

Content-3: Introduction to Chemical Inventory Management

Orientation

What can this unit help you with?

You may use this unit if you

- Have to know what chemical inventory management is;
- Have to know the purpose of inventorying chemicals;
- Are asked to inventory the chemicals present in a factory.

Intended results of the unit

- Students are capable of finding information on chemicals for making a chemical inventory;
- Students can inventory chemicals using a standard format provided by ZDHC;
- Students have an understanding of the benefits of inventorying chemicals;
- Students are capable of using and managing chemical inventory.

Input

A Chemical Inventory is a system by which we can record chemicals and other hazardous materials for a company. Ideally, all the chemicals in textile factories where chemicals constitute a key production input should maintain an up-to-date Chemical Inventory. It is an important database that monitors stock, expiry dates, and hazardous nature, such as flammable, toxic, corrosive or reactive. It also helps in responding effectively to any chemical emergency.

Managing an accurate chemical inventory is a requirement demanded by the regulatory authorities for using, handling, and storing hazardous materials and a means to effectively communicate and manage chemical hazards present in the factory.

Why Do We Need That?

A Chemical Inventory is a record of the chemicals for purchase and stock management purposes. In the context of resource efficient management of chemicals, the purpose of chemical inventory management goes beyond warehousing requirements.



Figure 1: Why do we need Chemical Inventory? Picture courtesy: Kazi Farhan Hossain Purba.

The chemical inventory serves as a key reference and chemical management information tool, for example, to assess conformance with restricted substances lists or report to the company stakeholders like buyers.

According to requirements set by Zero Discharge of Hazardous chemical (ZDHC), a company is expected to create and maintain a comprehensive chemical list, allowing all chemicals in the facility to be identified by name, also recording hazard class, container size, locations of containers and dates on which solutions were prepared or expire, if applicable and chemicals of concern for the customers. The inventory is also used for identification and assessment of the environment, health and safety hazards and risk.

What Are the Benefits?

Managing a proper Chemical Inventory has a lot of benefits. Often, they are linked to the direct cost of a factory. Let us see the benefits and then learn how to make a Chemical Inventory all by ourselves. By keeping a Chemical Inventory, we can:

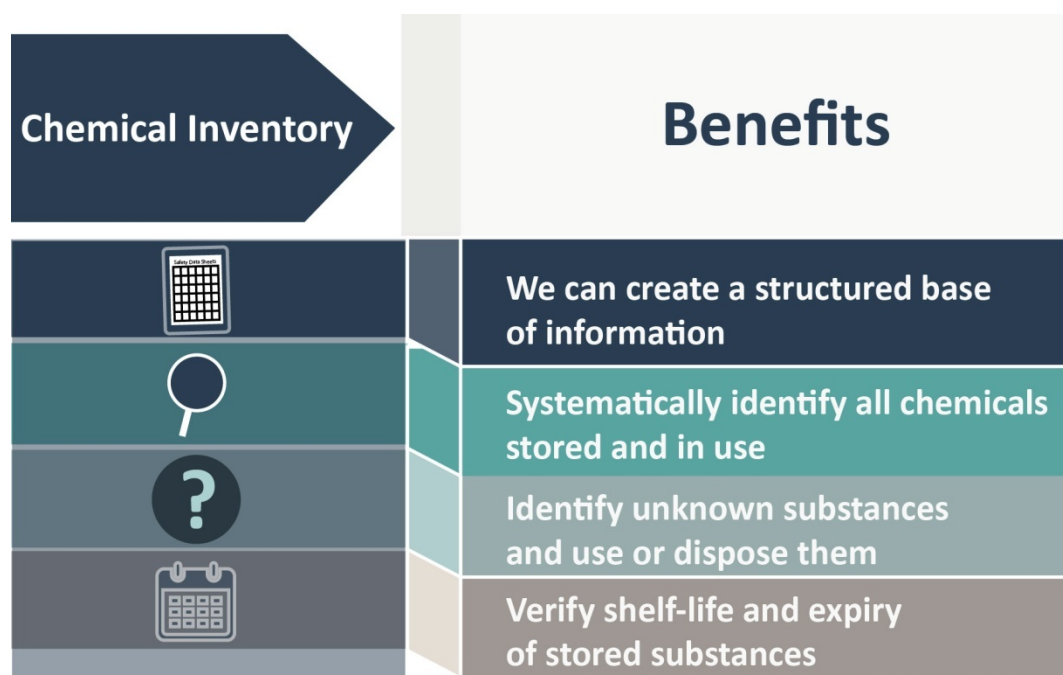


Figure 2: Benefits of a well-managed Chemical Inventory. Image courtesy: Kazi Farhan Hossain Purba.

- create a structured base of information (storage & chemical, environment, health & safety management),
- systematically identify all chemicals stored and in use,
- identify unknown substances and use or dispose of them,
- verify shelf-life and expiry of stored substances.

Where to Find Information to Make Chemical Inventory?

We can get the information needed for our inventory from the eco-maps, process flow diagrams, mass balancing and Safety Data Sheets (SDS). Let us see what we can extract from each of our information sources in the following picture:

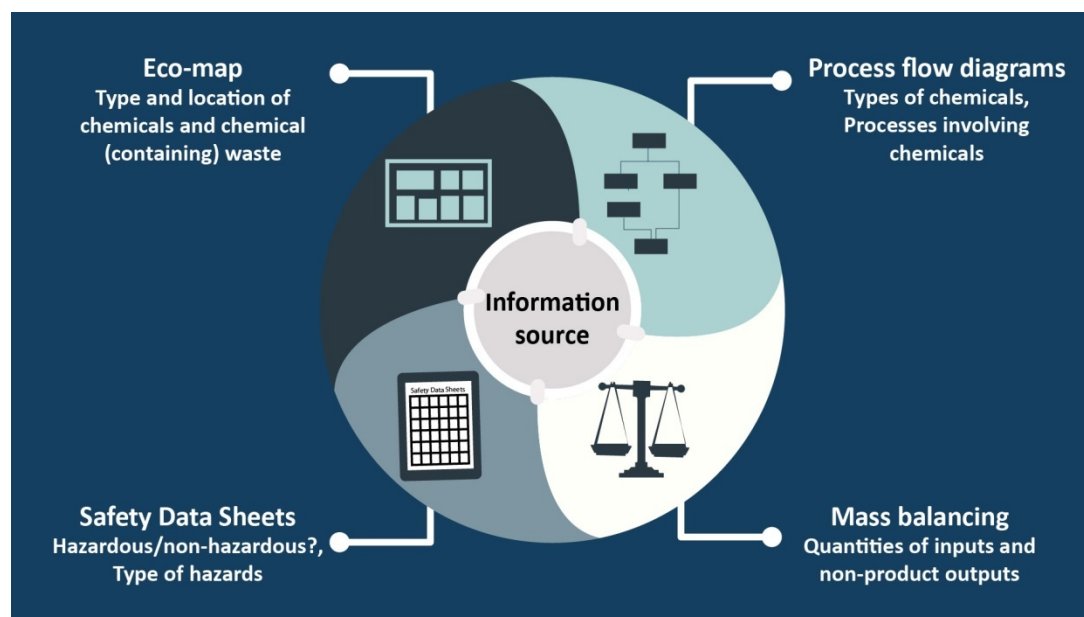


Figure 3: Where to find information to make a chemical inventory? Picture courtesy: Kazi Farhan Hossain Purba.

Chemicals That Must Be Included in the Inventory

A company deals with a lot of chemicals for its processes. But there are some chemicals which are a must to include in the inventory. They are:

- All chemicals with hazard indication or pictogram on container label,
- All chemical materials used in laboratory, pilot facilities and other locations,
- All compressed gases,
- Any flammable paints, solvents, glues, fuels and other petroleum product, and
- Materials that create an explosive or toxic vapour hazard to unprotected personnel during a fire.

