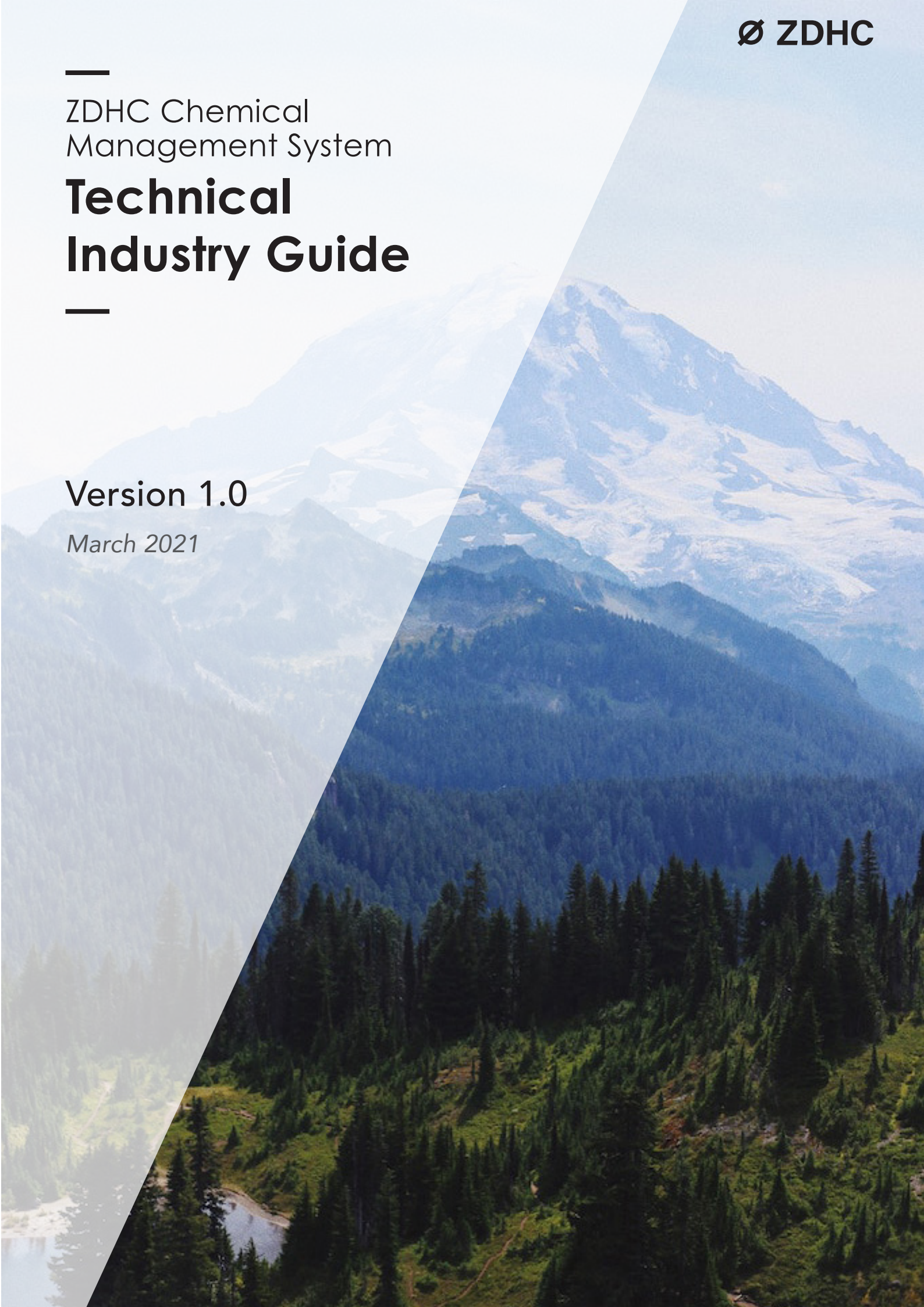
ZDHC

ZDHC Chemical Management System

Technical Industry Guide

Version 1.0

March 2021



NOTES

The ZDHC Foundation's Chemical Management System (ZDHC CMS) Technical Industry Guide is intended to either replace brand-specific requirements for chemical management and/or to be supportive or complimentary to such requirements.

The information in this ZDHC CMS Technical Industry Guide is provided for information only and does not

a) Guarantee compliance with or conformance to, any national or international environmental or workplace safety requirements including, but not limited to, relevant regulations and/or standards.
b) Guarantee compliance with or take the place of legal or regulatory requirements relating to the use, storage, and transport of chemical products.
c) Replace any national or international environmental or workplace safety requirements including, but not limited to, regulations and/or standards.

ZDHC refers to the UN GHS (Globally Harmonized System of Classification and Labelling of Chemicals) as the internationally recognised standard for hazardous material classification and labelling. All the other National/Regional existing schemes, derived from the implementation of the GHS, have to be considered included in the list of the accepted ZDHC standards for this purpose. To simplify the CMS Technical Industry Guide comprehension, ZDHC uses GHS throughout as its reference for Hazard Statements and Pictograms in SDS and labels in order to avoid local variables.

DISCLAIMERS

Whilst ZDHC takes every reasonable effort to make sure that the content of this Technical Industry Guide is as accurate as possible, ZDHC makes no claims, promises, or guarantees about the accuracy, completeness, or adequacy of the contents of this ZDHC CMS Technical Industry Guide.

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b) from any use, decision made or action taken or any other kind of reliance on the ZDHC CMS Technical Industry Guide by a reader or user of it and/or
c) for any results obtained or not obtained from the use of the ZDHC CMS Technical Industry Guide

Introduction

A Chemical Management System (CMS) is one of the cornerstones for ensuring continuous improvement towards our goal of zero discharge of hazardous chemicals. A sound chemical management system is paramount to worker safety and reduction in impacts on the community and the broader environment.

ZDHC's approach to a CMS Manual consists of two components:

1. ZDHC CMS Framework
2. ZDHC Technical Industry Guide

The ZDHC CMS Framework provides a high-level overview of minimum requirements for adoption of a CMS by the leadership of Suppliers and Brands for safe management of chemicals.

Scope

The ZDHC Technical Industry Guide provides guidelines for implementation of the CMS Framework (minimum requirements) and best practices by relevant personnel at Suppliers as well as to auditors evaluating facilities for their CMS implementation. At this moment, the ZDHC CMS Technical Industry Guide does not explicitly cover actions related to chemical conformance for end-products as well as improvements in productivity or resource efficiency through management of chemicals.

This document should thus be read and interpreted in conjunction with the ZDHC CMS Framework that is already published.

Structure of the Technical Industry Guide

The structure of this document is aligned with the **NINE SECTIONS** outlined in the ZDHC CMS Framework. It also aligns with the journey or steps that a supplier undertakes to establish a Chemical Management System.

The first step is to establish a **Policy** document that outlines the commitment (statement) of the Supplier's leadership and includes procedures and practices adopted for purchasing, transparency and traceability of the chemicals used. This commitment should then be translated into a **Strategy** which details the resources, budget and action plan for implementing a chemical management system.

The subsequent sections describe how to:

- conduct **Assessments** for a Supplier's regulatory compliance, chemical hazard and risk, supply chain partners capabilities and of safer alternatives
- implement **Health & Safety** actions for chemical exposure control, PPE and emergency response procedures for all staff
- manage a **Chemical Inventory List (CIL)** and SDS to make informed purchasing decisions, promote responsible chemical use, increase traceability, simplify chemical handling decisions, and control disposal costs
- ensure safe **Storage and Handling** procedures for the chemicals purchased

These sections are followed by a description of **Output Management** with respect to wastewater, sludge, air and solid waste outputs to reduce pollution as well as **Process Control** to ensure proper implementation of a CMS through records and documents control, incidence management and general maintenance and housekeeping.

Finally, the last section is about **Continuous Improvement** practices such as review of CMS, internal or external audits and improvements in identified areas. Training at the workplace to minimise accidents and environmental risk is also included in this section.

Each section describes not only the minimum requirements given in the ZDHC CMS Framework but also gives practical examples, templates, tables, illustrations, flow charts and recommendations to help suppliers and manufacturing facilities adopt industry best practice for chemical management. At the end of each section, there is a 'Check List' that summarises the requirements of that section in order to confirm actions to be taken.

The Technical Industry Guide cannot be "One Size Fits All' and must have the flexibility necessary to be adapted to a manufacturing facility according to its operations. Thus, descriptions, examples and templates are for guidance only, to be modified to the needs of a Supplier while broadly adhering to the requirements of the ZDHC CMS Framework. A Supplier should build on the recommendations to establish a robust CMS, far beyond a "cut-and-paste" exercise.

Contents

1. Policy

A policy is a set of principles, commitments, and practices to which a supplier commits in order to guide decision-making and to monitor outcomes. Thus a Chemical Management Policy is the first step towards the implementation of a unified system for chemical management. Such a policy is important to ensure that each stakeholder is aware of the goals of the facility and is provided with a clear path to achieve these.

1.1 How to Write a Chemical Management Policy

A Chemical Management Policy (referred hereafter as Policy) document should include the following:

1. **A Policy Statement (chapter 1.1.1)** endorsed by the Supplier's leadership
2. **Practices and Procedures (chapter 1.1.2)** for implementing the commitments given in the policy statement, including Purchasing Policy, Transparency Policy and Traceability Policy

1.1.1 Policy Statement

This should communicate your manufacturing facility's wide-ranging and long-term ambition for chemical management implementation. It should be aligned with the ZDHC mission and should include a commitment to:

- Adopting and implementing the ZDHC Roadmap to Zero Programme guidelines and platforms, such as the ZDHC Manufacturing Restricted Substances List (ZDHC MRSL), ZDHC Wastewater Guidelines and ZDHC Gateway
- Incorporating sustainable chemical management practices in to production processes
- Continuous improvement in CMS effectiveness
- Ensure the safe use of chemicals at your facility to secure Health & Safety of workers and to minimise environmental impact
- Anchoring traceability and transparency into the facility's operations

- Capacity Building and training of staff on the ZDHC CMS

Such a Policy Statement should be:

- communicated to all stakeholders, including staff
- signed and endorsed by the Supplier's leadership
- reviewed periodically, based on internal and external changes

For writing the Policy, one needs to ensure the following:

1. Commitment of the Supplier's leadership
2. Precise language
3. Effective date and revision date
4. Document control via reference numbers
5. Person identified as responsible to maintain and review the policy
6. Definitions or glossary of specific terms and/or abbreviations used in the document

Examples of Policy Statements covering diverse aspects of chemical management are given below. The final Policy Statement should be a mix of such statements, aligned to the Supplier's scope for chemical management, the scale of operations and the resources allotted for the implementation of these commitments.

Scope	Example of policy statements
Compliance to local laws and regulations	*"We will comply with all local regulatory requirements applicable to facility's manufacturing operations"*
Sustainable chemical management including a commitment to adopt the ZDHC Guidelines	*"We are committed to the elimination of hazardous substances as listed in the ZDHC MRSL from use and discharge from our facility. We do this through the use of the ZDHC Gateway for input chemical management and monitoring of our discharged wastewater to the ZDHC Wastewater guidelines"*
Minimise chemical risk to the separate environment and employee Health & Safety	*"We will use safer and sustainable chemicals in our manufacturing processes to ensure protection of employees, communities, environment and consumer health"*
Purchasing of chemicals	*"We purchase chemicals with proper supporting documentation (such as Safety Data Sheets (SDS)) and ZDHC MRSL Level 1 conformance as our minimum requirement and work towards higher levels of conformance"*
Conformance to Brands RSLs and global regulations on chemical restrictions for finished products e.g. REACH, CPSIA, Cal Prop 65, etc	*"We comply with global legislation and our customer requirements on restricted substances in our end products."*
Traceability of information	*"We actively engage and assess our suppliers and sub-contractors to ensure traceability from the manufacturing process to chemical inventory"*
Transparency	*"We share applicable information on our chemical management practices in a transparent manner to external stakeholders (such as Brands, contractors and Chemical Formulators) and internal stakeholders (employees, workers and staff)"*
Continuous Improvement	*"We continuously strive to substitute hazardous chemicals with safer alternatives and better environmental profiles wherever possible"*
	"We conduct regular training of all our employees on safe use, storage and handling of chemicals to create a healthy work environment"
Capacity Building and Training	*We will continuously update the knowledge and skills of the staff on Chemical Management via training.*

1.1.2 Communicating your Policy Statement

It is important that the Supplier's internal and external stakeholders are informed about the Chemical Management Policy. As best practice, the Policy Statement should also be displayed at key locations within the facility for communicating the commitments to all employees, visitors and sub-contractors, in the local language, wherever possible.

Figure 01: Ways to display the Policy Statement at key location

Other ways to communicate the statement are shown in figure 02:

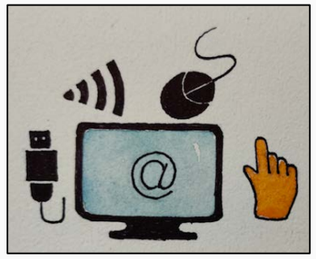
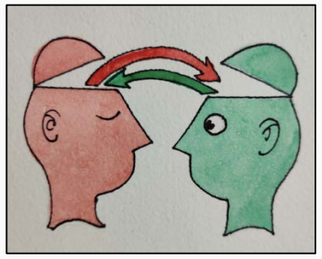
		
Digital: E-mail or website	**Face-to-Face:** Meetings and trainings	**Print media:** Poster, Leaflet, Company Handbooks

Figure 02: Ways to communicate the Policy Statement

1.2 Practices & Procedures for Chemical Management

A set of practices and procedures should be followed at the Supplier for implementation of the commitments stated in the Policy Statement. These should include, but are not limited to:

- Chemical purchasing policy (with a focus on ZDHC MRSL conformance)
- Transparency and Traceability Practices
- Chemical handling and storage practices
- Output Management (such as wastewater, solid waste, sludge and air emissions)
- Practices for continuous improvement of CMS such as training (through ZDHC Academy)

1.2.1 Chemical Purchasing Policy

It is essential that chemical products are purchased from a legitimate source which can meet your chemical management requirements. This eliminates, or at the very least, minimises, hazardous chemicals from entering a manufacturing facility in the first place. A robust chemical purchasing policy will reduce potential risk and liability.

The scope of the Chemical Purchasing Policy should cover the following:

- All dyes, pigments and inks directly applied in process
- Functional finishes (such as anti-microbials, flames retardants, OWR)
- Printing thickeners and binders
- Commodity chemicals
- Chemicals used in wastewater/effluent treatment process (except commodity chemicals)
- Chemicals used in engraving, developing and washing of printing screens
- Sizing chemicals and weaving oils/knitting oils used for in-house warping, weaving and/or knitting operations
- Beamhouse, wet-end and finishing auxiliaries for leather production
- Dyestuffs and pigments used in wet-end and finishing for leather production
- Printing inks and auxiliaries used for printed leather production
- Adhesives and rubbers used in footwear and leather-goods production
- Utility chemicals used for machinery maintenance (such as lubricants, grease)
- Chemicals used in quality control laboratory tests

- Pest control chemicals
- Floor cleaning/sanitation detergents

The following parameters need to be considered for purchasing decisions:

- Local/Regional/National and International laws and restrictions
- Hazards associated with the purchased chemicals
- ZDHC MRSL conformance requirements
- Brands' RSL/PRSL (Product RSL and Packaging RSL) requirements

The requirements that should be incorporated in a Purchasing Policy are, but not limited to:

1. Guidelines on purchasing chemicals from third-parties such as direct chemical formulators, agents, other facilities and chemical donations and approval flow diagrams
2. A goal to purchase only ZDHC MRSL conformant chemical products, at least at Level 1 ZDHC MRSL Conformance by qualifying the chemical products through the ZDHC Gateway or confirmation of a ChemCheck report
3. Ensuring proper relevant documentation for each chemical, such as Safety Data Sheet (SDS), Technical Data Sheet (TDS), applicable third-party certifications
4. Purchasing new chemical products only after proper assessment for hazards, ZDHC MRSL and Brand RSL conformance by Chemical Responsible Team
5. Communication of ZDHC MRSL/Brand RSL requirements to Chemical Formulators through statements in the purchase order and/or terms & conditions
6. Evaluation methodology of Chemical Formulators for their quality and competency to meet ZDHC MRSL conformance for their chemical products consistently
7. Specific precautions for purchase of recycled commodity chemicals (such as soda ash, acetic acid, etc) to ensure they are free of contaminations of ZDHC MRSL substances
8. Information on Labelling, lot number/batch number as well as expiry dates where applicable of chemicals

The steps for designing a chemical purchasing policy can be prepared as seen in the below table. Please note that for the specific end use of a chemical product you may or may not need all the below specifications:

Step	Description
Setting of Specification	Set up the specific compliance and technical requirements for all chemical products required for production/R&D/ Lab team. *Example of a specification:* • All chemical products should at least meet ZDHC MRSL Level 1 conformance • All dyes must have strength consistency of +/- 2% against the reference standards • Washing agents and wetting agents should be free from APEOs • Dye- fixing agent should contain low formaldehyde to meet RSL limit of 75 ppm in finished product • Bleaching agents must be chlorine-free
Communication with Chemical Formulator	Communicate the specifications to your Chemical Formulator. This could be through a separate document or in the purchase order terms & conditions, with all technical information about your specifications for easy reference and understanding
Pre-purchase documentation	Request all relevant documents such as SDS, ChemCheck Report (wherever required), Technical Data Sheet, Product Specifications or relevant third-party certification (wherever required)
Check ZDHC MRSL, hazard & other conformance information	Check for ZDHC MRSL conformance through registration of the chemical product by the Chemical Formulator in the ZDHC Gateway
	Request for RSL conformance to specific Brand requirement
	Review Safety Data Sheet (SDS) for completeness and correctness of information, especially Sections 2, 3, 9, 11, 12
	Ensure the traceability and source of the chemical product through proper labelling and batch number of each chemical product
	Consider the treatability factor of chemical product such as effluent load (BOD, COD, biodegradability, etc.) in the existing ETP design

Check storage & handling requirements	For a new chemical product, check for: • Adequate storage space, secondary containment requirements and any special storage conditions, such as separation or isolation or fire control or grounding requirements (information from Section 7 & 8 of SDS) • Availability of appropriate Personal Protective Equipment (PPE) for handling the chemical product for relevant health hazard • Any special chemical handling training requirement • Transport precautions for internal transfer within facility or to other facility site (information from Section 14 of SDS)
Purchase order	The purchase order (P.O) should contain clear communication about RSL & ZDHC MRSL requirements in the TERMS & CONDITIONS section. E.g.: • "Chemical Products requested in this PO should conform to a valid version of ZDHC MRSL" • "Chemical Products requested in this PO, at minimum, should meet the ZDHC MRSL conformance level 1 in ZDHC Gateway." • "All chemical products requested in this P.O should be supplied with SDS, CoA and TDS"
Quality control	Purchased chemical products entering within the facility should be first quarantined and checked for the specified quality requirements. If rejected, the chemical drums should be kept in a separate "NON-CONFORMITY" area for return to the Chemical Formulators, with all documents and records
Inclusion in CIL	Once the chemical product is approved by the quality department, it should be recorded into the stock and entered in Chemical Inventory List (CIL) with details required as per the CIL Template

For new chemical products, a trial to evaluate performance characteristics may be required. In such cases, the trial should be performed as per the Technical Data Sheet instructions. Leftover samples should be sent back to the Chemical Formulator after the trial.

As best practice, a *Chemical Formulator Evaluation* methodology may be included in the Chemical Purchasing Policy.

Chemical Formulators offering chemical products at ZDHC MRSL conformance level 1 may be evaluated for their competency in meeting the Supplier's specifications.

Such an evaluation can be done through an on-site visit of the Chemical Formulator's facility or through a document review by the Chemical Responsible Person.

Examples of parameters that can be evaluated about a Chemical Formulator whose products are registered at ZDHC MRSL Level 1:

No	Parameter	Not in place	In progress	Has in place
1	Competent personnel having product safety knowledge or a Product Stewardship team			
2	In house or outsourced analytical testing capability for MRSLs			
3	Environment Management Systems			
4	Third-party certifications for production site for safety in production			
5	Ability to author Safety Data Sheets (SDS)			
6	Membership of international or national organisations connected to product safety (e.g ETAD)			
7	R&D set-up to develop sustainable chemistry			
8	Strategy to register products for ZDHC Level 3			
9	Regulatory compliance to licenses and permits			
10	Worker Health & Safety policy			

1.2.2 Transparency Policy

Transparency is sharing relevant information with specific groups of stakeholders such as Brands/Retailers, supply chain partners, Industry Associations, local government, NGOs as well as internal staff. The Transparency Policy should be written to include;

- List of stakeholders that the Supplier engages with
- Documents and information to be shared with stakeholders
- Frequency of sharing the documents and information
- Process of sharing

For each stakeholder, the tools and documentation required to provide transparency on chemical management should be detailed in the Policy.

Given below are some examples of stakeholder-wise information that should be shared as part of the transparency policy.

Stakeholder	Examples of Transparency Information
NGOs	ZDHC- Supplier to Zero Certificate, DETOX.Live, ZDHC Gateway registration, Corporate Sustainability Report
Local Government or Pollution Control Boards	Wastewater test reports, Permit renewals, ETP design, environment clearance certificate and license to operate
Internal staff member	Chemical Management Policy Roles and responsibilities Training Plan
Brands/Retailers	InCheck Report (every month)
	Retailers
	Corrective Action Plan (CAP) for Non-Conformities in ClearStream
	ZDHC Training Academy Certificate of Chemical Responsible Team members
	Chemical Inventory List (CIL) (as per ZDHC template)
	Permits
Supply Chain Partners (such as Chemical Formulators and Raw Material Suppliers)	ZDHC MRSL/ Sustainable chemistry requirements, the need for a ChemCheck Report, SDS, etc
	Chemical Management Policy
	Specification for chemical compliance and quality requirements for chemical products

1.2.3 Traceability Policy

Traceability is a key aspect of a chemical management strategy in order to ensure a Supplier can locate the source of raw materials, such as fibres, chemical products, etc. To achieve this, an organisation should have a clear overview of its supply chain and an understanding of its processes. Traceability allows for continuous improvement and for incident management regarding chemical non-conformities in end-product and wastewater. Traceability Policy should cover the following:

Chemical Traceability:

Chemical Traceability requires the correct recording of lot/ batch numbers on the Purchase Order of every chemical product entering the manufacturing facility. It requires this be logged on the recipe sheet for each colour batch to be dyed/printed/finished/washed and/or against each article-type manufactured in the facility. This ensures every chemical product can be traced back to its origin should there be need for Root Cause Analysis (RCA) and planning of corrective actions in case of;

- Failure of the article for RSL requirement of a Brand/Retailer
- Non-conformities in ClearStream Report

For example, the failure of a particular batch of a silk garment for pentachlorophenol (PCP) can be traced to the specific lot of the printing thickener (guar gum) used in the printing process and the preventive actions can be planned by the Supplier after discussion with the Chemical Formulator.

