

**M/S. EMPEE SUGARS AND CHEMICALS LIMITED  
(Proposed Distillery Plant)**

**S.F. 89, 90, 91, 92(Part), 114(Part),116(Part)  
Edaikkal village,  
Ambasamudram Taluk  
Tirunelveli District  
Tamil Nadu**

**PROPOSED DISTILLERY PLANT**

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Management Summary for the Proposed Unit of  
100 KLPD Capacity Distillery Plant

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## **1.0 PROJECT DESCRIPTION**

### **1.1 INTRODUCTION**

**M/s. Empee Sugars and Chemicals Limited.** belongs to the EMPEE group of Companies having interest in Sugar, Industrial Alcohol, Distillery, Power and Hospitality Industry presently having manufacturing units in Tamil Nadu, Andhra Pradesh, Karnataka and Kerala.

This unit proposes to install 100KLPD alcohol Plant in Tamil Nadu and. In order to add value to molasses, it is proposed to set up a green field distillery to convert all the available molasses to a mix of alcohol products. Edaikkal location has been selected for setting up of the new distillery.

### **1.2 PLANT LOCATION**

The Proposed site is located at S.F. No 89, 90, 91, 92(part), 114(part), 116(part), Edaikkal village, Ambasamudram Taluk, Tirunelveli District, which is located 8 km away from Ambasamudram.

### **1.3 PRODUCTS MANUFACTURED**

The Production Capacity of Distillery Plant will be as follows.

<b>Distillery Basic details</b>	<b>Quantity</b>	<b>Unit</b>
No of days of operation	330	Days
Rectified Spirit (RS) from molasses / Extra Neutral Alcohol (ENA) / Anhydrous Alcohol from Rectified Spirit	100	KL / Day

## 1.4 RAW MATERIALS

S.No.	Raw Material	Quantity
1.	Cane Molasses	460 MTs/ day
2.	Nutrients	200 kgs/day
3.	Antifoam Oil	240 kgs/day
4.	Sulphuric Acid	230kgs/day

## 1.5 MANUFACTURING PROCESS

### 1. Fermentation Section

#### A. Molasses Handling and Distribution

Molasses from bulk storage is transferred to molasses receiving tank and molasses is weighed. Weighed molasses is distributed to cell mass propagation, fermentation and yeast activation section.

#### B. Yeast Propagation

Yeast is grown in laboratory during plant start up. Yeast propagation section comprises of molasses diluter and hygienically engineered yeast vessels equipped with heating, cooling and air sparging facility.

Dilute molasses media are prepared in yeast vessel by recirculating media through molasses diluter. Laboratory propagated cell mass is scaled up in series of yeast vessels.

Sterile air is sparged in pasteurized and cooled dilute molasses medium for optimum growth of yeast. Temperature is maintained at 30-32°C by recirculation cooling water through jacket of yeast vessels.

Cell mass from Yeast vessel is transferred to Prefermentors to build up cell mass required for fermentation transferred by cell mass transfer pump.

### **C. Fermentation**

At steady state, activated cell mass from Prefermentors is transferred to fermentors. Feed (Molasses), process water is also added.

As ethanol fermentation is exothermic process, optimum temperature required for yeast activity is maintained by forced recirculation through fermentor wash coolers. Fermented wash from Fermentor is sent to wash holding tank and pumped to distillation section.

### **D. Auxiliaries**

Auxiliary system comprises of dosing system for nutrient, antifoam, acid, Caustic (CIP) as well as sterile air supply system for yeast activation and yeast propagation (during start up) section.

### **E. Utility**

Cooling water is supplied to fermentation section. Cooling water return from fermentation is sent to cooling tower. Process water pumps supplies process water required for dilution of molasses in fermentor and Prefermentors.

## **2. Distillation Section**

### **A) Wash to RS Mode: -**

Following columns will be under operation

- i. Analyser Column (Vacuum)
- ii. Degasifying Column (Vacuum)
- iii. Rectifier cum Exhaust Column (Pressure)
- iv. Recovery Column (Atmospheric)

Pre-heated fermented wash will be fed to Degasifying column. Fermented wash is stripped off alcohol by ascending vapours in Analyser column. Rectifier vapours provide energy to Analyser column through a Thermosyphon reboiler. Vapours of Degasifying column are condensed and taken to Recovery Feed Tank. Analyser vapours are condensed in the Falling Film Evaporators in the Integrated Evaporation Section. The condensed Analyser vapours are taken to Rectifier Feed Tank. Rectifier column, which operates under pressure, concentrates the condensate of Analyser column to 95% v/v concentration. Condensing steam provides energy to rectifier

column through a vertical Thermosyphon reboiler. Fusel Oil Draws are taken from appropriate trays and fed to Recovery Column. Recovery Column concentrates the fusel oil streams and Degasifying condensate to 95% v/v concentration. An impure spirit cut of about 2-3% of total spirit production is taken out from the top of the recovery column. Rectified Spirit draw of 95% v/v is taken out from the upper trays of Rectifier Column.