How to Identify Chemicals in the Factory?

Before making the inventory, we need to understand which chemicals we have at our hands.

That's why we have to:

- read labels and markings on chemical containers;
- consult Safety Data Sheet (SDS);
- cross-check to rectify any error that may occur.

What to Do if the Chemical is Unlabelled?

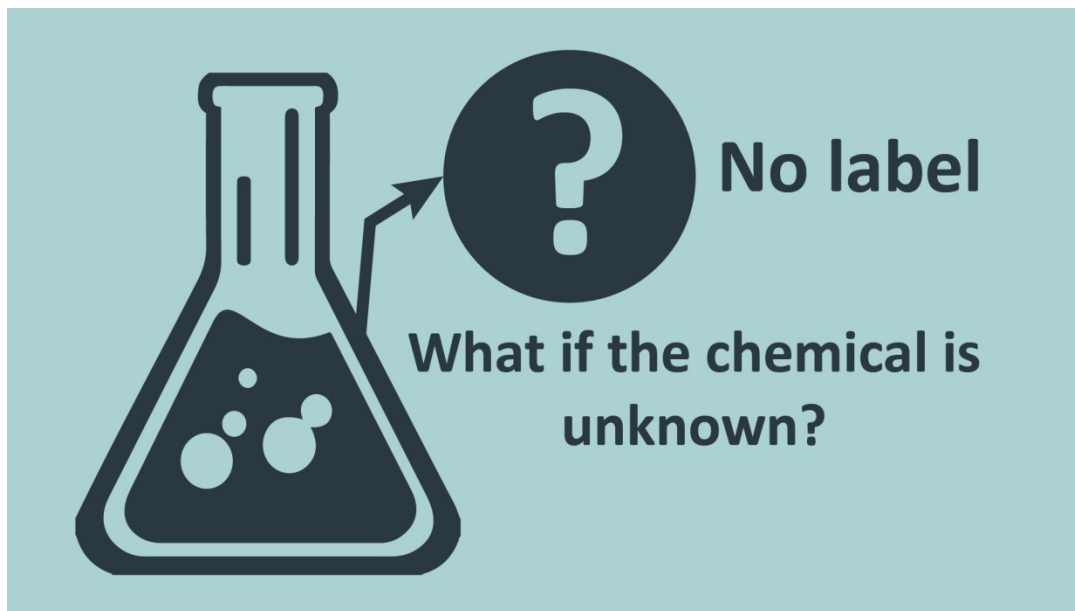


Figure 4: What if the chemical is unknown? Picture Courtesy: Kazi Farhan Hossain Purba.

If we find a chemical unlabelled, we have to do the followings:

- Try identifying them by asking the supplier and workers who handle these substances (where? what for?);
- Have it analysed in a laboratory;
- If we don't get the necessary information, we should dispose of it as hazardous waste using the precautionary principle.

How to Prepare a Chemical Inventory in Line With ZDHC Requirements

Previously, we have learnt where to seek information for making a Chemical Inventory. Now we will learn to put the information in the right place and create one.

When we make a Chemical Inventory, we follow a particular format. We need to input data to their designated places in the chosen format of the inventory by collecting all the necessary information. More information can also be added according to the buyer's requirements. For making a Chemical Inventory, we need to remember the following points:

1. We have to decide on a standard format of the enhanced chemical inventory. [Appendix C of the ZDHC \(Zero Discharge of Hazardous Chemicals\) CMS \(Chemical Management System\) Guide-lines](#) includes an outline of a recommended chemical inventory. We can add further columns in line with our requirements.
2. Referring to our existing inventory or using the findings from our eco-maps and flow-diagrams, we need to fill the information into the inventory template in the following way:

Deptr./ location/ building	Product name	Chemical name	Chemical Supplier	CAS	Quantity	Units	SDS on file	.....
Dyehouse 1	Hydrochloric acid (37 %)	Hydrochloric acid	XYZ Company	7647-01-0	2	Liters	Yes	.....
Dyehouse 1	Glauber's salt	Sodium sulphate	ABC Cooperation	7757-82-6	1000	kg	Yes	
.....								

