



The importance of substitution of hazardous substances: Governments role in strengthening substitution.

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Chemical risks prevention consultant

Meeting for the review of the Industrial Chemicals Toolkit under the Rotterdam
Convention

Barcelona, 25-26 February 2015



Technical support

SUBSTITUTION is

”... the replacement or reduction of hazardous substances in products and processes

by less hazardous or non-hazardous substances, or

by achieving an equivalent functionality via technological or organisational measures.”

Lohse/Lissner (2003)

Using less hazardous or non-hazardous substances:

Metal cleaning:

Replace hazardous solvents
(Eg. chlorinated, xilene, toluene, naftas, etc.)

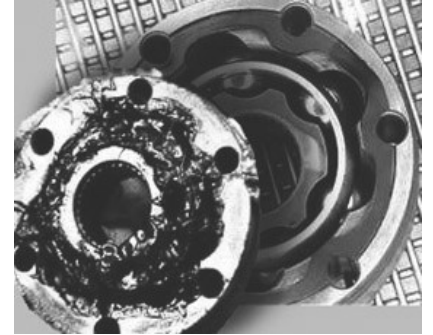
with safer substances:

Terpenes

Fatty acid esters

Aqueous cleaners

Semi-aqueous cleaners



Using alternative technological measures that achieve the same functionality:

Metal cleaning:

Ultrasonic cleaning

Spray cleaning

Blasting

Mechanical cleaning

Open spray cleaning

Vapour degreasing

CO₂ dry ice blasting



Alternative organizational measures that achieve the same functionality:

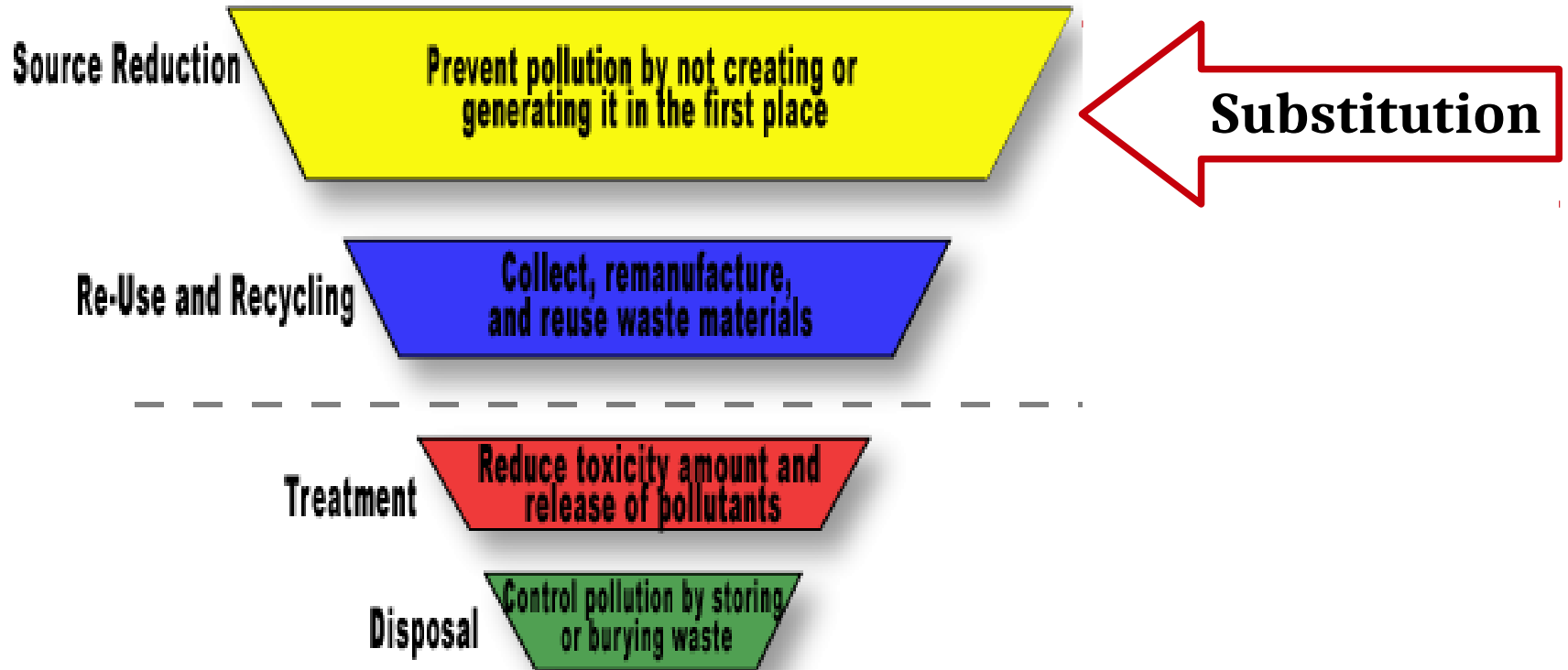
Metal cleaning:

Change work process to avoid the need to clean parts.

