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INTER MATERIAL COMPATIBLITY 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 Pantnagar (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

Figure: 1 Flow chart 1

1.3.2 LIST OF PROCESS IN PAINT SHOP

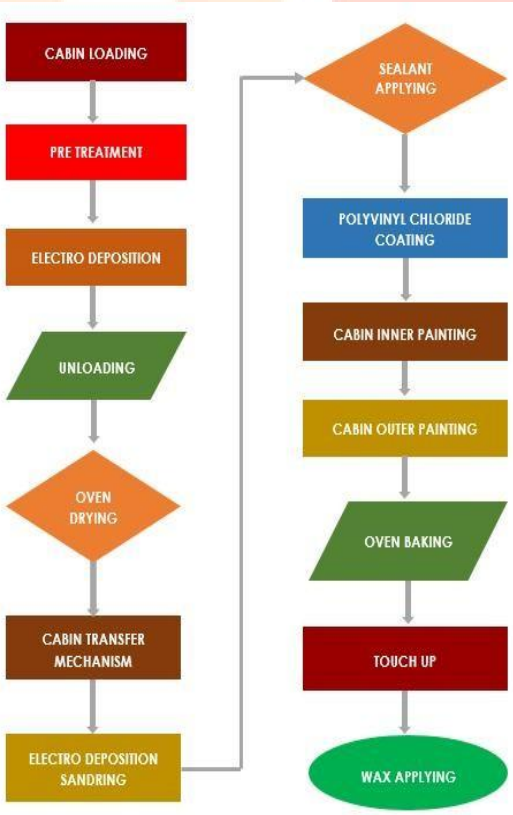


Figure: 2 Flow chart 2

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

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 OXIDZERS

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

