Training on substitution

7th Seminar on workers’ protection & chemicals
Paris, 27th January 2011

Dolores Romano Mozo (ISTAS/CCOO)
Ellen Schmitz-Felten (Kooperationstelle Hamburg)
Overview of the training session

13:45 – 14:30  PRESENTATION. SubsPort project.

14:30 - 15:15  WHAT IS SUBSTITUTION? Activity in small groups.

15:15-15:30  ALTERNATIVES AND COST ASSESSMENTS. Introduction

15:30-16:00  Break

16:00-16:45  ALTERNATIVES AND COST ASSESSMENTS. Activity in small groups.

16:45-17:00  Wrap up.
Welcome on SUBSPORT the Substitution Support Portal!

Here you can find information to support your efforts in substituting hazardous substances. Enjoy exploring the portal and please do not hesitate to contact the project team for any comments or questions.

SUBSPORT is an ongoing project. Therefore we recommend to revisit the portal from time to time if you could not yet find the information you expected. At the moment information is mainly provided in English. In 2012 the complete French, German and Spanish language versions will launch. To keep yourself informed about the progress of the portal and other related news you can subscribe to the SUBSPORT newsletter.
About the project

Objectives of the SUBSPORT project

Internet portal

The goal of the SUBSPORT project is to develop an internet portal that constitutes a state-of-the-art resource on safer alternatives to the use of hazardous chemicals. It should be a source of not just information on alternative substances and technologies, but also of tools and guidance for substance evaluation and substitution management.

Substitution tool

The portal is intended to support companies in fulfilling substitution requirements of EU legislation, such as those specified under the REACH authorisation procedure, the Water Framework Directive or the Chemical Agents Directive. Furthermore, other stakeholders like authorities, environmental and consumer organisations as well as scientific institutions will benefit from the portal.

Network

In addition, the project aims to create a network of experts and stakeholders who are active in substitution. The network should assist in content development and promotion of the portal as well as ensuring sustainable updates and maintenance. This will contribute to the project’s goal of raising awareness and promoting safer alternatives. Furthermore, training on substitution methodology and alternatives assessment will be provided.
SubsPort Basic data

- **Co-financers:**
  EU Life-Programme
  BAuA - Federal OSH Institute Germany
  Austria – Ministry for Environment and Agriculture

- **Co-financers:**
  Kooperationstelle, Hamburg
  ISTAS, Madrid
  GM, Copenhagen
  CHEMSEC, Gothenburg

- **Co-financers:** 3 Years (2010-2012)

- **Co-financers:** English, German, Spanish, French
Expert Committee

- ANSES, Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail (French agency for Food, Environmental and Occupational Health & Safety)
  Sophie Robert
  → www.anses.fr

- BAUA, Bundesanstalt für Arbeitsschutz und Arbeitsmedizin (German Federal Institute for Occupational Safety and Health)
  Eve Lechtenberg-Auffarth
  → www.baua.de

- Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft (Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management)
  Michael Witzmann
  → www.bundesministerium.at

- ECHA, European Chemicals Agency
  Thierry Nicot
  → echa.europa.eu

- ETUI-REHS, European Trade Union Institute Research, Education, Health & Safety
  Tony Musu
  → hesa.etui-rehs.org

- EU-OSHA, European Agency for Safety and Health at Work
  Elke Schneider
  → osha.europa.eu

- Inspectorat Muncii (Romanian Central Labour Inspection)
  Tamara Moraru
  → www.inspectmum.ro

- KEMI, Kemikalieinspektionen (Swedish Chemicals Agency)
  Lars Gustafsson
  → www.kemi.se

- Ministerio de Medio Ambiente y Medio Rural y Marino (Spanish Ministry of the Environment and Rural and Marine Affairs)
  Ana Fresno Ruiz, Juan José Izquierdo Galvez
  → www.marm.es

- Schülke & Mayr (German Producer of Disinfectants and Hygiene Products)
  Michael Stroek
  → www.schuelke.com

External Expertise

- TURI, Toxic Use Reduction Institute at the University of Massachusetts Lowell, USA
  Joel Tickner, Pamela Elason
  → www.turi.org
Substitution in Legislation

This section of the SUBSPORT website contains resumes of legislation and international agreements that are relevant to substitution, whether they refer to it directly or are closely related. Links to the original documents as well as archived copies of them are also provided.

