Isocyanates: new measurement techniques reveal a significant under-estimation of risks

On the initiative of Nordic Metal, researchers from the Department of Occupational and Environmental Medicine at the University of Lund, Sweden, came to the TUTB to discuss the problems arising from the non-estimation or under-estimation of isocyanates (thermal decomposition products, polyurethane plastics and other products containing polyurethanes)[1]. Gunnar Skarping and Marianne Dalene presented the results of a new air measurement technique, which was developed in their laboratory.

According to their research, the measuring methods that have been in use to date are inadequate in two respects. Firstly, they do not measure the real airborne concentrations which workers are exposed to. Secondly, they do not measure all components which can occur and which are, or might be, as harmful as those currently being measured.

The new method[2], which combines air measurements (with more sensitive instruments) and biological measurements of the breakdown of isocyanate products in the blood and urine, has revealed huge problems concerning isocyanate-related occupational diseases. Surprisingly large amounts of well-known and less well-known isocyanates have been detected in a large number of completely different workplaces, not only in the metal industry.

Application of this new measuring technique - for instance by taking blood and tissue samples from workers who weld varnished sheet steel (e.g. for repairing cars) - has revealed concentrations of up to 100 times more than the prescribed occupational exposure limit values (and in some cases up to 1000 times more)[3].

What are Isocyanates?

Isocyanates (aliphatic and aromatic derivatives of the isocyanic acid HN=C=O) are basic chemicals, mainly used in the production of polyurethane foam, elastomers, adhesives and varnish (polyurethanes are polymers based on isocyanates).

Where are Isocyanates and their derivatives found?

Isocyanates and their derivatives are found almost everywhere. For instance, in the:

- electronics industry;
- manufacturing of plastic goods;
- electrical industry;
- car and vehicle workshops;
- work involving plastic foam or insulation foam;

---

1 One of these substances, methyl isocyanate, became quite ill-reputed because of the Bhopal disaster in which more than 3,000 people which died following the release of the toxic gas.

2 This method is discussed at the International Standardisation Organisation (ISO/TC 146).

3 Most western European countries, the US and Canada apply the same OEL (0.005 ppm).

- work involving adhesives or glue components or products;
- work involving mineral wool (rockwool, Gullfiber, etc.);
- work involving bakelite and wood glue.

In Western Europe, the production of polyurethane has increased from 994,000 tons in 1983 to 1,687,000 tons in 1992. It is difficult to estimate the number of workers whose health is at risk because of isocyanates, but they can be counted by the thousand.

When do isocyanates occur?

The industrial manufacture of polyurethane and the processing of polyurethane products using heat can give rise to exposure to isocyanates and/or their derivatives and/or polyurethane decomposition products[4].
Tasks involving such risks are:

- heating treatment;
- welding;
- soldering;
- cutting (with a blowpipe or torch);
- sawing;
- painting;
- varnishing, etc.

What are the known health risks?

According to a substance guide on isocyanic acid published by the North American Emergency Response Guidebook 1996, the substance is *highly flammable and toxic. Inhalation, ingestion or contact (skin, eyes) with vapours, dusts or substance may cause very severe injuries, burns, or death.*
According to the National Board of Occupational Health and Safety, Sweden, isocyanates constitute a health risk when inhaled in the form of vapour, dust or mist. Inhaling can also give rise to irritation of the mucous membrane with symptoms similar to asthma or bronchitis and reduced lung function. There is a great risk of hypersensitivity. Isocyanates can also have an irritant effect on the eyes, skin and respiratory organs. Repeated contact with isocyanates can cause eczema and, in certain cases, skin allergies.

In Sweden, for example, isocyanate asthma is currently the most common form of workplace asthma.

The following symptoms are linked to working with products containing isocyanates:

[4] Because of the limits of the current method, this is only one facet of the problem. In the past, symptoms and related occupational diseases were not linked to exposure to isocyanates. Therefore, workers have not been and will not be compensated for their work-related diseases.

- Runny noses, stuffy noses, sneezing and / or itching in the nose, nosebleeds, soreness and dryness in the throat, wheezing.
- Breathlessness and / or a tight feeling in the chest, pain.
- Irritable coughs, breathing problems, asthma and deterioration of lung capacity.
- Irritation of the eyes, and skin problems ranging from redness to eczematic changes.

Meanwhile, Nordic Metal has presented the new method, with IG-Metall, in Wolfsburg at a Volkswagen plant. They have also contacted trade unions in Belgium, the Netherlands and the UK. They hope that this problem can be dealt with in a larger context. The TUTB will discuss the issue at its Chemical Network meeting next September.

Exposure standards

The current Swedish OEL for Isocyanates	0.005 mg/m³
Swedish Short Term Maximum OEL (5')	0,01 mg/m³
UK Maximum Exposure Limit (MEL)	0,02 mg/m³
UK Short Term OEL	0,07 mg/m³

For further information, contact Karola Grodzki: kgrodzki@etuc.org

Training session on Chemical Substances in Hattingen

The procedures for setting occupational limit values was also the subject of a joint TUTB / AFETT training seminar held last March in Hattingen, Germany.

This was a good opportunity for the trade union experts of the TUTB network to strengthen their knowledge of the European system of setting OELs and to exchange information on national procedures. The aim was to enable trade union organisations to participate in these procedures and, more generally, to be involved in the protection of workers who are exposed to chemical agents and substances at the workplace, be it on company, national or European level. There was a special presentation on the German model of trade union participation.

The documents and training material used for this seminar will soon be available in English and in German on the TUTB web site: http://www.etuc.org/tutb.