Figure: 5

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

Figure: 6

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

Figure: 7

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

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 IRRITANT

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 PROPOSEL

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

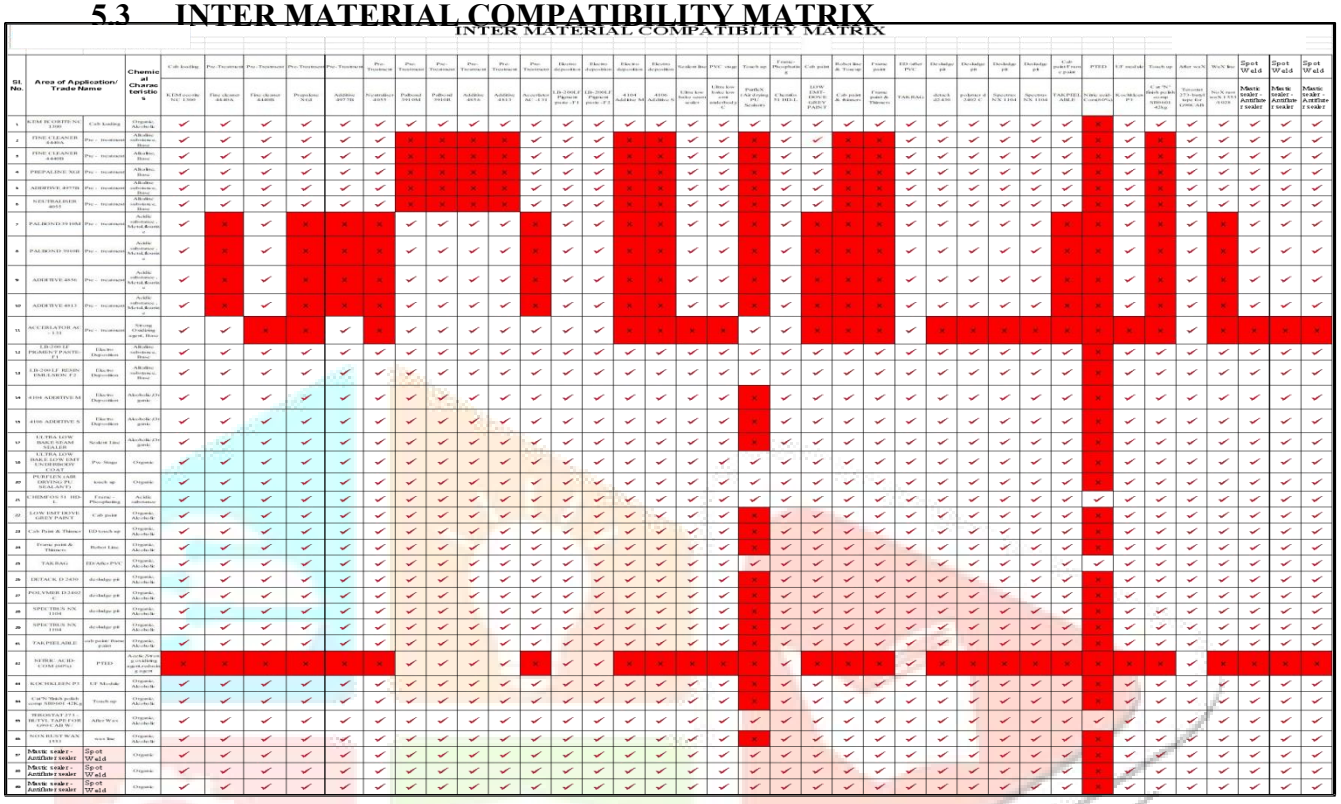
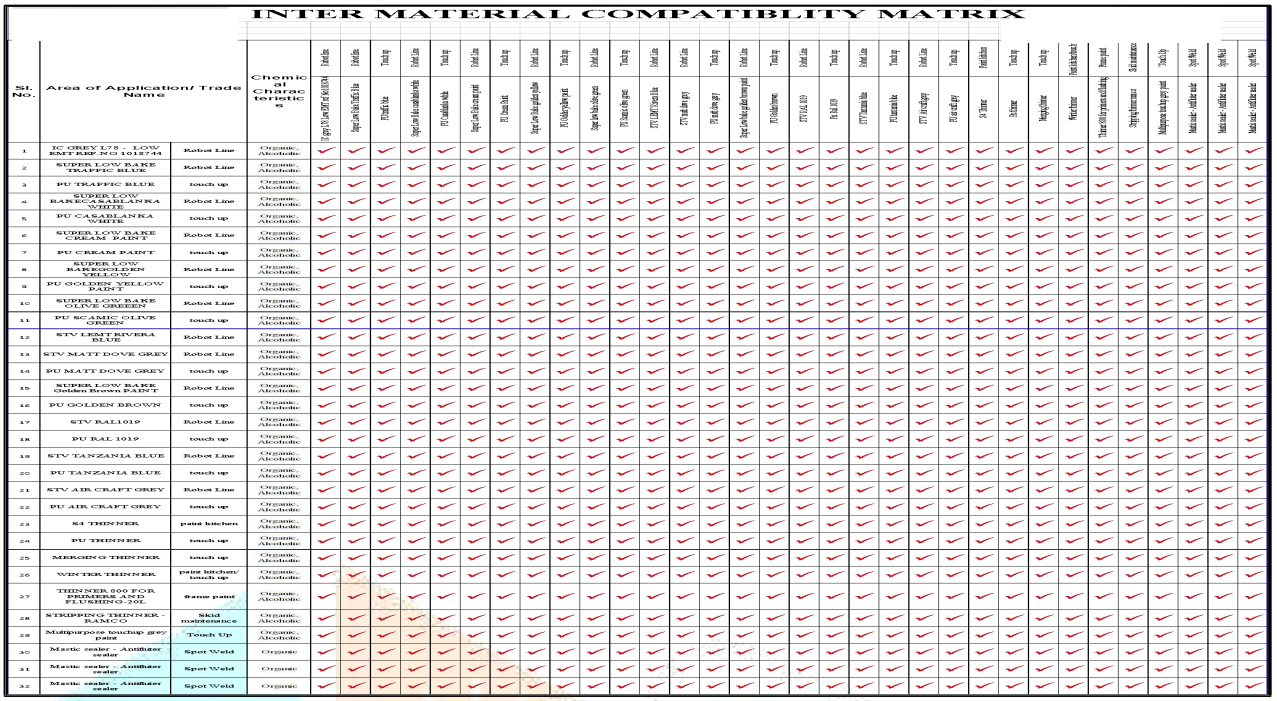


