

M/S. DHARANI SUGARS AND CHEMICALS LIMITED - UNIT III
(Distillery Plant)

S.F. No 47, 48(Part), 49, 50(Part), 51(Part)
Kalayanallur village,
Sankarapuram Taluk,
Villupuram District

The Proposed Distillery Unit

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

1.0 INTRODUCTION

Although India is the largest producer of sugarcane and sugar, the sugar factories in India are facing problems due to the mismatch between sugar cane price and sugar price. Sugar factories are not viable if they produce sugar alone. It is necessary to develop the factory into an integrated complex and use the valuable byproducts more beneficially.

Molasses is one of the important by product of the sugar industry. The profits earned by the conversion of molasses to alcohol will be higher than that of the value realized by sale of molasses. There is a good demand for alcohol in the country, as production and consumption of alcohol are not quite balanced.

The target of alcohol demand as projected in the perspective plan for chemical industry, prepared by the Govt. of India, Ministry of Industry, Dept. of chemical and petrochemicals is around 2400 million liters per annum. It is with this view that Mis. Dharani Sugars and Chemicals Limited has proposed to set up a green field distillery in Sankarapuram Taluk, Villupuram District. Mis. Dharani Sugars and Chemicals Limited already have one distillery with an annual installed capacity of 30,000 litres of Rectified spirit at Vasudevanallur factory. The existing distillery utilizes molasses captively from this sugar factory as the main raw material. Molasses from the other factories are presently sold to Industrial users I cattle feed. 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.

The proposed new distillery will have the flexibility to produce Rectified Spirit, Extra neutral alcohol and Anhydrous Alcohol based on the market requirement. The plant will incorporate multi-pressure distillation over conventional steam distillation for better energy efficiency and consistent good quality of the product.

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1.1 Plant Location

1.2

The Plant is located at S.F. No 47, 48(Part), 49, 50(Part), 51(Part) Kalayanallur village, Sankarapuram Taluk, Villupuram District. Kalayanallur village is located about 17 km away from Kallakurichi Town and it is in-between the road connecting Kallakurichi and Ulundurpettai. The site is located in the Northern direction of this road. The nearest Major railway station is Villupuram.

1.3 Project Estimated Cost

1.4

The gross assets value of the proposed project is RS.66.81 crores. Budgetary allocation for Environment Management alone will be RS.18 Crores

2.0 PLANT DETAILS

2.1 Products Manufactured

Distillery Basic details	Quantity	Unit
No of days of operation	300	Days
Alcohol production (Rectified Spirit) from molasses	100	KL / Day
ENA (Extra Neutral Alcohol) / Anhydrous Alcohol from Rectified Spirit	100	KL / Day

2.2 Raw Materials

S.No.	Raw Material	Quantity
1.	Cane Molasses	435 MT/day
2.	Nutrients	200 kgs/day
3.	Antifoam oil	250 Kgs/day
4.	Sulphuric acid	100 kgs/ day

2.3 Manufacturing Process

Manufacture of Rectified Spirit:

The yeast is initially propagated in the propagation vessels and then transferred to the fermenter. Molasses diluted with water to the desired concentration is metered continuously into a fermenter. Spent wash from distillations is recirculated to fermenter depending on solids concentration in fermented wash and molasses composition. During fermentation process yeast cells convert sugar into alcohol. Fermentation is an exothermic reaction; heat is evolved during this fermentation and it is cooled by continuous cooling through plate type heat exchanger. Temperature is maintained between 32-35°C. Small quantities of Urea and DAP are added in the fermentor as nutrients to the yeast cells. Viable cell population of 300- 500 million cells/ml is maintained in the fermentor by continuous aeration and yeast recycling.

The fermented wash passes through series of hydrocyclones, which removes grit, iron filings and heavy particulate matter. The material settled at the bottom of the hydrocyclone is fed to the bottom of the analyzer column to strip the alcohol present in it. The overflow from the hydrocyclone is fed to the yeast separators. Yeast cream is recycled back to the fermenter to maintain the yeast cell population. De yeasted wash is stored in prop III vessels.

The wash is preheated to 85 - 90°C in the heater, plate type mash heater and spent wash cooler and it is fed to top of the degasifying column. Fermented wash is stripped of alcohol by ascending vapours in Analyser column. Rectifier vapours provide energy to analyzer column through a Thermosyphon reboiler. Vapours of degasifying column are condensed and taken to pre Rectifier Feed Tank. Analyser vapours are condensed in Evaporation section. The condensed analyzer vapours are taken to pre Rectifier Feed Tank. Rectifier Column,

which operates under pressure, concentrates the condensate of analyzer column to 95% v/v concentration. Condensing steam provides energy to pre rectifier column through a vertical Thermosyphon reboiler. Fusels oil draws are taken from appropriate and fed to FO decanter. An impure spirit cut of about 2 - 3 % of the Total spirit production is taken out from the top of the pre rectifier column. Rectified spirit draw of 95% v/v is taken out from the upper trays of pre rectifier column.