**(B) Wash to ENA Mode: -**

Following Columns will be under operation

- |                                     |               |
|-------------------------------------|---------------|
| 1. Analyser Column                  | (Vacuum)      |
| 2. Degasifying Column               | (Vacuum)      |
| 3. Pre-Rectifier cum Exhaust Column | (Pressure)    |
| 4. Extractive Distillation Column   | (Vacuum)      |
| 5. Rectifier cum Exhaust Column     | (Pressure)    |
| 6. Recovery Column                  | (Atmospheric) |
| 7. Simmering Column                 | (Atmospheric) |

Pre-heated fermented wash will be fed to Degasifying column. Fermented wash is stripped off alcohol by ascending vapours in Analyser column. Rectifier vapours provide energy to Analyser column through a Thermosyphon reboiler. Vapours of Degasifying column are condensed and taken to Recovery Feed Tank. Analyser vapours are condensed in the Falling Film Evaporators in the Integrated Evaporation Section. The condensed Analyser vapours are taken to Pre-Rectifier Feed Tank. Analyser Condensate is concentrated in Pre-Rectifier column, which operates under pressure. Condensing steam provides energy to pre-rectifier column through a vertical Thermosyphon reboiler. A Technical Alcohol cut of about 1-2% of total spirit is taken from the Pre-Rectifier column.

Concentrated alcohol draw from Pre-Rectifier column is fed to Extractive distillation column for purification. Dilution water in the ratio of 1:9 is added in this column for concentrating higher alcohol at the top. Top of this column is condensed in its condensers and fed to recovery feed tank while bottoms are fed to Rectifier cum Exhaust Column for concentration. Rectifier Column operates under pressure and condensing steam provides energy to this column through a vertical Thermosyphon reboiler. Technical Alcohol cut is taken out from the top of this column while ENA draw is taken out from appropriate upper trays and fed to Simmering Column after cooling. Fusel Oil build up is avoided by taking fusel oil draws from appropriate trays.

These fusel oils along with the condensate of Degasifying & Extractive Distillation columns are fed to recovery column for concentration. A technical alcohol cut is taken out from the top of this column.

Simmering Column is operated under high reflux for better separation of methanol and di-acetyls. Final ENA product draw is taken from the bottom of this column.

### **3. Anhydrous Alcohol**

From Feed tank, rectified spirit is pumped to the Stripper/Rectifier column. A partial stream of vapours from the column are condensed in condenser and sent back to the column as reflux. Rest of the vapours are passed through a super heater and taken to the Mol Sieve Units for dehydration. The vapour passes through a bed of molecular sieve beads and water in the incoming vapour stream is adsorbed on the molecular sieve material and anhydrous ethanol vapour exits from the Molecular Sieve Unit.

Hot anhydrous Ethanol vapour from the Mol Sieve Units is condensed in the Mol Sieve Condenser. The anhydrous Ethanol product is then further cooled down in the product cooler, to bring it close to the ambient temperature.

The two Mol Sieve units operate sequentially and are cycled so that one is under regeneration while the other is under operation, adsorbing water from the vapour stream. The regeneration is accomplished by applying vacuum to the bed undergoing regeneration. The adsorbed water from the molecular sieve material desorbs and evaporates in to the ethanol vapour stream. This mixture of ethanol and water is condensed and cooled against cooling tower water in the Mol Sieve Regenerant Condenser. Any uncondensed vapour and entrained liquid leaving the Mol Sieve Regenerant Condenser enters the Mol Sieve Regenerant Drum, where it is contacted with cooled regenerant liquid.

The cooled regenerant liquid is weak in ethanol concentration, as it contains all the water desorbed from the Molecular Sieve Beds. This low strength liquid is recycled back to the stripper/Rectifier column for recovering the ethanol.

## **1.6 POWER AND FUELS**

For Distillery plant the power will be met from cogen plant.

## **1.7 RAW WATER**

The requirement of 1460 KLD water for this unit will be met by bore well and open well inside the premises

## **1.8 LAND**

The total area allotted for this factory is 59.67 acres.

