2014

Transways Exim Pvt Ltd

Detailed Project Report

To set up a
60 KLPD Total Spirit Grain based Distillery at
Kulpi, District: South 24-Parganas

Manoj Kumar Gupta

3/21/2014

PRE-FEASIBILITY REPORT

1.0 EXECUTIVE SUMMARY

1.1 SCOPE OF PROJECT

The company proposes to set up a new Plant for the production of Extra Neutral Alcohol with an installed capacity 60 KLD at JL Nos. – 104 & 105, Vill. - Basudevpur PO – Ramkrishnapur, Block/ PS – Kulpi, Gram Panchayat – Kamarchak (PO – Paschim Gopal Nagar, Dist: South 24 Parganas in West Bengal.

Project at a Glance

Table 01: Project at a Glance

Name of the company	Transways Exim Pvt Ltd
Date of Establishment	16-10-1996
Promoters	♦ Mr Sundeep Agarwal ♦ Mr Nishu Nigam
Project	♦ Manufacturing of Extra Neutral Alcohol = 60 KLD
Market Segment	♦ Extra Neutral Alcohol
Financial Parameters	
Project Cost	Rs.120.82 Crore
Bank Finance	Rs.84.50 Crore (70%)
Repayment Period	Loan amount: 84.50 Cr. Interest Rate: 14.00% Disbursement: 6 Quarters Moratorium: 4 Quarters after last disbursement Repayment Period: 26 Quarters Door to Door Period: 36 Quarters
Promoters Contribution	Rs. 36.32 Crore (30%)
Rate of Interest	Term Loan - 14.00% Working Cap.- 13.50%
COD	1st October 2015
D/E Ratio	2.33:1
TOL/ TNW	2.47 (FY 17)
Power	Power requirement : 2140 KWH Power Source : WBSEDCL.
Effluent	• Industrial effluent after adequate treatment will be used in non-critical purposes within the plant (zero discharge plant).

Table 01: Project at a Glance	
	• Domestic wastewater will be treated in Septic tank – Soak pit system.
Air Pollution Control	Adequate and appropriate air pollution control facilities and stacks of adequate height will be installed.
Solid Waste	• Distillers' Dried Grains & Solubles (DDGS) that would be generated as by-product will be sold as animal feed. • Boiler ash will be sold to the local brick manufacturers. • ETP sludge will be used for land filling. • Septic Tank sludge will be disposed off suitably in consultation with the concerned Civic body.
Manpower	53 persons
Conclusion: Project is technically, commercially and financially feasible	

1.2 SITE LOCATION

Company has considered the site for the proposed project at NH-117 (Diamond Harbour Road), JL Nos. – 104 & 105, Village – Basudevpur, PO – Ramkrishnapur, Block/ PS – Kulpi, Dist: South 24 Parganas in West Bengal. Its geographical coordinates are Latitude 22°04'18.01"N and Longitude 88°14'36.72"E. Nearest railway station is Kulpi, which is around 1.5 km from the project site. River Hooghly is passing at a distance of around 2 km from the project site in the west direction. Kulpi & Diamond Harbour Town is around 1.0 km & 15 km from the project site respectively. Alipore, the district Head Quarter is around 51.5 km from project site. Kolkata city is around 57 km in the northern side w.r.t. the project site. The nearest airport "Netaji Subhash Chandra Bose Airport", Kolkata is located about 67 km from the project site. The nearest Port is Haldia. The location map is presented in Figure-1.0.

1.3 LOCATIONAL ADVANTAGES

- Outskirts of Kolkata, a major metropolis
- On main road with wide frontage
- Diamond Harbour Road (NH-117) close to the project site
- Well connected with network of roads and highways to the rest of the State of West Bengal and rest of India
- Close to Haldia & Kolkata Port
- Feedstock is available locally from within the state of West Bengal

