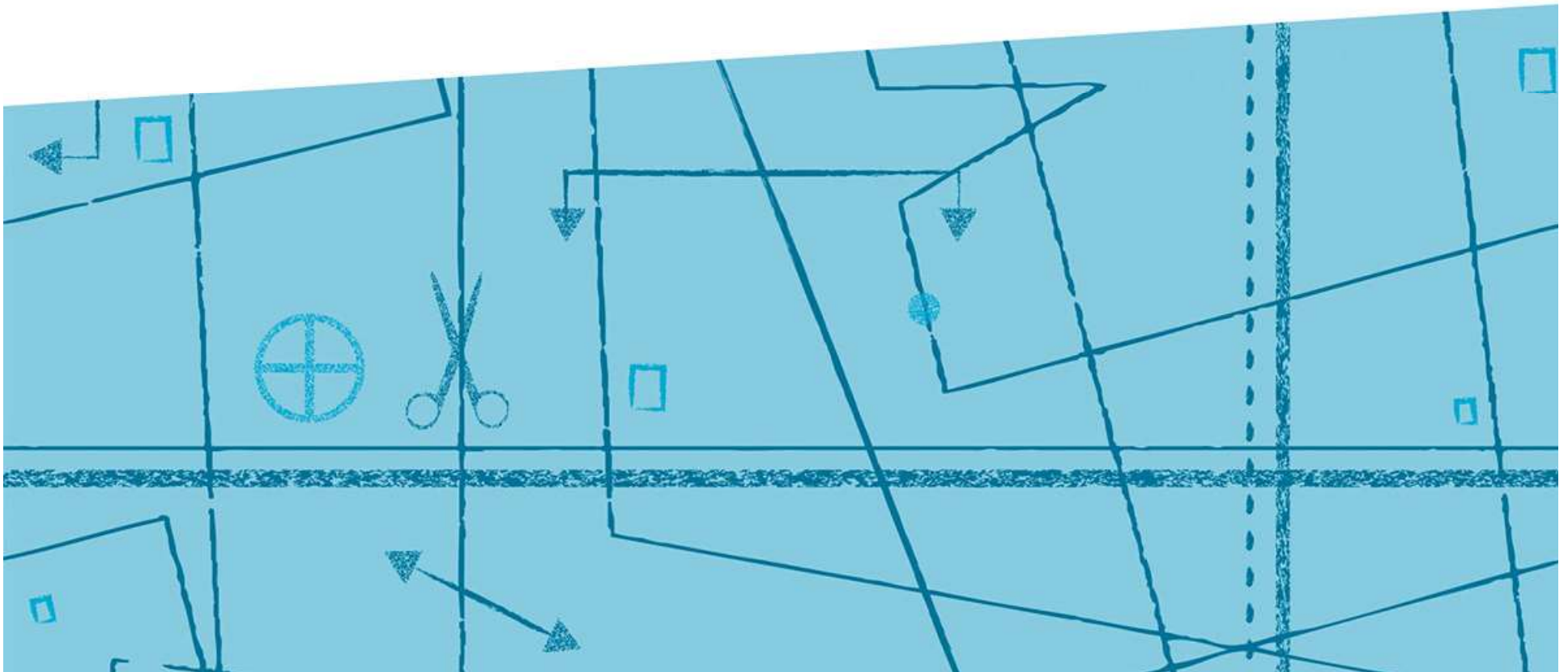


Module 2

Chemical Management



Overview and Content

Module 1: Chemicals in Textiles

Module 2: Chemical Management

Module 3: Good Housekeeping

Module 4: Wastewater and
Sludge Treatment

Module 5: Health Protection and
Occupational Safety

Module 6: Risk Analysis and Action
Planning

Module 7: Evaluation and Possible Next
Steps

- Target of the Module
- Develop a Chemical Management System
- Analyse Process and Flows
- Chemical and Waste Inventories
- Regulatory Requirements
- Identify Hazards and Chemicals of Concern
- Exercises and Examples

Target of the Module „Chemical Management“

- Familiarize with the framework of chemicals management, concept and elements
- Buyer expectations and requirements (current and outlook)
- Typical Chemical Management requirements
- Requirements regarding chemical inventories