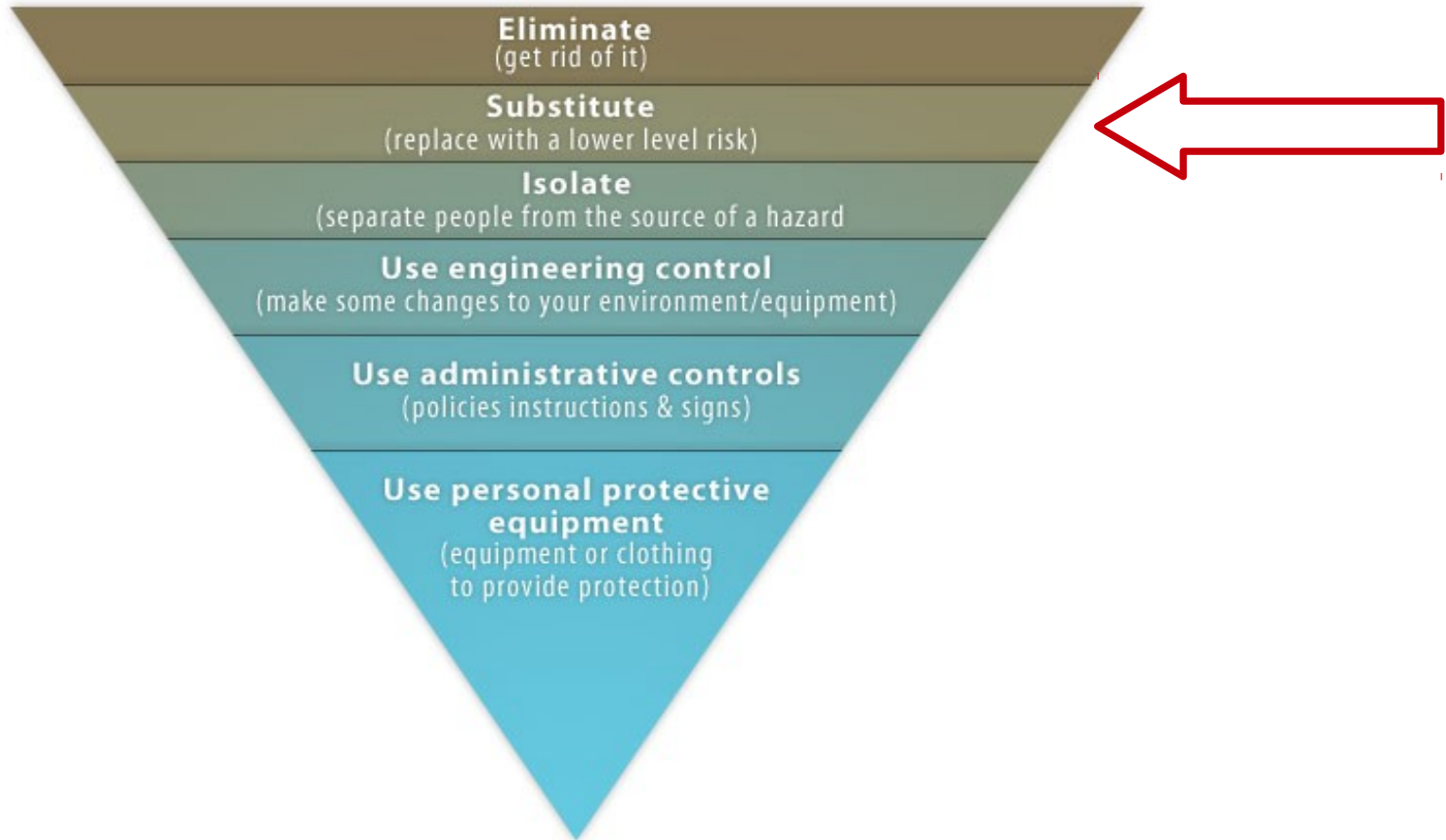
Folding metal sheets instead of soldering avoids need to clean soldering fumes.