2.0 INTRODUCTION OF THE PROJECT / BACKGROUND INFORMATION:

2.1 PROJECT IDENTIFICATION

The company is proposing to set up a Extra Neutral Alcohol/Ethanol/Industrial Alcohol etc manufacturing facility with an installed capacity of 60 KLD along with CO_2 & Distillers' Dried Grains & Solubles (DDGS) for Cattle/Poultry/Fish or Prawn feed as by-products. For the purpose of setting up the unit, the site is located at Kulpi, in South 24 Parganas district of West Bengal, 57 Km from Kolkata city and Kulpi & Diamond Harbour Town is around 1.0 km & 15 km from the project site respectively. The company will manufacture ENA through grain based process. The proposed site is chosen because of its proximity to the agriculture field surrounding the area & easy availability of food grains like rice, maize, etc to the distillery for producing alcohol. Apart from ENA company will also produce few by products. They are

- Technical Alcohol
- DDGS for cattle
- Fusel Oil
- Carbon Di oxide (CO_2)

The proposed plant land

- The total land earmarked for the entire project is around 9.00 acres.
- The land is rectangular shaped without any natural slope.
- The plot at present is protected around its perimeter with brick boundary walls of 3.5 mts high

SALIENT FEATURES OF NEW PROPOSED DISTILLERY PLANT:

1. Plant can operate different Grains like broken rice, Jowar, Corn, one at a time.
2. Provided with most efficient Fed batch Fermentation technology
3. Distillation operating on Multi-Pressure Technology – an efficiently heat integrated system, operating on fully automated PLC control system
4. On line cleaning system is provided for distillation equipment's to minimize plant shut down period.
5. Process equipment are designed as per TEMA/ ASME standards
6. Alcohol storage of 45 days
7. Imported Buhler make Mill and efficient Grain handling system is considered.

8. Closed water recycle system and plant process is designed to minimize fresh water requirement by recycling various effluents after treatment.
9. Drier is considered to dry distillery wet grain soluble (DWGS) , A MIXTURE OF SPENT GRAIN AND EVAPORATED THICK SLOPS.
10. Zero Liquid Discharge norms is applied while designing the plant.

2.2.1 PROJECT PROPONENT : TRANSWAYS EXIM PRIVATE LIMITED - AN OVERVIEW

Transways Exim Private Limited (TEPL) is planning to set up a 60 KLD total Spirit Grain based Distillery at Kulpi, District: South 24-Parganas in West Bengal.

The TEPL is a company incorporated under the Companies Act in the year 1996 mainly in the business of Indian Made Foreign Liquor (IMFL) distribution in West Bengal. Present turnover is Rs 216.00 Cr.

TEPL has its Head Office in Kolkata. At present 80 workers are working in this group.

TEPL is studying the possibility/ Feasibility of setting up a 60 KLPD Grain based distillery unit as part of its business growth strategy. The proposed distillery will produce superfine quality Extra Neutral Alcohol (ENA) from various grains. Grain spirit is far more superior than molasses based spirit.

Also it has plan to start manufacturing of Indian Make Foreign Liquor (IMFL) and Country Liquor (CL) in near future

Board of Director

The company is run by well qualified professionals with a sole aim of higher growth of business and high profits. In fifteen years company has touched turn over figure of Rs 216 Crores with high profit margins.

1. Mr. Sandeep Agarwal
2. Mr. Nishu Nigam

Vision, Mission & Goals

The vision and mission of the company are as follows:

Table 02: Vision, Mission & Goals	
Vision	To be the leader in the Production of Extra Neutral alcohol, Specially grade alcohols and its allied products in the state of West Bengal
Mission	Continual improvement in its processes and recover major portion of the product from wastage. Enter the fuel Ethanol market with Cellulosic Ethanol Production.
Goal	• To complete the present project on time

SWOT Analysis

We have analysed the strength, weakness, opportunities & threats of the company & the project. The SWOT analysis of the project is as given below:

SWOT Analysis
Strengths
➢ The company is promoted by experienced professionals. ➢ Demand for liquor is increasing day-by-day mainly due to increase in income and better life style of the people. ➢ The company is planning to give the entire project on turnkey basis evaluating Praj, who are leading in the distillation equipment.
Weaknesses
➢ Fluctuation in prices of raw material i.e. grains. As availability depends on Monsoon. To overcome this problem the company is constructing a grain godown which will store the required raw material for the units operations. Apart from this the company is planning to use both Broken Rice & Maize. Hence, the production is not subject to single crop. ➢ The unit is first time entering into a manufacturing business. They need to appoint professional people at all the important functions so that operational issues can be eliminated in future
Opportunities
➢ There is a growing demand for liquor in West Bengal and all over India and abroad. ➢ Indian alcohol industry is growing at a CAGR of 16.3% which is more than the world alcohol industry growth of 5.2%. ➢ The product can be used for manufacture of Ethanol, a substitute for petrol, with the price of oil heading $190 a barrel, this is quite viable source, based on present prices. ➢ West Bengal is importing ENA to manufacture alcohol which is in high demand. This

SWOT Analysis
provides the company with ample opportunity to market its products.
Threats
➢ Any changes in the Government Regulations and polices can have an adverse impact on these industries. However any change in the government policy in this area looks unlikely for the time being.

