

1. RISK ASSESSMENT AND SAFETY MANAGEMENT

1.1 Introduction

Satia Industries Ltd. is an existing agro-based Integrated Pulp and Paper Mill with captive power generation unit located at Rupana Distt. Muktsar (Punjab). Presently the unit is involved in manufacturing of writing and printing paper with the production capacity of 300 TPD and now, the unit intends to enhance the production capacity to 600 TPD. The Risk Assessment Study for the proposed project has been carried out and all the details are elaborated in this chapter. Based on the findings & recommendations of RA report, management plan has also been prepared and included.

Risk Assessment is defined as a continuous and integrated process of identification, evaluation and measurement of risks, along with their potential impact on the organization.

The benefits of risk assessment include the following:

- Prevention or reduction in occurrence of accidents.
- Mitigation of the severity and/or consequences by the way of improved process techniques, fire protection systems, arrangements of storage, inventory monitoring to fit production requirements.
- Confidence building in employees by improving competency.
- Preparedness and prompt response to deal with any accident.

1.2 Objective, Philosophy and Methodology of Risk Assessment

Objective:

The principle objective of this study is to identify major risks in the manufacturing and to evaluate on-site & off-site consequences of identified hazard scenarios. To give effective mitigation of hazards in terms of suggestions for effective disaster management, suggesting minimum preventive and protective measures & change of practices to ensure Occupational Health and Safety.

Philosophy:

The following aspects and areas are covered in this study;

- Identification of major risk areas.
- Hazard identification / Identification of failure cases
- Consequential analysis of probable risks / failure cases
- Determination of the probable risk by releasing of chemical due to leakage of storage tank and catastrophic failure.
- Risk assessment on the basis of the above evaluation & risk acceptability
- Minimum preventive & protective measures to be taken to minimize risks to maximum possible extent.
- Giving pointers for effective disaster management
- Suggesting other measures to further lower the probability of risk

Methodology:

Design data, built in safety systems has been studied. Mutual discussions has been carried with the officials. Safety related individual system is discussed. Hazard identification exercise is conducted taking into consideration of materials, material handling methods, operating procedures, built in safety in reactors, operating parameters and safety measures to be taken

in proposed plant. Few areas like process building, storage of hazardous chemicals, to evaluate safety systems in the event of any abnormalities occurring. Containment failure scenario related to storage area is considered for hazard analysis and consequences of such containment failures are considered in detail. Thus, this study is mainly oriented towards actual risks rather than chronic risks.

2. Hazardous Material, Process & Safety

2.1 Hazardous Products

No hazardous product is produced in the mill.

2.2 Hazardous Raw Materials

Hazardous substances may be classified into two main classes: Flammable substances and Toxic substances. Flammable substances or the vapours arising in some reaction require interaction with air for their hazard to be realized. Toxic substances are those whose exposure may result in occupational diseases in the human beings in vicinity. The main and only product of the unit is writing and printing paper which is non-hazardous. The basic raw materials for the manufacturing of writing and printing paper will be agro waste like wheat straw, rice husk, and sarkanda along with the few hazardous chemicals like, Chlorine Dioxide. Hazardous characteristics of the major flammable/ toxic materials employed in different stages of production are listed in Table 1.1 and the details of hazardous properties are listed in following Table 1.2.

Table 1.1 - Properties of storage chemicals used at the mill

Chemical	Codes/Label	TLV	BP	MP
			°C	
Sodium Hydroxide	Corrosive	2 mg/m ³	1390	318.4

TLV: Threshold Limit Value **BP:** Boiling Point **MP:** Melting Point

Table 1.2 - Properties of Hazardous Chemical

Property	Unit	Chlorine Dioxide
Boiling point	°C	11
Vapour Pressure	atm	1
Flash point	°C	NA
Freezing point	°C	-59
Density	Kg/m ³	1.54
Ambient Saturation Conc	ppm	1,000,000
TLV/TWA	ppm	0.1
IDLH	ppm	5
LEL	%	10
UEL	%	NA
Hazardous Classification	--	Hazardous, Toxic & Non-Flamable

2.3 Safety Measures for Transportation, Storage & Handling

General Safety Measures for Storage

For the safe storage company has provided the following safety measures.

- Sufficient storage area will be provided and will be kept away from service/maintenance buildings to ensure that spreading of fire in storage area can be prevented.
- Display boards has been provided on all storage tanks which includes the name of the product, stored material of construction, calibration of tanks and date of painting.
- The level indicators are provided to see the exact liquid level inside the tank and to avoid spillage.
- All the storage tanks are provided with dyke wall and transferring pumps which helps to reduce the risk of tank leakages.
- Raw material is properly stored in stacks and the sufficient space is provided between two stacks. Temp. of each stack of raw material is checked every week to avoid the possibility of auto combustion and proper record is maintained.
- Proper earthing is provided to all storage tanks to prevent the firing due to static charges.
- Water filled chamber is provided on silencer pipe of each and every vehicle before allowing it to enter in storage area.
- Hazardous display board and national fire prevention association code are displayed on all storage tanks.
- Temperature indicator and pressure gauge are provided to all storage tanks.
- Smoking is strictly prohibited in mills premises heat &/or smoke detection with alarm system will be provided at designated locations.
- Fire hydrants are provided in storage yard and firefighting equipments (fire extinguishers, water-bucket, sand buckets and hydrant points) are provided at designated locations in the plant area.
- The management will prepare the booklet on disclosure of information to general public, workers and authorities.

The details of raw material storage, handling and transportation are given in following **Table 1.3**.

Table 1.3 - Properties of Hazardous Chemical

Name of Chemical	Physical Form	Type of Storage	Storage Tank Capacity	Max. Storage Capacity	Storage Pressure Kg/cm ²	Storage Temp. °C	Source	Mode of Transportation
Chlorine Dioxide	Gas	Storage Tank	50 m ³	100 m ³	Atm.	<u>Amb.</u>	Local	Self-Manufacturing

2.4 Safety Measures for preventive maintenance

The safety measures in form of the general Do's & Don'ts for safety in process & other plant area are as below:

- Do not work on equipment without permission from plant head and maintenance head.
- Keep proper and adequate fire extinguisher near work area.
- Use proper PPE's.
- Do not allow any employment without pre-medical check-up or without checking fitness.
- Check all motors are disconnected and fuse pulled out before maintenance.
- Work in any equipment must be done under supervision.
- Make sure all process lines are disconnected.
- Additional safety measures in form of the checklist covering Do's & Don'ts of preventive maintenance, manufacturing utility staff for safety related measures should be updated timely and made available to all concern department & personnel and its use must be ensured by safety officer.

3. OCCUPATIONAL SAFETY & HEALTH PROGRAM

Occupational safety and health (OSH) is an area concerned with protecting the safety, health and welfare of people engaged in work or employment. The goals of occupational safety and health programs include fostering a safe and healthy work environment. OSH may also protect co-workers, family members, employers, customers, and many others who might be affected by the workplace environment.

OSH can also be used for moral, legal, and financial reasons. All organizations have a duty of care to ensure that employees and any other person who may be affected by the companies undertaking remain safe at all times. Moral obligations would involve the protection of employee's lives and health. Legal reasons for OSH practices relate to the preventative, punitive and compensatory effects of laws that protect worker's safety and health. OSH can also reduce employee injury and illness related costs, including medical care, sick leave and disability benefit costs.

Health hazards associated with the occupation are called occupational hazards. In industry due to handling of toxic and hazardous substance there are possibilities of developing occupational diseases. Occupational health needs attention both during construction & erection and operation & maintenance phases. However, the problem varies both in magnitude and variety in the above phases.

3.1 Construction and Erection

The occupational health problems envisaged at this stage can mainly be due to unconditional acts and condition at site. To overcome these hazards necessary protective equipment's will be provided to workers. Height job will done under supervision. Training will be provided to workers periodically related to the job. Good housekeeping will be maintained in construction area.

3.2 Operation and Maintenance

The problem of occupational health, in the operation and maintenance phase is primarily due to noise and chemical exposure. The necessary personal protective equipment's are/ will be

given to workers as per the job. Following personnel protective equipment's is/ will be provided.