Develop a Chemical Management System

Chemical management background

- Chemicals are presenting major production inputs and costs within textile wet processes.
 - Effectively managed chemicals can deliver financial and environmental benefits.
- Chemicals are necessary to achieve characteristics and qualities in a product,
 - But: growing concern about harmful chemicals in the products and their adverse effects on health and environment.
- The frameworks for standards, legal and other requirements become increasingly demanding



Develop a Chemical Management System

Obtain Management Commitment

Formulate a company management policy, a policy statement on the management of chemicals might include the following commitments (examples):

- *„Safe procedures and practices will be established for the transport, use and disposal of hazardous chemicals.“*
- *„The management will ensure that the workers have the right to be fully informed on the hazards of chemicals and to be thoroughly training in the safe handling.“*
- *„Before any chemical is brought into the enterprise, information on that chemical should be provided by the supplier, manufacturer or importer“*



Develop a Chemical Management System

A sound Chemical Management System should include the following aspects and more:

1. Chemical Management Change Team
2. Assessment of chemical management
 - Process flow
 - Regulatory Requirements
 - NPO / Waste Inventory
 - Chemical inventory
3. Identification and assessment of chemical hazards
 - Chemical Risk Assessment
 - Reducing Impacts on Human Health and Environment
 - Safety Data Sheet Management
4. Identification of chemicals and processes of concern
5. Setting performance goals and action plans

Full list of elements for a sound Chemical Management System:

- [ZDHC `Chemical Management System Guidance Manual`](#)
- [GIZ `Resource Efficient Management of Chemicals in Textile and Leather Sector Companies`](#)

Develop a Chemical Management System

From a chemical management change team:

- Teams should not be simply formed based on one person from each department.
- A needs analysis should drive the selection of members. Smaller organizations with less resources may seek external assistance.
- Be aware that as the scope of the tasks change, so may change the team. Evolve the composition of the team to match the dynamic nature of the task.
- In larger firms, there may be different levels of teams, and different teams in operation at the same time.



Develop a Chemical Management System

Chemical Management Change Team

Function/Department	Roles and responsibilities
Purchase	<ul style="list-style-type: none"> • Develop and implement controls of materials • maintain inventory • procure information on material hazards, environmental impacts and eco-friendly alternatives
Human Resources	<ul style="list-style-type: none"> • Define competency requirements and job descriptions for various roles in CM • Develop training programmes based on a needs analysis • Integrate the CM system into reward, discipline and appraisal systems
Maintenance	<ul style="list-style-type: none"> • Implement preventive maintenance for key equipment • Track equipment performance, cos efficiency etc. • maintain logs and inventory on equipment, machine parts, etc.
Legal/Compliance	<ul style="list-style-type: none"> • check requirements on compliance to all applicable regulations and laws • update legal documents • communicate risks of non-compliance
Finance	<ul style="list-style-type: none"> • Evaluate CM options for economic feasibility • Prepare budgets for CM options • Track data on costs incurred and benefits accrued in CM program
Engineering/ Production/EHS	<ul style="list-style-type: none"> • Implementation plans • implement CM options • carry corrective actions if required support training of line workers

