Risk Assessment Report for Obtaining Environmental Clearance

FOR THE PROPOSED DISTILLERY UNIT

By

M/s. SPAC Starch Products (India) Private Limited

SF. No. 118/2, 118/3, 118/4, 118/7, 118/8, 118/9, 118/10, 118/11, 118/12, 118/13, 118/14, 118/18, 119/13, 188/1A, 189/8, 189/9, Mugasipudhur Village, Anthiyur Taluk,

Erode District, Tamil Nadu

MoEF&CC Gazette Notification S.O. 2339(E) dated 16.06.2021
[Cat. 5 (ga) (Grain based distilleries producing ethanol, solely to be used for Ethanol Blended Petrol Programme of the Government of India)]

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CHAPTER 1

INTRODUCTION

1.1 GENERAL

Risk assessment is a term used to describe the overall process or method where we:

- Identify hazards and risk factors that have the potential to cause harm (hazard identification).
- Analyze and evaluate the risk associated with that hazard (risk analysis, and risk evaluation).
- Determine appropriate ways to eliminate the hazard, or control the risk when the hazard cannot be eliminated (risk control).

A risk assessment is a thorough look at your workplace to identify those things, situations, processes, etc. that may cause harm, particularly to people. After identification is made, you analyze and evaluate how likely and severe the risk is. When this determination is made, you can next, decide what measures should be in place to effectively eliminate or control the harm from happening.

The CSA Standard Z1002 "Occupational health and safety - Hazard identification and elimination and risk assessment and control" uses the following terms:

Risk assessment – the overall process of hazard identification, risk analysis, and risk evaluation.

Hazard identification – the process of finding, listing, and characterizing hazards.

Risk analysis – a process for comprehending the nature of hazards and determining the level of risk.

Notes,

(1) Risk analysis provides a basis for risk evaluation and decisions about risk control.

(2) Information can include current and historical data, theoretical analysis, informed opinions, and the concerns of stakeholders.

(3) Risk analysis includes risk estimation.

Risk evaluation – the process of comparing an estimated risk against given risk criteria to determine the significance of the risk.

Risk control – actions implementing risk evaluation decisions. Note: Risk control can involve monitoring, re-evaluation, and compliance with decisions.

1.2 IMPORTANCE OF RISK ASSESSMENT

Risk assessments are very important as they form an integral part of an occupational health and safety management plan. They help to:

- Create awareness of hazards and risk.
- Identify who may be at risk (e.g., employees, cleaners, visitors, contractors, the public, etc.).
- Determine whether a control program is required for a particular hazard.
- Determine if existing control measures are adequate or if more should be done.
- Prevent injuries or illnesses, especially when done at the design or planning stage.
- Prioritize hazards and control measures.
- Meet legal requirements where applicable.

1.3 GOAL OF RISK ASSESSMENT

The aim of the risk assessment process is to evaluate hazards, then remove that hazard or minimize the level of its risk by adding control measures, as necessary. By doing so, you have created a safer and healthier workplace.

The goal is to try to answer the following questions:

- What can happen and under what circumstances?
- What are the possible consequences?
- How likely are the possible consequences to occur?
- Is the risk controlled effectively, or is further action required?

When should a risk assessment be done?

There may be many reasons a risk assessment is needed, including:

1. Before new processes or activities are introduced.
2. Before changes are introduced to existing processes or activities, including when products, machinery, tools, equipment change or new information concerning harm becomes available.
3. When hazards are identified.

1.4 PLANNING FOR A RISK ASSESSMENT

In general, we determine:

What the scope of the risk assessment will be (e.g., be specific about what you are assessing such as the lifetime of the product, the physical area where the work activity takes place, or the types of hazards).

The resources needed (e.g., train a team of individuals to carry out the assessment, the types of information sources, etc.).

What type of risk analysis measures will be used (e.g., how exact the scale or parameters need to be in order to provide the most relevant evaluation).

Who are the stakeholders involved (e.g., manager, supervisors, workers, worker representatives, suppliers, etc.).

What relevant laws, regulations, codes, or standards may apply in your jurisdiction, as well as organizational policies and procedures.

1.5 METHODOLOGY OF RISK ASSESSMENT

Assessments should be done by a competent person or team of individuals who have a good working knowledge of the situation being studied. Include either on the team or as sources of information, the supervisors and workers who work with the process under review as these individuals are the most familiar with the operation.

In general, to do an assessment, we should:

- Identify hazards.

- Determine the likelihood of harm, such as an injury or illness occurring, and its severity.
    - ✓ Consider normal operational situations as well as non-standard events such as maintenance, shutdowns, power outages, emergencies, extreme weather, etc.
    - ✓ Review all available health and safety information about the hazard such as Safety Data Sheet (SDS), manufacturers literature, information from reputable organizations, results of testing, workplace inspection reports, records of workplace incidents (accidents), including information about the type and frequency of the occurrence, illnesses, injuries, near misses, etc.
    - ✓ Understand the minimum legislated requirements for your jurisdiction.
- Identify actions necessary to eliminate the hazard, or control the risk using the hierarchy of risk control methods.
- Evaluate to confirm if the hazard has been eliminated or if the risk is appropriately controlled.
- Monitor to make sure the control continues to be effective.
- Keep any documents or records that may be necessary. Documentation may include detailing the process used to assess the risk, outlining any evaluations, or detailing how conclusions were made.

