WHITE PAPER

IMPORTANCE OF AN EFFECTIVE CHEMICAL MANAGEMENT SYSTEM AT THE WORKPLACE

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1. Introduction

Chemicals are used in almost everywhere. At every workplace, workers may be exposed to some chemicals like paints, cleansing agents, adhesives, etc. through numerous routes, for instance, inhalation, dermal contact, and oral route.

Many workers die each year due to chemical exposure. *As per the U.S. Bureau of Labor Statistics, exposure to harmful substances or environments is one of five most common causes of fatal occupational injuries during 2016-2017*[1]. Improper usage, handling and storage of chemicals can cause severe hazards, including chemical disasters. Among the most serious ones are:

- Gorni Lom, Bulgaria – October 2014: 15 deaths, dismantling of old mines
- Mount Polley Mine Disaster, Canada – August 2014: Significant spill of lethal mining waste
- Modugno, Italy –July 2015, Fireworks factory explosion, 9 deaths
- Tianjin, China – August 2015, 165 deaths, 8 missing and 798 injuries, chemical warehouse explosion
- Coatzacoalcos, Mexico – April, 2016, 32 deaths in vinyl chloride plant explosion

High-profile chemical accidents draw lot of media and public attention while there are hundreds of accidents remained unnoticed at the workplace still poses serious harm to workers, society and environment. In many accidents like Bhopal Gas tragedy, India, December 1984, victims are still struggling with the serious medical conditions arising due to exposure to methyl isocyanate gas. Time offers no reclamation for them.

As per the statistics collected by the JRC's Major Accident Hazards Bureau (MAHB), a total of 667 chemical incidents were reported in the media during 2016-2017[2]*. The largest number of accidents occurred in the oil and gas industries (279), followed by those in chemical processing sites (183)*[2].

Due to the severe consequences of a chemical exposure on human health and the environment, several nations have developed regulations related to proper usage, storage, transportation, classification and labeling of the hazards of the chemical products and communication of health and safety information to workers through Safety Data Sheets (SDS), International Chemical Safety Cards, Safety Labels, etc.

This paper summarizes the numerous threats linked with the usage of chemicals, business challenges and necessity for managing them in the workspace and the essential constituents of a robust 'chemical management system' for an effective and full-proof management of chemicals.

2. Hazards Associated with Chemicals

Globally harmonized system (GHS) classifies and labels chemicals and categorizes hazards modelled by any chemicals into three categories - physical, health and environmental hazards based on their lethal properties.

GHS is a classification standard managed by the United Nations. The main aim of GHS classification is to perform the hazard identification of substances and mixtures and to communicate the same in the form of SDS, labels, trainings, etc. It also aims at developing a common framework for hazard classification so that there will be a standardized/harmonized classification for any chemical i.e.

One chemical = One classification

3. Need of Chemical Management

Chemical management is required because of the following key reasons:

- Regulatory Compliance: Ensuring regulatory compliance is a must for organizations dealing with chemical usage, storage and their discarding. Whether a chemical is dangerous or safe in use, it is important to control and manage the risk associated with it. Some examples of such chemical regulations are REACH regulations, TSCA, EU CLP, etc.

  A few other global controls in chemical management are: Montreal Protocol, Chemical Convection 1990, SAICM, Stockholm Convention, etc.

- Improved Workers Health and Safety: Improper usage of chemicals causes severe health impacts on the workers. It may also result in fire or explosions and increases the magnitude of severity. An effective chemical management encourages the safe usage of chemicals and lessens the incidents/accidents in chemical handling

- Reduced environmental impacts: Chemical management focuses on the identification of environmental hazards associated with the chemical and ensures proper usage and disposal of it and thus reducing its environmental impacts

- Improved Brand Image and Reputation: Nowadays there is an increase in the consumer consciousness regarding the environmental and health impacts associated with a product. The use of safer ingredients in a product will give a competitive edge over other manufacturers and improves the brand image and reputation.

For example: Some of the paint companies removed heavy metals like lead from the paints. Its long-term exposure causes neuropathy and abdominal pains

4. The Barriers to Chemical Management

The following are few of roadblocks faced by a company in chemical management:

- Significant change management efforts in the interpretation and implementation of regulatory compliance
- Limited skilled workers for conducting chemical evaluations.
- Difficulty in leveraging IT systems for managing huge amount of chemical data, processes and measures.
- Absence of validation tools/processes for keeping track of the change in compliance requirements with geography/region.
- Lack of unified information system about the quantity, characteristics and hazards of chemicals used in the workplace.
- Time consuming and non-auditable chemical data collection processes.
- Inconsistent document management system, leading to inability to track latest versions of the SDS, SOPs, etc.
- Lack of financial resources and disinterest of higher management towards chemical management

