INTER MATERIAL COMPATIBILITY OF CHEMICALS

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ABSTRACT

The chemical compatibility and the adhesion of energetic materials and additive materials exert a strong influence on the sensitivity, safety and performance of a polymer-bonded explosive. In this study, the chemical compatibility of different chemicals with several polymers were evaluated using the material safety data sheet. Made the inter material compatibility matrix by the chemical characteristics and chemical incompatibility available in material safety data sheet. Incompatible chemical storage procedure implemented and stored based on the inter material compatibility matrix. Chemical compatibility is a measure of how stable a substance is when mixed with another substance. If two substances can mix together and undergo a chemical reaction, they are considered incompatible. Chemical compatibility is important when choosing materials for chemical storage or reactions, so that the vessel and other apparatus will not be damaged by its contents. For purposes of chemical storage, chemicals that are incompatible should not be stored together so that any leak will not cause an even more dangerous situation by reacting after leaking. In addition, chemical compatibility refers to the container material being acceptable to store the chemical or for a tool or object that comes in contact with a chemical to not degrade. Chemical compatibility is also important when choosing among different chemicals that have similar purposes. For example, bleach and ammonia, both commonly used as cleaners, can undergo a dangerous chemical reaction when combined with each other. Even though each of them has a similar use, care must be taken not to allow these chemicals to mix.

1. INTRODUCTION

Ashok Leyland is an Indian multinational automotive manufacturer, headquartered in Chennai. It is owned by the Hinduja Group. It was founded in 1948 as Ashok Motors and became Ashok Leyland in the year 1955. Ashok Leyland is the second-largest manufacturer of commercial vehicles in India, the third-largest manufacturer of buses in the world, and the tenth-largest manufacturers of trucks. With the corporate office located in Chennai, its manufacturing facilities are spread across the country namely Ennore (Tamil Nadu), Bhandara (Maharashtra), Hosur (two units), Alwar (Rajasthan) and Panntagar (Uttarakhand).

1.2. OBJECTIVES

Chemical compatibility of different chemicals was identified through material safety data sheet.
Chemical characteristics identified through suppliers and prepared the list.
Inter material compatibility matrix prepared with the chemical characteristics and incompatibility of the chemicals.
Implemented the storage system of chemicals based on the inter material compatibility matrix and incompatibility procedure as per standards.
1.3. OBSERVATIONS

1.3.1 LIST OF PROCESS

1.3.2 LIST OF PROCESS IN PAINT SHOP

1.3.3 LIST OF STORAGE AREA

Cabin paint store
Pre-Treatment chemical store
Electro deposition chemical store
Sealant store
Frame paint store
1.3.4 EXISTING SAFETY SYSTEM

- Automatic Co2 Deluge system.
- Automatic water sprinkler system
- Smoke detectors.
- Flame proof equipment’s used in storage areas.
- Fire exits available and clearly identified.
- Emergency eye wash showers.

4.1 EXPLOSIVES

![Explosive symbol]

Figure: 3

Explosive, any substance or device that can be made to produce a volume of rapidly expanding gas in an extremely brief period. A nuclear explosive is one in which a sustained nuclear reaction can be made to take place with almost instant rapidity, releasing large amounts of energy. An explosive (or explosive material) is a reactive substance that contains a great amount of potential energy that can produce an explosion if released suddenly, usually accompanied by the production of light, heat, sound, and pressure. An explosive charge is a measured quantity of explosive material, which may either be composed solely of one ingredient or be a mixture containing at least two substances. A wide variety of chemicals can explode; a smaller number are manufactured specifically for the purpose of being used as explosives. The remainder are too dangerous, sensitive, toxic, expensive, unstable, or prone to decomposition or degradation over short time spans.

4.2 STRONG OXIDIZERS

![Oxidizer symbol]

Figure: 4

Oxidizers are solids, liquids, or gases that react readily with most organic material or reducing agents with no energy input. Oxidizers are a severe fire hazard. They are not necessarily combustible, but they can intensify combustion and increase the flammable range for chemicals so they ignite more readily. An oxidizing agent, also known as an oxidant or oxidizer, is a substance that has the ability to oxidize other substances in other words to accept their electrons. Common oxidizing agents are oxygen, hydrogen peroxide and the halogens.
4.3 TOXIC

A toxic substance is a substance that can be poisonous or cause health effects. People are generally concerned about chemicals like polychlorinated biphenyls (PCBs) and dioxin which can be found at some hazardous waste sites. Toxicity is the degree to which a chemical substance or a particular mixture of substances can damage an organism. Toxicity can refer to the effect on a whole organism, such as an animal, bacterium, or plant, as well as the effect on a substructure of the organism, such as a cell (cytotoxicity) or an organ such as the liver (hepatotoxicity). By extension, the word may be metaphorically used to describe toxic effects on larger and more complex groups, such as the family unit or society at large. Sometimes the word is more or less synonymous with poisoning in everyday usage.