Figure :10 Table 1

5.3.1 INTER MATERIAL COMPATIBILITY MATRIX CAB PAINT STORE



INTER MATERIAL COMPATIBLITY MATRIX

Sl. No.	Area of Application/ Trade Name		Chemical Characteristics
1	IC GREY L78 - LOW EMT REF NO 1013744	Robot Line	Organic, Alcoholic
2	SUPER LOW BAKE TRAFFIC BLUE	Robot Line	Organic, Alcoholic
3	PU TRAFFIC BLUE	touch up	Organic, Alcoholic
4	SUPER LOW BAKE CASABLANKA WHITE	Robot Line	Organic, Alcoholic
5	PU CASABLANKA WHITE	touch up	Organic, Alcoholic
6	SUPER LOW BAKE CREAM PAINT	Robot Line	Organic, Alcoholic
7	PU CREAM PAINT	touch up	Organic, Alcoholic
8	SUPER LOW BAKEGOLDEN YELLOW	Robot Line	Organic, Alcoholic
9	PU GOLDEN YELLOW PAINT	touch up	Organic, Alcoholic
10	SUPER LOW BAKE OLIVE GREEEN	Robot Line	Organic, Alcoholic
11	PU SCAMIC OLIVE GREEN	touch up	Organic, Alcoholic
12	STV EMT RIVERA BLUE	Robot Line	Organic, Alcoholic
13	STV MATT DOVE GREY	Robot Line	Organic, Alcoholic
14	PU MATT DOVE GREY	touch up	Organic, Alcoholic
15	SUPER LOW BAKE Golden Brown PAINT	Robot Line	Organic, Alcoholic
16	PU GOLDEN BROWN	touch up	Organic, Alcoholic
17	STV RAL1019	Robot Line	Organic, Alcoholic
18	PU RAL 1019	touch up	Organic, Alcoholic
19	STV TANZANIA BLUE	Robot Line	Organic, Alcoholic
20	PU TANZANIA BLUE	touch up	Organic, Alcoholic
21	STV AIR CRAFT GREY	Robot Line	Organic, Alcoholic
22	PU AIR CRAFT GREY	touch up	Organic, Alcoholic
23	S4 THINNER	paint kitchen	Organic, Alcoholic
24	PU THINNER	touch up	Organic, Alcoholic
25	MERGING THINNER	touch up	Organic, Alcoholic
26	WINTER THINNER	paint kitchen/ touch up	Organic, Alcoholic
27	THINNER 800 FOR PRIMERS AND FLUSHING-20L	frame paint	Organic, Alcoholic
28	STRIPPING THINNER - RAMCO	Skid maintenance	Organic, Alcoholic
29	Multipurpose touchup grey paint	Touch Up	Organic, Alcoholic
30	Mastic sealer - Antifluter sealer	Spot Weld	Organic
31	Mastic sealer - Antifluter sealer	Spot Weld	Organic
32	Mastic sealer - Antifluter sealer	Spot Weld	Organic