Supply Chain Traceability

As a best practice, an organisation must have clear oversight over its sub-suppliers and sub-contractors to maintain traceability for raw materials. For example, an organisation sourcing printed fabrics or pocket linings for their finished garments should maintain full information on the sub-supplier of these raw materials with respect to the sub-supplier's manufacturing site, processes and chemical management. A Supply Chain assessment, as detailed in section 3.1.3 can be included as part of the Transparency Policy.

1.3 How do the different elements of a Chemical Management Policy fit together?

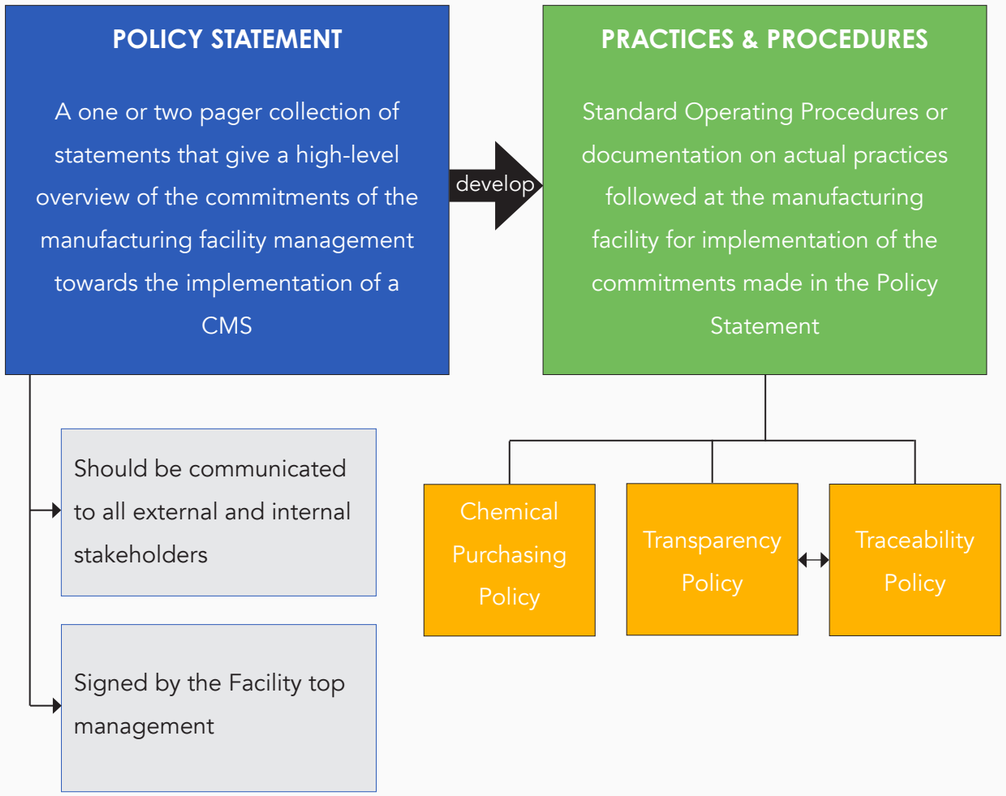


Figure 03: Interconnectivity of elements of chemical management policy

1.4 Check List

(1)	Create a Chemical Management Policy Statement that is communicated and displayed to internal and external stakeholders	
(2)	Outline the relevant practices and procedures for chemical management, from procurement, storage, handling to disposal of chemicals in the policy document	
(3)	Review and update the Policy Statement and current procedures or personnel managing the system for any changes	
(4)	Outline a policy for purchasing chemical products	
(5)	Prepare a Transparency Policy to share information with relevant stakeholders	
(6)	Prepare a Traceability Policy to trace source of chemical products and raw material sub-suppliers	

2. Strategy

Once the Chemical Management Policy Statement is established, a plan for implementation of the commitments should be elaborated and clarified in a Strategy Document. The Strategy should set out the scope and goals for chemical management along with timelines, resources, methodologies or tactics and milestones.

2.1 How to Build Your Chemical Management Strategy

A Chemical Management Strategy can be built on the following:

1. Define the scope of the facility for Chemical Management System (CMS)
2. Decide the infrastructure & resources required for implementing the CMS
3. Finalise an action plan with details of the goals as well as the tools and methodology, timeline, resources, budget and staff responsible and accountable for each defined goal

2.1.1 Defining the Scope

The first step in the Strategy is to define the extent of coverage of the value chain to implement a robust CMS and create a logical boundary.

The scope should cover, at a minimum;

- a Supplier's own single manufacturing facility or multiple facilities (in case the Supplier has multi-locational facilities) and
- engagement with the immediate next level of suppliers and sub-contractors.

In the figure 5 shown below, there is garment stitching Supplier with:

- an in-house garment washing plant and a positional (panel) printing activity. This forms the 'operations' of the Supplier and is the defined boundary of the manufacturing facility.
- a supply chain consisting of sub-suppliers of yarns and fabric, further connected to other yarn, knits and fabric manufacturing facilities
- a supply chain consisting of the Retailer to whom the final products (washed and printed garments) are supplied.
- a sub-contractor with a different ownership where positional printing is contracted

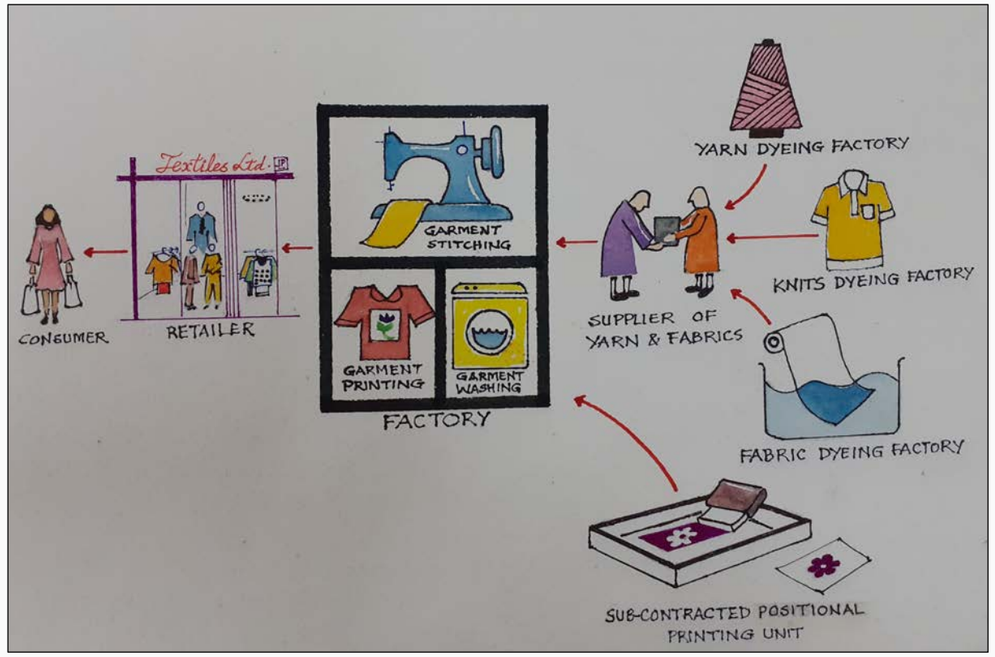


Figure 04: Supply Chain of a Garment Stitching Facility

As part of the Strategy for implementing a Chemical Management System, the scope of the facility to build a CMS Strategy should be:

Scope 1 (Minimum scope): Own operations consisting of garment stitching, garment washing and positional printing. Also adding the immediate sub-suppliers of yarn and fabric and the positional printing sub-contractor.

Scope 2: Own operations consisting of garment stitching, garment washing and positional printing. Also adding the immediate sub-suppliers of yarn and fabric, the positional printing sub-contractor, fabric dyeing factory and the knits dyeing facility.

The chemical management strategy, resources, action plans and budgets will vary for each scope defined by the Supplier.

2.1.2 Designing the Infrastructure and Resources for Chemical Management

As part of the strategy document, it is important to decide the infrastructure and resources required to meet the CMS implementation as per the defined scope.

Dedicated members of staff at the Supplier should have defined roles and responsibilities that will ensure the successful implementation and continuous improvement of the CMS.

Based on the size of operations, a facility can decide on the number of staff required for CMS implementation. It is best practise to have a Chemical Responsible Person or a Core Team, comprising of trained, capable and experienced personnel to oversee the implementation and monitoring of a chemical management system.

The Chemical Responsible Person or Team should have the requisite authority from leadership required to drive the CMS within the facility's scope (as shown by the orange line in figure 05). For larger scale facilities of broader scope, an individual or team may be supported by other departments or functions with complimentary roles and responsibilities (indicated by the dotted lines in Figure 5). A suggested organogram for CMS is given below:

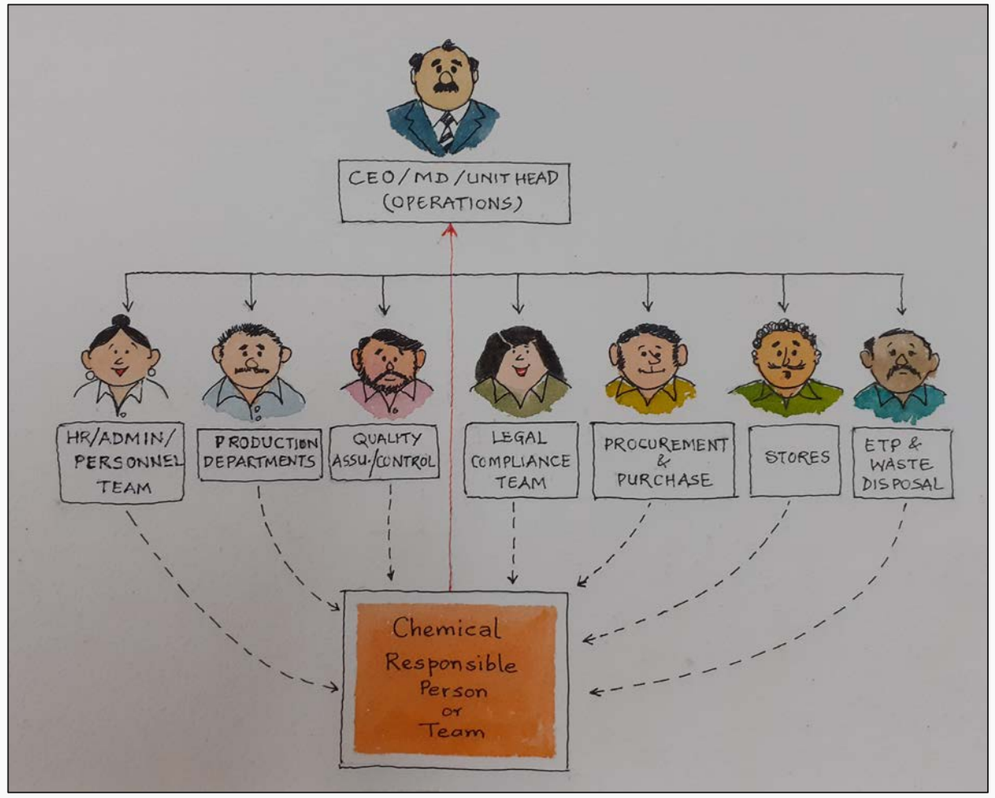


Figure 05: Organogram for chemical management team

The Chemical Responsible Person or Team Members should have the following skill sets:

- Knowledge of chemical products and textile/leather processes and applications
- Comprehensive knowledge of Globally Harmonised System (GHS) of classification and labelling or equivalent as well as local and global regulations on chemical restrictions
- Ability to read and interpret Safety Data Sheets (SDS)
- Competency in Brands Restricted Substances Lists (RSL) criteria and ZDHC MRSL
- Computer skills for usage of online tools such as The ZDHC Gateway
- Expertise in conducting interactive training for internal staff
- Strong people management, analytical, data tracking and communication skills

It is recommended the ZDHC Training Academy modules be used to improve the competency of the Chemical Responsible Person or Team members.

The Chemical Responsible Person or Team oversees all actions for implementation. But the roles and responsibilities of supporting departments should be well defined. Suggested below are the roles and responsibilities which can be used for guidance by a Supplier:

Department/ Member	Responsibilities
Chemical Responsible Person or Team	• Overall responsibility to implement all actions on chemical management required under national and global laws and drive the ZDHC Roadmap to Zero programme in the facility including ZDHC wastewater testing • Maintain access to and use the ZDHC Gateway for CMS implementation activities • Document and understand all chemical conformance requirements (Brand RSLs, ZDHC MRSL and ZDHC Wastewater Guidelines, Safety Data Sheets (SDS), Technical Data Sheets, ZDHC InCheck/ ChemCheck Reports, global & local legislation, eco-labels certifications and supplier declarations) • Conduct risk assessment of chemical inventory and plan precautionary actions for storage, handling and disposal for hazardous chemicals • Develop and maintain the Chemical Management Policy and Strategy documents • Screen & authorise new chemical product purchases after assessing them for ZDHC MRSL and Brand RSL risks prior to procurement and usage in bulk production • Maintain the foundational Chemical Inventory List (CIL) and ensure all data is up to date and complete at the Progressive and Aspirational levels, as applicable • Keep abreast of global regulations for chemical restrictions in end- and chemical products and ZDHC developments • Implement continuous improvement actions for CMS in line with the CMS Strategy
	• Conduct internal training of staff and workers on chemical management topics and safe usage of chemicals • Conduct regular internal audits and facilitate external audits (wherever required) for review and continuous improvement of CMS • Perform root Root Cause Analysis (RCA) and prepare Corrective Action Plan (CAP) for non-conformities (for example RSL failures, non-conformity to the ZDHC Wastewater Guidelines as per ClearStream Report and chemical-related accidents)
Production department(s)	• Responsible for proper storage, internal transportation and handling of chemical products at sub-stores and workplace (such as weighing and auto-dosing) in the production department • Ensure that input chemical products are applied as per specifications & limitations given in Technical Data Sheets (TDS) and Supplier declarations • Ensure that functional First-Aid boxes and eye/body showers are installed at risk areas in the production area for emergency response to chemical accidents • Monitor that workers are given, and they wear appropriate PPE during handling of chemicals on the shop -floor as per labelling guidelines • Maintain traceability of chemical products in recipe/process sheets
Purchase/ Procurement department	• Use the ZDHC Gateway for individual chemical product search or Chemical Formulator search for ZDHC MRSL conformance • Maintain Chemical Inventory List (CIL) Foundational and update with new chemical purchases • Generate the Performance InCheck Report and plan follow-up with those Chemical Formulators which are not registered on the Gateway • Request for ChemCheck Report from Chemical Formulators, when required and maintain a record of the same • Communicate ZDHC MRSL conformance requirements through the Purchase Order issued to Chemical Formulators • When purchasing a new chemical product, check with the Chemical Responsible Team before procurement

Chemical Stores	• Ensure that FIFO (First- In- First -Out) method is implemented and monitored • Plan proper stacking of chemical containers (for ease of access) and ensure their storage at the right place • Maintain a proper spill kit at the main and sub-stores • Ensure that labels on all chemical containers are properly displayed • Check that internal transportation of chemical containers is done in an efficient way to minimise risk of accident • Ensure that hazard communication and safety signage is displayed properly at the correct storage locations and workers are trained in understanding the GHS pictograms or equivalent • Ensure that workers at the stores are supplied with, and use, correct Personal Protective Equipment (PPE) when handling chemicals, as per hazard signage and labels on drums and appropriate to the task being performed • Dispose of used chemical containers and other hazardous chemical waste as per local legal requirements or best practices • Maintain a file of Safety Data Sheets (SDS) of the chemicals stored and update the same when storing new chemicals, make it accessible • Ensure that non-compatible chemicals are not stored together or close, as per compatibility chart • Maintain appropriate and adequate secondary containment for open chemical containers • Ensure cleanliness and good housekeeping at all areas of the main and sub-store
Quality Control/ Assurance Laboratories	• Test purchased chemical products against quality specifications as per purchasing policy • Ensure that test reports for finished articles (for RSLs) and chemicals (for ZDHC MRSL) are properly recorded, in case internal or external testing is done • Communicate any ZDHC MRSL and Brand RSL non-conformance to the Chemical Responsible Team to do an RCA/CAP

HR/Personnel/ Admin team	• Arrange training on chemical management topics and safe chemical handling for staff, supervisors and workers at all levels as per CMS Policy • Organise training and mock- drills on emergency procedures and first aid measures and maintain proper records • Display names of employees with photos and emergency contact numbers of employees trained in fire safety and first aid at key locations of the plant.
ETP/ Waste Management Department	• Monitor daily effluent for regulatory compliance as per local permits & laws and conduct RCA for non-conformities • Ensure proper storage and disposal of sludge as per local laws or best practice not conflicting with local laws • Ensure sampling and testing of wastewater & sludge for ZDHC Wastewater Guidelines and support the Chemical Responsible Person in Root Cause Analysis (RCA) and preparing Corrective Action Plan (CAP) for discrepancies found in the ClearStream report • Maintain proper storage & handling of chemical products used in ETP operations • Ensure regular training of ETP operators and supervisors • Plan proper segregation, storage, handling and transportation for all hazardous and non- hazardous waste • Maintain all required license copies of third- party authorised waste contractors and a logbook on all hazardous waste

2.1.3 Developing an Action Plan

The commitments made in the CMS Policy should be translated into 'SMART' (Specific, Measurable, Achievable, Relevant and Time-Bound) goals that should be tracked for implementation. The Supplier should select the goals based on the priorities and scope for the Chemical Management System.

Each goal should have a detailed methodology and a timeline for achievement. It should also include any financial investment requirements, resources required and the responsible person

or team members. Finally, the Action Plan should include any specific tools or technology required to achieve the goal.

The goals may be divided into milestones with specific timelines to show continuous improvement. For example, the first goal could be to achieve 100% Level 1 MRSL conformance of chemical inventory, which could progress to 100% Level 3 MRSL conformance, followed by phasing out of all chemicals that are Category 1 CMR (carcinogenic, mutagenic, reprotoxic or endocrine disrupting substances) or are persistent in the environment and toxic to aquatic life with long-term effects.

An example of a format that can be used to develop an Action Plan on the CMS Strategy is given below:

Goal	Methodology	Start Date	End Date	Budget Req.	Resources Req. (head-count/ man-days)	Respon-sible Team	Tools/ Technol-ogy req.
To achieve 100% MRSL confor-mance for all input dyes & chemicals	Prepare complete CIL			Nil		Purchase	ZDHC CMS Technical Industry Guide
	Use the ZDHC Gateway to check CIL formulations			Nil		Purchase	ZDHC Gateway
	Identify 'non-evaluated' products from InCheck Report			Access fee for InCheck		Purchase	ZDHC Gateway
	Follow-up with Chemical Formulator through e-mail and meetings			Nil		Purchase	Nil
Phase out chemicals that are identified as CMR, Respiratory sensitizer or aquatic toxic with long-term effect	Identity all chemicals that are classified for GHS Hazard Statements H 340, 341, 350, 351, 360, 361, 370, 371, 372 and H- 400, 410, 411 or with LC50 value < 1 mg/L from the SDS			Nil		Chem-ical Respon-sible Team	Safety Data Sheet (SDS)
	Search for safer alternatives through ZDHC Gateway or engage with chemical suppliers who offer safer chemical products			Nil		Chem-ical Respon-sible Person Purchase Team	ZDHC Gateway, ECHA Website, Other Public hazard data-bases
	Conduct trials of alternatives, evaluate for cost/ performance & implement in bulk production			- Trial lot of chemi-cal -Recipe cost in-crease		Pro-duction team	Nil

2.2 Check List

(1)	Define the scope or boundaries for CMS implementation in your Strategy	
(2)	Based on the scope, design the infrastructure and resources for implementing the Strategy	
(3)	Appoint Chemical Responsible Person or Team and define the roles and responsibilities of the core and support functions	
(4)	Make an Action Plan that details the goals, methodology, timelines, resources, accountable persons, budgets and tools/technology requirements	

3. Assessments

In this section, we will address methodologies for assessment of risks involved with chemical purchasing, use, storage, handling and disposal in a manufacturing facility. Assessments are important to ensure that these risks are eliminated or managed in agreement with your organisation's CMS Policy and Strategy.

3.1 How to Conduct Assessments

Risk assessments can be conducted for the following areas:

1. Regulatory Assessment
2. Chemical Hazard & Risk Assessment including Health & Safety Requirements
3. Supply Chain Assessment
4. Alternative Assessment for chemical products

3.1.1 Regulatory Assessment

Compliance with local laws, international regulations and permits/licenses issued by local or provincial authorities is a mandatory action for managing chemical risks and to ensure a sustainable business.

A regulatory assessment exercise enables you to identify and monitor regulations applicable to

- Chemical restrictions in chemical products and end-articles
- Storage and handling of chemical products
- Transportation of dangerous goods
- Environmental permits related to discharge of wastewater, air and hazardous waste
- Worker Health & Safety

As a manufacturing facility, you need not only to comply with local and provincial laws on chemical restrictions but also to those specific to countries to which you export goods or to those where Brands you supply are selling their end-product.

As the Chemical Responsible Person or Team you will need to do ,amongst others, the below;

1. Compile a list of countries you are exporting to
2. Find all applicable legislations for the countries for your product (e.g. baby-wear, Accessories, etc.)
3. Compile a list of what kind of chemical restrictions you need to follow

Examples of global laws on chemical restrictions that may be required to be monitored include, but are not limited to the following;

Regulations on Product or Consumer Article:

- The Consumer Product Safety Improvement Act (CPSIA), a Federal Law in USA
- California Proposition 65 (or Cal Prop 65) applicable to the State of California, USA
- The Washington Children's Safe Product Act (WCSPA) applicable to Washington State, USA
- Safety Confirmation Act, Supplier's Declaration of Conformity Act and Safety Quality Mark Act in Korea
- GB 18401- 2010 (National General Safety Technical Code for Textile Products) and GB 31701- 2015 (Safety Technical Code for infants' and Children's Textile Products) in China
- Consumer Product Safety Act, Canada
- The Act on Control of Household Products containing Harmful Substances, Japan
- The Chemical Risk Reduction Ordinance, Switzerland
- Regulations on limitations of substances in products, Norway

Regulations on Chemical Products:

- REACH (Registration, Evaluation, Authorization and Restriction of Chemicals) Regulation in EU
- Biocidal Products Regulation (EU 528/2012) applicable in the EU
- EU REGULATION (EC) No 850/2004 on Persistent Organic Pollutants

Regulations on Wastewater & Air Emissions & Hazardous Waste

- Various local regulations enacted by Pollution Control Boards or local authorities

For regulatory assessments, the Chemical Responsible Person or Team should compile:

- A list of local regulatory requirements in chemical use, storage, handling, disposal and discharge
- Copies of and/or internet links to local laws or gazettes or notifications issued by government departments related to chemical and environmental management
- A copy of the 'Environment Impact Assessment' submitted by the facility prior to issuance of the license to operate by the authorities
- An inventory of all permits and licenses issued by local authorities that need to be complied with and renewed on the due dates
- A record of the 'Consent to Operate' given by the local pollution control authority
- A list of global laws on chemical restrictions in finished goods applicable to the facility

After compiling the list, the Chemical Responsible Person or Team should:

- Monitor and study these laws and assign initial and on-going responsibilities for compliance (For example, if the facility is exporting goods to the State of California, then the Cal Prop 65 will be applicable or for exports to the EU, REACH Regulation for articles will be applicable)
- Design a system to communicate with leadership for any significant regulatory changes or permit constraints
- Prepare a workflow system to update applicable regulatory requirements and to ensure compliance with all requirements through an action plan. This includes:
    - Liaison with regulatory authorities for receiving updates and checking websites for monitoring changes in global regulations
    - Review of compliance status, e.g. quarterly meetings and management reviews
    - Internal communication for regulatory compliance, e.g. e-mail communication, regular employee meetings, training and awareness sessions
- Record the regulations and permits to be monitored in a template as suggested below:

No.	Title	Descriptions	Applicable to		Area of Applic-ability	Licenses / Com-pliance Records Required	Reviewed by
			Com-pany	Con-tractor / Supplier			
01	Environment Conservation Act 1996 (section xx)	Regulates air pollution from stationary sources and motor vehicles.	✓	✓			
02	Environment Conservation Act 1996 (section xx)	Regulates water pollution, including reference to specific discharge standards.	✓	X	Discharge of wastewater from production and other sources in the company.		