4.4 HARMFUL

A harmful substance is anything that is contaminated and threatens the safety of man in his environment. Harmful substances can be in the form of food, water, drugs, creams, fruits etc. Harmful substances are unfit for human consumption.

4.5 FLAMMABLE

A liquid with a flash point under 100°F is considered flammable. Examples: gasoline, acetone, toluene, diethyl ether, alcohols. Hazard: May produce ignitable vapors at normal ambient temperatures. Flammable substances are those gases, liquids and solids that will ignite and continue to burn in air if
exposed to a source of ignition. Many flammable and combustible liquids and solids are volatile in nature; that is, they evaporate quickly and are continually giving off vapors. The rate of evaporation varies greatly from one liquid to another and increases with temperature. It is their vapors combined with air, not the liquid or solids themselves, that ignite and burn. In many instances, an increase in temperature creates a more hazardous condition because of the increase in the rate at which vapors are evolved.

4.6 CORROSIVE

![Corrosive Icon]

Figure: 8

Corrosives are materials that can attack and chemically destroy exposed body tissues. Corrosives can also damage or even destroy metal. Most corrosives are either acids or bases. Common acids include hydrochloric acid, sulfuric acid, nitric acid, chromic acid, acetic acid and hydrofluoric acid. Corrosion is a natural process that converts a refined metal into a more chemically-stable form such as oxide, hydroxide, carbonate or sulfide. It is the gradual destruction of materials (usually a metal) by chemical and/or electrochemical reaction with their environment. Corrosion engineering is the field dedicated to controlling and preventing corrosion.

4.7 IRITANT

![Irritant Icon]

Figure: 9

Chemical irritants are materials that cause reversible inflammation or irritation to a body surface, including eyes, respiratory tract, skin or mucous membranes, upon contact. Many chemical irritants also cause have other hazardous properties. An irritant a chemical, which is not corrosive, but which causes a reversible inflammatory effect on living tissue by chemical action at the site of contact. This effect is called irritation.

5. PROBLEM IDENTIFICATION AND SOLUTION

5.1 PROBLEM IDENTIFIED

Storage of different chemicals combined together due to non-availability of incompatibility matrix.
Non availability secondary containment for chemicals based on their storage capacity.
Non availability of adequate safety systems.
5.2 PROPOSED
   Identifying chemicals hazards.
   Identifying composition of ingredient mixture.
   Identifying chemical characteristics.
   List out the incompatible materials.
   Preparing Inter material compatibility matrix.
   Storage of chemicals based on incompatibility matrix.

5.3 INTER MATERIAL COMPATIBILITY MATRIX

![Inter Material Compatibility Matrix]

Figure: 10 Table 1
### 5.3.1 INTER MATERIAL COMPATIBILITY MATRIX CAB PAINT STORE

![Image of the table and figure representing the INTER MATERIAL COMPATIBILITY MATRIX CAB PAINT STORE.](image)

**Figure: 11 Table 2**

### 5.3.2 INTER MATERIAL COMPATIBILITY MATRIX PT STORE

![Image of the table and figure representing the INTER MATERIAL COMPATIBILITY MATRIX PT STORE.](image)

**Figure: 12 Table 3**
### 5.3.3 INTER MATERIAL COMPATIBILITY MATRIX ED PAINT STORE

#### INTER MATERIAL COMPATIBILITY MATRIX

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Area of Application / Trade Name</th>
<th>Chemical Characteristics</th>
<th>Electro deposition</th>
<th>Electro deposition</th>
<th>Electro deposition</th>
<th>Electro deposition</th>
<th>PVC stage</th>
<th>UF module</th>
<th>Wax Line</th>
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Figure: 13 Table 4

### 5.3.4 INTER MATERIAL COMPATIBILITY MATRIX FRAME PAINT STORE

#### INTER MATERIAL COMPATIBILITY MATRIX

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<th>Sl. No.</th>
<th>Area of Application / Trade Name</th>
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</table>

Figure: 14 Table 5
5.3.5 INCOMPATIBLE MATERIALS STORAGE PROCEDURE

Figure: 15 Table
7. CONCLUSION
Throughout this project I have completely studied and analyzed the incompatibility of chemicals through MSDS and prepared inter material compatibility matrix and as per inter material compatibility matrix storage has implemented.

8. REFERENCES
1. Chemical compatibility chart safe/unsafe combinations