3M Science. Applied to Life.™

Personal Safety Division

Hazard awareness bulletin.

Manganese

Helping to reduce your exposure to Manganese during metal production and fabrication.

What is Manganese?

Manganese is a grey-white metal that resembles iron but is harder and more brittle. Being highly chemically reactive, elemental manganese is not found in nature, but is found in a variety of minerals and ores.

Manganese metal is used in many metal alloys, mainly steel but also aluminium alloys. Manganese promotes hardness and durability in steel and helps resist galvanic corrosion in aluminium alloys.

Aluminium alloys contain up to 1.5% manganese, with steel alloys up to 2.5% manganese, with some special steel grades significantly higher proportions. Manganese also frequently makes up a significant proportions of welding rods and filler metals, as the manganese helps the flux flow freely due to its lower boiling point compared to that of iron.

Manganese compounds have other uses in a range of applications, particularly in the chemical and ceramics industries.

How can Manganese affect me?

Workplace exposures to manganese can cause a range of detrimental health effects – some can result from short-term acute exposures, others from long-term, repetitive, chronic exposures.

Chronic health effects from metal production or fabrication

- Male fertility issues
- Central Nervous System damage, commonly known as ‘manganism’
- Early symptoms – sleepiness, weakness, mood swings
- Late stage symptoms – slowed speech, tremors, motor-control issues
- Pneumonitis

Did you know?

Metal workers, and particularly welders, are prone to developing pneumonia infections. These can normally be treated by antibiotics, but there is a clear correlation between welders and increased risk of developing serious or fatal pneumonia infections.

When do workplace exposures occur?

Inhalation

Often the primary route of manganese exposure is through inhaling dust and fumes from the production and working of elemental manganese and alloys. In metal fabrication the welding, grinding, cutting, drilling and polishing of alloys that contain manganese can result in significant exposure.

What is welding fume?

The majority of welding fume is filler wire material that is vapourised by the welding arc. The gaseous metal will react with oxygen in the air to form a metal oxide and will solidify to form tiny metal oxide particles, of fume. Some welding fume will orginate from the metals being welded.

Many filler wires will contain metals that are known to be toxic and that can have detrimental health effects if inhaled. The contents of the filler wire and the amount of welding fume generated will vary by welding process.

Hot work

Other high energy or 'hot work' processes, including cutting, grinding and even polishing metals can create particles of metal and metal oxides that can be readily inhaled.

Other industrial applications may create dusts, mists or fumes of manganese, for example the handling or application of powered or liquid chemicals which contain manganese.

Dermal

The secondary route of exposure is through contact with the skin and eyes, particularly if manganese is in a liquid form that can readily pass through or damage the skin.

Ingestion

Workers can be exposed by the accidental ingestion of manganese, for example workers eating, drinking, smoking or biting their nails when their hands are contaminated.

Industries / Applications where workplace exposures may occur.

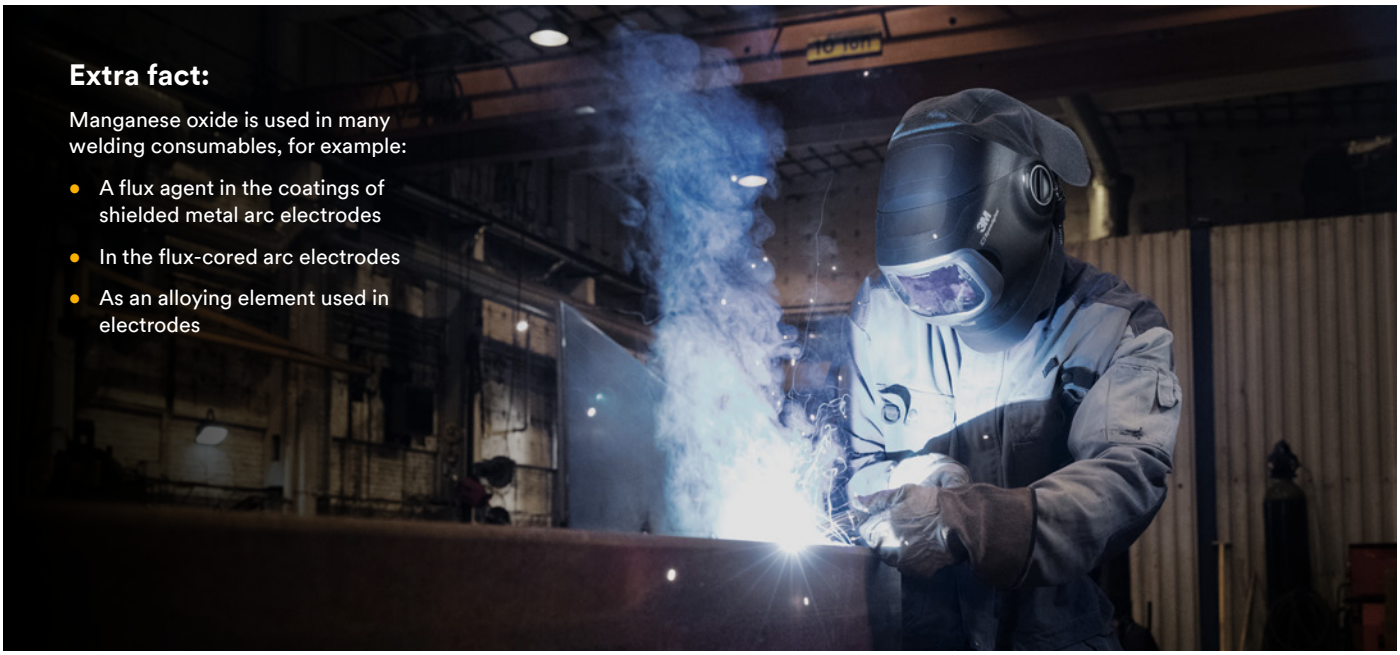
Examples of metal production and fabrication applications, as well as other industries and processes in which individuals may be exposed to manganese compounds:

Metal production, metal fabrication and related

- Manganese mining, smelting and refining processes
- Production of alloys, melting and foundry operations as well as powder metallurgy, particularly alloys:
- Steel – improves rolling and forging properties
- Stainless steel
- Aluminium and antimony (sometimes with copper) – creates ferromagnetic alloys
- Welding and grinding of manganese and alloys
- Polishing or other processes on stainless steel and manganese alloy

Other applications

- Pigments, de-colouriser and additives for paint, pottery, glass and other ceramics
- Chemical industry, particularly the permanganates which are powerful oxidising agents
- Manufacture, use of specialist dry cell batteries



Extra fact:

Manganese oxide is used in many welding consumables, for example:

- A flux agent in the coatings of shielded metal arc electrodes
- In the flux-cored arc electrodes
- As an alloying element used in electrodes

What can I do to protect myself?

Use appropriate controls

Employers need to conduct a risk assessment, including a determination of exposure levels compared to exposure limits to understand what control measures may be needed.

If required, controls from the hierarchy of controls should be implemented and their effectiveness measured. For example local exhaust ventilation (LEV) can be a highly effective engineering control used in welding, grinding and many other applications.

Get the equipment that you need.

In addition to implementing other control measures, Personal Protective Equipment (PPE) such as Respiratory Protective Equipment (RPE) is commonly required to reduce exposures and risks to workers.

Respiratory Protective Equipment (RPE) – filtering respirators

From disposable particulate respirators, to reusable half- and full-face masks, through to heavy-duty battery powered air purifying respirators combined with a range of robust face masks, headtops and helmets; 3M has a range of RPE that can help reduce your exposure to dusts, mists, metal fume, ozone as well as other gases and vapours, commonly encountered in metal production and fabrication.

Respiratory Protective Equipment (RPE) – supplied air respirators

3M also has a wide range of continuous and demand valve supplied air respirators, suitable for use in some of the most demanding working environments.

Welding shields with respiratory protection

3M also has a wide range of 3M™ Speedglas™ Welding shields that provide eye and face protection from harmful light, sparks and splatter. All of these welding shields can be used with 3M disposable or reusable half-masks. Alternatively, 3M has welding shields and helmets that are designed to work with 3M powered or supplied air systems, to give you multiple types of protection in one product.

Eye and Face Protective Equipment

Whether it be a 3M™ Spedglas™ welding visor with an auto-darkening filter or a light-weight full face shield, 3M has a full range of PPE to help protect you from the many hazards encountered in welding and metal working.

Other PPE

3M also can provide a wide range of other safety solutions you need to work safely, comfortably and effectively, including:

- Head, eye and face protection
- Disposable and reusable ear plugs, ear muffs
- Communication solutions
- Disposable and reusable protective coveralls
- Appropriate gloves for hand and skin protection
- Fall protection
- Confined space solutions
- Fixed and personal gas detection
- Fixed flame detection solutions

Training

A key component of an effective PPE programme is a training concept for workers, those responsible for health and safety and employers in their roles and responsibilities.

For example, workers wearing PPE should be trained in and understand:

- the nature of all hazardous substances present and the potential effects upon their health
- how PPE works, what it does and its limitations
- proper fitting and use of the PPE
- inspection, maintainance and cleaning of the PPE as well as identifying defective PPE and knowing how to deal with it

Stay informed

When selecting the appropriate protective equipment, local or national regulations, laws and guidelines need to be complied with.

One of the tasks of the occupational safety and health department is to keep an eye on constantly changing legal regulations, occupational exposure limits, etc.

Technical help

At any time, you can get in touch with one of our PPE experts for personalised help on the selection and use of 3M products. Their job is to help you through the process of selecting adequate and suitable products based on your risk assessment, as well as helping you understand how to fit, use and look after your PPE – helping you to stay healthy and safe so you can focus on what matters: doing your job properly and staying healthy for your loved ones and family.

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