Template 1: Regulatory Requirements Inventory (Source: GIZ, 2014)

Permit Applicability	Name of the Permit	Issuing Author-ity	Docu-ment No.	Issue Date	Expiry Date, if applic-able	Plan to Review	Respon-sible Team	Remark
Facility	Factory license							
Water	Water Use							
Air	Air emission							
Wastewater	Wastewater discharge							
Hazardous waste	Generation & storage of hazardous waste							
LPG	Storage of Petroleum products							
Hazardous chemicals	Hazardous chemical storage							

Template 2: Permit Inventory

3.1.2 Chemical Hazard and Risk Assessment

Storage and handling of chemical products in a manufacturing facility may pose a risk to human health and the environment. Thus, a manufacturing facility should establish and implement a process for assessing the hazards and risks associated with chemical products identified in the chemical inventory and plan precautionary actions to mitigate these risks.

A hazard is an intrinsic property of a chemical substance to cause harm to humans and/or the environment. Risk is the probability of a chemical substance to cause harm or an adverse impact. Hazard and risk are linked by exposure, which is the possibility of a chemical coming in contact with a person or the environment.

Hazard X Exposure = Risk, which means risk of a chemical substance can be reduced by reducing exposure to it. One can identify the hazard of the chemical product and determine the exposure. Once this is done, all efforts should be made to reduce exposure to reduce the risk.

What type of risks need to be assessed?

Chemical inventory, at minimum, should be assessed for:

1. ZDHC MRSL requirements through the ZDHC Gateway
2. Physical, health and environmental hazards through the SDS

3. RSL-risks (As we are reviewing the risks of the chemical product we are excluding RSL risks at this moment as there are other factors that impact on the conformance or non-conformance of the end-product such as recipes and process conditions)
4. Risks to health & safety of staff through identification of what chemicals staff may be exposed to and what activities can increase exposure risk

All risk can be reduced by ensuring knowledge of what is in a chemical product and proper control of processes for it is shared across those with access to it. Please refer to Appendix A for Guidelines from the council directive for risk assessment.

ZDHC MRSL non-conformance risks can be mitigated by purchasing chemical products from the ZDHC Gateway which is a published database of ZDHC MRSL-conformant chemical products. In case access to the ZDHC Gateway is not available, the facility can ask its chemical vendors for a ChemCheck Report for each chemical product being used in its production process. At a minimum, the facility should aim to use chemical products that are at Level 1 ZDHC MRSL Conformance on the ZDHC Gateway and have a roadmap to move towards higher conformance levels. The higher the ZDHC MRSL conformance level, the greater the confidence that chemicals will meet ZDHC MRSL norms and thus reduce risk of ZDHC MRSL substances in the chemical inventory.

Hazards are of 3 types (as per GHS):

Physical: Chemical substances that may be explosive, self- reactive, corrosive to metals, oxidising liquids, etc.

Health: Chemical substances that may be toxic or cause cancer, germ cell mutagenicity, skin/ eye allergies, damage organs, affect fertility & reproduction or may be an endocrine disruptor.
Environmental: Chemical substances that are toxic to aquatic or terrestrial life, persistent, bio accumulative or impact the ozone layer.

Both health and environmental hazards are considered in the ZDHC MRSL, for more information please review the MRSL Update Principles and Procedures.

How do we identify hazards?

Hazards in chemical products can be identified in the following ways:

1. Through Safety Data Sheets (SDS)
2. Through labels on the chemical container
3. Information on ingredients through CAS numbers

Safety Data Sheet (SDS) is a document that is provided by a Chemical Formulator and contains information on the hazards of a substance or preparation, potential effects on exposure to the chemical product and safe procedures for storage, handling and disposal. A GHS/CLP based SDS contains 16 sections.

1	Product and Producer identification	9	Physical and Chemical Properties
2	Hazards Identification	10	Stability and Reactivity
3	Information on ingredients	11	Toxicological Information
4	First Aid Measures	12	Ecological information
5	Firefighting Measures	13	Disposal considerations
6	Accidental Release Measures	14	Transport Information
7	Handling and Storage	15	Regulatory information
8	Exposure Controls/PPE	16	Other information

Immediate details on hazards can be identified from the Hazard or H-Statements described in Section 2 of an SDS that have been prepared as per the Globally Harmonized System/ Classification, Labelling and Packaging Directive (GHS/CLP) for classification & labelling norms. This section contains the following details:

- Signal Word: Danger/Warning
- Hazard Statements
- GHS Pictograms for specific hazards of the substance or formulation
- Precautionary Statements
- Overall hazard classification of the formulation

In the below snapshot of Section 2 of the SDS of a chemical, it has two hazards:

- Causes skin irritation
- May cause allergy or asthma or breathing difficulties if inhaled

Safety Data Sheet

according to Regulation (EC) no. 1907/2006
version 5.2 Revision date 03.01.2015
Print date 10.12.2015

GENERIC EU SDS - NO COUNTRY SPECIFIC DATA - NO SPECIFIC DATA

SECTION 2 : Hazard Identification

Label Elements

Signal Word	:	Danger
Hazard Statements	:	H-315 Causes skin irritation H-334 May cause allergy or asthma or breathing difficulties if inhaled
Pictograms	:	
Precautionary Statements	:	P-101 Read label before use P-261 Avoid breathing dust / gas / mist / vapors P-280 Wear protective gloves/eye protection/face protection
GHS Classification	:	Skin Corrosion/Irritation Category 2 Respiratory sensitization Category 1

Figure 06: Example of a hazard identification from a section 2 of a Safety Data Sheet (SDS)

Other Sections in the SDS that may be referred to for more information on hazards are:

Section 11 – Toxicological information, where the toxicity dose (LD50 value) of the substance or formulation should be checked. If this value is < 2000 mg/Kg, the chemical is deemed harmful or toxic and potential exposure through mouth or skin should be avoided. If possible, substitute such a chemical with a safer alternative that has an LD50 value > 2000 mg/Kg

Section 12 – Ecotoxicological information, where Aquatic toxicity (LC50 value) and inherent biodegradability should be checked. Chemicals with LC50 value < 1 mg/L and/or inherent biodegradability of < 70% should be discouraged from being discharged to the environment. If possible, they should be substituted with safer alternatives.

Section 9 (Physical & Chemical properties) and *Section 10 (Stability & Compatibility)* give information on physical hazards and storage compatibility issues.

The SDS should be studied and interpreted to manage risks, reduce accidents, ensure worker Health & Safety, safe storage and plan any environmental and ETP impacts by using the information in the different sections as shown below:

Risk Management

Section 2: Hazard Identification
Section 3: Composition, Information or Ingredients
Section 15: Regulatory Information

Incident & Accident Management

Section 4: First Aid Measures
Section 5: Fire-Fighting Measures
Section 6: Accidental Release Measures

Health & Safety Management

Section 8: Exposure Controls and Personal Protection
Section 10: Stability and Reactivity
Section 11: Toxicological Information

Quality Control

Section 9: Physical and Chemical Properties
Section 10: Stability and Reactivity

Store Management

Section 7: Handling and Storage
Section 9: Physical and Chemical Properties
Section 10: Stability and Reactivity

Environmental Management

Section 9: Physical and Chemical Properties
Section 12: Ecological Information

WWTP Management

Section 12: Ecological Information

Figure 07: Interpretation of SDS sections for actions on chemical management

Labels on chemical containers can also be used to identify the hazards. As per GHS/CLP, there are 5 elements that must appear on a container:

1. Product Name or Identifier (as given in the Section 1 of the Safety Data Sheet (SDS))
2. Signal Word
3. Hazard Statements (with code)
4. Precautionary Statements (with code)
5. Pictogram

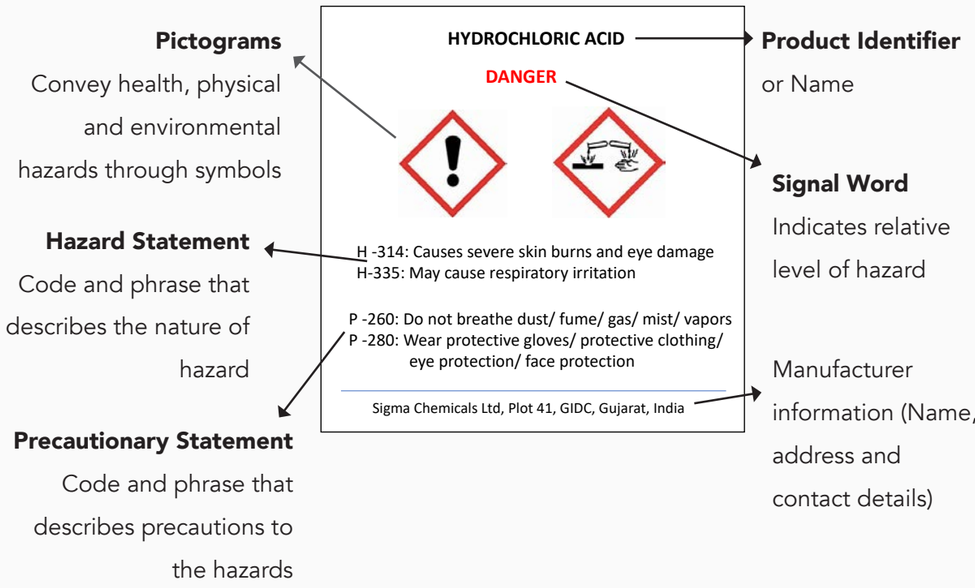


Figure 08: GHS Label Elements

As per the ZDHC CMS Framework, the following information should also be available on the label of the container:

- Chemical Formulator name and contact details
- Lot number
- Date of manufacture/expiry date (where possible)

Once the hazards in a chemical product are identified, they should be documented in the Chemical Inventory List (CIL) (refer section 5 for more details) along with precautions required to be implemented for storage, handling and disposal.

Also, hazards in chemical products should be communicated to workers and other stakeholders in the facility through Signage and/or Chemical Snapshots. Signage can be for Warning, Forbidden or Suggestions, as shown below:

Figure 09: Examples of signages to communicate hazards at critical places in a facility

Health & Safety Assessment

The Chemical Risk Assessment reveals INFORMATION. The Health & Safety Assessment illuminates ACTION needed as a result of knowing that information, in order to PREVENT risk. In other words, chemicals should be assessed for impact on the safety and the health of staff by measuring which activities at the manufacturing facility and to which extent may expose them to risk.

Five steps to assess Health & Safety Risks:

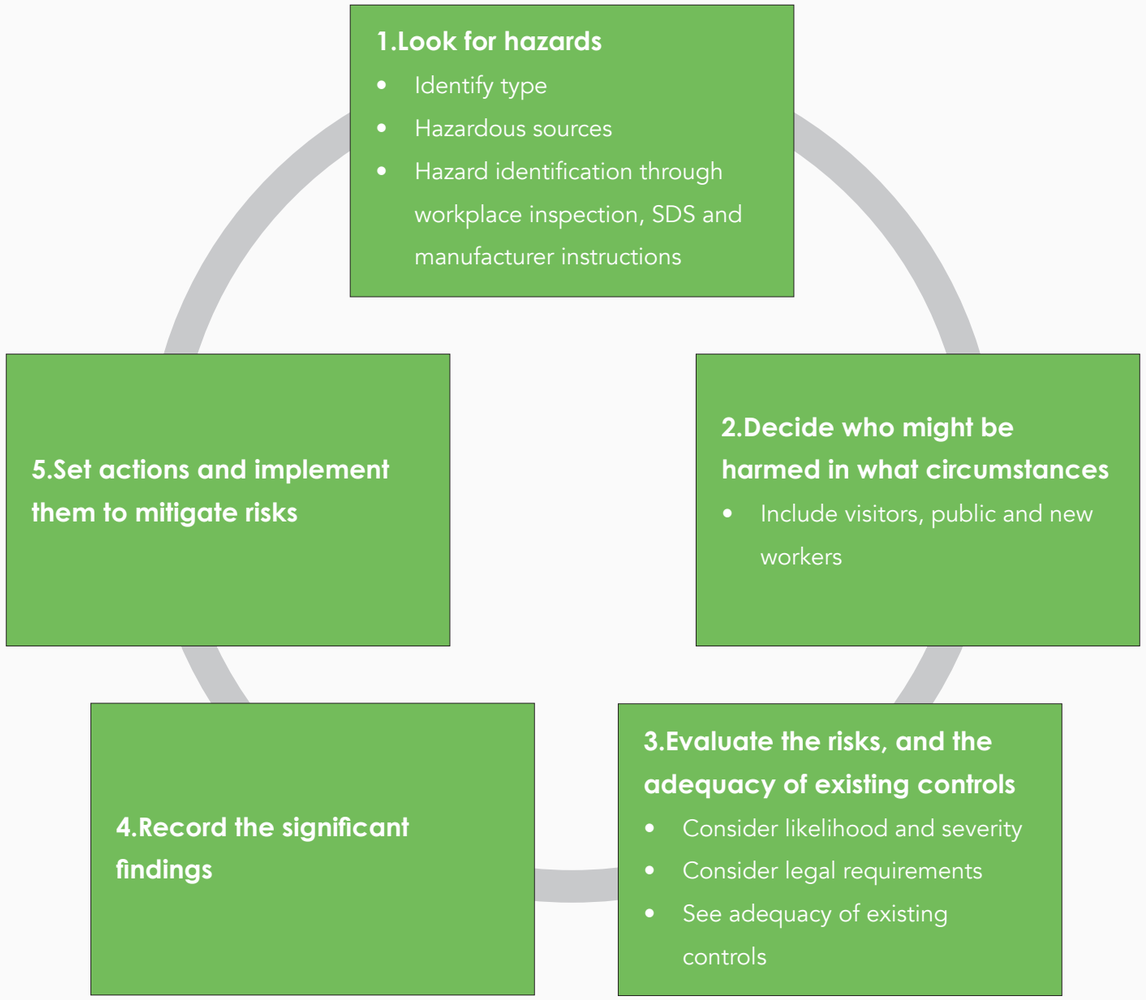


Figure 10: Five steps to assess Health & Safety Risks

Some parameters suggested for health & safety assessment are:

- General housekeeping and maintenance of
  - machinery, piping and other equipment for leakages, pressure gauges, heat emissions, etc.
  - emergency response equipment (eye wash and body showers), First-Aid boxes, engineering controls, electrical wiring, heat exchangers, boilers, ventilation, secondary containment, spill kits, assembly points, etc.
- Safety precautions at all solid and hazardous waste collection and storage areas

- Ergonomic risks associated with repetitive tasks for work-related musculoskeletal disorders
- Expiry, adequacy and appropriateness of PPE
- Records of incident management with preventive actions implementation
- Regular training and emergency/mock drills to all workers and staff on chemical handling and Health & Safety measures
- Emergency contacts for responsible persons, First-Aid, nearest hospital, fire station, etc to be displayed prominently throughout the facility

3.1.3 Supply Chain Assessment

Raw material suppliers or sub-contractors, should be assessed to cover risks for chemical management.

The supply chain assessment exercise can be conducted with the following steps:

1. List all activities in the manufacturing facility which are sub-contracted. Examples of such activities are:
   - a yarn dyeing unit outsourcing work to a unit it does not own due to lack of capacity
   - a fabric dyeing facility outsourcing the printing of fabrics
   - a garment washing unit without dyeing equipment outsourcing garment dyeing to a separate facility
   - a finishing unit outsourcing the sizing operations for woven fabrics
2. List all raw materials (other than chemical products) entering the facility and the sub-suppliers for these. This may include, but is not limited to: greige yarn, greige fabrics, unwashed garments, trims & accessories, raw hides, wet blue hides, dyed yarn, printed fabrics, coated fabrics, etc.
3. Design an assessment plan for the sub-contractors listed in 1 and 2 for the suggested parameters in the table below. The assessment can be done through a site visit by the Chemical Responsible Person or competent Team member or through document review. The assessment should be documented and reviewed, and if a sub-supplier or sub-contractor does not meet the criteria of your CMS Policy & Strategy, corrective actions need to be taken

Parameter	What to assess
MRSL conformance	Systems followed for purchasing ZDHC MRSL conformant chemicals in their facility *Example KPI; All chemical products purchased by the sub-contractor should be at minimum ZDHC MRSL Conformance Level 1*
RSL conformance	Systems followed for PRSL conformance management. *Example KPI; Randomly test raw materials for Brand PRSL conformance*
CMS	Chemical Purchasing Policy Quality Policy Competent CMS Team and procedures *Example KPI; Have completed Supplier to Zero Foundational*
Legal compliance	licenses and permits, any violations for wastewater, sludge and air emissions to legal norms
Social compliance	All applicable social compliance norms *Example KPI; Have the* HIGG FSLM
Traceability	CIL with chemical product batch numbers and recipe sheets (in case chemical products are used)
Health & Safety	Proper PPE availability, exposure controls and good housekeeping practices *Example KPI; PPE kept at accessible location.*
Wastewater	ZDHC Wastewater Guidelines *Example KPI; Complete wastewater test on the ZDHC Gateway 2x per year*
Training & Continuous improvement	Records of training on CMS, internal audits and CAP reports

3.1.4 Alternative Chemicals Assessment

Chemicals of concern should be replaced with safer alternatives while maintaining performance and economic viability. However, to avoid regrettable substitutions, a science-based and transparent assessment of the proposed alternative must be done.

The following steps are suggested for chemical alternative assessment:

1 Identify Hazards and Properties
Define the hazards, function and performance properties of the chemical identified for substitution. Check if substitution might imply changing conditions of aplication such as pH, temperature, equipment.

2 Set Substitution Criteria
Describe the criteria to eliminate substitutions that may not be safer or safe enough. Use public databases to list substances of concern or those on 'blacklists' in regulations.

3 Search for Alternatives
Use the internet, public databases, website of regulatory authorities and other sources available in public domain to look for alternatives already implemented. Discuss with your chemical supplier if safer formulations are produced and available from them.

4 Compare Alternatives
Assess all alternatives using same method and against the set substitution criteria. Do a cost-benefit analysis and select the alternative that best suits the nature and dimension of the problem.

5 Pilot Trials
Check the safer alternative on a small-scale trial and plan the changes needed in process and equipment. Assess the performance, quality and the impact on workers. Confirm if risks in other areas could occur.

6 Implement in Bulk
Scale-up pilot trials to implement in production. Continuously measure any impacts in risks or performance during implementation. Collect feedback from stakeholders and improve if required.

Figure 10: Steps for substitution (Resource: www.subsport.eu)

Tools and Methods	Explanation
Chemical Formulator	Contact new and existing Chemical Formulators to discuss what sustainable or safer alternatives they offer.
ZDHC MRSL	See ZDHC MRSL for substances banned from intentional use in commercial chemical formulations. Check alternatives for presence of these banned substances to avoid regrettable substitutions.
ZDHC Gateway-Chemical Module	The ZDHC Gateway is a database of commercial chemical formulations verified for conformance to the ZDHC MRSL through third-party certifications. A search using the 'organisation type' or 'certifier type' or 'substrate type' filters can be done to procure ZDHC MRSL conformant products.
ZDHC ChemCheck	Request ZDHC ChemCheck from your chemical supplier to demonstrate the ZDHC MRSL conformance level.
ZDHC InCheck	Use the ZDHC InCheck Report to track your inventory for ZDHC MRSL conformance levels.
Alternative assessment tools	Several tools exist on the market such as, but not limited to: Greenscreen, SUBSPORT, or Toxics Use Reduction Institute (TURI).
Further resources	Use reports on chemical substances from authorities such as ECHA, US EP, ChemSec Marketplace or KEMI.
Collaboration	Collaborate with other businesses, academic research institutes or brands for alternative assessment.

3.2 Check List

(1)	Conduct a regulatory assessment of local and global laws, permits and licenses to ensure compliance	
(2)	Conduct a chemical hazard and risk assessment of chemical products used in the facility for ZDHC MRSL and physical/health/environmental hazards	
(3)	Access Health & Safety of staff through measuring exposure to chemical risks	
(4)	Conduct an assessment of your sub-suppliers and sub-contractors for CMS activities	
(5)	Prioritise chemicals of concern for substitution through a chemical alternative assessment using ZDHC Gateway and other public tools to avoid regrettable substitution	

4. Health & Safety

Onsite, chemical products are stored, handled, transported internally, used and then chemical waste and containers are disposed of. Chemical hazards can thus have an impact on the Health & Safety of staff (workers and other employees) as well on that of sub-contractors and visitors.

4.1 How to Ensure Health & Safety For Chemical Hazards

After doing a proper Health & Safety Assessment (as outlined in Section 3.1.2), actions should be planned for:

1. **Controlling exposure** to the identified hazards through a hierarchy of control measures
2. Providing suitable **Personal Protective Equipment (PPE)** to staff handling these chemicals.
3. Establishing **emergency response procedures** to mitigate accidents

All staff need to be educated on hazards in chemicals they use, how to control exposure by the proper use of PPE and on emergency procedure

4.1.1 Controlling exposure through a hierarchy of control measures

The risks from chemical products can be reduced or eliminated by controlling exposure of staff to that hazard. The main objective of exposure control is to protect staff from intentional as well as inadvertent exposure during normal usage or in an emergency situation. Exposure to chemicals is through 3 routes:

1. Inhalation (nose)
2. Oral (mouth), and/or
3. Dermal (skin)

Inhalation – exposure:

Chemicals can enter the body through the nasal route and damage the respiratory tract or lungs if they:

- form dust and/or mist
- liberate vapour or gases

Examples of chemicals with risk of inhalation exposure are:

- Dusting of Hydrosulphite during the transfer from a container to a machine
- Dusting of dyestuffs in the weighing area
- Volatile chemical vapour in printing area (screen or roller preparation)
- Handling and use of ammonia in printing
- Stain remover sprayed on finished garments
- Hypochlorite fumes in bleaching processes
- Formaldehyde release during application of resin finishing on a stenter machine
- Potassium permanganate spray on denim jeans for faded effects
- Chrome sulphate during the tanning stage

The use of appropriate nose masks to restrict this exposure can control the risks.

