



Elimination and substitution of dangerous substances



Courtesy of Arkadiusz Ojczyk; 'Chemicals always fresh'.
Included in a poster competition organised by the
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Introduction

The theme for the European Week for Safety and Health at Work 2003 is the prevention of risks from dangerous substances. The Agency is producing a series of factsheets focusing on the communication of OSH information on dangerous substances including biological agents. This factsheet introduces the process of eliminating or substituting dangerous substances.

Legislation

European Union law places elimination and substitution at the top of the hierarchy of control measures for protecting workers from the risks related to chemical agents, ⁽¹⁾ carcinogens, ⁽²⁾ and biological agents. ⁽³⁾ For carcinogens and mutagens, substitution requirements are even more stringent and replacement has to be carried out insofar as it is technically possible. Provisions for substitution are laid down in national regulations related to the protection of workers and Member States are entitled to include some additional or more stringent provisions for the protection of workers such as the restriction on use of some work processes, as the corresponding directives only lay down minimum requirements.

Other regulations impose EU-wide restrictions on the marketing and use of certain dangerous substances and preparations, ⁽⁴⁾ including, for example, asbestos.

Under the new EU system for chemicals management (REACH) that is currently being developed by the Commission, it is intended to introduce use-specific authorisation for some substances.

It is therefore strongly recommended that you seek clarification of specific national legislation that may apply relating to restrictions in use and the substitution of dangerous substances in the workplace.

Elimination and substitution in the European control hierarchy

European legislation provides a hierarchy of measures to prevent or reduce the exposure of workers to dangerous substances.

Elimination — the best way to reduce the risks connected with dangerous substances is to remove the need to use those substances by changing the process or product in which the substance is used.

Substitution — if elimination is not possible, then the substitution, or replacement, of the hazardous substance or the process with one less dangerous under its condition of use is the next best option.

Control — if a substance or process cannot be eliminated or substituted, then exposure may be prevented or reduced by:

- enclosure of the emitting process;
- control of the emission by better management of the processes;
- technical solutions to minimise the concentration in the exposure zone;
- organisational measures such as minimising the number of exposed workers and the duration and intensiveness of the exposure;
- use of personal protective equipment.

Elimination and substitution in practice

Changing from one substance to another is a three-stage process:

1. **Identify the alternatives:** find out all the options available to you. Look for alternative process methods (to remove the need to use a substance entirely) and potential replacement substances (if elimination is not possible). If the substance you wish to replace is used in a widely applied process such as spray-painting or degreasing, then the number of options available is likely to be larger.
3. **Compare the alternatives:** carry out a risk assessment of all the alternatives, including the substance or process used, and compare your findings. Check relevant national legislation on occupational safety and health, as well as environmental and product safety legislation to ensure that the options are legal and compatible, and ascertain the minimum standards that you have to achieve.
4. **Make the decision:** take the decision based on the regulatory needs, technological possibilities, potential implications for the quality of the products, costs, including the required investment, and training for use of the new product.

Where to start

Any avoidable exposure to dangerous substances should be eliminated.

Some hints on where to look:

- Regarding **hazards caused by the process:**
 - open processes, e.g. painting big surfaces, mixing/compounding in open containers/vessels;
 - processes generating dusts, vapours or fumes or dispersing liquids in the air e.g. welding, spraying paint.
- **Related to the substance:**

If you cannot change the work process, try to eliminate or avoid the exposure for substances that:

 - increase fire and explosion risks;
 - leads to high exposure of workers;
 - results in exposure to many workers;



⁽¹⁾ Council Directive 89/391/EEC contains the basic provisions for health and safety at work where not covered by more specific legislation.

⁽²⁾ Council Directive 90/394/EEC of 28 June 1990 on the protection of workers from the risks related to exposure to carcinogens at work and its amendments.

⁽³⁾ Directive 2000/54/EC of the European Parliament and of the Council of 18 September 2000 on the protection of workers from risks related to exposure to biological agents at work.

⁽⁴⁾ Council Directive 76/769/EEC of 27 July 1976 relating to restrictions on the marketing and use of certain dangerous substances and preparations, its amendments and technical adaptations.

- are volatile, e.g., organic solvents;
- are dispersed in the air (aerosols, dust);
- cause acute health risks, e.g., poisons, corrosives and irritants;
- cause chronic health risks, such as allergens, substances toxic for reproduction and others;
- are covered by specific national regulations imposing restrictions of use in the workplace;
- have already caused problems in your enterprise (health problems, accidents or other incidents);
- cause occupational diseases;
- make regular health monitoring (medical examination of workers) necessary;
- can be absorbed through the skin;
- or substances for which the use of personal protective equipment impairing workers (e.g. inhalation protection) is necessary.

