

Chemical Inventory Management **System**



Software Requirements Specifications

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1.Introduction

Tracking in chemical inventory and management are important for safety as regulatory and challenging laboratory organizations, minimization of hazardous waste, responses and preparedness for emergency, and all benefit by knowing where they exist and located, which has responsibility. So we are going to develop a web-based system for chemical inventory information and information management. This paper explains how the data in the database is going to ease work for chemical coordinators to manage chemicals , and it will be useful for chemical coordinators to maintain and manage chemical inventory and management.

A Chemical Inventory is an inventory system that keeps a record of chemicals and other hazardous materials present in the laboratory/workplace. Ideally, all corporations, whether big or small, are required to maintain an exclusive Chemical Inventory System. It is an important database that monitors all kinds of materials that are flammable, toxic, corrosive or reactive. It also helps in responding effectively to any chemical emergency. It is also known as CIS.

There are at least three reasons why a Chemical Inventory should be maintained. Reasons include: Safety of Workers, Regulatory Compliance, and Cost Reduction. Often the Safety of Workers and Regulatory Compliance are the driving forces, and for good reason; but at the same time maintaining an accurate Chemical Inventory can drive cost reduction. Chemicals used in laboratories have the potential to be Toxic, Water or Air Reactive, Flammable, Radioactive, Pyrophoric, Caustic and/or Acutely Hazardous. It is paramount that workers be protected from these hazards and often there are regulations that mandate that people and the environment are protected from these hazards. In order to keep workers safe and comply with these regulations, the members of the laboratory staff who physically populate and update their Chemical Inventory. The more accurate an inventory is, the better able you are to protect workers, minimize cost, minimize wastes and comply with the applicable regulations. The chemical inventory allows laboratory staff to identify chemicals and quantities in their

lab. Not having an accurate inventory can result in, at best, ordering too much of a particular chemical and not using the chemical before it expires or worse, change to an explosive or reactive chemical. This results in overspending in chemical procurement and increased waste disposal costs. At worst, an inaccurate inventory can result in workers being exposed to unknown hazardous chemicals.

Maintaining an accurate chemical inventory is a never-ending job, and one with little margin for error. Any disagreement or inconsistency could lead to major problems for health, safety, and sustainability. That's why a chemical inventory system is a must for any organization looking to take control of their chemical inventory. A good chemical inventory system offers a number of advantages that will help you simplify chemical ordering, storage, use, and reporting while reducing the potential for human error.

1.1 Purpose

The purpose of this document is to specify, in detail all the functionalities that this software will contain, as agreed upon by the client and the developers. This document will hence assist the developers in realizing this makeshift idea into a solid working application. Further, any individual who wishes to use or appropriate this piece of software can consult this document.

1.2 Document Conventions

MSDS	Material Safety Data Sheet
CAS	Chemical Abstracts Service
GHS	Global Harmonization System

1. Material Safety Data Sheet (MSDS):

A Material Safety Data Sheet (MSDS) is a document that contains information on the potential health effects of exposure to chemicals, or other potentially dangerous substances, and on safe working procedures when handling chemical products.

2. Chemical Abstracts Service (CAS):

CAS Registry Number, also referred to as CASRN or CAS Number, is a unique numerical identifier assigned by the Chemical Abstracts Service to every chemical substance described in

the open scientific literature, including organic and inorganic compounds, minerals, isotopes, alloys and non-structural materials.

3.Global Harmonization System(GHS):

The Globally Harmonized System of Classification and Labelling of Chemicals is an internationally agreed-upon standard managed by the United Nations that was set up to replace the assortment of hazardous material classification and labelling schemes previously used around the world. Labelling schemes are shown in the further section of this srs.(source:wikipedia).

1.3 Intended audience and Reading suggestions

This SRS has been developed mainly with the objective of guiding the creation of a software that shall assist Dr.Apurba Das, his students and his staff in maintaining inventory of the Chemical Laboratory. So, it goes without saying that these individuals were kept in mind while writing this document.