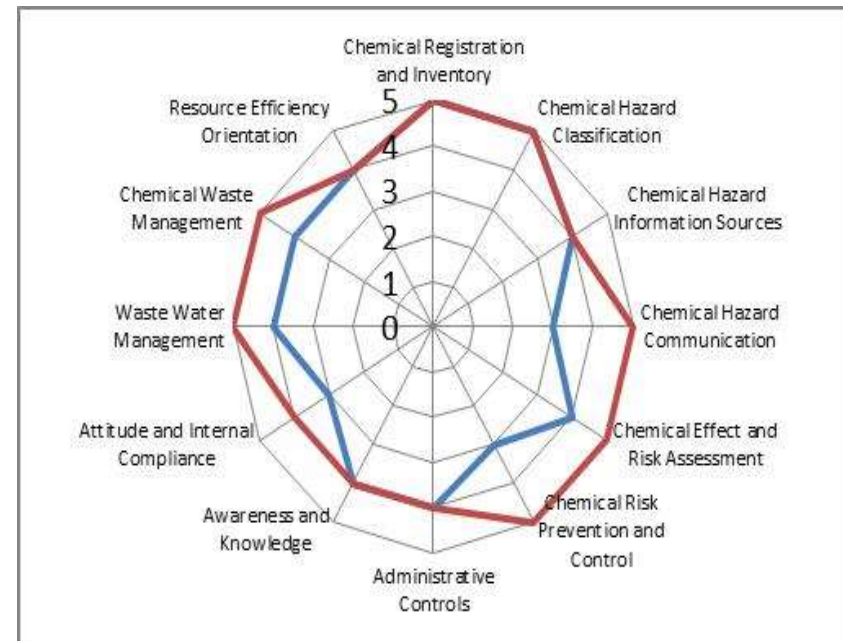
Source: GIZ

Develop a Chemical Management System

Assessment of chemical management

As a preparatory step for the implementation of chemical management (CM), it may be helpful, if your CM team gets a quick idea of the situation and challenges at hand.

Your team can conduct a comprehensive self-assessment, for example using checklists such as in the ZDHC Chemical Management System Guidance Manual.



Analyse Process and Flows

- The analysis and documentation of the chemical process flows lays the groundwork for inventorying of chemicals and establishing a chemical management system.
- This also makes it easier to later identify and document hazard/risks related to entire range of production processes, products, non-product outputs (NPO) activities under the purview of the company as well as plan and monitor improvement measures.

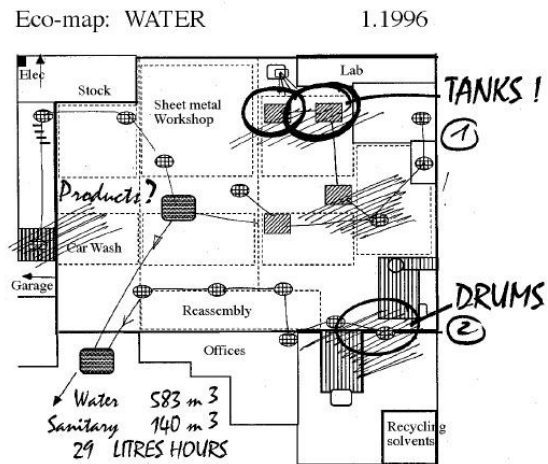
There are two ways of documenting the chemical process flow:

1. Eco-mapping
2. Process flow diagrams



Analyse Process and Flows

Example: Eco-Mapping



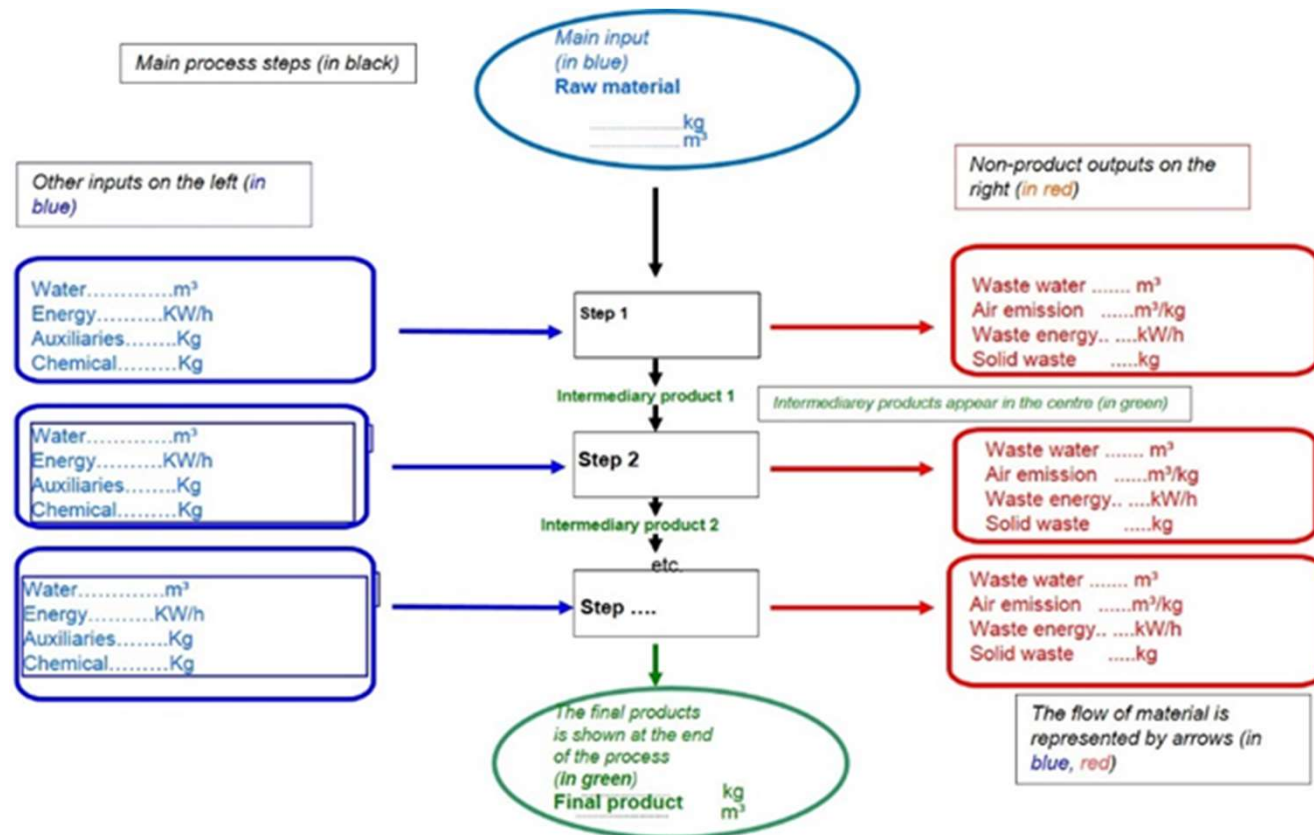
TO DO:

