

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

### **CHAPTER- 6:**

### **RISK ASSESSMENT & DMP**

#### **6.1 BACKGROUND**

Identification analysis and assessment of hazards and risks provide vital information to the risk management, that what should be the type & capacity of any on-site and off-site emergency plan & what type of safety measures and maintenance is required. Risk and consequence analysis is carried out considering storage and handling of various hazardous raw materials, intermediates and product as well as manufacturing process.

#### **6.2 METHODOLOGY**

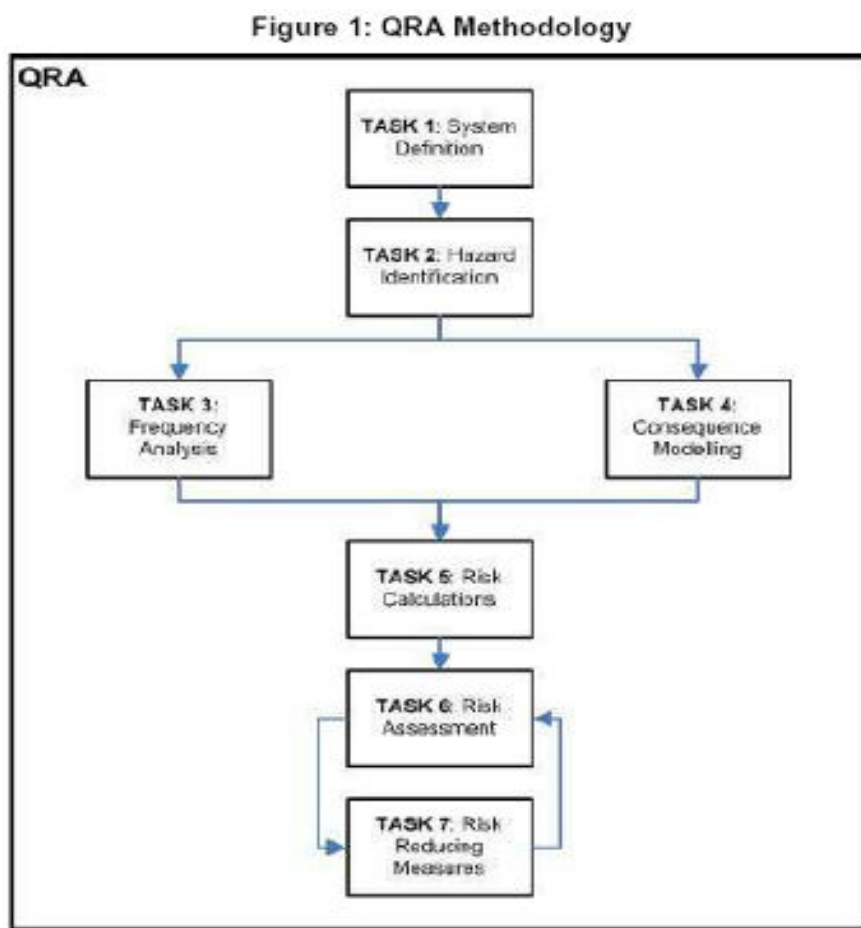
Quantitative risk assessment (QRA) is a means of making a systematic analysis of the risks from hazardous activities, and forming a rational evaluation of their significance, in order to provide input to a decision-making process. The term 'quantitative risk analysis' is widely used, but strictly this refers to the purely numerical analysis of risks without any evaluation of their significance. The study has been conducted based on the premises of a traditional Quantitative Risk Assessment. The key components of a QRA are explained below, and illustrated in Figure 1.

# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

FIGURE – 1

### QRA METHODOLOGY



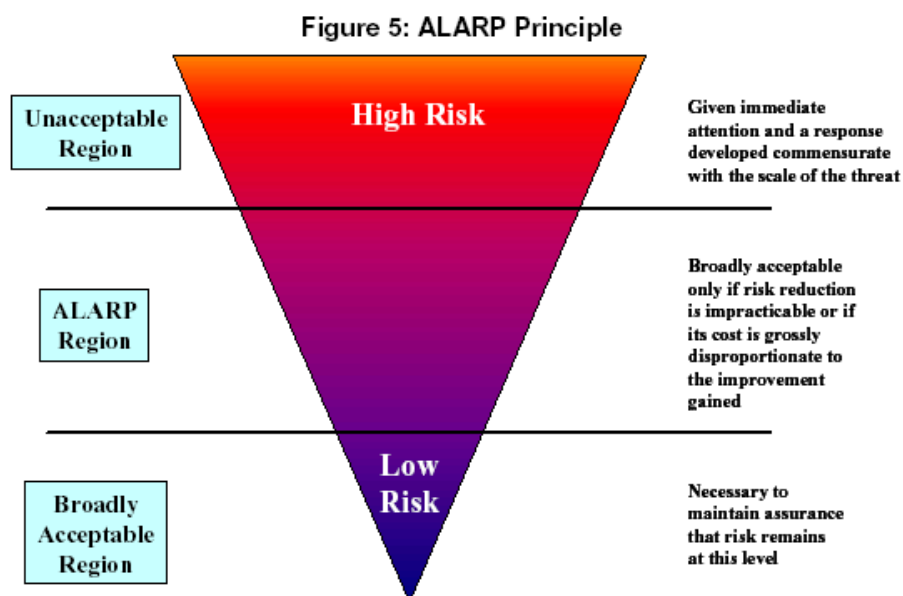
The purpose of **Risk Assessment** is to develop mitigation measures for unacceptable generators of risk, as well as to reduce the overall level of risk to As Low as Reasonably Practical.

# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

FIGURE – 2

### ALARP PRINCIPLE



In order to help assess the viability of Risk Reduction Measures (RRM), the economic costs of the measures can be compared with their risk benefits using **Cost Benefit Analysis (CBA)**.

### 6.3 STORAGE AND HANDLING OF HAZARDOUS CHEMICALS

The details of storage of Hazardous chemicals along with measures taken during storage are given in Table 6-1.

# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

**TABLE-6.1**

**STORAGE DETAILS OF HAZARDOUS CHEMICALS**

Sr. No.	Name of the Hazardous Substance	Maximum Storage	Mode of Storage	Actual Storage	State & Operating pressure & temperature	Possible type of Hazards
1	Acetic Anhydride	20 MT	MS Tank (1 Nos.)	20 MT	NTP	Flammable/ Toxic
2	MDC	20 MT	MS Tank (2 Nos.)	10 MT	NTP	Toxic
3	Ethyl Acetate	10 MT	MS Tank (1 Nos.)	10 MT	NTP	Flammable
4	Sulphuric Acid	10 MT	MS Tank (1 Nos.)	10 MT	NTP	Corrosive
5	Liquor Ammonia	20 MT	MS Tank (1 Nos.)	20 MT	NTP	Toxic

## GSP CROP SCIENCE (P) LTD.

### ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

**Table -6.2**

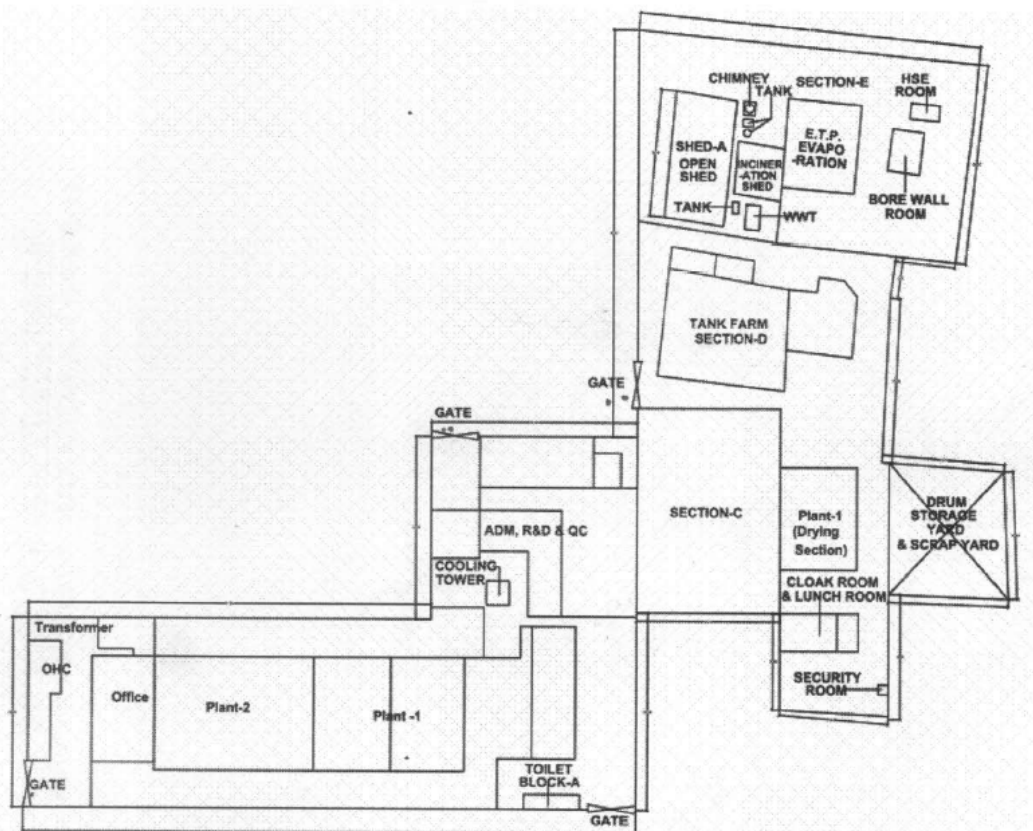
**Properties of Chemicals**

SR. NO.	NAME OF THE RAW MATERIALS	HAZARD	FP deg C	BP deg C	SP.GR . 20 deg C	VD vs air	SOLUBILITY WITH WATER at 20 deg C	VP mm Hg 20C	LEL %	UEL%	TLV (ppm)	IDLH (ppm)	LD50 ORAL mg/kgs	LC 50 mg/L
1	Acetic anhydride	Flammable/Toxic	51	139.9	1.09	3.52	Not Soluble	3.52	2.7	10.3	5 ppm	200 ppm	--	4000 mg/kg (Rat)
2	Sulphuric Acid	Corrosive	-	270	1.84	3.4	Soluble	1	-	-	1	3	2140 Rat	320 mg/m <sup>3</sup> /2H
3	Liq. Ammonia	Toxic	-	-	0.898	-	Soluble	-	-	25	50	350	-	Liq. Ammonia
4	MDC	Toxic	-4	39.8	1.322	2.9	10-50 mg/ml	349	13	22	50	2300	1600 Rat	52000 Rat 1h
5	Ethyl Acetate	Flammable, Toxic	7.2	77	0.902	3.04	Soluble	12.4 Kpa	2.2	9	400	1400	5620 Rat	45000 Rat 4h

# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

FIGURE – 3  
SITE PLAN



### **GSP CROP SCIENCE PVT. LTD. (UNIT-I)**

Plot No. 100-103, GVMM Industrial Estate, Odhav, Ahmedabad-382415

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

### **6.4 Facilities / System for process safety, Storage, transportation, fire fighting system and emergency capabilities to be adopted.**

#### **6.4.1 Process Safety:**

- Flameproof equipments and fittings are provided for handling of hazardous chemicals.
- Tanks and all pump motors are earthed.
- Road tanker earthing lines have been provided near the unloading pumps.
- Dykes have been provided for hazardous chemicals storage to contain leakages. Floors of the dyke area have impervious finish.
- Housekeeping of the plant is as per prescribed norms. Floors, platforms, staircases, passages are kept free of any obstruction.
- All hazardous operations are explained to the workers. They are periodically trained on the hazardous processes.
- Dedicated supply of firewater is available in the plant.
- Only authorized persons are allowed inside the plant.
- All instrument and safety devices are checked and calibrated during installation. They are also calibrated, checked at a frequent interval. Calibration records are maintained.
- All electrical equipments are installed as per prescribed standards.
- All the equipments of the plant are periodically tested as per standard and results are documented. All equipments undergo preventive maintenance schedule.
- Hydrant system is pressured with a Jockey Pump.
- Flame arrestor is provided on each tank.
- Pressure gauge is provided on each tank.
- In addition to fire hydrant system, nos. of fire extinguishers is also installed at different locations within premises.
- Retention basin is provided to collect the contaminated water used during fire fighting.

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

- Adequate ventilation arrangement has been provided for safe and better working in the plant as per the standard.
- Process, equipments, plant involving serious fire hazards are designed as per prescribed guideline.
- Additional systems/facilities, if any, will also equip with all above precautions.

### **6.4.2 For Underground and above ground storage tank farm :**

- Class A petroleum products are received through road tanker and stored in underground storage tank as per petroleum rules.
- Tank farm are constructed as per explosive department requirement and separation distance will be maintained.
- Static earthing provision is made for road tanker as well as storage tank.
- Flame arrestors with breather valve are provided on vent line.
- Road tanker unloading procedure is prepared and implemented.
- Fire load calculation is done and as per fire load Hydrant System is provided as per NFPA std. and Fire extinguishers are provided as per fire load calculation.
- Spark arrestors are provided to all vehicles in side premises.
- Flame proof type equipments and lighting are provided.
- Lightening arrestor is provided on the top of chimney.
- Trained and experience operators are employed for tank farm area.
- NFPA label (hazard identification) capacity and content is displayed on storage tank.
- Solvents are transferred by pump only in plant area and day tank is provided. Overflow line return to the storage tank or Pump On-Off switch is provided near day tank in plant.
- Jumpers are provided on solvent handling pipe line flanges.
- Flexible SS hose is used for road tanker unloading purpose and other temperature connection.

### **6.4.3 Transportation**

- Class A petroleum products will be received through road tanker and stored in underground storage tank as per petroleum Act & Rules.



## **GSP CROP SCIENCE (P) LTD.**

### **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

- Road tanker unloading procedure is in place and implemented for safe unloading of road tanker.
- Static earthing provision is made for tanker unloading.
- Earthed Flexible Steel hose is used for solvent unloading from the road tanker.
- Fixed pipelines with pumps are provided for solvent transfer up to Day tanks/reactors.
- Double mechanical seal type pumps are installed.
- NRV provision is made on all pump discharge line.

# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

### 6.4.4 Transportation, Unloading and handling procedure

SR.NO.	ACTIVITY	TYPE OF POSSIBLE HAZARD	MITIGATION MEASURES
1	Transportation of Chemicals like sulphuric acid and Solvents by road tanker	<p>Leakage&amp; Spillage</p> <p>Fire,&amp; explosion,</p> <p>Toxic release</p>	<ul style="list-style-type: none"> <li>• Check the source of leakage point.</li> <li>• Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.</li> <li>• Stop leak if you can do it without risk.</li> <li>• Use water spray to reduce vapors; do not put water directly on leak, spill area or inside container.</li> <li>• Keep combustibles (wood, paper, oil, etc.) away from spilled material.</li> <li>• Isolate the area</li> <li>• Isolate the container</li> <li>• Training are provided to driver and cleaner regarding the safe driving, hazard of Flammable chemicals, emergency handling.</li> <li>• TREM card are kept with TL.</li> <li>• Fire extinguishers are kept with TL.</li> <li>• Flame arrestor is provided to TL exhaust.</li> <li>• Instructions are given not to stop road tanker in populated area.</li> <li>• Clear Hazard Identification symbol and emergency telephone number is displayed as per HAZCHEM CODE.</li> <li>• Appropriate PPEs are kept with TL.</li> </ul>
2	H <sub>2</sub> SO <sub>4</sub> & Solvents Road tanker unloading at project site.	<p>Leakage&amp; Spillage</p> <p>Fire,&amp; explosion,</p> <p>Toxic release</p>	<ul style="list-style-type: none"> <li>• Check the source of leakage point.</li> <li>• Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.</li> <li>• Stop leak if you can do it without risk.</li> <li>• Use water spray to reduce vapors; do not put water directly on leak, spill area or inside container.</li> <li>• Keep combustibles (wood, paper, oil, etc.) away from spilled material.</li> <li>• Isolate the area</li> <li>• Isolate the container</li> <li>• Check the source of leakage point.</li> <li>• Spray the water on leakage</li> <li>• Priority is given to Tanker to immediately</li> </ul>

# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

			<p>enter the storage premises at site and is not kept waiting near the gate or the main road.</p> <ul style="list-style-type: none"> <li>• Security personl check License, TREM CARD, Fire extinguisher condition; Antidote Kit, required PPEs as per SOP laid down.</li> <li>• Store officer takes sample as per sampling SOP from sampling point.</li> <li>• After approval of QC department unloading procedure is allowed be started.</li> </ul> <p><b>Following precautions are adopted during unloading</b></p> <ul style="list-style-type: none"> <li>• Wheel stopper is provided to TL at unloading platform.</li> <li>• Static earthing is provided to road tanker.</li> <li>• Tanker unloading procedure is followed according to check list and implemented.</li> <li>• Flexible SS hose connection is done at TL outlet line.</li> <li>• The quantity remaining in the hose pipeline is drained to a small underground storage tank, which is subsequently transferred by nitrogen pressure to the main storage tank thus ensuring complete closed conditions for transfer from road tanker.</li> <li>• All TL valves are closed in TL.</li> <li>• Finally earthing connection and wheel stopper is removed.</li> <li>• Only day time unloading is permitted.</li> </ul>
3	H <sub>2</sub> SO <sub>4</sub> & Solvents Storage tank safety	<p>Leakage&amp; Spillage,</p> <p>Fire, Explosion</p> <p>Toxic release.</p>	<ul style="list-style-type: none"> <li>• Check the source of leakage point.</li> <li>• Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.</li> <li>• Stop leak if you can do it without risk.</li> <li>• Use water spray to reduce vapors; do not put water directly on leak, spill area or inside container.</li> <li>• Keep combustibles (wood, paper, oil, etc.) away from spilled material.</li> <li>• Isolate the area</li> <li>• Isolate the container</li> <li>• Check the source of leakage point.</li> <li>• Spray the water on leakage</li> <li>• SS storage tank is provided as per IS code.</li> <li>• Dyke wall is provided to storage tank.</li> <li>• Level transmitter is provided with low level high level auto cut-off provision.</li> </ul>

# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

			<ul style="list-style-type: none"> <li>• Vent is connected to water trap and vent of water trap is provided with flame arrestor.</li> <li>• Water sprinkler system is provided to storage tank.</li> <li>• Fire hydrant monitor with foam attachment facility is provided.</li> <li>• Dumping / Drain vessel/alternate vessel is provided to collect dyke wall spillage material.</li> <li>• FLP type pump is provided.</li> <li>• Nitrogen blanketing is provided to storage tank.</li> <li>• Double static earthing is provided to storage tank.</li> <li>• Double Jumper clip is provided to all solvent handling pipeline flanges.</li> </ul>
4	H <sub>2</sub> SO <sub>4</sub> & Solvents transfer from storage tank to Day tank	Leakage & Spillage due to Line rupture, Flange Gasket failure, Fire, Explosion, Toxic release.	<ul style="list-style-type: none"> <li>• Double mechanical seal type FLP type pump is provided.</li> <li>• Double on / off switch is provided at tank farm and process area near day tank. Pump auto cut off with day tank high level is provided.</li> <li>• Flame arrestor is provided on day tank vent.</li> <li>• Over flow is provided for additional safety and it is connected to main storage tank.</li> <li>• NRV is provided on pump discharge line.</li> <li>• Double Jumper clip is provided to all solvent handling pipeline.</li> <li>• Double static earthing is provided to day tank.</li> </ul>
5	Transportation of Chemicals like H <sub>2</sub> SO <sub>4</sub> & Solvents transfer from Day tank to reactor.	Leakage, Spillage due to Line rupture, Flange Gasket failure, Fire, Explosion, Toxic release.	<ul style="list-style-type: none"> <li>• Gravity transfer.</li> <li>• Total quantity of day tank material is charged in to reactor at a time.</li> <li>• Static earthing is provided to storage tank.</li> <li>• Double Jumpers is provided to pipeline flanges.</li> </ul>

# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

### 6.4.5 FIRE FIGHTING SYSTEM

#### Fire Extinguisher Detail

Sr. No.	Location of Fire Extinguisher	Types	Capacity
1	Engg Store	ABC	5 KG
2	Transformer Area	CO2	4.5 KG
3	Main Office	ABC	6 KG
4	OHC Outside	ABC	6 KG
5	Main Office outside	ABC	6 KG
6	SP Plant at Column	ABC	6 KG
7	SFD Plant GF Entrance	ABC	6 KG
8	SFD Plant GF Near ANF	ABC	6 KG
9	Acephate Plant GF	ABC	6 KG
10	Acephate Plant Entrance	ABC	6 KG
11	Nr Organic Tank 6	ABC	6 KG
12	Acephate Plant Near AQ Tank	ABC	6 KG
13	GF Near CF	FOAM	9 LTR
14	Acephate Plant Near ANF	ABC	6 KG
15	FF Nr D01B	NASA	2.2 KG
16	FF Nr CR4	ABC	6 KG
17	FF Near In-charge Table	ABC	6 KG
18	FF Nr C-6	NA	NA
19	FF Maintenance Room	CO2	2 KG
20	SF Nr SF 301	ABC	6 KG
21	GF Main Electric Room	CO2	4.5 KG
22	WDG Inside	ABC	6 KG
23	Chilling Plant outside	CO2	4.5 KG
24	Brine Plant	ABC	6 KG
25	Boiler House	CO2	2 KG
26	RM Godown	FOAM	9 LTR
27	RM Godown	ABC	6 KG
28	Acephate SP Dryer	ABC	6 KG
29	Maintenance Workshop	ABC	6 KG
30	NEW WDG Plant Near Office Entrance	ABC	6 KG
31	ETP Plant	ABC	6 KG
32	R & D Lab FF	CO2	4.5 KG
33	R & D Lab SF	ABC	6 KG
34	R & D Passage	FOAM	9 LTR
35	QC Lab	CA	4 KG
36	QC Lab	ABC	6 KG
37	R & D Passage	ABC	6 KG

# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

38	R & D Technical Room	CA	4 KG
39	R & D Store	CA	4 KG
40	R & D Lab	CA	4 KG
41	RM Tank Farm	ABC	6 KG
42	RM Tank Farm	ABC	6 KG
43	RM Tank Farm	ABC	6 KG
44	RM Tank Farm	ABC	6 KG
45	RM Tank Farm	ABC	9 KG
46	RM Tank Farm	ABC	9 KG
47	RM Tank Farm	ABC	9 KG
48	RM Tank Farm	ABC	9 KG
49	RM Tank Farm	FOAM	50 LTR
50	DG Set	CO2	4.5 KG
51	SP Plant Entrance	ABC	6 KG
52	SP Plant Near Glass Door	CO2	2 KG
53	SP Plant FF on Platform	ABC	6 KG
54	New WDG Plant FF on Platform	ABC	6 KG
55	New WDG Plant FF on Platform	CO2	4.5 KG
56	New WDG Plant on Column	FOAM	9 LTR
57	New WDG Plant on Column	FOAM	9 LTR
58	New WDG Plant near shutter door	ABC	6 KG
59	New WDG Plant near old office	FOAM	9 LTR
60	SFD FF on Platform	ABC	6 KG
61	SFD SF on Platform	ABC	6 KG
62	SFD TF on Platform	FOAM	9LTR

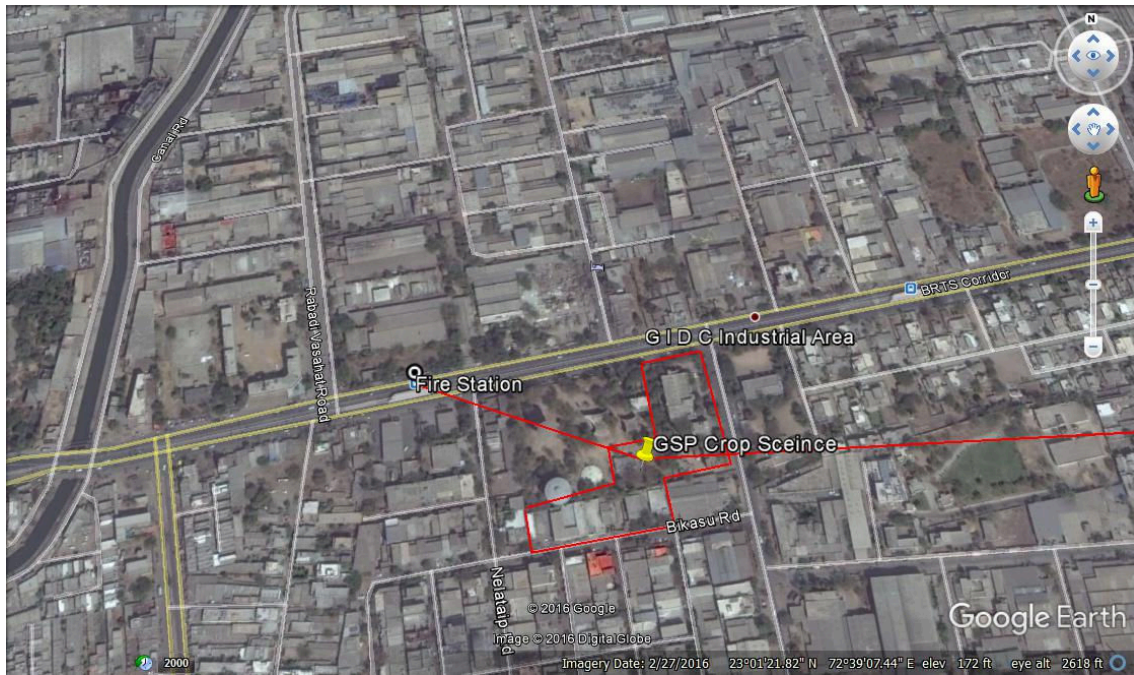
### Hydrant System Detail:

1. Hydrant: 6 No.
2. Water monitor: 2 No.
3. Hose Reel: 5 No.
4. Foam Concentration: 100 ltr.

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

### **Location of Fire Nearest Station**



# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

### **6.4.6 OCCUPATIONAL HEALTH AND SAFETY PROGRAM FOR THE PROJECT**

Occupational Health is eventually a branch of preventive medicine which examines the relationship between work & health and effects of work on the health of the worker. Occupational health service is operated to achieve the statutory declared aim of occupational health by medical and technical measures. Its role is mainly preventive and to give first aid and emergency treatment. It is certainly useful in early detection of any occupational or non-occupational disease or any man-adjustment of the man-job relationship.

#### **OCCUPATIONAL HEALTH AND SAFETY PROGRAM:**

1. Medical examinations: Pre-employment, periodic and others
2. Supervision of the working environment industrial hygiene, safety, job analysis and adaptation of the job to the worker in good working conditions.
3. Advice to management and worker.
4. Health education and training.
5. Health statistics.
6. Medical treatment-first aid, emergency and ambulatory treatment.
7. Health counseling-individual.
8. Nutrition.
9. Research in occupational health.
10. Co-operation with other services in the undertaking.
11. Collaboration with external services.

Other purposes of industrial medical services are:

- I) Identifying the Hazards
- II) Preventing or minimizing the Hazards
- III) Curative treatment in case of exposure
- IV) Determining the Compensation for damages



# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

### Expected Occupational Health & Safety Hazards

- Physical Hazards: Noise, Heat, Dust etc.
- Chemical Hazards: Corrosive, Toxic Substances, Irritants, Carcinogens, Chemical emissions
- Psychological hazards resulting from stress and strain
- Hazards associated with the non-application of ergonomic principles, for example badly designed machinery, mechanical devices and tools used by workers, improper seating and workstation design, or poorly designed work practices.

### Expected chemical hazards in work environment

Name of Chemical	Health Hazard due to exposure to these chemicals
MDC	Irritant: may be irritating to Respiratory tract, skin and eyes. May cause central nervous system effects. May cause kidney and liver damage.
Acids (Sulphuric Acid)	Corrosive, Irritant. Causes severe eye burns. Causes skin burns. May cause deep, penetrating ulcers of the skin.
Ethyl Acetate	Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

### Mitigation Measures for OSH: It is proposed to formulate and implement a structure for Occupational Safety and Health with following aims...

- To keep air-borne 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.
- It is recommended that EMP be formulated on the guidelines issued by Bureau of Indian Standards on OH&S Management Systems: IS 18001:2000 Occupational Health and Safety Management Systems

### EMP also includes measure to keep air-born concentration of toxic and hazardous chemicals below its PEL and TLV, like...

- Leak Surveys
- Separate storage for toxic chemicals

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

- Exhaust Ventilation
- Proper illumination
- On-line detectors toxic chemicals
- Close processes to avoid spills and exposures
- Atomization of process operations to hazards of manual handling of chemicals
- 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
- Decontamination procedure for empty drums and carboys.
- Regular maintenance program for pumps, equipment, instruments handling toxic and corrosive chemicals.
- Display of warning boards
- Training to persons handling toxic and corrosive chemicals

### **Workplace Monitoring Plan**

- Workplace Monitoring Plan is prepared & implemented in consultation with FMO and industrial hygienists.
- Each workplace must be evaluated to identify potential hazards from toxic substances or harmful physical agents. Air-borne concentrations of toxic chemicals are measured and record will be kept.
- The current state-of-the-art exposure measurement model is as follows: For purposes of measuring worker exposure across a single shift it is sufficient to place a reasonably accurate exposure measuring device on the worker, within the worker 's breathing zone, and have it operate for nearly the full shift.
- 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.

### **Health Evaluation of Workers**

- Management is devise a plan to check and evaluate the exposure specific health status evaluation of workers.
- Workers are 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

# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

employed for that purpose. Basic examinations like Liver Function tests, chest x-ray, Audiometry, Spirometry Vision testing (Far & Near vision, color vision 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 are carried 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.

### **Action Plan for occupational health of the workers:**

- Based on the nature of the Products and raw materials handled the proper antidotes are identified and ensuring the stock of the required antidotes For Insecticide exposures Depletion in the Cholinesterase's level in the Blood, PAM and Atropine are the antidotes, For exposure in the cyanides, Amyl Nitrate injections are the antidotes.
- Full fledged Occupational Health centre with Qualified Medical Officers and Male nurse are provided to take care of the Health issues of the employees.
- The Ambulance with all life saving accessories is made available round the clock.
- The contacts with nearby Health centers and hospitals are also established to handle occupational health related emergencies.
- Depending on the nature and handling of the product proper Personal Protective Equipments are available.
- Periodic monitoring of employees health are conducted as per the health parameters & records are verified with respect to previous data in terms of health deterioration.
- Regular work place monitoring is conducted to ensure safe work environment.
- To supplement the envisage health hazards, nutrients like Banana, Milk are provided to the employees in addition to regular Breakfast, lunch and other facilities.
- Nutritious food with proper hygiene is available in the company canteen for Employees after consultation with Doctors & dietitians.

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

- Appropriate training is provided to the employees regarding handling and precautions to be taken in work area.
- Proper sign boards and Work instructions are displayed.
- First aid boxes and Team of First aiders is available.
- Rest room and Safe Drinking water facilities are available in the Company along with bathing and washing facilities.
- Uniforms → Decontamination of used clothes.

### **6.5 HAZARD IDENTIFICATION**

The major hazards in the M/s. GSP Crop Science (P) Ltd. are described below.

- Toxic hazard due to leakage of hazardous chemicals MDC, ammonia from storage tank.
- Fire and Explosive hazard due to leakage of chemicals like, ethyl acetate, acetic anhydride from storage tank.
- Corrosive hazard due to leakage of chemicals like  $H_2SO_4$  etc from storage tank.
- Electrical hazards due to the electrical major equipment/ machinery, operations, welding, motors, and heavy lift devices, cabling, human intervention (short circuit possibility), maintenance work (due to machinery breakdown etc.), plant lighting related electrical hazards.
- Possibility of human injury due to working with mechanical machines, manual handling etc.
- Possibility of injury during chemicals handled, during operations and due to intoxication.
- Major dropped objects hazard due to large number of physical handling steps/operations involved with crane/ overhead lifting/ hoisting equipment.
- Fires in any part of the plant working areas – there is a possibility of rapid escalation if it is not brought under control quickly.
- Possibilities of fire hazards at transformers, switchgear and other electrical equipment etc.

