CHEMICAL MANAGEMENT HANDBOOK

FEBRUARY 2017

otto group

INTRODUCTION

WHY DID WE SET UP THIS HANDBOOK?

We, the Otto Group, are aware of our responsibility towards the environment and people - our customers, employees and business partners. Hence, sustainable development is at the core of our business. Together with our business partners, we want to strive for good working conditions and high environmental standards along the whole value chain.

Among other topics, we aim for clean production based on good chemical management in our textile supply chains. Our goal is to phase-out selected critical chemical substances from the entire supply chain by 2020 in order to fulfill our own aspirations and responsibilities. This will also affect your organization as well as your pre- supplier sources, sub-suppliers and relevant production processes.

HOW DOES THIS HANDBOOK HELP?

This handbook provides an overview of the most important chemical topics within production. Structured into 4 chapters, it provides helpful and “easy-to-understand”-knowledge to everyone working with (or around) chemicals. Additionally, it gives practical advice (including success stories from factories) to our partners and concrete guidance for factories.

WHY SHOULD I WORK WITH THIS HANDBOOK?

More efficient chemical management can reduce costs and environmental impact. First of all, good chemical management improves product safety and helps to avoid fails / rejected products by clients. Secondly, many well- known brands also ask their suppliers and sub-suppliers to fulfill environmental standards within their production chains. This handbook can help achieving these standards.

FOR WHOM IS THIS HANDBOOK?

This handbook was developed to support our business partners to further enhance their chemical management. Thus, it addresses not only direct business partners, but also other related business

partners along the supply chain. This handbook is mainly designed for **wet processing** facilities (**dyeing, washing, finishing,…**). But it can also be helpful for other textile production steps where the use of chemicals might play a role.

The intended audience is the factory management and their 'Environmental Health and Safety' managers. The person should be familiar with the structure and workflows of the factory. It needs to have the authority to act and make changes to systems and procedures, so that lasting improvements regarding chemical management can be made.

CAN I SHARE THIS HANDBOOK WITH OTHERS?

It is highly welcomed to share this handbook with other business partners you are working with, especially with all the ones conducting wet processes. Please introduce this document to all relevant pre- supplier sources you are working with.

WHAT ELSE IS IMPORTANT TO KNOW?

The practices being described in the handbook cover todays best practices. Compliance with national and local law will require further efforts. It is the responsibility of each facility to ensure all legal requirements, on health and safety as well as environmental standards, are met. Suppliers should always follow the strictest guideline at hand, be it the national law or our guidelines. As this handbook is not exhaustive, it is highly recommended to also rely on material / information around good chemical management from others (e.g. associations following the "Detox approach")

By providing this handbook, we hope to move faster towards our goal of sustainability along our entire value chain and encourage our business partners to join us on this way.

We suggest to read this handbook carefully and follow the indicated recommendations.

CHEMCIAL MANAGEMENT

CHEMICAL STORAGE

CHEMICAL HANDLING

CHEMICAL DISPOSAL

I. CHEMICAL MANAGEMENT

MANAGEMENT

> Roles I Responsibilities

Factory management has the ultimate responsibility to provide a safe and healthy work environment for its workers, and to manufacture a product that is safe for consumers and the environment. Therefore, it is essential that factory management fulfills these responsibilities by establishing the appropriate documentation in the form of relevant policies, procedures, plans and instructions.

Management has specific responsibility for:	
☐	Ensuring health & safety standards to provide a safe and healthy working environment for the employees
☐	Proactively identifying and addressing hazards in a timely manner
☐	Providing written policies and personnel organisation on health & safety subjects (including fire safety, chemical and waste manager, etc.)
☐	Retaining comprehensive records of: ➢ Governmental permits or certificates (e.g. boilers, building structural loads, etc.) ➢ Monitoring and test results (e.g. waste water treatment and discharge, air quality and worker exposure to chemicals) ➢ Internal training exercises and drills (in particular, evacuation drills) ➢ Hazards and risk lists
☐	Ensuring proper storage, handling and disposal of chemicals
☐	Raising awareness among employees
☐	Implementing M-RSL from clients (including organization of 'Declaration of MRSL Conformity' letters from chemical suppliers)

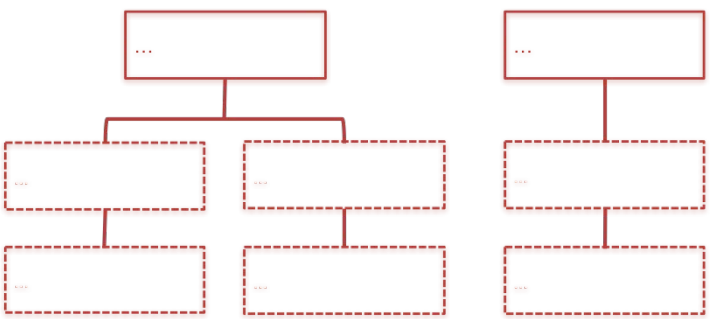
Proper chemical management will lower production costs, improve product quality, reduce environmental impact and improve the health and safety conditions for workers!

The responsibility for managing chemicals should not be the responsibility of one person but rather a team. The following team should be involved:

Chemical Management Team should involve:	
☐	**EHS Manager** to oversee the entire chemical management system
☐	**Effluent Treatment Plant (ETP) Manager/Technician** to provide insight and understanding of the impacts on effluent from chemical inputs
☐	**Product Quality Manager** to ensure performance quality of the purchased chemicals while ensuring compliance with the MRSL
☐	**Operations/Production Manager** to ensure the proper application of chemicals (for example, nature, quantity) for the production of products
☐	**Purchasing/Procurement Manager** to ensure alignment of purchasing chemicals in compliance with the MRSL

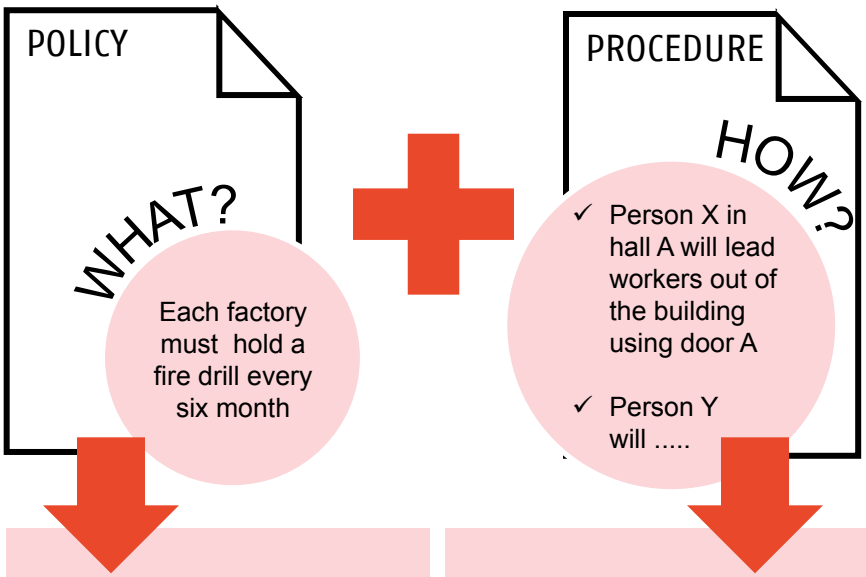
The responsibilities of different sections in a factory should be documented and communicated effectively. A defined structure enables the functionality of chemical management.

Provide organigrams that show clearly the responsibilities within the factory.



MANAGEMENT

> Policies I Procedures



SET UP A CHEMICAL MANAGEMENT POLICY

A chemical policy is a statement about a factory's position and values regarding chemical management

A chemical policy must:

☐include a commitment for continual improvement and prevention of pollution

☐include a commitment to comply to legal and other requirements

☐provide the framework for setting and reviewing environmental objectives and targets

SET UP ‚STANDARD OPERATING PROCEDURES' (SOPs) FOR ALL PROCESSES

Standard Operating Procedures (SOPs) describe how individual processes are carried out and ensure consistency within the factory

A SOP provides step by step details of what needs to be done in order to carry out a task such as:

☐the equipment used

☐temperature and timings

☐chemicals used

☐etc.

11 Priority Chemicals

Azo Dyes	Phthalates	Chlorobenzenes
Alkylphenols	Heavy metals	Perfluorinated chemicals
Chlorinated solvents	Organotin compounds	Chlorophenols
Brominated and chlorinated flame retardants	Short-chain chlorinated paraffins	+

Details on PFCs and APEOs can be found on the following pages! To substitute other chemicals please contact your chemical supplier!

These eleven groups of chemicals are used extensively in the textile industry and are also in the focus of Greenpeace. Once released, many of them accumulate in the environment, which means they are defined as **persistent**. Some substances are **bioaccumulative**, meaning they can accumulate in the blood, organs and tissues of living organisms and damage health. Also most of them are **toxic** and harm living organisms. That is why these chemicals should be avoided.

Phase out all priority chemicals latest by 01 January 2020!

Look for better performing and greener chemicals

When purchasing chemicals, consider to:

- ☐ Ensure compliance with MRSL
- ☐ Ask for a declaration of Detox 'MRSL Conformity
- ☐ Obtain an approval from EHS personnel
- ☐ Obtain the **MSDS**
- ☐ Check labels, storage and PPE requirements
- ☐ Keep purchase documentation in accordance with regulatory requirements
- ☐ Written **requirement** for suppliers

PERFLUORINATED CHEMICALS

Per- and polyfluorinated chemicals are a family of man-made, fluorine-containing chemicals with unique properties to make materials stain resistant and waterproof.