Oral – exposure:

Chemicals can enter the bloodstream if swallowed. This can happen if a chemical is handled without gloves and the worker

- uses his hands later for eating food without washing hands properly or
- inadvertently touches his lips or mouth with contaminated hands or
- uses a used and contaminated chemical container for storing and drinking water or food

Good personal hygiene, use of suitable gloves and provision of separate and clean eating areas can help to control the risks.

Dermal – exposure

Chemicals can damage the skin or eyes or enter the body on absorption through skin. This can happen during weighing chemical products, transferring chemical products from one container to another, internal transportation from stores to sub-stores or machines, chemical product splashes or during spillages or breakages of containers.

The use of gloves, body suits, face masks, goggles and boots when handling chemicals with skin hazards, as well as installation of emergency response measures such as eye wash and body shower areas at critical areas in the facility can help to control these risks.

Based on the assessments mentioned in section 3.1.2 you should implement protective measures for identified exposure risks. Once information about hazardous chemicals and their exposure routes is available, follow the control measures given below in figure 11 to ensure health & safety of staff.

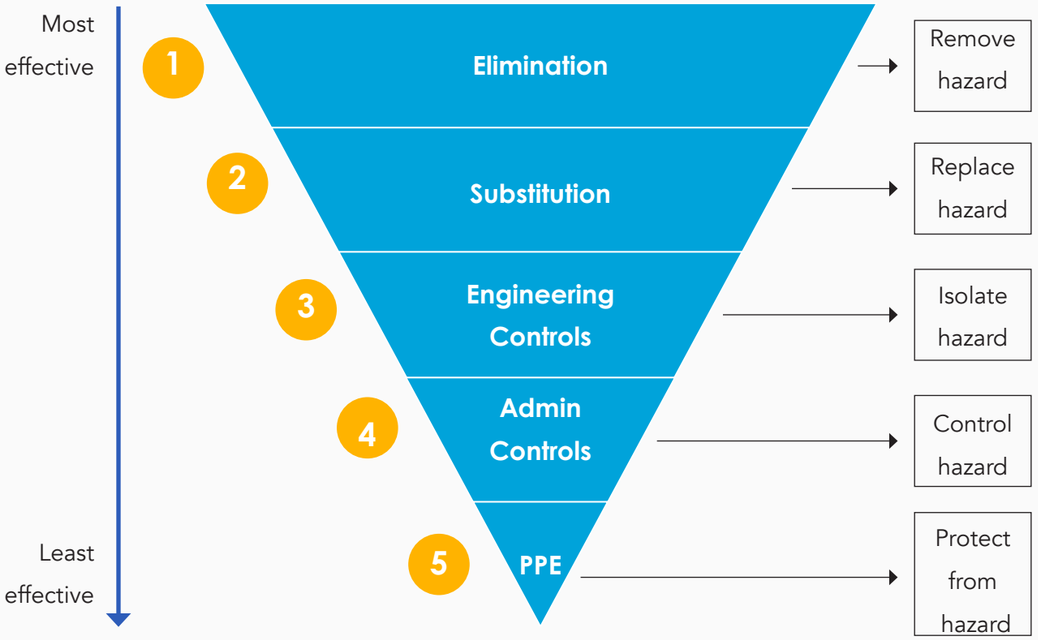


Figure 11: Hierarchy of Controls

Examples to show how chemical products can be evaluated for the hierarchy of controls on a case-by-case basis based on conditions are given in Appendix B.

4.1.1.1 Elimination

Elimination requires that the purchasing and usage of any chemical identified as hazardous should cease.

Examples of exposure control through elimination are:

- Stop using PFC-based finishes unless the need for oil repellency is specifically required
- Use of enzymes for soaking and liming that eliminates certain commodity chemicals
- E-Control (Pad- Humidity-Fix) dyeing process to eliminate use of Sodium Silicate
- Cold-Pad-Batch process to eliminate use of salt

4.1.1.2 Substitution

Substituting safer chemicals in place of hazardous chemicals leads to the reduction of exposure to harm. Substitution may be possible through;

- The use of alternative chemical product without affecting performance properties
- Change in physical form of the chemical product

Examples of exposure control measure by substitution are:

- Replacing powdered vat dye (which has a high risk of dust formation) with liquid or colloidal form of vat dyes
- Using a resin finishing agent with low formaldehyde or zero formaldehyde
- Using formic acid in place of acetic acid to reduce COD load on effluent
- Substituting a PP spray with laser- cutting or ozone technology in garment finishing
- Replacing pumice stones with enzymes in denim garment washing
- Water-based polyurethane as opposed to solvent-based polyurethane in synthetics manufacturing
- Use of enzymes for pre-treatment of cotton to eliminate use of hazardous chemicals such as caustic soda
- Fatty-alcohol based washing agents in place of APEO- based detergents

4.1.1.3 Engineering Controls

Engineering controls can help reduce exposure to chemicals. Examples of engineering controls are:

- Installing local exhaust ventilation (LEV) measures and equipment in the workplace area where maximum exposure can happen
- Isolated or cordoned-off areas or booths for processes where volatile emissions are high (such as screen preparation areas or spray areas)
- Auto-dosing systems for dyeing machines
- Installation of an exhaust system on stenter
- Installation of suction hood for dyestuff weighing – to collect dye dust particles during weighing (see figure 12)
- Water curtain for PP sprays in denim garment finishing (see figure 13)
- Use of de-dusting machine after buffing machine

Always refer to the Globally Harmonized System (GHS) compliant SDS, Section 8.2.1. to understand the engineering controls required for a chemical product.

Figure 12: Fuming hood ventilation for dye storage

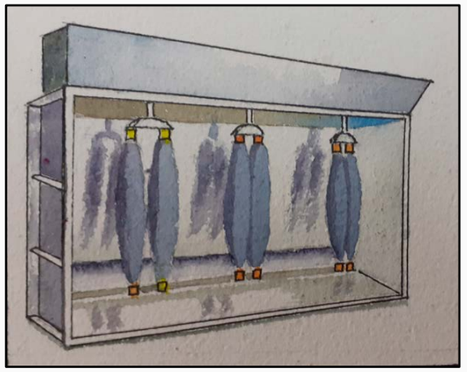


Figure 13: Spray booth for PP-Spray

4.1.1.4 Administrative Controls

Administrative controls are work practices or procedures to reduce/eliminate chemical exposure of staff and manage the way they work.

Examples of administrative controls are:

- Rotating staff/tasks to reduce exposure time in chemical use area
- Restricting the task to only those competent or qualified to perform the work
- Limiting the quantities of hazardous chemical products stored and the provision of segregated storage areas for hazardous chemicals (for example Sodium hydrosulphite should be stored in an isolated dry area)
- Restrict access to chemical product storage area to authorised staff only
- Provide appropriate hygiene facilities, e.g. wash stations
- Conduct regular training to staff on hazards and safe handling of chemical products, understanding and reading labels & hazard symbols, spill management procedures and/or PPE use
- Perform a preventative maintenance programme for all process machinery

4.1.1.5 Personal Protective Equipment (PPE)

Use of PPE should be considered only if none of the other controls can be applied or in conjunction with other measures. For more information please see 4.1.2.

4.1.1.6 Creating a Standard Operating Procedures (SOP) on Exposure Control

The Chemical Responsible Person or Team can prepare an SOP on Exposure Control that documents health & safety requirements and the control measures required to reduce risks for staff at the manufacturing facility. The SOP should:

- consider the hierarchy of control measures based on the assessment done for health & safety due to chemical hazards
- describe the 'chemical flow' right from entry to exit of a chemical product through a manufacturing facility along with procedures that will be applied to control exposure to chemicals

- identify the 'hotspots' in the manufacturing facility where exposure risks are the highest
- detail the training and supervision methods (including mock drills) for exposure control

4.1.2 Personal Protective Equipment (PPE)

Personal protective equipment should be used for protection against accidents and incidents that may occur despite appropriate exposure control systems and operational procedures. A proper inventory of PPE should be maintained by the Chemical Responsible Person. PPE required for prevention of different exposures is:

	Type of Protection	Exposure Route	PPE examples
	Eye and face protection	Oral, Dermal	Safety glasses, goggles, face shields etc.
	Skin protection	Dermal	Chemical resistant footwear – shoes/boots/wellingtons, Clothing –aprons/suits
	Hand protection	Dermal, Oral	Gloves or gauntlets, disposable or otherwise, which are suitable for the job
	Respiratory protection	Inhalation	Respirators, masks or hoods that give adequate protection

At minimum, an organisation shall:

- Make a Standard Operating Procedures (SOP) to identify and use appropriate PPE
- Ensure that appropriate PPE is available to staff at potential exposure areas
- Segregate storage of chemical products based on type of PPE required to handle, as far as possible
- Review PPE effectiveness and replacement when necessary

4.1.2.1 Selection of PPE

PPE must be selected based on a formal job hazard review that identifies the specific chemical or physical hazards associated with the work task and the proper type of PPE. Complete information on PPE recommendations and selection for a chemical can be found in Section 8 of an GHS (or equivalent) SDS.

Face and eye protection

Eye and face protection must be used for exposure to hazards resulting from flying particles, dusts and mists and handling of liquids, acids and corrosive chemicals to prevent splashes coming onto the skin or eyes. Eye or face protection should

- fit comfortably, without pinching the nose or causing pressure on the head.
- not distort or block vision

Hand protection

Impervious gloves protect the hands of staff from absorption of chemicals through skin. Chemical-resistant gloves are typically made of

- Rubber such as natural, butyl, neoprene, nitrile and fluorocarbon (Viton) or
- Plastic such as polyvinyl chloride (PVC), polyvinyl alcohol and polyethylene.
- These materials can be blended or laminated for better performance.

When working with chemicals, always check the SDS (Section 8) to know the glove specification.

Latex (natural rubber)	Nitrile rubber	Butyl rubber	Neoprene	Norfoil
				
Low chemical-resistance. Suitable for general cleaning. Do not use to handle chemicals	Protects against oil, grease, some acids, bases and some solvents Do not use when working with oxidizing agents, strong organic solvents.	Protects against peroxides, acids, bases and alcohols Do not use working with halogenated solvents or petroleum-based products.	Protects against gasoline, some alcohols, hydraulic fluids, organic acids and alkaline Do not use working with strong organic solvents	Applicable for most hazardous chemicals.

Respiratory protection

This is to prevent inhalation of harmful airborne substances or volatile compounds emitted from chemical products during application or handling. Respirators are selected based on results of staff exposure in terms of time and extent of exposure as well as regular testing of air samples to monitor conformance to occupational exposure limits as outlined in Section 8.1 of the GHS (or equivalent) SDS.

The different types of respirators are:

- **Air purifying respirator (APR):** has an air-purifying filter, cartridge or canister that removes specific air contaminants, such as particulates, gases and vapours or both from the air. APRs are of three types: Dust mask, Half-face mask and full- face mask. Filters/cartridges should be replaced after a certain period of use.

- **Supplied air respirators (SAR):** are respirators that supply clean breathing air from an uncontaminated source (independent supply).

Common respiratory protection:

Figure 14: Full face mask, Supplied air respirators (SAR), Half face mask, Dust mask, Air purifying respirators (APR)

Selection of appropriate respiratory protection can be based on the following criteria:

- Hazard Identification – Identify if a respiratory hazard is associated with the chemical product after checking the SDS (Section 2)
- Exposure Assessment – Assess the exposure levels of staff in the work environment
- Respirator Selection – Select the appropriate respirators based on respiratory hazards and user factors
- Fit-Testing – Perform fit testing of the respirator on every staff member

Skin Protection

Skin protection PPE prevents the contaminant or hazardous chemical from reaching the clothing or skin of the wearer. The most common skin PPE is chemical resistant apron or full body suit. Other skin-protection PPE such as impermeable boots (for legs), gloves (for hands) and face masks (for face protection) can also be used in combination.

4.1.2.2 Training for staff on PPE

The training should be given to all new staff joining the facility as well as new sub-contracted workers. Training should be provided to regular staff in case of new chemical products or processes used in the manufacturing facility and to refresh their knowledge. Records of such training must be maintained. The topics for training could be:

- *When and How to use PPE?*
- *How to take care of PPE after every use?*
- *Where and how to store it safely to prevent contamination?*

- *How to check PPE for its functionality and based on the calculation of the time interval where the PPE is being exposed?*
- *How to dispose PPE after use*

Also refer to Chapter 9.2 for additional information on training

Important PPE considerations

1. Identify all types of PPE needed in the facility
2. Select PPE appropriate to multiple chemical-related tasks to avoid staff having to add or change it mid-task
3. Segregate chemical storage according to PPE required to handle them. This will help staff understand and use appropriate PPE
4. PPE is personal equipment. Each person responsible for handling chemicals should be provided with their own individual PPE
5. PPE should be provided and maintained by the employer at no cost to the employee
6. PPE should be checked regularly for damage, contamination or wear-and-tear and replaced with new where applicable

4.1.2.3 PPE Signage

Prominent display of instructions for use of PPE is a vital communication tool in areas where handling of chemicals takes place. Recommended symbols for PPE are as follows:

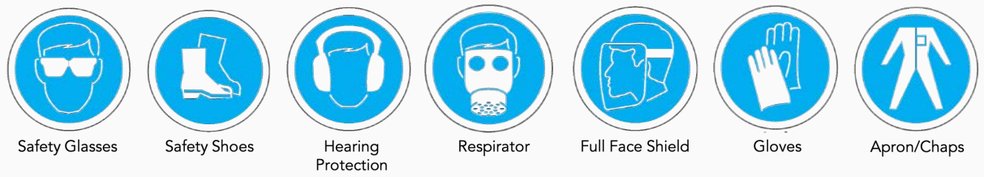


Figure 15: Recommended symbols for PPEs

4.1.3 Emergency Response Procedures

A written Emergency Response Procedure should be prepared by the facility. This should comprise crisis planning in response to fire, chemical leaks, spills and splashes and other medical emergencies after proper assessment. It may also outline response to damage to buildings and persons due to major external emergencies such as earthquakes, flooding, civil unrest, tsunami or industrial gas leaks. The appropriate authorities should be consulted as to details of emergency planning that might be useful or required to include.

It is important to establish an 'Emergency Response Team' with defined roles and responsibilities for possible emergencies.

- The names and contact numbers of the members of the team should be displayed at prominent locations of the facility.
- The team should have a 'Command and Coordination' structure consisting of personnel trained in emergency procedures and mitigation.
- A checklist of emergency activities can also be prepared and assigned for responsibility to specific team members.

Important aspects of an Emergency Response Procedure are:

- Establish "Assembly Point(s)" for employees to gather in case of evacuation from the factory premises. The Assembly Point(s) should be in an open area having enough space to accommodate all employees on a temporary basis, be free of any obstacles or encroachments and easily accessible.
- Display "Evacuation Plans" with factory layout at critical positions in the facility so that employees and visitors know their exact location in the facility and how to quickly move to the Assembly Point in case of emergency.
- Mark all "Exit Points" with glow signs and pathways with fluorescent yellow or green lines to indicate exit paths.
- Ensure that there is a record of staff and visitors present on the premises to make sure no one is left behind in the case of an emergency evacuation.
- Disabled staff or those with a certain medical history should be assigned to an emergency response team member to guide them to safety.
- Display signage at locations where fire extinguishers, First-Aid boxes and eyewash/ body showers are located for easy identification by staff and visitors.
- Perform emergency mock drills at regular intervals to ensure alertness of staff and

effective monitoring of response systems. At a minimum, these should be conducted twice a year and the procedures updated after the practice drill, wherever required.

- Provide back-up emergency lighting in Stores and other production areas (where natural lighting may not be available) in case of power outages during emergencies.
- Regularly check First-Aid boxes, eyewash and body shower stations to see these are properly maintained and functional.
- Evaluate buildings for any structural damage or wear and tear.
- Install warning systems such as loudspeakers and sirens and have regular checks that these are working efficiently.
- Keep First-Aid boxes at high risk locations and ensure that there are proper numbers available (as a rule of thumb, there should at least be 1 First-Aid box for every 100 workers or, should local regulations decree more, that should be followed).
- Make a list of external services to be called for emergency support such as fire brigade, hospital, disaster management centres.

4.1.3.1 Fire Management

The prevention of fire is the core principle of fire management. However, in case of fire outbreak, its spread can be prevented by managing one of the three factors – suppressing oxygen supply, fuel and the ignition source.

Typical fire safety measures include, but are not limited to:

- Fire alarm systems (sound and light) which are distinct from other alarms and notification systems
- Fire extinguishers suitable for types of fire (Class A, B, C or D) which are serviced regularly
- Sand buckets, hydrants and fire hoses at chemical stores and other high-risk areas in the facility
- Automatic sprinkler system at the place where flammable chemicals are stored
- Emergency lighting along exit routes
- Regular Fire drills and training of staff on use of fire equipment and evacuation methodology
- Display "No Smoking" signs and prevent staff from smoking within the facility

- Electrical wiring cables that are fire-proof and wiring systems that do not lead to short-circuit
- Explosion-proof lighting should be installed in chemical stores
- Segregated storage of chemicals identified as fire hazards with all fire safety systems

	**Know your fire extinguishers**				
	Water	Foam Spray	CO2	ABC Powder	Wet Chemical
 Wood, paper and textiles	✓ Safe for	✓ Safe for	⊘ Not safe for	✓ Safe for	✓ Safe for
 Flammable liquids	⊘ Not safe for	✓ Safe for	✓ Safe for	✓ Safe for	⊘ Not safe for
 Gaseous fires	⊘ Not safe for	⊘ Not safe for	⊘ Not safe for	✓ Safe for	⊘ Not safe for
 Cooking oils and deep fat fires	⊘ Not safe for	⊘ Not safe for	⊘ Not safe for	⊘ Not safe for	✓ Safe for
 Live electrical equipment	⊘ Not safe for	⊘ Not safe for	✓ Safe for	✓ Safe for	⊘ Not safe for

Figure 16: Types of Fire extinguishers

4.1.3.2 Chemical Spill Management

Even in the best managed chemicals stores and areas, spillage happens occasionally.
You can prevent spillages by:

- Checking containers on delivery for any cracks or damage before storage
- Ensuring safe handling practices (such as mechanised or manually-driven trolleys) for internal movement of chemical containers
- Proper stacking of containers in slotted angle racks in the chemical stores to prevent their falling over

To contain any spillages, following measures should be incorporated:

- Secondary containment for chemical containers to arrest the spread of spillage
- Spill control kits (see figure 17): This should contain
  - sawdust, sand or any other absorbent container to absorb the liquid spill
  - broom, shovel and gloves
  - an empty container marked "Hazardous Waste"
  - a trolley to keep these items (for taking them quickly to the spillage place)
- Refer to Safety Data Sheet (SDS) and manufacturer's instructions for corrective action and if PPE is needed

The procedure for containing spillage is as follows:

- Communicate the spillage to the stores in-charge person
- Move the 'Spill Kit' to the place of spillage on an urgent basis
- Sprinkle sand or other absorbent material around the outskirts of the spill area to stop the flow or spread, in case of a liquid spill
- Sprinkle absorbent material on the complete area of the spill to absorb the spill
- Use the broom and shovel to collect the material containing the spilled chemical (waste), using protective gloves (see figure 18)
- Transfer the collected waste to the plastic container marked "hazardous waste"
- Send the spilled waste to hazardous waste storage area for disposal to an authorised third -party waste contractor
- If liquid spills enter drains, these should be connected to the effluent treatment plant
- Return the spill kit to the allocated place at the Stores

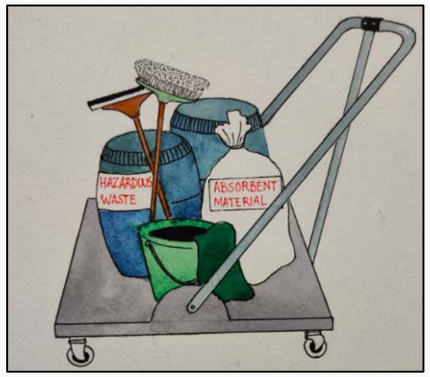


Figure 17: Spill Control Kit

Figure 18: Collecting liquid chemical spill

4.1.3.3 First-Aid Management

Installation of First-Aid boxes at appropriate locations in the facility is required for immediate response to an accident. A First-Aid box contains at minimum the following items:

1. Bandages and/or dressings
2. Antiseptic cream or spray and disinfectant liquid
3. Sterile gauze pads and cotton swab or cotton wool
4. Burns dressing and gel
5. Adhesive tape and scissors
6. Disposable gloves
7. Pain killer medicine (e.g. Aspirin tablet)

For First-Aid measures, facility should follow the below steps:

- Identify and train First-Aid Personnel from the staff
- Display the names and photos of the trained staff prominently at key locations
- Ensure that at least one trained staff member is present on each work shift
- Clearly mark where the First-Aid box is placed and ensure that this is not locked and is easily accessible to workers
- Inspect the First-Aid box at least monthly, replace used or expired items and update the inspection tag
- Provide written First-Aid instructions in local language near the First-Aid box
- Display the contact details of ambulance providers and nearest hospital or central emergency number

- Where possible, provide a medical room to which a member of staff can be moved to await doctor or ambulance
- Place an incident logbook next to the First-Aid box to record any incidents

4.1.3.4 Eye Wash and Body Shower Stations Management

For splashes of chemicals into eyes or skin, it may be required to cleanse the affected area with water as quickly as possible to decrease extent of injury. For this, eye wash and body shower stations should be installed at key locations in the chemical stores and production areas with proper signages (see figure 19) for easy identification. These stations should be:

- reachable quickly (high hazard = closer distance)
- placed in a well-lit area and identified with signage (see figure 20)
- located on the same floor level as the hazard area
- properly functioning with adequate supply of water at the right temperature and pressure

Figure 19: Signage for eye wash station

Figure 20: Eyewash stand

4.2 Check List

(1)	Assess the impact of hazardous chemicals used in your manufacturing facility on health & safety of staff, sub-contractors and visitors as well as the exposure of staff through oral, nasal and dermal routes when handling these chemicals	
(2)	Prepare an Exposure Control Procedure document	
(3)	Identify requirements and provide appropriate PPE to staff	
(4)	Establish an Emergency Response Plan for accidents that includes fire safety, spill containment, First-Aid measures and installing eye wash and body shower stations at high risk areas	

5. Chemical Inventory

A chemical inventory is an integral part of a chemical management system implementation. A Chemical Inventory List (CIL) will assist the facility with purchasing decisions, promote responsible chemical use, prevent pollution, increase traceability, simplify chemical handling decisions, and control disposal costs. An organisation should have a robust process for creating and updating a CIL and a dedicated person, in charge of maintaining the CIL.