Regardless, any individual who wishes to use and/or understand how our software works can refer latter sections of this SRS.

1.4 Software Scope

The idea behind this software is to keep inventory of a laboratory the size of a typical institution. Its data manipulation functionalities and data storage capabilities cant match the needs of a full-fledged enterprise. Since, this software is meant to cater to the very specific needs of the client, it is very limited in its ability to adapt.

1.5 References

1. Dr. Apurba Das, Associate Professor in Chemistry, Indian Institute of Technology Indore
2. IEEE Recommended Practice for Software Requirements Specifications:
<http://www.cse.msu.edu/~cse870/IEEEExplore-SRS-template.pdf>

2. General Description

2.1 Product Perspective

Our project will store following information

1.Chemical Details :

The certain properties of the chemicals such as : chemical formula , molecular weight, physical state, purity etc .

2.Technical Details :

Expiration date , Lot no. , CAS no. , Bottle Reference

3.Location, Sub-location, Additional location information if required .

2.2 Product Functions

The following are the aims the project serves to achieve in order to meet the client's requirements :-

Stock inventory management that updates the available quantities of chemicals and supplies when used in experiments. Other relevant product attributes could include locations and expiration information. Once a chemical is received, proper storage is a proactive means to mitigate the risk associated with the hazards of the chemical. An accurate inventory can provide the basis for ensuring that appropriate safety measures are in place. By tracking chemicals from date of purchase until disposal, we can easily determine how often or with what frequency chemicals are used and will need to be replaced. This saves precious purchasing dollars and reduces needless waste. Lastly, when a chemical nears the end of its lifecycle, proper disposal is crucial to maintain compliance with the relevant legislation.

Records for chemical inventories will include the following:

- Date of inventory
- Date chemical received
- Specific amount of each chemical
- Name, formula, and grade of each chemical printed on the container's label
- Chemical hazard of each item (Material Safety Data Sheet information)
- Safety Data Sheet(SDS)
- Chemical Abstract Service (CAS) registry number
- Source (supplier)
- Container type
- Hazard classification
- Required storage conditions
- Expiration date
- Storage location of each chemical
- Amount of chemical in the container

2.3 User Classes and Characteristics

Users of the system should be able to access the database as per the following classification :

1.Admin:

- a) Can view information about chemicals
- b) Can insert information about new chemicals
- c) Can delete information of chemicals
- d) Can update all information of chemicals

2.Staff:

- a) Would be able to view the database but not modify or manipulate it.

3. System Features :

The chemical inventory management system keeps a record of the physical and chemical properties of the chemicals present in the lab along with their location, CAS number, purity, manufacturer and vendor.

Hazard Communication Standard, requires employers to make a chemical inventory list of the hazardous chemicals present in the workplace. The chemicals on these lists are identified with markers to easily find the corresponding safety data sheets(sds).

Quick and easy access to the chemical inventory list and safety data sheets allows employees to find important information about the chemicals in their workplace.

- Employees are able to find information on chemical hazards, properties, first aid, personal protective equipment (PPE), emergency procedures, and disposal methods.
- Emergency responders can quickly access chemical safety and hazard information.
- Regulatory chemical and waste reporting can be easily tracked and reported.

Our Chemical inventory lists will include notations of the following for each product :

- Identification marker
- Corresponding SDS on file
- Product name
- Manufacturer's name
- Manufacturer's address, city, and state
- Manufacturer's telephone number and emergency telephone number

Response Sequence :

- Search for a chemical by its name
- Displays a detailed list of all the above mentioned properties

4.User Interface requirements :

User interface (UI) is an important part of any software or hardware or hybrid system. A software is widely used and accepted if it is :

- => Easy to operate
- => Quick in response
- => Effectively handling operational errors
- => Providing a simple yet consistent UI.

User acceptance majorly depends upon how the user can use the Software . UI is the only way for users to perceive the system.