1. Pierre A.: Empty septic tank
Weld sedimentation tank --> 6.96
2. Enrico M.: Close drums
Move hydraulic oil immediately!!

OK ✓

Analyse Process and Flows

Example: Process Flow Diagram



Analyse Process and Flows

The process flow diagram represents a schematic of the:

- production/process steps
- different inputs
- intermediary products
- final product
- non-product outputs (defines as materials which do not end up in the final product)

Allows to prepare mass balance and/or cost analysis as well as identify where you can encounter opportunities for cost savings.

- Draw a general outline of the production process
- Include inputs, outputs and non-product outputs
- Indicate quantities and/or value of inputs, outputs, non-product outputs as far as already known



Chemical and Waste Inventories


Chemical Inventory

- provides a comprehensive list of the chemicals entering your production
- In the context of resource efficient management of chemicals, the purpose of chemical inventory goes beyond warehousing requirements:
 - It serves as key reference
 - It can be used for identification and assessment of environment, health & safety hazards and risk
 - It can be used as chemical management information tool

→ According to ZDHC, companies should create and maintain a comprehensive list of chemicals used and stored. The Chemical Inventory List (CIL) of ZDHC can be downloaded under the following link: <https://www.roadmaptozero.com/documents>.

Chemical and Waste Inventories

Joint Chemicals Inventory Template (Partnership for Sustainable Textiles / ZDHC):



Ø ZDHC

2. CHEMICAL INVENTORY

Version: 1.0

Company Name: ABC Company Ltd.

Contact Person: John Smith

Title: Chemicals Manager

Email: john.smith@abc.com

Date Completed: March 16, 2017

Reporting Period: February 2017

KEY

Instructions on how to complete the field

Example of the type of information required

* Please refer to OSHA, EU Regulation etc, by clicking on the following links:
https://www.unece.org/trans/danger/publi/ghs/ghs_rev06/06files_e.html
https://www.unece.org/fileadmin/DAM/trans/danger/publi/ghs/ghs_rev06/English/07e_annex4.pdf
https://echa.europa.eu/documents/10162/23036412/sds_en.pdf/01c29e23-2cbe-49c0-aca7-72f22e101e20,
 ^ These column are mandatory for the purpose of reporting to ZDHC Gateway InCheck Tool.

