

# How to reduce exposure to dioxins in aluminium recycling

Exposure to dioxins can happen to workers recycling:

- aluminium;
- copper, and its alloys such as brass and bronze;
- zinc.

**Employers** have a duty to manage work activities so that exposure to dioxins is reduced to as low a level as is reasonably practicable.

**Employees** have a duty to work in a way that helps reduce their exposure.

## What are dioxins?

'Dioxins' is the collective name for a group of chemicals that have been linked to a skin condition called 'chloracne' and to concerns about male infertility and to cancer. Scientific studies have shown these effects can occur following exposure to one dioxin known as 2,3,7,8-TCDD, but sixteen other dioxins are also believed by analogy to be able to cause these effects.

Dioxins are formed in tiny quantities when organic materials such as oil, grease and plastic are burnt, especially when chlorine and metals are present.

Dioxins are found naturally in the environment - in the air, the soil and the food we eat. You can get as much as 95% of your total intake of dioxins from food, but it is important to reduce any extra exposure to dioxins from work, so that the total intake is below recommended levels.



# PROTECT YOURSELF - PROTECTIVE EQUIPMENT AND HYGIENE

## How to prevent dioxins entering your body

### *Through your skin*

Although dioxin passes poorly through intact skin, damaged skin offers little protection. Cover cuts and abrasions properly, eg with sticking plasters or similar dressings.

Wear protective gloves. The glove supplier may be able to offer advice on suitability. Viton gloves offer the highest protection for high-risk activities such as handling baghouse dust, but you need to store, inspect and maintain them and be trained in how to put them on and take them off properly (see below for published guidance on gloves).

### *Through your mouth*

Avoid swallowing dioxins; keep your hands away from your mouth. Always wash your hands before eating, drinking or smoking.

### *Through your lungs*

Powered respirators, with a filter protective against particulates, are a good solution. They are usually more comfortable than the alternatives, and so are more likely to be worn properly. They may seem expensive to buy, but maintenance costs are similar to dust masks.

Disposable half-mask grade P3 respirators will provide some protection, but they must be fitted properly and well maintained. They can be uncomfortable and restrict heavy work.

Simple dust masks can be uncomfortable and provide little effective protection (see below for published guidance on respiratory protection).

## Summary

### **Exposure to dioxins occurs:**

- when loading the furnaces with contaminated scrap;
- during cleaning, and when dust is disturbed;
- during skimming and cooling of dross;
- when baghouse dust is moved.

### **To reduce exposure:**

- remove non-metals from scrap before it enters the furnace;
- enclose furnaces where possible - use extraction to minimise dust and fume in the workplace;
- do not dry sweep - use vacuum sweeping;
- enclose dross presses;
- wear protective clothing when moving dust from bag filters.

Dioxins are usually attached to small dust particles. They can get into your body by:

- breathing in contaminated dust;
- ingestion, when dust is transferred from the fingers into the mouth (good personal hygiene can lower the risk, and eating and drinking should only be allowed in designated areas);
- skin contact (wearing suitable gloves and covering cuts or abrasions can reduce the risk).

## How are they formed?

In the recycling industry, you have the three factors needed to make dioxins:

- high temperatures - from the melting of the metal;
- organic material - eg grease, dirt, oils, plastics like PVC, wood, lacquers and paints, and soil - contaminating the feed stock;
- chlorine - this is found in salts used for fluxes and in PVC.

## How much dioxin is formed in metal recycling?

The highest air levels of dioxins are found near older furnaces, especially rotary ones, and particularly where scrap contaminated with oil, grease or plastics is melted. Hot dross, when left to cool, can increase the air levels of dioxin. Because dioxins build up in the body slowly, exposure over many years may be more dangerous than short-term peaks.