This section of the SUBSPORT website is intended to help users to:

- get an overview of the legal approach of substitution, mainly in the European Union, but also with some examples of legislation from other countries
- identify legislation that is relevant to substitution,
- have easy access to the original legislation text and to other related documents by providing links to them,
- decide if they have to comply with the described legislation,
- focus on direct information on substitution by presenting in detail those paragraphs containing such information,
- notice the relevance to substitution of the legal text by presenting a short SUBSPORT point of view.

Please read the instruction how to use this section before proceeding.

List of legislative items described

EUROPEAN UNION LEGISLATION

1. REACH Regulation
2. CLP Regulation
3. EU POP Regulation
5. VOC Solvents Directive
6. Chemical Agents Directive
7. Carcinogens and Mutagens Directive
8. RoHS Directive
12. IPPC Directive

INTERNATIONAL AGREEMENTS

15. OSPAR Convention
16. Convention on Long-range Transboundary Air Pollution, the Geneva Protocol on VOC
17. Montreal Protocol on Ozone Depleting Substances – ODS
18. Rotterdam Convention On the Prior Informed Consent Procedure
19. Agenda 21
20. Aarhus Protocol on heavy metals
21. Aarhus Protocol on Persistent Organic Pollutants (POPs)
Title: Protection of workers from the risk related to exposure to carcinogens or mutagens at work

Directive 2004/37/EC

1. Issued by / date / date of implementation
EU / 29 April 2004 / June 2004

2. Type of legislation
European Union Directive, to be implemented by all Member States by transposition of the legislation and enforcement with their means

3. General purpose
The aim of this Directive is to protect workers against risks arising from exposure to carcinogens and mutagens at work.


Specific obligations: record keeping and notification

4. Substitution relevant paragraphs

4.1. "The employer shall reduce the use of carcinogens or mutagen at the place of work, in particular by replacing it, in so far as is technically possible, by a substance, preparation or process which, under its condition for use, is not dangerous or is less dangerous to worker’s health or safety."

5. Assessment of relevance for substitution

Substitution is defined as first priority; all Member States have to follow this principle in their national legislation.

Strict obligations of enterprises, when using a carcinogenic or mutagenic substance also support the idea of substitution.

6. Link to the legal text

- English version: archived copy or original document
- Multilanguage site can be found here

7. Further information

7.1 Studies or publications about the legislation or its impact

7.2 Other relevant legislation

The Directive 2003/18/EC on the protection of workers from the risks related to exposure to asbestos at work: archived copy or original document

Last update: 18.11.2010
Identifying substances of concern

REACH defines substances of very high concern (SVHC) in its article 57, as first step to identify chemicals that should be subject to authorisation within EU. Similar terms, like ´substances of (high) concern´ or ´priority substances´, are used by different organisations to refer to chemicals that should be substituted due to their hazards.

The table below presents an overview of the criteria and their definitions that are most used by different sources to identify substances of concern. For definitions using Risk phrases corresponding Hazard statements were added (not always a direct translation is possible). More detailed descriptions are also available, with links to the original documents.

You can also search the list of lists database that contains lists of priority substances.