When doing an assessment, also take into account,

- The methods and procedures used in the processing, use, handling or storage of the substance, etc.
- The actual and the potential exposure of workers (e.g., how many workers may be exposed, what that exposure is/will be, and how often they will be exposed).
- The measures and procedures necessary to control such exposure by means of engineering controls, work practices, and hygiene practices and facilities.
- The duration and frequency of the task (how long and how often a task is done).
- The location where the task is done.

- The machinery, tools, materials, etc. that are used in the operation and how they are used (e.g., the physical state of a chemical, or lifting heavy loads for a distance).
- Any possible interactions with other activities in the area and if the task could affect others (e.g., cleaners, visitors, etc.).
- The lifecycle of the product, process or service (e.g., design, construction, uses, decommissioning).
- The education and training the workers have received.
- How a person would react in a particular situation (e.g., what would be the most common reaction by a person if the machine failed or malfunctioned).

It is important to remember that the assessment must take into account not only the current state of the workplace but any potential situations as well. By determining the level of risk associated with the hazard, the employer, and the health and safety committee (where appropriate), can decide whether a control program is required and to what level.

1.6 IDENTIFICATION OF HAZARDS

Overall, the goal is to find and record possible hazards that may be present in your workplace. It may help to work as a team and include both people familiar with the work area, as well as people who are not - this way you have both the experienced and fresh eye to conduct the inspection. In either case, the person or team should be competent to carry out the assessment and have good knowledge about the hazard being assessed, any situations that might likely occur, and protective measures appropriate to that hazard or risk.

To be sure that all hazards are found:

- Look at all aspects of the work.
- Include non-routine activities such as maintenance, repair, or cleaning.
- Look at accident / incident / near-miss records.

- Include people who work off site either at home, on other job sites, drivers, teleworkers, with clients, etc.
- Look at the way the work is organized or done (include experience of people doing the work, systems being used, etc).
- Look at foreseeable unusual conditions (for example: possible impact on hazard control procedures that may be unavailable in an emergency situation, power outage, etc.).
- Determine whether a product, machine or equipment can be intentionally or unintentionally changed (e.g., a safety guard that could be removed).
- Review all of the phases of the lifecycle.
- Examine risks to visitors or the public.
- Consider the groups of people that may have a different level of risk such as young or inexperienced workers, persons with disabilities, or new or expectant mothers.

It may help to create a chart or table such as the following:

Example of Risk Assessment				
Task	**Hazard**	**Risk**	**Priority**	**Control**
Delivering product to customers	Drivers work alone	May be unable to call for help if needed		
	Drivers have to occasionally work long hours	Fatigue, short rest time between shifts		
	Drivers are often in very congested traffic	Increased chance of collision		
		Longer working hours		
	Drivers have to lift boxes when delivering product	Injury to back from lifting, reaching, carrying, etc.		

1.6.1 Research of Hazard

Each hazard should be studied to determine its' level of risk. To research the hazard, you can look at:

- Product information / manufacturer documentation.
- Past experience (knowledge from workers, etc.).
- Legislated requirements and/or applicable standards.
- Industry codes of practice / best practices.
- Health and safety material about the hazard such as safety data sheets (SDSs), research studies, or other manufacturer information.
- Information from reputable organizations.
- Results of testing (atmospheric or air sampling of workplace, biological swabs, etc.).
- The expertise of an occupational health and safety professional.
- Information about previous injuries, illnesses, near misses, incident reports, etc.
- Observation of the process or task.

Remember to include factors that contribute to the level of risk such as:

- The work environment (layout, condition, etc.).
- The systems of work being used.
- The range of foreseeable conditions.
- The way the source may cause harm (e.g., inhalation, ingestion, etc.).
- How often and how much a person will be exposed.
- The interaction, capability, skill, experience of workers who do the work.

1.6.2 Ranking of Risks

Ranking or prioritizing hazards is one way to help determine which risk is the most serious and thus which to control first. Priority is usually established by taking into account the employee exposure and the potential for incident, injury or illness. By assigning a priority to the risks, you are creating a ranking or an action list.

There is no one simple or single way to determine the level of risk. Nor will a single technique apply in all situations. The organization has to determine which technique will work best for each situation. Ranking hazards requires the knowledge of the workplace activities, urgency of situations, and most importantly, objective judgment.
For simple or less complex situations, an assessment can literally be a discussion or brainstorming session based on knowledge and experience. In some cases, checklists or a probability matrix can be helpful. For more complex situations, a team of knowledgeable personnel who are familiar with the work is usually necessary.