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

### **6.6 Risk Management**

M/s. GSP Crop Science (P) Ltd. is managed the economical and social aspects of risk. Improvement in scientific and factual basis for risk assessment is necessary for better risk management decisions and public creditability of those decisions. However, M/s. GSP Crop Science (P) Ltd. is done the QRA to be undertaken prior to risk management decisions.

M/s. GSP Crop Science (P) Ltd. is considered the Risk management strategies including all the specific activities. First step involves taking a decision about the weather any actions are necessary and if so, what nature of the action should it be. Industries' risk management decision is based not only computed risk in terms of fatality probability (fatality/year), but also on judging the acceptability of the risk – a matter of personal and social value judgment. The risk management includes implementing the actions, decided upon and evaluating their effects.

The fatality probability is function of:

- Probability of occurrence of hazardous events
- Probability of weather condition, wind direction
- Probability of number of persons exposed which depends on the severity of the consequences
- Lethality factor
- Probability of ignition source

Any potentially hazardous installation or operation in individual member industries could be made safer through enhances implementation of safeguards, diverse control systems, multiple containment barriers and redundant structures.

### **6.7 Risk Acceptance**

The acceptance of risk by individuals and collectively by society in M/s. GSP Crop Science (P) Ltd. is affected by many parameters. Some people may accept the risk voluntarily while some may do so involuntarily. The general public acceptance also depends on their understanding and knowledge of risks. Finally each individual has a different perception for risk acceptance. The lowest level for involuntary uses is set by the risk of death from natural

# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

events such as lightening, flood, earthquakes, etc. M/s. GSP Crop Science (P) Ltd. is carried out survey of risks in this range which is shown in Table -6.3.

**Table -6.3**

**Risk level for various activities commonly encountered**

Sr.No.	Activities/Resources	Estimated Risk * $10^{-6}$ fatalities per year
1.	Run over by Road Accidents	55
2.	Natural Disasters (Floods, Storm)	1.8
3.	Falling Aircrafts	1.2
4.	Explosions of vessels	0.5
5	Transportation of Chemicals	0.7

The level of risk above the order of annual fatality risk level of  $10^{-4}$  per year is unacceptable.

**Table – 6.4**

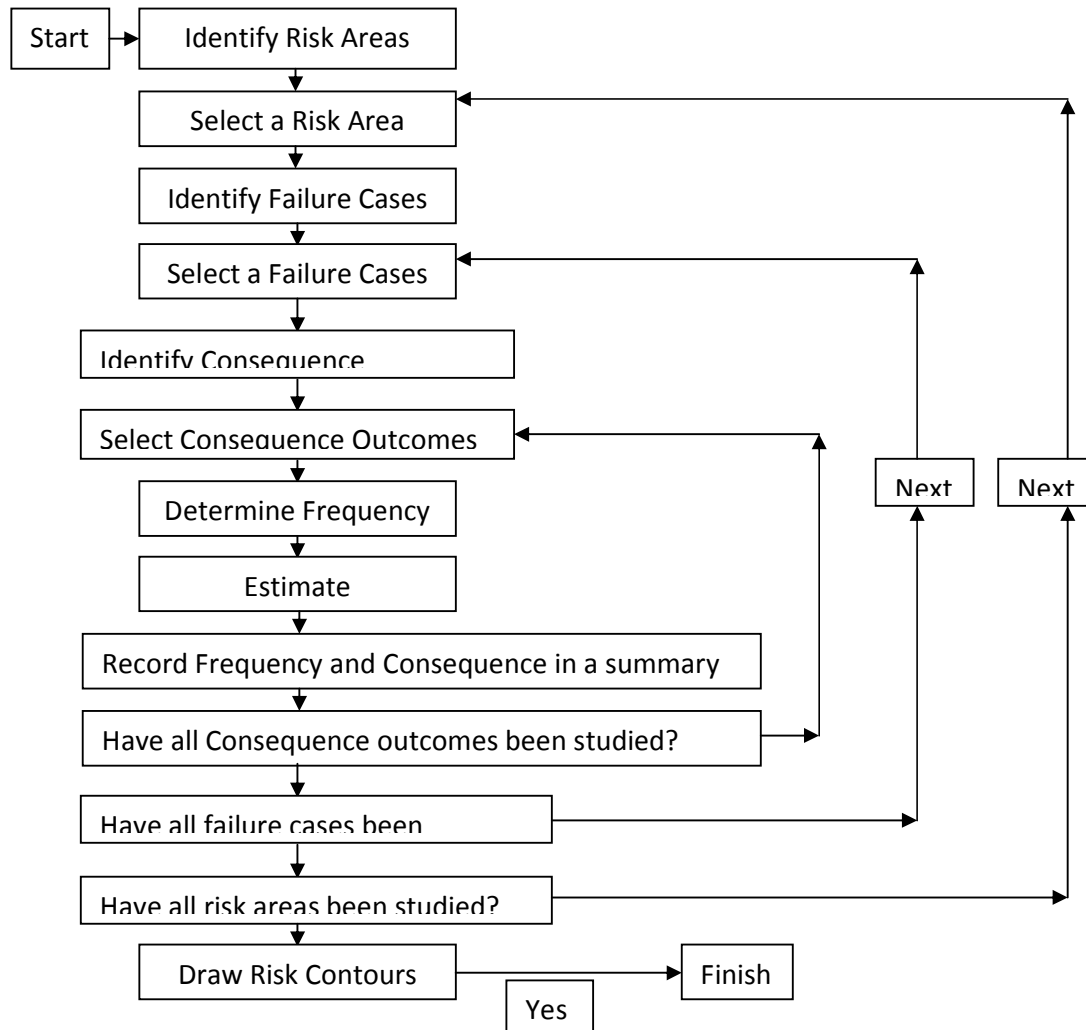
**Acceptance of annual fatality risk levels**

Sr. No.	Annual Fatality risk level per year	Conclusion
1.	$10^{-6}$	<ul style="list-style-type: none"><li>• Not of great concern to average person.</li><li>• People are aware of these accidents but feel that they can't happen to them.</li><li>• Phrases associated with these hazards have element of resignation: "lighting never strikes twice", an act of God".</li></ul>

# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

### 6.8 Quantitative Risk Assessment



# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

### **6.8.1 Identification of Hazardous Areas**

The procedure for QRA starts with identification of major risk areas in the installation. Operation carried out in bulk drug Industry usually come under certain board, general categories. In M/s. GSP Crop Science (P) Ltd. major risk areas is storage tank area, plant area and utility area.

- Bulk storage of liquids (e.g. Acetic Anhydride, MDC, Ethyl Acetate, liquor Ammonia, Sulfuric Acid etc) area in M/s. GSP Crop Science (P) Ltd. at ambient temperature and atmospheric pressure.
- Process Plant involving Piping, pumping, transportation, reactors, distillation, heating, cooling, electricity etc.
- Bulk loading from storage tanks into road or rail tankers.
- Drum Storage Area.

### **6.8.2 Identification of Failure cases for Hazardous areas**

- Release due to catastrophic failure of storage tanks or process vessels.
- Rupture of connected pipe with storage tank or process vessels.
- Continuous release at significant rates for long durations transfer pipelines caused by sudden, major break of the pipeline.
- Continuous release at low rate through small holes or cracks in piping and vessels, flange leaks, and leakage from pump glands and similar seals.

### **6.9 CONSEQUENCE ANALYSIS**

In a plant handling hazardous chemicals, the main hazard arises due to storage, handling & use of these chemicals. If these chemicals are released into the atmosphere, they may cause damage due to resulting fires or vapour clouds. Blast overpressures depend upon the reactivity class of material and the amount of gas between two explosive limits.

#### **Operating Parameters**

Potential vapour release for the same material depends significantly on the operating conditions. Especially for any liquefied gas, the operating conditions are very critical to assess the damage potential.



# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

### **Inventory**

Inventory Analysis is commonly used in understanding the relative hazards and short listing of release scenarios. Inventory plays an important role in regard to the potential hazard. Larger the inventory of a vessel or a system, larger the quantity of potential release. The potential vapour release (source strength) depends upon the quantity of liquid release, the properties of the materials and the operating conditions (pressure, temperature). If all these influencing parameters are combined into a matrix and vapour source strength estimated for each release case, a ranking should become a credible exercise.

### **Loss of Containment**

Plant inventory can get discharged to Environment due to Loss of Containment. Certain features of materials to be handled at the plant need to be clearly understood to firstly list out all significant release cases and then to short list release scenarios for a detailed examination. Liquid release can be either instantaneous or continuous. Failure of a vessel leading to an instantaneous outflow assumes the sudden appearance of such a major crack that practically all of the contents above the crack shall be released in a very short time. The more likely event is the case of liquid release from a hole in a pipe connected to the vessel. The flow rate will depend on the size of the hole as well as on the pressure, which was present, in front of the hole, prior to the accident. Such pressure is basically dependent on the pressure in the vessel. The vaporisation of released liquid depends on the vapour pressure and weather conditions. Such consideration and others have been kept in mind both during the initial listing as well as during the short-listing procedure. In the study, Maximum Credible Loss accident methodology is to be used, therefore, the largest potential hazard inventories have been considered for consequence estimation.

### **6.9.1 DAMAGE CRITERIA**

In consequence analysis, use is made of a number of calculation models to estimate the physical effects of an accident (spill of hazardous material) and to predict the damage (lethality, injury, material destruction) of the effects. The calculations can roughly be divided in three major groups:

- a) Determination of the source strength parameters;

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

- b) Determination of the consequential effects;
- c) Determination of the damage or damage distances.

The basic physical effect models consist of the following.

### **Source strength parameters**

- Calculation of the outflow of liquid, vapour or gas out of a vessel or a pipe, in case of rupture. Also two-phase outflow can be calculated.
- Calculation, in case of liquid outflow, of the instantaneous flash evaporation and of the dimensions of the remaining liquid pool.
- Calculation of the evaporation rate, as a function of volatility of the material, pool dimensions and wind velocity.
- Source strength equals pump capacities, etc. in some cases.