(Click to see the full table)

<table>
<thead>
<tr>
<th>HAZARD CRITERIA</th>
<th>CRITERIA AND DEFINITION</th>
<th>European</th>
<th>Source of criteria</th>
<th>Non-European</th>
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<td>Very toxic by skin contact (R23) (H310)</td>
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<td>Very toxic by swallowing (R26) (H350)</td>
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<td>Combinations of those phrases with R37/38</td>
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<td>Contact with eyes is likely to cause severe effects (R22) (H400)</td>
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<td>Toxic or dangerous to humans and animals through inhalation (R28) (H331)</td>
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<td>Contact with skin (R24) (H341) or skin immersed in water (R25) (H342)</td>
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<td>Contact with water or acids causes severe effects (R29)</td>
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<td>Vapours may cause damage on or to eyes (R50) (H330)</td>
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<td>Repeated exposure may cause skin dryness or irritation (R60) (H409)</td>
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<td>GHS Acute toxicity Category 1 or 2</td>
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<td></td>
<td>Causes severe irreversible eye damage</td>
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<td>+GHS Category 1 (eyes or eyes)</td>
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<td>Highly toxic</td>
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<td>Danger of cumulative effects (R53) (H412)</td>
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<td>Carcinogenicity</td>
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<td>ED Category 1 (2) (R45) (H512), (R46) (H513)</td>
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<td>ES Category 3 (4) (R47) (H514)</td>
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</table>
### SEARCH RESULTS:

4 matches found for "50-00-0" in "all 29 lists"

### OPTIONS

1. Order the search results by CAS or EC no. using the green triangles.
2. Use the "description of list" icon to the right of a list name to get more information and the link to the original source.
3. Click on list name in a certain row to get to this entry in the single list view.
4. Click on a CAS or EC no. to search for it in all 29 lists.
5. Substance names were taken from the original sources and could not be harmonised. Search also by CAS or EC no. in order not to miss information.

<table>
<thead>
<tr>
<th>No.</th>
<th>Substance/group name</th>
<th>▲CAS No.</th>
<th>▲EC No.</th>
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<td>1</td>
<td>Formaldehyde</td>
<td>50-00-0</td>
<td>200-001-8</td>
<td><strong>KEMI PRIOR Risk-Reduction</strong></td>
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<td><strong>Canadian EPA</strong></td>
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<td><strong>US EPA</strong></td>
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<td><strong>BSI Black</strong></td>
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<td><strong>Nokia</strong></td>
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<td>2</td>
<td>Formaldehyde (Adult/children)</td>
<td>50-00-0</td>
<td>200-001-8</td>
<td>Puma</td>
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<tr>
<td>3</td>
<td>Formaldehyde (in Wood products)</td>
<td>50-00-0</td>
<td>200-001-8</td>
<td>Dell</td>
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<tr>
<td>4</td>
<td>Formaldehyde (solution)</td>
<td>50-00-0</td>
<td>200-001-8</td>
<td><strong>US EPA</strong></td>
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<td><strong>Mass TURA</strong></td>
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</tbody>
</table>
Substitution Steps

1. Define the Problem

Describe both hazards and useful properties of the candidate to substitution. Ask your suppliers and/or use reliable sources to check hazards. Describe the function of the substance and the conditions needed to make it work at the desired performance level; operational parameters (pH, temperature, etc), quantity, equipments. Substitution might imply changing some of these, too. Prioritize substitution considering applicable legislation or policies of your company and your customers.

List of useful links – hazards identification

2. Set substitution criteria

Set criteria to eliminate alternatives that are not safer or not safe enough. When establishing criteria check what substances are on a priority/block list of legal bodies or companies or see which of the hazards you have identified were used by others in defining substances of concern.

‘List of lists’ of hazardous substances database, Screening criteria list

3. Search for alternatives

Search on internet, ask authorities, professional associations, NGOs, trade unions. Look for alternatives already elaborated and implemented, this may lower the innovation costs and risks. You may also ask your supplier to formulate a safer alternative. But first, search within your own company.