Pollution prevention hierarchy



Occupational health and safety risk management measures hierarchy



Benefits of substitution:

- ✓ Avoid/reduce health and environmental risks
- ✓ Improve safety (and related costs).
- ✓ Reduction of need of risk management measures and related costs, including administrative burdens.
- ✓ Improve relations with workers, community, consumers
- ✓ Improve corporate image
- ✓ Comply with legal obligations

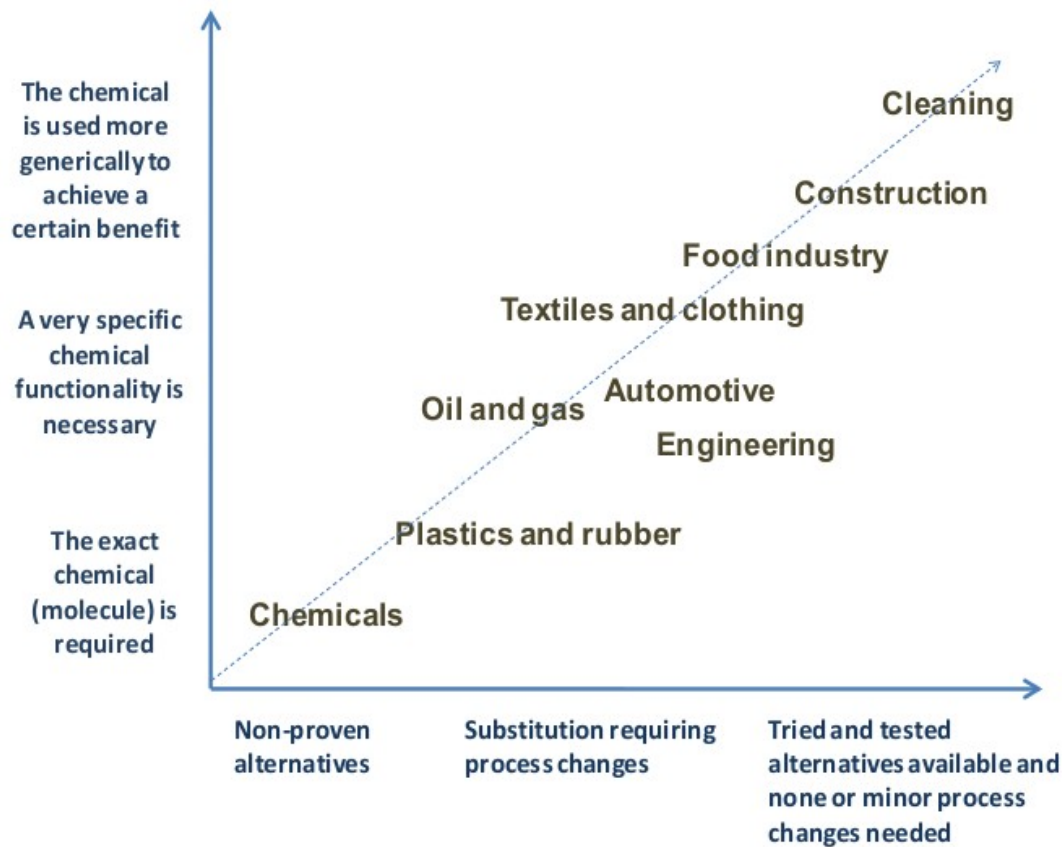


Figure 19: Substitution complexity as a function of alternatives and chemical requirements. Complexity decreases in the direction of the dotted arrow

DG Employment. Minimising chemical risk to workers' health and safety through substitution. Luxembourg: Publications Office of the European Union, 2012

Initiatives: intergovernmental and governmental

EUROPEAN UNION LEGISLATION

1. REACH Regulation
2. CLP Regulation
3. EU POP Regulation
4. Water Framework Directive
5. VOC Solvents Directive
6. Chemical Agents Directive
7. Carcinogens and Mutagens Directive
8. RoHS Directive
9. End-of Life Vehicles Directive
10. Biocides Directive
11. Batteries and Accumulators Directive
12. IPPC Directive
13. Directive on General Product Safety

INTERNATIONAL AGREEMENTS

14. Stockholm Convention on Persistent Organic Pollutants (POPs)
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 Polutants (POPs)

USA

22. U.S. Clean Air Act – Hazardous Air Pollutants
23. Massachusetts Toxic Use Reduction Act (TURA)
24. Michigan Executive Directive – Promotion of Green Chemistry
25. Illinois Toxic Chemical Safety Act
26. U.S. Battery Act