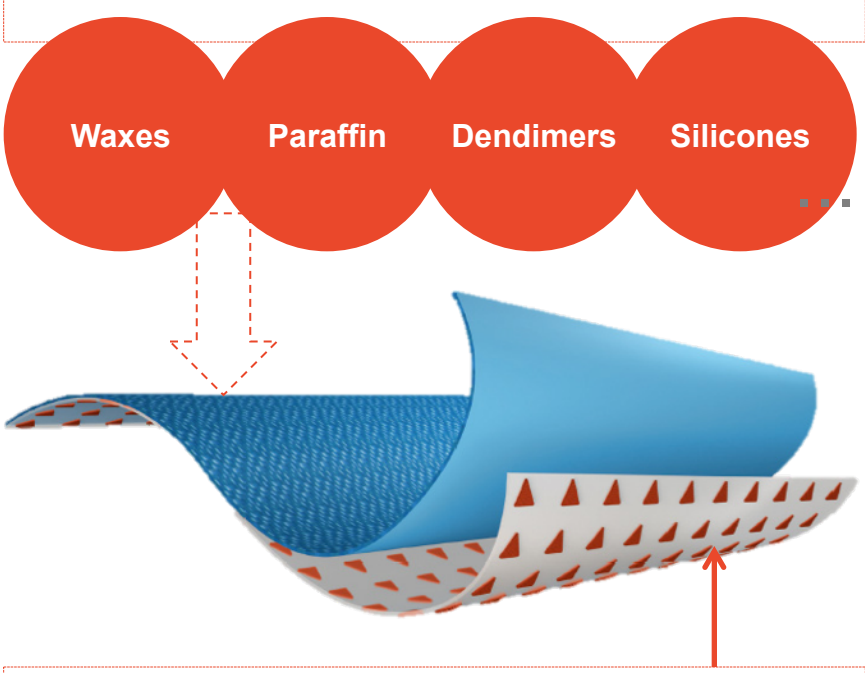
Many PFCs, especially ionic PFCs such as the long chained **PFOS and PFOA**, are highly persistent and do not readily break down once released to the environment, which has led to their presence throughout the environment, even in remote regions. Researchers are finding serious health concerns about PFCs, including increased risk of some cancers.

WHAT TO DO:

PFC-HOT SPOT 1:

DWR-FINISH

The phase-out of PFC containing durable water repellent finishes is strongly required. For the manufacture of water repellent textile products many alternative PFC free finishes are available (paraffin, wax, polymers, etc.).



PFC-HOT SPOT 2:

MEMBRANE

The use of waterproof PFC-membrane (Polytetrafluoroethylene, PTFE) is strictly prohibited. Only Polyester- or Polyurethane-membranes are supposed to be used.

PFCs are banned in all products! Articles that contain PFCs may not be shipped nor merchandised.

ALKYLPHENOLS

APEOs (alkylphenol ethoxylates)
> NPEOs (nonylphenol ethoxylates)
> OPEOs (octylphenol ethoxylates)
> ...

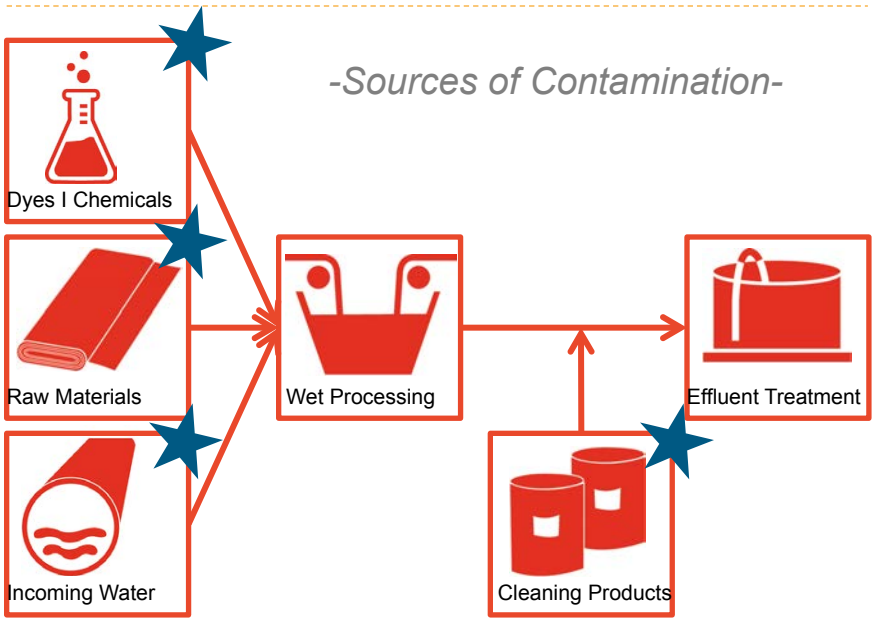
90% of produced APEO are NPEO!

breakdown

APs (alkylphenols)
> NPs (nonylphenols)
> OPs (octylphenols)
> ...

- toxic to aquatic organisms
- impair human fertility
- cause harm to unborn children

-Sources of Contamination-



APEOs are non-ionic surfactants which can be found in many chemicals, including detergents, emulsifiers, dispersing agents and spinning lubricants. Additionally incoming raw material or process water can be contaminated with APEOs. They may also be present in non-process chemicals like in machine cleaning preparations, and in general industrial and 'domestic' products used for cleaning areas such as dormitories, floors, ceilings etc.

WHAT TO DO:

☑Obtain written "APEO-free declaration" from chemical supplier
☑Check MSDS
☑Perform risk-based testing
☑Discuss safer alternatives
☑Obtain monthly test reports from water supplier to give a quantitative analysis of APEO
☑If the supplier cannot provide this for any reason, have the water tested independently

MANAGEMENT

> MRSL Compliance

What is the difference between RSL and MRSL?

RSL – Restricted Substances List

RSL contains chemicals which are either completely prohibited or restricted above certain threshold levels **in final products!**

MRSL – Manufacturing Restricted Substances List

MRSL contains chemicals which are either completely prohibited or are restricted above certain threshold levels **in production processes!**

What limits need to be met?

PRODUCTION

Input Chemicals

Waste Water

Sludge

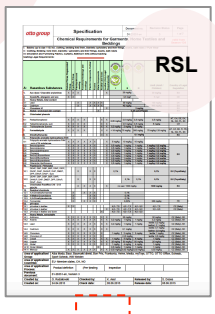
CLEAN INPUT = CLEAN OUTPUT !

Production processes in line with ZDHC will help you to meet product and legal requirements

PRODUCT

Final Product

MRSL



RSL

The **'ZDHC MRSL'** defines limit values for commercial chemicals provided by chemicals suppliers. ZDHC-compliant chemicals may be used for all production processes!

The **'ZDHC Wastewater Guidelines'** aim to establish an industry wastewater discharge quality that goes beyond regulatory compliance, not only for conventional wastewater parameters, but also for hazardous chemicals. Limit values for wastewater and sludge shall be met.

The **'Otto Group Chemical Requirements for Garments'** define limit values for finished products. Articles that do not comply with these requirements may not be shipped nor merchandised.

Download ZDHC documents on http://www.roadmaptozero.com

How to ensure that MRSL requirements are met?

OPTION 1 Get a 'ZDHC Declaration of MRSL Conformity'

A declaration of the chemical supplier can confirm that the chemicals comply with the ZDHC MRSL requirements without providing an additional test or certificate issued by an accredited test laboratory. Many suppliers have already tested their portfolio for compliance with the ZDHC MRSL requirements. The issuance of the certificate does not involve any additional costs. Nevertheless this proof of ‚MRSL compliance' is only acceptable if provided by a credible supplier (e.g. bluesign® system partners).

Get a proof of ‚MRSL conformity' for all chemicals (except base chemicals) and store the evidence at least 24 months to show clients upon request

Certificate

Name, address, contract information

Declaration that no substance included in the ZDHC MRSL was deliberately added possible restrictions

Date, signature

Typical structure of a 'ZDHC Declaration of MRSL Conformity'

- ✓ Contract information provided by the chemicals manufacturer or supplier
- ✓ Clear chemical formulations or batch identification
- ✓ Declaration of conformity
- ✓ Possible limitations regarding conformity

OPTION 2 Get a certificate from test laboratory

Certificates of accredited test laboratories or recognised certificate issuers are also accepted. You can either test your chemicals by an accredited test laboratory (e.g. BV, SGS, Intertek) or only purchase chemicals that are certified by the OEKO-TEX® ECO PASSPORT or GOTS.

- Sample
- Analysis
- Report on the presence of >400 chemicals

OR

OPTION 3 Only purchase bluesign® approved chemicals

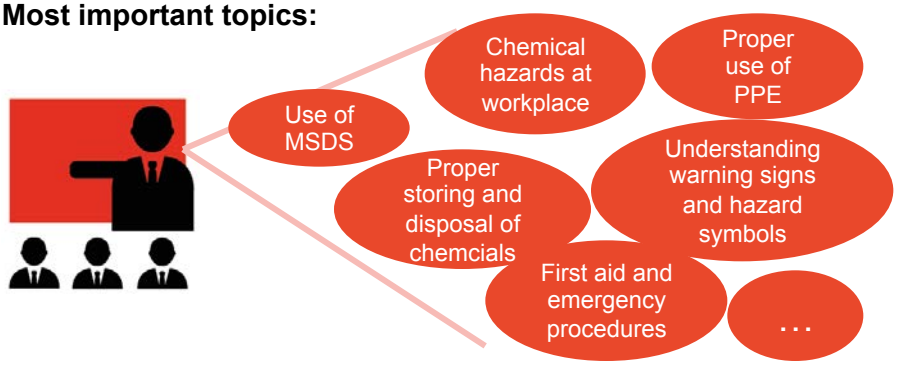
The blueguide database can also be used for verification purposes as it only contains products which comply with the chemical-related bluesign® requirements and thus fulfill MRSL requirements.

MANAGEMENT

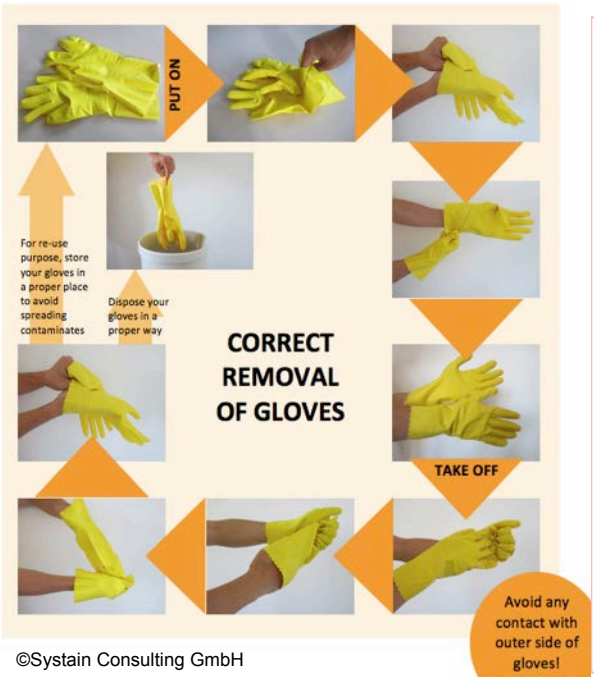
> Worker Trainings

Proper worker trainings are at the core of any chemical management program. This enables the workers to recognize health and safety hazards and to prevent accidents and injuries.