NOTE: DO NOT MERGE CELLS

MANDATORY													
Chemical formulation (English)^	Chemical formulation (Local)^	Chemical formulator (English)^	Chemical formulator (Local)^	Chemical formulator type^	ZDHC use category ^	CAS No.	Colour Index	Amount onsite^	Amount onsite (unit)^	Monthly usage	Monthly usage (kg)	Annual Consumption (kg/year)	% mass of Substances in SVHC Candidate list?
				(use drop-down to select)	(use drop-down to select)			(enter number)		(enter number)			
SERAGAL C-FTRH		DyStar Colours Distribution GmbH		Original manufacturer/formulator	1.2.a. Bleaching			2000	kg	150			

0. INSTRUCTIONS
1. Chemical Supplier Contacts
2. Chemical Inventory
Look-up
+

Chemical and Waste Inventories

NPO / Waste Inventory

- Chemical process flow charts and eco-maps documents account for materials (chemicals) entering and leaving a system.
- The chemical inventory provides a comprehensive list of the chemicals entering your production.
- **Not all of these chemical inputs end up in the final product, for example for technical/production process reason, fabrics will absorb only part of a dye stuff.**



Chemical and Waste Inventories

NPO / Waste Inventory

- Remaining chemicals (non-product outputs - NPO) leave the system as discharge into the air, water or residuals in solid or liquid form.
- According to the ZDHC CMS, factories are expected to plan how and where to safely store such chemical waste as well as to document where it is generated and how it will be disposed

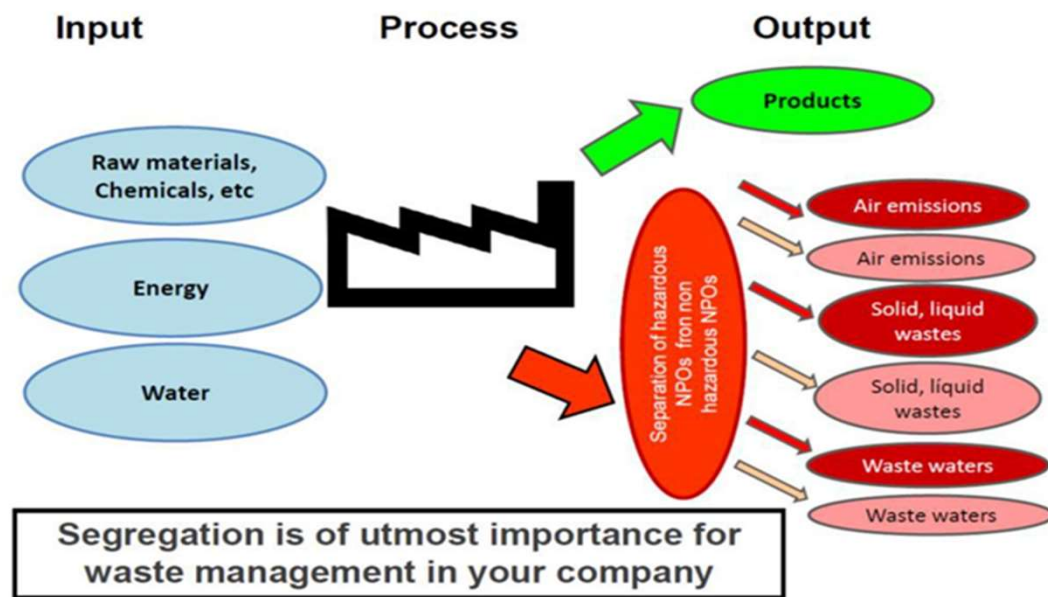


Figure – Non-product output flows, Source: GIZ CHS

Chemical and Waste Inventories

NPO / Waste Inventory

Information/data gathered during the process flow analysis and mass/material balancing will provide key inputs in compiling an inventory of the non-product outputs in your factory and developing a (chemical) waste management plan and/or decide on measures to reduce non-product outputs, for example:

- use of good basic manufacturing practices,
- process optimization,
- increase in chemical uptakes



Chemical and Waste Inventories

NPO / Waste Inventory

The remaining non-product outputs need to be managed and disposed. The on-site or off-site treatment processes themselves can produce chemical containing waste, for example treatment sludge, or used air filters. (see also Module 5, Waste Water Treatment)

Waste Name	Category /Type	Source Process	Storage Area	Yearly Quantity	Associated Hazards	Disposal Method (actual/recommended)	Waste Disposal Vendor Address	License Number	License Validity Time