Manufacture of Extra Neutral Alcohol:

The concentrated rectified spirit from Pre-Rectifier column is fed to the Extractive Distillation column. Dilution water is fed on the top most of the column with a dilution ratio of 1 :9. this column serves to remove the impurities based on the principles of Hydro-Extraction. The water is fed to the column in such a way that it selects the higher alcohols and other impurities to move upwards and extracts ethanol down. The top vapours of the columns are condensed and feed to the recover column.

The purified dilute ethanol is removed from the bottom of the column and feed to the rectification column, which concentrates ethanol to 96% v/v. Rectifier Column operates under pressure and condensing steam provides energy to this column through a vertical Thermosyphon reboiler. ENA draw is taken out from appropriate upper trays and fed to Simmering Column after cooling. 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. The lees of the column are recycled as dilution water after a part of it is purged.

Lower side draw streams are taken from rectification column to avoid fusel oil build up in the column. These streams are sent to the Recovery Column where these fusel oils are concentrated and then sent to decanter where these streams are diluted with water and fusel oil rich layer is separated. Washings are sent back to the column to recovery alcohol. An impure spirit cut will be taken from top of this column.

Manufacture of Anhydrous Alcohol:

Production of anhydrous alcohol from rectified spirit (Industrial Ethanol) with molecular sieve dehydration utilizing pre concentration column:

The rectified spirit, before sending in for dehydration process, it is heated and water is stripped in the pre concentration column through a pre-heater. The mixture of alcohol and little water is sent to molecular sieve in the form of vapour.

The molecular sieves are hard granular substances, cylindrical extrudates manufactured from clay like silica gel material such as potassium aluminosilicates. They are graded according to the nominal diameter of the myriad of internal pores,

which make up the interstitial free volume found within their structure. A typical sieve used in ethanol dehydration is Type 3A. This designation means that the average diameter of the interstitial passageways is 3 Angstroms (One Angstrom: 1A is unit of measure equivalent to 10⁻⁸ centi meters). Thus, the passageways in the structure have a diameter that is molecular scale. The water molecule has a mean diameter less than 3A, while the ethanol molecule has a mean diameter greater than 3A.

In addition, the water molecules can be absorbed on the internal surface offered by the passageways within the molecular sieve structure. It is the physical property of the sieves,

which make them useful for the separation of mixture of ethanol and water.

Water molecules can invade the inner structure of the molecular sieve beads and be absorbed thereon, while the ethanol molecules are too large and pass out of the vessel leaving the water behind. Thus, dehydration of ethanol takes place in the molecular sieve technology.

In this technology, the re-generation of beads is done by one bed under vacuum; while the other bed is producing anhydrous ethanol vapour under pressure with an automated operation, the feed of vapour to the molecular sieve system can be taken directly from the pre concentration column passing through a superheater. The pre concentrated column is operated at a pressure sufficient to economically operate a reboiler. The condensed anhydrous alcohol vapour are cooled and passed to storage through product cooler. The recovered ethanol and water from the regeneration phase is fed back to the pre-concentration column for recovery. Thus, there is no generation of effluent except the condensate water from steam is cooled and taken back process.

2.4 Power and Fuels

Total Power requirement of the Plant will be 1400 KWH. Total Power will be obtained from its sister concern MIS. Dharani sugars and chemicals limited (cogeneration Plant).

2.5 Raw Water

The total requirement of raw water for this unit will be 600 KLD, which will be met from wells inside the factory premises

2.6 Land

The total area allotted for this factory is 9.71 hectares.

2.7 Manpower

The total workforce including staff and workers will be 60.

3.0 POLLUTION CONTROL MEASURES

3.1 Air Emissions

In the Fermentor, the evolved traces of CO₂ 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 wet scrubber, 15.0 meter height from ground level and 0.6 m diameter of stack will be provided. The emission from boiler will be controlled by 40m height of stack with bag filter will be provided.

3.2 Wastewater Generation

The waste water from the domestic usages (4 KLD) will be sent directly to the septic tank of size 5 x 2 x 2 m (2 Nos) followed by the dispersion trench of size 5.0 x 2.0 x 2.5 m . 700 CU M spent wash of 17% concentration will be generated from the process, which is further concentrated in Evaporators to a concentration up to 55% V/V and used along with coal in the specially designed boiler and incinerated. The condensate water coming out from evaporators are used in Boiler as well as in Distillery process

By this way, the management proposes to achieve zero discharge system to have a better environment not only in the factory premises and also to the surrounding environment.

PROCESS DESCRIPTION OF EVAPORATION SYSTEM

Five Effect Falling Film Evaporator

Flow = inlet - E1 - E2 - E3 - E4 - E5

The above 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 55 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 j cement blocks manufacturing.