Most important topics:



- ✓ Ensure your training program provides the opportunity to ask questions and offer refresher trainings at least once a year
- ✓ Ensure **proper training material** in local language
- ✓ Ensure **proper documentation** → Records with signature of all participants need to be kept



Example for information poster at workplace

Also provide work instructions/ poster on the safe use of protection equipment, machineries, etc.

A written instruction must be given in a simple and straightforward language so that the workers know how to behave during routine activities. They have to understand that disregarding the work instructions can result in accidents and serious injuries. The use of pictograms or drawings can facilitate the communication of the content.

Work instructions should be printed out and placed where they can easily be seen!

MANAGEMENT

> Transparency I Disclosure

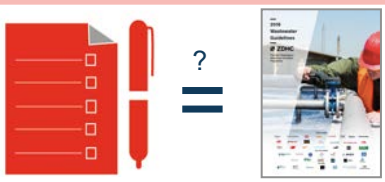
Hazardous chemicals do not only have an influence on product rejection rate and environmental pollution. They might also harm the health and therefore every global citizen has a fundamental 'Right to Know' which hazardous chemicals are being used and discharged into the environment. That is why every factory is encouraged to publicise up to date information on the use and discharge of hazardous chemicals in a form that can be easily accessed by local communities, the general public and public interest organisations, e.g. via the IPE (Chinese Institute for Public and Environmental Affairs) online platform.

WHAT TO DO:

1.) Conduct waste water and sludge analyses including all 11 Detox chemicals (not only basic waste water parameters)

- ☐ Alkylphenols
- ☐ Perfluorinated compounds (PFCs)
- ☐ Phthalates
- ☐ Brominated/chlorinated flame retardants
- ☐ Azo dyes
- ☐ Organotin compounds
- ☐ Chlorobenzenes
- ☐ Chlorinated solvents
- ☐ Chlorphenols
- ☐ Short-chain chlorinated paraffins (SCCPs)
- ☐ Heavy metals

2.) Check the report and compare with ZDHC Wastewater Guidelines to find out if limit values are exceeded



3.) Conduct a Root Cause Analysis to find the reason for exceeded limit values

Root Cause Analysis: consider all possible sources of contamination: chemicals, raw materials, incoming water, packaging material, etc.

4.) Disclose the analyses results on the IPE platform as one option.

(http://www.ipe.org.cn/En/pollution/discharge_detox.aspx)

CASE STUDY

Increase of Orders through **Clean Chemical Use**

Established in 1978, this family-run company employs 185 people who work in three 8-hour shifts around-the-clock. The company acts as a 'job shop', **dyeing and printing** polyester fabrics for other Indonesian companies. The final products are destined for both the local market and for export. The company wants to create a reputation as a high quality supplier. The management believes this will increase the interest of international buyers in its products.

Hot Spot

By setting up a chemical inventory, it was discovered that a dyestuff used within this company is an azo-dye formulation, according to the Material Safety Data Sheet (MSDS) provided by the chemical supplier. Certain azo-dyes when splitted in aromatic amines are carcinogenic and therefore present a serious **health risk** to humans. The company was informed that the use of certain azo-dyes can lead to its products being **rejected** by international buyers.

Action

After consulting with the chemical supplier, the company determined that banned aromatic amines were present and could be detected in the final product. The company investigated and found an **alternative dyestuff** with the same generic colour index number. This substance provided an almost equivalent effect in production and was not a restricted azo-dye.

Benefits

By demonstrating awareness of the chemicals being used and the implications down the whole value chain, the company's reputation as a high quality supplier increased in the eyes of its direct customer.

Within 6 months, word had spread and the company began receiving additional orders for fabrics destined for the export market.

II. CHEMICAL STORAGE

STORAGE

> Efficient Use of MSDS

MSDS = **M**aterial **S**afety **D**ata **S**heet

MSDSs are documents, which list the properties of a particular chemical substances or mixtures. These sheets are a widely used system for providing information such as potential hazards associated with a chemical and instructions for the safe use.

ORIGINAL MSDS

1. Identification of substance
2. Hazards identification
3. Composition/ ingredients
4. First Aid measures
5. Fire-fighting measures
6. Accidental release measures
7. Handling and storage
8. Personal Protective Equipment
9. Physical/ chemical properties
10. Stability and reactivity
11. Toxicological information
12. Ecological information
13. Disposal considerations
14. Transport information
15. Regulatory information
16. Other information

ABSTRACT MSDS

- Chemical Name
- Hazards identification
- First Aid measures
- Accidental release measures
- Personal Protective Equipment
- Toxicological Information

The original MSDS provided by chemical supplier follows a 16 section format which is internationally agreed (MSDS from countries outside the EU may have a different structure!) An abstract of each MSDS should be provided by the factory in local language for every chemical.

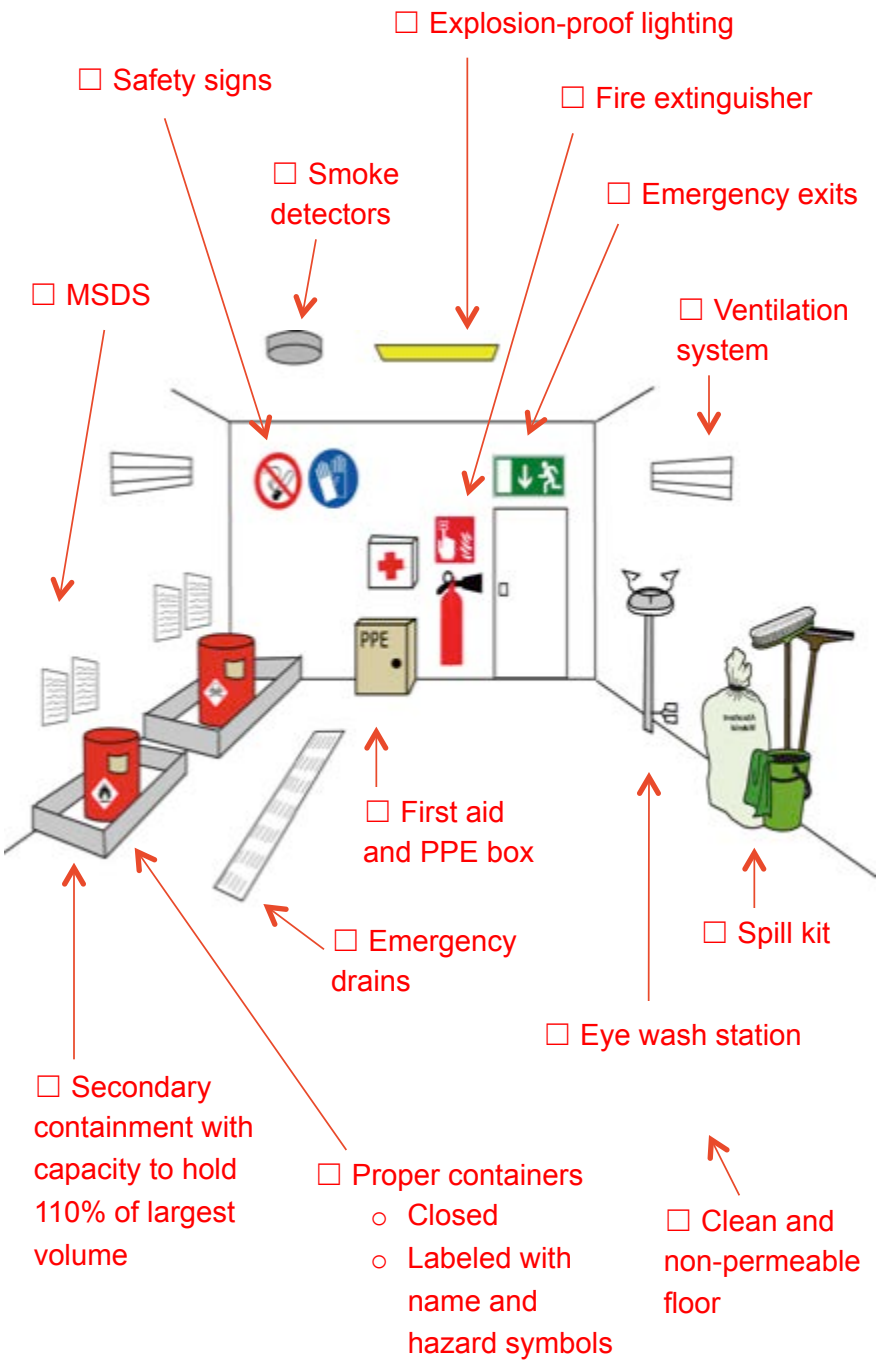
MSDS should always be provided by chemical supplier. If an MSDS is not included, contact your chemical supplier and request this document!!

Archive all MSDS for at least 24 months!

It must be ensured that MSDS for all chemicals are available and properly stored.

The MSDS helps to determine whether any hazardous chemical agents are present at the workplace and to assess any risk to the health & safety of workers arising from their use and how to control them!

Chemicals should be stored in such a manner that minimal impact to workers and the environment may occur. To ensure this, the following measures are required:



Proper chemical management of stores is a key element to avoid economic losses and risks to health and property!

GOOD STORING PRACTICES


Good housekeeping


Protective equipment


Work instructions

MSDS at chemical container


Secondary containment

BAD STORING PRACTICES


Open containers


Ground contamination

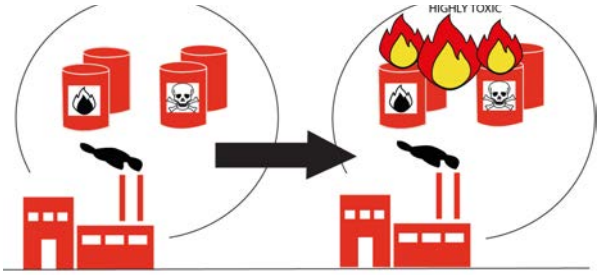

No proper label


Chemicals stored at excessive height

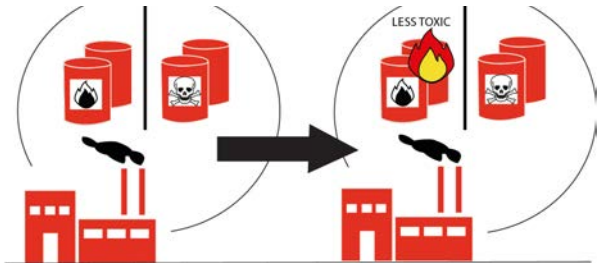

Bad housekeeping

To minimize the potential impact of chemical leaks and spills, and the possible consequences of fires in chemical storage areas, it is important that incompatible chemical materials are stored with adequate separation.