Database on safer alternatives

4. Assess and compare alternatives

Assess all alternatives with the same method/tool for comparability. Consider hazard criteria set at point 2. Analyse costs (can you afford it?) and cost/benefit. An all-risk reduction solution is the ideal alternative. However, most solutions are more suited for some of the risks than for others. Select the alternative which is safer, feasible and fits the nature and dimension of your problem.

Substitution tools

5. Experiment on pilot

First try substitution on a smaller, pilot scale. Plan the technological and organisational changes needed. Pre-evaluate risks with an appropriate methodology. Assess substitution as regards functional performance, impact on workers, environment or consumers. Pay special attention to possible shift of risks and the necessary control measures. Consult employees.

List of useful links – exposure and risk assessment

6. Implement and improve

Think what other measures would be needed when implementing substitution at full capacity.
Searching for alternatives –
google search

MOVING TOWARDS SAFER ALTERNATIVES

Support for Substitution
Substitution of hazardous chemicals is a fundamental measure to reduce risks to environment, workers, consumers and public health.
Legislation encourages you to substitute, this site will show you how.
Read more

Latest News
Alternative Identification and Assessment Training
in Paris
SUBSPORT Project News | 23.01.2012
SUBSPORT will conduct a training session on Alternative Identification and Assessment in Paris, January 27. The SUBSPORT training session will be part of the European Trade Union Institute (ETUI) internal seminar “7th Seminar on workers’ protection and chemicals”.
Read more

Substitution Steps
Substitution may be fast and easy or a more complex process. Generally it includes the following steps:
1. Define the problem
2. Set substitution criteria
3. Search for alternatives
4. Assess and compare alternatives
5. Experiment on pilot
6. Implement and improve
Read more
Substitution Databases and Websites

Search the following websites and databases in one step:

- subsport.eu
- catsub.eu
- cleantool.org
- istas.net/risctox/alternativas
- substitution-cmr.fr
- turi.org
- cleanersolutions.org
- cleanproduction.org
- cprac.org
- epa.gov/dfe
- epa.gov/lean
- iehn.org
- ihobe.net
- infocarquim.insht.es
- istas.net/fittema/att
- ktn.innovateuk.org
- mass.gov/Eoeea
- noharm.org
- pius-info.de
- p2pays.org
- sustainablehospitals.org
- sustainableproduction.org
- who.int/ifcs
Searching for alternatives – google search

**Reproductive Health of Men Working with Bisphenol A in the United ...**
File Format: PDF/Adobe Acrobat
To generate new knowledge in the field of occupational safety and health and to transfer that knowledge into practice for the betterment of workers. © NIOSH ...
www.epa.gov/dfe/pubs/projects/bpa/3_niosh_presentation_7_15.pdf

**BPA Alternatives in Thermal Paper Partnership | Design for the ...**
EPA has issued an action plan for bisphenol A (BPA) under its enhanced chemical safety program. The action plan (PDF) (22pp, 209K, About PDF) includes ...
www.epa.gov/dfe/pubs/projects/bpa/index.htm

**EPA’s Chemical Action Plan on Bisphenol A**
File Format: PDF/Adobe Acrobat
EPA’s Enhanced Chemical Management Program. • On September 29, 2009, Administrator Jackson outlined her framework for the Agency’s enhanced ...
www.epa.gov/dfe/pubs/projects/bpa/2_action_plan_intro_7_15.pdf

**About the BPA Alternatives in Thermal Paper Partnership | Design ...**
The EPA’s Design for the Environment (DfE) program is conducting an alternatives assessment to help identify safer substitutes for bisphenol A (BPA) in the ...
www.epa.gov/dfe/pubs/projects/bpa/about.htm

**ENVIRONMENTAL HEALTH PERSPECTIVES ENVIRONMENTAL ...**
File Format: PDF/Adobe Acrobat
Mar 30, 2011 ... Food Packaging and Bisphenol A and Bis(2-Ethylhexyl) Phthalate ...
Running title: Dietary Intervention to Reduce BPA and DEHP. Key words: ...
Searching for alternatives –