Figure: 11 Table 2

5.3.2 INTER MATERIAL COMPATIBILITY MATRIX PT STORE

INTER MATERIAL COMPATIBLITY MATRIX

Sl. No.	Area of Application/ Trade Name		Chemical Characteristics	Cab loading	Pre-Treatment	Pre-Treatment	Pre-Treatment	Pre-Treatment	Pre-Treatment	Pre-Treatment	Pre-Treatment	Pre-Treatment	Pre-Treatment	Pre-Treatment	ED /after PVC	WaX line
				KEM ecorite NC 1300	Fine cleaner 4440A	Fine cleaner 4440B	Prepalene XGI	Additive 4977B	Neutraliser 4055	Palbond 3910M	Palbond 3910R	Additive 4856	Additive 4813	Accerlator AC -131	TAKRAG	NoX rust waX 1553 / 1028
1	KEM ECORITE NC 1300	Cab loading	Organic, Alcoholic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	FINE CLEANER 4440A	Pre - treatment	Alkaline substance, Base	✓	✓	✓	✓	✓	✓	X	X	X	X	✓	✓	✓
3	FINE CLEANER 4440B	Pre - treatment	Alkaline, Base	✓	✓	✓	✓	✓	✓	X	X	X	X	✓	✓	✓
4	PREPALENE XGI	Pre - treatment	Alkaline, Base	✓	✓	✓	✓	✓	✓	X	X	X	X	✓	✓	✓
5	ADDITIVE 4977B	Pre - treatment	Alkaline substance, Base	✓	✓	✓	✓	✓	✓	X	X	X	X	✓	✓	✓
6	NEUTRALISER 4055	Pre - treatment	Alkaline substance, Base	✓	✓	✓	✓	✓	✓	X	X	X	X	✓	✓	✓
7	PALBOND 3910M	Pre - treatment	Acidic substance , Metal, flourine	✓	X	✓	X	X	X	✓	✓	✓	✓	X	✓	X
8	PALBOND 3910R	Pre - treatment	Acidic substance , Metal, flourine	✓	X	✓	X	X	X	✓	✓	✓	✓	X	✓	X
9	ADDITIVE 4856	Pre - treatment	Acidic substance , Metal, flourine	✓	X	✓	X	X	X	✓	✓	✓	✓	X	✓	X
10	ADDITIVE 4813	Pre - treatment	Acidic substance , Metal, flourine	✓	X	✓	X	X	X	✓	✓	✓	✓	X	✓	X
11	ACCERLATOR AC - 131	Pre - treatment	Strong Oxidizing agent, Base	✓	✓	X	X	✓	X	✓	✓	✓	✓	✓	✓	X
12	TAKRAG	ED/After PVC	Organic, Alcoholic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
13	NOX RUST WAX 1553	wax line	Organic, Alcoholic	✓	✓	✓	✓	✓	✓	✓	✓	X	X	✓	✓	✓

Figure: 12 Table 3

5.3.3 INTER MATERIAL COMPATIBILITY MATRIX ED PAINT STORE

INTER MATERIAL COMPATIBLITY MATRIX

Sl. No.	Area of Application/ Trade Name		Chemical Characteristics	Electro deposition	Electro deposition	Electro deposition	Electro deposition	PVC stage	UF module	WaX line
				LB-200LF Pigment paste - F1	LB-200LF Pigment paste -F2	4104 Additive M	4106 Additive S	Ultra low bake low emt underbody C	Kochkleen P3	NoX rust waX 1553
1	LB-200 LF PIGMENT PASTE- F1	Electro Deposition	Alkaline substance, Base	✓	✓	✓	✓	✓	✓	✓
2	LB-200 LF RESIN EMULSION F2	Electro Deposition	Alkaline substance, Base	✓	✓	✓	✓	✓	✓	✓
3	4104 ADDITIVE M	Electro Deposition	Alcoholic,Organic	✓	✓	✓	✓	✓	✓	✓
4	4106 ADDITIVE S	Electro Deposition	Alcoholic,Organic	✓	✓	✓	✓	✓	✓	✓
5	ULTRA LOW BAKE LOW EMT UNDERBODY COAT	Pvc Stage	Organic	✓	✓	✓	✓	✓	✓	✓
6	KOCHKLEEN P3	UF Module	Alcoholic,Organic	✓	✓	✓	✓	✓	✓	✓
7	NOX RUST WAX 1553	wax line	Organic, Alcoholic	✓	✓	✓	✓	✓	✓	✓