3.3 Solid Waste

The solid waste will be generated from this unit is as follows.

S.No.	Solid Wastes	Quantity	Method of Disposal
1.	Settled Yeast Sludge	6.0 T/Day	Collected and used in Bio-composting
2.	Ash from Boiler	25.0 T/Day	Used as fertilizer.

3.4 Hazardous Waste

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

3.5 Noise

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 CO₂ scrubber will be proposed with world-class technology, the odour from the process will be of very minimum.

4.0 PRESENT ENVIRONMENT SCENARIO

4.1 Climate

The climate is generally arid with temperatures varying from 20.00C to 37.9°C. The rainfall is maximum in the NE monsoon period and minimum in SW monsoon period.

4.2 Ecology

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

4.3 Hydrological Conditions

4.3.1 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

4.3.2 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.

4.4 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 (asSO₄), Calcium (as Ca), Magnesium (as Mg), Total Hardness(as Caco₃), Phenolphthalein Alkalinity(as CaCO₃), Total Alkalinity (as CaCO₃), Iron (as Fe)

4.5 Ambient Air Quality and Noise Levels

The ambient air quality will be conducted as per the SPCS Norms. The following parameters will measured as follows, SPM, RPM, SO₂, NO_x.

4.6 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.

4.7 Socio-Economic Conditions

There is no habitation or settlement in the industrial area. The nearest village of Kalayanallur is having a population of 1739 with 940 males and 799 females as per 2001 census data. The workers constitute 56.6%. The major source of income of the local population is from these types of industries and agriculture only.

5.0 ENVIRONMENTAL IMPACT ANALYSIS

5.1 Air Quality

In the Fermentor, the evolved traces of CO₂ 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 wet scrubber, 15.0 meter height from ground level and 0.6 m diameter of stack will be provided. The emission from boiler will be controlled by 40m height of stack with bag filter will be provided.

5.2 Water Resource

This proposed unit is depending on bore well for its different water requirements and the quantity will be 600 KLD.

5.3 Waste Water

The wastewater from the domestic uses is sent directly to the septic tank and dispersion trench. 700 KLD spent wash of 17% concentration will be generated from the process, which is further concentrated in Evaporators to a concentration up to 55% V/V and used along with coal in the specially designed Boiler and incinerated. The condensate water coming out from evaporators are used in Boiler as well as in Distillery process

5.4 Solid Waste Management

The solid waste will be generated from this unit is as follows.

S.No.	Solid Wastes	Quantity	Method of Disposal
1.	Settled Yeast Sludge	6.0 T/day	Collected & Used for Bio composting.
2.	Ash from Boiler	25.0 T/Day	Used as fertilizer.

5.5 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.

5.6 Noise Level

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

5.7 Socio-Economic Consideration

This project does not involve any displacement of local people. Employment opportunities will be improved in the nearby villages because of this proposed unit and this will provide direct employment opportunity for 60 persons. The unit as a responsible corporate citizen tries to contribute towards social causes like health, education, and amenities for the surrounding areas.

6.0 ENVIRONMENTS, SAFETY AND HEALTH MANAGEMENT

6.1 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.

6.2 Budgetary Allocation for Environmental Management

Category	Capital Investment	Annual Operating Costs
	(Rupees in Lakhs)	
Air Pollution Management	7.5	1.5
Water and Wastewater Management	1770	22.5
Solid Waste Management	10.5	3
Greenbelt	7.5	1.5
Environmental Monitoring and Training	4.5	1.5
Total	1800	30

6.3 Air Quality Management

Proper control measures will be provided in all process area in order to control all emissions if any to maintain a safe and healthy work place environment. The vent air will be passed through pollution control equipments before it is released into the atmosphere.

6.4 Wastewater Management

The domestic sewage will be disposed by means of septic tank of size 5.0 x 2.0 x 2.0 m (2

Nos) followed by dispersion trench of size 5.0 x 2.0 x 2.5m. The quantity of sewage generated will be 4 KLD. 700 KLD spent wash of 17% concentration will be generated from the process, which is further concentrated in Evaporators to a concentration up to 55% V/V and used along with coal in the specially designed Boiler and incinerated. The condensate water coming out from evaporators are used in Boiler as well as in Distillery process

6.5 Greenbelt Plan

Greenbelt is developed inside the factory premises covering a total area of about 2.42 hectares. 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.

6.6 Environment, Safety and Health Monitoring

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

Monthly monitoring of stack emissions

Daily monitoring of water and wastewater

Quality monitoring of ambient air, noise and work place air
Monitoring of occupational safety
Yearly monitoring of occupational health.

Once again the unit assures that, there will be no adverse impact due to proposed activities.

**For Dharani Sugars and chemicals Limited - Unit III
(Distillery Plant)**