

Loss Prevention Standards

Isocyanates

Introduction

Isocyanates, or di-isocyanates, are chemicals that are used in the production of polyurethane based plastics such as foams, adhesives, laminated fabrics and paints. They are in the raw materials for all polyurethane based products and can also be present in the thermal decomposition of polyurethane.

Isocyanates are known to cause a number of ill health effects, some of which are serious, and the main effects of exposure are occupational asthma and other lung problems. They can also cause irritation of the throat, eyes, nose and skin. One particularly serious effect of isocyanates exposure is sensitisation, whereby individuals exposed to isocyanates can develop a sensitivity which results in adverse reactions at very low levels of exposure. The sensitisation can occur in the respiratory system and the skin. Respiratory sensitisation can produce severe shortness of breath and in extreme cases, respiratory failure, whilst skin sensitisation results in rashes and itching.

A number of different forms of isocyanates are used in industry with MDI (4,4-diphenylmethane diisocyanate and its isomers) and TDI (toluene diisocyanate) being the most common.

TDI is used in the production of flexible foams and is the most volatile of the common isocyanates. It gives off vapours at room temperatures which are likely to cause harm to health.

MDI is used to make foams, tough elastomers and flexible foams. It is considerably less volatile than TDI, so when used at room temperature is regarded as less hazardous. However, significant exposure can cause asthma, particularly where it is sprayed or heated.

Common Uses

Flexible foams - used for furniture upholstery, mattresses, packing materials, etc., and made by mixing TDI or MDI with a polyol and a foaming agent, using a foaming head which delivers the mixture to either a mould or a paper lined conveyor. The mixture expands to fill the space and is then left to cure. Whilst curing, isocyanate vapour is given off.

Solid mouldings are made using similar plant and the density and flexibility can be varied according to needs. Other typical products include shoe soles and mouldings for the automotive industry.

Rigid foams - these are frequently used to insulate articles or structures and are usually MDI based. The foam mixture can be sprayed or injected and the equipment is often portable.

Paint Spraying - two pack polyurethane paints are mixed together and applied before the mixture begins to cure. Often the paint is applied by spraying and heat curing may be used. These processes are probably responsible for the majority of cases of isocyanate induced asthma. The paints are particularly used in the motor vehicle trade.

Other applications include use in adhesives, printing inks, foundry core binders and many other areas.

Occupational Exposure and Assessments

The Control of Substances Hazardous to Health (COSHH) Regulations 2002 (as amended) requires employers to assess the risks from isocyanates and determine what is required to prevent exposure or control the risks. Since inhalation is the greatest risk, isocyanates have been assigned a workplace exposure limit (WEL) as published in the Health and Safety Guidance Note EH40. The WEL for isocyanates is 0.02 mgm⁻³ but as isocyanates cause asthma, they must always be reduced to as low as reasonably practical. There is also a secondary risk of skin contact causing dermatitis that must be assessed and controlled.

Health Surveillance

Where employees are likely to be exposed to isocyanates, appropriate health surveillance should be provided by the employer. This should include pre-employment examination and on-going monitoring. The examination should include a respiratory questionnaire plus a lung function test followed by further tests as required.

Key Action Steps

- Identify if isocyanates are used in the workplace. Read the material safety data sheets for suspected substances. Remember that even water based products can contain isocyanates.
- Where practicable replace TDI with a safer substance if possible or a less volatile isocyanate such as with MDI.
- All areas where isocyanates are poured, weighed, or dispensed must be well ventilated which in most cases will require local exhaust ventilation (LEV), or a separate ventilated room or booth to be installed. Other features include:
 - A pressure gauge to show that a pressure drop is being maintained in the room or booth. The gauge should be checked every day
 - Thorough examination by a competent person of the LEV carried out at least once every 14 months
 - Air line fed masks used as respiratory protection
 - Masks to be inspected and maintained. They should be checked every time they are used and examined thoroughly every month.
 - The ventilation should be discharged safely through filters
 - Spray gun cleaning must also be carried out using extracted or enclosed gun washing equipment (or in a booth or ventilated mixing room with normal controls and breathing apparatus)
 - The time taken to clear the room of isocyanates should be known and displayed. Masks should not be removed or other people enter the room until this time has passed
- Where assessment shows that exposures are within acceptable limits, personal protective equipment (PPE) such as coveralls, gloves, and eye protection should be used. Employees should be trained in their use.
- All employees likely to be exposed to isocyanates should be trained in the hazards, COSHH assessments and control measures associated with their use.

Health surveillance programmes should be undertaken by a responsible person and set up to check:

- Biological samples, e.g. breathing (lung function) and urine
- For any signs and reporting of any symptoms
- For recurring soreness and watering of eyes
- For recurring blocked or running nose
- For coughing
- For chest tightness, wheezing or breathlessness
- If symptoms improve over weekend or holidays
- Skin complaints (rashes, etc.)

Additional Information

- [Health and Safety Executive: Guidance Note EH40 Workplace Exposure Limits](#)
- [Health and Safety Executive: Safety in Isocyanate Paint Spraying INDG388](#)
- [Health and Safety Executive: Surveillance for Occupational Asthma G402](#)
- [Health and Safety Executive: Guidance on Asthma](#)
- [Health and Safety Executive: Control of Substances Hazardous to Health Regulations 2002 \(as amended\) – Approved Code of Practice and Guidance L5](#)
- [Health and Safety Executive: Working with Substances Hazardous to Health – A Brief Guide to COSHH INDG136](#)



Further risk management information can be obtained from [Aviva Risk Management Solutions](#)

Please Note

This document contains general information and guidance and is not and should not be relied on as specific advice. The document may not cover every risk, exposure or hazard that may arise and Aviva recommend that you obtain specific advice relevant to the circumstances. AVIVA accepts no responsibility or liability towards any person who may rely upon this document.