5.1 Chemical Inventory List (CIL)

A CIL made with the objective of chemical management is different from an Inventory List that is maintained by the purchasing department, where the focus is primarily on:

- names of chemical products and vendors
- quantity delivered or in stock
- consumption or usage
- the price of the chemical product
- Use/function of the chemical product
- Lot/Batch numbers
- Storage location

The CIL for chemical management should expand this information to include data on

- ZDHC MRSL Conformance Levels,
- Identification numbers (CAS nos.) of hazardous substances
- availability of certificates for specific global legislation or eco-certificates,
- hazard information from Safety Data Sheets (SDS)
- planning of precautions for safe storage, handling and disposal of chemicals based on the identified hazards

The above are minimum requirements as per the ZDHC CMS Framework, a CIL can also contain information on:

- environmental and toxicological indicators
- resource efficiency impacts of the listed chemical products.

It is thus important that the CIL for chemical management is maintained and updated by the Chemical Responsible Person or Core Team with knowledge about or training in the interpretation of Safety Data Sheets (SDS).

A CIL should contain all chemicals used and stored in the facility and may cover, but is not limited to, cleaners, adhesives, paints, inks, detergents, dyes, colourants, auxiliaries, coatings and finishing agents, and commodity chemicals, as well as those used for ETP, sanitary, laboratory and utility purposes.

The CIL, in combination with the recipe/use log, makes it possible to establish traceability of chemical formulations used in the production processes as well as for Root Cause Analysis (RCA) and Corrective Action Plan (CAP) for non-conformance for example to the ZDHC Wastewater Guidelines.

By having all this information clearly listed and updated, the Supplier is able to control its production in terms of:

- Health & Safety
- Environmental and ecological impact
- MRSL/RSL conformance

ZDHC provides a template for a CIL. This is designed to help a Supplier progress in chemical management expertise by preparing an inventory of chemicals to achieve ZDHC Foundational, Progressive and Aspirational level.

You can download it on the ZDHC Website. The 3 levels are colour coded as follows:

Level	Colour Code
Foundational	
Progressive	
Aspirational	

5.1.1 Foundational Level CIL

The Foundational Level CIL represents the basic requirement for managing a chemical inventory. Compiling the information required needs only a minimum level of technical knowledge. Hence, it may be compiled by the Purchase or Stores department.

The information required for **Foundational Level CIL** is:

- Product related information:
  - *Chemical Product and Chemical Formulator name*: This can be obtained from Section 1 of the SDS where the Chemical Product name and Chemical Formulator name are detailed. This should also be confirmed with the GHS-label on the chemical container.
  - *Supplier name*: in case different from Chemical Formulator, such as a trader or distributor.
  - *ZDHC Use category*: this can be inputted with the help of the dropdown box in that column and indicates the use or application of the formulation.
- Volume related information: Actual monthly usage amount and unit
- ZDHC MRSL Conformance level: Choose from a drop-down if the chemical product is (a) Not Registered (b) ZDHC MRSL Registered (c) Level 1 (d) Level 2 (e) Level 3 after checking the chemical product on the ZDHC Gateway- Chemical Module
- ZDHC MRSL third- party certification: Optional. Third- party certification approved by ZDHC for ZDHC MRSL conformance and validity date may be inputted as confirmation of ZDHC MRSL conformance. This may be useful when the chemical product is not visible on the ZDHC Gateway for whatever reason
- Storage Location: The location such as main store, sub-store or a specific storage place can be described here to quickly understand the place of storage
- Lot Number: The batch or lot number(s) of the chemical product purchased in the month can be inputted to establish traceability in case of Root Cause Analysis (RCA)
- Expiry Date: Optional. Should the chemical manufacturer of the formulation provide the dates of manufacture and/or expiry, this data may be inputted
- SDS information: The date of issue of the SDS should be inputted, only if the SDS for the chemical product is available in the manufacturing facility. In case the SDS is not available or is found to be outdated, a follow-up should be made with the Chemical Formulator to obtain the latest SDS and then the date of issue should be inputted

FOUNDATIONAL

Information on chemical product				Volume related information		ZDHC MRSL	ZDHC MRSL 3rd party certification (optional)		Storage Location	LOT Number	Expiry Date- OPTIONAL	SDS Information
Chemical formulation	Chemical formulator (manufacturer)	Chemical supplier	ZDHC use category	Monthly usage (amount)	Monthly usage (unit)	ZDHC MRSL conformance level, if registered	Name/type of certification	Valid until				SDS date of issue
Insert the full name of the formulation, including any prefix/suffix in the case. This is the formulation name as detailed on the packaging of the container and on any accompanying paperwork (Delivery note, SDS etc.)	Insert the name of the chemical manufacturer of the formulation as given in the SDS or container label	Insert name of the supplier of the formulation in case it is not purchased from the manufacturer/ formulator	Choose from the dropdown menu the use category that best describes the intended use of this formulation.	Insert the amount of this chemical formulation used within the month of the DL	Define the unit of monthly usage e.g. kg, liters etc	Choose from: Not Registered, Registered, L1, L2, L3 from dropdown	Insert certification standard	Write the date of validity of the certificate (dd/mm/yyyy)	Add location of storage on site	Add the lot number of the drum/ chemical product in storage	Expiry date of the chemical product (dd/mm/yyyy)	Insert date as written on the SDS document (dd/mm/yyyy). If blank this means SDS is missing
WETTOL - DT	BIBSAR ALGOCHEM GmbH	Mega Marketing Polymers	1.2.a. Bleaching	300	kg	Level 1	BSTS 5.0 - Tex Held	20.12.2020 till 20.12.2022				15.10.2018

Figure 21: Foundational Level CIL template

5.1.2 Progressive Level CIL

To upgrade to a Progressive Level CIL, the supplier should complete information related to hazard identification and precautionary actions to be taken. Inputting information in the Progressive CIL requires technical competency and training in SDS. Hence, the primary responsibility for its completion rests with the Chemical Responsible Person in the facility.

The Progressive Level CIL is considered an intermediate step and allows the Supplier to implement safe chemical management by:

- Assessing physical, health and environmental hazards and planning control measures for storage, handling, discharge, internal transportation and legal compliance
- Identifying root-causes in case of any product or wastewater failures

Information on the following needs to be completed for each chemical product:

- Hazardous substances indicated in SDS:
  - Input the CAS (Chemical Abstract Service) numbers of the hazardous substances listed under Section 3 of a GHS/CLP compliant SDS
  - Against each of the CAS number, input the % of the substance as given in the Section 3 of the SDS
- Hazard information in SDS: Hazard Statements for the three Hazard Types - Physical, Health and Environmental- should be inputted, as listed in Section 2 of the

SDS. H-200 series of statements should be inputted under Physical Hazards, H-300 series of statements under Health Hazards and H-400 series of statements under Environmental Hazards. The H- Statements can be chosen from the drop down menu in the CIL Template. Multiple choices can be done in case there is more than one H-Statement given in the SDS for a Hazard Type.

- Precautions for identified Hazards:
    - *Storage Precautions*: Refer to the P-Statements given in Section 2 of the SDS related to storage (P-400 series) and information given in Section 7.2 in SDS for specific storage Precautions to describe the data under this column. These precautions are required in case Physical Hazards have been identified
    - *Handling Precautions*: Refer to the P-Statements given in Section 2 of the SDS related to prevention and response (P-200 & 300 series) and Section 8 in SDS for information on specific engineering controls and individual protection measures (such as PPE) and input relevant data under this column. These precautions are required in case Health Hazards have been identified
    - *Discharge Precautions*: Refer to the P-Statements given in Section 2 of the SDS related to disposal considerations (P-500 series) and recommendations given in Section 13 in SDS and input these under this column. These Precautions are required in case Environmental Hazards have been identified
- Compatibility information: Describe materials or chemicals that are not compatible for storage by referring to section 10.5 of SDS so that appropriate segregation can be done during storage.

PROGRESSIVE								
Hazardous substances indicated in SDS		Hazard information in SDS			Precautions for identified hazards			Compatibility information
CAS number of hazardous substance	% of hazardous substances reported in SDS	Physical	Health	Environmental	Storage	Handling	Discharge	Non-compatible materials
Write the CAS number of the hazardous substance listed in Section 3 of SDS	*Insert the percentage (%) of hazardous substances within the formulation as given in Section 3 of SDS*	*Select the H-Statement from dropdown box if mentioned in Section 2 of SDS*	*Select the H-Statement from dropdown box if mentioned in Section 2 of SDS*	*Select the H-Statement from dropdown box if mentioned in Section 2 of SDS*	*Refer to the P-Statement given in Section 2 of SDS and also Section 7.2 for specific storage requirements*	*Refer to the P-Statement given in Section 2 of SDS and also Section 7.2 and Section 8*	*Refer to the P-Statement given in Section 2 of SDS and also Section 13*	*Describe materials or chemicals that are not compatible for storage - Refer section 7.1 and 10.5 of SDS*
1015447-12-7 77-92-9	*35% 2%*	*H-242: Heating may cause a fire*	*H-318: causes eye damage*	*H 412: Harmful to aquatic life with long lasting effects*	*Keep away from heat, hot surfaces, sparks, open flames and other ignition sources.*	*Wear protective gloves and eye/face PPE*	*Do not drain to environment without proper treatment*	*None known*

Figure 22: Progressive Level CIL template

5.1.3 Aspirational Level CIL

The **Aspirational Level CIL** is the best in class level of ZDHC CIL and it is achievable only through continuous and collaborative actions among the facility's management team. It requires deep technical knowledge of SDS, chemistry of textile/leather products, environmental & toxicological norms, production and wastewater treatment processes.

An Aspirational Level CIL allows the Chemical Manager to:

- Eliminate at source chemicals where there is high level of concern of health or environment hazard and to plan for substitution of safer alternatives
- Reduce impact on ETP processes by purchasing chemicals with low COD, BOD and high biodegradability/bio eliminability values
- Focus on substituting chemical products in place of those with high aquatic or oral toxicity
- Purchase products that can help to conserve resources such as water and energy

The data required for Aspirational Level CIL is as follows:

- Phase-Out list: Chemical products of high concern and classified with any or more of the following H-Statements should be considered for a Phase-out from usage in the facility and replaced with safer alternatives that do not have these hazard classifications:

H340 -May cause genetic defects
H341- Suspected of causing genetic defects
H350 - May cause cancer
H351- Suspected of causing cancer
H360 - May damage fertility or the unborn child
H361- Suspected of damaging fertility or the unborn child
H370 - Causes damage to organs
H371- May cause damage to organs
H372- Causes damage to organs through prolonged or repeated exposure
H410 - Very toxic to aquatic life with long lasting effects
H413 – May cause long lasting effects to aquatic life

The list of phase-out products should be tracked by the Chemical Responsible Person for actions such as:

- Potential to stop usage of such products in the facility processes (elimination)
- Discussions with existing and new chemical vendors to seek out safer alternatives (substitution)
- Search for safer alternatives on the ZDHC Gateway - Chemical Module
- Using public platforms (such as Chemsec Marketplace) to search alternatives

Substitutes for such products should be evaluated for cost and performance before these are purchased in bulk. It is important to evaluate that any substitutions do not themselves present other hazards. Please refer to section 3.1.4 for more information.

- Environmental indicators: Information on COD value of the chemical (in terms of mg of O2/g of chemical) is an important criteria to measure the impact of organic load on the effluent treatment plant. Efforts should be made to use chemicals with low COD values to reduce this load. Other indicators such as Inherent biodegradability, bio eliminability (for colorants and silicone softeners) , AOX% and Aquatic toxicity (in terms of LC_{50}/EC_{50} value) can be described – but this is optional, especially for facilities which do not discharge directly into the environment or have a Zero Liquid Discharge set-up. The data on these parameters is available in Section 12 (Ecotoxicological information) in the SDS.
- Toxicological information: Oral toxicity data (in terms of LD_{50} value) should be inputted to identify chemicals that could impact worker safety. Other optional parameters are Skin/Eye damage potential, Carcinogenic, Mutagenic, Reprotoxic (CMR) data and Specific Target Organ Toxicity (STOT) data. The information on these parameters is detailed in Section 11 – Toxicological information in the SDS.
- Resource Efficiency: Information on whether the chemical usage leads to a reduction or savings in water or energy usage when used in production should be inputted here through a "Yes/No" selection of the dropdown box. The selection should be made only after controlled studies are made by the facility to establish and quantify the savings made in water and/or energy usage against an earlier process or chemical. This should be done by the Production team and inputs provided to the Chemical Responsible Team.

ASPIRATIONAL											
Phase-Out	Environmental Indicators (Blue is optional)					Toxicological information (Blue is optional)				Resource efficiency	
Actions required to replace with safer alternative	COD (mg O2/g)	AOX %	Inherent biodegradability	Bioeliminability	Aquatic toxicity (LC/ EC 50 value in mg/L)	Oral toxicity (LD 50 value in mg/kg)	Skin/Eye damage	CMR data	STOT data	Reduction in water usage	Reduction in energy usage
Choose Yes from dropdown box for formulations that are classified as H-340, 341, 350, 351, 360, 361, 370, 371, 372, 410, 413	Enter the information from Section 12 of SDS	Enter the information from Section 12 of SDS	Enter the information from Section 12 of SDS (as per OECD 309 R test method)	Enter the information from Section 12 of SDS (For dyes and pigments only)	Enter the information from Section 12 of SDS	Enter the information from Section 11 of SDS	Enter the information from Section 11 of SDS	Enter the information from Section 11 of SDS	Enter the information from Section 11 of SDS	Indicate Yes or No if the chemical product leads to reduction of water usage in process from the dropdown box	Indicate yes or No if the chemical product leads to energy savings in process from the dropdown box
No	200	1	85%	Not applicable	10	>2000	Causes serious eye damage	No data	Not known to affect organs (for single and multiple dose	Yes	No

Figure 23: Aspirational Level CIL

Other considerations for a CIL:

1. Assign a knowledgeable and trained person to maintain the CIL, especially for the Progressive and Aspirational levels
2. Ensure that every chemical purchased or stored in the facility is entered in the CIL and that the CIL is always updated with new chemicals entering the facility. If a product is discontinued or substituted, it should be deleted from the CIL so that the CIL always reflects the current status of chemical inventory in the facility
3. Check the name of the chemical product appearing in the CIL with that on the label of the chemical container and inform the chemical vendor in case of any discrepancies
4. Conduct a regular review or audit of the physical stock of chemicals recorded in the CIL
5. Put the date of review of the CIL and the responsible person to ensure transparency
6. Ensure that there are no manual errors in entering the names of the product or producer or any of the data that is entered in the CIL format
7. Input the correct use type from the dropdown list provided in the ZDHC CIL template that correctly matches the application that the chemical product is being used for in the facility
8. Additional columns may be included in the CIL template to suit the specific needs of the facility or if there are any specific local regulatory or Brand compliance requirements

9. Ensure that proper and latest documents, such as SDS and TDS, are obtained from chemical vendors before inputting data from these documents into the CIL

5.2 Safety Data Sheet Management

To input hazard data in a CIL, a proper Safety Data Sheet (SDS) management should be in place. An SDS is the fundamental source of hazard information that can be used to control the health & safety impacts from chemicals stored, used and disposed of. It is a document that provides information on:

- Hazards of a chemical substance or preparation
- Potential health effects on exposure to a chemical
- Safe handling and storage of chemicals

An SDS for every chemical product used in the manufacturing facility should be collected from every Chemical Formulator and kept at a central location and also at the point of storage (either as hard or soft copy) so that it is readily available for consultation by staff. As best practice, SDS can be displayed at the point of storage for a quick reference point, as shown in the examples illustrated in figure 24 below.

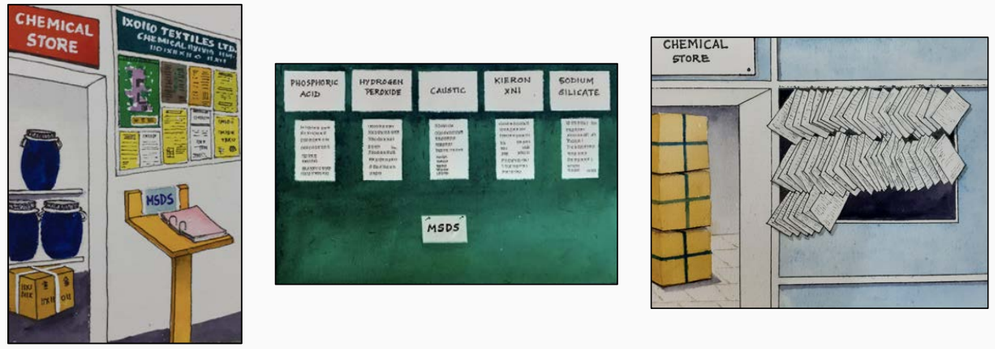


Figure 24: Left – SDS file kept on a stand near the Store; Middle – SDS displayed on a notice board; Right – SDS documents kept in plastic sheets on hooks outside the chemical store

make table with text
underneath

The SDS should preferably follow the Globally Harmonized System (GHS). If the facility is in a region where GHS or CLP has not been adopted, an equivalent standard should be followed to ensure that all the necessary information required in an SDS is complete. An SDS should be in the local and/or official language(s) of the Supplier's location.

SDS soft copies can also be uploaded on a company server and access given to the Chemical Management Team. The Chemical Responsible Person should delete outdated information and upload any updates.

The date of issue of the SDS and its version number should be carefully monitored. An SDS needs to be updated by a chemical manufacturer when:

1. Any ingredient used in the formulation is changed due to which there is an impact on the hazard classification of the formulation
2. New toxicological/legislative information is applicable to any ingredient used in the formulation that may impact the overall hazard classification of the formulation
3. Any type of restriction or authorisation has been imposed on a substance or mixture under EU- REACH regulation or another legislation

It is the responsibility of the Chemical Formulator to send an updated SDS if any of the above is applicable to its chemical product. However, it would be good practice if the Chemical Responsible Person monitors the validity of the SDS for each chemical product by checking with the Chemical Formulator for any potential updates.

5.3 Check List

(1)	Prepare a Chemical Inventory as per the ZDHC CIL template for chemical management	
(2)	Start with Foundational level and move further to Progressive and Aspirational levels	
(3)	Ensure proper SDS management	
(4)	Implement the precautionary actions listed in the CIL for identified hazards for health and safety of staff, reducing impact on ETP, planning for safer substitutes and using chemical that improve resource efficiency	

6. Storage and Handling

Hazards in chemical products should be identified properly to plan precautionary measures for storage and handling. These hazards should be communicated to staff and they should be trained in safe handling procedures (training modules from the ZDHC Academy are recommended).

1. All chemical products brought into the manufacturing facility premises, including any given as free samples by Chemical Formulator, should be stored in a safe manner to prevent spillage or accidents.
2. The handling of chemical products should be done in a safe manner to ensure no risk to health or other related emergency.

The key elements to ensure safe storage and handling that are recommended to be implemented are:

1. Chemical labelling
2. Chemical handling procedures, including hazard communication, provision of appropriate PPE and storage precautions

6.1 Chemical Labelling

Labels are a quick way to convey chemical safety information to staff using simple and understandable words (in English and local or official language) and pictograms for hazard characteristics and safe handling requirements. Every single chemical container in the manufacturing facility should be clearly identified with printed labels on the containers.

The Globally Harmonized System of classification and labelling of chemicals (GHS) was created by the United Nations in 1992 as a common language for hazard classification and labelling. It harmonises different national labelling standards with consistent norms applicable on a global basis. GHS has been adopted by

- the European Union as ‘Classification, Labelling and Packaging (CLP) regulation’ in 2008,
- the USA in June 2015,
- China in Dec 2011 and
- Vietnam in March 2016

Many other countries are adopting the GHS into their regulatory framework for chemical products.

GHS has defined guidelines for labels on chemical containers, which must include 5 label elements:

1.Product Identifier

This is the name of the chemical product that is the same as mentioned in the SDS. This is also the name that is used by the supplier in their Purchase Contracts with the Chemical Formulator.

2.Signal Word

A signal word is used to "signal" the relative level of severity of hazard to the reader of the label. The signal words used in the GHS are "**Danger**" and "**Warning**".

- **Danger** is mostly used for the more severe hazard categories
- **Warning** is mostly used for the less severe hazard categories

3.Hazard Pictogram

These are images that convey the hazard pictorially. GHS has harmonised hazards into 9 pictograms. Each pictogram is an image inside a red diamond on a white background. The pictogram is related to the hazard class and category of classification as per the GHS, which is conveyed through the Hazard or H-Statement(s). The GHS pictograms and the explanation of each is given below:

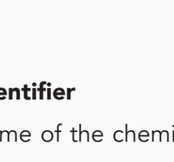
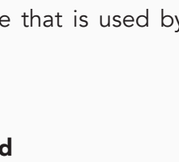
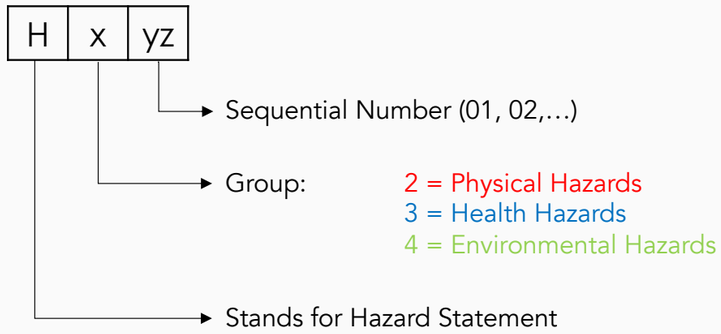
GHS Code	Hazard Pictogram	Symbol description	Represents/Conveys
GHS 01		EXPLODING BOMB	Explosive, Self-Reactive, Organic Peroxides
GHS 02		FLAME	Flammable, Self-reactive, pyrophoric, Self- heating, emits flammable gas, organic peroxides
GHS 03		FLAME OVER CIRCLE	Oxidizers
GHS 04		GAS CYLINDER	Gases under pressure
GHS 05		CORROSION	Corrosive to skin and metal parts
GHS 06		SKULL AND CROSSBONES	Acute Toxicity
GHS 07		EXCLAMATION MARK	Irritant, Dermal Sensitizer, Acute Toxicity (harmful), Narcotic effects, respiratory tract irritation
GHS 08		HEALTH HAZARD	Carcinogen, Respiratory Sensitizer, Reproductive toxic, Target Organ Toxic, Mutagenicity, Aspiration toxicity
GHS 08		ENVIRONMENT	Environmental hazard

Figure 25: GHS Pictograms for chemical labelling

4.Hazard Statement(S)

GHS has harmonised all physical, health and environmental hazards into standardised statements called Hazard or H-Statements. These are arranged in codes, followed by a description of the hazard.