Industrial safety helmet

- Face shield with replaceable acrylic vision
- Punk Type safety goggles for dust protection
- Chemical splash proof goggles
- Eye/ Face shower & eye wash bottles
- Gum boots
- Welders equipment for eye and face protection
- Cylindrical type earplug
- Emergency chlorine leakage control kit
- Ear muffs
- PVC apron
- Full body harness
- Water gel blankets
- Asbestos and rubber hand gloves
- Acid/Alkali proof PVC hand gloves
- Self contained breathing apparatus
- Boiler suit
- Electrically tested electrical resistance hand gloves

3.3 Hospital facilities

Satia Industries had made formal agreements with nearby hospital (Bansal Nursing Home ,6 km from SIL, Dr. Mukesh Bansal-MBBS,MS,Ph.No.-01633-262023 and Guru Nanak Hospital ,6 km from SIL, Dr. Madan Mohan Bansal-MBBS,MD,Ph.No.01633-240686) to attend affected persons during emergency/ accident.

3.4 Factory medical officer

A qualified doctor has been appointed as Factory Medical Officer (FMO) (Dr. Sandeep Singh Sandhu-MBBS, Mo.9872622642) on retainer ship basis. Paramedical Staff will be employed additionally.

3.5 Ambulance van

Ambulance van facility is available with the company 24x7.

3.6 First aid box

First aid box is located at security room, control room, admin building etc. at in the plant; training is given to employees for First Aid.

3.7 Periodic medical examination

The medical checkup program is being conducted as pre-employment and post-employment check-up programs. Pre employment check up has been mandatory and tests like chest x rays, audiometry, spirometry vision testing, ECG, haemogram (examination of the blood), urine (Routine and Microscopic), complete physical examination i.e. Musculo-skeletal disorders (MSD), backache, pain in minor and major joints, fatigue, etc. are being/will be conducted.

Medical check-up of all the employees is being/will be carried out periodically by qualified medical officer and health records are maintained in prescribed format.

Employed Workers are/will be medically examined by a qualified medical practitioner/Factory Medical Officer, in the following manner:

- Once in a period of 6 months, to ascertain physical fitness of the person to do the particular job and to ascertain the health status of all the workers in respect of occupational health hazards to which they are exposed and in cases where in the opinion of the Factory Medical Officer it is necessary to do so at a shorter interval in respect of any workers;
- In periodic and premedical examinations, various parameters are being checked. Viz. Liver Function Tests, Chest X-rays, Audiometry, Spirometry, Vision testing (Far & Near vision, color vision and any other ocular defect) ECG and other parameters as will be found necessary as per the opinion of Factory Medical officer.

3.8 Management plan for occupational health & safety

Following management plan has been proposed so that exposure of the workers can be kept within Permissible Exposure Level (PEL)/Threshold Level value (TLV) to protect their health;

1. To formulate and implement an Environmental management Plan (EMP) for OHS with following aims:
 - To keep airborne concentration of toxic and hazardous chemicals below PEL and TLV.
 - Protect general health of workers likely to be exposed to such chemicals
 - Providing training, guidelines, resources and facilities to concerned department for occupational health hazards.
 - Permanent changes to workplace procedures or work location to be done if it is found necessary on the basis of findings from workplace Monitoring Plan.
2. EMP be formulated on the guidelines issued by Bureau of Indian Standards on OHS Management Systems: IS 18001:2000 Occupational Health and Safety Management Systems.
3. EMP is incorporated in Standard Operating Procedure also.
4. The EMP includes measure to keep airborne concentration of toxic and hazardous chemicals below its PEL and TLV, like
 - a) Leak surveys
 - b) Separate storage for toxic chemicals
 - c) Exhaust ventilation
 - d) Proper illumination
 - e) On-line detectors toxic chemicals like chlorine
 - f) Close processes to avoid spills and exposures
 - g) Supply of proper PPEs like air mask, berating canisters, SCBA sets, on-line breathing apparatus at the places where there is possibility of presence of toxic chemicals
 - h) Decontamination procedure for empty drums and carboys.
 - i) Regular maintenance program for pumps, equipment, instruments handling toxic and corrosive chemicals
 - j) Display of warning boards
 - k) Training to persons handling toxic and corrosive chemicals

l) All First Aid Measures such as Flushing bottles for eyes with plenty of water, Flushing bottles for skin with plenty of water while removing contaminated clothing and shoes and flush skin with plenty of soap and water, not to induce vomiting, fluid and electrolytes as antidotes have been made available.

5. Workplace Monitoring Plan

Each workplace must be evaluated to identify potential hazards from toxic substances or harmful physical agents. It is in concern that a workplace Monitoring Plan to be prepared & implemented in consultation with FMO and Industrial Hygienists. The work zone monitoring has been conducted in the industry during the study period with respect to following parameters such as PM_{2.5}, PM₁₀, TSPM, SO₂, NO_x, Noise, etc.

Table 1.4 - Work Place Monitoring in the Industrial Premises

#	Location	PM ₁₀ (24 h) (µg/m ³)	PM _{2.5} (24 h) (µg/m ³)	SO ₂ (24 h) (µg/m ³)	NO ₂ (24 h) (µg/m ³)	Noise dB(A)
1.	Pulp Mill	88.9	48.2	32.6	20.3	67.8 - 88.9
2.	Paper Machine	82.5	44.8	24.5	22.8	79.0 - 91.0
3.	Power Plant	74.6	32.9	18.6	26.9	92.9 - 99.4
4.	Main Gate	78.7	36.0	11.8	18,4	42.5 - 69.9

6. Health Evaluation of Workers

- The management has derived a plan to check and evaluate the exposure specific health status evaluation of workers.
- Workers have been checked for physical fitness with special reference to the possible health hazards likely to be present where he/she is being expected to work before being employed for that purpose. Basic examinations like Liver Function tests, chest x ray, Audiometry, Spirometry Vision testing (Far & Near vision, color vision and any other ocular defect) ECG, etc. are carried out. However, the parameters and frequency of such examination are decided in consultation with Factory Medical Officer and Industrial Hygienists.

While in work, all the workers are periodically examined for the health with specific reference to the hazards which they are likely to be exposed to during work. Health evaluation is carrying out considering the bodily functions likely to be affected during work. The parameters and frequency of such examination are decided in consultation with Factory Medical Officer and Industrial Hygienists Plan of monthly and yearly report of the health status of workers with special reference to Occupational Health and Safety. Details of Health evaluation of workers is placed in Table 1.5.

Table 1.5 - Health Evaluation of Workers

To which chemicals workers are exposed directly or indirectly	Whether these chemicals are within TLV/Permissible exposure levels as	What measures company have taken to keep these chemicals	How the workers are evaluated concerning their exposure to chemicals during	What are onsite and offsite emergency plan during chemical

	per ACGIH recommendation	within PEL/TLV	pre-placement and periodical medical monitoring	disaster
Chlorine Dioxide	Within TLV Limit Conc.: BDL	Local exhaust ventilation, personnel protective equipment,	Lung Function Test, Examination of Respiratory and eyes, chest roentgenogram, x-ray if necessary	1. Fire hydrant system and foam monitor 2. Trainer fire fighter 3. Sand bucket stand

4. FIRE FIGHTING SYSTEM AND EMERGENCY MANAGEMENT

4.1 Firefighting system

- Necessary fire fighting arrangements at each strategic location of the mill specifically, the raw material storage yard, finished product godown, chemical godown and all the electrical penal rooms are covered by suitable kind of fire extinguishers and fire hydrant networks. At different strategic locations, fire hose boxes (containing fire hose pipes and gun metal nozzles) are provided.
- Mock drill & training is/will be conducted at scheduled intervals.
- Fire fighting is/ will be available 24x7 in the premises.

4.2 Emergency Management

Emergency Planning:

- Emergency siren and wind sock has been installed.
- On Site emergency Plan is prepared.
- Tele Communication system and mobile phone are used in case of emergency situations for communication.
- First Aid Boxes and Occupational health centre are made at site.

Safety Practices in the Work Area:

- We inform our all employees of the potential hazards of contact with chemicals and train them in appropriate first-aid procedures.
- Chemical handling areas are clearly marked and restricted to qualified, trained personnel only.

Emergency Procedures

- In case of emergencies, follow recommended first aid and emergency response procedures adopted.

Transportation Emergencies

In emergency situations resulting from vehicle accidents:

- Notify the local police, fire departments, emergency responders and the carrier.
- Isolate the area.
- Any person not dressed in proper protective clothing and not using a NIOSH approved self-contained breathing apparatus should be kept a safe distance away.
- Call to the supplier.
- Seek immediate medical assistance for those injured and follow recommended first aid procedures.

