Abatement, Exhaust & Waste Collection

Greg Owen, PE
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Clean Lab Process Chemical Flow
Federal Regulations

• Air Emissions
  • Clean Air Act - 40CFR, Chapter I, Sub Chapter C
  • Regulates Toxic, Hazardous and Particulate emissions
• Solid Waste
  • Resource Conservation and Recovery Act (RCRA) 40 CFR
    • Parts 235 – 259 Non-Hazardous Waste
    • Parts 260 – 273 Hazardous Waste
• Waste Water Effluent – Semiconductor Subcategory
  • 40 CFR Part 469
  • Regulates Total Toxic Organics, Fluoride and pH

States are allowed to implement more stringent requirements
Air Emissions

• Historic Exhaust Air Systems
  • Heat (General) Exhaust
    • Waste of Energy, Recycle back to Recirculation System.
  • Ammonia Exhaust
    • \( \text{NH}_3 + \text{HCl} \rightarrow \text{NH}_4\text{Cl} \), A white plume in the exhaust stream.
    • Due to low quantities (generally beaker chemistry) of HCl and \( \text{NH}_3 \) this in NOT a problem in University Clean Labs.
  • Acid (Scrubbed) Exhaust
    • Caustic or Acid fumes
    • Tool Exhaust
Air Emissions

- University Clean Lab Exhaust Air Systems
  - “General” Exhaust System
    - Wet Decks, Beaker Chemistry Minimizes Chemical Vapors
    - Non-HPM Tool Exhaust (No Pretreatment)
    - HPM Tool Exhaust (Pretreated)
Air Emissions

- HPM Tool Exhaust
  - **PFC Exhaust Pretreatment:**
    - Plasma Conversion
      (Piranha Type System)
    - Thermal Oxidation with Wet Scrubber
    - Dry Absorption
Air Emissions

- HPM Tool Exhaust
  - Toxic Exhaust Pretreatment:
    - Wet Scrubber
    - Dry Absorption
Air Emissions

• HPM Tool Exhaust
  • **Silane Exhaust Pretreatment:**
    • Passive Destruction
    • Burn Box
    • Dry Absorption
Federal Regulations

• Solid Waste (NOT Gaseous)
  • Resource Conservation and Recovery Act (RCRA)
    40 CFR Parts 260 - 282
  • Regulates Hazardous Waste as listed in 40 CFR Part 262.32 and 261.33.

States are allowed to implement more stringent requirements.
Solid Waste Accumulation

- Solid Waste
  - Sources and Residual Materials
  - Sludge Resulting from HF Waste Treatment
  - Chemical containers (cleaned and uncleaned)
- Accumulation
  - Labeled Containers
  - Controlled Access Storage
- Disposal
  - Cradle to Grave Responsibility
  - Use Permitted Disposal Company
Federal Regulations

• Waste Water Effluent – Semiconductor Subcategory
  • 40 CFR Part 469 Sub Part A
  • Excludes Sputtering Vapor Deposition and Electroplating
  • Regulates:
    • Total Toxic Organics
      • Maximum for any one day - 1.37 mg/l
    • Fluoride
      • Maximum for any one day - 32.0 mg/l
      • Average of daily values for 30 consecutive days – 17.4
    • pH
      • Minimum - 6
      • Maximum - 9

States are allowed to implement more stringent requirements
## Federal Regulations

- **Waste Water Effluent – Electroplating, Heavy Metals**
  - 40 CFR Part 4613 Sub Part A
  - Regulations:

<table>
<thead>
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<th>Pollutant or pollutant property</th>
<th>Maximum for any 1 day</th>
<th>Average of daily values for 4 consecutive monitoring days shall not exceed</th>
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<td>Cd</td>
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States are allowed to implement more stringent requirements
Liquid Process Waste Disposal

- Liquid Process Waste Systems:
  - Solvents and Toxic Organics
  - Fluoride Containing Process Waste Water
  - Acid Process Waste Water
  - Heavy Metal Liquid Waste
Liquid Process Waste

- Total Toxic Organics (TTO’s) Option:
  - Local or Central Accumulation of TTO’s and Solvents waste effluent for disposal by a Regulated Vendor

Carboy for Wet Deck

Packaged Accumulation System with Enclosure
Liquid Process Waste

- Common Fluoride Treatment Options:
  - Local or Central Accumulation of Fluoride Waste for disposal by a Regulated vendor
  - Central accumulation system with Batch Flocculation treatment system discharging to Acid Waste Neutralization System. Filter Press Residue requires hazardous solid waste disposal
Liquid Process Waste

• Acid Waste Neutralization (pH Adjustment) Options:
  • Local or Central Accumulation of Acid Waste Water for disposal by a Regulated vendor
  • Central accumulation system with Continuous Flow or Batch Waste Neutralization System that discharges to POTW System

3 GPM Max Continuous Flow Packaged AWN System

Batch Packaged AWN System
Process Waste Water

• Heavy Metal Waste Options:
  • Local or Central Accumulation of Heavy Metal Waste Water for disposal by a Regulated vendor.
  • Central accumulation system with Batch Heavy Metal Removal System that discharges to POTW System

Batch Packaged Heavy Metal Removal System

Waste Accumulation
Discussion