### **Consequential effects**

- Dispersion of gaseous material in the atmosphere as a function of source strength, relative density of the gas, weather conditions and topographical situation of the surrounding area.
- Intensity of heat radiation [in kW/ m<sup>2</sup>] due to a fire or a BLEVE, as a function of the distance to the source.
- Energy of vapour cloud explosions [in N/m<sup>2</sup>], as a function of the distance to the distance of the exploding cloud.
- Concentration of gaseous material in the atmosphere, due to the dispersion of evaporated chemical. The latter can be either explosive or toxic.

### **Selection of Damage Criteria**

The damage criteria give the relation between extent of the physical effects (exposure) and the percentage of the people that will be killed or injured due to those effects. The knowledge about these relations depends strongly on the nature of the exposure. For instance, much more is known about the damage caused by heat radiation, than about the damage due to toxic exposure, and for these toxic effects, the knowledge differs strongly between different materials.

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

In Consequence Analysis studies, in principle three types of exposure to hazardous effects are distinguished:

- Heat radiation, from a jet, pool fire, a flash fire or a BLEVE.
- Explosion
- Toxic effects, from toxic materials or toxic combustion products.

In the next three paragraphs, the chosen damage criteria are given and explained.

### **6.9.2 MAXIMUM CREDIBLE LOSS ACCIDENT SCENARIOS**

A Maximum Credible Accident (MCA) can be characterised 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. As per the reference of the study, weather conditions having an average wind speed of 1.80 m/s have been chosen.

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 judgement, the cases have been found to be credible and modelling for assessing vulnerability zones is prepared accordingly. Only catastrophic cases have been considered and not partial or small failures (as is the case in Quantitative Risk Assessment where contributions from low frequency - high outcome effect as well as high frequency - low outcome events are distinguished). 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.

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

### **6.9.3 CONSEQUENCE ANALYSIS CALCULATIONS**

The Consequence Analysis has been done for selected scenarios. This has been done for weather conditions having wind speed 1.80 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.

### **6.9.4 SOFTWARE USED FOR CALCULATIONS**

#### **6.9.4.1 Phast Micro:**

Phast is the most comprehensive software available for performing Process Hazard Analysis (PHA), Quantitative Risk Assessment (QRA) and Financial Risk Analysis (FRA). Our extensively validated software for consequence and risk analysis is used by governments and industry helping them to comply with local safety regulation and their own corporate best practice. Phast contains all the discharge, dispersion, effects and risk models you will need to accurately assess all your major hazards and associated risks. Phast Consequence provides you with comprehensive hazard analysis facilities to examine the progress of a potential incident from the initial release to its far-field effects.

#### **Toxic and Flammable Impact**

It calculates the initial discharge, as the material expands from its storage conditions to atmospheric, through dispersion, as the material mixes with air and dilutes, and the subsequent toxic or flammable effects. Phast includes a wide range of models for discharge and dispersion as well as flammable, explosive and toxic effects.

#### **Discharge**

- Phast requires basic information about storage or process conditions and material properties in order to perform discharge calculations
- The software comes with an integrated material property database containing more than 1,600 pre-defined pure component chemicals
- Various discharge scenario options have been implemented to represent common process failures, and model their behavior. These include:

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

- ❖ Leaks and line ruptures from long & short pipelines
- ❖ Catastrophic ruptures
- ❖ Relief valve and disc ruptures
- ❖ Tank roof collapse
- ❖ Vent from vapour spaces
- ❖ In building release effects

### **Dispersion**

The dispersion models within Phast are able to model the following phenomena

- Dispersion of gas, liquid and two-phase releases
- Liquid droplet thermo dynamics calculations and liquid droplet rainout
- Pool spreading and vaporization
- Building wake dispersion effects for vapour releases

### **Flammable Effects**

For releases of flammable material Phast calculates

- Radiation profiles and contours from a range of fire scenarios including pool fires, flash fires, jet fires and fire balls, including cross-wind effects on a jet fire
- Vapour Cloud Explosion modeling using industry standards models including the TNO Multi-energy, Baker Strehlow Tang and TNT Equivalence models
- Overpressure contours from Boiling Liquid Expanding Vapour Explosions

### **Toxic Effects**

- Graphs of toxic concentration profile
- Indoor and outdoor toxic dose prediction
- Reporting of distance to specific dose and concentration
- Calculated exposure time and use as “averaging time” for passive dispersion effects

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

### **Phast Risk**

Phast Risk allows you to combine the flammable and toxic consequences from each scenario in your QRA model with their likelihood to quantify the risk of fatalities. Phast Risk allows you to take account of local population distribution, sources of ignition, land usage and local prevailing weather conditions. It is designed to perform all the analysis, data handling and results presentation elements of a QRA within a structured framework.

Phast Risk allows you to quickly identify major risk contributors so that time and efforts can be directed to mitigating these highest risk activities. Based on effects calculations and population vulnerabilities, Phast Risk can integrate over all scenarios and weather conditions to estimate the total risk. The established individual and societal risk indicators are predicted by Phast Risk across your facility and surrounding area using the classical QRA methodology. Risk ranking reports can be produced at points of strategic importance to show the relative influence of the various failure scenarios and their contribution to both the individual and societal risk metrics.

A key benefit of Phast Risk is the ability to identify major risk contributors and differentiate these from incidents with worst case consequences which might otherwise dominate the safety reviews. Whilst medium scale incidents have lesser consequences, they may have a higher frequency, which, when combined with their hazardous effects, generate a higher level of risk. Time and effort directed to mitigating high consequence but often low frequency events may not be well spent. Phast Risk helps you direct this effort more effectively.

Phast Risk also provides facilities to help you manage large quantities of input data, including scenarios, parameters, wind roses, ignition and population, and combine these in many ways. This is critical when looking at sensitivity analyses and assessing the merits of a range of risk reduction measures.

### **Benefits**

- Facilitates cost reduction in terms of losses and insurance

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

- Allows optimization of plant and process design
- Assist in compliance with safety regulators
- Enables quicker response to hazardous incidents
- Improve engineer's understanding of potential hazards
- Regular software upgrades incorporate industry experience and expertise, and advances in consequence modeling technology

### **Financial Extension**

The Financial Consequence extension is used to assess situations which present potential hazards not only to life but also to the environment, property and business and help quantifying their severity in financial terms. Phast Financial helps you to estimate the cost of a particular release of a given material under specified conditions. The Financial Risk extension helps you to calculate the broader financial risks associated with accidents and can be used to help manage your business risk and assess appropriate levels of insurance.

### **Blast Extension for Explosion Risk**

The Blast extension permits more accurate explosion modeling and thus better risk predictions. It provides all the extra functionality required to assess overall risks taking account of protection provided by different types of structure and areas of congestion on your plant.

### **Multi-Component Extension**

The multi-component extension to Phast provides greater accuracy for liquid or two-phase mixture releases compared to the standard pseudo-component approach. The composition of each component of the mixture is calculated throughout the discharge and dispersion phases of the release.

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

### **6.10 SCENARIOS**

**TABLE – 6.5**

#### **POSSIBLE ACCIDENT SCENARIOS**

<b>Scenario</b>	<b>MCL Scenario</b>	<b>Quantity</b>
1	Release of Sulphuric Acid	10 KL
2	Release of Acetic Anhydride	20 KL
3	Release of MDC	20 KL
4	Release of Ethyl Acetate	10 KL



# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

### **Consequence Analysis**

#### **Introduction**

In this, the source terms for each defined failure cases are presented, including calculated release rate, release duration and total released mass of fluid. Subsequently consequence results from selected failure cases are also presented in order to give overview on the extent of impact from potential major accident scenarios. Five types of consequences are presented, i.e. jet fire, pool fire, flash fire, explosion and toxic impact.

#### **Consequence Distances**

##### **Pool Fire, Fire ball, Flash Fire**

The extent of the consequence of a Pool fire is represented by the thermal radiation envelope. Three levels of radiation are presented in this report, i.e.:

- 4 kW/m<sup>2</sup>; this level is sufficient to cause personnel if unable to reach cover within 20s; however blistering of the skin (second degree burn) is likely; 0: lethality.
- 12.5 kW/m<sup>2</sup>; this level will cause extreme pain within 20 seconds and movement to a safer place is instinctive. This level indicates around 6% fatality for 20 seconds exposure.
- 37.5 kW/m<sup>2</sup>; this level of radiation is assumed to give 100% fatality as outlined above.

# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

### 6.10.1 DETAILED SUMMARY OF RESULTS:

Detailed Results of the consequence analysis of above-mentioned scenarios have been given below:

#### Scenario # 1: Release of Sulphuric Acid

This scenario considers release of Sulphuric Acid from Storage Tank:

#### Results indicate:

Catastrophic Rupture	
Input Data	
Stored quantity - 10 KL	
Molecular weight -98.08	
Wind speed – 1.80 m/s	
Density ( Air) – 1840 kg/m <sup>3</sup>	
Results indicate	
LC50 – 460 ppm	29.33 meter
IDLH – 3 ppm	407.07 meter
TLV –0.2 ppm	1102.23 meter