Leaking Containers

- When handling leaking bottle personnel protective clothing, goggles and NIOSH approved self-contained breathing equipment must be worn.
- Clear contaminated area of non-essential personnel and send them to assembly point.
- There should be provision of proper ventilation. Scrub the floors and equipment with soap and water.

First Aid Procedure

- Immediate medical assistance is required if chlorine dioxide and hydrogen peroxide are inhaled or has contacted the eyes or skin.
- If chlorine dioxide and hydrogen peroxide has been inhaled, move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- For skin contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
- If hydrogen peroxide comes in contact with the eyes, check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately
- In all cases of injury, obtain immediate medical attention. Provide emergency personnel with information about all materials used by the person and provide appropriate information and first aid procedures.

Details of Fire equipment's and Hydrants are attached as **Annexure X**.

5. RISK ASSESSMENT STUDY

Risk involves the occurrence or potential occurrence of some accidents consisting of an event or sequence of events. The description of the tasks of the various phases involved in the risk analysis is detailed below. The study aims to analyze the risk associated with the following scenarios in the pulp & paper mill:

i) Hazards associated with various processes

ii) Raw material storage in the plant.

The risk analysis assessment study covers the following:

- Identification of potential hazard area;
- Identification of representative failure cases;
- Assessment of the overall suitability of the site from hazard minimization and disaster management point of view;
- Furnishing of specific recommendations on the minimization of the worst accident possibilities; and
- Preparation of broad Disaster Management Plant (DMP), On-site Emergency Plan, which includes Occupational Health & Safety Plans.

5.1 Hazard Identification

Hazard is an inherent property of a substance, agent, and source of energy or situation having potential of causing undesirable consequences.

Identification of hazards in pulp & paper mill is of primary significance in the analysis, quantification & cost effective control of accidents involving chemicals and process. Estimation of probability of an unexpected event and its severity form the basis of quantification of risk in terms of damage to property, environment or personnel as:

$$\text{Risk} = \text{Probability} \times \text{Severity}$$

Therefore, the type, quantity, location and conditions of release of a toxic or flammable substance have to be identified in order to estimate its damaging effects, the area involved and the possible precautionary measures required to be taken.

The following two methods of hazard identification have been employed in the study:

- Identification of major hazards based on Manufacture, Storage, And Import Of Hazardous Chemicals Rules (MSIHC Rules), 2000 Government Of India, as amended till date.
- Process Hazard Analysis (PHA) is a method to evaluate and identify credible hazardous scenarios. PHA is a thorough, orderly, systematic approach for identifying, evaluating, and controlling the hazards of processes involving hazardous chemicals.

The probable potential hazards are classified as under:

1. Storage Hazards:

All the hazardous materials used during the manufacturing activity are stored in drum/tank/cylinder. Storage hazard can be evaluated based on the storage of various materials. The condition of event like catastrophic failure of storage tank, rupture of pipe connected to storage tank, small crack and leakage in the tank may lead to storage hazard.

2. Fire hazards:

Fire hazard can be evaluated based on storage quantity and flammability of materials stored. The condition of events like spillage, leakage of material could leads to fire. Equipment failures, presence of open flame or spark in the area, static charge accumulation, open live cables and

reaction between incompatible materials are some of the reasons which lead to the occurrence of fire.

3. Toxicity Hazard:

Toxic substances affect in three ways by ingestion, absorption & inhalation. Adequate provision of safety along with personnel protective equipment are made, breathing apparatus and emergency kit are provided at various locations of the installation.

4. Explosion Hazard:

Release of energy in a rapid and uncontrolled manner gives rise to explosion. Identified locations having explosion hazards are in tank and storage area (warehouse). Extra care shall be taken by providing rupture disc, pressure release valve and temperature controller. In addition, fire and explosion hazard is identified as catastrophic failure of storage tanks area.

5. Corrosive Hazard:

Corrosion is a chemical reaction-taking place at the surface of metal. The corrosive chemicals have their typical hazard when it comes in contact with human tissues. Most corrosive substances produce chemical burns, while certain chemical produce deep ulceration. Other has detailing effect on skin and may cause dermatitis. This also has adverse effects on weakening the strength of material in contact.

6. Mechanical Hazard:

Following mechanical hazards are identified which can cause any unforeseen event which will again result in accident.

- Handling of cranes, trolleys, construction machineries.
- Handling of mechanical equipment's like shovel, forklift, etc.
- Handling of raw material MS Scrap, products and various mechanical accessories. Maintenance workshop etc.

7. Electrical Hazard:

Use of various electrical instrument, electrical appliances may cause electrical hazards during use of various appliances.

5.2 Hazard Assessment and Evaluation

Preliminary Hazard Analysis (PHA)

It is based on the philosophy "prevention is better than cure". Safety is relative and implies freedom from danger or injury. But there is always some element of danger or risk in anything we do or build. The purpose of preliminary hazard analysis is to identify early in the design process the potential hazards associated with, or inherent in, a process design, thus eliminating costly and time consuming delays caused by design changes made later. This also eliminates potential hazard points at design stage itself. A preliminary hazard analysis is carried out initially to identify the major hazards associated with storages and the processes of the plant. This is followed by consequence analysis to quantify these hazards. Finally, the vulnerable zones are plotted, for which risk reducing measures are deduced and implemented.

There are various process activities involved in this pulp and paper mill operations like raw material handling and preparation, chemical pulping bleaching of pulp stock preparation paper making & processing except for chemical pulping, pulp bleaching and chemical recovery from black liquor, all the other processes involve purely mechanical operations that are not complex or hazardous. Chemical pulping involves cooking of raw material with sodium hydroxide. Sodium hydroxide is a mildly hazardous chemical in nature. The washing and paper manufacturing process contains no involvement of any hazardous chemicals as such. Oxygen delignification and chlorine dioxide bleaching are used to eliminate elemental chlorine bleaching i. e. The purpose of introducing elemental chlorine free bleaching (ECF bleaching) in the process is to reduce pollution load as well as AOX level. Bleaching process including ODL, chlorine dioxide, alkali extraction, hydrogen peroxide, oxygen i.e. (ODL, EOP, pulping sequence) is being employed which reduces pollution load in treated waste water and improve product quality. Hence, no major hazards with the potential for any emergency situation exist in the process plant.

A preliminary hazard analysis is carried out initially to identify the major hazards associated with storages and the processes of the plant. This is followed by consequence analysis to quantify these hazards. Finally, the vulnerable zones are plotted, for which risk reducing measures are deduced and implemented. The various process activities involved in this pulp and paper mill operations are:

- Raw material handling and preparation
- Chemical Pulping
- Bleaching of pulp
- Stock Preparation
- Paper Making & Processing

Except for chemical pulping, pulp bleaching and chemical recovery from black liquor, all the other processes involve purely mechanical operations that are not complex or hazardous. Chemical pulping involves cooking of raw material with sodium hydroxide at temperatures below 175°C. No major hazards are expected from this process. Sodium hydroxide is a mildly hazardous chemical in nature.

The washing and paper manufacturing process contains no involvement of any hazardous chemicals as such. Hence, no major hazards with the potential for any emergency situation exist in the process plant. The other hazards related to boiler operation and other storage areas are given in Table 1.6 and preliminary hazard analysis for whole of the plant is given in Table 1.7.

Table 1.6- Preliminary hazard analysis for process and storage areas

Equipment	Process	Potential Hazard	Provision
Power Transformer	--	Fire & Explosion	All electrical fittings and cables are provided as per the specified standards
Switch Yard Control Room	-	Fire in cable trenches and switches	All electrical fittings and cables are/will be provided as per the specified standards
Caustic	Used in	Leakage	Standby storage tank provided to empty up

	chemical pulping		the leaking tank.
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Table 1.7 - Preliminary hazard analysis for the whole plant in general

PHA Category	Description of plausible hazards	Recommendation	Provision
Environmental Factors	Any leakage and eventuality of source of ignition	-	All electrical fittings and cables are provided as per the specified standards. All motor starters are flame proof.
	Fire hazard in the storage facility.	A well-designed fire protection including mechanical foam, dry powder and fire buckets are provided.	Fire extinguishers of medium capacity are provided at all potential fire hazard places. In addition to the above, fire hydrant network is/will be provided.