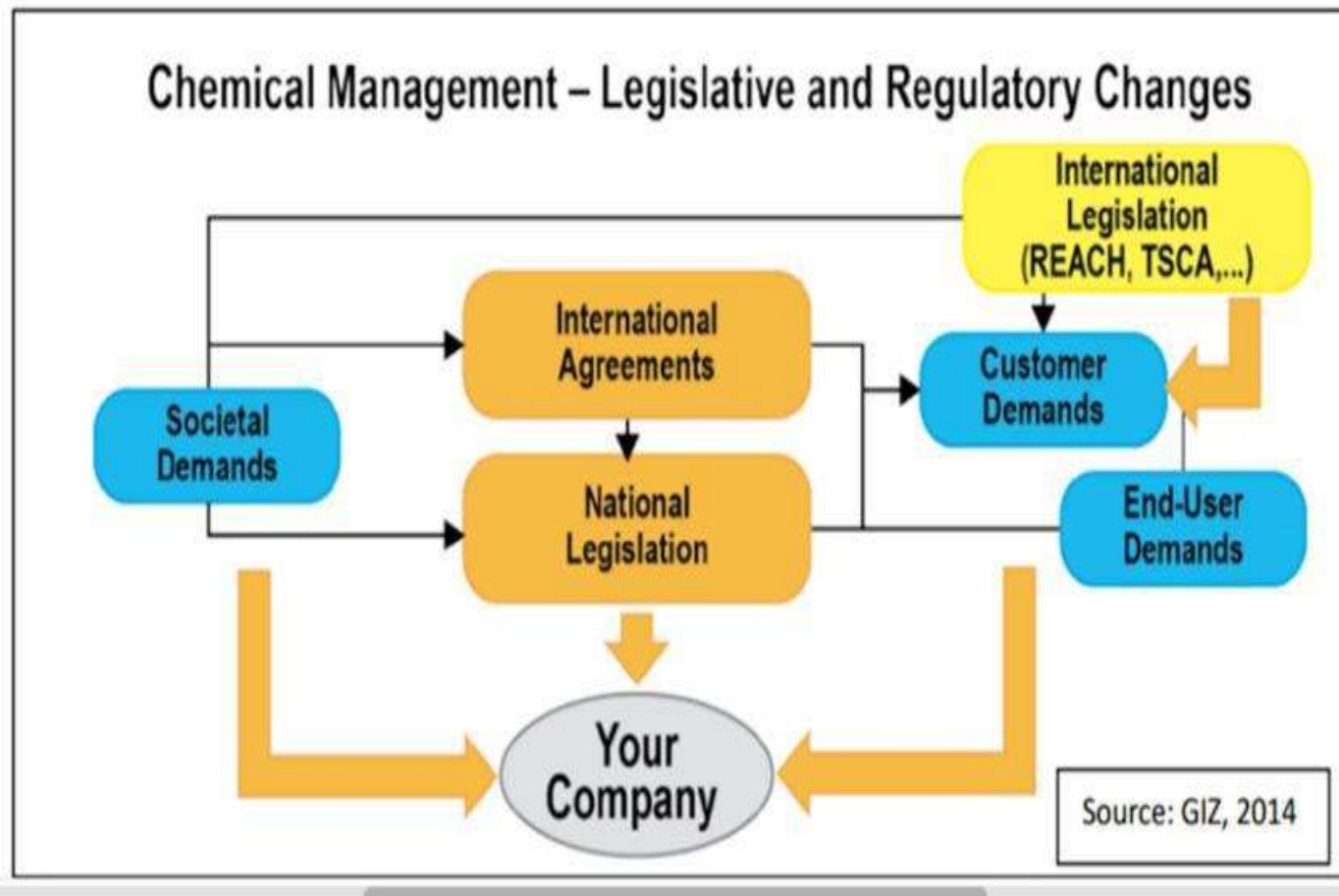


Regulatory Requirements

- National legislation in the country of the company's residence
 - National requirements, state and local requirements
- Comply with and be aware of regulations outside your country, such as with those of your export markets (for example, the European chemical regulations REACH).
- Other requirements such as industry codes of practice, pledges or commitments made voluntarily by your company
- customers' requirements (e.g. supplier code of conducts).