Consequences of a fire in a **common store** of toxic and flammable materials:



Consequences of a fire in a **separated store** of toxic and flammable materials:



Storage of chemicals should be based on their compatibility with other chemicals

Chemicals that may react with each other should be stored remotely from each other. The table below can help to identify the compatibility of substances:

Chemical Class	Storage Guidelines
Acids	☐ Store away from reactive metals such as potassium, sodium, magnesium. ☐ Store oxidizing acids away from organic acids, flammable and combustible materials. ☐ Store acids away from chemicals which could generate toxic or flammable gases upon contact. ☐ Store acids away from bases.
Bases	☐ Store bases away from acids, metals, explosives, organic peroxides and easily ignitable materials.
Flammable and Halogenated Solvents	☐ Store in approved safety cans or cabinets. ☐ Store away from oxidizing acids and other oxidizers. ☐ Keep away from heat sources, including sparks and open flames.
Oxidizers	☐ Store in cool, dry place. ☐ Store away from combustible and flammable materials. ☐ Store away from reducing agents such as zinc, alkali metals, and formic acid.
Cyanides	☐ Store away from acids and oxidizers.
Water Reactive Chemicals	☐ Store in cool, dry place away from any water source. ☐ D Class fire extinguisher must be nearby.

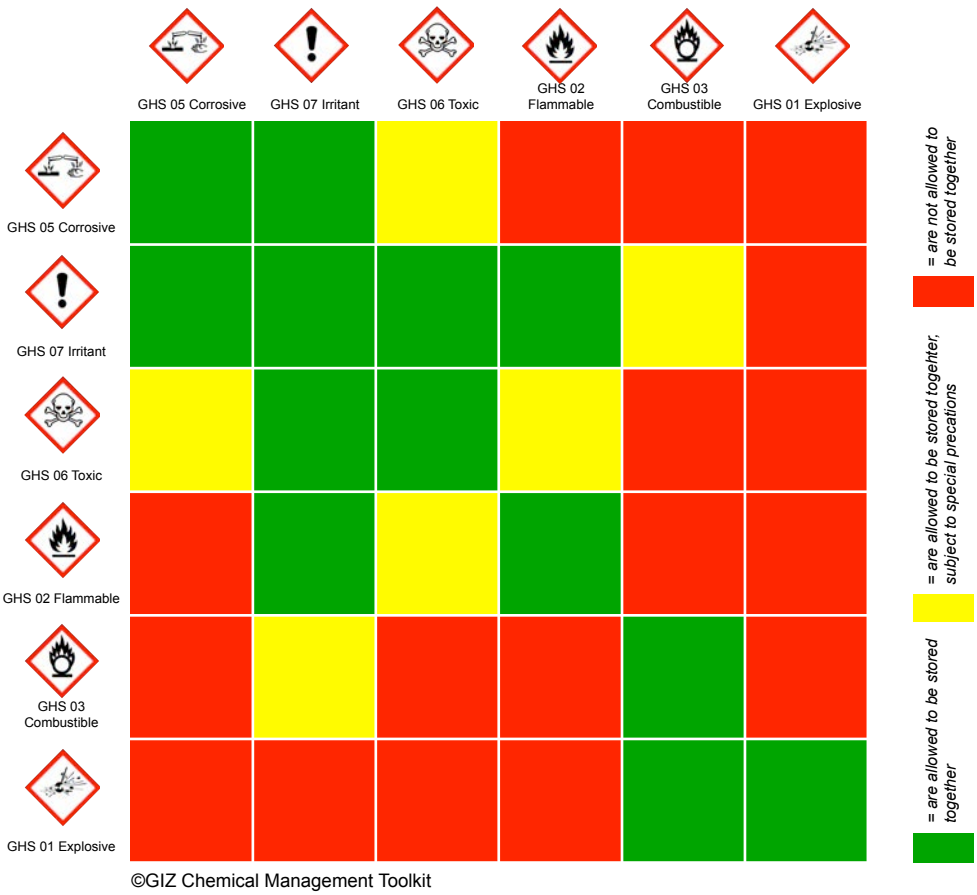
Table for chemical compatibility check	Gases	Flammable liquids	Flammable solids	Substances liable to spontaneous combustion	Substances emitting flammable gases when wet	Oxidizing agents	Toxic substances	Corrosives
Gases								
Flammable liquids								
Flammable solids								
Substances liable to spontaneous combustion								
Substances emitting flammable gases when wet								
Oxidizing agents								
Toxic substances								
Corrosives								

= are likely to react dangerously

= are likely to be incompatible

= are likely to be compatible

MSDS provide specific information on chemical compatibility. Hazardous symbols are also helpful for a compatibility check:



STORAGE

> Stock List I Inventory

It is essential to keep an **inventory of the chemicals** used and stored in the facility in order to…

… keep track of the applied chemicals.

… conduct laboratory hazard assessments.

… provide chemical hazard information to emergency responders.

… minimize unnecessary stockpiling of chemicals.

Archive all inventory lists for at least 24 months!

Maintaining a chemical inventory (inventory list) enables the production facilities to quickly identify those chemicals that conflict with customer requirements.

4 Steps to set up a Chemical Inventory

	Gather information for all chemicals stored and used in the facility: a) Use MSDS b) Contact chemical supplier	☑
	Insert information into chemical inventory table	☑
	Keep inventory up to date ✓ Add new chemicals ✓ Remove expired chemicals ✓ Update monthly	☑
	Make inventory available to anyone entering the work area	☑

Inventory Control Table

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
Department	Building	Room #	Product Name	Chemical Name	Chemical Supplier	CAS #	Quantity	Units	SDS on file? Y/N	Hazard Class	H Phrase	11 ZDHC Priority Chemical Classes	On Factory/ ZDHC MRSL?	On Brand's RSL?	Shelf Life	Catalogue Order Number/ Supplier Order Name	
Dye Weigh House	#1	12	Hydrochloric acid (37%)	Hydrochloric acid	Dystar Tel. No.: +49 (0)214/3099300 msds@dystar.com	7647-01-0	2	litres	Yes	Class 8	H 35	N/A	No	No	Jun-15	xxx-xx-xx	
Dyeing	#3	-	Glauber's salt	Sodium sulfate	Huntsman p@huntsman.com	775782-6	1000	kg	Yes	Non-hazardous	N/A	N/A	No	No	Jun-15	xxx-xx-xx	
...	...		...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Catalogue Order Number/ Supplier Order Number
Identification number as specified internally

On Brand's RSL?
Indicate if the chemical is covered by the customer brand's restricted substances list by "yes" or "no"

Shelf Life
Specify the expiration date

On Factory/ ZDHC MRSL?
Indicate if the chemical is covered by the manufacturing restricted substances list by "yes" or "no"

11 ZDHC Priority Chemical Classes
Indicate the respective class if the chemical is on the ZDHC list of priority substances

H-Phrase
Standardized abbreviations/codes for different hazard types
! You can find them in the safety data sheet (SDS) !

Hazard Class
Indicates whether there is a hazard

SDS on File?
Indicate if safety data sheet is available by "yes" or a tick mark

Quantity/ Units
List the usual amount per batch/ day and the related measurement unit

CAS #
Allows a clear identification of the chemical substance

Chemical Supplier
List name and contact details

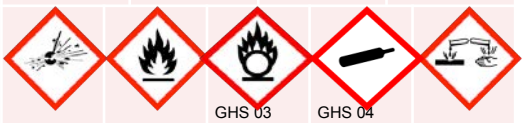
Chemical Name
List all ingredients of the chemical product

Product Name
Commercial product name of the chemical as known and used in your company

Department
Location or part of your company where this chemical is used or stored
!!! If same chemical is used in several places, add additional lines

Building/ Room
Indicate where the chemical is stored exactly

It is required to put up warning signs in the factory to make sure that work area and chemical hazards are communicated properly:

Safety Colour	Shape	Meaning/ Purpose	Example
Red Border Black Symbols White Background	Round	Stop/ Prohibition	 No fire; No drinking water; No smoking; No mobile; No walking
Black Border Yellow Background Black Symbols	Triangular	Caution/ Warning of Danger	 risk of fire; gas cylinder; toxic hazard; risk of electr. shock
Red Border Black Symbols White Background	Diamond	Caution/ Warning of Danger	 GHS 01 Explosive; GHS 02 Flammable; GHS 03 Combustible; GHS 04 Gas under pressure; GHS 05 Corrosive  GHS 06 Toxic; GHS 07 Irritant; GHS 08 Carcinogenic; GHS 09 Eco-toxic
Blue Border and Background White Symbols	Round	Mandatory Action	 Wear eye protection; Wear gas mask; Wear gloves; Wear head protection; Wear foot protection
Green Border and Background White Symbols	Square	Safety Facilities	 Doctor; Eye wash facitility; First aid; Emergency shower; Emergency phone  Exit direction; Exit direction; Assembly area
Red Border and Background White Symbols	Square	Fire Protection	 Extinguisher; Fire hose; Ladder

STORAGE

> GHS Label

Besides putting up warning signs, it is also essential to label containers properly:

Elements of a Label

- ☐ Product Identifier
- ☐ Signal Words
- ☐ Hazard Statement
- ☐ Precautionary Statement
- ☐ Supplier Information
- ☐ GHS Pictograms

1) Product Identifier

2) Signal Words

3) Hazard Statement

4) Precautionary Statement

5) Supplier Information

6) GHS Pictograms

Why is it important to label every chemical container?

Proper labelling enables you to determine whether any hazardous chemicals are present at the workplace and to assess any risk to the health & safety of workers arising from their use and how to control them!

ALWAYS ENSURE PROPER LABELLING OF ALL CHEMICAL CONTAINERS!!