Figure 5: Chemical inventory according to the ZDHC (first part) // Collage done by Marie Akoury for Edutex

The ZDHC inventory template contains other columns that deal with the identification, classification of inherent hazards characteristic, and listing of chemicals of priority concern (for example, ZDHC Manufacturing Restricted Substances List – ZDHC MRSL). We need to fill information in the following way:

Product name	Chemical name	.....	SDS on file	Hazard class	R-phases/ H-statements	11 ZDHC Priority Chemical Class	On factory/ ZDHC MRSL	On brand's RSL	Shelf life	.....
Hydrochloric acid (37 %)	Hydrochloric acid	.....	Yes	Class 8	H290 H314 H335	N/A	No	No	mm.yy	
Glauber's salt	Sodium sulphate	.....	Yes	Non hazardous	H317	N/A	No	No	mm.yy	

Figure 6: Chemical inventory according to the ZDHC inventory (second part) // Collage done by Marie Akoury for Edutex

In the inventory, we can see a column named R-phrases/H-statements.

Here, R-phrases or risk phrases refer to a list of abbreviated descriptions of hazardous characteristics associated with chemicals as originally defined in Annex III of European Union Directive 67/548/EEC. These risk phrases were widely used internationally, not just in Europe, and have been replaced with a more harmonised system under the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) is an internationally agreed-upon system, created by the United Nations.

H-statements or hazard statements/codes refer to a list of abbreviated descriptions of hazardous characteristics associated with chemicals as defined under GHS. We can find the H-statement(s) for chemicals used in a company on the chemical container/package and/or in the Safety Data Sheet. If not available, we have to inquire with the chemical supplier or check in one of the internet based chemical databases against the CAS number (e.g. [GESTIS](#)).

As we have learnt to make Chemical Inventory, we can make a waste inventory in the same way by choosing a proper template and inputting necessary data.

Conclusion

A chemical inventory is a living document that should be reviewed and updated regularly (at least every 6 months) by dedicated and trained staff.

We can manage our inventory properly by making it Excel based. Excel-based inventories work great as they provide a simple format that is easy to maintain and can be sorted/searched by various items.

By keeping a well-managed inventory, we can identify and prioritise hazardous chemicals for substitution, restricted chemicals, significant human/environmental health impacts, track chemical usage quantities. Inventories can also be used to develop and track targets, identify any unknown chemicals on-site, and regulate purchasing approvals.

Inventories serve as a list of chemicals approved for purchase. So, we can also determine to standardise purchasing schedules and quantities from the companies early purchasing trend. We can reduce overstocking, expiration and identify any redundant chemistries or areas of excessive use. So, managing a chemical inventory can greatly benefit any company where chemicals constitute a key production input.

Didactical elements

Quizzes and self-tests:

True-false

1	It is optional to include the compressed gases in the Chemical Inventory.	
	<ul style="list-style-type: none">▪ Correct▪ False	False
2	A Chemical Inventory is a system by which we can keep a record of chemicals and other hazardous materials for a company.	
	<ul style="list-style-type: none">▪ Correct▪ False	Correct
3	All chemicals with hazard indication or pictogram on container label must be included in the chemical inventory.	
	<ul style="list-style-type: none">▪ Correct▪ False	Correct
4	If we don't get necessary information about a particular chemical, we should dispose it as hazardous waste using precautionary principle.	
	<ul style="list-style-type: none">▪ Correct▪ False	Correct
5	From eco-map, we can find out the processes involving chemicals	
	<ul style="list-style-type: none">▪ Correct▪ False	False

Open Questions:

