Dealing w/ Hexavalent Chromium in FCCU Refractory Repairs During Turnarounds

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STRUCTURAL PRESERVATION SYSTEMS

Agenda

- Key Takeaways
- Refractory related processes that produce Cr(VI) in confined spaces
- Engineering ventilation controls to reduce/eliminate exposure
- Personal Protective Equipment and Monitoring Requirements
- Summary of Best Practices

Key Takeaways

- Safety is an important consideration when working in confined spaces
- What is Hexavalent Chromium?

What is Hexavalent Chromium?

- Hexavalent chromium (Cr(VI)) compounds are a group of chemical substances that contain the metallic element chromium in its positive-6 valence (hexavalent) state.
- Occupational exposures to Cr(VI) occur during the production of stainless steel, chromate chemicals, and chromate pigments. Cr(VI) exposures also occur during other work activities such as stainless steel welding, thermal cutting, chrome plating.

*From CDC Workplace Safety & Health Topics

Why do we care?

- NIOSH considers all Cr(VI) compounds to be potential occupational carcinogens
- An increased risk of lung cancer has been demonstrated in workers exposed to Cr(VI) compounds
- Other adverse health effects associated with Cr(VI) exposure include…
  - Dermal irritation
  - Skin ulceration
  - Allergic contact dermatitis
  - Occupational asthma
  - Nasal irritation and ulceration
  - Perforated nasal septa
  - Rhinitis, nosebleed, respiratory irritation, nasal cancer, sinus cancer
  - Eye irritation and damage, perforated eardrums, kidney damage, liver damage, pulmonary congestion and edema, epigastric pain, and erosion and discoloration of the teeth.

NIOSH Recommended Exposure Limit (REL)

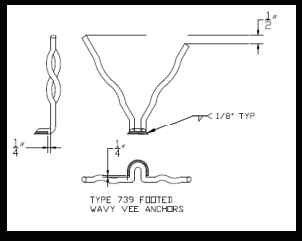
- Airborne exposure to all Cr(VI) compounds be limited to a concentration of .2 micrograms per cubic meter of air for an 8-hr TWA exposure, during a 40 hr work week
- All reasonable efforts be made to reduce exposures to Cr(VI) compounds to below the REL through the use of engineering controls, work practices, appropriate respiratory protection programs

What produces Cr(VI)?

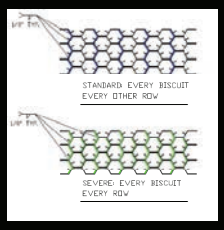
- Refractory related processes that produce Cr(VI) in confined spaces
  - Gouging and burning of old stainless steel anchor systems
  - Installation of new stainless steel anchor systems
    - Vee anchors
    - Hexsteel
    - Independent anchor systems such as curl anchors
    - Other contractors working in the same space

What produces Cr(VI)?