Regulatory Requirements



Regulatory Requirements

Establish and maintain a regulatory inventory

→ Because legal and other requirements change over time, your procedure should include a means to ensure that you are working with up-to-date information.

Example: Legal inventory format

No.	Title	Descriptions	Applicable to		Area of Applicability	Licenses/ Compliance Records Required	Re- viewed
			Company	Contractor /Supplier			
xxx	Environment Conservation Act 1996 (section xx)	Provides for the control of air pollution from stationary sources and motor vehicles. Also enables promulgation of regulations	✓	✓	Air emissions from plant, ...	xxx	
xxx	Environment Conservation Act 1996 (section xx)	Provides for the control of water pollution, including reference to specific discharge standards	✓		Discharge of waste water from production and other sources in the company	xxx	
xxx	Sludge ordinance	Provides for the control of management and disposal of treatment sludge	✓		Disposal of treatment sludge from ETP	xxx	

Identify Hazards and Chemicals of Concern

Identifying and assessing chemical hazards

- Not all of the chemical substances which you have identified in your inventory list have to be hazardous.
- Hazardous chemicals are defined as chemicals which have an inherent property to cause harm either to humans or the environment and/or cause damage through fire, explosion or through corrosiveness or toxicity, with local or global effects. These usually require special procedures for safe handling and disposal.
- How to systematically identify hazardous chemicals and their hazard properties as well as to categorise these in form of hazard bands.



Identify Hazards and Chemicals of Concern

Identifying and assessing chemical hazards

Tasks/Elements:

- Review your hazard information sources
- Identify hazards and determine hazard bands of chemicals
- Identify and classify hazardous chemical waste



Identify Hazards and Chemicals of Concern

Review your hazard information sources

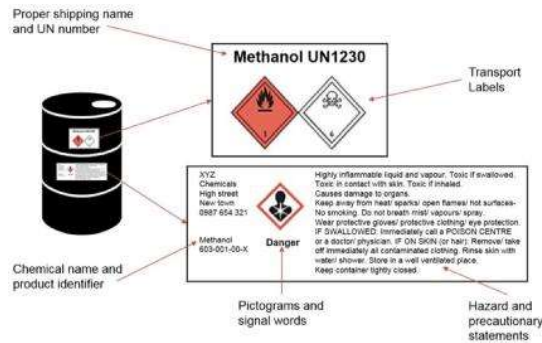
Standard chemical hazard pictograms



Chemical hazard pictograms used during transport of chemicals



Verify availability and content of chemical container/package labels



Verify availability and content of chemical safety data sheets



Identify Hazards and Chemicals of Concern

Identify hazards and determine hazard bands of chemicals

At this point you start categorising the chemicals as being hazardous and non-hazardous by using information sources such as:

- labels
- safety data sheets
- information from chemical supplier
- other sources

As part of this process, take a closer look at the different categories and levels of hazards associated with the chemical substances and get further information on how these chemicals may affect health, safety and/or the environment.

Identify Hazards and Chemicals of Concern

Identify hazards and determine hazard bands of chemicals

The standard classification systems of hazards under **the Globally Harmonized System of Classification and Labelling of Chemicals (GHS)** distinguishes between three main groups of hazards. These groups are further separated into classes of hazards

- 1 Physical: 16 classes of hazards**
- 2 Health: 9 classes of hazards**
- 3 environmental hazards: 2 classes of hazards + global warming**

In turn, each hazard class is further divided into hazard categories.



Identify Hazards and Chemicals of Concern

Identify hazards and determine hazard bands of chemicals

Classification of chemical hazards as per GHS system:

Physical (P)		Health (H)	Environment (E)
1. Explosives	11. Self-heating substances and mixtures	1. Acute toxicity	1. Hazardous to aquatic environment
2. Flammable gases	12. Substances and mixtures which, in contact with water, emit flammable gases	2. Skin corrosion/irritation	2. Hazardous to ozone layer
3. Aerosols	13. Oxidising liquids	3. Serious eye damage/irritation	3. Global warming effect
4. Oxidizing gases	14. Oxidising solids	4. Respiratory or skin sensitization	
5. Gases under pressure	15. Organic peroxides	5. Germ cell mutagenicity	
6. Flammable liquids	16. Corrosive to metals	6. Carcinogenicity	
7. Flammable solids		7. Reproductive toxicity	
8. Self-reactive substances and mixtures		8. Specific target organ toxicity (single exposure)	
9. Pyrophoric liquids		9. Specific target organ toxicity (repeated exposure)	

Identify Hazards and Chemicals of Concern

Identify chemicals and processes of concern

With the enhanced chemical inventory in place, you can easily identify those chemicals of special concern for your customers and other stakeholders.

