Loss Prevention Standards – Casualty Classes

Management of Isocyanates

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Used in the production of polyurethane-based plastics, isocyanates can cause some serious side-effects to human health, such as **occupational asthma. It's important to** manage these risks.

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Management of Isocyanates

Introduction

Isocyanates, or di-isocyanates, are chemicals used in the production of polyurethane-based plastics such as foams, adhesives, laminated fabrics and paints. Isocyanates are known to cause a number of negative health effects, some of which are serious – so it's essential that employers know how to identify and manage the risks they pose.

Types of Isocyanates

As well as their use in the production of foams, adhesives, laminated fabrics and paints, isocyanates are in the raw materials of all polyurethane-based products and can also be present in the thermal decomposition of polyurethane.

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

Health Risks Posed by Isocyanates

The main effects of exposure to isocyanates are occupational asthma and other lung problems, but they can also cause irritation of the throat, eyes, nose and skin. Click here for further details provided by the Health and Safety Executive (HSE).

One particularly serious effect of isocyanates exposure is sensitisation. This is where people exposed to isocyanates develop a sensitivity, resulting in adverse reactions even at very low levels of exposure.

Sensitisation can occur in the respiratory system and the skin. Respiratory sensitisation can produce severe shortness of breath and in extreme cases, respiratory failure. Skin sensitisation results in rashes and itching.

Specific Health Risks of TDI and MDI

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

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

Common Uses of Isocyanates

Flexible Foams

Flexible foams are used for items such as furniture upholstery, mattresses and packing materials.

They're made by mixing TDI or MDI with a polyol and a foaming agent, using a foaming head. The foaming head delivers the mixture to either a mould or 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 a similar process, and the density and flexibility can be varied accordingly. Other typical products include shoe soles and mouldings for the automotive industry.

Rigid Foams

Rigid foams are often used to insulate items or structures and are usually MDI-based. The foam mixture can be sprayed or injected, often using portable equipment.

Paint Spraying

During paint spraying, two-pack polyurethane paints are mixed together and applied before the mixture begins to cure - heat curing may be used. These processes are probably responsible for the majority of cases of isocyanate-induced asthma.

Isocyanate-based paints are commonly used in the motor vehicle trade, while other applications include use in adhesives, printing inks and foundry core binders.

Risk Assessments for Occupational Exposure

Under the Control of Substances Hazardous to Health (COSHH) Regulations 2002, employers must assess the risks from isocyanates, and determine what's required to prevent exposure and control the risks.

Because 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 mg/m3, but because isocyanates cause asthma, their levels must always be kept as low as possible.

The secondary risk of skin contact causing dermatitis must also be assessed and controlled.

Health Surveillance

Where employees are likely to be exposed to isocyanates, employers must provide appropriate health surveillance.

This should include pre-employment examinations and ongoing monitoring. The examination should include a respiratory questionnaire and lung function test, followed by further tests as needed.

Risk Control Measures

Identify if isocyanates are used in the workplace by reading the material safety data sheets for any suspected substances. Please note that even water-based products can contain isocyanates.

Where possible, replace TDI with a safer substance, or a less volatile isocyanate such as MDI.

Where a risk assessment shows that exposure levels are within acceptable limits, personal protective equipment (PPE) such as coveralls, gloves, and eye protection should be used. Employees should be trained on how to use them.

All employees who are likely to be exposed to isocyanates should be trained in the hazards, COSHH assessments, and control measures associated with their use.

Additional Information about Ventilation

All areas where isocyanates are poured, weighed, or dispensed must be well-ventilated. In most cases this will require local exhaust ventilation (LEV), or a separate ventilated room or booth to be installed. Other measures should 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-fed masks for respiratory protection - these should be checked every time they are used and examined thoroughly once a month
- The ventilation should be discharged safely through filters
- Spray gun cleaning must 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 recorded and displayed. Masks should not be removed – or other people allowed to enter the room – until this time has passed

Health Surveillance Checklist

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

- Biological samples, such as breathing (lung function) and urine
- Signs or reporting of any symptoms
- Recurring sore and watery eyes
- Recurring blocked or running nose
- Coughing
- Chest tightness, wheezing or breathlessness
- Whether symptoms improve over weekends and holidays
- Skin complaints, such as rashes

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Sources and Useful Links

- Safety in Isocyanate Paint Spraying INDG388 -HSE
- Health Surveillance for Occupational Asthma G402 – HSE
- Asthma – HSE
- Control of Substances Hazardous to Health L5 – HSE
- Working with Substances Hazardous to Health INDG136 - HSE

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