5.3 MCA Scenarios and Consequences Analysis

A Maximum Credible Accident (MCA) can be characterized as the worst credible accident. In other words an accident in an activity, resulting in the maximum consequence distance that is still believed to be possible. A MCA analysis does not include a quantification of the probability of occurrence of the accident. Another aspect, in which the pessimistic approach of MCA studies appears, is the atmospheric condition that is used for dispersion calculations.

The Maximum Credible Loss (MCL) scenarios have been developed for the facility. The MCL cases considered, attempt to include the worst "Credible" incidents-what constitutes a credible incident is always subjective. Nevertheless, guidelines have evolved over the years and based on basic engineering judgment, the cases have been found to be credible and modeling for assessing vulnerability zones is prepared accordingly.

The objective of the study is emergency planning, hence only holistic & conservative assumptions are used for obvious reasons. Hence, though the outcomes may look pessimistic, the planning for emergency concept should be borne in mind whilst interpreting the results.

This has been done for weather conditions having wind speed 3.0 m/s. In Consequence Analysis, geographical location of the source of potential release plays an important role. Consideration of a large number of scenarios in the same geographical location serves little purpose if the dominant scenario has been identified and duly considered.

The Consequence Analysis has been done for selected scenarios by ALOHA (version 5.4.1.2) of EPA. The details of software used for MCA analysis are described below.

- A computer based version ALOHA 5.4.1.2 is used to calculate toxic and explosive effect of the accidental release of liquid chemicals within the plant area.
- ALOHA (Areal Locations of Hazardous Atmosphere) is a computer program designed especially for use by people responding to chemical release as well as for emergency planning and training.
- ALOHA was jointly developed by the National Oceanic and Atmospheric Administration (NOAA) and the Environment Protection Agency (EPA).

- The mathematical model is based on the Emergency Response Planning Guidelines (ERPGs) which gives Toxic Levels of Concern (LOCs) to predict the area where a toxic liquid concentration might be high enough to harm people.

ALOHA models key hazards-toxicity, flammability, thermal radiation (Heat), and over pressure (expansion blast force)-related to chemical releases that result in toxic gas dispersion, fire and/or explosion.

5.4 Definitions & Explanation of Terms Used

ERPG-1: The maximum concentration in air below which it is believed nearly all individuals could be exposed for up to one hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odour.

ERPG-2: The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.

ERPG-3: The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.

AEGL-1: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic no sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

IDLH: IDLH is an estimate of the maximum concentration in the air to which a healthy worker could be exposed without suffering permanent or escape-impairing health effects.

LEL: LEL is the minimum concentration of fuel in the air needed for a fire or an explosion to occur if an ignition source is present. If the concentration is below the LEL, there is not enough fuel in the air to sustain a fire or an explosion -- it is too lean.

UEL: UEL is the maximum concentration of fuel in the air that can sustain a fire or an explosion if an ignition source is present. If the concentration is above the UEL, there is not enough oxygen to sustain a fire or an explosion -- it is too rich (much like an engine that cannot start because it has been flooded with gasoline).

STEL: The concentration to which workers can be exposed continuously for a short period of time without suffering from

- Irritation
- Chronic or Irreversible tissue damage

- Narcosis of sufficient degree to increase injury, impair self-rescue or materially reduce work efficiency and provide that the daily TLV-TWA is not exceeded.

TWA: The time-weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day by day, without adverse effect.

Source Strength: The source strength is either the rate the chemical enters the atmosphere or the burn rate, depending on the scenario. A chemical may escape very quickly (so that source strength is high), as when a pressurized container is ruptured, or more slowly over a longer period of time (so that source strength is low), as when a puddle evaporates.

Threat zone: It represents the area within which the hazard level (toxicity, flammability, thermal radiation, or overpressure) is predicted to exceed the Level of Concern (LOC) at some time after a release begins.

Evaporation Puddle: Choose Puddle from the Source submenu under the set up menu to model a liquid that has spilled and formed a puddle on the ground. ALOHA can model the puddle either as an evaporating puddle or, if the chemical is flammable, as a Pool Fire. Choose Puddle when a puddle has already formed on the ground and is not changing in area. If liquid is continuing to leak from a tank and spilling into a puddle (so that the puddle's area and volume are increasing) choose Tank from the Source submenu instead. Check the "Tank source" help topic to learn more about this option.

Toxic Threat zone: A Toxic Level of Concern (LOC) is a threshold concentration of an airborne pollutant, usually the concentration above which a hazard may exist.

Threat at Point: It represents the specific information about the hazards at point of interest (such as schools and hospitals) in and around the threat zones.

5.5 Possible Accident Scenario

Major two raw materials, chlorine dioxide and hydrogen peroxide, are used for the manufacturing activity area hazardous, which are hazardous in nature. The details of storage and properties of hazardous chemical are given earlier in Table-7.2 & Table-7.3 and the threshold value of these hazardous chemicals is mentioned in the Table- 7.8.

Different scenarios for occurrence of any accidents due to storage/usage of hazardous chemicals are prescribed below;

Scenario-A: Release of chemical due to leakage and form evaporating puddle (not burning)

Scenario-B: Release of chemical due to leakage and form burning puddle (pool fire)

Scenario-C: Release of chemical due to catastrophic failure (Bleve)

During the current analysis only Scenario- A is considered for both hydrogen peroxide and chlorine dioxide because Scenario- B & C is not applicable as the chemical is non-flammable. The atmospheric condition and possibilities of source strength considered at the time of accident are given in Table-1.9 and 1.10

Table 1.8: Threshold values of the Hazardous Chemicals

Sr. No.	Hazardous Chemicals	Threshold Value*		
		AEGL / ERPG-1	AEGL / ERPG-2	AEGL / ERPG-3
1.	Chlorine Dioxide	0.15 ppm	1.1 ppm	2.4 ppm
*AEGL: Acute Exposure Guideline Levels (For Chlorine Dioxide)				
ERPG: Emergency Response Planning Guidelines (For H ₂ O ₂)				

Table 1.9: Atmospheric Condition Assumed

Particulars	Details
Wind	3.0 meters/second
Ground Roughness	Open Country
Cloud Cover	0 tenths
Air Temperature	40° C
Stability Class	C
Relative Humidity	50%

Table 1.10: Source Strength considered

Particulars	For Chlorine Dioxide
Tank/Cylinder Diameter	1.0 m
Tank/Cylinder Length	1.15 m
Tank/Cylinder volume	900 kg
Internal Temperature	40° C
Chemical Mass in Tank	2.89 Kg
Circular Opening Diameter	1 inches
Opening from Drum bottom	0.5 m
Internal Pressure at Failure	1.2 atm
Percentage of Tank Mass in Fireball	--

Scenario-A1: Release of Chlorine dioxide due to leakage and form evaporating puddle (Not burning)

a) Source Strength

In case of chlorine dioxide gas escape from cylinder by a hole of 1 inch, then approximate average sustained release rate will be 28.2 g/Sec and hence approx. 1.69 Kg of gas will be released in one minute as shown in the below **Figure-1.1**.

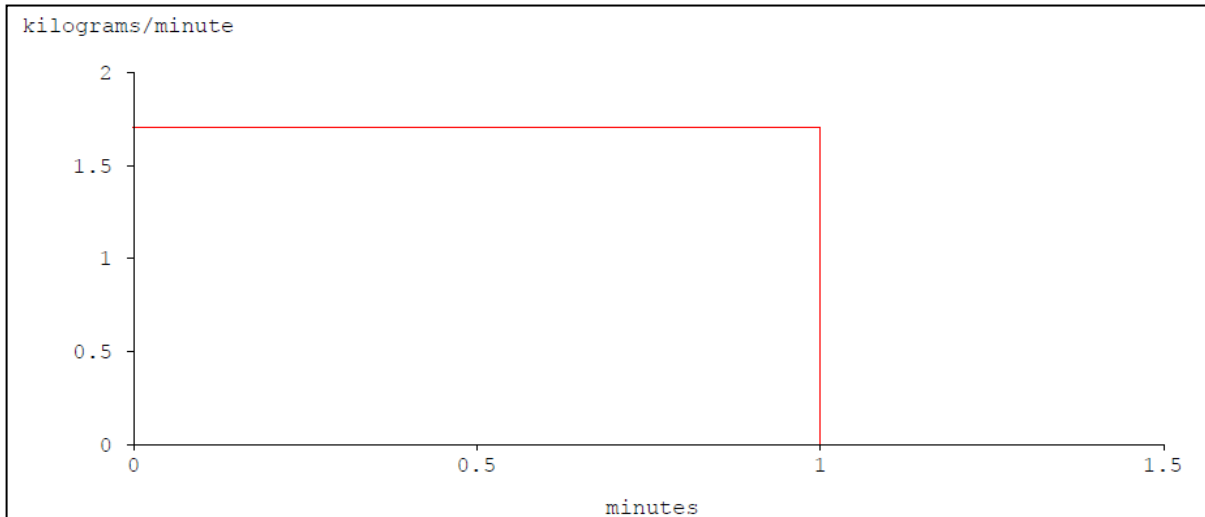


Figure-1.1: Source Strength in case of Chlorine Dioxide gas escape

b) Threat Zone

Toxic Threat Zone

Model output and Isopleths result of Toxic threat zone for gas release is given in **Table 1.11&Fig. 1.2.**