GHS = Globally Harmonized System of Classification and Labelling of Chemicals

GHS is an internationally agreed-upon system, created by the United Nations. The purpose of this new system is to achieve global uniformity. This system is supposed to replace the 'EU System of Classification and Labelling of Chemicals (67/548/EWG)'. Labelling in conformity with GHS is mandatory since 1 June 2015.

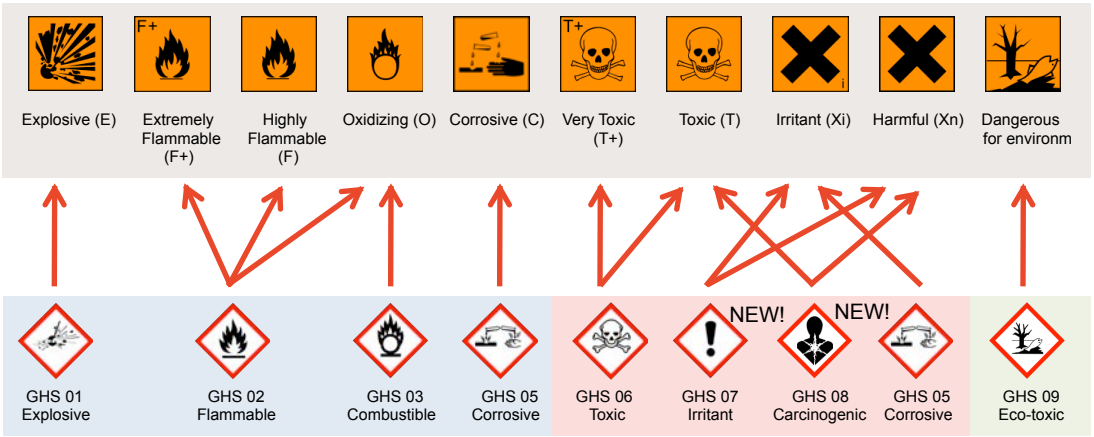
OLD: EU System

- ✓ Text indicating the type of hazard
- ✓ R(isk)-sentences
- ✓ S(aftey)-sentences

NEW: GHS (effective 1 June 2015)

- ✓ Signal words like 'Hazard' or 'Danger'
- ✓ H(azard)-sentences
- ✓ P(recautionary)-sentences

Changes from EU system to GHS



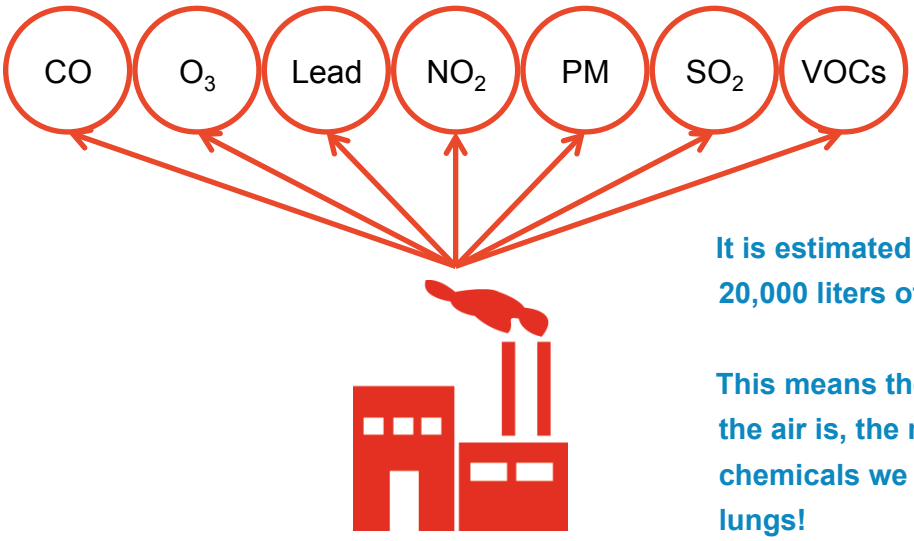
There is no equivalent for this new pictogram.

This symbol is omitted. There is no direct equivalent to a GHS pictogram.

STORAGE

> Ambient Air Quality

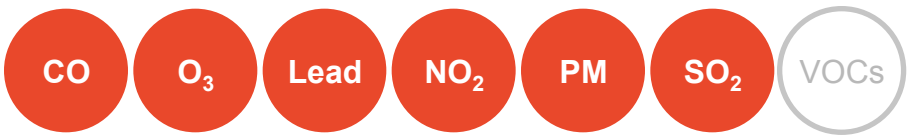
Textile manufacturing operations cause air pollution. Air pollutants are generated by fossil fuel fired combustors due to their flues and/or a variety of chemicals in use for production.



It is estimated that you breathe 20,000 liters of air each day.

This means the more polluted the air is, the more dangerous chemicals we breathe into our lungs!

Main Pollutants



SOURCES OF POLLUTANTS IN TEXTILE:

→ Emissions from power generation/ boiler houses

STEPS TO REDUCE EXPOSURE:

The goal shall be to use low emission fuels, as for example natural or liquid pressured gas. In cases where heavy oil or coal is used an appropriate off-gas abatement system minimizing SO2 and particle emissions shall be installed.

LIMIT VALUES:

Local requirements have to be fulfilled.

Volatile Organic Compounds

CO | O3 | Lead | NO2 | PM | SO2 | **VOCs**

VOCs are emitted as gases from certain solids or liquids

HEALTH EFFECTS

- Eye, nose and throat irritation
- Headaches
- Damage to liver, kidney and nervous system
- Cancer

SOURCES OF POLLUTANTS IN TEXTILE:

→Use of solvents in printing processes, fabric cleaning, etc.
→ Heat treatments

STEPS TO REDUCE EXPOSURE:

☑Adoption of water-based methods

☑Substituting cleaning solvents with less toxic solvents

☑Use of appropriate control technologies

☑Use of well-ventilated rooms

☑Installation of extraction and air recycling systems

☑Use of shift and task rotation strategies for workers

☑Use of personal protective equipment (PPE)

LIMIT VALUES:

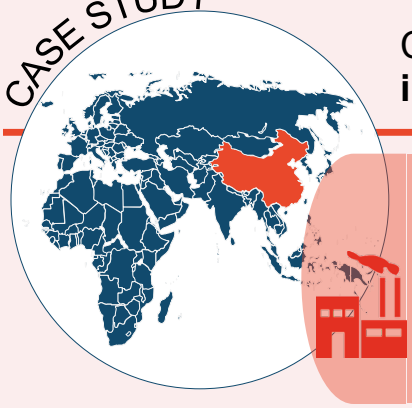
ISO 16200 – Workplace Air Quality
> Sampling and analysis of volatile organic compounds

Examples of VOC Limit Values	OSHA *(TWA)*	NIOSH *(STEL)*	ACGIH *(TWA)*
Toluene	750 mg/Nm	560 mg/Nm	188 mg/Nm
dichloroethane	400 mg/Nm	400 mg/Nm	405 mg/Nm
Isoprophyl alcohol	980 mg/Nm	1225 mg/Nm	983 mg/Nm
ethylbenzene	435 mg/Nm	545 mg/Nm	545 mg/Nm
mp-xylene	435 mg/Nm	435 mg/Nm	655 mg/Nm
dichloropropane	350 mg/Nm	No limit value	47 mg/Nm

OSHA: Occupational Safety and Health Administration
NIOSH: National Institute for Occupational Safety and Health
ACGIH: American Conference of Governmental Industrial Hygienists

TWA = testing method for 8 hours waiting, average weight of the chemical
STEL = testing method for 15 minutes waiting, average weight of the chemical

CASE STUDY



Cost saving through **improved chemical storage**

The factory was one out of 43 BMI partner mills. The Better Mill Initiative, launched in 2013, was initially a collaboration between Solidaridad and H&M. Other brands have since associated. The programme focuses on improving the textile wet processing industry in China, with particular emphasis on the Yangtze and Pearl River Delta.

Chemical Storage before and after improvement

Improvements on chemical storage are implemented, e.g.:

- Standard operating procedures have been developed
- Dyestuffs are stored in stainless steel containers with clear labels and are placed on wooden pallets to keep away from moisture which will affect the accuracy of chemical weighing
- Dyestuff are measured strictly according to the process recipes to avoid unnecessary waste

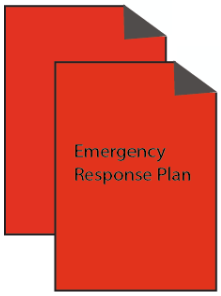
Total investment	RMB 20,000
Dyestuff saving	3 t/a
Annual cost saving	RMB 150,000
Payback period	1 month

III. CHEMICAL HANDLING

Emergency events include especially fires and accidents. Injuries to workers and damage to buildings and equipment can be reduced if you are prepared well for emergencies:

GENERAL SAFETY PREPARATIONS

EMERGENCY RESPONSE PLAN



- ☐ A senior factory manager is assigned responsibility for making sure that the factory has procedures in place to prepare for, and respond to, emergency situations.
- ☐ Procedures to prepare for possible emergencies such as fire, earthquakes, hurricanes, and chemical spills are in place. These procedures are written in local language.
- ☐ The emergency evacuation plan and evacuation routes are posted in each work area.

WARNING SIGNS

- ☐ “Danger,” “Warning,” and “No Smoking” signs are clearly visible in all areas.
- ☐ Signs are provided requiring workers to use the proper PPE.

PERSONAL PROTECTIVE EQUIPMENT

- ☐ Proper personal protective equipment is provided to workers.
- ☐ Workers who are required to wear personal protective equipment are trained regularly on the proper use.

SPILL CONTROL EQUIPMENT

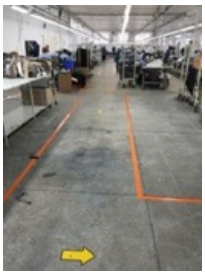
- ☐ Spills are cleaned up immediately.
- ☐ Spill kits with materials for containment and absorption are readily available.
- ☐ Workers who are responsible for cleaning up a spill (e.g. by using absorbent material) are trained on spill clean-up procedures, including how to protect themselves from contacting the spilled wastes.