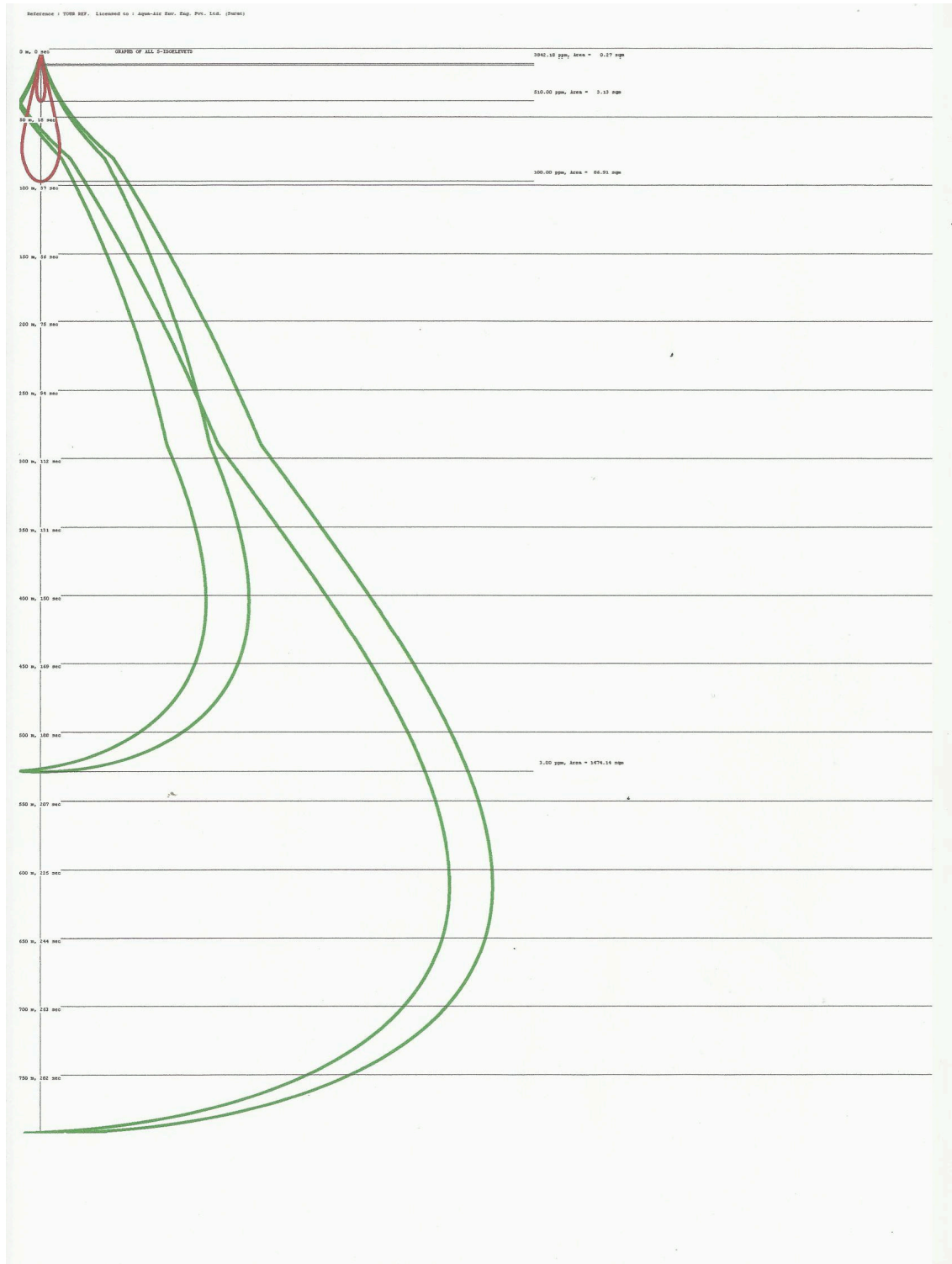
#### Results:

LC50 HUMAN (460 ppm) area up to 29.33 meter, Immediate danger to life and health (3 ppm ) concentration area up to 407.07 meter and TWA (0.20 ppm ) area up to 1102.23 meter. Therefore 407.07 meter area in wind direction is considered as evacuation area.

# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

### Toxic Effect:



# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

### **Measures to control and mitigate Emergency:**

#### **MITIGATION MEASURES FOR SULPHURIC ACID LEAKAGE:**

- ✓ Isolate the source if possible without risk.
- ✓ If leakage is small, dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.
- ✓ Absorb with DRY earth, sand or other non-combustible material.
- ✓ Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift.
- ✓ Use water spray to reduce vapors.
- ✓ Prevent entry into sewers, basements or confined areas.
- ✓ Neutralize the residue with a dilute solution of sodium carbonate.

#### **PREVENTIVE MEASURES TO AVOID SULPHURIC ACID LEAKAGE:**

- ✓ A dike will be provided to accommodate the full quantity in tank.
- ✓ Periodic testing of storage tank will be done by competent person.
- ✓ Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective TLVs. Storage tank vent is connected to scrubber system.
- ✓ Flange guard provided to prevent splash of material.
- ✓ Level interlock
- ✓ Keep container dry. Never add water to this product.
- ✓ In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label.
- ✓ Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture.
- ✓ Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.
- ✓ While handling always use face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent.
- ✓ Ensure that eyewash stations and safety showers are proximal to the work-station location.

# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

### Scenario # 2: Release of Acetic Anhydride

This scenario considers release of Acetic Anhydride from Storage Tank:

#### Results indicate:

Catastrophic Rupture		
Input Data		
Stored quantity - 20 KL		
Molecular weight -102.09		
Wind speed - 1.80 m/s		
Density ( Air) –1.080 g/cm <sup>3</sup>		
Results indicate		
Pool Fire Scenario		
Radiation Level (KW/m <sup>2</sup> )	Distance in meter	Effect if IHR at Height of simulation
4	67.69	This level is sufficient to cause personnel if unable to reach cover within 20s; however blistering of the skin (second degree burn) is likely; 0: lethality
12.5	31.43	This level will cause extreme pain within 20 seconds and movement to a safer place is instinctive. This level indicates around 6% fatality for 20 seconds exposure.
37.5	6.82	This level of radiation is assumed to give 100% fatality as outlined above.
Vapor Cloud Explosion		
UFL (103000)	5.43062	This level is sufficient to cause personnel if unable to reach cover within 20s; however blistering of the skin (second degree burn) is likely; 0: lethality
LFL (29000)	5.47601	This level will cause extreme pain within 20 seconds and movement to a safer place is instinctive. This level indicates around 6% fatality for 20 seconds exposure.
LFL Frac (14500)	5.49436	This level of radiation is assumed to give 100% fatality as outlined above.

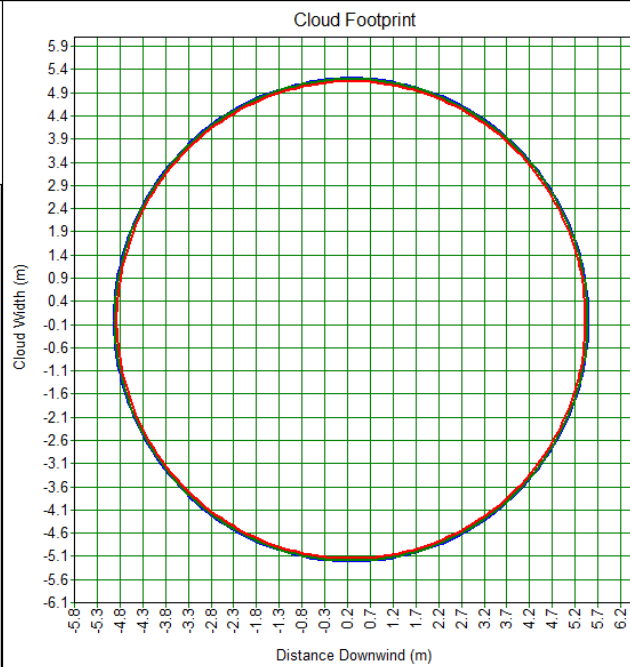
# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

### Acetic Anhydride

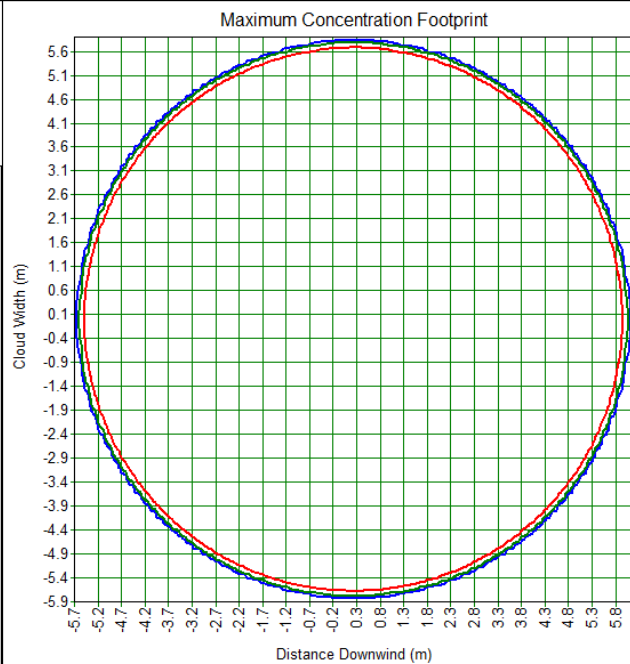
Study Folder: NewPhastMicro  
Audit No: 7571  
Model: Vessel/Pipe Source  
Weather: Category 1.5/F  
Material: ACETIC ANHYDRIDE  
Averaging Time: Flammable(18.75 s)  
Height: 0 m  
Concentration  
Time: 1.815 s

— 85.3017m2 @ 14500ppm  
— 84.6988m2 @ 29000ppm  
— 83.215m2 @ 103000ppm



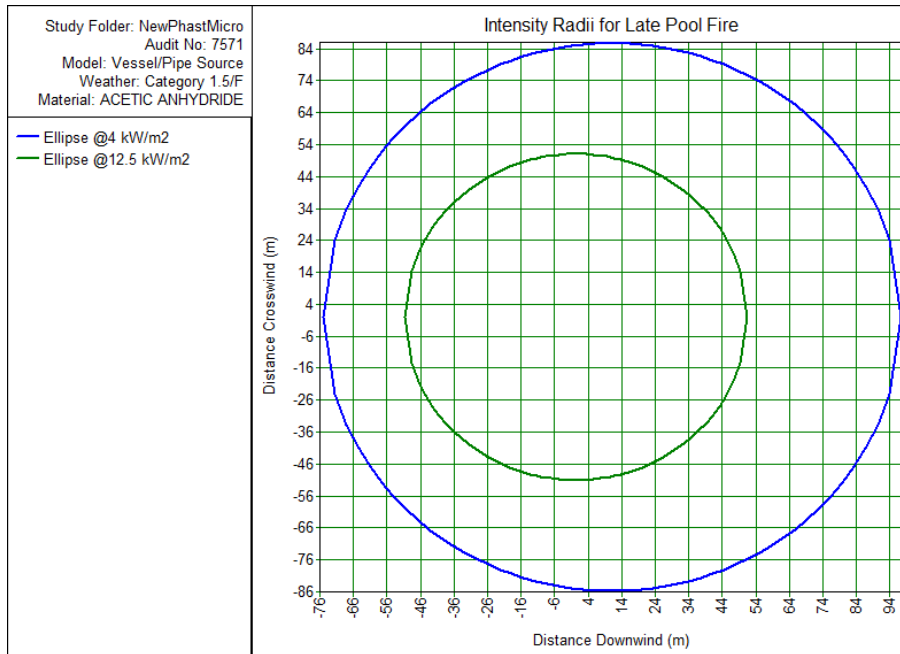
Study Folder: NewPhastMicro  
Audit No: 7571  
Model: Vessel/Pipe Source  
Weather: Category 1.5/F  
Material: ACETIC ANHYDRIDE  
Averaging Time: Flammable(18.75 s)  
Height: 0 m  
Concentration

— 107.567 m2 @ 1.45e+004 ppm  
— 105.839 m2 @ 2.9e+004 ppm  
— 101.844 m2 @ 1.03e+005 ppm