Table 1.11: Threat zone of toxic gas concentration (AEGL Value)

Threat Zone	Concentration, ppm	Threat Zone
Red	2.4	237 m
Orange	1.1	352 m
Yellow	0.15	862 m

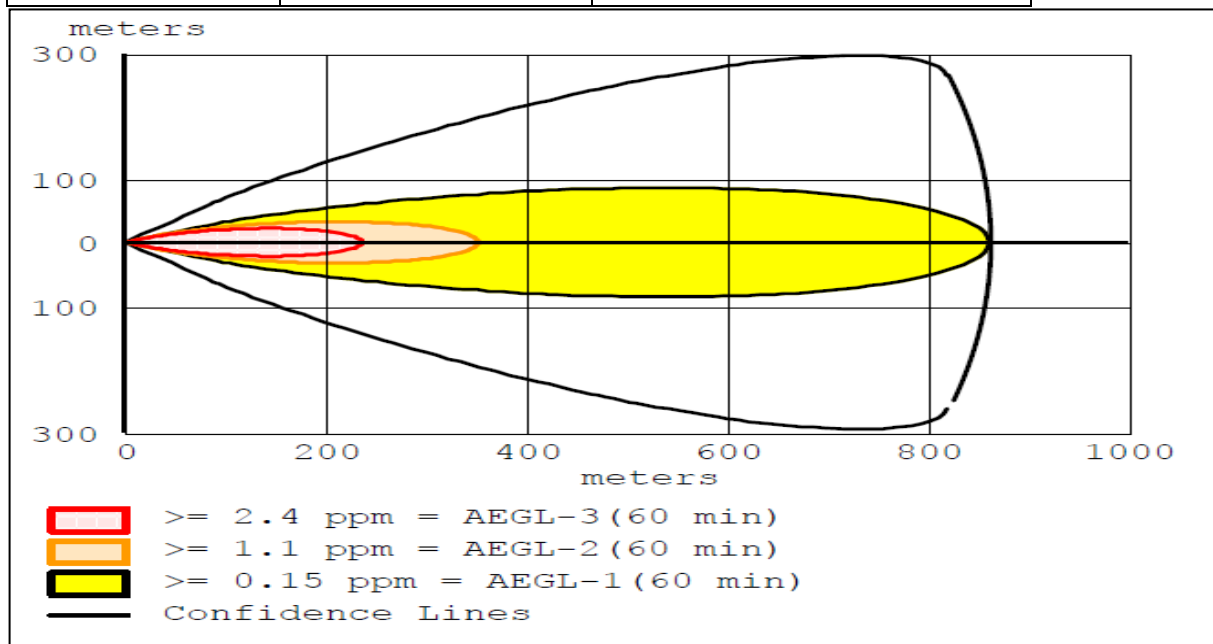


Figure-1.2: Isopleths result of Toxic threat zone

c) Threat at point

In case of leakage of chlorine dioxide gas from drum through hole and not burning, the significant effects will be up to 862 m in case of toxic threat zone. Thus the effect in case of any accident will remain in surrounding of the unit only and there will be no significant concentration or effect at a far distance to the nearest habitat area.

5.6 SAFETY HAZARD

Safety of plant personnel and equipment's is of utmost importance irrespective of plant size. Units should bring its environment, health and safety policy and follow it. The need of safety is to protect and serve the mankind, to search and suggest the safe ways of behaviour and keeping the safe working. The concept of safety has developed through three stages: Accident Prevention, Total Loss prevention and Total Loss Control. The chemical poses more of Occupational Health Hazard, while fuel poses more of safety / accidental hazards. Hazard & risk assessment has been carried out for exposure to harmful dust / vapours, liquid pool evaporation or boiling and leakage's in confined space. The hazards involved and its control measures for the chemicals which are being handled or stored in the premises are given in **Table 1.12:**

Table 1.12: Hazards and its control measures for Chlorine Dioxide

Types of hazard / exposure	Acute hazards / symptoms	Prevention	First aid / fire fighting
Fire	Not combustible but enhances combustion of other substances, Oxidising agent	No open flames, No sparks, and No smoking.	Self-contained breathing apparatus with a full facepiece operated in pressure demand or other positive pressure mode.
Explosion	Reacts violently with organics, phosphorus, potassium hydroxide and sulphur, causing fire and explosion hazard	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limits value. Ensure that eyewash stations and safety showers are proximal to	Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out

		the work-station location.	
Inhalation	Slightly hazardous in case of inhalation (lung sensitizer)	Ventilation, local exhaust, or breathing protection.	Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Call a doctor.
Skin	Irritation to skin	Protective gloves and boots.	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Eyes	Irritation	Safety goggles, face shield or eye protection in combination with breathing protection.	Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.
Ingestion	Nausea, vomiting, or loss of consciousness.	Do not eat, drink, or smoke during work.	Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Observation and Recommendation to prevent exposure to chemicals are as follows:

- Safety guards (enclosures) is/will be provided on the moving parts of the machines.
- Safety hand rails are also provided around the heavy machineries.
- Standard operating procedures (SOP) also provided near the machines to read before operation. It is available in Hindi and English Language which can be easily readable to the workers.
- Personal Protective Equipment (PPE) like goggles, safety shoes, helmet, apron, earplugs, facemask & clothing is/will be provided to employees as per the job requirements
- First aid kit is/will be provided at every working location.
- Hand trolley is also used occasionally for manual handling and movement of the raw material and products.
- Proper ventilation is/will be provided throughout the plant.
- Eating in plant premises will be strictly prohibited except canteen.
- Facilities that allow work clothes to be separated from personal clothes, and for washing / showering after work are provided.
- Policy for periodic health checks will be implemented.
- Use of filter respirators when exposed to dust.

Following actions are being taken to ensure safety

1. Procedures of safe shut down and isolation.
2. Actions to be taken if emergency arise from any fire, explosion, collapsing of structures or equipments etc.
3. Workers are fed with the knowledge of safety measures and controls.
4. The workers are/will be trained for the operation of artificial respiratory equipment such as self contained breathing equipment.
5. Rehearsals are done so that on-site personnel can fully train themselves for the emergency.
6. Emergency boards are/will be provided at the various places in Punjabi, Hindi and English to materialize the emergency.
7. Suggestions from the workers will always be welcomed to modify the system as well as to make system more reliable and effective.
8. Material Safety data Sheet (MSDS) of the chemical used and products are made available at the place of use also attached here as **Annexure -XI**.
9. Storage and process areas are posted with “No Smoking” signs. Smoking is prohibited throughout the factory. All management staff, executives are responsible to ensure compliance.
10. Adequate ventilation is provided in process area so that airborne concentration does not exceed threshold limit value.
11. On site and off site emergency plan has been prepared.

12. Annual mock drill is regularly carried out to train and aware the workers and other employees in case of emergency situation as a part of on-site emergency. Record of the same are maintained regularly.
13. Assembly Point has been decided where all the employees and worker should meet at the time of emergency occurrence. Counting of workers and employees take place immediately at assembly point and compared with those present.
14. To provide appropriate instruction, training, retraining and supervision to employees in health and safety, first aid and to ensure that adequate publicity is given to ensure proper implementation of fire prevention methods and an appropriate fire fighting service together with training facilities for personnel involved in this service; To organize collection, analysis and presentation of data on accident, sickness and incident involving people injury or injury to health with a view to taking corrective, remedial and preventive action; To promote through the established machinery, joint consultation in health and safety matters to ensure effective participation by all employees
15. To publish/notify regulations, instructions and notices in the common language of employees
16. To prepare separate safety rules for each type of occupation/processes involved in a plant
17. To ensure regular safety inspection by a competent person at suitable intervals of all buildings, equipments, work places and operations.