CHINA

27. Chinese Law on Promotion of Clean Production
28. Chinese RoHS

The screenshot shows the homepage of the OECD Substitution and Alternatives Assessment Toolbox. The header includes the OECD logo with the tagline "BETTER POLICIES FOR BETTER LIVES" and a navigation menu with "HOME", "ABOUT", "RESOURCES", and "GLOSSARY". The main heading is "OECD Substitution and Alternatives Assessment Toolbox". A welcome message states: "Welcome to the OECD Substitution and Alternatives Assessment Toolbox (SAAT) – a compilation of resources relevant to chemical substitution and alternatives assessments. Visit the four resource areas below to learn more about chemical substitution and alternatives assessments and get practical guidance on conducting them." A video player titled "What's an Alternatives Assessment?" is featured, with a description: "A process for identifying, comparing and selecting safer alternatives to replace hazardous chemicals with the objective of promoting sustainable production and consumption. Read more definitions...". Below this are four resource sections: "Alternatives Assessment Tool Selector" (described as a filterable inventory of chemical hazard assessment tools), "Alternatives Assessment Frameworks" (a summary of current frameworks), "Case Studies and Other Resources" (links to case studies, toolkits, and product rating systems), and "Regulations and Restrictions" (a list of regulations and restrictions throughout OECD member countries). Each section includes a "Learn more" link.

Initiatives: academia, technical institutes

International Symposium on Alternatives Assessment

Advancing Science & Practice

NATCHER CONFERENCE CENTER | BETHESDA, MD | MARCH 5-6, 2015

Organized by The Lowell Center for Sustainable Production at



HOME ABOUT PROGRAM SPEAKERS VENUE

About the Symposium

Symposium

The field of alternatives assessment has grown significantly over the last decade because of increasing regulatory, marketplace and consumer demands to substitute chemicals of concern in consumer products and manufacturing processes.

This two-day international symposium will provide a collegial forum for governmental agency staff, university researchers, industry sustainability professionals, advocates and others to:

- **Understand gaps in knowledge and methods** confronting the use of alternatives assessment.
- **Identify elements of a research agenda** for alternatives assessment and a process for moving it forward.
- **Advance and support** the growing community of practice for alternatives assessment.

Symposium Planning Committee

- **April Bennett**, National Institute of Environmental Health Sciences
- **Ann Blake**, Environmental and Public Health Consulting
- **Sally Edwards**, University of Massachusetts Lowell, Lowell Center for Sustainable Production
- **Pam Eliason**, Massachusetts Toxics Use Reduction Institute
- **Molly Jacobs**, University of Massachusetts Lowell, Lowell Center for Sustainable Production
- **Tim Malloy**, University of California Los Angeles, Sustainable Technology Policy Program, School of Law & School of Public Health
- **Ray Lizotte**, Schneider Electric
- **Mark Rossi**, Clean Production Action
- **Alex Stone**, Washington State Department of Ecology
- **Joel Tickner**, University of Massachusetts Lowell
- **Christopher Weis**, National Institute of Environmental Health Sciences
- **Meg Whittaker**, ToxServices
- **Martin Wolf**, Seventh Generation

Symposium Organizers

The University of Massachusetts Lowell, Lowell Center for Sustainable Production organized this conference with the help of our organizational financial sponsors and dedicated symposium planning committee:

Financial Sponsors



TOXSERVICES



Toxics Use Reduction Institute
Making Massachusetts a Safer Place to Live and Work

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Training

Upcoming Events

February 24, 2015
Beyond the MSDS: A Workshop on Finding Information to Inform Decision Making About Chemical Hazards >>

February 27, 2015
WEBINAR: Identifying Safer Solvents Using Hansen Solubility Parameters >>

March 10, 2015
WEBINAR: Identifying Safer Solvents Using Hansen Solubility Parameters >>

March 26, 2015
Environmental Management Systems Training >>

April 09, 2015
TURA Continuing Education Conference >>

May 12, 2015
OSHA Update >>

[View All Events >>](#)

ORGANICAFRICA

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- Introduction
- Module 1: Definition and Benefits
- Module 2: Soil Fertility Management
- Module 4: Pest, Disease and Weed Management
- Module 5: Animal Husbandry
- Module 6: Farm Management
- Module 7: Marketing and Trade
- Module 8: Conversion to Organic Farming
- Module 9: Crop Management
- Module 10: Animal Species
- Swahili Module 2: Usimamizi wa rutuba ya udongo
- Swahili Module 4: Wadudu/magonjwa na magugu
- Swahili Module 9: Kupanda

African Organic Agriculture Training Manual

The African Organic Agriculture Training Manual aims at delivering best farming practices to farmers, farmer groups, extension workers and trainers in Africa. The version presented on this website is an initial step towards a comprehensive collection of training materials to promote organic and other sustainable farming practices in Africa. The aim is to continually add new materials and further improve their content. It is also planned to gradually add translations in Swahili and French.