2.3 BRIEF DESCRIPTION OF NATURE OF THE PROJECT

The company is proposing to set up a Extra Neutral Alcohol/Ethanol/Industrial Alcohol etc manufacturing facility with an installed capacity of 60 KLD along with CO_2 & Distillers' Dried Grains & Solubles (DDGS) for Cattle/Poultry/Fish or Prawn feed as by-products at Kulpi, in South 24 Parganas district of West Bengal. The company will manufacture ENA through grain based process. The proposed site is chosen because of its proximity to the agriculture field surrounding the area & easy availability of food grains like rice, maize, etc to the distillery for producing alcohol. Apart from ENA company will also produce few by products like Technical Alcohol, DDGS for cattle, Fusel Oil & Carbon Dioxide (CO_2).

2.4 NEED FOR THE PROJECT

Ethyl alcohol, also called ethanol, grain alcohol, or alcohol, a member of a class of organic compounds that are given the general name alcohols; its molecular formula is C_2H_5OH. Ethyl alcohol is an important industrial chemical; it is used as a solvent, in the synthesis of other organic chemicals, and as an additive to automotive gasoline (forming a mixture known as a gasohol). Ethyl alcohol is also the intoxicating ingredient of many alcoholic beverages such as beer, wine, and distilled spirits.

Now with hundreds of kind of alcoholic beverages being made and consumed in India, the industry can be categorised into four broad groups' viz. Indian Made Foreign Liquor (IMFL), Country Liquor (CL), illicit liquor & Beer.

IMFL products contain about 42.85% of alcohol. The consumption of CL is slowly on the decreasing trend as some cheap IMFL is available. Inspite of this, the CL industry is growing at around 8%. However, government is taking necessary steps to restrict the illicit liquor as it causes loss of revenue and spoils the health of the people, also bad quality may lead to death of consumer. The major consumption of alcohol as of now is for alcoholic beverages. Ethyl alcohol has the potential to become the fuel of the future relegating gasoline to a secondary place.

The ethanol produced from the grains is superior in quality as compared with that form molasses. It is estimated that IMFL market will require around 3000 million litres in the year 2014 and expected to grow more than 50% in next 3 years. As Government declares 5% mandatory mixing of fuel ethanol in the gasoline thus there is great potential for new distillery establishment.

In the present scenario, in West Bengal 75 million litres of alcohol will be consumed for the production of IMFL in a year. Out of total requirement, manufacturers are arranging locally nearly 40 percentage from the one sole grain distillery unit named as M/s. IFB Agro Industries Pvt. Ltd. So clearly there is huge scope to capitalise the shortage of availability of spirit and it can happen if one can set up a second distillery in West Bengal.

The ethyl alcohol manufactured from molasses is largely being used for blending with petrol. This leaves a lesser quantity for the potable alcohol industry which in turn causes the potable alcohol industry to rely completely on ethyl alcohol manufactured from grain. Since the potable alcohol industry is constantly growing at a good rate and is insulted from economic conditions hence the future of a grain distillery is ensured.

2.5 EXPORT POSSIBILITY

The project site being nearer to both Orissa and Jharkhand states, the select plant location is ideal for growing markets especially West Bengal, Orissa & Jharkhand. Further, proximity to the Haldia port is ideal for export of product to neighbouring countries.

2.6 DOMESTIC / EXPORT MARKETS

The entire production is envisaged for the domestic mainly but as per international markets demand (like Bangladesh, Nepal, and Bhutan etc.) product can be exported by Ship through Haldia Port, Road and Railway.