EVACUATION PREPARATIONS

EMERCENCY EXITS

- ☐ The maximum distance for a worker to travel to an exit is 61 m (200 ft) in a building without fire sprinklers and 76 m (250 ft) in a building with fully automatic sprinklers. Corridors with only one exit are not longer than 15 m (50 ft).
- ☐ All exit routes should have > 1 lux of light. Emergency lighting is provided by battery-powered units or generators that can run for 1.5 hours.
- ☐ Exit doors are free at all times and release easily to the outside

EVACUATION ROUTES



- ☐ Evacuation routes are clearly marked with lines and arrows (floor markings)
- ☐ The width of an exit route must be sufficient to accommodate the maximum permitted occupant load of each floor served by the exit route.
- ☐ Routes are free from obstacle

EVACUATION PLAN

- ☐ Evacuation plan is available, hung on the wall and clearly visible for everyone
- ☐ Evacuation plan contains clear explanations and is easily understandable
- ☐ ISO 23601:2009: Safety identification – Escape and evacuation plan signs

ASSEMBLY AREAS

- ☐ Assigned locations are available that can shelter the entire worker population in case of an emergency.
- ☐ Assembly areas outside the building are designated, and do not interfere with emergency service.

EVACUATION DRILLS

- ☐ Clear evacuation procedure needs to be communicated and regular drills need to be conducted
- ☐ All employees/workers (all shifts) need to participate, implementation needs to be documented and records with signature of all participants need to be kept

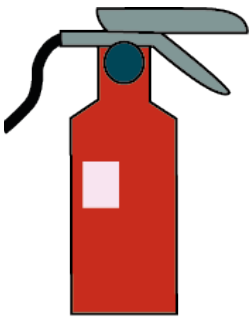
SMOKE DETECTOR

- ☐ Smoke detectors are installed in all areas of the factory
- ☐ Full testing of smoke detectors is ensured every six months.

FIRE ALARM

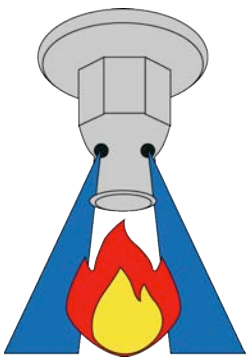
- ☐ Fire alarm systems (sound and light) are installed and clearly distinct from other alarms and notification systems.
- ☐ Full testing of alarm systems is ensured every three months.
- ☐ In addition to the factory's audible alarm, visible fire alarms (such as a flashing light) are installed in all work areas that require workers to wear hearing protection.

FIRE EXTINGUISHER



- ☐ Fire extinguishers match the potential fire hazard and are located within 15 m (50 ft) of flammable liquids and 23 m (75 ft) of every worker (Extinguishers should be rated for Class A, B, & C fires). SEE APPENDIX
- ☐ Fire extinguishers are equipped with maintenance tags to indicate the date they were last checked and serviced.
- ☐ Work instructions are provided that show workers how to use extinguishers.

AUTOMATIC SPRINKLER



- ☐ At least all two-story buildings are equipped with automatic sprinklers.
- ☐ Pressure checks of the water storage container are conducted every 5 years and documented.
- ☐ Water level and pressure, water pumps and the general condition of related equipment is inspected monthly.
- ☐ Sprinkler heads are always kept clean.
- ☐ Water flow through the sprinkler system activates the building fire alarm.
- ☐ There is at least 0.45-meter clearance between sprinkler heads and stored materials.

FIRE DRILLS

- ☐ At least three evacuation drills are conducted in the factory buildings and dormitories each year. Records should be kept of each drill.

FIRST AID PREPARATIONS

EYE WASH STATION

- ☐ Workers handling chemicals have immediate access (within 10 seconds) to an eyewash station and shower that can be operated without use of hands.
- ☐ Once an eyewash station is turned on, it continues to flow without requiring a worker to operate it with his/her hands. Workers have both hands available to hold open their eyes if they require flushing.

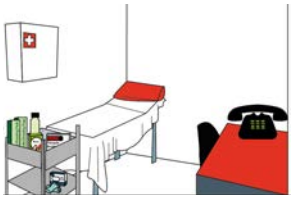
TRAINED FIRST AIDERS

- ☐ One first aid provider is appointed for every 100 workers.
- ☐ First Aid providers are adequately trained by professional personnel on an annual basis.

FIRST AID KITS

- ☐ A sufficient number of First Aid kits is available (1 kit for ~100 workers) and easily accessible.
- ☐ First Aid kits are kept in sealed containers that provide protection from dirt and water.
- ☐ The kits contain first aid materials, all within their expiration dates:
  - ✓ Scissors, tweezers and safety pins
  - ✓ Adhesive tape
  - ✓ Disposable latex gloves
  - ✓ Burn treatment applications (spray/cream)
  - ✓ Antiseptic applications
  - ✓ Sterile eye coverings
  - ✓ Large individually wrapped sterile triangular bandages
  - ✓ Individually wrapped sterile adhesive bandages (>20#) of assorted sizes
  - ✓ Small-sized individually wrapped sterile unmedicated wound dressings (absorbent compress) (>6#, ~12 cm x 12 cm in size)
  - ✓ Medium-sized individually wrapped sterile unmedicated wound dressings (adsorbent compress) (>2#, ~18 cm x 18 cm in size)
- ☐ First Aid kits are inspected monthly and restocked after each use or as required over time.

FIRST AID ROOMS

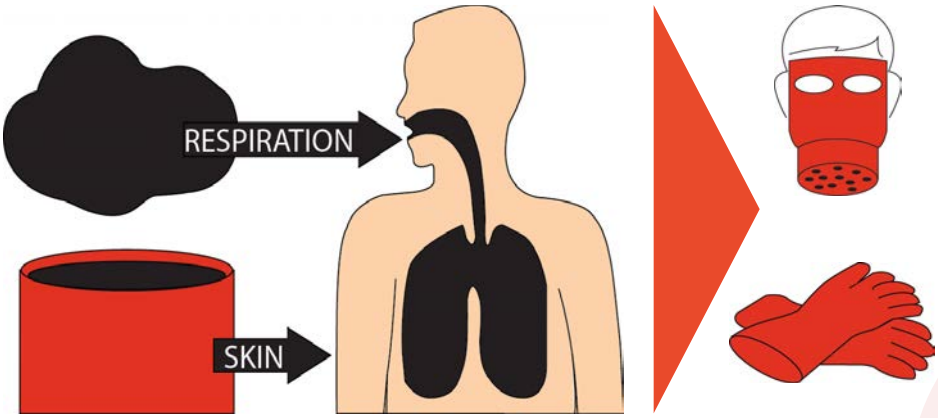


- ☐ A First Aid room is available in factories with more than 1,000 workers.
- ☐ First Aid room is easily accessible, clean and adequately equipped for the type of injuries that may reasonably be expected in the factory.

HANDLING

> Personal Protective Equipment

The two most important routes how workers are exposed to chemicals are **inhalation** and **absorption through the unprotected skin**:



Respiratory protection and protection gloves are the most important PPE for workers!

To avoid health risks, it is essential that workers are provided with:

- ✓ Appropriate Personal Protective Equipment (PPE)
- ✓ Training on the proper use of PPE
- ✓ Signs and instructions of the use at the workplace

The use of PPE is always the last line of defence after the implementation of engineering and work practice controls.

HOW TO SELECT PROPER RESPIRATORY EQUIPMENT?

Be aware that not every mask is right for chemicals:

Dust Mask

Only for dust

Air Purifying Respirator

For chemicals

1) Air Purifying Respirators (APR)

a) Disposable

b) Half-face mask

c) Full-face mask

Purifies air by filtering out the hazard

2) Supplied Air Respirators (SAR)

Uses an independent supply of clean air

SELECT A RESPIRATOR IN 4 SIMPLE STEPS:

1 Hazard Identification

First, identify the contaminants you're dealing with**:** The primary source of information on a chemical's state and physical form is the Material Safety Data Sheet (MSDS).

2 Exposure Assessment

Then, test your environment: Once the potential contaminants are identified, air sampling should be done to determine how much of the contaminant is likely to be present.

3 Respiratory Selection

All respirators have limitations. There is **no universal protection**! You must carefully select appropriate respirator based on respiratory hazards and user factors.

4 Respiratory Fit-Testing

Every single worker needs to be fit tested in the type, size and style of respirator he or she will be wearing on the job.

HOW TO SELECT PROPER PROTECTION GLOVES?

The selection of the proper glove is essential for good protection. There are two criteria that need to be taken into consideration in the selection process:

1) GLOVE MATERIAL: Different materials are needed for protection against different chemicals

	Butyl Rubber	Neo-prene	PVC	Nitrile	Natural Latex
Acetates	G	NR	NR	NR	NR
Acids, inorganic	G	E	E	E	E
Acids, organic	E	E	E	E	E
Acetonitrile	G	E	G	S	E
Alcohols	E	E	NR	E	E
Aldehydes	E	G	NR	S*	NR
Amines	S	NR	NR	F	NR
Bases, inorganic	E	E	E	E	E
Ethers	G	F	NR	E	NR
Halogens (liquids)	G	NR	F	E	NR
Inks	G	E	E	S	F
Ketones	E	G	NR	NR	E
Nitro compounds	G	NR	NR	NR	NR
Oleic Acid	E	E	F	E	NR
Phenols	E	E	NR	NR	G
Quinones	NR	E	G	E	E
Solvents, Aliphatic	NR	NR	F	G	NR
Solvents, Aromatic	NR	NR	F	F	NR

S - Superior | E - Excellent | G - Good | F - Fair | NR – Not recommended

* Not recommended for Acetaldehyde, use Butyl Rubber

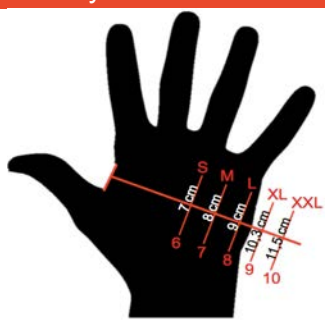
Disposable gloves have a poor protection capacity. Only use them for the short term and change them often!

2) GLOVE SIZE:
A good fit is essential for efficient work and safety

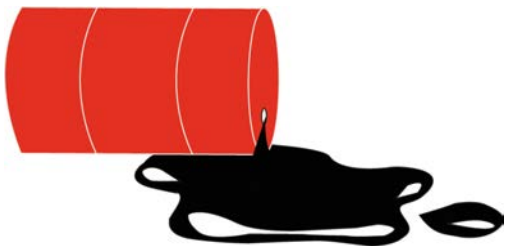
<u>To determine your glove size, you need to know your hand size:</u>

>Use a tape measure to find the circumference of your hand!