Thus, H- statements are grouped into 3 series:

H-200 series: Physical Hazards

H-300 series: Health Hazards

H-400 series: Environmental Hazards

Examples of H-Statements:

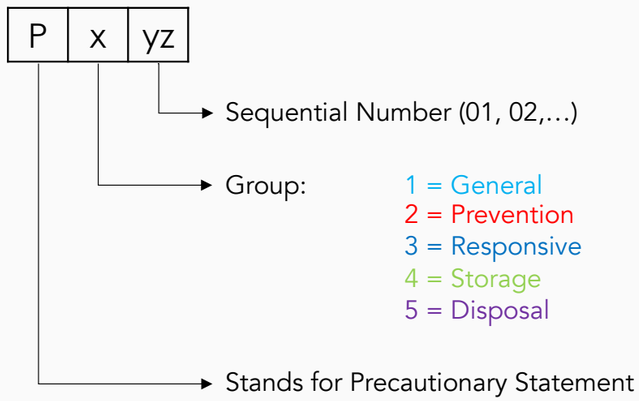
H201 - Explosive; mass explosion hazard. (Physical hazard)

H304 - May be fatal if swallowed and enters airways (Health hazard)

H410 - Very toxic to aquatic life with long lasting effects (Environmental hazard)

5.Precautionary Statement(s):

Information on precautions to be taken for each H-Statement is described in the Precautionary or P-Statements. These are also arranged in codes, with a description of the precaution against each code. The GHS label for the chemical container should include appropriate precautionary information for the H-Statements mentioned.



Thus, P- statements are grouped into 5 series:

P-100 series: General precautions

P-200 series: Prevention precautions

P-300 series: Response precautions

P-400 series: Storage precautions

P-500 series: Disposal precautions

Examples of precautionary statements:

P-102: Keep out of reach of children

P-201: Obtain special instructions before use

P-310: Immediately call a POISON CENTER/doctor/…

P-403: Store in a well-ventilated place

P-501: Dispose of contents/container to...

Other information that is important to be stated on the label

ZDHC finds additional elements, besides the GHS label requirements, are important to be present on each label:

- The name, address and contact details of the Chemical Formulator (minimum requirement)
- Lot number or batch number (for traceability) (minimum requirement)
- Date of manufacture and end-of- life (expiry) date (recommended)

A Typical GHS-label with the required elements is illustrated in the figure 26 below:

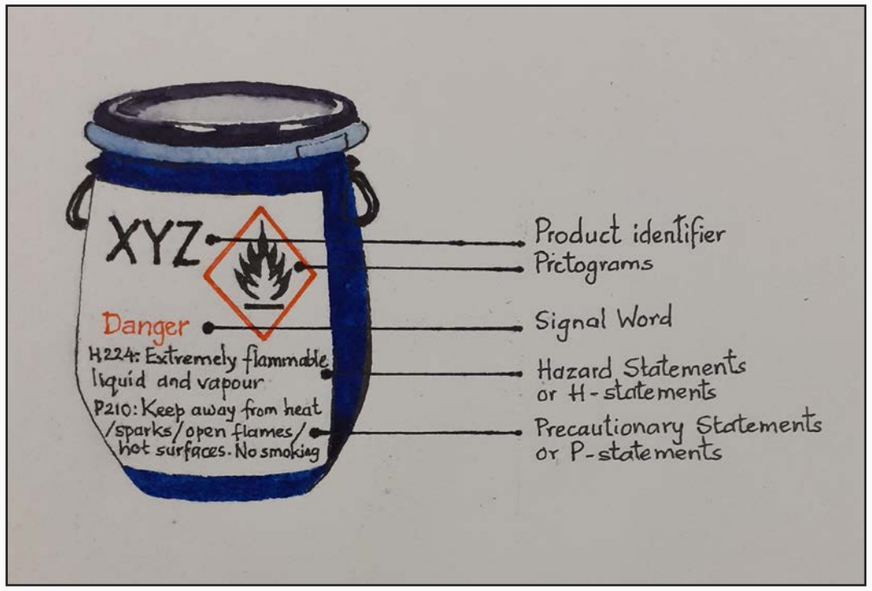


Figure 26: GHS label elements on a chemical container

Actions recommended to be taken by supplier for labels:

Checkpoint	Guidance
Chemical container	• Do not accept chemical containers with labels totally or partially removed or include handwritten information from the Chemical Formulator • If chemical container is received without proper label, store it in isolation until its contents and hazards can be identified and a proper label affixed • Avoid repackaging and relabelling of chemical product. This should only be carried out when strictly necessary. If this happens, add the label to the new containers to ensure traceability to the original one
Information on labels	• Check that the original label includes the GHS label elements • Ensure lot no./batch no. information present on label for complete traceability of product • Confirm that product identifier matches with product name in section 1 of SDS of that chemical • Signal word, pictogram, hazard and precautionary statements – given on the label should match with information provided in section 2 of SDS of the chemical product

Training of relevant personnel	• Provide training to all the staff handling chemical products on chemical labelling, GHS pictograms and Hazard & Precautionary statements. This training could be provided by internal qualified chemical management person who has a certification from ZDHC Academy courses on chemical management
	• Training topics should cover:
	  • How to read a label.
	  • How to verify the correctness of the information
	  • Meaning of GHS pictograms
	  • Precautionary and hazard statements
	  • Use of appropriate PPE as per the label pictograms

6.2 Chemical Handling

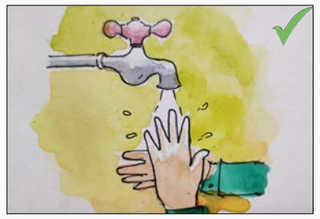
Well-defined chemical handling practices help to prevent spillages, personal injury due to chemical splashes or inhalation and loss of material and money. The conditions for safe handling and storage, including incompatibilities for a chemical product are explained in Section 7 (Handling and Storage) of a GHS- compliant SDS.

It is recommended to create a documented procedure for handling of chemical products in the safest way possible by considering the following points:

- Competency of staff handling chemical products (pouring, transporting and weighing chemical products)
- Communication of hazard through appropriate signage at chemical storage area.
- Need for appropriate PPE and engineering controls when using chemicals
- Regular training on handling, storage, PPE use, secondary containment, emergency response to spills and accidents
- Record of any accident or incident

For a basic understanding of what you should and should not do when handling chemical products, please refer to the below images (figure 27):

Read label before use



Wash hands thoroughly after chemical usage

Do not smoke near chemical containers

Do not mix chemicals without knowing the contents

Do not do welding activity near flammable chemicals

Do not roll or push drums

Figure 27: DOs and DON'Ts for chemical handling

6.2.1 Safe Chemical Storage

Safe storage practices for chemical products are described in Section 7.2 (Conditions for safe storage, including any incompatibilities) of a GHS SDS. Additional data in following sections should be understood when planning precautions for safe storage:

Section	Description
2	Hazards Identification (check for any H-200 statements)
5	Fire-fighting measures (check for suitable and unsuitable fire extinguishers)
6.3	Methods and materials for containment and clean-up
9.1	Physical and chemical properties (especially flash point, viscosity)
10	Stability and reactivity (materials and conditions to avoid, incompatible materials)

Chemical products are often stored in several locations including main stores, sub-stores close to production and in bulk storage areas for commodity chemicals. It is important that appropriate controls are in place at each of these to ensure Health & Safety and protection of the environment. Having a separate storage area for Flammable chemical products, with all fire-control measures installed, is advised. Typical chemical storage areas within a facility are illustrated in figure 28 below:

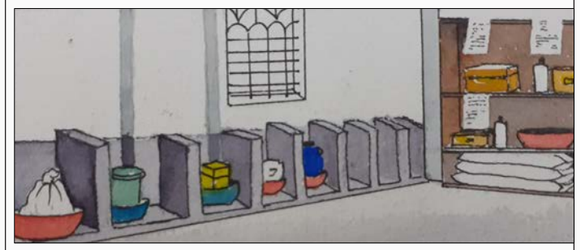
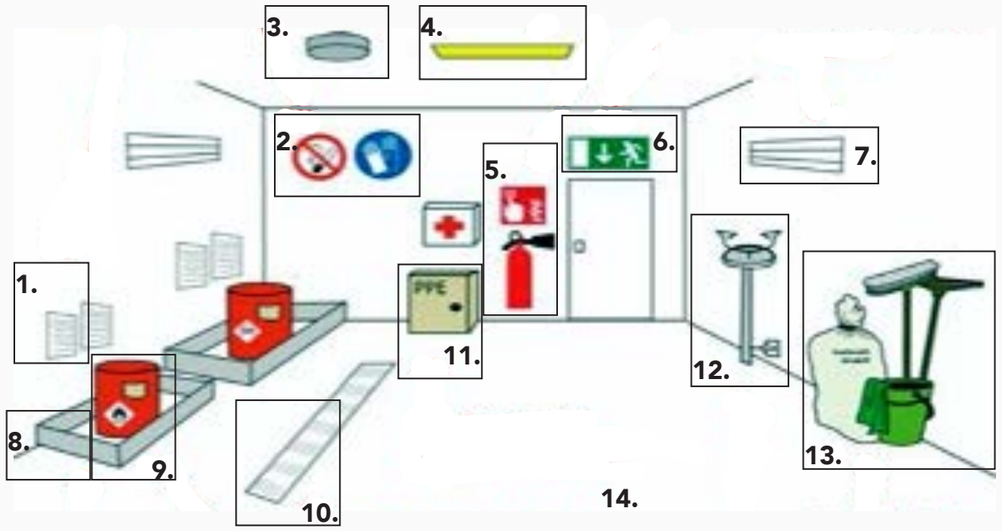
Type of Storage facility	Example of Storage facility
Temporary storage area Area assigned to store chemical products temporarily as quarantine area pending internal Quality Assurance team approval, before moving to Main Storage area	
Main storage area Area assigned for storage of chemical product stock after Quality Approval and before subsequent delivery to sub-storage area as per demand	
Sub-storage area Area assigned for storage and weighing of chemical products during their use in production processes	

Figure 28: Different chemical storage areas in a manufacturing facility

A well-planned storage area allows easy movement and protection of chemical products during handling and use. Good storage conditions should be based on SDS information or chemical suppliers' recommendations for storage conditions. A typical storage area should have the following safety precautions, as shown in figure 29:



1. MSDS
2. Safety signs
3. Smoke detectors
4. Explosion-proof lighting
5. Fire extinguisher
6. Emergency exits
7. Ventilations system
8. Secondary containment with capacity to hold 110% of largest volume
9. Proper containers
   - Closed
   - Labeled with name and hazard symbols
10. Emergency drains
11. First-Aid and PPE box
12. Eye wash station
13. Spill kit
14. Clean and non-permeable floor

Figure 29: Safety requirements in Storage area

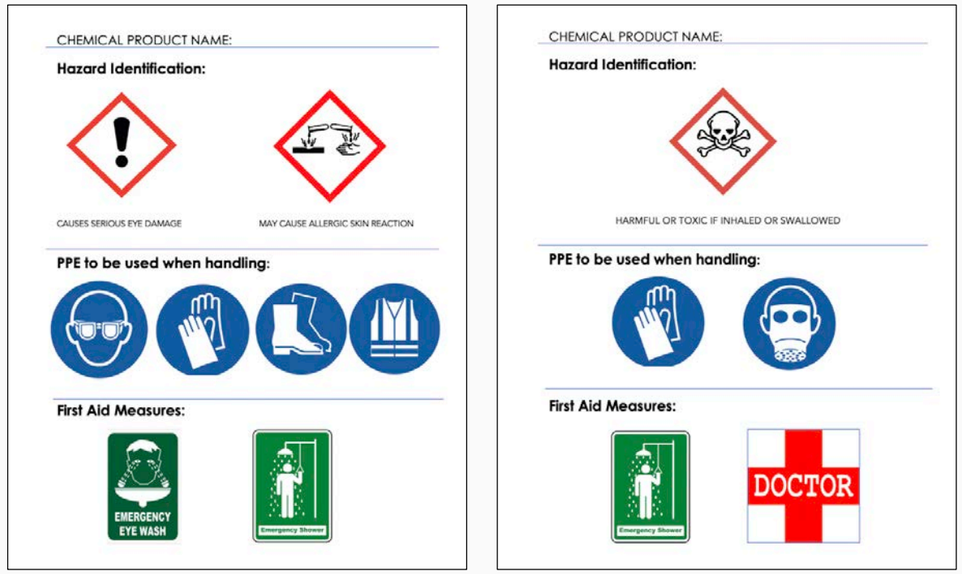
6.2.2 Safety considerations recommended for storage of chemicals

1. Separate your chemical products based on their physical state and inherent properties. Solid and liquid chemicals should be stored separately
2. Ensure proper compatibility of chemical products as per information in the SDS (section 10)
3. Provide proper ventilation, lighting and controlled temperature and humidity wherever required for storage of chemical products sensitive to these parameters
4. Make floors of storage area impermeable to liquids and non-slippery. They should be easy to clean and resistant to acids and organic solvents
5. Plan the layout to accommodate all chemical containers with enough space for movement and easy accessibility to the containers. Use colour markings on the floor for designated walk areas and exit glow signs
6. Ensure that an emergency exit is opposite to the main entrance, that there are no obstacles piled inside or outside of it and that the exit door opens outwards by push-bar handle
7. Do a regular clean-out of expired chemical products, spill wastage and used containers
8. Mark a designated area with a red (or the local required colour) border for non-conformant chemical products that are to be returned to the chemical supplier. Keep relevant documents in the vicinity
9. Keep requisite amount of compatible fire- extinguishers in the Stores and install smoke-detection alarms or sprinkler systems
10. Ensure secondary containment for containers as shown in figure 30. At a minimum, the capacity of secondary containment should be 110% of the original (primary) container(s)

Figure 30: Examples of secondary containment

11. Gas cylinders should be stored in an upright position and in a separate location. The stored cylinders should be secured in a cabin away from the main chemical store. LPG cylinders should be protected from direct sunlight and separated from flammable, combustible or oxidizing chemicals or other compressed gas cylinders
12. Chemical products stored outdoors should have a proper cover to protect from sun and rain and high temperatures. The area should be fenced to prevent unauthorised access. The flooring of such storage areas should be secured to prevent any leakages from contaminating the soil or water
13. Access to chemical stores should be given only to authorised staff and their names and photographs should be displayed near the main entrance door
14. Keep a spill control kit to contain spillages
15. Keep a box file of all the SDS of chemical products stored near the Stores main entrance door. The file should be indexed properly with the names of the Chemical Formulator and products. The SDS file should be accessible to all staff. SDS can also be put in plastic folders and displayed on a notice board near the stores
16. Install warning signboards at key locations of Stores to keep staff informed of risks

17. As best practise, prepare "Chemical Safety Cards" to convey important information on hazards and First-Aid/emergency response measures in a pictorial manner for a quick understanding by staff handling chemical products. These "Chemical Safety Cards" should be displayed near the storage area of the chemical product. Examples of 'Chemical Safety Cards' are given in figure 31:



Chemical Safety Card for chemical product hazardous to eyes and skin

Chemical Safety Card for chemical product harmful or toxic if inhaled

Figure 31: Examples of Chemical Safety Cards for display near chemical storage area for each chemical product

6.3 Check List

(1)	Ensure proper GHS-compliant labels on chemical containers plus additional ZDHC requirements	
(2)	Train staff on GHS pictograms and safe handling practices	
(3)	Implement specific storage requirements as given in Section 7.1 of the SDS	
(4)	Display warning signboards and Chemical Safety Cards that convey hazards and safety precautions pictorially near the storage area of each chemical product	
(5)	Take all requisite fire safety precautions at the store	
(6)	Keep an indexed file of SDS of all chemical products stored at the store	
(7)	Ensure secondary containment for all chemical products	

7 Output Management

Chemicals that are used and applied in processes in a manufacturing facility can find their way out in the form of five output streams:

(1) End-Product
(2) Wastewater
(3) Sludge
(4) Air emissions
(5) Solid Waste

The end-product output needs to meet the legal and Brand requirements for chemical restrictions (RSL and/or PRSL) and is thus not covered in the scope of this document. For the purpose of this document, we will focus on monitoring and controlling the following outputs:

- wastewater
- sludge
- air
- solid waste

To fulfil minimum requirements for output management, an organisation must

- identify all output streams and ensure appropriate control mechanisms are in place
- Set goals to reduce chemical waste and discharges
- Maintain relevant records for all output streams, their volume and disposal.
- Share relevant documents with stakeholders in line with your transparency policy such as ClearStream, permits, etc

Output management can help the organisation to understand how well the CMS is implemented.

7.1 Wastewater Management

Large quantities of water are used to manufacture and process apparel, textile, leather and footwear products. At the end of the production line, wastewater gets discharged. If that is not properly treated, it poses a threat to the environment. There are multiple ways to discharge water:

- Indirect Discharge
- Direct Discharge
- Zero Liquid Discharge

7.1.1 ZDHC Wastewater Guidelines

To monitor wastewater output, ZDHC has published the ZDHC Wastewater Guidelines which is a unified set of expectations across the industry for wastewater discharge quality and goes beyond regulatory compliance. It covers not only conventional wastewater parameters, but also hazardous substances mentioned in the ZDHC MRSL. It specifies:

- sampling points for different types of wastewater discharges,
- limit values for each parameter and
- recommended analytical test methods.

For sampling and analysis procedures, ZDHC has also published a ZDHC Wastewater and Sludge Laboratory Sampling and Analysis Plan (SAP) for the ZDHC accepted laboratories.

Through the adoption of the ZDHC Wastewater Guidelines (WWG), a facility can:

- Ensure wastewater discharge does not have an adverse impact on communities and the environment
- Provide a unified monitoring, testing and reporting programme, enabling suppliers to systematically and efficiently share discharge data with brands and other interested parties - reducing duplication
- Increase operational efficiencies of ETPs by measuring performance against the conventional parameters, and developing continuous improvement plans to reach aspirational levels
- Monitor input chemical management for ZDHC MRSL conformance
- Utilise Root Cause Analysis (RCA) to understand non-conformity against ZDHC MRSL or conventional parameters and creating corrective actions plans to resolve this

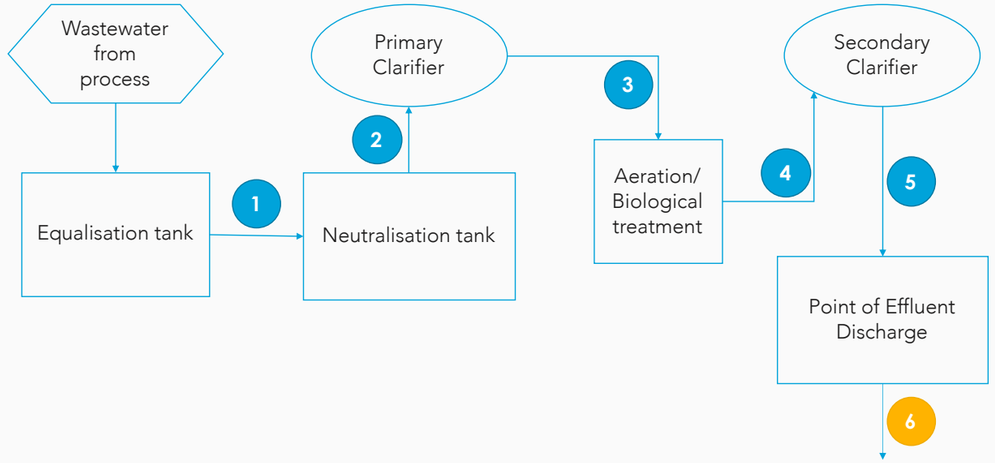
It provides a three-level approach for wastewater discharge limits for conventional parameters: Foundational, Progressive and Aspirational, where the limit values get stricter with each level. Through continuous improvement actions on input chemical management and the effluent treatment processes, a supplier can advance from meeting foundational level to meeting aspirational level limit values.

Wastewater output monitoring should involve the following:

1. Regular in-house monitoring for ETP efficiency and compliance to local regulatory norms
2. Testing for ZDHC Wastewater Guidelines
3. Root Cause Analysis (RCA) and Corrective Action Plan (CAP) for non-conformities to ZDHC Wastewater Guidelines

7.1.2 In-house monitoring

Sampling and testing of effluent at different stages of the Effluent Treatment Plant (ETP) in a facility should be done to not only ensure compliance of the final discharged wastewater to local regulatory norms but also to check that the ETP is working efficiently. A general recommended sampling and testing plan for a typical ETP for conventional parameters is shown below, but this should be amended to fit the ETP-design and operations at the Supplier:



1. Homogenised effluent in the equalisation tank: ***pH, temperature, COD, BOD, TSS and TDS***
2. Sample after neutralisation: ***pH***
3. Sample fro primary clarifier: ***colour, pH, COD, BOD, TSS and TDS***
4. Sample after aeration: ***pH, temperature, DO, MLSS***
5. Sample after secondary clarifier: ***colour, BOD, COD, TSS, TDS***
6. Sample at final point of discharge: ***all parameters as per local regulations***

Figure 32: Recommended sampling and testing plan to monitor conventional parameters

The data that is collected from the above testing/monitoring should be recorded in a log book to keep track of any discrepancies in the established norms at each sampling stage so that corrective actions in the ETP performance can be implemented. Figure 33 shows a suggested template for such a log book.

Sample point	Flow rate (m^3/day)	Key parameters								
		Colour (visual)	pH	Temp (°C)	TSS (mg/L)	TDS (mg/L)	BOD (mg/L)	COD (mg/L)	DO (mg/L)	MLSS (mg/L)
1										
2										
3										
4										
5										
6										

Figure 33: Recommended log book template to monitor conventional parameters

The following frequency is recommended for testing of key conventional parameters, please check with your regulatory body and Chemical Responsible Team to determine the optimal frequency for your manufacturing facility:

Table for Textiles Processing

Daily	Weekly	Fortnightly	Quarterly
pH	MLSS	BOD_5	Heavy metals
Colour	TSS	Oil & Grease	Sulphides
Temperature			Sulphites
Persistent foam			Total-N
DO			Coliform
TDS			AOX
COD			

Table for Tanneries

Daily	Weekly	Fortnightly	Quarterly
pH	MLSS	BOD_5	Coliform
Colour	Oil & Grease	Heavy metals	AOX
Temperature	Sulphates	Persistent foam	
TSS	Chlorides		
COD			
Sulphides			
Total-N			
Total Chrome			
Chrome VI			

A manufacturing facility should establish an in-house testing lab to monitor at the minimum the daily frequency parameters listed above. The Supplier should also have qualified personnel to monitor, manage and maintain the ETP.

7.1.3 ZDHC Wastewater Guidelines Testing

All information regarding what and how to test can be found at:

- ZDHC Wastewater Guidelines
- Sampling and Analysis Plan

7.1.4 Root Cause Analysis for Non-Conformities

In case of non-conformities to the ZDHC Wastewater guidelines, as shown in a ClearStream report, a Supplier should conduct a Root Cause Analysis (RCA) to generate and implement a Corrective Action Plan (CAP).