**Advanced Search**

**Substance name, CAS/EC/Index No.**

**Sectors**
Select Sector

**Functions**
Select Function

**Processes**
Select Process

**Products**
Select Product

[Search Database]

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**Substitution of Chloroform with 1-Bromo-3-chloropropane in RNA-isolation.**

**Substitution of PFC in paper with natural greaseproof paper.**

**Sustitución de octametilciclotetrasiloxano, sustancia disruptora endocrina y tóxica para la reproducción, utilizada en encherados para cítricos.**

**Sustitución de pinturas plástica, con dióxido de titanio, por pinturas minerales.**
Searching for alternatives –
google search

Evaluating Energy Efficiency in the Garment Care Industry: A Comparison of Five Garment Care Technologies

Alternatives to Perchloroethylene vapor degreasing for plating operations: Case study conversions

Substitution of perchloroethylene in the cleaning of garments

Five Chemicals Alternatives Assessment Study
Substitution of perchloroethylene in the cleaning of garments

Abstract
A textile company used Superfluide P, a product containing perchloroethylene for garment cleaning and in the maintenance service. After the intervention of trade union health and safety expert, the product was replaced by a safer alternative containing isoalkanes C11-C15.

Case study (general section)
Substitution of perchloroethylene in the cleaning of garments

Type of information Case study (general section)

Abstract

A textile company used Superfluide P, a product containing perchloroethylene for garment cleaning and in the maintenance service. After the intervention of trade union health and safety expert, the product was replaced by a safer alternative containing isoalkanes C11-C15.

Substituted substance(s)

Name Tetrachloroethylene
CAS No. 127-18-4
EC No. 204-825-9

Chemical group Organochlortide compounds, halogenated aliphatic hydrocarbons, degreaser, solvent, cleaner

» check classification at official site

Chemical Alternative(s)

Name 3,5,7-Trimethyldecane
CAS No. 90622-58-5
EC No. 292-460-6

Chemical group Alkane, solvent

» check classification at official site
Application

**Sector**  Manufacture of textiles, wearing apparel, leather and related products  
**Function**  Solvents  
**Process**  Cleaning / washing / rinsing / dry cleaning  

**State of Implementation**  In use  
**Date when alternative was implemented**  2008  
**Country**  Spain  

**Reliability of information**

Evidence of implementation: there is evidence that the solution was implemented and in use at time of publication.

**Description**

**Case presentation**

This substitution experience was included in the Project "Prevention of exposure to endocrine disruptors in the textile industry" developed by the Trade Union’s Textile, leather, chemical and related industries federation (CC.OO.) in different regions of Spain between 2007-2008.

The first step was to compile safety data sheets of chemicals used in the industry. Information was provided by safety reps and the management. Risk assessments which included general information were also requested. The use of perchloroethylene was revealed by these documents.

The second action included a visit to observe the use of chemicals, especially perchloroethylene. The product Superfluid P was used in the cleaning of some garments and in the maintenance service.

Workers that cleaned with perchloroethylene decanted the chemical from 5-litre containers into dispensers without any preventive measure. The product was applied directly on garments and sometimes they used a box, made by the head of maintenance to “isolate” the process. The only personal protection equipment used by workers was a mask worn by 5 workers. As a result of the use of perchloroethylene workers presented a series of symptoms, particularly dizziness.
Advantages

Risk reduction, cleaner production, use of safer products and better compliance with applicable legislation.

Contact

ISTAS

http://www.istas.net/risctox/gestion/estructuras/_3545.pdf

Last update

2012-06-20 11:00:00

Source

http://www.istas.net/risctox/gestion/estructuras/_3545.pdf

Availability freely available
Potential alternatives to musk xylene

Abstract

This document concerns information on musk xylene, a synthetic musk used in phragrances and potential alternatives to its use. The main alternatives to musk xylene are compounds from the macrocyclic musk group as well as the alicyclic musk group. Polycyclic musks are also an alternative but have in recent years been considered unsafe because of their potential negative effects on the environment.