[About the project](#)

English Edition

[Introduction](#)

[Module 1: Definition and Benefits](#)

[Module 2: Soil Fertility Management](#)

[Module 4: Pest, Disease and Weed Management](#)

[Module 5: Animal Husbandry](#)

[Module 6: Farm Management](#)

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[Module 10: Animal Species](#)

Swahili Translations

[Module 2: Usimamizi wa rutuba ya udongo](#)

[Module 4: Wadudu/magonjwa na magugu](#)



Contribute to the validation process!



Help improve the draft version of the training materials by testing them in your local context and giving us your feedback. [Further information](#)

Organisations presently validating the training manual

- > Agro Eco Louis Bolk Institute - Eastern Africa, Uganda
- > Uganda Coffee Development Authority
- > CARITAS Uganda
- > Rural Community in Development (RUCID), Uganda
- > Sustainable Agriculture Trainers network (SATNET), Uganda
- > National Organic Agricultural Movement of Uganda (NOGAMU)
- > National Union of Coffee Agribusinesses and Farm Enterprises (NUCAFE), Uganda
- > International Centre of Insect Physiology

... skills and capacity of managers, the mission of TURI's educational ... some Massachusetts-certified Toxics ... continuing education. >>

>> In the News

Premier Cleaner of Westford Demonstrates Professional Wet

TURI 25th Anniversary





GREEN CHEMISTRY & COMMERCE COUNCIL

Business Mainstreaming Green Chemistry

IMAGE PROVIDED BY GC3 MEMBER STEELCASE

Initiatives: companies

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TEXT SIZE

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MEMBER AREA



The Green Chemistry & Commerce Council is a cross sectoral, business-to-business network of companies and other organizations working collaboratively to advance green chemistry across sectors and supply chains.



ROUNDTABLE

PROJECTS

MEMBERSHIP

GC3 members engage in cutting edge, collaborative projects to develop and pilot tools, educational programs, and business practices that address common challenges and support green chemistry adoption in their businesses.

[VIEW CURRENT PROJECTS](#)

Búscanos en Facebook



Green Chemistry & Commerce Council

Me gusta 63



Green Chemistry & Commerce Council

5 de febrero a la(s) 15:54

Watch GC3's Monica Becker LAUNCH Green Chemistry Fo <http://www.launch.org/innovat/becker>

Ver traducción



LAU
Collective Genius

Plug-in social de Facebook



RØADMAP TO ZERO DISCHARGE OF HAZARDOUS CHEMICALS

ZDHC Group Releases Key Milestone: Manufacturing Restricted Substances List (MRSL)



ZDHC Guidance Sheets Released for Eleven MRSL-restricted Chemicals



[ABOUT ZDHC](#)



[JOINT ROADMAP](#)



[NEWS BULLETIN](#)



Initiatives: NGOs



Leading the global movement for environmentally responsible healthcare

Welcome to Health Care Without Harm! Please join us as we work to transform the health sector worldwide, promoting environmental health and justice.



GET STARTED

Choose Your Region »

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Español | Português
- Asia
- Europe
- US & Canada
- Global



América Latina



Asia



Europe



US & Canada



Global

PAN Pesticides Database - Alternatives to Pesticides

Home > Least/Non-Toxic Alternatives

Alternatives to chemical pest control

Many alternatives to toxic pesticides can be used to manage pest problems effectively. This page provides links to other organizations that provide information on non-toxic or least-toxic approaches to pest management. Links are organized by the following categories:

- Pest
- Crop or site
- Geographical area
- General information

Please note that the alternatives section is still under development; if you have suggestions for content please let us know. For this section we are looking for resources that are immediately useful for solving specific pest problems and emphasize non-chemical solutions. We are also currently looking for partners and funding to complete this work. If you are interested in sponsoring this work [please contact us](#).