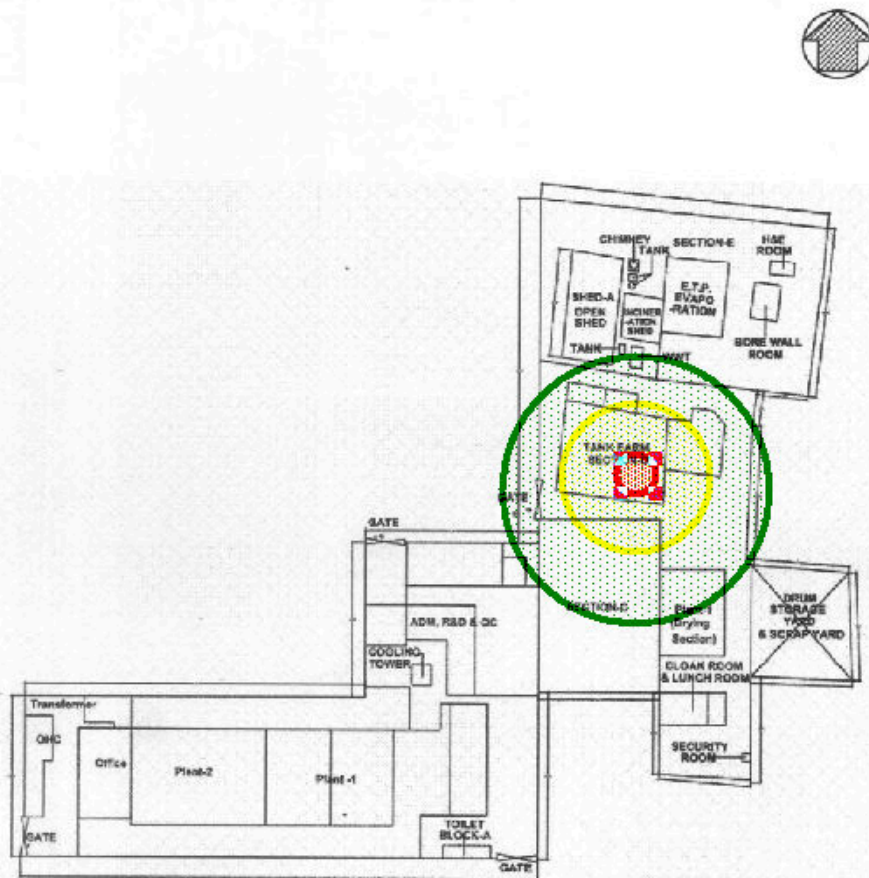
# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT



## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

### Pool Fire Scenario:



**GSP CROP SCIENCE PVT. LTD. (UNIT-I)**

Plot No. 100-103, GVMM Industrial Estate, Odhav, Ahmedabad-382415



# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

### Scenario # 3: Release of MDC

This scenario considers release of MDC from Storage Tank:

**Results indicate:**

Point Source simulation module for MDC road tanker catastrophic failure		
Scenario : SPILL POOL		
Input Data		Results of Computations
Stored quantity	20 MT	End point (meter)
Release Rate	6650 Gms/ Sec.	
LC50 Human	52000 ppm	7.9
IDLH value	2300 ppm	76.47
TLV value	50 ppm	1327.74

### Results

- LC50 HUMAN (52000 ppm) area up to 7.9 meter, IDLH (Immediate danger to life and health- 2300 ppm) concentration area up to 76.47 meter and TWA (50 PPM ) area up to 1327.74 meter. Therefore 76.47 meter area in wind direction is considered as evacuation area.

# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

### Scenario # 4: Release of Ethyl Acetate

This scenario considers release of Ethyl Acetate from Storage Tank:

#### Results indicate:

Catastrophic Rupture		
Input Data		
Stored quantity - 10 KL		
Molecular weight -88.11		
Wind speed - 1.80 m/s		
Density ( Air) -0.897 g/cm <sup>3</sup>		
Results indicate		
Pool Fire Scenario		
Radiation Level (KW/m <sup>2</sup> )	Distance in meter	Effect if IHR at Height of simulation
4	53.36	This level is sufficient to cause personnel if unable to reach cover within 20s; however blistering of the skin (second degree burn) is likely; 0: lethality
12.5	31.43	This level will cause extreme pain within 20 seconds and movement to a safer place is instinctive. This level indicates around 6% fatality for 20 seconds exposure.
37.5	12.52	This level of radiation is assumed to give 100% fatality as outlined above.



# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

### **Measures to be taken to prevent such accident:**

- Priority will be given to Tanker to immediately enter the storage premises at site and will not be kept waiting near the gate or the main road.
- Security person will check License, TREM CARD, Fire extinguisher condition, Antidote Kit, required PPEs as per SOP laid down.
- Store officer will take sample as per sampling SOP from sampling point.
- After approval of QC department unloading procedure will be allowed be started.

### **Following precautions will be adopted during unloading**

- Wheel stopper will be provided to TL at unloading platform.
- Static earthing will be provided to road tanker.
- Tanker unloading procedure will be followed according to check list and implemented.
- Flexible SS hose connection will be done at TL outlet line.
- The quantity remaining in the hose pipeline will be drained to a small underground storage tank, which will be subsequently transferred by nitrogen pressure to the main storage tank thus ensuring complete closed conditions for transfer from road tanker.
- All TL valves will be closed in TL.
- Finally earthing connection and wheel stopper will be removed.
- Only day time unloading will be permitted.

### **Following precautions will be adopted Storage of such chemicals**

- Storage tank will be stored away from the process plant.
- Tanker unloading procedure will be prepared and implemented.
- Caution note and emergency handling procedure will be displayed at unloading area and trained all operators.
- NFPA label will be provided.
- Required PPEs like full body protection PVC apron, Hand gloves, gumboot, Respiratory mask etc. will be provided to operator.
- Neutralizing agent will be kept ready for tackle any emergency spillage.
- Safety shower, eye wash with quenching unit will be provided in acid storage area.

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

- Material will be handled in close condition in pipe line.
- Dyke wall will be provided to all storage tanks, collection pit with valve provision.
- Double drain valve will provided.
- Level gauge will be provided on all storage tanks.
- Safety permit for loading unloading of hazardous material will be prepared and implemented.
- TREM CARD will be provided to all transporters and will be trained for transportation Emergency of Hazardous chemicals.
- Fire hydrant system with jockey pump as per TAC norms will be installed.

### **For Storage tank farm area:**

- Under N2 pressure storage.
- Safety valve provided and storage facility to ensure safe release of HC in case of over pressure.
- Dyke with separate fencing area is provided.
- SOP prepared
- Road tanker unloading procedure prepared
- Work permit followed
- PPEs used
- Safety shower, eye wash provided.
- NFPA labeling system adopted for storage tanks.
- Level indicator at local.
- Alarm for high level & high pressure.
- Automatic fire fighting indication provided for around the storage area
- Sprinkler system will be provided

Emergency organization and team will be prepared as per On site-Off site emergency planning

### **Mitigation measures to control Emergency:**

- ◆ Hydrant system & sprinkler system will be provided as per requirements.

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

- ◆ Foam attachment and portable foam trolley will be provided in tank farm area.
- ◆ Emergency organization and team will be prepared as per On site-Off site emergency planning
- ◆ Solvent transportation safety SOP will be prepared and trained employees.
- ◆ Emergency siren and wind sock will be provided.
- ◆ Scenario base On Site emergency Plan will be prepared.
- ◆ Tele Communication system and mobile phone will be used in case of emergency situations for communication.
- ◆ First Aid Boxes and Occupational health centre will be made at site.
- ◆ Full body protection suite and other PPEs will be kept ready in ECC at site.
- ◆ Emergency team will be prepared and trained for scenario base emergency. Like Toxic control team, Fire control team, First aid team, Communication and general administration team, Medical team etc.
- ◆ Safety Shower and eye wash will be provided away from the tank and unloading station.
- ◆ Sand bags/ buckets will be provided near tank area.
- ◆ Neutralizing medium (Lime and dry sand) will be kept ready near tank farm.

### **EMERGENCY RESPONSE**

**DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.**

#### **Small Fire**

- Dry chemical or CO2.

#### **Large Fire**

- Water spray or fog.
- Move containers from fire area if you can do it without risk.

#### **Fire involving Tanks**

- 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.

## **GSP CROP SCIENCE (P) LTD.**

### **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

- Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

#### **SPILL OR LEAK**

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.
- Do not direct water at spill or source of leak.
- Prevent spreading of vapors through sewers, ventilation systems and confined areas.
- Isolate area until gas has dispersed.

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

### **6.11 HAZARDOUS MATERIALS TRANSPORTATION SAFETY GUIDELINES**

#### **Introduction**

Transportation typically involves carrying of small amounts of materials over short distances transportation does, however, pose significant risks from the frequency of the activity and the lack of observance of prescribed regulations. The hazardous materials should be packaged, based on the composition in a manner suitable for handling, storage and transport. Labeling and packaging is required to be easily visible and be able to withstand physical conditions and climatic factors. These guidelines are issued to facilitate safe transportation of the hazardous material in compliance of the regulations. In view of the stringent product quality requirement, various complex processes are introduced involving the handling of hazardous chemicals. These chemicals pose various types of hazards like flammability, toxicity, explosives, corrosives etc. Inadequate awareness about the hazardous properties of these chemicals may lead to serious accidents which will affect the men at work and the environment.

#### **Scope**

This document applies to the vehicular transportation, within geographically contiguous, of hazardous materials, substances, and wastes. Hazardous materials include chemical materials, substances or wastes. Transportation is performed in a manner which minimizes risk to the health and safety of employees, the public and the environment.

#### **Guidelines for Transportation**

##### **General**

It is ensured that during the transportation, contents are not spilled, packaging is not damaged and personnel are properly trained to generate, transport and receive such materials. In general, the traffic control program at M/s. GSP Crop Science (P) Ltd. requires that an on site driver possess a valid driver's license. The maximum speed limit is 16 KMPH. TREM (Transport Emergency) cards are to be provided to the drivers.



## **GSP CROP SCIENCE (P) LTD.**

### **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

#### **Packing**

The containers must be able to withstand normal handling and retain integrity for a minimum period of six months. In general, packaging for hazardous substances must meet the following requirements:

- All packaging materials including containers are of such strength, construction and type as not to break open or become defective during transportation.
- All packaging materials including containers are so packaged and sealed those spillages of hazardous materials / substances are prevented during transportation due to jerks and vibrations caused by uneven road surface.
- Re-packaging materials including that used for fastening must not be affected by the contents or form a dangerous combination with them.
- Packaging material should be such that there is no significant chemical or galvanic action among any of the material in the package.
- Ensure that any cushioning or absorbent material used for packaging is also compatible with the hazardous material.

The containers when used for packaging of the hazardous Material shall meet the following requirements:

- Modes of packaging, like collection in 200-litre plastic drums, cardboard cartons, PP and HDPE/LDPE containers etc., also work for variety of materials. However, all such container should be amenable to mechanical handling.
- It should be leak proof.
- Use drums that are in good condition and free of rust and major dents.
- Ensure that drums are not leaking or overfilled before transporting them.
- Ensure that drum bungs are tight.
- Carefully inspect pallets before they are loaded.
- Do not use pallets with cracked or broken slats.
- Use a drum dolly to place drums on pallets.
- Secure all drums to the pallet with appropriate strapping material.