1.6.3 Methods of Hazard Control

Once you have established the priorities, the organization can decide on ways to control each specific hazard. Hazard control methods are often grouped into the following categories:

- Elimination (including substitution).
- Engineering controls.
- Administrative controls.
- Personal protective equipment.

1.7 Importance of Reviewing & Monitoring the Assessments

- It is important to know if your risk assessment was complete and accurate. It is also essential to be sure that any changes in the workplace have not introduced new hazards or changed hazards that were once ranked as lower priority to a higher priority.
- It is good practice to review your assessment on a regular basis to make sure your control methods are effective.

1.8 Documentation done for a Risk Assessment

Keeping records of the assessment and any control actions taken is very important. We may require storing assessments for a specific number of years. Check for local requirements in our jurisdiction.

The level of documentation or record keeping will depend on:

- ✓ Level of risk involved.
- ✓ Legislated requirements.
- ✓ Requirements of any management systems that may be in place.

The records should show that we,

- ✓ Conducted a good hazard review.
- ✓ Determined the risks of those hazards.
- ✓ Implemented control measures suitable for the risk.
- ✓ Reviewed and monitored all hazards in the workplace.

CHAPTER 2

DETAILS OF THE PROJECT

2.1 PROJECT PROPONENT

M/s. SPAC Starch Products (India) Private Limited has proposed to establish a Distillery Unit with the capacity of 160 KLPD (Fuel grade Bio Ethanol) S. No. 118/2-4,118/7-14,118/18,119/13, 188/1A, 189/8, 9, Mugasipudur Village, in Erode District, Tamil Nadu. The nearest major human settlement is Anthiyur. The nearest railway station is Erode Railway Junction (37 km). The nearest airport is Coimbatore Airport which is 95.2 km from the project site.

2.2 PROJECT CATEGORIZATION

The project activity is listed at item 5g(a) [Ethanol based distilleries, solely to be used for Ethanol Blended Petrol Programme of the Government of India] in the Schedule of EIA Notification, 2006 and subsequent amendments vide gazette notification S.O. 2339(E) dated 16.06.2021 & categorized as Category "B" project (to be appraised under category B2 as per condition listed in column 5 of the project /activity 5 to the schedule of the notification) and there-fore requires prior Environmental Clearance from MoEF CC.

2.3 SALIENT FEATURES OF THE PROJECT

The salient features of the project are summarized as under:

TABLE 2.1 SALIENT FEATURES OF THE PROJECT

Sl. No.	Item		Details
1.	Name of the Project	:	SPAC Starch Products (India) Private Limited
2.	S. No. of the Schedule	:	5g (a)
3.	Proposed capacity/area/length/tonnage to be handled/command area/lease	:	Fuel grade Bio Ethanol -160 KLPD DDGS (for Broken rice) -10320 TPA DDGS (for Maize) – 17844 TPA CO2 – 14549.54 TPA

	area/number of wells to be drilled.		Technical Alcohol – 5.24 KLPD Fusel Oil – 0.16 KLPD Co- gen Power – 4.6 MW
4.	New/Expansion/Modernization	:	New
5.	Existing Capacity/Area etc.	:	N/A
6.	Category of Project i.e. 'A' or 'B'	:	Category 'B2'
7.	Does it attract the general condition? If yes, please specify.	:	No
8.	Does it attract the specific condition? If yes, please specify.	:	No
9.	Location		Latitude : 11°35'52.64"N Longitude:77°40'27.92"E
	Plot/Survey/Kharse No	:	SF. No. 118/2, 118/3, 118/4, 118/7, 118/8, 118/9, 118/10, 118/11, 118/12, 118/13, 118/14, 118/18, 119/13, 188/1A, 189/8, 189/9
	Village	:	Mugasipudur
	Tehsil	:	Anthiyur
	District	:	Erode
	State	:	Tamil Nadu
10.	Nearest railway station/airport along with distance in kms	:	Railway Station: Erode Railway Junction – 37 km Airport: Coimbatore – 95.2 Km
11.	Nearest Town, city, District Headquarters along with distance in kms	:	Nearest Town: Anthiyur – 10.5 km Nearest City: Erode – 28.9 Km District Head Quarters: Erode – 28.9 km.
12.	Village Panchayats, Zilla Parishad, Municipal corporation, Local Body (complete postal addresses telephone no. to be given)		Anthiyur Town Panchayat, Anthiyur Taluk, Erode - District, Tamil Nadu. 638314
13.	Name of the applicant	:	M/S.SPAC Starch Products (India) Private Limited
14.	Registered Address	:	D4/2, Vijayaraghava Manor VijayaRaghava Road, Teynampet, Chennai