Given below are some recommendations of steps to be followed for RCA of conventional parameters and ZDHC MRSL Parameters listed in the ZDHC Wastewater Guidelines:

Wastewater Root Cause Analysis (RCA): Conventional Parameters – Table 1	
Step 1	Identify the conventional parameters of concern through the ClearStream Report
Step 2	• Review your Chemical Inventory List (CIL) and study which chemicals from the inventory can impact the parameters of concern (for example, chemicals with high COD or BOD or low fixation reactive dyes for excessive colour) • Review the production recipe and the consumption of such chemical products to measure their impact on the organic load on the ETP • Work with the ETP manager to understand whether ETP chemicals were used correctly, in line with load calculations • Conduct a full assessment of the ETP operations and confirm proper maintenance • Check if any treatment system was shut down for an extended time prior to the collection of the wastewater sample • Investigate if any other activities occurred before the sampling, which may have caused a shock load or excess flow to the ETP, such as emptying and washing chemical containers. • Investigate whether any other engineering and operational aspects of the wastewater treatment plant may have created non-compliant test results, such as faulty aerators or non-replenishment of biomass/activated sludge
Step 3	Document your RCA and plan corrective actions in line with the root cause identified
Step 4	Implement the Corrective Action, prepare a CAP document and upload on the ZDHC Gateway
Step 5	Prepare an SOP to prevent the same failure for the future. Train your team as required

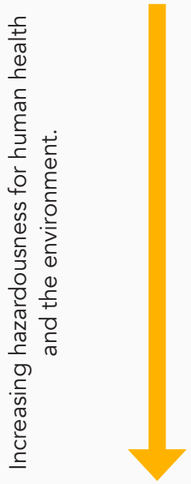
Wastewater Root Cause Analysis (RCA): MRSL Parameter - Table 2A-N	
Step 1	Identify MRSL substances of concern from the ClearStream Report
Step 2	• Review your Chemical Inventory List (CIL) to identify chemical products where ZDHC MRSL substances have been used intentionally and if these are potential cause of risk for MRSL substances of concern. (For example, non-conformity for APEOs could be due to purchase and use of an APEO based soaping agent or non- conformity for a phthalate could be due to the use of a plastisol ink in printing, see ZDHC Guidance Sheets) • Review also other indirectly used chemical products in the manufacturing facility such as cleaning, maintenance, utility, lab and sundry chemical products. (for example, presence of chromium in the wastewater could be due to the use of Potassium Dichromate used in the lab for shade development) • Reach out to your Chemical Formulator for any additional information or conduct third- party testing required to determine any MRSL contaminations in the chemical products • Determine if MRSL risks are possible from raw materials or input raw water used in the manufacturing facility • Conduct a full assessment of the ETP operations and confirm proper maintenance
Step 3	Document your RCA and plan corrective actions in line with the root cause identified
Step 4	In case you need to substitute a chemical product, search on the ZDHC Gateway - Chemical Module for suitable alternative
Step 5	Implement the Corrective Action, prepare a CAP document and upload on the ZDHC Gateway (refer to Appendix D for suggested CAP template)
Step 6	Ensure that purchasing of ZDHC MRSL conformant chemical products is always done as per purchasing policy using the ZDHC Gateway

7.2 Sludge Management

Sludge is the residual solid, semisolid, or slurry material produced as a by-product of wastewater treatment processes, including septic/sewage and Zero Liquid Discharge (ZLD) systems.

Sludge could potentially contain high levels of chemicals and requires proper handling and disposal. Sludge disposal must meet all local requirements and proper safety protocols need to be followed when handling and transporting sludge.

Sludge is categorised based on the source of generation and hazard properties:



Category A: Municipal sludge from domestic or urban wastewaters only.

Category B: Sludge from industry, including from CETP.

Category C: Sludge from industry belonging to a hazardous waste category including sludge from CETP. Exhibits one or more hazardous characteristics such as high flammability, explosive property, oxidizing property, poisonous, infectious, etc.

Sludge must be disposed of through a qualified/authorised waste contractor. Proper Waste disposal documentation, including a copy of the license of the authorised waste contractor, should be kept on record by the manufacturing facility. Where sludge is disposed of within the manufacturing facility premises, it should be in a secured land-fill that is approved by local regulatory authorities.

Please check the ZDHC Wastewater Guidelines for any testing details.

7.3 Air Emission

In textile and leather products manufacturing, various processes lead to the generation of air pollution. The typical production processes that may result in workplace air emissions are print screen making, engraving, stenter finishing and drying, curing, spraying, spot cleaning, chemical mixing, coating, glueing etc. Air emissions may also be created from manufacturing facility operations such as boilers, generators, fuel burning and refrigeration operations, etc. Air emissions are classified as point source and fugitive source.

Standard Operating Procedure steps for air emission management

1. Identifying all sources and types of air pollutants generated and released from a facility operation and processes.
2. Create comprehensive air emission inventory for facility.
3. Check all permits, authorisations, laws, regulations and standards required with regards to air emissions.
4. Track pollutant emission quantities and compliance with emission standards.
5. Monitor the emission through available online monitoring system or through third-party approved laboratory.
6. Install appropriate control measures in order to meet the applicable requirements.
7. Do regular maintenance on control measures to ensure their working order.
8. Perform third-party checks for all types at regular intervals to ensure compliance and to identify opportunities for improvement.
9. Strive for continual improvement on air emission beyond compliance for process modification, new machinery, chemical substitution, etc.

7.3.1 Air Emission Control

The reduction and control of air emission from your processes and operations are achieved through various emission control devices available. At the minimum, manufacturing facilities are expected to:

- Meet or exceed requirements for compliance to local regulations
- Identify manufacturing facility's sources of emissions and relevant discharge points
- Track air emissions from processes and the use of volatile chemicals
- Track air emissions from manufacturing facility operations

- Modernise equipment or install emissions control devices to protect staff and prevent emissions to the environment

To control air pollution, a manufacturing facility can install abatement technology or other control measures, such as:

Types of emission control devices	Goal
Cyclone Precipitator	to remove particulate matter from exhaust gases
Electrostatic Precipitator (ESP)	to reduce particulate emissions from boilers, kilns, engines, etc.
Baghouse	particulate control
Scrubbers	to reduce pollutants such as particulate and SOx emissions.
Activated Carbon Adsorption	to remove organic compounds (such as VOCs)

For more information see Appendix E.

Through the ZDHC Air Emissions, we will be defining minimum requirements for the processes and facility activities.

7.4 Solid Waste Management and Disposal

Every supplier generates solid waste that is classified as hazardous or non-hazardous. Hazardous waste needs to be collected and disposed of in accordance with local regulations. A list of such waste can include, but is not limited to, the following:

Hazardous Waste	Non-hazardous Waste
As defined by local regulations or international conventions, based on risks posed by it to human health and/or environment.	Type of waste that does not pose any risk to human health and environment.
Examples • Used chemical drums and containers • Residual chemical waste from padding mangles, print pastes • Film and Printing Frame • Expired/unused chemicals • Compressed gas cylinders (refrigerants, Argon gas, LPG cylinders, etc.) • Contaminated materials (oily rags) • Decommissioned equipment (contaminated parts, electronic waste) • Batteries • Fluorescent light bulb • Ink cartridges • Waste oil and grease (from cooking or boilers) • Electronic waste • Combustion residuals (fly ash and bottom ash/coal slag) • Wastewater treatment sludge (industrial /domestic	**Examples** • Materials (fabric waste) • Rubber • Metals • Plastic • Paper/Cardboard • Glass • Domestic wastes (food, yard waste)

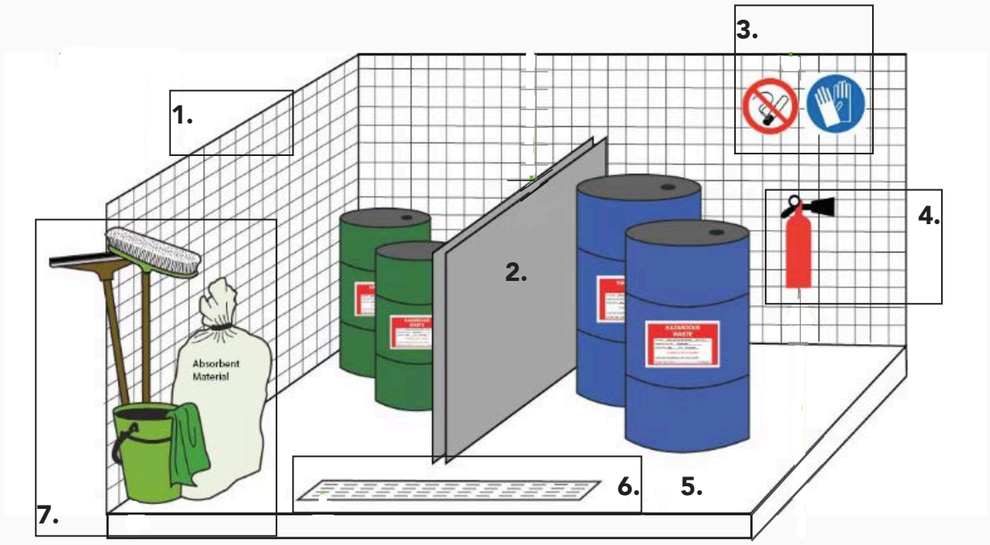
7.4.1 Managing Waste in the Manufacturing Facility

1. Systematically identify and quantify all types of solid wastes in the manufacturing facility.
2. Identify, separate and classify hazardous waste.
3. Create a waste inventory table for off-site treatment and disposal.
4. Set up a dedicated waste yard to store all waste, segregated as per materials.
5. Conduct a yearly waste audit and plan actions to reduce waste generation.

7.4.2 Storage conditions for hazardous waste

In case of hazardous solid waste storage, consider the following (see figure 34)

- Keep the store locked with no access by unauthorised staff
- Provide adequate ventilation where volatile waste is stored
- Construct secondary containment systems with materials appropriate for the waste being contained and adequate to prevent loss to the environment
- Ensure impermeable surface in storage area
- Use proper signage
- Label hazardous waste containers to identify them
- Maintain spill clean-up equipment and proper PPE at the waste yard
- Do not burn hazardous waste within or outside the facility, as the burning process may result in release of toxic by-products such as dioxins, furans and persistent organic pollutants



1. **Latticework** instead of concrete walls surround the area
2. Containers with **incompatible wastes are separated** by a dike, berm or wall
3. **Warning signs** and emergency information are displayed
4. **Fire extinguisher** is kept ready at easily accessible location
5. **Floor** is made of impermeable material or plastic sheets or lined with sheets
6. Floor house provisions for **containment** and dyking
7. **Spill kit**/Clean-up material is available

Figure 34: Recommended precautions for storage of hazardous waste

7.5 Check List

(1)	Identify, monitor and control all outputs from the manufacturing facility for chemicals	
(2)	Adopt and implement the ZDHC Wastewater Guidelines and undertake Root Cause Analysis (RCA) and Corrective Action Plan (CAP) for non-conformities in conventional as well as MRSL parameters	
(3)	Perform regular in-house testing and analysis of basic conventional parameters for wastewater	
(4)	Dispose of any sludge generated as per legal regulations and to authorised third-party waste contractors	
(5)	Test sludge as per the ZDHC wastewater guidelines for MRSL parameters	
(6)	Control air emission through abatement technology or other measures	
(7)	Identify and document all hazardous waste generated in the manufacturing facility and ensure its proper labelling, handling and storage in a dedicated waste or scrap yard	

8. Process Control

Controlling the processes and documentation at a Supplier helps to ensure a proper implementation of CMS and monitoring of traceability, transparency and continuous improvement.

8.1 How to Implement Process Control

The three main elements of process control for a successful CMS are:

1. Document and Record control
2. Incident and non-compliance management
3. General maintenance and housekeeping

8.1.1 Document and Record Control

A Supplier should have a process in place to store and control documents and records related to CMS as part of good business practice. The process should cover, at the minimum, all documents and records referred to in the ZDHC CMS Framework. Relevant employees should always be informed on where the latest documents are stored and have access to these documents.

Documents related to CMS that should be stored are (but not limited to):

Regulatory

1. Local legislation and compliance requirements and monitoring procedure
2. Global regulations of countries where the supplier is exporting its goods

Organisation Policies & Strategy

3. Chemical Management Policy document
4. Chemical Strategy document
5. Purchasing, Transparency and Traceability Policy documents
6. Production traceability documents (recipe sheets, process logs)

ZDHC Related

7. ZDHC solutions (MRSL, Wastewater Guidelines, MRSL Conformance Guidance, etc)

8. ZDHC Performance InCheck Reports
9. ChemCheck Reports from Chemical Formulators

Chemical Inventory Related

10. Chemical Inventory List (CIL), with details on ZDHC MRSL conformance and hazards
11. Supplier declarations from Chemical Formulators to ZDHC MRSL and Brand RSL requirements, wherever required
12. Third-party certifications from Chemical Formulators and raw material suppliers such as a ZDHC MRSL accepted conformance certificate
13. Safety Data Sheets (SDS) and their management process

Supply Chain Related

14. Latest RSL documents of brands serviced
15. Sub-supplier and sub-contractor evaluation documents, when included in the CMS scope

Training Related

16. Records of training and mock drills conducted

Health & Safety

17. PPE requirements and assessment
18. Emergency response plan
19. Incident register

Continuous Improvement

20. Internal and external test reports and CAP
21. Internal and external audit report, Management Review Meeting (MRM) minutes and follow-up actions
22. Root Cause Analysis (RCA) for product non-conformities and corrective/preventive actions

A Standard Operating Procedures (SOP) on document control should be prepared that addresses:

- **Access (protection and retrieval):** Who should be granted access to view only and who should be granted access to edit or upload documents? A central authority to control all documents should be designated (preferably the Chemical Responsible Person or Team). The actual workflow and procedures to manage CMS-related documents should be described.
- **Location (retention):** The location for documents and records for CMS should be decided so that the relevant staff are able to access the documents required for their working without any difficulties. Some documents should be available to all staff (e.g. SDS or Chemical Policy) while some may be required by specific departments (e.g. training records by HR department or Brand RSL documents by QC lab). The documents can be stored as hard copies in files or as soft copies on the company server or open source platforms (such as Google Drive) with access to employees to "view only" or "view and edit". The location(s) of all documents and records should be communicated to the staff.
- **Review (updates & removal):** The documents and records should be regularly reviewed to update obsolete documents with new ones or delete/destroy documents that are no longer valid.

A summary of revisions made in CMS document should be maintained, as suggested below:

Type	Title	Date Revised	Author	Document No.
Policy	Chemical Management Policy	01.01.2020	Mr. Abdul Hala	P-CM-01
Supplier List	Material Suppliers and Subcontractors	07.02.2020	Ms. Joy Abba	L-MS-01
Report	Chemical Risk Assessment	01.03.2020	Mr. Abdul Hala	R-CRA-01
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8.1.2 Incident & Non-compliance Management

In a manufacturing facility, there may be incidents such as chemical accidents, RSL rejections, health & safety issues and other non-compliance cases. Such incidents should be recorded, along with a Corrective Action Plan (CAP) to detect the root cause and eliminate it to prevent recurrence of the incident.

A robust incident management procedure follows "MAIC" – the four steps approach:

- **M**easure: Understand the problem and its magnitude. Conduct random checks and tests
- **A**nalyse: Identify the root cause using different techniques
- **I**mprove: Determine the best solution, pilot and verify it
- **C**ontrol: Set up a Control Plan or KPIs to measure effectiveness of your Corrective Action

There are different methodologies for Root Cause Analysis (RCA), please select the best approach based on your particular incident, such as:

1. Fish bone diagrams:

This is a visualisation technique for categorising the potential causes of a specific problem and then arriving at the root cause. It is generally done as a brainstorming or mind mapping team exercise that makes you think about all potential causes of a given problem, rather than just one or two. It captures the relationship between potential causes and connects them to the main problem in the form of a fish bone chart. It is a great tool to solve complex problems and ensure involvement of all team members. An example is given on the next page.

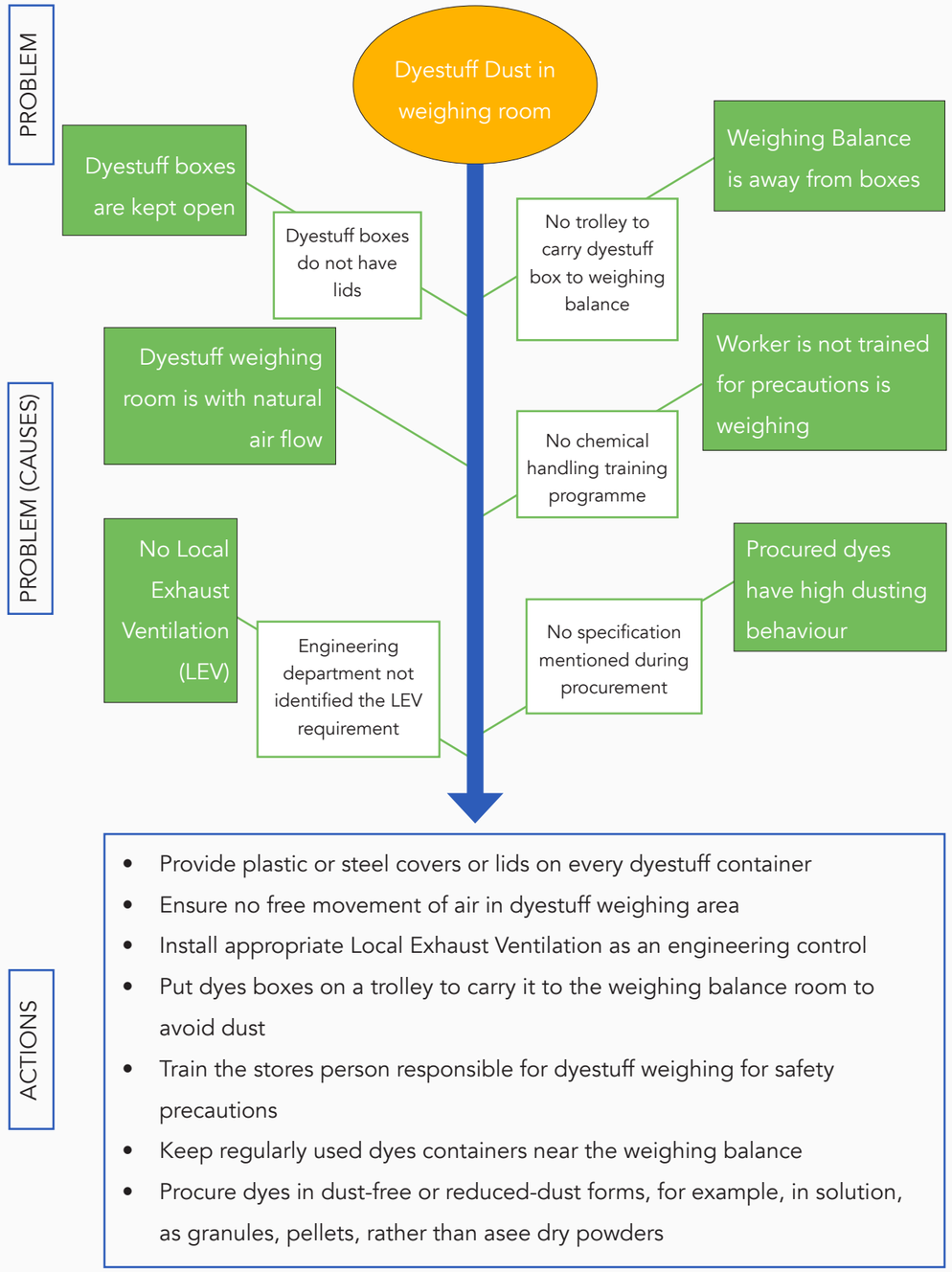


Figure 35: Example of Fish Bone diagram for Root Cause Analysis (RCA)

2. 5-WHY methodology:

This involves asking "WHY" to each reason given to a failure or incident until you reach the root cause of the problem. Actions can be initiated at each level of the 'Why' to arrive at a holistic Corrective Action Plan (CAP). An example of how to use the "5-Why technique" is shown below for a finished article that is rejected and recalled for presence of a banned amine:

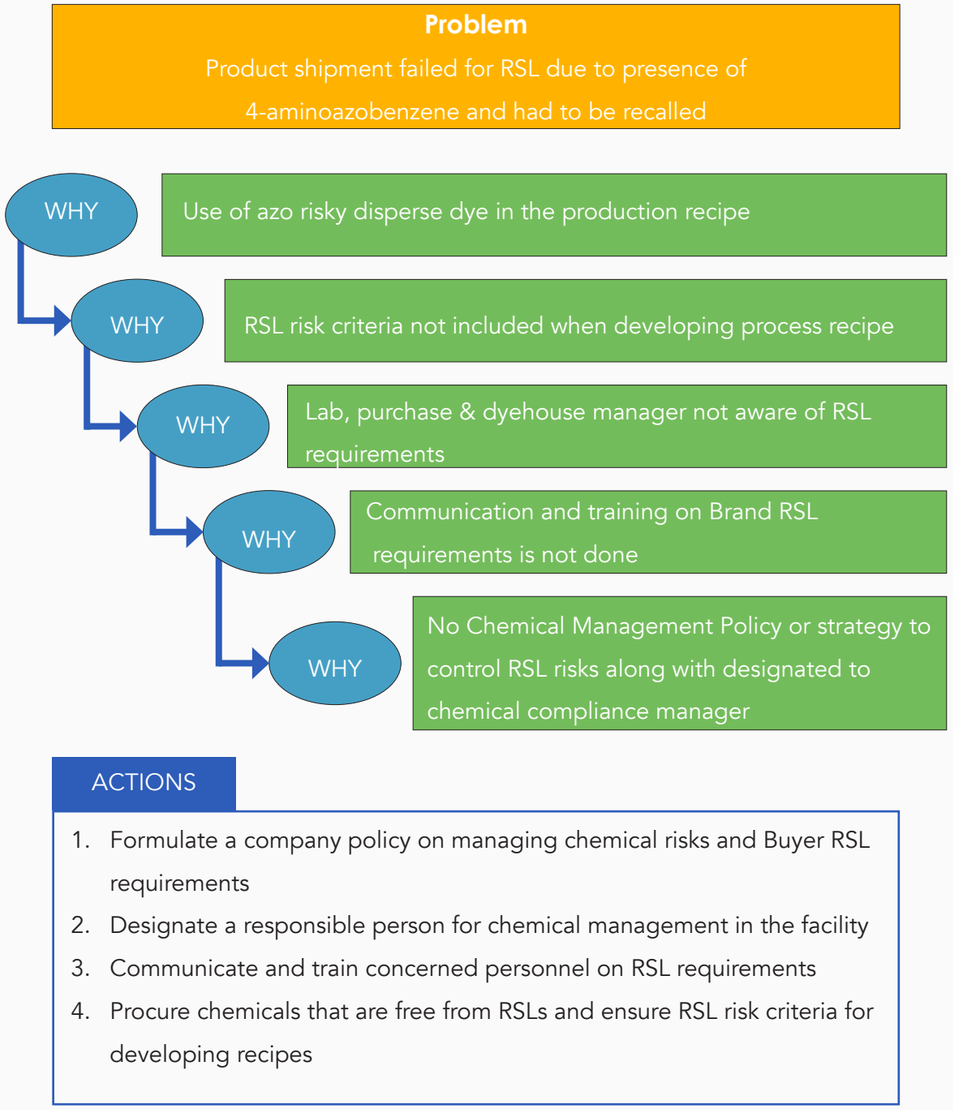


Figure 36: Example of 5-WHY methodology for Root Cause Analysis (RCA)

3. Sampling, Testing and Analysis of additional data:

Some problems or incidents would require collection of additional data or sampling and testing, the results of which should be analysed to find the root cause. This approach is typically used for wastewater or end- product failures (such as testing of input chemicals used) as well as incidents on spillages and chemical handling (such as testing of containers for strength).