>The measurement helps to identify your glove size!

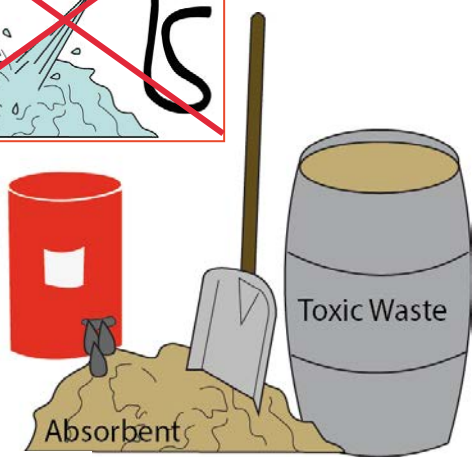


1) Plan and **prepare** for spillage response
2) Evaluate and **handle** spills
3) Deal with hazardous **waste**



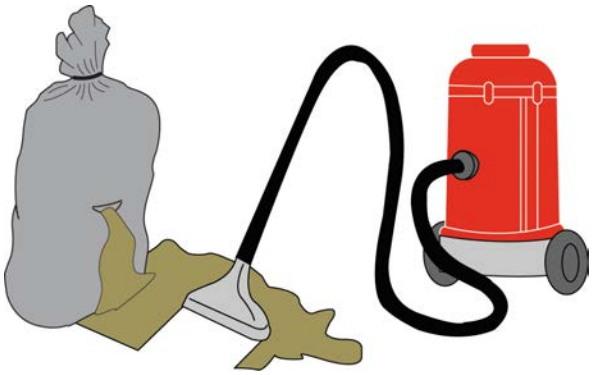
Handling **liquid** spillages

- ☑ Should be treated asap
- ☑ Collect with solid absorbent (in clay, sand, sawdust)
- ☑ Decontaminate area according to information on MSDS
- ☑ Do not use water to wash away liquid spills



Handling **solid** spillages

- ☑ Remove with industrial vacuum cleaners
- ☑ Collect solid contaminated materials in old open-top drums until final disposal
- ☑ Dispose waste according to manufacturer's instructions and/or legal requirements



HANDLING

> Hazardous Chemical Use

☑ Read the label before using the chemical

☑ Review MSDS if unsure of any hazards

☑ Only mix chemicals wearing proper PPE

☑ Minimize disposal

☑ Do not use food container for chemicals

☑ After handling chemicals, wash hands before eating

☑ Do not smoke near chemical storage area

☑ Do not eat or prepare food in chemical storage area

☑ Use ventilation system to reduce the inhalation of chemicals

☑ Wear PPE

MANUAL DOSING AND DISPENSING OF CHEMICALS

Indirect **pollution** from inaccurate dosing and handling of chemicals (spillage, poor shade repeats, etc.)

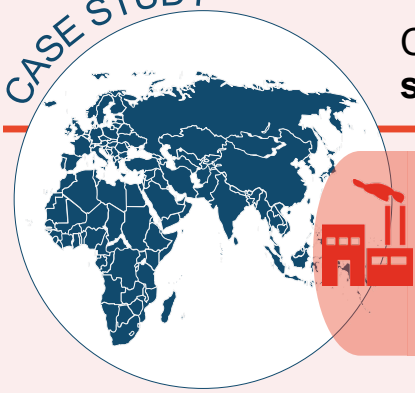
AUTOMATIC DOSING AND DISPENSING OF CHEMICALS

Benefits of Automatization:

- ✓ Improved right-first-time performance
- ✓ Reduction of waste water pollution and wasted chemicals
- ✓ Safer and healthier working environment

Automatization in the ‘Dye Kitchen’

CASE STUDY



Cost Savings through **Automatic dyestuff storage and weighing System**

An automatic dyestuff storage and weighing system enables controlled storage of different dyestuffs and direct delivery of the dyestuff into dyeing machinery without manual handling. This reduces manual error as well as exposure to hazardous chemicals.

Semi-automatic dyestuff weighing system

Total investment	RMB 308,000
Dyestuff saving	13.57 t/a (=10%)
Annual cost saving	RMB 203,600
Payback period	23 months

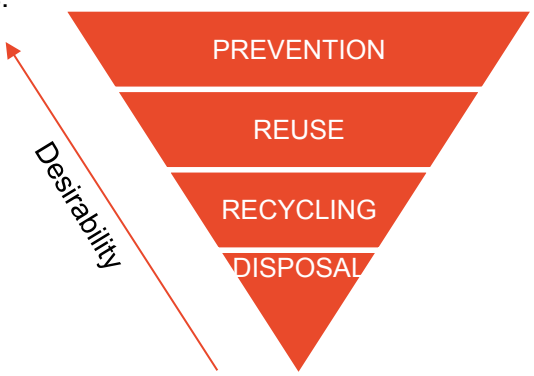
IV. CHEMICAL DISPOSAL

DISPOSAL

> Understanding Waste Streams

Waste = material that is not a prime product produced for the market and which needs to be disposed.

The „waste hierarchy" is a concept that provides a preferred order of priorities for selecting and deciding upon waste management options:

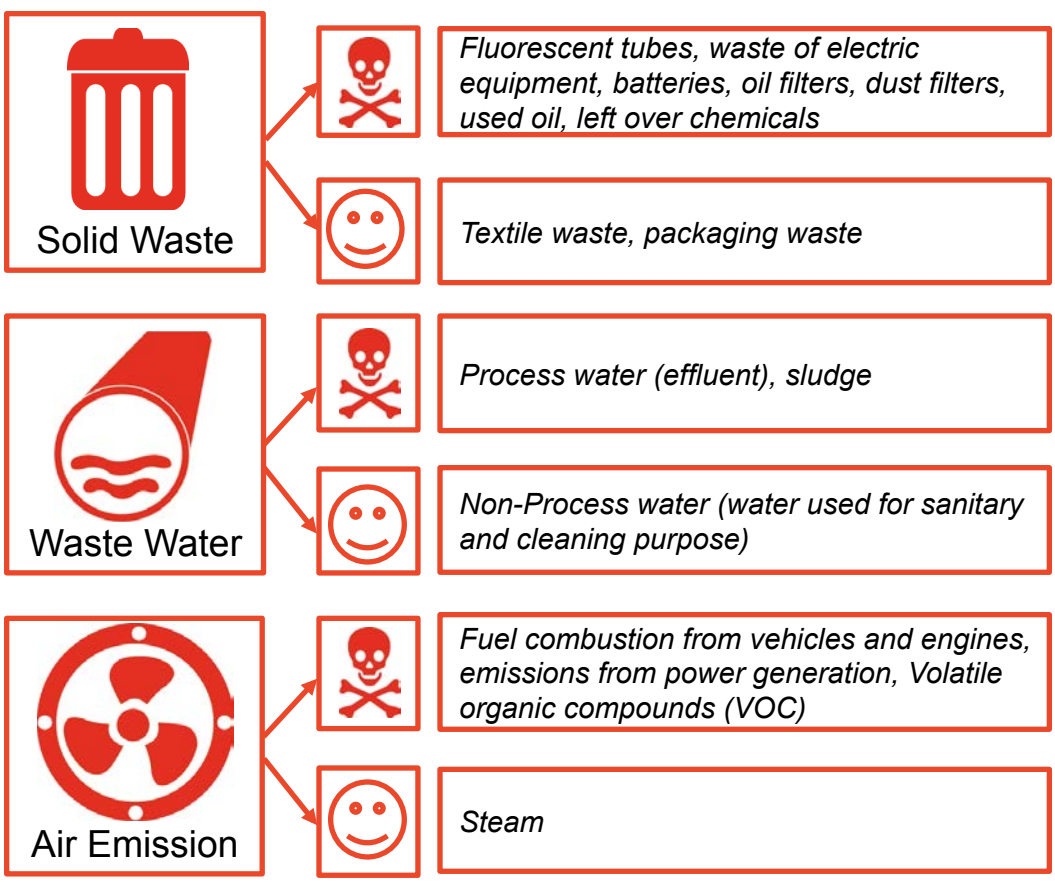


Waste Minimization

Total Waste Cost → 10-30% of Total Production Cost

Waste Minimization = Cost Minimization

Types of waste:



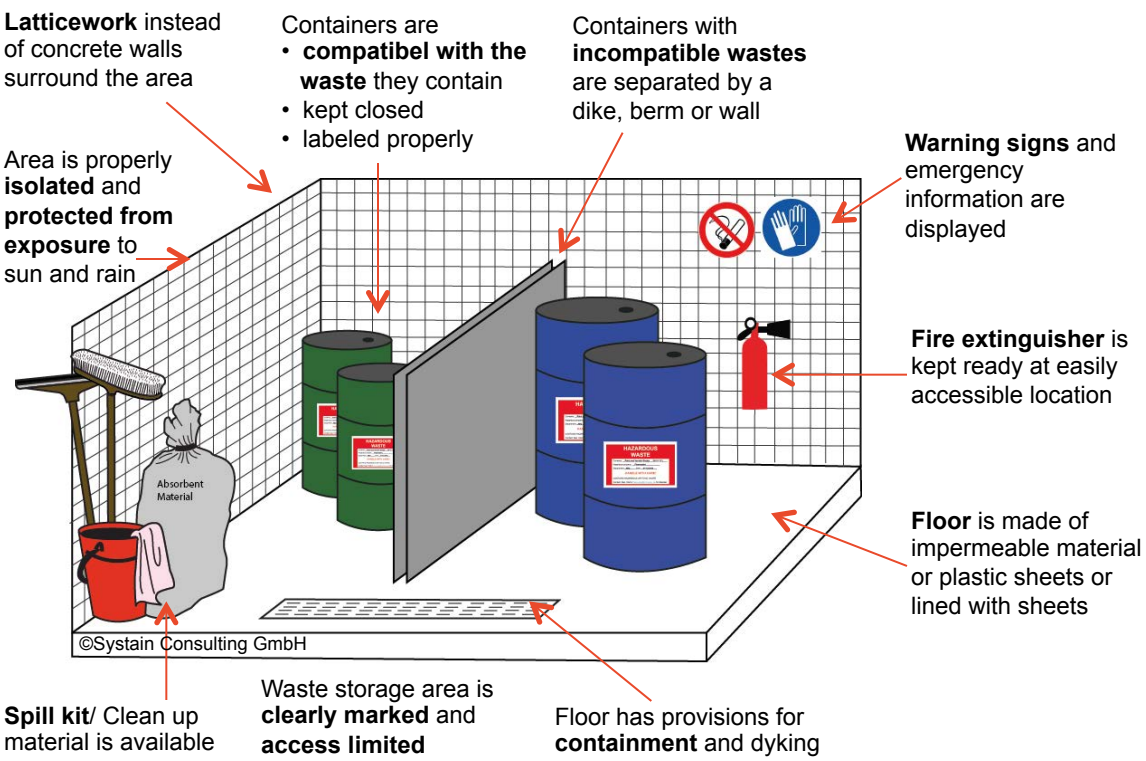
How to manage waste?