			Tamilnadu – 600 018
15.	Address for Correspondence :	:	SPAC Starch Products (India) Private Limited, S.F.No : 65,66,67, Poonachi Village Anthiyur Taluk, Erode - 638314
	Name	:	S. Balamurugan
	Designation (Owner /Partner/CEO)	:	Associate Vice President (Operation & Maintenance)
	Address	:	D4/2, Vijayaraghava Manor Vijaya Raghava Road Teynampet, Chennai Tamilnadu
	Pin Code	:	600 018
	E-mail	:	gm@spacstarch.com
	Telephone No.	:	04256 257901
	Fax No.	:	--

2.4 PREVIEW OF THE PROJECT

Project Overview			
Sl. No.	**Description**	**Broken Rice Operation**	**Maize Operation**
1	Capacity of Ethanol plant in terms of AA Production (KLPD)	160	160
2	Capacity of Ethanol plant in terms of Total Spirits Production (KLPD)	174.74	174.74
3	Feed Stock	Broken Rice	Maize
4	No. Of days of operation	165	165
5	Starch content in Broken Rice (%)	68	60
6	Total Spirit production per MT of feed stock (Yield) (Lites/MT)	466	411
7	Feed Stock requirement per day (MT / Day)	375	425
8	Annual requirement of Feed Stock (MT)	58,778	66,600
9	Distillery Products	Absolute Alcohol (AA)	
10	AA Production/Annum, Lakh Lites	250.80	250.80
11	Distillery by products	DDGS, Carbon-di-oxide, Technical Alcohol, Fusel oil	
12	DDGS produced per day (MT)	65.84	113.84
13	DDGS produced per annum (MT)	10320	17844
14	CO_2 produced per day (TPD)	132.6	
15	CO_2 recoverable per day (TPD)	92.82	
16	CO_2 recoverable per Annum (MT)	14,549.54	
17	Technical Alcohol (RS2) Produced per day (LPD)	5240.00	
18	Technical Alcohol (RS2) Produced per annum (Lakh Litres)	8.21	
19	Fusel Oil produced per day (LPD)	160	
20	Fusel Oil produced per annum, (Lakh Litres)	0.25	
21	Process steam requirement for Distillery plant (TPH)	25.48	27.67
22	Boiler design MCR capacity	40	
23	Boiler steam outlet parameters	45 kg/Sq.cm & 440 Deg. C	
24	TG capacity (KW)	4600	
25	Type of TG Selected Back Pressure with exhaust pressure of	Back	Back

	4.5	Pressure with exhaust pressure of 4.5 kg/Sq. cm (g)	Pressure with exhaust pressure of 4.5 kg/Sq. cm (g)
26	Steam generation from New Boiler (TPH)	31.36	33
27	Power Generation from TG (kW)	3380	3550
28	Power consumed for Distillery plant & Power plant	3380	3550
29	Fuel Envisaged in the Boiler	Rice Husk or Imported Coal/ Combination of Rice Husk and Coal	
30	Rice Husk / Imported coal Consumption in the Boiler (TPH)	5.3 & 1.8	5.6 & 1.9
31	No. of days of operation with Rice Husk in an Year	165	165
32	No. of days of operation with Coal in an year	165	165
33	Total water requirement (Cu.M / day)	2899	
34	Actual Fresh water requirement considering recycling of water (Cu.M/day)	1036	
35	Project Commissioning Schedule	31st January 2024	
36	Total Works cost Including GST (in Rs. Lakhs)	20475	
37	Installed project cost considering IDC, Contingency, Pre-operative expenses etc., (Rs. In Lakhs)	23109.02	
38	Equity (Rs. in Lakhs)	2310.9	
39	Term Loan (Rs. Lakhs)	20798.12	
40	Average DSCR	1.65	
41	IRR - Post tax (%)	20.75	
42	Net Present Value (NPV) (Rs.in Lakhs)	19541.82	
43	Return on Equity (ROE) %	92.62	
44	Payback period (years)	4.2	

2.5 LOCATION (MAP SHOWING GENERAL LOCATION, SPECIFICLOCATION AND PROJECT BOUNDARY & PROJECT SITE LAYOUT) WITH COORDINATES

- Location map of project site is given in the Fig.2.1
- Satellite imagery of the project site is given in the Fig.2.2
- Topo Map of the project site is given in the Fig2.3
- Layout of the project site is given in the Fig. 2.4
- Location(coordinates)of project site are detailed below:

Latitude	:	11° 35' 52.64" N
Longitude	:	77° 40' 27.92" E

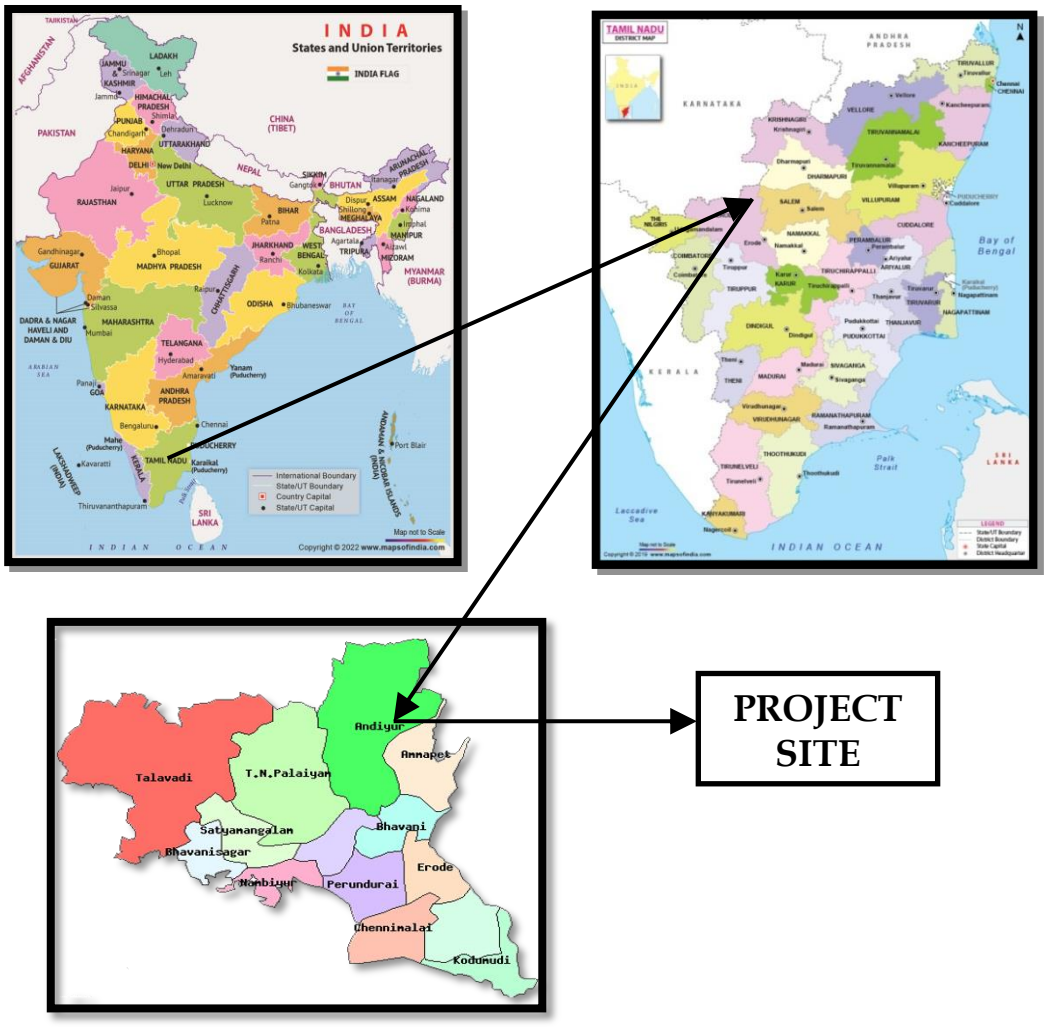

Fig 2.1 Location Map of the Project Site

Fig.2.2. Satellite imagery of the project site

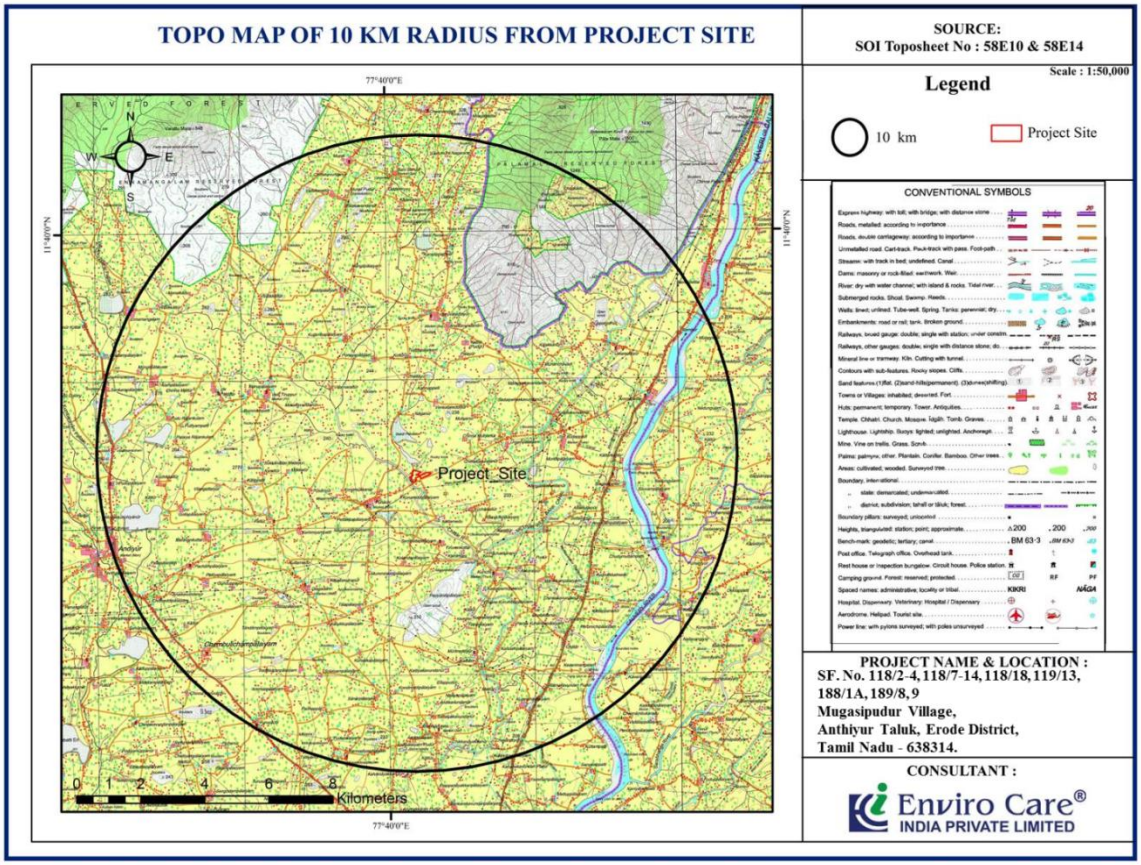

Fig.2.3 Topography Map of the Project site (10kmRadius)

CHAPTER 3

RISK ASSESSMENT STUDIES

3.1 GENERAL

The study includes risk assessment by estimating maximum damage distance by Maximum Credible Accident (MCA) analysis. The study helps in drawing damage contours to assess the consequence of an event. The analysis does not consider probability of occurrence. The probability is therefore rated on experience and previous similar experience elsewhere.

3.2 RISK ASSESSMENT FOR BOILER, TURBINES AND COMPRESSORS BOILER

The risk associated with boiler operation and turbine operations and its appropriate mitigation measures are as given in Table 3.1 and Table 3.2 respectively. The associated with compressor and mitigation measures are represented in Table 3.3.

Table 3.1 Risk Associated with Boiler Operation and Mitigation Measures

Identified hazard	Precautions taken	Mitigation measures
Fire & explosion	• Boilers will be equipped with safety valves used to release excess pressure. • All the steam lines will be insulated. • Silencers will be provided for all start up vent lines and safety valves.	• Portable fire extinguishers will be fixed at strategic points. • Wet risers will be provided with suitable hose reel at strategic points. • Fire hydrant pump will be connected with an independent power source (D.G) to provide uninterrupted service in case of emergency.

Other risks from boiler operation are detailed below

Bursting of tubes:

The steam generated in the boiler goes to the turbo-generator to drive the prime mover, i.e., the turbine. In this turbine, the steam is condensed and that condensate is returned back to the boiler again. This process is repeated continuously. Due to this, the dissolved salts present initially in small amount in the water gets concentrated, which attains its threshold limit over a period of time. This results in scale formation in the tubes, which drastically reduces the heat transfer rate. This in turn leads to the localized overheating of the tubes. This overheating makes the tube material soft and starts bulging, eventually leading to bursting of the tubes. Control is periodical steam blow and periodical inspection and maintenance.