5.7 Safety organization

A safety organization is formed in the mill comprising of Technical Director as the Incident controller. A detailed organization chart of safety organization is given below prescribing the roles of different personnel's roles and responsibilities.

Safety Committee

Safety committee in the mill is formed comprising of HODs and workers in 50:50 ratio. A total of 14 members are part of this committee. A quarterly meeting of the safety committee is started from November – 2007. The committee shall discuss their plan of action for implementation of safe working habits among the employees and labourers. They shall also discuss about the accidents happened during the previous quarter and failure/ negligence to be identified to prevent the accidents in future. A report of the same shall be sent to the Chief Inspector of factories & boiler for their reference & record.

Details of Inspection Procedures & Systems

The inspection of various equipments like pressure vessels, lifting tools and tackles, etc. are being carried out on regular basis through an external agency of repute. The agency also issues certificate for the proper maintained equipments. A copy of the same is available with maintenance department in the mill.

Vital Records & methods to their safeguard

All the vital records of the industry are safeguarded in a room and all the necessary measures like fire fighting arrangement etc. are taken to prevent any danger to the records.

Information to Workers & Public

- **Safety Awareness among workers**

The mill has a full-fledged training room with state-of-the-art training facilities like multimedia projector, a laptop (computer), trained professionals and subject matter experts to train the employees & labourers about the hazards present in the mill. All the employees and labourers are given training about the mill operations and their work that they supposed to do with respect to safety aspects. The safety department has films about safety to show to their workers. The training record of each of the worker is maintained in the personnel department.

- **Public Awareness and Disclosure of information**

The mill does not pose any disaster that may release to environment and affect the people living in the surrounding. But, to avert any eventuality, the mill is planning to educate people living in the vicinity about the hazards that are present in the premises.

5.8 Observations & Recommendations

From the Risk Analysis studies conducted, it would be observed that by and large, the risks will be confined within the boundary walls in case of fire & explosion, it will create OFF-site emergency situations and required more attention and emergency preparedness for combat such situations. To minimize the consequential effects of the risk scenarios, following steps are being taken.

- All the pipelines, equipment & machines are color coded as per the BIS standards mentioned to protect from corrosion. Also, there is clear demarcation of safe passage routes, emergency exits & fire exits, safe assembly points etc. in different sections of the plant.
- The work permit system is started in the mill on experimental basis and with-in-a few weeks are expected to be implemented fully in whole of the plant. For its full implementation, the various training programs are being organized in the mill to train different users from different sections.
- The maintenance departments have maintained the entire breakdown/ periodic maintenance records and the routine maintenance are being carried out strictly as per the schedule. Daily log books are maintained in the respective departments and all the precautions are taken before doing any work to prevent the chances of accident, however minor it is.
- Plant should meet provisions of the manufacture, storage & import of Hazardous Chemicals Rules, 2000 & the Factories Act, 1948.
- Emergency siren has been provided in the plant to declare emergency.
- Emergency handling facilities to be maintained in tip top condition at all time.

- Safe operating procedure has been prepared for hazardous process and material handling process.
- Safety devices and control instruments to be calibrated once in a year.
- Periodic on site emergency mock drills and occasional off site emergency mock drills are conducted, so those staffs are trained and are in a state of preparedness to tackle any emergency.
- Safety manual has been prepared and the same is distributed to all employees and nearby public.
- Manual call points for fire location identification to be installed in plant premises.
- Induction safety course to be prepared and trained all new employees before starting duties in plant.

6. ONSITE EMERGENCY PLAN AND DISASTER MANAGEMENT PLAN

As emergency is said to have risen when operators in the plant are not able to cope with a potential hazardous situation i.e. loss of an incident causes the plant to go beyond its normal operating conditions, thus creating danger. When such an emergency evolves, chain of events which affect the normal working within the factory area and / or which may cause injuries, loss of life, substantial damage to property and environment both inside and around the factory takes place and a DISASTER is said to have occurred. It is necessary for all industries must prepare a Disaster Plan for their respective operations. The various steps involved in the Disaster Management Plan can be summarized as follows:

1. Minimize risk occurrence (Prevention)
2. Rapid Control (emergency response)
3. Effectively rehabilitate damaged areas (Restoration)

Disaster Management Plan is evolved by careful scrutiny and interlinking of

- a. Types and causes of disaster
- b. Technical know-how
- c. Resource availability

DMP is the term used to express, unpredicted accident /burst/failure of system, causing there by injury to a large number of persons in and around the mill. For such eventualities, management plan is prepared as how to tackle disaster and what steps to be taken in case of disaster. This is to ensure that in case of disaster there may not be a chaos and all the steps are taken with cool and composed mind. This will definitely reduce the casualties and ensure proper treatment to the victims. The Disaster Management Plan enumerated in the following pages cover the steps required for handling any type of emergency at Satia Industries Limited, Muktsar. The safety and health policy (under Factories Act, 1948) of Satia Industries Ltd, Muktsar is attached as **Annexure XII**

- **Identification of hazard**

At the Satia Industries Ltd. the following hazards are envisaged:-

(i) Bursting of digesters.

(ii) Fire in the raw material section where agriculture waste, rice husk stored

- **Siren Sounding System**

S.No.	Type of system	Type of siren sounding
1	Fire	2 minutes continuous siren
2	Pressure vessel failure	1 minutes siren after every 10 seconds break silence
3	All other	After every 5 seconds break silence inhalations

- **First aid**

Move the affected person immediately to an uncontaminated area, remove contaminated clothing and wash contaminated parts of body with plenty of water, call a physician and obtain medical assistance at the earliest.

- **Failures of pressure vessel**

Following preventive measures have been taken to avoid the disaster:-

- Each digester is/will be tested internally and externally after every six months and proper record is maintained.
- Hydraulic testing of each digester is performed annually and proper record is maintained.
- Safety valve is provided in each digester and these are tested periodically and proper record is maintained.
- Extra lid locking arrangement is/will be provided for each digester.
- Each digester is provided with rigid forged lever and release bolt.
- Each digester and its steam line is provided with pressure gauges.
- Lock switch (electrical) is provided in each digester so that only the responsible person can operate the digester.
- A register is maintained to keep the record regarding the checking of lid, lid lock, release bolt etc. before steaming the digester (after closing the lid, lid lock release valve etc. by operator) these are checked by Shift Incharge/Supervisors on duty and essential entries are made in the register specially kept for this purpose only then operator can run the digester.
- Safe operating procedure is displayed at various places on operating floor.

- **Corrosive chemical**

Satia Industries Ltd. has caustic lye and hydrochloric acid storage tanks.

- I. Cautionary notices are displayed on board.

- II. Precautions to be taken are displayed on board.
- III. Floor area is smooth and having adequate drainage system.
- IV. Suitable protective wear for hands and feet, suitable apron, face shield, chemical safety goggles etc. are provided.
- V. Tanks and pipe lines are periodically checked and proper record is maintained.
- VI. Adequate fresh water supply is there in the area.
- VII. Each tank is equipped with level indicator system.
- VIII. All flanges in pipe lines are wrapped with PVC sheet.

- **Fire**

The hazardous in mill falls into three categories:-

- (a) The storage of raw material.
- (b) The paper manufacturing process.
- (c) The finished stock storage.

In the paper manufacturing process moisture content, is retained sufficiently enough not to offer any favourable climate for combustion. However, at the end, paper has 6-7% moisture content and if it catches fire accidentally will burn instantly. The process includes dry or mechanical friction also.

Types of Disaster:

- a. Due to Fire and Explosion
- b. Due to Vapour Cloud
- c. Due to Toxic Gas Release from:
 - i. Within the Unit
 - ii. External Sources
- d. Hurricane, Flood, Cyclone and other Natural Calamities

This plan is developed to make best possible use of resources to:

- Reduce possibilities of accident.
- Contain the incident and control it with minimum damage.
- Safeguard others
- Rescue the victims and treat them suitable.
- Identify the persons affected/ dead.
- Inform relatives of the casualties.
- Provide authoritative information to the news media.
- Preserve relevant records and equipment needed as evidence incase of any inquiry.
- Rehabilitate the affected areas.

The primary purpose of the on-site emergency plan is to control and contain the incident and so as to prevent from spreading to nearby plant. It is not possible to cover every eventuality in the plan and the successful handling of the emergency will depend

on appropriate action and decisions being taken on the spot. Following three staged activities suggested as they are co-related and provide better points for emergency preparedness, emergency action and subsequent follow up.