2.7 EMPLOYMENT GENERATION (DIRECT & INDIRECT) DUE TO THE PROJECT:

For smooth functioning of the plant, the company needs a team of 53 persons. These persons are responsible towards their respective department such as Process Plant, Boiler Operating Plant and administrative block. Here is the detail description of the manpower requirement of the company.

1.00	Process Plant		
Sr.	Description	Requirement	Total Requirement
1	Plant Manager	1	1
2	Shift Supervisor	3 shifts	2
3	Chemist (for Laboratory analysis)	3 shifts	2
4	Process Operator for –		
	Þ Liquefaction & Fermentation	3 shifts	2
	Þ Distillation & Evaporation	3 shifts	2
	Þ Common Reliever(Liq. & Ferm.)	1	1
	Þ Common Reliever (Distn. & Evapn.)	1	1
5	Helpers	3 shifts	2
6	Þ Mechanical Fitter	COMMON RESOURCE FROM MAINTENANCE DEPTT.	
	Þ Electrical Technician		
	Þ Instrumentation Engineer		
	Sub-Total for Main plant		13
2.00	Boiler Operating Plant	Requirement	Total Requirement
1	Grain handling, Storage and Milling	3 shifts	2
2	DDGS & Water treatment (Process condensate +ETP)	3 shifts	2
3	Alcohol Management and Fuel Receiving (Coal etc.)	3 shifts	2
4	Common Reliever	3 shifts	2
5	Maintenance Staff		
	Þ Mechanical Engineer	1	1
	Þ Electrical /Instrumentation Engineer	1	1
	Mechanics –		
	Þ Mechanical Fitter	2 in each shift	6
	Þ Electrical / Instrumentation Technician	2 in each shift	6
	Sub-Total for BOP		22
3.00	Boiler House Plant	Requirement	Total Requirement
1	Boiler Operator	3 shifts	2
2	TG Set & Power house	3 shifts	2
3	Common Reliever for Boiler/Power House	1	1
	Sub-Total for Boiler House		5
4.00	Administrative Plant	Requirement	Total Requirement
1	Managing Director	1	1
2	Executie Director	1	1
3	Technical Director	1	1
4	Operation/Works Manger	1	1
5	Admin/HR Manager	1	1

1.00	Process Plant		
Sr.	Description	Requirement	Total Requirement
6	Drivers	2	2
7	Admin/Accounts/Purchase/Time Office/ Store Staff	2	2
8	Causual Labour (Cleaning Staff, Security, Canteen)	4	4
	Sub-Total for Admin.		13

3.0 PROJECT DESCRIPTION

3.1 SITE LOCATION

Company has considered the site for the proposed project at NH-117 (Diamond Harbour Road), JL Nos. – 104 & 105, Vill. - Basudevpur PO – Ramkrishnapur, Block/ PS – Kulpi, Dist: South 24 Parganas in West Bengal. Its geographical coordinates are Latitude 22°04'18.01"N and Longitude 88°14'36.72"E. Nearest railway station is Kulpi, which is around 1.5 km from the project site. River Hooghly is passing at a distance of around 2 km from the project site in the west direction. Kulpi & Diamond Harbour Town is around 1.0 km & 15 km from the project site respectively. Alipore, the district Head Quarter is around 51.5 km from project site. Kolkata city is around 57 km from the project site. The nearest airport "Netaji Subhash Chandra Bose Airport", Kolkata is located about 67 km from the project site. The nearest Port is Haldia. The proposed site area is well developed and has all necessary infrastructure facilities such as motorable road upto the plant site, nearness to rail head, telephone facilities etc.

Indicative location of the project site is presented in Figure-1.0. The location of Project Site on Google image is presented in Figure-2.0.