Substitution of xylen with isopropanol for use in dehydration of tissue samples before embedding in paraffin.
Case Studies

Database of substitution case studies – first publication in January 2012, official launch in May 2012

As SUBSPORT is an ongoing project the database of substitution case studies is currently under development. The first case study descriptions will be available starting from January 2012. The official launch of the database will take place in May 2012. If you want to keep yourself informed about the database launch and further project related news please subscribe to the SUBSPORT newsletter.

Case study information

The SUBSPORT case study database will provide detailed descriptions of substitution cases for 10 priority substances in various essential applications along with examples of substitution for many other substances, for which more general information will be given. Background documents supporting the process of substitution will also be presented.
Alternative Identification and Assessment Training in Paris

SUBSPORT Project News | 23.01.2012

SUBSPORT will conduct a training session on Alternative Identification and Assessment in Paris, January 27. The training session is organised in cooperation with ETUI, the European Trade Union Institute, the independent research and training centre of the European Trade Union Confederation (ETUC) which itself affiliates European trade unions into a single European umbrella organisation. The SUBSPORT training session will be part of the internal Trade Union seminar “7th Seminar on workers’ protection and chemicals”.

The Alternatives Identification and Assessment training provides participants with basic concepts and tools to facilitate the substitution of hazardous chemicals in products and processes with safer alternatives. The training is designed for authorities, industry, trade unions, NGOs and other interested parties in substitution of hazardous chemicals in products and processes with safer alternatives.

Our SUBSPORT Team also conducts training session according to your company/organisation requirements. If you are interested in our training sessions and would like to organise a training session, please contact SUBSPORT
MOVING TOWARDS SAFER ALTERNATIVES

Newsletter

Keep yourself informed with the SUBSPORT newsletter. Enter your name and e-mail address to subscribe. The newsletter will be available solely in English.

Former issues can be found in the newsletter archive.

Your name

Your email

Subscribe

Edit this entry
Alternatives Assessment

• Methods that compare data on hazards:
  – Column Model
  – COSHH Essentials
  – Pollution Prevention Options Analyses System (P2OAyS)

• Sifting Methods:
  – Green Screen
  – Quick Scan
## Comparative Scores

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</table>
**Green Screen for Safer Chemicals**

Start at Benchmark 1 (red) and progress to Benchmark 4 (green).

**Benchmark 1**
- PBT: high P + high B + high T (high Human Toxicity or high Ecotoxicity)
- vPvB: very high P + very high B
- vPT (vP + high T) or vBT (vB + high T)
- high Human Toxicity for any priority effect

**Avoid — Chemical of High Concern**

**Benchmark 2**
- moderate P + moderate B + moderate T (moderate Human Toxicity or moderate Ecotoxicity)
- high P + high B
- (high P + moderate T) or (high B + moderate T)
- moderate Human Toxicity for any priority effect or high Human Toxicity
- high Flammability or high Explosiveness

**Use but Search for Safer Substitutes**

**Benchmark 3**
- moderate P or moderate B
- moderate Ecotoxicity
- moderate Human Toxicity
- moderate Flammability or moderate Explosiveness

**Use but Still Opportunity for Improvement**

**Benchmark 4**
- ready biodegradability (low P) + low B + low Human Toxicity + low Ecotoxicity
  (+ additional ecotoxicity endpoints when available)