Pest-Specific Information

Crop or Site Specific Information

Regional Information

General IPM and Organic Links

[Pest Control in Nurseries](#)
[Pests in Nurseries - HortIPM Profiles](#)
[Pest Control in Nurseries - HortIPM Profiles](#)
 Citation: Kegley, S.E., Hill, B.R., Orme S., Choi A.H., PAN Pesticide Database, Pesticide Action Network, North America (Oakland, CA, 2014), <http://www.pesticideinfo.org>.
 © 2000-2014 Pesticide Action Network, North America. All rights reserved.
[Weed Identification - UC IPM](#)
[Weed Management - IPM Access](#)



Search

HOME

Eliminate Lead Paint: Protect Children's Health

Since 2007, NGOs associated with the IPEN network have collected and analyzed decorative paints for sale on the market in 30 developing countries and countries with economies in transition. In every one of these countries, if there was no national law or regulation in force to control the lead content of paints, the majority of the enamel decorative paints for sale on the market contained lead levels above 600 parts per million (ppm). Many of the paints contained more than 10,000 ppm lead and would be prohibited for sale or use in virtually all highly industrial countries. In almost all cases however, the consumer had no way to tell which of the enamel decorative paints for sale contained added lead and which did not.

This short booklet discusses many aspects related to the sources, uses, exposures and health effects of lead, and suggests frameworks for its elimination from paint marketed throughout the world.

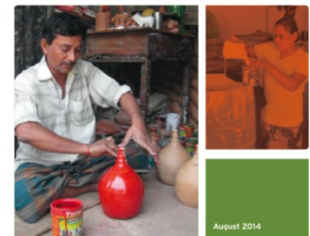
Document:

Attachment	Size
العربية (Arabic)	64.48 MB
русский (Russian)	268.08 KB
español (Spanish)	473.13 KB
français (French)	575.74 KB
English	586.71 KB
中文 (Chinese)	743.27 KB

Tags: Lead in Paint



**ELIMINATE LEAD PAINT:
PROTECT CHILDREN'S HEALTH**



August 2014

Initiatives: www.subsport.eu



MOVING TOWARDS SAFER ALTERNATIVES



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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

Alternatives Identification and Assessment Training for BSI members

Events & Training |
12.01.2015

As a part of the SUBSPORT Textile project, Kooperationsstelle Hamburg and the Association of the German Sporting Goods Industry (BSI) carried out a training/seminar in Bonn in December 2014. The search for substitutes for hazardous substances and the assessment of alternative substances are key steps of a substitution process and were in the focus of this seminar.

[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](#)

Search SUBSPORT

- Website
- Restricted and priority substances database » [link](#)
- Case story database » [link](#)

[Search](#) » [Overview](#)

External substitution websites and databases

Your contribution

[Provide substitution examples](#)
[Provide feedback](#)

Training

Governments role?