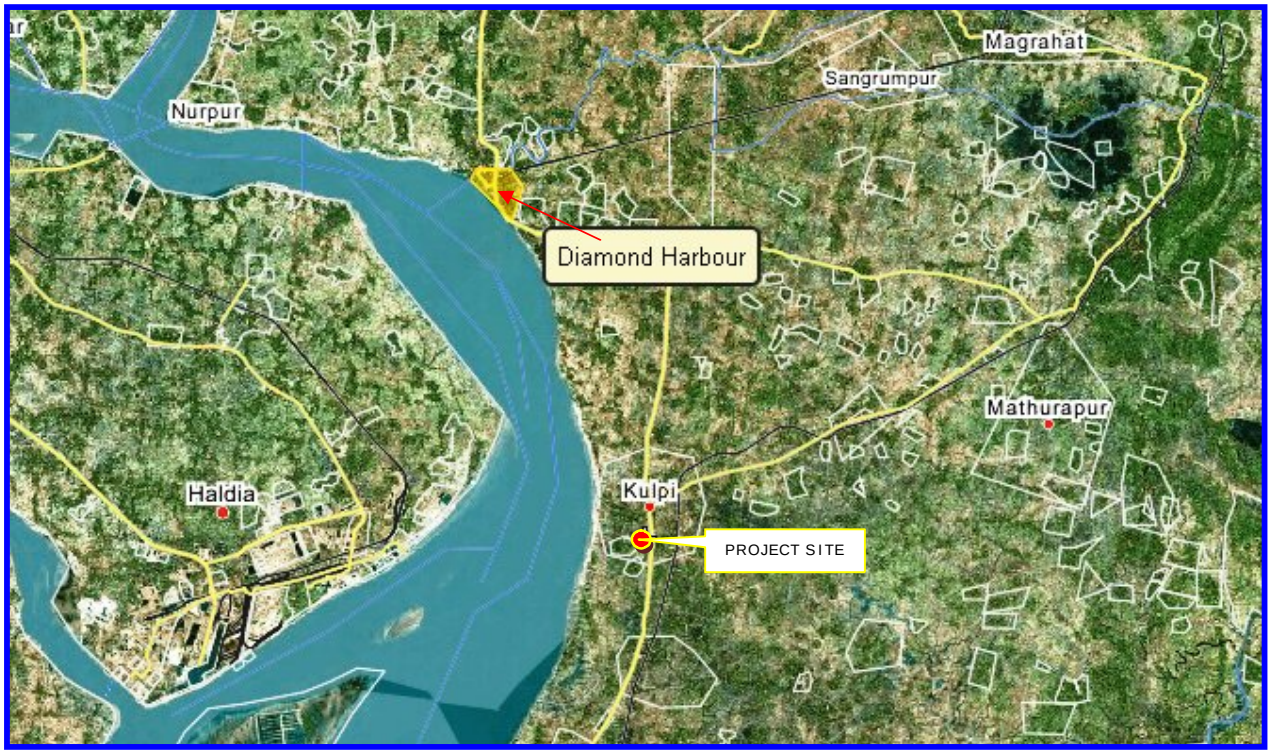
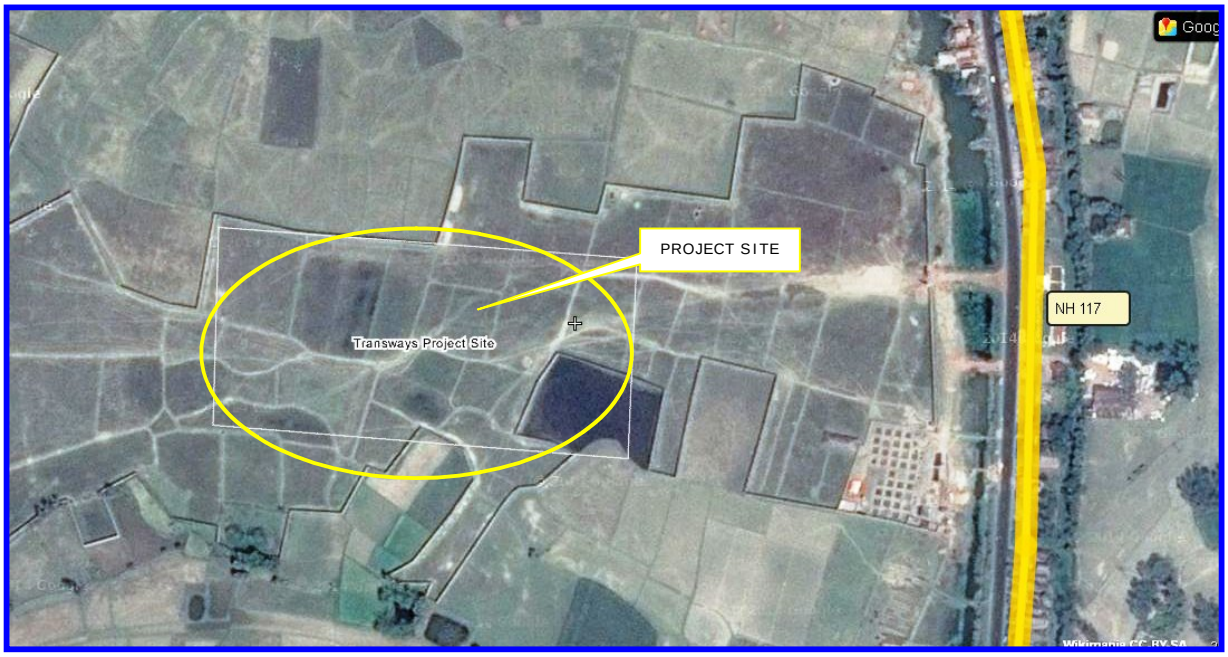