Figure: 13 Table 4

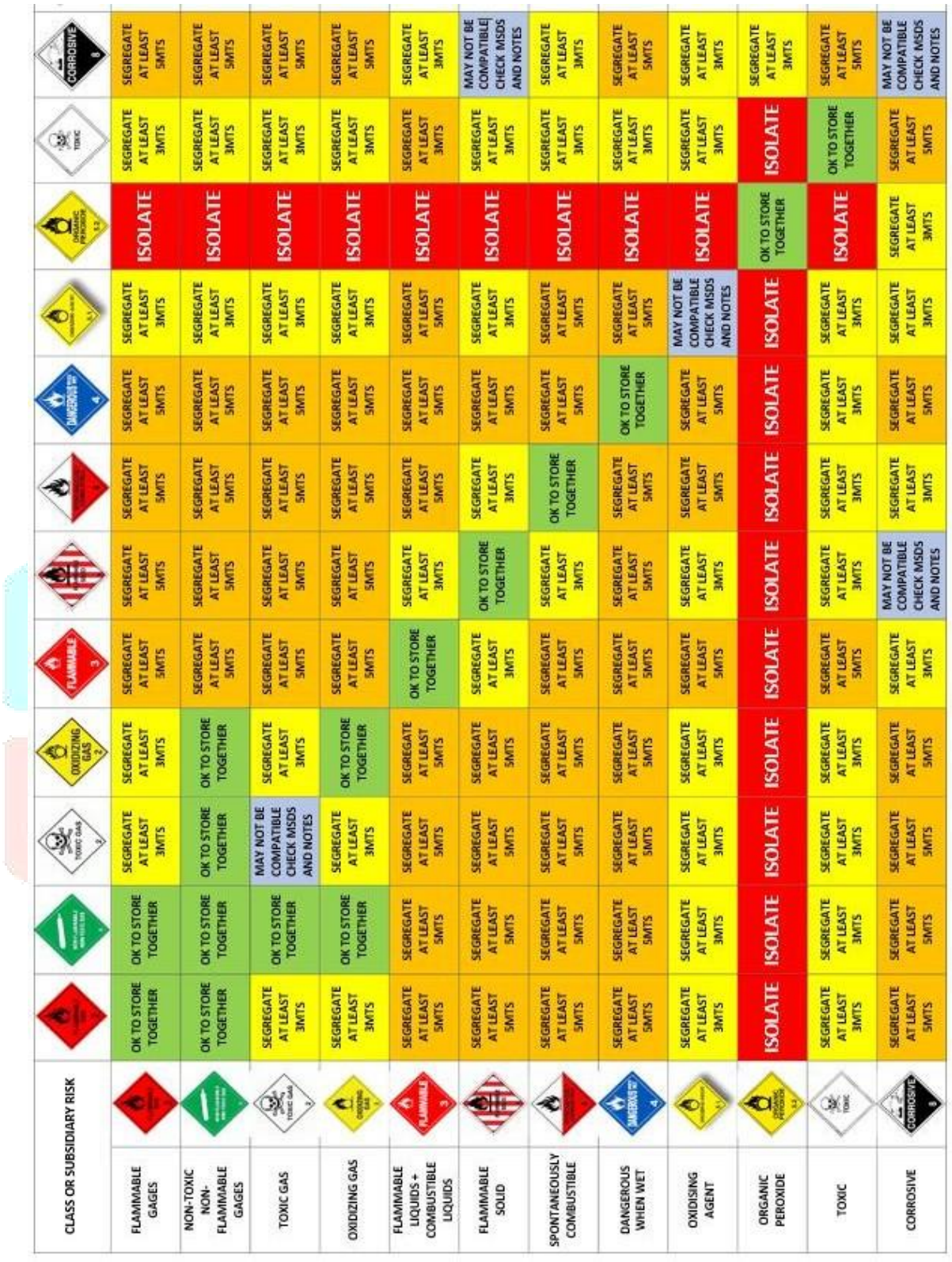
5.3.4 INTER MATERIAL COMPATIBILITY MATRIX FRAME PAINT STORE

INTER MATERIAL COMPATIBLITY MATRIX

Sl. No.	Area of Application/ Trade Name		Chemical Characteristics	Cab loading	Frame-Phosphating	ED Touch up	Frame paint	Frame paint	Frame paint	Desludge pit	Desludge pit	Desludge pit	Desludge pit	Cab paint/Frame paint
				KEM ecorite NC 1300	Chemfos 51 HD-L	Nerokan 1k EpoXy primer grey	ASE polyester black	Thinner 800 for primers and flushing	Thinner 12906	detack d2430	polymer d 2402 C	Spectrus NX 1104	Spectrus NX 1106	TAKPEELABLE
1	KEM ECORITE NC 1300	Cab loading	Organic, Alcoholic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	CHEMFOS 51 HD-L	Frame - Phosphating	Acidic substance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	NEROKAN 1K EPOXY PRIMER GREY	ED touch up	Organic, Alcoholic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	ASE POLYESTER BLACK	frame paint	Organic, Alcoholic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5	THINNER 800 FOR PRIMERS AND FLUSHING-20L	frame paint	Organic, Alcoholic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6	THINNER 12906	frame paint	Organic, Alcoholic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
7	DETACK D 2430	desludge pit	Organic, Alcoholic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
8	POLYMER D 2402 C	desludge pit	Organic, Alcoholic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
9	SPECTRUS NX 1104	desludge pit	Organic, Alcoholic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
10	SPECTRUS NX 1104	desludge pit	Organic, Alcoholic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
11	TAKPEELABLE	cab paint/ frame paint	Organic, Alcoholic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Figure :14 Table 5

5.3.5 INCOMPATIBILE MATERIALS STORAGE PROCEDURE



CLASS OR SUBSIDIARY RISK													
FLAMMABLE GAGES	OK TO STORE TOGETHER	OK TO STORE TOGETHER	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 3MTS	ISOLATE	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 5MTS
NON-TOXIC NON-FLAMMABLE GAGES	OK TO STORE TOGETHER	OK TO STORE TOGETHER	OK TO STORE TOGETHER	OK TO STORE TOGETHER	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 3MTS	ISOLATE	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 5MTS