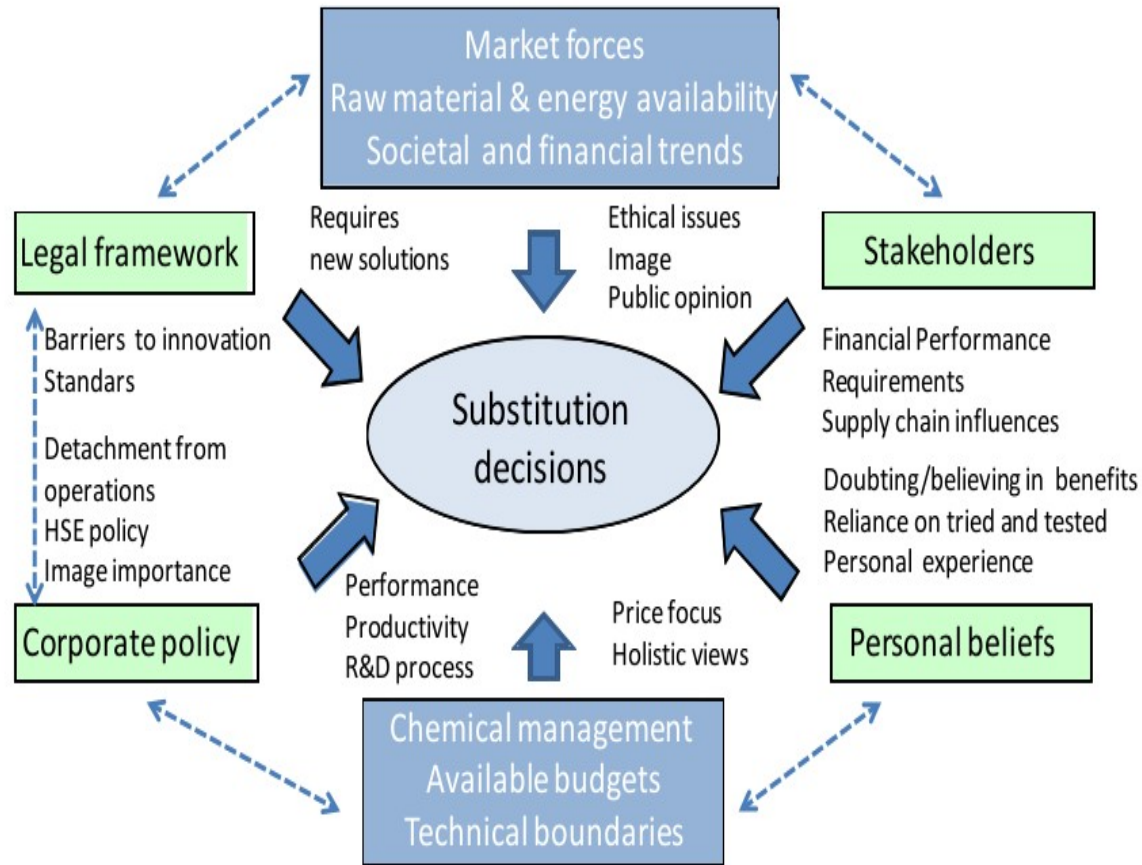


Figure 11: Drivers and barriers to substitution

DG Employment. Minimising chemical risk to workers' health and safety through substitution. Luxembourg: Publications Office of the European Union, 2012

Governments role?

6.1.2 The role of authorities

Authorities are seen as having a dual role in promoting chemical risk management. Firstly, they **create the boundaries of acceptable operations** through defining the legal requirements. At the same time, authorities interpret the legal text and define how enforcement and monitoring is taking place as well as execute enforcement. Secondly, authorities are viewed as a **significant source of knowledge** and are expected to provide guidance for how to best achieve risk reduction. Despite this, a common finding was that there is much to be done in enforcement of legislation and in information provision.

DG Employment. Minimising chemical risk to workers' health and safety through substitution. Luxembourg: Publications Office of the European Union, 2012

Governments role: INFORMATION

ON:

- ✓ Hazards and risks
- ✓ Alternatives
- ✓ Economic benefits
- ✓ Substitution process
- ✓ Methodologies ...

Through:

- ✓ Leaflets
- ✓ Workshops
- ✓ Pilot projects ...

TURI
THOMAS LAWELL

Massachusetts Chemical Fact Sheet

Hexavalent Chromium Compounds

The fact sheet is part of a series of chemical fact sheets developed by TURI to help Massachusetts consumers, community organizations and residents understand the chemical, physical, health and environmental effects, as well as the availability of safer alternatives.

Hexavalent chromium compounds are a toxic form of chromium and are used in a variety of industrial processes and products.

Hexavalent chromium compounds are known carcinogens, mutagens and developmental toxicants and are acutely toxic. Hexavalent chromium compounds do not pose the same level of concern with regard to either chronic or acute toxicity.

Since 2011, all chromium compounds were listed as a single category under TURI's Reporting with Regard to 2012. Hexavalent chromium compounds are reported under TURI as a separate category and are designated as a Higher Hazard Substance, which lowers the reporting threshold to 1000 grams.

Chromium (Cr) is a naturally occurring metal that exhibits a range of possible forms or oxidation states ("valence states"). The most commonly found form are:

- **Zero valence:** Metallic chromium or Cr(0) is found in metal alloys.
- **Trivalent:** Chromium compounds are stable in the oxidation form Cr(III).
- **Hexavalent:** The hexavalent Cr(VI or +6) form is the second most soluble form. Hexavalent chromium only occurs naturally, it is usually produced from industrial activity. Cr(VI) can also be generated through hot work, such as welding of stainless steel or other metals alloyed with Cr. A number of commonly used hexavalent chromium compounds, along with their chemical formulas are listed in Table 1.

Hazards

Cr(VI) compounds are toxic to both humans and wildlife. Human health hazards include respiratory, gastrointestinal, immunological, hematological, reproductive, and developmental toxicity, as well as eye and skin irritation.¹

Acute (Short-Term) Health Effects

Cr(VI) exposure can cause several short-term and intermediate effects including, but not limited to, respiratory irritation, nosebleeds, vomiting, nose, mouth irritation, ulcers, excoriations, skin burns, and pneumonia.¹

Chronic (Long-Term) Health Effects

Cr(VI) compounds can cause cancer. The International Agency for Research on Cancer (IARC) classified Cr(VI) compounds as Group 1 (carcinogenic to humans). Exposure to Cr(VI) is associated with lung cancer, nasal and sinus cancer, leukemia in the nose, and cancer of the esophagus in industrial workers. In addition, studies concerning reproductive cancer risk associated with long-term Cr(VI) exposures, and human and animal studies demonstrating links to other types of cancer (skin, oral, and intestinal).¹