A) Pre-emergency activity

The following are the details of Pre-emergency plan:

Internal Safety Survey

It is to be conducted by Safety department.

- To identify various hazards in plant area.
- To check protective equipment of workability.
- To check various safety installations.
- To check fire system, fire water pumps, water shower etc.
- To suggest extra modification required.

Third Party Survey

Experts of consultants can conduct Third Party Survey.

- To identify various hazards inside the factory.
- To conduct survey on available safety equipments.
- To check built in safety system for its efficiency.
- To suggest modification/new additions in the system.

Non-Destructive Testing (NDT)

- To prepare a list of equipments/pipe lines for non-destructive testing.
- To prepare a plan for replacements/repairs as per testing reports.
- To maintain plant wise record to compare with the last period.

Safety valve Testing

- To prepare a lists in the plant.
- To prepare a periodic schedule for their testing & maintaining record.
- To prepare a plan for replacements/repairs.

Fire Fighting system Testing

- To prepare a list of fire hydrants, fire fighting appliances, fire water pumps and other available appliances and maintain the record.
- To plan for testing schedule.
- To replace defective equipments/accessories.
- To check fire water pumps capacity.
- To check all the fire fighting equipments/appliances under fire services for operability.

Mock drills

- Internal mock drill to be conducted for training the workers.
- Periodic drills to be conducted to check the performance of workers and equipments.
- To know the draw backs/defects of the system and its corrective actions.

Training

- To operate regular training of the employees for handling various safety equipments.

- To train workers for fire emergency.
- To educate workers for different type of emergency.

Personal Protective Equipments (PPE)

- To arrange for sufficient quantity of personal protective equipments.
- To train workers to use each PPE.
- To maintain them in good condition.

Communication

- To maintain internal/external communication system in good working condition.
- To modify the siren sound for emergency.
- To install wind-sacks to indicate wind direction.

Emergency Lights

- To check and maintain the emergency lights in control room and selected areas.
- To keep sufficient number of torches in supervisor's cabin/plant and in each department.

Emergency Control Room

- To identify the place of emergency control room.
- To identify the alternative emergency control room.
- To keep sufficient quantity of PPE in control rooms.
- To provide proper telephone system in emergency control room.
- To provide plan of the factory showing hazardous points and emergency control point in emergency control room.

Assembly Points

- To identify the location for assembling the plant emergency staff and co-ordinate in case of emergency.
- To utilize the services of others to fix assembly points for non essential workers and to assemble in case of emergency.
- Considering the kind of disaster & wind direction administrative block & canteen have been marked as assembly points for the workers who are not working during the execution of emergency plan.

Liaison with State Authorities

- To keep liaison with police, fire brigade, factory inspector, collector, local hospital and keep them informed.
- To inform them about the requirement in advance.
- To keep them informed about mock drills.

Following preventive measures have been taken to avoid disaster

1. Storage area is enough and away from important buildings, especially vital production and service buildings to ensure that fire in storage area can be prevented from spreading to the building.

2. Raw material is properly stored in stacks and the sufficient space is provided between two stacks.
3. Temperature of each stack of raw material is checked every week to avoid the possibility of auto combustion and proper record is maintained.
4. Water filled chamber is provided on silencer pipe of each and every vehicle before allowing it to enter in storage area.
5. Smoking is strictly prohibited in mills premises.
6. Hydrants are provided at various points in storage yard.
7. Storage yard is within boundary and at a safe distance from the boundary to avoid fire from outside the wall.
8. Entire mill is divided in different zones to avoid spread of fire from one zone to other.
9. Fire fighting equipments (fire extinguishers, water-bucket, sand bucket, hydrant points) are provided at various places in the plant area so that prompt action can be Taken at smouldering stage. Blue print showing location of hydrants is attached.
10. Process area is kept neat and clean.

B) Emergency Organisation

Under these activities, the staffs in the plant at various levels with pre-assigned duties is expected to work in a coordinated manner to meet emergency situation, remove the emergency conditions and bring the plant to normal with the help of resources available within and outside the plant. Availability and correct use of different means of communication and control is an important time activity.

In case of any accident failure of pressure vessel burst/major fire etc. which may turn into a disaster, concerned operator or assistant operator/watchman on duty will inform to the On-duty shift In charge/Supervisor/Security Officer and after that he shall turn back to control the emergency until and unless Shift In charge comes at the spot. Shift In charge/ Security Officer will inform at one to the Rescue Force Co-ordinator and Department Head and then he shall have full control until Rescue Force Co-ordinator and his crew does not reach at the spot. Department Head shall inform firstly to the Chief Emergency Co-ordinator and then Chief Plant Co-ordinator after that he shall reach at the spot of mishap. He shall assess the situation and initiate remedial measures.

Sequence of action in case of various types of emergencies (Fire and Leakage of chemicals):

- Any person noticing fire or explosion or leakage of chemicals from pipeline or other equipment, should attract attention of nearby personnel by using siren available within premises.
- The area is checked clear of people and organize emergency shutdown of the plant/ equipment.
- The total quantity of chemical leaked is ascertained and discharge of Air pollutants through stack is stopped.

- Other persons in the area should help the injured persons to go out of the place i.e. at open area and immediately arrange for first aid.
- Simultaneously by telephone he should contact the emergency control centre.
- He should inform the Incident controllers and key personnel depending upon the nature of emergency.
- He will also guide the outside agency emergency aid services till the incident controller/ site main controller reaches to the site of Incident.
- As soon as Incident controller/site main controller reaches to the site of incident he will take charge of the situation and guide/advice in tackling the emergency.
- It is necessary to know that everyone on the site should be accounted for and that the relatives of casualties have been informed. As plant is small there is no problem of accounting the personnel. It is necessary to have an up dated list of the names of people at site on holidays and weekly off days.
- If the situation is not likely to be controlled by the available sources incident controller/site main controller will assess the situation and declare the emergency as "OFF SITE EMERGENCY".
- The incident controller/site main controller will continue to do the available resources to control and contain the emergency till the outside authorities and aid services reaches to the incident site.
- After District Authority reaches to the site, it will extend all the necessary help, assistance and give required information/data as when required to control & contain the emergency.

CHIEF EMERGENCY CO-ORDINATORS:-

President (Work)

He shall be responsible for :- (a) Shifting of victims to the hospital if required. (b) Arranging vehicles to bring the persons/experts required to take care of the incident like doctor etc. (c) Get in touch with hospital/nursing homes to get him, prepared to take care of the victims. (d) Contacting other factories. (e) To take help of the police & fire brigade. (f) Inform Govt. Authorities. (g) To inform new Agencies. (h) Liaison with govt. bodies.

Following officers and their staff will assist the Chief Emergency Co-ordinator:-

V.P. (P&A): 1. contacting other factories 2. C.M.O./Nursing Homes 3. Police Station.

SR.G.M. Raw Material 1. Shifting of victims to the hospitals. 2. Arrangement of vehicles.

V.P. (Finance): 1. Factory gate

EMERGENCY RESCUE FORCE CO-ORDINATOR:-

Sr. security officer/security officer/Sr. security supervisor shall be responsible for controlling of disaster shifting of victims from the spot and first aid of victims. Members of team and allocation of duties are as follows:-

Controlling Crew: Operator on duty, shift In charge on duty, Electrician on duty, fitter on duty, trained persons on duty, security guards on duty.

CHIEF PLANT CO-ORDINATOR PRESIDENT (WORKS): He shall be responsible for operation of plant he will take steps to normalizing the mill working after disaster.

COMMUNICATION CO-ORDINATOR V.P. (P&A)

He shall be responsible for communication with the people inside & outside the plant. He shall keep contact with district authorities, fire brigade, media agencies & workers of the plant. He will be assisted with his office-staff, security supervisor & liaison officer. He shall also take roll call of the people in the plant. He will further keep constant touch with Chief Emergency Co-coordinator & apprise him of the situation.

C) Post – Emergency Activities

A post-emergency base activity of steps taken after the emergency is over so as to establish the reasons of the emergency and preventive measures to be taken.