4.1 User Interfaces :

- => Front-end software :HTML,JavaScript,Css
- => back-end software : Mysql,PHP

4.2 Hardware Interfaces :

- => Windows
- => We will be using google chrome as browser which supports Html, Javascript and CSS.

4.3 Software Interfaces :

We will use following softwares in our project :

- => **Operating system** : We will use windows as an OS.
- => **Code Editor** : We will implement our project using Visual Studio Code as the code editor.
- => **Database** : To store all the information about chemicals such as their chemical and physical properties we will use MySql.

4.4 Communication Interfaces :

Web portal for chemical inventory management system will have different login

pages for staff and admin .We will be using signup and login forms to create profiles of admin and staff. Our project will contain the following pages :

=> login page

=> sign up page

=> chemicals information page

=> page for chemical details such as exp date,qty etc.(can be accessed by admin only.)

=> a page to place order of chemicals.

=> location page.

=> storage page in which we will update information of chemical as it get added or removed.

Our project will have a responsive UI with content presentation,it will also have feedback mechanism and easy navigation to navigate through different pages, strategic use of color and texture to make responsive UI.

5. Non- Functional Requirements

5.1 Performance Requirement

The various steps involved to implement Chemical Inventory Management System are listed down below :

A) E-R Diagram :

An ER diagram shows the relationship among entity sets. An entity set is a group of similar entities and these entities can have attributes. In terms of DBMS, an entity is a table or attribute of a table in a database, so by showing relationship among tables and their attributes, ER diagram shows the complete logical structure of a database.This analysis is then used to organize data as a relation, normalizing relation and finally obtaining a relational database.

B) Normalisation :

Normalization is a process of organizing the data in database to avoid data redundancy, insertion anomaly, update anomaly & deletion anomaly.

There are three types of anomalies that occur when the database is not normalized. These are – Insertion, update and deletion anomaly.

Here are the most commonly used normal forms:

- First normal form(1NF)

- Second normal form(2NF)
- Third normal form(3NF)
- Boyce & Codd normal form (BCNF)

Normalization is the process of breaking down a table into smaller tables. So that each table deals with a single theme. There are three different kinds of modifications of anomalies and formulated the first, second and third normal forms (3NF) is considered sufficient for most practical purposes. It should be considered only after a thorough analysis and complete understanding of its implications.

5.2 Safety requirements

Since the project will be stored **initially** on a **desktop database** i.e a database system that is made to run on a single computer or PC , safety will not be an issue as long as the access to the main PC is restricted (password protected) . However , If we are requested to make an online database by Mr Apurba Das , then we can Backup and restore the database . Database backup is a way to protect and restore a database. It is performed through database replication and can be done for a database or a database server. Database administrators can use the database backup copy to restore the database to its operational state along with its data and logs. The database backup can be stored locally or on a backup server.

5.3 Privacy and Security Requirements

Security is an important issue in database management because information stored in a database is very valuable and many times, a very sensitive commodity. So the data that will be stored in our database system will be protected from abuse and from unauthorized access and updates.

We firmly believe that privacy is just as important as security. That's why you retain full ownership of all data you upload to our servers. We'll never sell your information to third parties.

If we are requested to make an online database , we would segment our database for security . What it really means is that for instance, we might want to have users, super users, administrators, and super administrators. Users can access or input basic information, but not alter information beyond what they've put in, whereas superuser has computer permissions that allow wider access to

data without being able to change everything. An administrator can work above all of these users, altering the structure of the database or having access to more sensitive information, while a super administrator can run the whole operation. This ensures that, should a password be exposed on the site, it's not devastating if it's only someone with access to basic information on the site.

5.4 Availability

This software is basically being designed to be used by Mr . Apurba Das for the purpose of maintaining inventory of his Chemical Laboratory and hence will be available to him and his concerned staff .

5.5 Maintainability

The administrators and staff in charge should maintain correct record of the chemicals in the inventory and should update the database as and when required.