Bursting of Pipeline Joints:

The water required for boiler is pumped and transferred by using high-pressure pumps. Also, the high-pressure steam generated in the boiler is sent to the turbine through the pipelines. This pipeline will have flanged joints, with sandwich gaskets in between for better sealing. At times, due to water hammering this gasket fails and leads to bursting of the flange joint. Therefore, proper design of the pipeline is necessary for avoiding water hammering.

Table 3.2 Risk Associated with Turbine Operation and Mitigation Measures

Identified hazard	Precautions taken	Mitigation measures
Fire & noise	•Smoke detector system provided. • All the turbines will be covered in acoustic enclosures reduce noise. • Noise level in the turbine area will be monitored regularly. Efforts will be made to control the noise	•Portable fire extinguishers will be fixed at strategic points. • Fire alarm system will be installed. • PPEs will be provided as required. •Fire-fighting training will

	wherever possible by installing noise generating sources inside the building, providing double air lock doors, double frame glass windows reducing the noise of blower etc. Use of ear plugs/muffs will be mandatory for the workers working in high noise zones and caution boards will be displayed.	be imparted to employees.

Compressor: It used for operation of Various Pneumatic Devices

Table 3.3 Risk Associated with Compressor Operation and Mitigation Measure

Impacts Identified	**Precautions taken**	**Mitigation measures**
Explosion/ Noise	• All compressors will be installed in room/s. • Pressure test of all compressor tanks, wall thickness tests and hydro tests will be conducted as per statutory requirements and guidelines by competent persons. • All compressor vessels will be equipped with safety measures.	• To reduce noise compressor room doors will be provided with door closers. • Warning signs will be displayed at entrance of compressors room. • All compressor vessels are equipped with pressure gauges and safety valves. • The test date and due testing date will be painted on compressors vessel. • Un-authorized entry

		will be restricted in compressor room/s.