1	Why do you think it is necessary to make a chemical inventory for a company?
	<p><i>Open text</i></p> <p>A Chemical Inventory is a record of the chemicals for purchase and stock management purposes. In the context of resource-efficient management of chemicals, the purpose of chemical inventory management goes beyond warehousing requirements.</p> <p>The chemical inventory serves as a key reference and chemical management information tool, for example, to assess conformance with restricted substances lists or report to the company stakeholders like buyers.</p> <p>As per ZDHC, a company is expected to create and maintain a comprehensive chemical list, allowing all chemicals in the facility to be identified by name, also recording hazard class, container size, locations of containers and dates on which solutions were prepared or expire, if applicable and chemicals of concern for the customers. The inventory is also used for identification and assessment of environment, health & safety hazards and risk.</p>

Choose multiple:

1	As per ZDHC, a company is expected to create and maintain a comprehensive chemical list for: (Choose multiple)	
	<ul style="list-style-type: none">▪ allowing all chemicals in the facility to be identified by name.▪ Calculating the benefits of using safe chemicals and determining the right kind of ETP▪ recording hazard class▪ recording container size▪ Knowing more about the characteristics of the persons who are responsible for chemical inventory▪ recording locations of containers▪ recording dates on which solutions were prepared or expire	<p>Answer:</p> <ul style="list-style-type: none">▪ allowing all chemicals in the facility to be identified by name.▪ recording hazard class▪ recording container size,▪ recording locations of containers▪ recording dates on which solutions were prepared or expire

Sorting tasks:

Sort the words to the correct sentences:

containers	key reference	labels	toxic	tool
------------	---------------	--------	-------	------

1. The chemical inventory serves as a __ and chemical management information __.
2. Materials that create an explosive or __ vapour hazard to unprotected personnel during fire must be included in the Chemical Inventory.
3. We need to read __ and markings on chemical __ to identify the chemicals in a factory.

Answers:

1. key reference, tool
2. toxic
3. labels, containers

Exercise: 1

Imagine the situation below and take action for the mentioned company:

Colour House, a printing factory, deals with many chemicals that are needed for different purposes. The factory sometimes orders the same chemicals redundantly. Expired chemicals are frequently found in the chemical warehouses. Most of the time, giving room to newly ordered chemicals become a headache for the storeroom supervisor. For the company, you have to do the following tasks:

- Demonstrate the factory why they need a functional Chemical Inventory system.
- Demonstrate them the process of making a Chemical Inventory by making one with at least five examples.
- Show them how they can manage their chemical storage using a Chemical Inventory.

Exercise: 2

Beirut Chemical Explosion

[BBC reported](#), "A devastating explosion in Beirut on 4 August killed at least 200 people and injured around 5,000 others."

[According to The New York Times](#), "The exact cause remains undetermined, but fire ravaged a port warehouse around 6 p.m. There were two explosions, a smaller one followed seconds later by a larger blast that destroyed swathes of the city."

Officials say the second, more devastating explosion most likely came from a nearby 2,750-ton stockpile of ammonium nitrate, a highly explosive chemical often used as fertiliser, which Prime Minister Hassan Diab said had been stored in a depot for six years."

