-Chromated Anodize Seal</td>
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<td>Nitric-Chromic Acid Passivation</td>
<td>Nitric Acid Passivation</td>
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Memtek Facility

- A pretreatment system is used to treat the rinse waters from the Metal finishing

- The Memtek system is the chemical waste processing system used to reduce chemical waste effluent

  — After treatment, rinse water is clean enough for discharge to sanitary sewer
Memtek Facility

- Utilizes a pH adjustment followed by membrane filtration technology to remove metals prior to discharge to the sewer.
- The supernatant sludge is processed through a plate and frame filter creating a dried filter cake.
- Prior to 1998, the filter cake was considered hazardous waste due to the concentrations of metals contained in the waste.
Environmental Current Initiatives

• Environmental Initiatives in Progress

— JSC M&P Engineering is working with the Aerospace Chromium Elimination (ACE) industry team in seeking alternatives to hexavalent chromium conversion coatings
  • *Non-chromated conversion coatings do not yet match performance of current conversion coatings*

— Working towards eliminating the need for a Hazardous Waste Permit for waste collection system
Summary

• Metal Finishing Lab is a state-of-the-art facility
  — Meets all current and *proposed* safety, environmental
    and quality requirements
  — Allows JSC to develop new replacement technologies

• The Metal Finishing Facility provides fast turnaround required for Space Station and
  Shuttle mission critical flight hardware at JSC
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