**Prefer — Safer Chemical**

**Clean Production Action, 2008**

[http://www.cleanproduction.org](http://www.cleanproduction.org)
<table>
<thead>
<tr>
<th>Product:</th>
<th>Acute health hazards</th>
<th>Chronic health hazards</th>
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<tbody>
<tr>
<td><strong>Risks</strong></td>
<td>(single affection, e.g. accident with chemicals)</td>
<td>(repeated affection)</td>
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<tr>
<td>very high</td>
<td>□ Highly toxic substances/preparations (R26, R27, R28)</td>
<td>□ Carcinogenic substances of categories 1 or 2 (Carc.Cat.1, K1, Carc.Cat.2, K2, R45, R49)</td>
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<td>□ Substances/preparations, which may produce highly toxic gases when in contact with acids (R32)</td>
<td>□ Mutagenic substances of categories 1 or 2 (Mut.Cat.1, M1, Mut.Cat.2, M2, R46)</td>
</tr>
<tr>
<td>high</td>
<td>□ Toxic substances/preparations (R23, R24, R25)</td>
<td>□ Preparations, containing carcinogenic or mutagenic substances of categories 1 or 2 in concentrations ≥ 0.1 %</td>
</tr>
<tr>
<td></td>
<td>□ Highly corrosive substances/preparations (R35)</td>
<td>□ Substances toxic to reproduction of categories 1 or 2 (Repr.Cat.1, Re1, Rf1, Repr.Cat.2, Re2, Rf2, R60, R61)</td>
</tr>
<tr>
<td></td>
<td>□ Substances/preparations, which may produce toxic gases when in contact with water or acids (R29, R31)</td>
<td>□ Preparations, containing substances toxic to reproduction of categories 1 or 2 in concentrations ≥ 0.5 % (in case of gases ≥ 0.2 %)</td>
</tr>
<tr>
<td></td>
<td>□ Skin sensitising substances (R43, Sh)</td>
<td>□ Carcinogenic substances of category 3 (Carc.Cat.3, K3, R40)</td>
</tr>
<tr>
<td></td>
<td>□ Substances sensitising respiratory tracts (R42, Sa)</td>
<td>□ Mutagenic substances of category 3 (Mut.Cat.3, M3, R68)</td>
</tr>
<tr>
<td></td>
<td>□ Preparations, containing skin or respiratory tract sensitising substances in a concentration ≥ 1 % (in case of gases ≥ 0.2 %)</td>
<td>□ Preparations, containing carcinogenic or mutagenic substances of category 3 in concentration ≥ 1 %</td>
</tr>
<tr>
<td></td>
<td>□ Substances, which can accumulate in the human body (R33)</td>
<td>□ Substances, which can accumulate in the human body (R33)</td>
</tr>
<tr>
<td>medium</td>
<td>□ Substances/preparations harmful to health (R20, R21, R22)</td>
<td>□ Substances toxic to reproduction of category 3 (Repr.Cat.3, Re3, Rf3, R62, R63)</td>
</tr>
<tr>
<td></td>
<td>□ Substances, which may accumulate in breast milk (R64)</td>
<td>□ Preparations, containing substances of category 3 toxic to reproduction in concentration ≥ 5 % (in case of gases ≥ 1 %)</td>
</tr>
<tr>
<td></td>
<td>□ Corrosive substances/preparations (R34, pH ≥ 11.5, resp. ≤ 2)</td>
<td>□ Otherwise chronically affecting substances (no Rphrase, but nonetheless a hazardous substance)</td>
</tr>
<tr>
<td></td>
<td>□ Substances harmful to eyesight (R41)</td>
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</tr>
<tr>
<td></td>
<td>□ Non toxic gases; may cause suffocation by air displacement (e.g. nitrogen)</td>
<td></td>
</tr>
<tr>
<td>low</td>
<td>□ Irritant substances/preparations (R36, R37, R38)</td>
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<tr>
<td></td>
<td>□ Skin affections when working in damp environment</td>
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<tr>
<td></td>
<td>□ Substances/preparations, which may cause lung defects when swallowed (R65)</td>
<td></td>
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<tr>
<td></td>
<td>□ Skin affecting substances/preparations (R66)</td>
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<tr>
<td></td>
<td>□ Steam causing drowsiness and stupor (R67)</td>
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<tr>
<td>negligible</td>
<td>□ Harmless substances by experience (e.g. water, sugar, paraffin and similar)</td>
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</tr>
<tr>
<td>Environmental hazards</td>
<td>Fire and explosion hazards</td>
<td>Exposure potential</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Substances/preparations with the warning symbol N and hazards indications R50, R51, R53, R54, R55, R56, R57, R58, R59</td>
<td>Explosive substances/preparations (R2, R3)</td>
<td>Gases</td>
</tr>
<tr>
<td>Substances/preparations of the German water pollution class WGK 3</td>
<td>Extremely flammable gases and liquids (R12)</td>
<td>Liquids with vapour pressure &gt; 250 hPa (mbar) (e.g. dichloromethane)</td>
</tr>
<tr>
<td>Highly flammable substances/preparations (R11)</td>
<td>Spontaneously flammable substances/preparations (R17)</td>
<td>Dust producing solids</td>
</tr>
<tr>
<td>Substances/preparations, producing extremely flammable gases with water (R15)</td>
<td>Oxidizing substances/preparations (R7, R8, R9)</td>
<td>Aerosols</td>
</tr>
<tr>
<td>Substances/preparations with determined properties (R1, R4, R5, R6, R7, R14, R16, R18, R19, R30, R44)</td>
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<td>Substances/preparations without warning symbol N, but with hazards indications R52, R53</td>
<td>Flammable substances/preparations (R10, flashpoint 21...55°C)</td>
<td>Liquids with vapour pressure 50...250 hPa (mbar) (e.g. methanol)</td>
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<td>Substances/preparations of the German water pollution class WGK 2</td>
<td>Hardly flammable substances/preparations (flashpoint 55...100°C)</td>
<td>Liquids with a vapour pressure 10...50 hPa (mbar), except water (e.g. toluene)</td>
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<td>Substances/preparations of the German water pollution class WGK 1</td>
<td>Not water polluting substances/preparations (NWG, before WGK 0)</td>
<td>Liquids with a vapour pressure &lt; 2 hPa (mbar) (e.g. glycol)</td>
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<tr>
<td>Inflammable or very hardly flammable substances/preparations (liquids; flashpoint &gt; 100°C)</td>
<td>Non dusting solids</td>
<td>Tightly closed equipment</td>
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<td>Closed equipment with exhaust facilities at points of emission</td>
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## Alternatives Assessment