3.2.1 Inference

According to the ALOHA simulation analysis, the consequential impacts from each incident scenarios can be though flammable vapour cloud and thermal radiation. The damage distance indicates the distance of consequential impacts for flammable vapour cloud release would on plant personnel, equipment and machinery. All scenarios will be within the plant site. The storage of ethanol needs utmost attention owing to the magnitude of the impact. Risk associated with distillery unit and mitigation measures are given in Table 3.4.

Table 3.4 Risk Mitigation Measure for Ethanol Plant

Identified Hazard	**Precaution Taken**	**Mitigation Measures**
Fire and Explosion	• There shall not be any electrical overhead lines in ethanol storage tank area. • All ethanol storage area pipelines will have jumper for avoiding static electricity. • All tank thickness tests will be done by competent person. • All tanks and motors will have proper earthing system and double earthing. • Flameproof type	Portable fire extinguishers will be provided at identified locations in distillery section. • Sand buckets will be provided. • Entire plant will be covered with fire hydrant line and foam monitor system. • Warning and informatory signage's will be displayed.

	lighting system will be provided for controlling of spark.	
Fire and Noise	• Mobile usage prohibited in distillery plant. • No smoking allowed in factory premises. •Flameproof motors will be provided in distillery section. • Welding and gas cutting prohibited in distillery section premises. • Work permit followed for all high risk work.	• Fire-fighting training will be provided to all employees. • Mock drill will be conducted once in 2 months.

3.2.3 Risk Mitigation Measures -Safety Measures for Transportation, Storage & Handling of Chemicals

- Follow standard loading and unloading procedure for safe loading of chemicals into tanker.
- Provide static earthing provision for tanker.
- Provide display boards on all storage tanks to communicate the material of construction, name of the chemical stored and MSDS.
- Provide on-site detectors for fire & smoke detection with alarm system as required.
- Provide relevant fire extinguishers at accessible places
- Provide first aids boxes in all control rooms/cabins.

- Declare the entire premises as "NO SMOKE ZONE".
- Ensure that, hazardous material handling is done by using all requisite PPEs, with proper ventilation and under supervision.

Safety Measures to Prevent Spillage/Leakage of Toxic Chemicals

- Provide requisite PPEs like goggles, gloves, protective clothes to those handling toxic chemicals.
- Store finished products under safe condition.
- All tanks storing hazardous chemicals tested periodically for the thickness.
- All pipe joints provided with heavy duty gaskets to prevent any leakage.
- Dyke wall to areas where hazardous chemicals are stored.
- Provide spare barrels of sufficient quantity kept ready for any emergency spillage or leakage.
- All storage tanks to be constructed in line with PESO guidelines.

3.2.4 Specific Recommendations Based on Hazard and Severity Mapping for Hazardous Raw Materials

The specific engineering or management recommendations based on the simulation analysis are as under:

3.2.4.1 Mechanical and Equipment Integrity

Following are the engineering recommendations:

- ✓ The material of construction and thickness of storage vessels are designed to accommodate the maximum pressure.
- ✓ The tanks are located in isolated areas where there is no/minimum personnel would be working in the downwind direction at any given point of time.
- ✓ To ensure no equipment sensitive to thermal radiation are installed in the downwind direction of these tanks.
- ✓ The tanks will be provided with dyke wall with arrangement to recover the spillage/leakage.

- ✓ Provide with high pressure detector with interlock to the incoming material.
- ✓ Provide high temperature alarm with an interlock to cut off the heat source.

3.2.5 Management Approach

Following are the management recommendations:

- ✓ The operating personnel are trained on the consequential impacts and the action to be taken under different scenarios.
- ✓ The operating personnel have relevant PPEs.
- ✓ List of do's and don'ts will be displayed.
- ✓ These storage tanks are tested every 6 months to confirm that there is no loss of material of construction and the tank thickness is intact. Record of such testing is maintained for reference.

3.3 Occupational Health and Safety

The project proponent strongly believes in the safety and health of the workers. The company will conduct regular medical check-ups of the workers and for the safer side there will always be a rotation of the workers where the exposure to dust and chemicals is high.

Table 3.5 Preventive Action and Corrective Action for Impacts

Sl. No.	Activity	Aspect	Impact	Preventive action	Corrective action
1	Coal and husk handling/ conveying	Air borne dust	On respiratory system like chronic obstructive pulmonary disease (COPD)	i. To provide close conveyor system for Coal / husk to boiler. ii. To sprinkle water over Coal/Husk iii. To transport fly-ash in closed	Periodic Medical Examination – Spirometer/PFT /Pulse oxymetry

				trucks	
2	Boilers/ DG sets operation/ compressors	Noise	Noise Induced Hearing Loss (NIHL) / cardiovascular disease/ hypertension	i. Reduce noise at source by changing design / proper maintenance/ providing acoustic enclosures ii. Provide PPE	Audiometry
3	Boiler operation	Exposure to heat	Heat exhaustion	Proper location/design of operator cabin	Job rotation

3.3.1 Occupational Health and Safety Precautions

Provision of all necessary equipment like portable detectors, online detectors and other laboratory equipment for regular monitoring of workplace air and other conditions (temperature, humidity and light intensity etc.) shall be made. All the work places will be provided with MSDS of chemicals & materials being handled. The concerned employees will be trained and all the employees will be made aware of the hazards in handling chemicals.