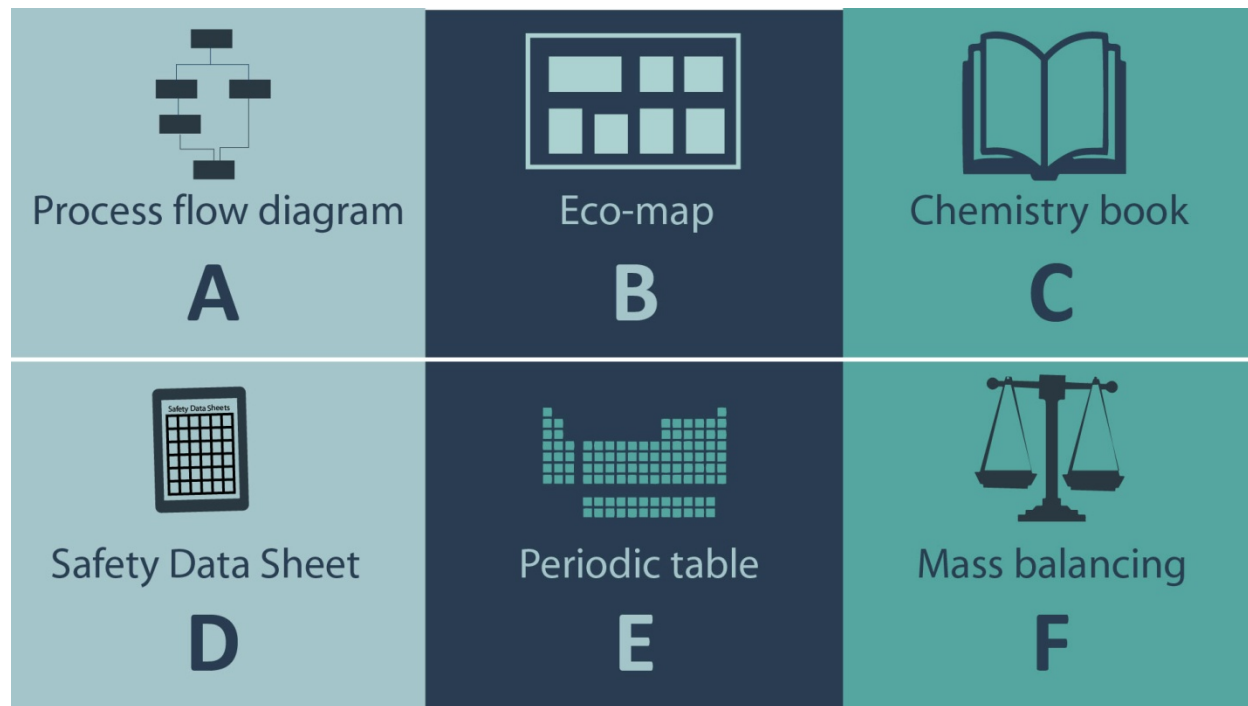
But Ammonium nitrate's shelf life is six months from the date of production.

Task:

- How can you prevent such an accident in your factory?
- How can the Chemical Inventory play a role in preventing such occurrences?

Hotspots

Which ones work as information sources for Chemical Inventory?



Answer: A, B, D, F. Image Courtesy: Kazi Farhan Hossain Purba

References/additional literature/links

1. Resource Efficient Management of Chemicals, PSES II, GIZ
2. More information on preparing chemical inventory efficiently can be found here: <https://ohsonline.com/Articles/2013/05/01/Eight-Tips-to-Get-a-Grip-on-Your-Chemical-Invento-ry.aspx?m=1&Page=2>
3. More information on Chemical Inventory management and how a Chemical Inventory is used can be found here: https://ehs.princeton.edu/laboratory-research/chemical-safety/chemical_inventory_management
4. A quick overview on the development and maintenance of a chemical inventory can be found here: <https://outdoorindustry.org/chemical-manuals/1/en/topic/development-and-maintenance-of-a-chemical-inventory>
5. To know more about Chemical Inventory Management, you can visit this link: <https://www.google.com/amp/s/www.labmanager.com/business-management/managing-your->

chemical-inventory-8246/amp Though it is written on a chemical laboratory perspective, the knowledge is reproducible for a factory also.

6. To know more about appendix C of the ZDHC (Zero Discharge of Hazardous Chemicals) CMS (Chemical Management System) Guidelines, you can go to the following link: [Appendix C of the ZDHC \(Zero Discharge of Hazardous Chemicals\) CMS \(Chemical Management System\) Guidelines](#)

Unit Feedback

If you wish you can give us feedback on the learning unit here. This is of course, optional.

Technical Elements

How did the technical elements of the unit work for you? Did you have any difficulties?

Didactical Elements

How did the didactical structure of the learning unit work for you? Do you have any comments or suggestions to make it better?

Open

Do you have any other comments on this unit?

Export feedback

On this page you can choose to export your feedback and send it to xyz.