manage | store | dispose | transport

1) Management

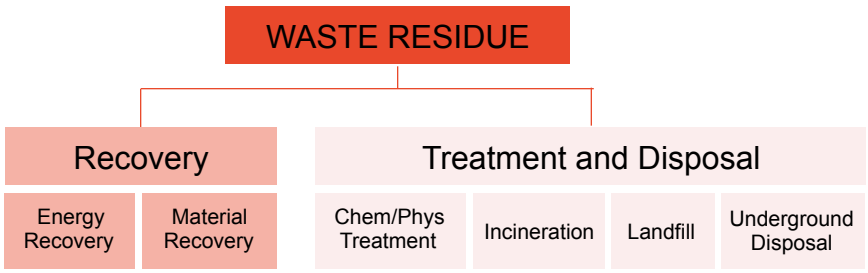
Checklist
☐ A 'Waste Management Policy' is available
☐ An internal person is in charge of waste management
☐ Workers are trained in proper handling of hazardous waste
☐ Waste is tracked and documented in a waste inventory
☐ Suitable PPE is always available when handling waste

2) Storage



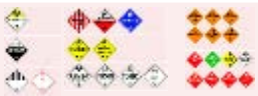
3) Disposal

Whether hazardous waste can be sent to recovery or has to be disposed depends on the chemical and physical properties of the waste. There are several options for the on-site treatment:



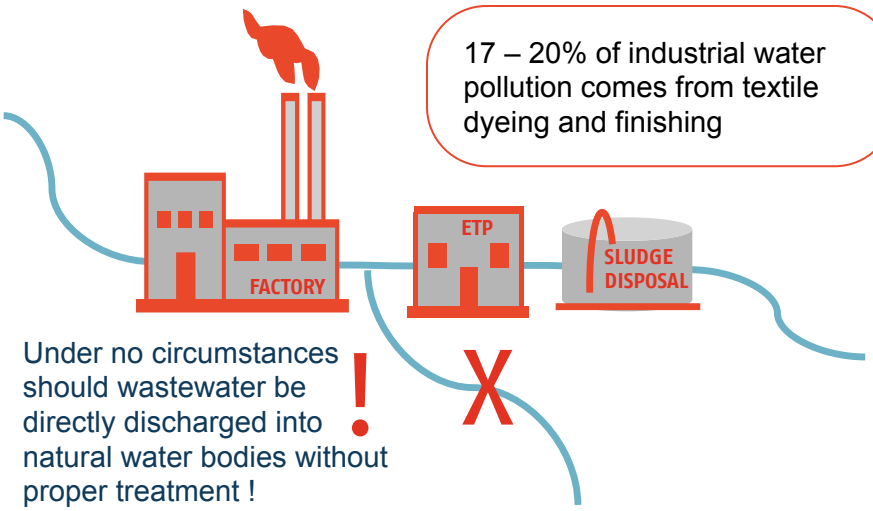
4) Transport

If hazardous waste is disposed off-site, appropriate transportation to external locations has to be assured:

☐ Containers are used in compliance with package specifications on the respective dangerous goods class and quantity	
☐ Respective danger labels are placed on the packages	
☐ Containers are packed properly	*Up to 30l:*  *Drums of 200l capacity with clamping ring lid* *Over 30l:*  *Containers stacked on pallets*
☐ Carrier has a license for the transport of dangerous goods	
☐ Equipment and truck sent by the carrier is suitable for the transport of dangerous goods	
☐ Truck is clearly signed	*…indicating the type of waste transported*
☐ Truck is equipped with necessary safety equipment	✓ *Fire extinguisher* ✓ *Protective clothing* ✓ *Spill collection equipment*
☐ Driver is supplied with necessary documentation	✓ *Consignment notes* ✓ *Copy of Waste Data Sheets* ✓ *Copy of Transport Emergency Cards*
☐ Driver is trained	*…in safety and emergency procedures*

DISPOSAL

> Waste Water Treatment



- UNTREATED EFFLUENT MUST NEVER BE DISCHARGED
- EFFLUENT MUST BE TREATED IN FULLY FUNCTIONAL ETP BEFORE DISCHARGE
- CAPACITY OF ON-SITE ETP MUST BE SUFFICIENT TO PROCESS TOTAL FACTORY OUTPUT
- AN EMERGENCY PLAN FOR A BREAK-DOWN OF ETP MUST EXIST
- FULL COMPLIANCE WITH LOCAL AND NATIONAL LAWS/ STANDARDS
- TREATED EFFLUENT MUST BE TESTED ON A FREQUENT BASIS

WASTE WATER QUALITY TESTING

WHAT?

A) Basic effluent parameters

	ZDHC Limits		
Parameter	**Foundational**	**Progressive**	**Aspirational**
Temperature (°C)	Δ15 / max. 35	Δ10 or 30	Δ5 or 25
pH, Standard Units		6.0 – 9.0	
Total Suspended Solids (TSS)	50 ppm	15 ppm	5 ppm
Biological Oxygen Demand (BOD)	30 ppm	15 ppm	5 ppm
Chemical Oxygen Demand (COD)	150 ppm	80 ppm	40 ppm

ZDHC generic wastewater parameters shall be met. It is recommended that testing is carried out at least weekly.

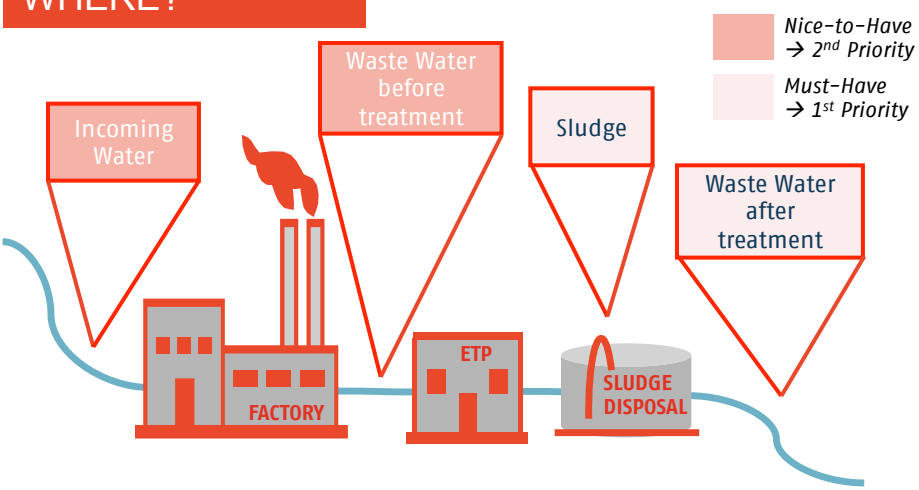
B) Detailed testing covering the 11 Detox chemicals

- ☐ Alkylphenols
- ☐ Perfluorinated compounds (PFCs)
- ☐ Phthalates
- ☐ Brominated/chlorinated flame retardants
- ☐ Azo dyes
- ☐ Organotin compounds
- ☐ Chlorobenzenes
- ☐ Chlorinated solvents
- ☐ Chlorophenols
- ☐ Short-chain chlorinated paraffins (SCCPs)
- ☐ Heavy metals

At least once a year the 11 Detox chemicals shall be tested.

Keep records, analyse trends and develop monitoring reports! Be transparent – one option is to upload effluent data on IPE platform.

WHERE?



POOR Sludge Management

Sludge is stored directly under sludge digester and not in proper drying beds.

No proper sludge storage

GOOD Sludge Management

- ☑ Sludge should be **dried before disposal**
- ☑ Sludge temporarily **stored on-site** should be wrapped and be placed on a cast concrete foundation with a protecting roof
- ☑ The **amount** of sludge obtained should be **documented**
- ☑ Basic sludge **parameters** should be **tested** regularly
- ☑ Sludge needs to be **disposed properly**

SLUDGE DISPOSAL OPTIONS

LANDFILLING

Landfilling: It's the most common method for the solid waste disposing and currently 90% of the sludge is disposed with this method. However due to the high organic compound content it created high amount of greenhouse gas emission. Landfill has low costs compared to other disposal options.

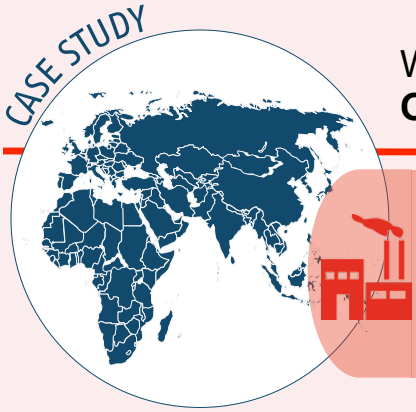
USE IN SOIL

Sludge as well as boiler ash can be used as alternative raw material **to substitute clay in brick-making**

INCINERATION

Sludge is also considered as **biomass**. This is a great way to produce energy.

CASE STUDY



Waste Reduction through **Optimized Material Flow**

- Dyeing factory with own ETP
- Established in 1996 in Bangladesh
- 500 employees
- Production capacity of 12,000 tons per year

Hot Spot

By analyzing chemical flows and setting up a material flow-chart, a large amount of chemical loos was discovered

Action

The amount of chemicals wasted could be significantly reduced by establishing a monitoring and recording system

Benefits

- ✓ The factory **saved 14,000 USD** through reducing chemical waste and emissions
- ✓ This corresponds to **cost savings in chemicals of 71%** in the dye section
- ✓ Also, the **water consumption was reduced** from 90-100 l/kg to 70-80 l/kg

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Imprint

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