5. Components for an Efficient Chemical Management System

Following crucial components should be covered in any chemical management system for achieving a highly competent chemical management at work place and to guarantee that various risks imposed are thoroughly assessed and correctly controlled with the purpose of the nil release of harmful chemicals across the product's life cycle :

S. No	CMS Components	Requirements
1	Chemical Management Plan	• Higher management vision and approach towards chemical management • Policy for monitoring and controlling use of restricted/hazardous chemicals at the workplace
2	Organization Structure	• Details of key people responsible for managing chemical management strategies
3	Accurate Chemical Inventory Management	• Up to date database of all the chemicals used/placed in the facility • Creation of flow diagrams to detect the general flow of chemicals through different processes and equipment at the workplace
4	Chemical Procurement Management	• Chemical purchasing policy • Assessment of chemical inventory before any chemical procurement • Disposal cost consideration at the time of procurement (Some chemicals deteriorate with time) • Chemical supplier approval/removal process
5	Chemical Risk Assessment	• Assessment of hazards/risks related with chemicals placed in the chemical inventory. • Job safety Analysis
6	Environment Impact Management	• Identification and management of potential environmental impacts from the use of chemical placed in the chemical inventory • Hazardous waste management program • Reduce chemical wastes/releases
7	Alternatives Assessment	• Assess alternatives for chemicals that are found to significant physical, health or environmental hazards
8	Health Surveillance	• Periodic health surveillance is recommended for the workers who are dealing with hazardous chemicals • Implementation of good industrial hygiene and safety practices
9	Labelling and Packaging Management	• Standard labelling and packaging of all the chemicals used or placed at the workplace as per regulatory requirement
10	Chemical Transport Management	• Proper transport of chemicals when transferred from one place to other. • Leak detection and management system
11	Regulatory Obedience	• Ensure compliance with the statutory obligations under relevant HSE regulations
12	Folder Management	• Accessibility of SDS/SOPs, H&S documents
13	Skill Management	• Track proficiencies/ workforce skills • Technical and Functional Trainings for employees, contractors and visitors • Ongoing Assessments
14	Crisis Retort Plan	• Crisis reaction plan if anything goes wrong. • Distress System • Smart devices/indicators
15	Analytics	• Reporting tools • Collaborative dashboards for faster decision making
16	Inspection Drives	• Inspection plans to check the success of executed chemical management system

Use of technologies like IoT and machine learning also improves chemical management system execution. For example, IoT devices tracking chemical inventory system, Workers wearing IoT device as wearable, which can detect exposure to toxic chemical and raises alarm, etc. Gartner forecasts that by the year 2020, there will be 20.4 Billion IoT devices. Imagine the potential of data generated by combining smart sensors, manufacturing tools, mobile apps, ERP solutions or other softwares. This data can be used in decision making, defining KPI's, improve quality, efficiency and streamlining business processes.

6. Benefits of Chemical Management System

- A chemical management system provides accurate information about chemicals placed at the workplace. It prevents overbuying and overstocking of chemicals. Thus the amount of chemical inventory can be reduced to only the necessary levels
- Increase availability of information regarding chemicals and reagents by centralizing all of it within a single accessible database
- Increase operational efficiency
- Reduce overall chemical risk exposure and environmental effect.
- Reduced finances related to accidents and incidents handling
- Competitive edge on other market players

7. Conclusion

There are a vast number of people employed in the chemical sector. The US chemical industry employs more than a million people in the United States alone[3]. In Europe the chemical, plastics and rubber sectors are among the largest industrial sectors and together they generate about 3.2 million jobs in more than 60,000 companies[3]. Given the volume of workforce in the chemical sector and the nature of physical, health and environmental hazards associated with the chemicals, it is very much essential to manage them properly and efficiently.

As per UNEP Global Chemical Outlook (GCO) towards Sound Management of Chemicals - Synthesis Report for Decision-Makers, "of the tens of thousands of chemicals on the market, only a fraction has been thoroughly evaluated to determine their effects on human health and the environment[4]

Clearly there is no easy, one-size fits all solution for chemical management. While choosing chemical management options we must consider the basic components of the chemical management system, which are already discussed in this paper. When considering various options, it is significant to consider not just the interim costs to the company, but also the budget involves in the chemical life cycle, i.e. manufacture, transport, usage, storage, and disposal.

Chemical management is not a compulsion which we have to follow because of pressure of the regulatory authorities and fear of huge fines and brand image. It is important because it our duty of protecting our planet and its resources from the long term and short term harmful chemical effects.

About the Authors

Neha Chauhan

Senior Consultant – Domain Consulting Group, Infosys

Neha Chauhan is a Senior Consultant with Infosys Manufacturing Domain Consulting Group. She has over nine years of experience in SAP EHS (Environment, Health and Safety) Management and Regulatory compliance. She holds a Master of Science degree in Toxicology and has provided solution and functional consulting to various Chemical and Oil and Gas companies for their Health & Safety Requirements.

She can be reached at neha.chauhan03@infosys.com

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