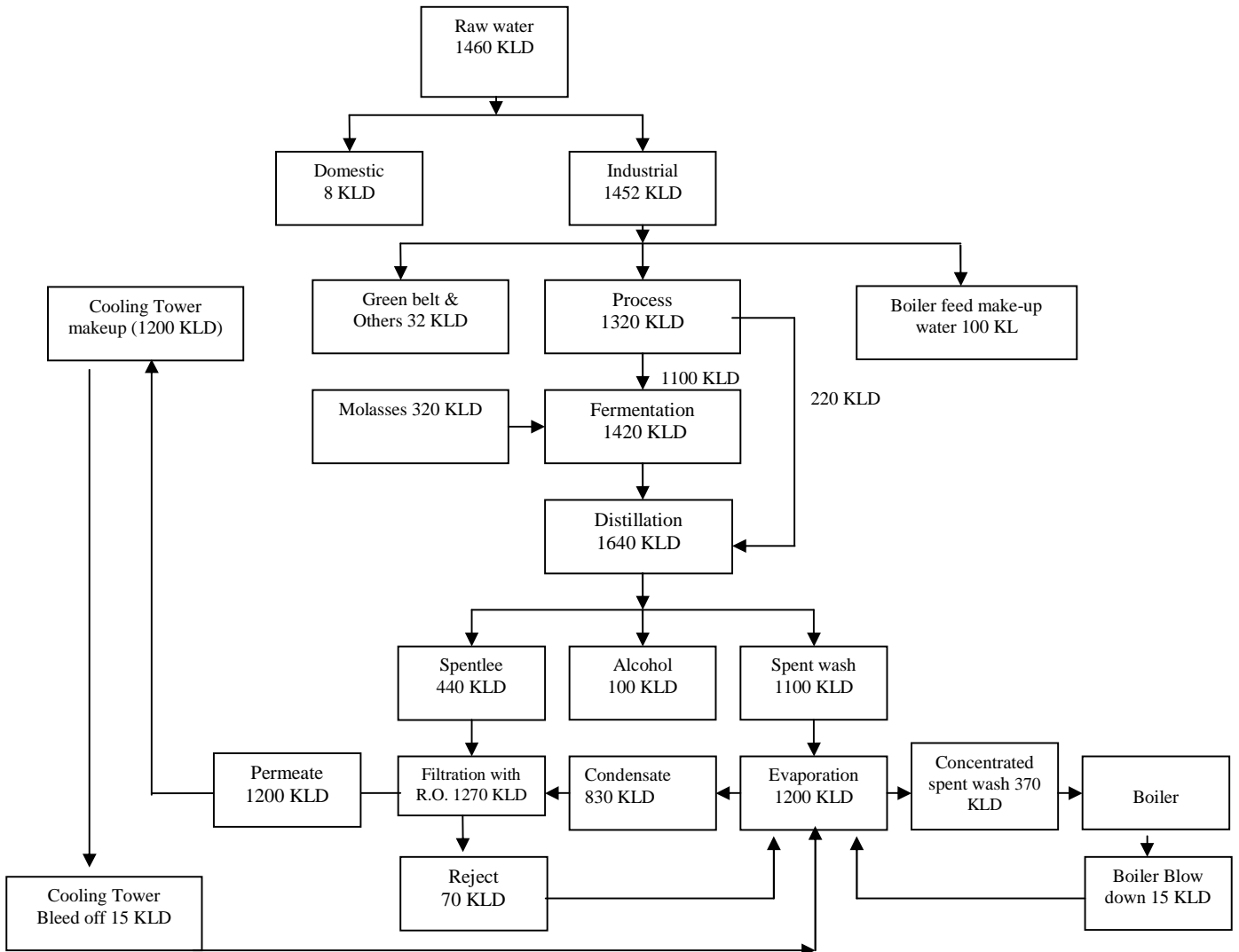
## **1.9 MANPOWER**

The total workforce including staff and workers will be 160.

## **1.10 ORGANIZATION STRUCTURE**

The Senior General Manager is responsible for the factory operations. There are several executives for various sections such as Production, Human Resource, Purchase, Store, Accounts, Environmental & Safety, Maintenance, and Quality Control etc

**DISTILLERY WATER BALANCE DIAGRAM**



## **2.0 DESCRIPTION OF THE ENVIRONMENT**

### **2.1 Climate**

The climate is generally semi arid with temperatures varying from 20.0°C to 39°C. The rainfall is maximum in the NE monsoon period and minimum in SW monsoon period.