Your customer may refer to standardized lists such as:

- ZDHC Manufacture Restricted Substances List (ZDHC MRSL) -> refers to manufacturing process
- Bluesign System Substances List (blue sign BSSL) -> refers to manufacturing process and end product
- the European REACH -> refers to manufacturing process and end product
- customer specific Restricted Substances Lists (RSL) -> refers to end product



Identify Hazards and Chemicals of Concern

Identify chemicals and processes of concern

- Gather also information about substances banned, restricted or otherwise regulated in the respective national regulatory framework.
- Any of these lists should have been already identified and listed in your inventory of regulatory requirements.
- Under the **European REACH** regulation, special attention should be paid to Chemicals/Substances of **High Concern (CoHC/SoHC)** and Chemicals/Substances of **Concern (CoC/SoC)**.



Identify Hazards and Chemicals of Concern

SUBSTANCES OF CONCERN

Example under European REACH

Chemicals of High Concern (CoHC)	Chemicals of Concern (CoC)
<ul style="list-style-type: none"> • Carcinogenic, mutagenic or toxic to reproduction (CMR 1A or 1B) • Persistent, bio-accumulative and toxic substance (PBT per criteria according to Section 1 Annex XIII, REACH) • Endocrine disruptors or neurotoxins • Chemical whose breakdown products result in a CoHC that meets any of the preceding criteria • Found on http://sinlist.chemsec.org/ 	<ul style="list-style-type: none"> • Of moderate concern for ecotoxicity or human toxicity, but not a Chemical of High Concern (CoHC) • With GHS signal word „DANGER“ • Classified as an allergenic (respiratory or skin sensitization, Category 1, 1A and 1B; containing H334 or H317) • Classified as environmentally hazardous, long-term effects (Hazardous to the aquatic environment, chronic category 1 and 4: H410 or H413) • Found on California’s Candidate list https://calsafer.dtsc.ca.gov/chemical/search.aspx

Identify Hazards and Chemicals of Concern

Identify chemicals and processes of concerns

- Processes of concern are those areas where gaps between recommended and existing control exists as well as for which you have assigned a high-risk rating during the risk assessment process.
- Establish, document and implement a procedure for verifying compliance with lists of restricted substances according to the ZDHC requirements to be implemented in your organization (wet processes). The compliance verification can be part of the purchase and audit process in your organization.
- As per these requirements, your company needs to maintain records (e.g. chemical inventory) and records indicating how you conduct the compliance verification and the results. In case such restricted substances are identified, specific action plans are to be drawn up on how to eliminate these from your production.



Possible useful corrective actions

- Inventory
- MRSL conformance and RSL compliance
- Chemical Management Policy
- Good Housekeeping Programme



Literature, sources and further Reading

- GIZ: Resource Efficient Management of Chemicals in Textile and Leather Sector Companies, Company Handbook: <https://www.sia-toolbox.net/solution/resource-efficient-management-chemicals-textile-and-leather-sector-companies>
- ZDHC Chemical Management System Guidance Manual: https://www.roadmaptozero.com/fileadmin/layout/media/downloads/en/CMS_EN.pdf
- ZDHC MRSL: www.roadmaptozero.com/programme/manufacturing-restricted-substances-list-mrsl-conformity-guidance/
- Bluesign System Substances List: www.bluesign.com/industry/infocenter/downloads
- Chemsec's SIN List: <http://sinlist.chemsec.org/>



Exercise and Example

- Exercise and checklist

“Assessing Chemical Management: Description of the current situation in the company with regard to chemical management” to be filled as a self assessment.

- Example of chemical management tool:

“SDS Quick Look” Where to find which information in safety data sheets SDS



Questions?