- ✓ Inspection and preventive & breakdown maintenance of all the equipment including pollution control equipment will be undertaken.
- ✓ Compulsory use of necessary PPEs.
- ✓ Installation of fire extinguishers at required places.
- ✓ Regular work place monitoring.
- ✓ Provision of part time qualified medical officer as per factories act guidelines.
- ✓ Regular medical check-up of employees by qualified medical practioners.
- ✓ Monitoring of occupational hazard parameters like noise, ventilation, chemical exposure at frequent intervals.

- ✓ Display of various instruction boards, cautionary notices etc., at different locations.

3.3.2 Fire Protection and Fighting System

The fire protection system for the unit is to provide for early detection, alarm, containment and suppression of fires. The fire detection and protection system have to be planned to meet the objectives of statutory as well as insurance requirements of the governing bodies. As with any process industry, Grain based distillery also have unique fire risk associated with it. Some of the impacts due to fire in the factory might be damage to the equipment's, process buildings, storage tanks and injury to workers i.e. overall damages are the high economic losses. This type of losses can be avoided by preventing and controlling the fire instantly for which fire fighting group will be established. Distillery is classified as a high hazard industrial occupancy and hence there is the need for automatic fire protection systems. Fire protection is also applicable to the storage tanks also where there is the greatest risk of fire and explosion. Foam System for fire fighting will be provided to control fire from the alcohol storage tank. The foam thus produced will suppress fire by separating the fuel from the air (oxygen) and hence avoiding the fire and explosion to occur in the tank. Foam would blanket the fuel surface smothering the fire. The Ethanol will also be cooled by the water content of the foam. The foam blanket suppresses the release of flammable vapours that can mix with the air. Fire extinguishing media will be provided in the entire factory at the high-risk areas to prevent and the fire incidents.

3.3.3 Fire Extinguishers/ Fire Hydrants

Liquefied Co2 fire extinguisher shall be upright type of capacity 10 kg having standards marked. The fire extinguisher will be suitable for fighting fire of Oils, Solvents, Gases, Paints, Varnishes, Electrical Wiring, Live Machinery Fires, and all flammable Liquid & Gas. We will provide 10 numbers of portable fire extinguisher and fire hydrants as specified.

3.3.4 Fire Fighting Equipment's

- ✓ Hydrant System
- ✓ Hose Reel System
- ✓ Portable fire extinguishers
- ✓ Medium Velocity Water Spray system
- ✓ Foam Protection system
- ✓ Fire Detection and Alarm System

Tale 3.6 Budget Allocation for Occupational Health and Safety

Sl. No.	**Particulars**	**Budget** **(Rs. per annum)**
1	Periodic medical examination	5,00,000
3	Personal Protective Equipment like gloves, safety shoes, aprons, goggles, Self-contained breathing apparatus (SCBA)	3,50,000
4	Training on occupational health & safety	1,00,000
Total		**Rs. 9,50,000/- Lakhs /Annum**

3.4 Occupational Health Centre

- Full time round the clock doctor, para-medical staff (nurse and attendant) will be appointed.
- Ambulance with round the clock driver will be provided.
- Medical examination room, bed ward room, record and drugs stores with all the equipments and medicines as prescribed will be provided.

3.4.1 Frequency & Parameters of Health Check-Up

Medical surveillance will be carried out by maintaining the health records.

- Pre-employment health check-up followed by periodical health check-up will be undertaken every year with special attention to occupational health hazards for all the employees.
- Special test like eye, audiometry etc., based on the occupational hazards will be planned.
- This activity will be outsourced to the local hospitals and diagnostic centres.
- Parameters that will be part of pre-employment & annual periodical medical check-up are given in Table 3.7.

Table 3.7 Health check-up Parameters

S. No.	Test Details
1	Complete Blood Examination Haemoglobin % (Hb%), WBC, RBC etc.
2	Blood Pressure
3	Pulse
4	Physical Fitness Certificate
5	Central Nervous System (CNS)
6	Cardio Vascular System (CVS)
7	Vision
8	Electro Cardio Gram (ECG)
9	Respiratory System-Lung Function (RS)
10	Chest X-ray
11	Total Leucocyte Count (TC)
12	Differential Leucocyte Count (DLC)
13	Absolute Eosinophil Count (AEC)
14	Complete Urine Examination [Physical / Chemical /Albumin, sugar & bile salt etc.
15	Random Blood Sugar (RBS)