## Legal requirements

Under the Control of Substances Hazardous to Health Regulations (COSHH), there is a legal requirement to adequately control exposure to dust of any kind in the workplace which exceeds certain specified levels. You can achieve adequate control of exposure to dust containing dioxins by a combination of engineering, process and other control measures. These are set out in COSHH Regulations 7(3) and (4). For the 17 dioxins listed in Schedule 1 of COSHH that are treated as carcinogens for the purposes of the Regulations, employers have a duty to apply the additional control measures set out in Regulation 7(5).

There are some simple things you can do to reduce your dioxin intake considerably.

## PROTECT YOURSELF - MINIMISE DUST AND FUMES

Reducing the amount of dust and fume in the air will reduce the amount of dioxin in the air.

The correct thing to do if you identify a dust or fume risk is *not* to wear a dust mask, but to ask 'How do we control the dust and fume so that we don't have to use personal protective equipment?'

### **Pre-furnace work - sorting, shredding and cleaning**

Any procedure which removes non-metallic material from the scrap will help to reduce dioxin formation during the melting and cooling process. Remove oil, insulating coatings, loose dirt, PVC or plastic and enamel paint where possible before it enters the furnace.

If using rotary driers to remove some contaminants, the emissions they cause may be a potential source of dioxins. The driers should operate without leakage and be extracted efficiently.

Decoaters burn off the organic material before it is loaded into the furnace. Their very high capital costs can be partially offset by lower energy costs for the furnace and improved quality of the aluminium produced. But such equipment needs efficient extraction to prevent a build-up of dioxins in the air around it.

Instead of drying the swarf/turnings by heat, centrifugation is an option that in theory recovers much of the oil.

### **Furnace loading**

- Adequate local exhaust ventilation (LEV) should be provided and *properly maintained*.
- Keep all staff not involved in the loading operation out of the area during charging, as this is when dust and fume levels are highest.

### **Furnace operation**

So far as is reasonably practicable, prevent furnace dust and fume from entering the workplace air. Complete enclosure is the ideal solution, but can be difficult with many furnaces. Where canopy hoods are used to capture rising fumes, additional partition walls and curtains improve their fume-capturing abilities.



**Figure 1** Induction furnace with aluminium scrap

Extraction systems must be regularly maintained, tested and examined by a competent person. Systems should be checked weekly for damage to ducting and hoods, and for cleanliness of the filter system.

Workers involved in maintenance and cleaning will be exposed to more dust, so should wear protective clothing (see under 'Dust handling' below).

General ventilation helps to prevent the build-up of background dust levels. Open doors wide to allow any dust or fume in the air to escape.



**Figure 2** Induction furnace producing aluminium ingots

## Dross removal and cooling

Dross containers should be lidded or removed from the work area until the contents are cool.

## Dust handling

Do not disturb dust unnecessarily as it may become airborne for a considerable time, and will be breathed in by everyone. Overall dust exposure is greatest during sweeping and cleaning, especially in the pouring area.

Baghouse dust can contain high levels of dioxins. As a result, handle these dusts carefully and take measures such as wearing personal protective equipment and ensuring good hygiene to minimise exposure.

- Enclose all dust discharges to bins or hoppers.
- Do not carry out dry sweeping. Vacuum cleaning and damp sweeping methods will significantly reduce dust levels.
- You may need to wear adequate personal protective equipment.

## Further reading

*Dust and fume in foundries* Castings Technology International in association with HSE (available from Castings Technology International Tel: 01527 66414)

*Cost and effectiveness of chemical protective gloves for the workplace: Guidance for employers and health and safety specialists* HSG206 HSE Books 2001 ISBN 0 7176 1828 5

*The selection, use and maintenance of respiratory protective equipment: A practical guide* HSG53 (Second edition) HSE Books 1998 ISBN 0 7176 1537 5

*Control of substances hazardous to health. The Control of Substances Hazardous to Health Regulations 2002.*

*Approved Code of Practice and guidance L5* (Fourth edition) HSE Books 2002 ISBN 0 7176 2534 6

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