Carcinogenic and mutagenic substances have to be replaced insofar as technically possible! In some Member States this regulation also applies to substances toxic for reproduction.

Do not forget maintenance procedures and potential hazards due to accidents. A contained substance can present a high risk when released due to an accident.

Information on dangerous substances can come from a number of sources. One of the easiest, although preliminary, ways to compare potential dangers from substances is to look at the classification and labelling information. It should be in the safety data sheets supplied with the chemical. For substances where safety data sheets are not available, information will be available from supplier sources (technical documents, instructions for use).

Other sources of information include local restrictions on substances and legislative limit values such as occupational exposure limits (OEL), emission limits, or product content limits. Indications of substances that can penetrate the skin or provoke allergies can also be found in some national OEL lists.

An inventory of dangerous substances must be set up in your enterprise when assessing the risks. It will also give indications for priorities to be taken on elimination and substitution, by making it possible to compare the data related to the substances used, i.e. the amount, process, number of workers exposed, results of workplace measurements or estimation of exposure and classification of the substances.

The priorities for substitution identified in the risk assessment should be reviewed regularly and when there is a change in the work process.

Other questions:

Who decides on what substance is being purchased?

Who has to comment or give agreement (management, safety committee, preventive services, etc.)?

Is this decision revised regularly?

Guides for substitution

In most of the Member States, public or non-profit private organisations have provided easy, understandable guides on risk reduction and substitution. Typical examples are 'Seven steps to substitution' ⁽⁸⁾ (HSE, UK), 'Gevaarlijke stoffen op het werk' ⁽⁹⁾ (Dangerous substances at work, Centrum GBW; NL).

An easy calculation model is provided by the German 'Column model' ⁽⁷⁾ (BIA, DE). Using the classification of the chemical product and the relevant workplace information, it helps to compare chemicals in a systematic and easy way. It is especially aimed at small and medium-sized enterprises.

Several databases have been developed by industry groups to assist their members in choosing substances. These databases are often sector-oriented and give very specific information. ⁽⁶⁾

Benefits from substitution

Eliminating the use of a dangerous substance or changing to one less hazardous benefits everyone involved in the process. Elimination or substitution can lead to:

- improved immediate and long-term health of the workers exposed to the dangerous substance;
- reduced pollution of the environment;
- reduced costs to the enterprise by:
 - lowering sickness absence,
 - spending less on control measures,
 - reduced cost in compliance with environmental legislation,
 - saving money on fire and explosion protection,
 - lower consumption of a product,
 - using cheaper materials,
 - more efficient work processes.

Further information

Further information on the elimination and substitution of dangerous substances is available through the Agency's web site at: http://europe.osha.eu.int/good_practice/risks/ds/

Other factsheets available in this series on dangerous substances and further information are also available at <http://osha.eu.int/ew2003/>. This source is being continually updated and developed.

The Danish MAL-KODE system — a practical tool for substitution

The Danish Code Number Wizard MAL-KODE ⁽⁸⁾ is used for paints, adhesives and other chemical products intended to be applied on surfaces by professionals. It is built upon a code system consisting of two numbers joined with a hyphen, e.g., 2-1. The number before the hyphen represents the minimum safety precautions against inhalation of vapours from the product. The number after the hyphen represents the minimum safety precautions against contact with skin, eyes or ingestion. The necessary protection is described in guidance documents related to the numbers.

The calculation of the code number is based on the chemical composition of the product. The code number is an integral part of producer information and a strong tool for substitution. It is much easier to compare code numbers of different products than comparing the labelling of the products or the information in the safety data sheets.

⁽⁸⁾ <http://www.hse.gov.uk>

⁽⁹⁾ http://www.arbobondgenoten.nl/arbosthem/gevstof/GBWleaf1_gevaarlijke_stoffen.pdf

⁽⁷⁾ <http://www.hvbg.de/d/bia/pramodel/spaltee.htm>

⁽⁶⁾ e.g. for the Nordic pulp and paper industry (<http://www.kcl.fi/info/database.html>) or for European car manufacturers (<http://www.mdsystem.com/index.jsp>)

⁽⁵⁾ <http://www.ic.dk/dkcodenum.htm>