

# WELDING IN THE OIL & GAS INDUSTRY:

## Understanding Welding Fumes Hazards & Controls

Welding is common in the oil and gas industry, in that, welding fumes can contain manganese (*Mn*), chromium-6 (*Cr(VI)*), nickel (*Ni*), and other toxic metals and gases. Exposures to welding fumes can cause serious short and long-term health effects, including damage to the lungs, upper respiratory and central nervous systems, and some types of cancers. Individual exposure risk depends on the type of welding that is performed, type of base metals that are welded, the amount of flux coating, duration of exposure, and effective use of appropriate controls.

Oil and gas companies, contractors, welders, and health and safety professionals must understand the hazards, risks, and controls for inhalation exposures to welding fumes. **Improved hazard awareness and exposure prevention are key to controlling exposures and protecting the health of welders and their helpers.**



## PREVENT exposures to welding fumes with PROPER TRAINING and use of CONTROLS!

### Hazards: Welding Fumes

- **Exposure:** Welding fumes are generated when metal is vaporized forming very small respirable particles that can reach the deepest parts of the lungs when inhaled.
- **Health Effects:**  
Short-term exposure can cause:
  - Nausea
  - Dizziness
  - Irritation of the eye, nose, and throat



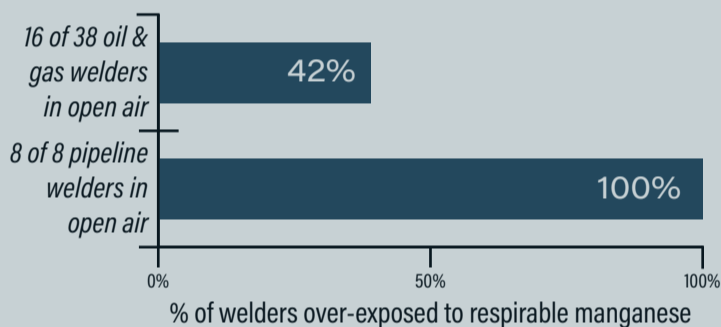
Long-term exposure to welding fumes can cause:

- Damage to the lungs and kidneys
- Damage to the nervous system, including Parkinson's Disease-like symptoms that include tremors, slow movement, and poor balance (*Mn* exposure specifically)
- Cancers, including lung and other types
- Increase risks for susceptibility to lung infections/pneumonia from certain biological agents

*See: Welder's Anthrax (osha.gov)*

### Exposure Assessments

#### Case Study - Manganese Exposure During Welding & Hot Work Tasks:



Presentation can be found on the National STEPS Network:  
[www.nationalstepsnetwork.com](http://www.nationalstepsnetwork.com)

- Welding in confined spaces will increase exposure risk;
- Welding in open air can reduce exposure risk, but may not adequately control exposures to respirable *Mn*, *Cr(VI)*, and *Ni*

#### Things to Remember:

- The purpose of air sampling exposure assessments is to determine the effectiveness of controls in limiting welding fumes exposures
- Use the lowest occupational exposure limits (OELs) for *Mn*, *Cr(VI)*, and *Ni*, published by NIOSH and ACGIH. They are lower and more protective than OSHA permissible exposure limits for these compounds

### Responsibilities

#### EMPLOYER:

- Must conduct exposure and hazard assessments at the worksite and review with workers
- Provide local exhaust ventilation (LEV) as a primary engineering control to reduce exposures to welding fumes:
  - Correct use of LEV while welding can significantly reduce exposures. Adding a flange to the LEV hood can increase capture efficiency
  - Consider substituting low *Mn* welding wires, rods, or electrodes as an option during gas metal arc and shielded metal arc welding
- Implement administrative controls in conjunction with engineering controls:
  - Establish safe operating procedures to minimize welding fumes exposures
  - Train workers on the hazards of and controls for welding fumes
  - Welding and other types of "hot work" on stainless steel and other metals that contain Chromium:
    - A regulated and demarcated work area is needed when welding on metals containing Chromium
    - For *Cr(VI)*, employee rotation to different jobs to achieve compliance with the Permissible Exposure limit (PEL), is not allowed.
- Conduct assessment for hygiene and protective clothing
- Provide appropriate personal protective equipment (PPE) when other controls cannot reduce exposures below OELs for *Cr(VI)* and other welding fumes components. Respirator use by workers may be required:
  - Select respirators on the results of welding fumes hazard analyses and follow the OSHA Respiratory Protection Standard requirements, especially medical evaluation and fit testing
  - Change respirator filters regularly to prevent overloading or restricted breathing
  - For workers with facial hair, consider providing a loose-fitting powered air purifying respirator (PAPR) that does not require the respirator to seal against clean-shaven skin
- Implement medical examinations for welders exposed to *Cr(VI)* according to the OSHA *Cr(VI)* Standard

#### WORKER:

- Follow safe operating procedures for welding
- Use LEV, if provided, to minimize exposures. For maximum efficiency, consistently position the LEV capture hood very close to the source of fumes emissions
- Attend and participate in employer trainings
- Use required PPE properly



\* All Oil and Gas Hazard Alerts can be found on National Steps website:  
[www.nationalstepsnetwork.com/hazard-alerts](http://www.nationalstepsnetwork.com/hazard-alerts)

If you're uncertain about potential risks or have questions,  
**STOP THE JOB AND ASK — IT COULD SAVE YOUR LIFE!**