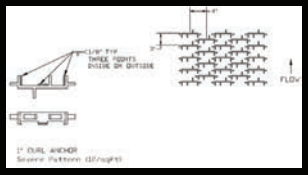
304ss Footed Wavey Vee Anchor



304ss ¾" or 1' Tall Hexsteel

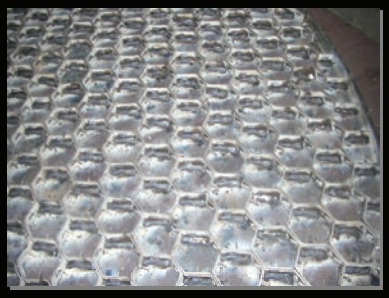


304ss Curl Anchor

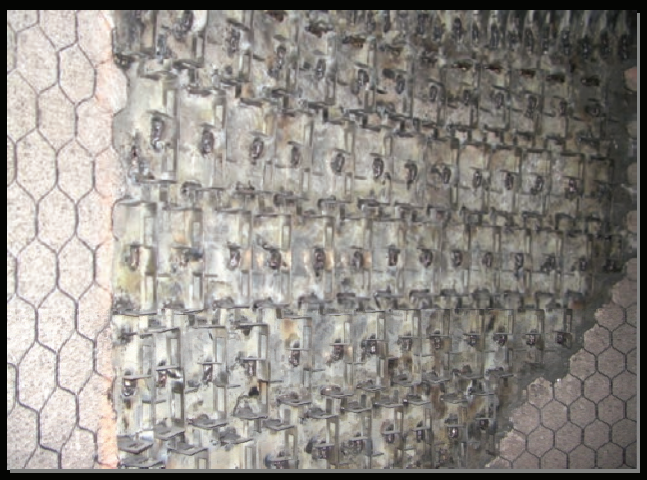


Vee Anchors on 8” Staggered Pattern

Hexsteel Installation



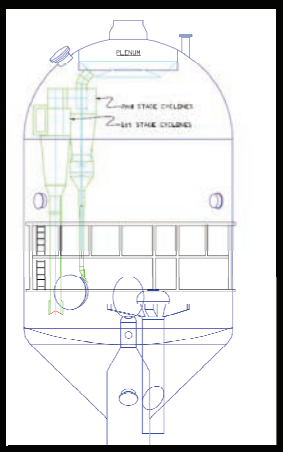
Curl Anchor Installation



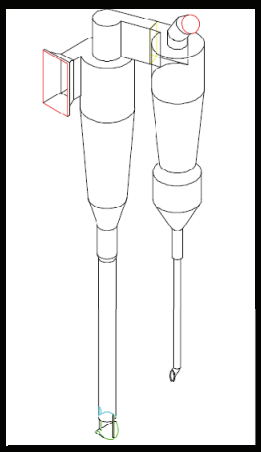
Engineered Ventilation

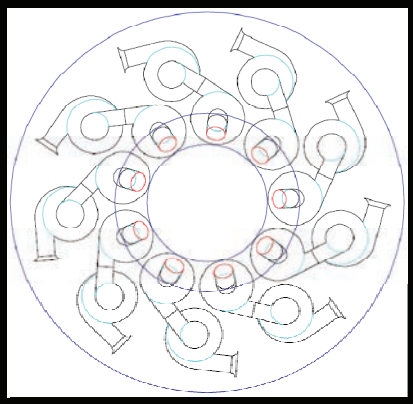
- Based on scope…
  - How many welders will be needed?
  - How many areas at once?
- Seal decks to separate work areas
- Work in multiple cyclones
- Coppus blowers with octopus extraction hoses
- Portability of the ventilation equipment and hoses

Typical Regenerator w/ Scaffold Seal Decks



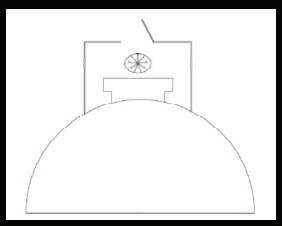
Regenerator / Reactor Cyclones

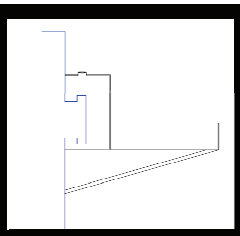




Manway Doghouses

- Competition for air extraction points vs worker access to the vessel or line
- Ventilation doghouses provide one viable solution to this problem





Coppus Blowers and Ventilation Machines

Personal Protective Equipment & Monitoring Requirements

- Respirator training requirements and monitoring
  - Is fresh air training required?
  - Non IDLH atmosphere
- Half mask and full face respirators with welding fume cartridges
- Supplied air yolks for respirators

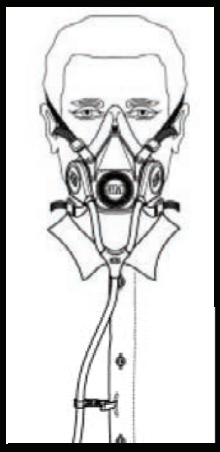
Half Mask & Full Face Respirators

Hepa Particulate & Organic Vapor Cartridges

- The 3M™ Particulate Replacement Filter is NIOSH approved for environments containing certain oil and non-oil based particles
- Used for various applications including brazing, welding, torch cutting, soldering, metal pouring, and exposure to arsenic, asbestos, cadmium and lead
- Provide protection for concentrations up to 10 times the Permissible Exposure Limit (PEL) with half face pieces or 50 times PEL with full face pieces

Supplied Air Line Yolk w/ or w/out Cartridges

- Half mask respirator with supplied air yolk provides 50 x the PEL
- Full face respirator with supplied air yolk provides 1000 x the PEL
- When using supplied air, it is usually most economical to use breathing air compressors rather than bottle trucks because of the free flow nature of supplied air respirators



Summary of Best Practices

- Each job is unique and requires detailed planning with all contractors to come up with a workable ventilation plan
- Initial monitoring of your system is required unless you have results for an identical set up from previous monitoring and could reasonably expect the results to be the same
- Even with the best efforts of engineering solutions, sometimes the use of supplied air respirators cannot be avoided and may even be preferable

Thank you!

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