### **2.2 Ecology**

There is no endangered species of flora and fauna noticed in this area. The area does not shelter any specific wildlife.

### **2.3 Hydrological Conditions**

#### **2.3.1 Surface Water**

The run-off during monsoon period contributes to the surface water. There is no perennial stream or river in the surrounding villages. These villages get water from open wells and bore wells which get recharged in rainy season

#### **2.3.2 Ground water**

The ground water table varies from 68 m to 92 m. It is therefore a low to medium potential zone for ground water.

### **2.4 Water Quality**

Water samples were collected from different locations, and the following parameters will be monitored for Ph, Colour (Visual), Odour, Turbidity (NTU), Electrical Conductivity, Total Suspended Solids, Total Dissolved Solids, Chlorides (as Cl), Sulphates (asSO<sub>4</sub>), Calcium (as Ca), Magnesium (as Mg), Total Hardness(as CaCO<sub>3</sub>), Phenolphthalein Alkalinity(as CaCO<sub>3</sub>), Total Alkalinity (as CaCO<sub>3</sub>), Iron (as Fe)

### **2.5 Ambient Air Quality and Noise Levels**

The ambient air quality will be conducted as per the SPCB Norms. The following parameters will measured as follows, SPM, RPM, SO<sub>2</sub>, No<sub>x</sub>.

## 2.6 Land Use Pattern

The entire area is a patta land owned by the company and it is in the form of shrub land. The buffer zone has no forests.

## 3.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

### 3.1 Air Emissions and Control Measures

The minimum quantity of CO<sub>2</sub> emitted from the fermentor will be washed in CO<sub>2</sub> scrubber and the clean CO<sub>2</sub> air alone will be vented to atmosphere. Hence in this project, there will not be any chance of air Pollution. For better atmosphere the proper ventilation will be provided in the structure.

S. No.	Particulars	Air Pollution Control Measures
1.	Fermenter	15 m height of stack with CO <sub>2</sub> scrubber be provided.
3.	Boiler (38 T)	50 m height of stack with bagfilter will be provided.

### 3.2 Wastewater Generation and Method of Treatment

S.No.	Particulars for Distillery	Waste water Quantity (KLD)
1.	Sewage	6.4
2.	Spent wash	1100

1100 cu.m/day of spent wash will be subjected to Incineration Boiler followed by evaporator to achieve zero discharge system.

The domestic sewage will be disposed by means of septic tank of size 4.5 x 3.5 x 3.0 m followed by dispersion trench of size 5.0 x 4.0 x 2.5m. The quantity of sewage generated will be 6.4 KLD.

## **PROCESS DESCRIPTION OF EVAPORATION SYSTEM**

The flow pattern is specially designed for utilization of available energy. High wetting rates are provided in falling film bodies. This will reduce scaling and the offline CIP frequency/downtime of evaporator.

The spent wash from distillery from storage is fed to falling film Evaporator system, where it is concentrated from 17% to 25% solids. The analyzer column vapors and exhaust steam from Turbine are used as heating media. All the Effects are falling film type with vapour separators.

The feed from feed tank will be introduced into the effect 1. The vapours from analyzer column are used as heating media in Effect 1 and recovered in the form of condensate. Partially concentrated feed is then transferred to Effect 2 and subsequently to effect 3. The vapour from Effect 1, are given to Effect 2 as heating media. Evaporated vapours from effect 2 are used as heating media in Effect 3 and so on. Finally the vapours separated in VS 3 are condensed in a Plate type surface condenser.

The partially concentrated feed flows from E1 to E2, E2 to E3 and further up to E5, by means of transfer cum recycle pumps. Final concentration is achieved in Effect 5. Level control loops are provided for all effects to ensure trouble free operation.

## **INCINERATION OF CONCENTRATED SPENT WASH**

The concentrated spent wash of around 60 brix from the concentration plant is then pumped in to the specially designed boiler for incineration along with coal as supplement fuel. The concentrated spent wash with above composition and calorific value is burnt to generate steam at designed pressure and temperature. This steam is then taken into turbine for generation of power and the exhaust steam is utilized for concentration and other process requirements.

The flue gas from combustion process is vented out after removal of suspended particulate matter in specially made bag filters and sulfur-dioxide in scrubbers. The ash collected from the process rich in potash can be sold for fertilizer application and used in brick / cement blocks manufacturing.