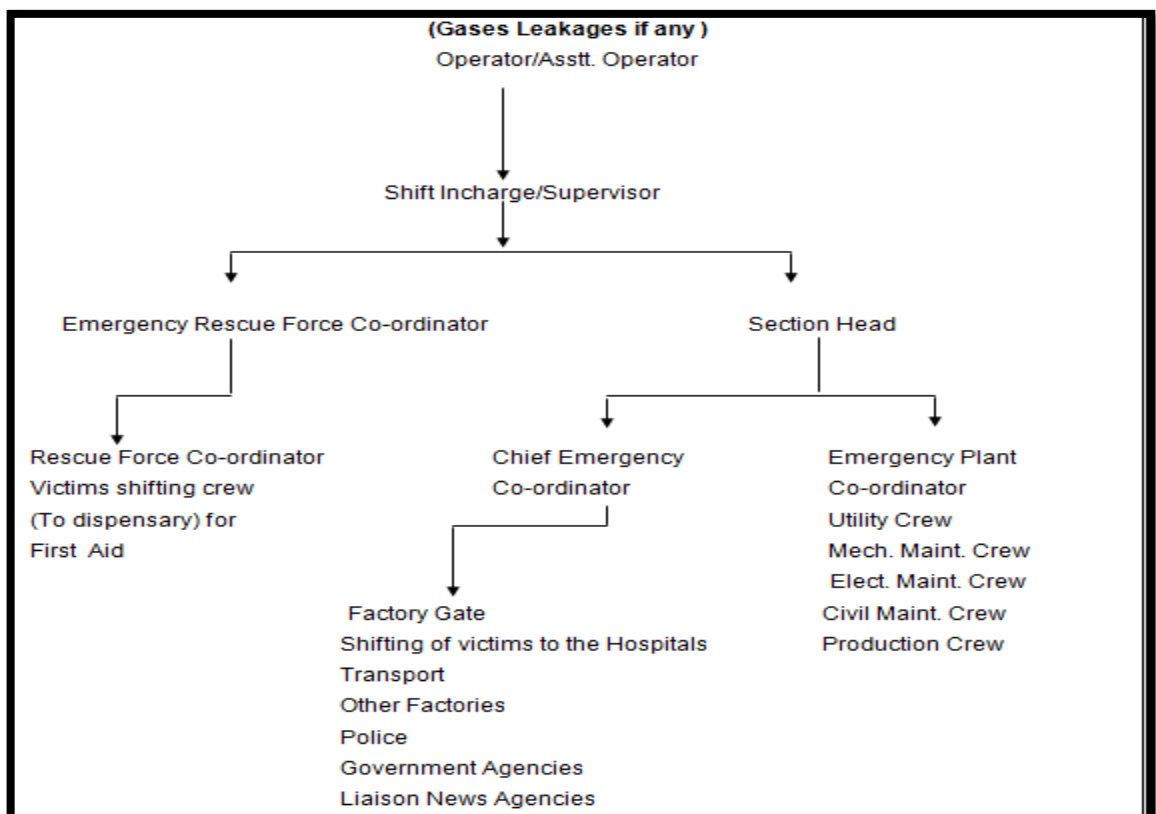
The main steps involve:

- Collection of records
- Conducting inquiries and preventive measures.
- Making Insurance claims
- Inquiry reports and suggestions Implementations

Emergency Preparedness Plan (EPP)

EPP involves the constitution of the emergency committee and its preparedness for any eventuality occurred within and outside of the plant.

The Emergency Plan Organization plan is given in figure below.



7.0 OFFSITE EMERGENCY PLANS

- **Role of management**

1. Immediately sound district administration giving details of accident and impending risk involved.
2. Sound the fire fighting agencies to be ready for any emergency response.
3. Contact meteorological department to work out the probable course of vapour cloud.
4. Dispatch emergency response vehicle with public address system to warn the public of concerned area advising best escape route.
5. Contact Government transport agencies in case of evacuation are required.
6. Contact public health department giving them details of Antidotes/medicines.
7. Contact local police department and inform them of the disaster and area where effective policing may be required to maintain law and order.
8. Give true story in media so that rumour and confusion could be minimised.

- **Role of district administration**

1. To keep watch on overall situation after the accident.
2. To give direction to nearby hospital of the area, giving them details of accident and activating them to receive casualties. Designated members of the team should reach hospital and organise relief operation.
3. To give direction to metrological department and get the data of wind direction from them, based on this they have to arrive at vapour clouds path and the most likely localities which shall get affected.
4. Direction to transport agencies and organise evacuation if required.
5. Direction to police department and organise proper security arrangements.
6. Direction to media people and give them the right picture so that rumour mongering and confusion could be minimized.
7. Organise dry runs of its emergency response programme so that people are aware of this programme and respond fast to the instructions of his team in an actual disaster.
8. The proper communication systems should exist so that in an actual situation, information flows fast.

- **Role of police**

On receipt of information, Police will organise:

- Maintain law and order situation.
- Stoppage of traffic from both ends of the road (Malout –Muktsar Road) if required depending upon the wind direction.

- Cordoning of the affected areas. Information may be collected from factory gate emergency centre.
- Warning to the people living in the adjacent area for evacuation and safe escape routes if necessary.
- Restricting the entry of unauthorised persons.
- Vigilance in liaison with factory employees against anti-social elements.
- Set up separate communication control point with police head-quarters for reinforcement of required services giving situation report.
- Extending help in removing of injured persons to the nearest first aid Centre/Hospital, completing legal formalities in case of any casualty.
- Rescue operation of people affected in nearby localities.

- **Role of medical service**

- To depute doctors and nurses to the factory/affected area with ambulance and provide immediate medical relief to casualties.
- Transport serious casualties to hospital as deemed necessary.
- Seek help from nearby Hospitals for the following antidotes, emergency occupational medicines etc. along with the services of expert Doctors
 - a. Injection dexamethasone.
 - b. Injection methanlene.
 - c. Injection avil.
 - d. Benadril.
 - e. Philips milk of magnesia.
 - f. Lasagnas (Victims halls, streusels)
 - g. Eye Drops.
 - h. Nose Drops.
 - i. Glucose Ms.
 - j. Brancodylitors Injection
 - k. Transfusion Apparatus.
 - l. Medicated oxygen cylinder

- **Role of meteorological department**

- Convey early notification of impending changes in weather condition to district authority and factory.

- **Role of Muktsar municipality**

- Arranging temporary shelter for affected/evacuated people.
- Arranging drinking water at site.
- Arranging Snacks etc. for combating team/affected people.

- **Role of fire brigade**

Chief fire officer along with other employees has to rush to the site and give assistance if required.

- **Role of transport officer District Transport Officer Muktsar**

- Control the traffic movement/divert traffic through alternate route if required.
- Arranging vehicles

The list of important telephone no. is given in **Table 1.13**

List of vehicles is given as **Table 1.14**. Beside these vehicles, Vehicles from other sources may also be arranged at the time of requirement.

Table 1.13: Important Telephone No.

Sr. No.	Name of Officials	Telephone No
1	Hon'ble Dy. Commissioner	01633-263643
2	Sr. Superintendent of Police	01633-263810
3	Dy. Superintendent of Police	01633-263643
4	S.D.M.	01633-262031
	<u>HOSPITALS</u>	
1	Civil Hospital	01633-262175
2	Mission Hospital	01633-262616
3	Adesh Hospital	01633-262184
4	Rural Hospital	01633-262064
5	Police Station City	80543-70100
6	Police Station Sadar	01633-262028
7	National Insurance Co.Ltd.	01633-262679
8	Fire Brigade Muktsar	01633-262101
9	S.D.O (Telephone)	01633-260742

Table 1.14: List of vehicles

Sr. No	Vehicle Number	Type of Vehicle
1	PB-30L-9007	Cruiser
2	PB-30T-6215	Bollero
3	PB-30H-9190	Bus
4	PB-30N-4426	Bus
5	PB-04AA-2626	Ambulance
6	PB-30B-9099	Fire Brigade
7	PB-30G-0291	Car
8	PB-30J-3396	Car
9	CH-01PU-2306	Car
10	CH-01AX-6786	Car

8. SUMMARY

As a part of the EIA study, an additional study including Risk Assessment (RA) has been carried out for the proposed project. Public hearing is applicable to proposed project as per MoEFCC's OM dated 27/04/2018 as proposed project is fall under Pulp and Paper Industry Cat. 5 (i).The Risk Assessment addresses major hazards and reviews the effectiveness of selected safety measures and to expand the safety measures in order to achieve a safety culture at the industry. The Risk Assessment also encompasses Disaster Management Study and Occupational Health & Safety.