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

- In general, the containers for liquid HM should be completely closed, in fact sealed. There should be no gas generation due to any chemical reaction within the container, and, hence, there should not be any need for air vents; expansion due to increase /decrease in temperature normally does not need air vents.
- Container should be covered with a solid lid or a canvas to avoid emissions of any sort including spillage, dust etc. and to minimize odour generation both at the point of loading as well as during transportation.
- Container used for transportation of Material should be able to withstand the shock loads due to vibration effect/undulations of pavements etc.
- Container should be easy to handle during transportation and emptying.
- As far as possible, manual handling of containers should be minimized. Appropriate material handling equipment is to be used to load, transport and unload containers. This equipment includes drum, dollies, and forklifts, drum handling equipment, lift gates and pallets. Drums should not be rolled on or off vehicles.
- Where two-tier or three-tier storage is envisaged, the frame should have adequate strength to hold the containers.
- One-way containers are also allowed. The multi-use containers should be re-usable provided it should be cleaned and free from deterioration or defects.
- Loads are to be properly placed on vehicles. HM containers are not to overhang, perch, lean or be placed in other unstable base. Load should be secured with straps, clamps, braces or other measures to prevent movement and loss. Design of the container should be such that it can be safely accommodated on the transport vehicle.
- Dissimilar materials shall not be transported in the same container.

### **Labeling**

There are two types of labeling requirements:

- i. Labeling of individual transport containers [ranging from a pint-size to a tank], and
- ii. Labeling of transport vehicles.

## **GSP CROP SCIENCE (P) LTD.**

### **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

- All hazardous Material containers must be clearly marked with current contents. The markings must be waterproof and firmly attached so that they cannot be removed. Previous content labels shall be obliterated when the contents are different. Proper marking of containers is essential.
- Color code is to be provided to the tanker to indicate the type of material present in that.
- Containers that contain HM are labeled with the words "HAZARDOUS MATERIAL" in Vernacular language, Hindi / English. The information on the label must include the code number of the Material, the Material type, the origin (name, address, telephone number of the supplier and receiver), hazardous property (e.g. flammable, corrosive), and the symbol for the hazardous property.
- The label must withstand the effects of rain and sun. Labeling of containers is important.

The following are the requirements for labeling:

Emergency contact phone numbers are prominently displayed viz. the phone number of concerned Regional Officer of the SPCB, Fire Station, Police Station and other agencies concerned.

#### **Unloading of Tank Trucks / Tank Wagons**

- Before the tanker enters the industry premises, the tanker is to be inspected for authorized entry and safe & sound condition of the tanker, its contents and that of the prime mover.
- Tankers entering plant are to be fitted with flare arresters on their exhaust.
- The quality of the chemical in the tanker should be ascertained before unloading to avoid contamination of chemical already at storage.
- In case of flammable chemicals, the prime mover (engine) should be kept off. The tanker should be properly blocked from movement before connections are made for unloading hazardous chemicals.

## **GSP CROP SCIENCE (P) LTD.**

### **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

- In case of flammable chemicals, the unloading point should be located at a safe distance outside the storage dyke.
- Pressurizing with air / inert gas for unloading should be avoided. It is recommended to use pumps / vacuum systems for unloading. Pumps should preferably be of seal less type and valves should be of glandless types. Solid chemicals in bulk should be handled with lifting machines and conveyors.
- Coupling used for connecting hose to tanker must be leak proof. Flange connections are preferred. Where threaded connections are used, the threaded portion should be properly preserved against corrosion / wearing of threads and thoroughly inspected before connections are made.
- The unloading hose should be devoid of cracks & blisters and should be capable of withstanding whatever pressure developed during unloading operation. The hose should be hydro-tested at a frequency guided by experience. Proper records of hydro-test should be maintained.
- Same hose should not be used for unloading different chemicals. Hoses for different chemicals should be marked with different color stripes for easy identification.
- For flammable chemicals, the tanker and the hose are to be properly earthed before starting unloading operation.
- Unloading should preferably be done in day time.
- Unloading should be done under personal supervision of responsible staff authorized by the management.
- The operating staff must use suitable personal protective clothing /equipment. Suitable breathing canisters and first aid box must be available at site for use in case of emergency.
- Provision of sample quantity of water / neutralizing medium to take care of leakage / spillage must be made. Also steam and inert gas hose stations must be available at unloading point.
- There must be adequate illumination at site. Flame proof fittings should be used wherever necessary.

# GSP CROP SCIENCE (P) LTD.

## ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

- The unloading systems should have facility to vent / drain the remaining chemical in the hose to a suitable safe point. The hose should be kept blinded when not in use. Thermal safety valve discharging to safe disposal or handling facility should be provided.
- Before starting unloading, the silage of the receiving tank should be checked. Care should be taken to avoid overflow of tanks. Gas / chemical leak detection system to sound an alarm at the control room/site may be provided wherever possible, so that quick remedial measures can be taken. Wherever necessary, quick/remote isolation valves should be provided.
- Fire fighting facility commensurate with the chemical – as mentioned in the data sheet should be provided at the unloading point.
- Effective communication system like telephone must be available for communicating with the control room / fire station / health unit.

### Unloading of Drums / Containers

- Manual handling of drums / containers should be minimized. It is preferable fork-lifters and suitable cradles are used to handle drums.
- Carboys containing hazardous chemicals should not be subjected to impact.
- Suitable protective clothing should be used while handling drums / containers and the operators should position him such that he is in the upwind direction so that even in case of accidental release of chemical, he is safe.

### 6.12 RECOMMENDATIONS

The following actions are particularly recommended to be implemented in order to ensure **ALARP (As low as reasonably practical)** performance in the operation: Maintain and ensure effectiveness of all the safety measures, among others through the following actions:

#### Raw Material Storage Area (Ware House I&II)

- The raw material storage area, i.e. ware house, should be declared as a prohibited area and should be provided having at least two exits, “No Smoking” and “Prohibited Area” display boards, as applicable should be provided at site.

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

- Regular inspection of drums containing raw material to be done to take care.
- Periodic site inspection should be carried out to ensure that there is no leakage from any of the drums in the ware house.
- Fire hydrant system needs to be provided in ware house area as per TAC standards.
- Smoke detector and fire alarm systems need to be provided.
- Provision of fire doors in ware house area.

### **Fire access for Tank Farm area and Ware Houses**

- Fire access roads should be provided to storage area. The storage tanks / area should have suitable fire protection and fire fighting facility.

**The following features are also important for the project by taking the layout into consideration:-**

- Hinged doors swing outward in an explosion.
- Window panes (if installed) are shatterproof or plastic in frame.
- Floors, walls and ceilings are designed and installed to limit the generation and accumulation of static electricity.
- All doors must be fire resistant. Floors, walls and ceilings are designed for at least 2 hours of fire resistance.
- Walls or partitions are continuous from floor to ceiling, and securely anchored.
- Integrity of the wall should be ensured i.e. blast wall not to be broken or drilled as that can leads to weak spots.
- The building is constructed of non-combustible materials, on a substantial frame.
- Restrained deflagration vent panels are present.
- There is adequate ventilation, and any heating in rooms is limited to steam, hot water, or other indirect means.

### **Electrical Safety for Whole Facility**

- Electrical Safety: All cables and electric fittings are constructed, installed, protected, operated and maintained in such a manner so as to prevent risk of open sparking.

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

### **6.13 DISASTER MANAGEMENT PLAN**

#### **6.13.1 DEFINING THE NATURE OF EMERGENCY**

1. Hazop study is conducted before setting up of the expansion plant.
2. Onsite Emergency Plan is to be up graded and mock drills are conducted.
3. Emergency Response Team (ERT) activities are continued.
4. Training to be imparted to all employees on safety and health aspects of chemicals handling.

#### **LEVEL OF EMERGENCY CAN BE CLASSIFIED IN THREE CATEGORIES.**

##### **LEVEL - 1:**

The leakage or emergency, which is confinable within the plant, premises. It may be

Due to -

- a) Small fire in the plant
- b) Low toxic gas release for short duration.
- c) Collapsing of equipment that do not affect outside premises.

##### **LEVEL - 2:**

The emergency, which is confinable within the factory premises. It may arise due to -

- a) Major fire inside the factory premises.
- b) Medium scale explosion confined to the factory premises.
- c) Heavy toxic / flammable gas leakage for short duration.

##### **LEVEL - 3:**

The emergency, which is not confinable within the factory premises and general public in the vicinity likely to be affected. It may arise due to -

- a) Explosion of high magnitude affecting the adjacent area
- b) Heavy / Profuse leakage of toxic / flammable gases for a long duration.

# **GSP CROP SCIENCE (P) LTD.**

## **ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

### **6.13.2 OBSERVER**

#### **DUTIES OF OBSERVER**

Any person noticing a fire, leakage of chemicals or an unusual occurrence makes contact the security personnel a main gate and Plant Supervisor by:

1. Giving a telephone message
2. Sending message through a messenger
3. Rush personally

While giving the message, he is:

1. Identity himself
2. State briefly type of emergency
3. Location of Incident / accident
4. Severity of emergency

After giving message, he returns to the scene / area of emergency by taking all personnel protection measures, if possible and awaits instructions from Plant Supervisor (Incident Controller).

### **6.13.3 CHIEF EMERGENCY CONTROLLER**

#### **Responsibility of Site Main Controller**

Immediately when he is aware of the emergency, the Site Main Controller proceeds to the Emergency Control Room, where he meets communications officer, liaison officer and safety officer.

1. The Site Main Controller assesses the magnitude of the situation, in consultation with the Incident Controller and decides if staff needs to be evacuated from their roll call points. He announces the emergency through Messenger or via Intercom line and will give an order for evacuation.
2. Ensure that outside emergency services are called. (Fire Brigade, Police, Doctors, etc.)
3. Ensure that KEY PERSONNEL are called.



**GSP CROP SCIENCE (P) LTD.**  
**ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT**

4. Exercise direct operational control of those parts of the works, outside the affected area.
5. Maintain a speculative continuous review of possible developments and assess these to determine the most probable course of events.
6. Ensure that the emergency is intimated to District Emergency Authorities
7. Issue authorized statements to the news media. Where appropriate, inform the seniors.
8. Ensure that proper consideration is given to the preservation of evidence.
9. Control rehabilitation of affected areas on cessation of emergency.
10. Determine what investigations and reporting should be carried out, and by whom, to determine cause and (if appropriate) prevention of recurrence.