TOXIC GAS	SEGREGATE AT LEAST 3MTS	OK TO STORE TOGETHER	MAY NOT BE COMPATIBLE CHECK MSDS AND NOTES	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 3MTS	ISOLATE	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 5MTS
OXIDIZING GAS	SEGREGATE AT LEAST 3MTS	OK TO STORE TOGETHER	SEGREGATE AT LEAST 3MTS	OK TO STORE TOGETHER	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 3MTS	ISOLATE	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 5MTS
FLAMMABLE LIQUIDS + COMBUSTIBLE LIQUIDS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	OK TO STORE TOGETHER	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 3MTS	ISOLATE	SEGREGATE AT LEAST 3MTS	MAY NOT BE COMPATIBLE CHECK MSDS AND NOTES
FLAMMABLE SOLID	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 3MTS	OK TO STORE TOGETHER	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 3MTS	ISOLATE	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 5MTS
SPONTANEOUSLY COMBUSTIBLE	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 3MTS	OK TO STORE TOGETHER	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	ISOLATE	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 3MTS
DANGEROUS WHEN WET	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	OK TO STORE TOGETHER	SEGREGATE AT LEAST 5MTS	ISOLATE	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 5MTS
OXIDISING AGENT	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	MAY NOT BE COMPATIBLE CHECK MSDS AND NOTES	ISOLATE	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 3MTS
ORGANIC PEROXIDE	ISOLATE	ISOLATE	ISOLATE	ISOLATE	ISOLATE	ISOLATE	ISOLATE	ISOLATE	ISOLATE	OK TO STORE TOGETHER	ISOLATE	SEGREGATE AT LEAST 3MTS
TOXIC	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 3MTS	MAY NOT BE COMPATIBLE CHECK MSDS AND NOTES	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 3MTS	OK TO STORE TOGETHER	SEGREGATE AT LEAST 5MTS
CORROSIVE	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 5MTS	SEGREGATE AT LEAST 3MTS	SEGREGATE AT LEAST 5MTS	MAY NOT BE COMPATIBLE CHECK MSDS AND NOTES

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.

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