### 3.3 Solid Waste generation and method of disposal

<b>Sl.No.</b>	<b>Solid Wastes</b>	<b>Quantity</b>	<b>Method of Disposal</b>
1.	Settled Yeast Sludge	6 T/Day	Collected, Dried and used incineration boiler as a fuel.
2.	The Potash rich ash from boiler	25 T/Day	Collected and disposed as fertilizer rich in potash and phosphate.

### 3.4 Hazardous Waste

There will be no hazardous waste generated from this proposed distillery unit.

### 3.5 Noise Level

The noise level in the inside & outside the factory is maintained at low level.

### 3.6 Odour Control System

Since the entire process like distillation and CO<sub>2</sub> scrubber will be proposed with world-class technology, the Odour from the process will be of very minimum.

## 4.0 ENVIRONMENTAL MONITORING PROGRAMME

### 4.1 Environmental Monitoring

The environment, safety and health monitoring programme in the factory are as follows:

<b>Particulars</b>	<b>Parameter</b>	<b>Frequency</b>
Stack Emissions	SPM, SO <sub>2</sub> , NO <sub>x</sub>	Monthly
Ambient Air Quality	SPM, RPM, SO <sub>2</sub> , NO <sub>x</sub>	Monthly
Waste water	pH, BOD, COD, SS, TDS, Cl <sub>2</sub> , SO <sub>4</sub> and Oil & Grease Etc.	Monthly

Noise monitoring	Noise Levels	Monthly
Safety and Occupational Health	--	Yearly

#### 4.2 Budgetary Allocation for Environmental Management

<b>Category</b>	<b>Capital Investment</b>	<b>Annual Operating Costs</b>
	<b>(Rupees in Lakhs)</b>	
Air Pollution Management	2348.0	11.5
Water and Wastewater Management	1539.0	7.7
Solid Waste Management	5.0	1.2
Greenbelt	3.0	0.5
Environmental Monitoring and Training	4.0	0.8
<b>Total</b>	<b>3899.0</b>	<b>21.7</b>

#### 5.0 ADDITIONAL STUDIES

##### 5.1 Socio-economic Conditions

There is no habitation or settlement in the industrial area. The nearest village of Idaikkal is having a population of 5176 with 2609 males and 2567 females as per 2001 census data. The major source of income of the local population is from these types of industries and agriculture only.

#### 6.0 PROJECT BENEFITS

##### 6.1 Socio-economic benefit

The proposed project on implementation will generate 50 - potential jobs directly, and will also generate many indirect job opportunities.

Due to the proposed project, indirect employment to the extent of 150 will be generated. The Government revenue from the project will increase by way of direct and indirect taxes, duties, etc. The infrastructure development will get an impetus with this industrial growth. Communications, transport, schools, hospitals, trade and commerce will indirectly get an impetus.

## **7.0 ENVIRONMENTAL MANAGEMENT PLAN**

### **7.1 Air Pollution Management**

In the Fermentor, the evolved traces of CO<sub>2</sub> will be scrubbed with water and scrubbed water will be recycled in the process. Clean air will be discharged from the scrubber to the atmosphere. For CO<sub>2</sub> scrubber, 15.0 meter height from ground level of stack will be provided. The emission from boiler will be controlled by 50m height of stack with bag filter will be provided.

### **7.2 Waste water management**

1100 cu.m/day of spent wash will be subjected Incineration Boiler followed by evaporator to achieve zero discharge system.

### **7.3 Solid Waste Management**

<b>Sl.No.</b>	<b>Solid Wastes</b>	<b>Quantity</b>	<b>Method of Disposal</b>
1.	Settled Yeast Sludge	6 T/Day	Collected, Dried and used incineration boiler as a fuel.
2.	The Potash rich ash from boiler	25 T/Day	Collected and disposed as fertilizer rich in potash and phosphate.

### **7.4 Noise Level**

As per the observations, the noise level in the buffer zone is found to be very low.

### **7.5 Land Degradation**

Since, the small quantity of wastewater will be generated from domestic usages, the chances of contamination of soil will be nil. The vacant area in the industry will be used for tree plantation to improve the surrounding environment of the industry.

## **7.6 Greenbelt Plan**

Greenbelt is developed inside the factory premises covering a total area of about 25 Acres. The unit will also develop the nearby area around the industry for greenbelt. The inter-spaces are laid with shrubs. The inter-space between trees planted is about 5m. It is proposed to double the tree density in future.

**For Empee Sugars and chemicals Limited  
(Distillery Plant)**

**VICE PRESIDENT**