¹The Toxicity and Risk Assessment is currently underway and will be made available by the Massachusetts Office of the Registrar of Professions and Occupations at the University of Massachusetts Lowell 100 North Street, Room 301 • Lowell, Massachusetts 01854. By: 09/19/2014 12:00 • Page: 09/19/2014 12:00 • Web: 10/24/2014

Compound	Chemical Formula	CAS #
Acronium chromate	(NH ₄) ₂ Cr ₂ O ₇	77838-04-8
Ammonium dichromate	(NH ₄) ₂ Cr ₂ O ₇	77838-04-8
Barium chromate	BaCrO ₄	13284-43-1
Barium Chromate	[BaCrO ₄ ·2H ₂ O]	13348-81-1
Calcium chromate	CaCr ₂ O ₇	13716-11-2
Chromic acid	H ₂ CrO ₄	77326-84-7
Chromium VI chloride	CrCl ₃	14688-49-2
Chromic chloride	CrCl ₃	13332-01-0
Hexavalent chromium ion	Cr ⁶⁺	185-62-29-9
Lead chromate	PbCrO ₄	77838-01-6
Lead chromate oxide	PbCrO ₄ ·PbO	984-32-1
Potassium dichromate	K ₂ Cr ₂ O ₇	10671-53-4
Potassium chromate	K ₂ CrO ₄	77838-04-8
Potassium dichromate	K ₂ Cr ₂ O ₇	17718-01-8
Silver chromate	Ag ₂ CrO ₄	7784-01-2
Sulfur chromate	H ₂ SO ₄	7719-09-2
Sulfur hexafluoride	SF ₆	77838-12-6
Sulfur hexafluoride	SF ₆	10058-11-8
Strontium chromate	CrO ₃	77838-01-2
Zinc chromate	ZnCrO ₄	13538-85-9
Zinc dichromate	ZnCr ₂ O ₇	14038-89-2

Sustitución de sustancias disolventes peligrosas
Guía para Delegados y Delegadas de Prevención

istas INSTITUTO TECNOLÓGICO DE MASSACHUSETTS

FUNDACIÓN PARA LA PREVENCIÓN DE RIESGOS LABORALES

Governments role: TECHNICAL ASSISTANCE

Clean Production centers

Technical institutes:
TURI(US), KEMI (Sweden),

Academia

Business associations/ industrial sectors

NGOs



Governments role: LEGISLATION

Substitution obligations: EU CMR, EU REACH,

**TUR planning obligations: TURA, OSH
legislation**

Substance restrictions: WEE, toys, cosmetics ...

Emission restrictions: water, air, waste ...

Green chemistry incentives

Governments role: **ECONOMIC INCENTIVES**

Fees: TURA Massachusetts

Financial support

Grants/ Subsidies

Public procurement

Green Tenders

An Action Plan on Green Public Procurement



Substitution pays off!

Successful Implementation of the Toxics Use Reduction Act

Toxics Use Reduction in Massachusetts

THE PROOF IS IN THE DATA

The Massachusetts Toxics Use Reduction Act (TURA) of 1989 encourages companies to reduce toxic chemical use in Massachusetts. The data show that companies have voluntarily reduced toxic chemical use while maintaining their competitive advantage. **Industries subject to reporting since 1990 have reduced their toxic chemical use by 40 percent, byproducts by 71 percent, and releases on site by 91 percent.**

The law was amended in 2006 to provide flexibility in planning and better focus program resources on helping companies reduce the use of higher hazard substances.

Companies benefit from the joint efforts of the Department of Environmental Protection, Massachusetts Office of Technical Assistance, and the Toxics Use Reduction Institute at the University of Massachusetts Lowell as well as from the following entities:

GOVERNANCE | Administrative Council: Representatives of state agencies responsible for environmental protection, public health, occupational safety, public safety and economic development. Has responsibility for governance of the TURA Program and coordination of all state activities regarding toxics.

FEEDBACK | Advisory Committee: The stakeholder committee advises the Administrative Council on program policies, higher and lower hazard chemical designations, the TURA fee structure, and chemical listing and delisting petitions.

SCIENCE | Science Advisory Board: Makes recommendations to add or delete chemicals from the TURA chemical list and to designate chemicals as higher and lower hazard—all based on science.



Thank you!

Dolores Romano Mozo

Chemical risk prevention

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Technical support