8.1.3 General Maintenance and Housekeeping

Maintenance & Housekeeping activities as listed below are essential to ensure that the CMS is being implemented successfully:

- determining and recording which machines require maintenance,
- which chemical containers are unlabelled or expired,
- which First-Aid boxes or eye showers are not working properly,
- whether containers are stacked properly in the Stores, etc.

A Maintenance & Housekeeping Standard Operating Procedures (SOP) should incorporate procedures for:

- Identification of machinery, components and equipment not performing at optimum operating conditions and a record of this maintained as suggested in figure 37 below
- Planned replacement of machinery, components, PPE, equipment, First-Aid box components, spill kits and stores materials as per their expiry date
- Maintaining machinery and equipment servicing records
- Determining chemical containers in poor condition or without labels or expired
- Chemical clean-out and safe disposal of unused, rejected chemical products
- Regular review of emergency response measures such as eyewash and body showers, exit signs, assembly points, exit pathways, fire safety and First-Aid boxes

Equipment	Date Checked	Action Required	Action Completed	Name of person checking	Signature or person checking	Due Date for next Check

Figure 37: Simple chart to track general maintenance and house keeping

There are three types of maintenance processes:

- **Corrective Maintenance:** This is done after the occurrence of a failure to eliminate the source of the failure or to reduce its recurrence
- **Preventive Maintenance:** This is done at pre-determined intervals to reduce the probability of failure
- **Planned or Improvement Maintenance:** This is done when making changes in the process/ machinery layout or for upgrading of the machinery

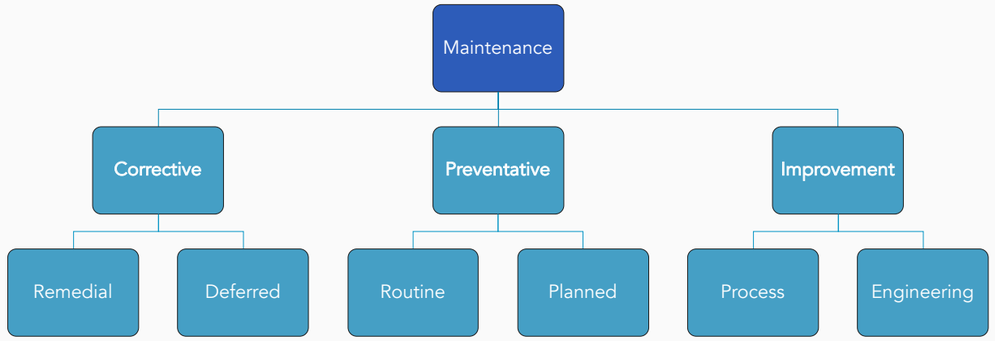


Figure 38: Different types of maintenance processes

8.2 Check List

(1)	List all documents and records that need to be stored and controlled	
(2)	Write and implement a document and control Standard Operating Procedures (SOP) to include access, retrieval and updates for all documents	
(3)	Ensure proper location and access to these documents	
(4)	Record incidents and non-compliances and work out Corrective actions using different Root Cause Analysis (RCA) methods	
(5)	Write and implement a Maintenance & Housekeeping Standard Operating Procedures (SOP)	

9. Continuous Improvement

Setting up a CMS is only the first step in the commitment to safer chemical management practices. The CMS needs to be reviewed periodically to ensure continuous improvement to keep in tune with changes that happen in organisations, regulations, Brand requirements, supply chain partners and manufacturing processes. A Supplier must install an internal process to do this or get the support from external agencies.

9.1 How to Ensure Continuous Improvement

Once the CMS elements are set, continuous improvements can be implemented through the following steps (as shown in figure 39):

1. Review of CMS policy and strategy at specified time periods by Chemical Responsible Team or by external experts through periodic internal or external audits, followed by a review by the leadership
2. Identify areas of improvements or pending actions or inconsistencies with new requirements in the existing CMS
3. Revise the CMS to include changes and improvements in action plans, strategy, procedures, policies, documents, tools, personnel, compliance and training requirements and priorities
4. Implement the updated and revised CMS

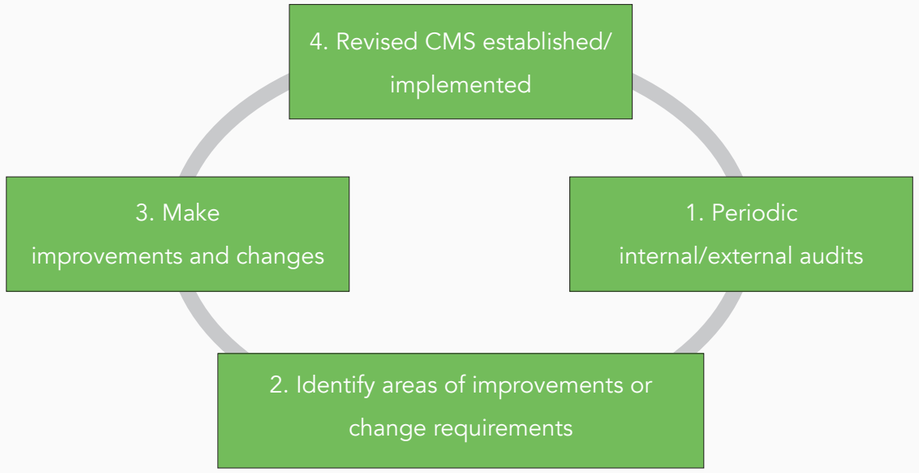


Figure 39: Steps to ensure continuous improvements

9.1.1 CMS Performance Review

CMS review helps a Supplier to continuously update its strategies and priorities. This can be done through an internal or external audit of the following:

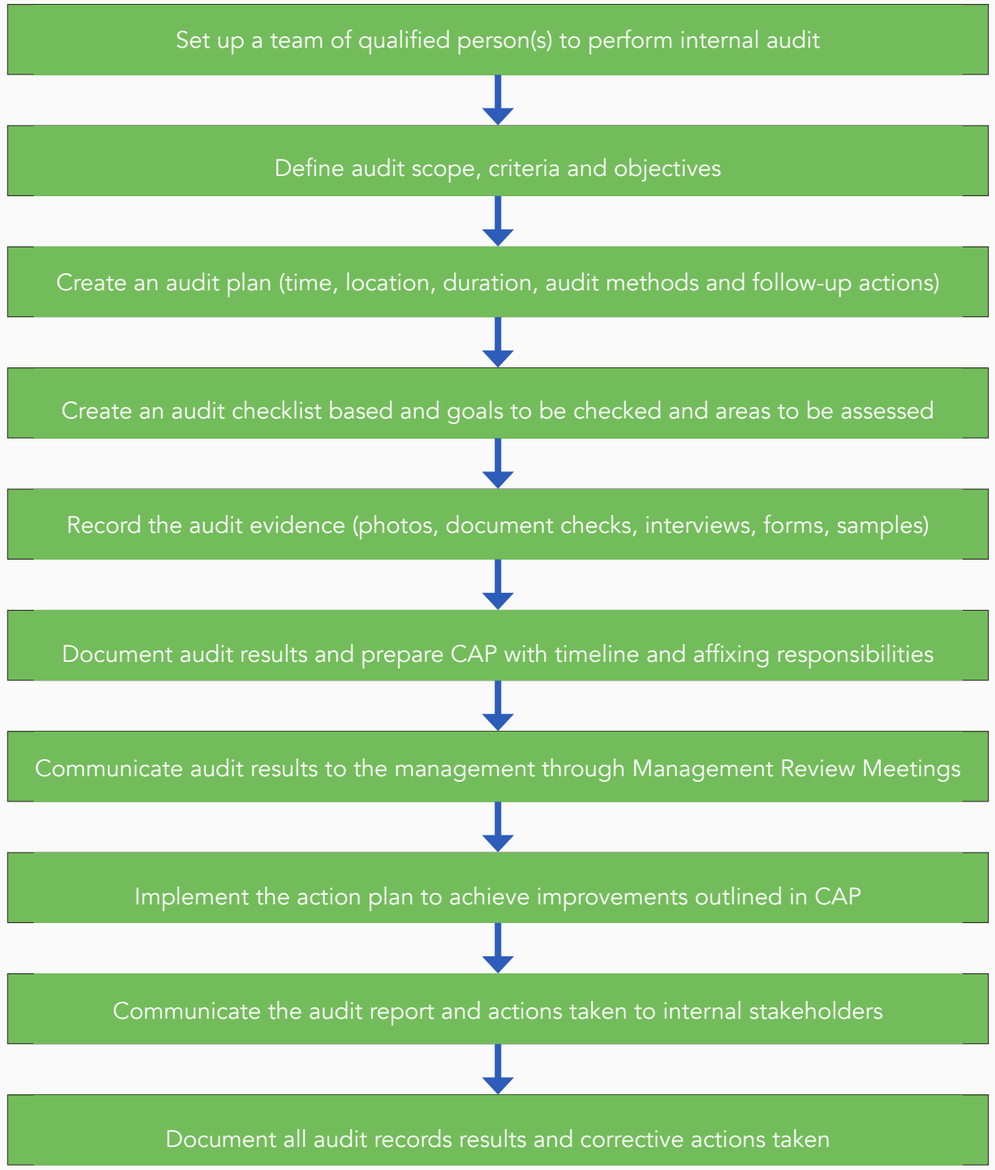
1. Check the Policy document to see if the Policy Statement needs any amendments to include changes in Brand or legal or ZDHC requirements, manufacturing processes or sustainable chemistry standards. Review the existing purchasing, transparency and traceability policies for improvements
2. Review the scope, goals, timelines, resources and methodologies to identify progress made as well as the areas of improvement in the Strategy document
3. Review systems implemented to manage compliance to legal requirements and risks from chemical hazards and supply chain
4. Check measures implemented to control exposure of workers to chemical hazards, PPE requirements and emergency response measures
5. Assess existing chemical storage and handling systems, including labelling, hazard communication, storage precautions and worker training for chemical handling
6. Identify if there are any changes in legal or ZDHC requirements for wastewater, sludge and air emissions and review goals set to reduce hazardous waste streams
7. Review all documentation and records, including SDS management, incident management and general maintenance & housekeeping
8. Supplier to Zero Programme can be used to do an assessment of your CMS

Internal audits:

The CMS performance review can be done by establishing an **INTERNAL AUDIT** process that considers the following:

- Who needs to be involved in the audit process?
- Who will be the CMS auditor(s)? What should the qualifications be?
- What is the internal audit frequency?
- How are the audits results and corrective actions documented?
- What possible links can be made with other audit programmes (for example quality, EMS or Health & Safety management system audits)?
- Would the CMS auditor(s) need any training?
- How should the audit results be communicated and reviewed by facility leadership?

The internal audit process can be set up as per the below suggested flow of activities:



External audits:

The CMS Performance Review can also be done through an audit by an external qualified agency that is aligned with the ZDHC Accepted Experts. An external audit can ensure additional objectivity of your performance assessments.

An external audit can be conducted once a year and the findings should be corroborated with the internal audit results.

Management Review:

All internal/ external audits should lead to identification of improvement areas and CAP. These should be reviewed by the Supplier's leadership through a Management Review Meeting (MRM), where the internal audit team or Chemical Responsible Team can present the audit results and decisions are taken for implementation of corrective actions. The MRM should also lead to new targets to enable continuous improvement.

Suggested agenda points for MRMs are:

- Status of follow-up actions from previous MRMs
- Overall progress of CMS towards set goals (as per CMS Strategy document)
- Internal/external audit reports which includes findings and Corrective Action Plan (CAP), including resource requirements and timelines
- Decisions required from leadership for financial investments or manpower requirements for CAP
- Incidents of chemical emergencies, spills, etc.
- Status of current compliance with legal and other requirements
- Any changes that could impact the CMS, such as change in chemicals or employees
- Any other topic relevant to CMS

The MRM minutes should be documented. Given below is an example of such a documentation:

ABC Textiles Ltd.						
MRM Agenda Points					Date	1 Feb 2020
Sr. No.	Area	Agenda point	Current status	Proposed next step	Responsible person	Target date
1	Chemical weighing area	To install automated weighing system	Manual weighing is done that results in spills and dusting	Check with vendors, get quotes and finalise investments	Stores responsible person	31 Jul 2020
2	Chemical Stores	Conduct training on PPE	Last training done one year back	Get PPE manufacturer to conduct workshop	HR responsible person	1 Sep 2020

9.1.2 Training

Training and awareness at the workplace are important aspects of chemical management as they help in minimising accidents in a manufacturing facility, reduce the environmental impact and optimise efficiency.

Staff are motivated if they work in a healthier environment, thus ultimately leading to increased productivity. Training should also be provided to sub-contractors as well as sub-suppliers on topics relevant to the scope of their engagement in the CMS Strategy and Supply Chain Assessment (e.g.: training on Brand RSLs to raw material suppliers).

Each manufacturing facility should have relevant staff members who have undergone training who have undergone training through the ZDHC Academy and have secured the ZDHC Certificate after successfully completing the online exam. Register to the ZDHC Academy for free and have a look at the courses offered: academy.roadmaptozero.com.

Trained staff can conduct training workshops for other staff within the manufacturing facility. External experts can also be invited, wherever required, to conduct in-house training workshops to user groups drawn from different departments.

Training topics that should be covered include (but not limited to):

- ZDHC MRSL and Brand RSL conformance
- Safe handling and disposal of chemical products
- Use of Personal Protective Equipment (PPE)
- First-Aid measures for emergencies
- Fire-fighting drills as per Standard Operating Procedure (SOP)
- Emergency Response drills to spillages and leakages of chemicals

Records of training provided should be documented by the Personnel/HR department, along with date of training, name of trainer and trainees and the topic/subject of the training provided. For First-Aid, fire-fighting and emergency response measures, physical mock-drills should be conducted and recorded. These records can be then used to support the transparency policy.

A training plan can be prepared through an evaluation of the below questions suggested in figure 40.

Whom to train?

- Staff who handle chemicals and waste
- Staff exposed to chemicals during use
- Purchase/maintenance staff
- Contractors and suppliers
- Managers

What to train?

- Safe handling and storage
- PPE and Engineering Controls
- Transfer of chemicals
- Restricted substances
- SDS
- SOPs on chemical management
- Emergency response measures

When to train?

- At time of joining (new staff)
- Refresher training for existing staff
- New buyer requirements are to be communicated

How to train?

- Through internal trainer
- Mock drills
- Attending external workshops
- Arranging on-site workshops
- Online training webinars

Figure 40: Training Plan preparation method

9.2 Check List

(1)	Conduct a CMS Performance Review through internal and/or external audits to identify areas of improvement and planning changes or corrective actions for the CMS. Review the actions through Management Review Meetings	
(2)	Make a training calendar for new and existing employees on topics relevant to them for chemical management. Extend these trainings to sub-contractors and vendors, if they are included in the CMS scope	

APPENDIX A
Council Directive 98/24/EC

The process of hazard identification and risk assessment should be aligned with Article 4 of the COUNCIL DIRECTIVE 98/24/EC or similar regulations in other regions. In particular: The employer shall first determine whether any hazardous chemical agents are present at the workplace. If so, he shall then assess any risk to the safety and health of workers arising from the presence of those chemical agents, taking into consideration the following:

- their hazardous properties
- information on safety and health that shall be provided by the supplier, (e.g. the relevant Safety Data Sheet (SDS) in accordance with the provisions of Directive 67/548/EEC or Directive 88/379/EEC)
- the level, type and duration of exposure
- the circumstances of work involving such agents, including their amount
- any occupational exposure limit values or biological limit values established on the territory of the Member State in question
- the effect of preventive measures taken or to be taken
- where available, the conclusions to be drawn from any health surveillance already undertaken

APPENDIX B
Case Studies

How chemical products can be evaluated for the hierarchy of controls on a case-by-case basis.

Case Study 1

A Supplier was using PFC -based chemical products to impart oil and water repellant finish as per requirement of their Buyer. Such a chemical was controlled through:

1. ELIMINATION of use: The Supplier and Buyer discussed the technical requirements of the final finish and decided that oil repellency could be deleted in the end-product criteria. Thus, the use of PFC- based chemistry was not necessary for the oil repellency requirement
2. SUBSTITUTION: Since the technical requirement was now only water repellency, safer alternatives to PFCs, such as dendrimer chemistry or silicone chemistry was trialed, and the PFC chemical products substituted by safer chemical products

Case Study 2

A Supplier installed an automated dosing system for dosing of all the dyes and chemicals directly into the dyeing machines. The dosing system included a robotic, programmable dyes dissolving system. Thus, exposure to dyes and chemicals of workers was reduced through ENGINEERING CONTROL.

Case Study 3

Hydrogen peroxide and caustic soda containers of 50 kgs capacity were purchased and stored by a Supplier for their bleaching operations. This required internal transport of the chemical products as well as exposure in handling them. The Supplier shifted to bulk storage tanks for these chemical products (located outside the bleaching department) with piping to directly dose these chemicals into the bleaching machines. The chemical products were off-loaded into these bulk storage tanks directly from the delivery trucks. Through this ENGINEERING CONTROL, the exposure and hence the risks were reduced.

Case Study 4

A Supplier built a main chemical store in a building separate from the process house and installed keycard access to the Store. Only authorised persons – who were granted the keycards – could gain access to the chemical store by swiping or tapping their card at the keycard reader installed at the main gate. This is how exposure of staff to chemicals was controlled through ADMINISTRATIVE CONTROLS.

Case Study 5: Leather

The pickling stage requires a big quantity of salt (NaCl) and of inorganic acids. The high Sodium Chlorides concentration and the strong acidity of the pickle float can be reduced by the SUBSTITUTION of the Salt and the Sulfuric acid with the use of products based on modified polysulphonic acids. The benefit of this best practice is related to the hazard reduction of the pickel floats and the relevant savings of the Sodium Chlorides use.

Case Study 6: Leather

During the fatliquoring stage a tannery was using a chemical based on medium chain Chloro-paraffins. It has been decided to make small scale trials with long chain Chloro-paraffins and other ingredients, in order to SUBSTITUTE the hazard through non hazardous chemical products. The new chemical is able to guarantee the same performances than the more hazardous one, without causing quality problems for the final articles.

Case Study 7: Leather

A tannery had problems with the Chromium III limits in the WW treated discharges. It has been decided to install a dedicated pipeline for Chromium float in order to recycle it in the tanning and retanning steps. Through this ENGINEERING CONTROL, the exposure and hence the risks were reduced.

APPENDIX C

Norms & Standards for Personal Protective Equipment (PPE)

All PPE is recommended to be verified against the conformity of their standards (published or in progress) with the essential Requirements of the Regulation (EU) 2016/425 on PPE.

In this table all the types of Chemical Protective Clothing and their related ISO Standards are included, as an example to be extended to all the required PPE.

Please refer to this link to detect the appropriate ISO Standards for each PPE: www.iso.org

Standard	PPE purpose	Chemical Protective Clothing type
EN 943-1	Protection against hazardous gases, liquids, aerosols, and solid particles	• Type 1 gas-tight suit • Type 2 air-fed non-gas-tight suits
EN 943-2	Protection against hazardous gases, liquids, aerosols, and solid particles	
EN 14605	Protection against pressurized liquids	• Type 3 liquid-tight suit • Type 4 spray-tight suits
EN ISO 13982-1	Protection against dusts and solid particles	• Type 5 suits against solid particles
EN 13034	Protection against e.g. minor splashes of irritant chemical	• Type 6 suits offering limited protective performance against liquid chemicals

APPENDIX D

Suggested CAP template for Wastewater Management

Name of manufacturing facility:					
Wastewater testing cycle: (April/ October) – tick applicable				April	October
MRSL Group non-conformity in ClearStream Report					
Analytes detected in MRSL Group	ZDHC WWG limit value (µg/L)	Detected value as per test report (µg/L)	Root cause determined (What? / How? / Why?)	Corrective action taken (What? / When? By whom?)	Preventive measures taken (What? How will it prevent reoccurrence?)
NPEO	5 (µg/L)	15 (µg/L)	**What**: Auxiliary (product ABC) used **How**: Reviewed CIL **Why**: Auxiliaries have not been checked for MRSL conformity, yet. ABC is not listed on ZDHC Gateway	**What**: Substitution identified. ABC won't be purchased or used anymore **When**: 11.11.2020 **By whom**: John Doe, Head of Chemicals	**What**: Will do InCheck in order to get full CIL checked **How**: We can intensify substitution process and won't use chemicals not in line with ZDHC MRSL anymore

MRSL Group non-conformity					
Analytes detected in MRSL Group	ZDHC WWG limit value (ppb)	Detected value as per test report (ppb)	Root cause determined and preventive action taken		

APPENDIX E
Air Emissions Control Devices

Types of emission control devices	Explanation
Cyclone Precipitator	A cyclone used to remove particulate matter from exhaust gases. The working principle is centrifugation and difference in specific gravity of the particle and exhaust gas, where particulate matter collects at the bottom.
Electrostatic Precipitator (ESP)	ESPs are typically used to reduce particulate emissions from boilers, kilns, engines, etc. The system consists of electrically charged metal plates, which attract the charged particulates, and removes them from exhaust gas.
Baghouse	A baghouse system is used for particulate control, and typically consists of several layers of filter bags where "dirty air" enters and gets filtered through bags. Dust is periodically removed from the filter and is collected in a tray under the filter installation (hopper).
Scrubbers	Wet scrubbers can be used to reduce pollutants such as particulate and SOx emissions. They operate by using a liquid spray (such as water, sodium hydroxide) that mixes with the exhaust gas and removes contaminants. Wet scrubber generates wastewater effluent (highly alkaline in case of alkali wet scrubber) which needs to be managed appropriately.
Activated Carbon Adsorption	Carbon adsorption is used to remove organic compounds (such as VOCs) through adsorption on the surface until it is saturated. However, once the activated carbon's saturation level has been reached, it is replaced or regenerated.
Others	• Optimise boiler operations to reduce the emissions of nitrous and sulphur oxides. • Consider changing fuel from coal to biomass or natural/liquid pressured gas. • Avoid fugitive air emissions of chemicals through • 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. • Improved working practices through training on handling practices to avoid chemical spills. • In case of Refrigeration systems, substitute the refrigerant with a safer alternative or one with low Global Warming Potential.

APPENDIX F

List of Tables and Templates