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<tr>
<td>ACRIBOND</td>
<td>High Risk: R43</td>
<td>High Risk: R40</td>
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<td>High Risk: R11</td>
<td>Very high risk &gt;250hPa</td>
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<tr>
<td>ESTASOL</td>
<td>Negligible risk</td>
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## Cost Assessment

### Comparison of annual costs:

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<th>Cost category</th>
<th>PERC Degreaser</th>
<th>Ultrasonic System</th>
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<tr>
<td>Equipment Cost</td>
<td>-</td>
<td>1,310 € (13,100 € / 10 years)</td>
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<tr>
<td>Cleaner Cost</td>
<td>5,950 €</td>
<td>872 €</td>
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<tr>
<td>Electricity Cost</td>
<td>540 €</td>
<td>835 €</td>
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<td>Labour Cost</td>
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<td>Maintenance Cost</td>
<td>1,670 €</td>
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<td>Disposal Cost</td>
<td>554 €</td>
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<td>Regulatory Fees</td>
<td>1,645 € (1,495 € + 150 €)</td>
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<td><strong>Total Cost</strong></td>
<td><strong>35,359 €</strong></td>
<td><strong>34,687 €</strong></td>
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Notes for discussion:

Other costs that have not been taken in account in this case story:

Operational costs
  ✓ Personal protection
    o Personal protection consumables
    o Personal protection insurance
  ✓ Water consumption

One time capital cost
  ✓ Health/safety and environment protection costs
  ✓ Surface occupied by cleaning process
www:subsport.eu/training-info

Password: Subsporttraining