FIGURE 2.0 : PROJECT SITE ON GOOGLE IMAGE



TRANSWAYS EXIM (P) LTD. – CLOSE VIEW ON GOOGLE IMAGE
(JL Nos. – 104 & 105, P.O. Basudevpur, P.S. Kulpi,
Dist: South 24 Parganas, West Bengal)

3.2 DETAILS OF ALTERNATE SITES

M/s TEPL has planned to set up the proposed Distillery for production of Extra Neutral Alcohol/Ethanol/Industrial Alcohol etc. with an installed capacity of 60 KLD along with CO_2 & Distillers' Dried Grains & Solubles (DDGS) for Cattle/Poultry/Fish or Prawn feed as by-products at NH-117 (Diamond Harbour Road), JL Nos. – 104 & 105, Vill. - Basudevpur PO – Ramkrishnapur, Block/ PS – Kulpi, Dist: South 24 Parganas in West Bengal. Its geographical coordinates are Latitude 22°04'18.01"N and Longitude 88°14'36.72"E. The proposed site is quite suitable in view of raw materials requirement, connectivity, manpower availability & others infrastructural support. Thus, no alternative site is considered for the proposed project.

3.3 SIZE OR MAGNITUDE OF OPERATION

In the proposed project, 60 KLD Extra Neutral Alcohol/ Ethanol/ Industrial Alcohol etc. with some by-products at Kulpi, Dist: South 24 Parganas in West Bengal.

3.4 MANUFACTURING PROCESS OF ENA

The manufacturing process consists of mainly four sections in starch based alcohol fermentation

1. Grain Handling & Milling
2. Fermentation
3. Liquefaction
4. Sachharification & Instantaneous Fermentation(SIF)
5. Distillation

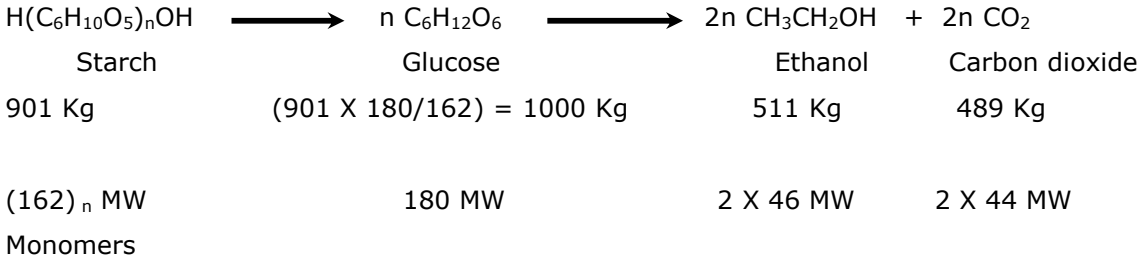
1. GRAIN HANDLING AND MILLING:

Pre-Cleaned Grains are stored in the Silos & from there they are conveyed through Screw Conveyer to Bucket Elevator. Bucket Elevator lifts the grains to approximately 18 meters height and then passes the grains through Vibrating Screen, De-stoner and Magnetic Separator to remove dust and Stones. The flow through these equipments is under gravity.

The cleaned grains are then again conveyed by bucket elevator to an intermediate Hopper, which is provided with rotary air lock system for controlled flow in Hammer Mill. In Hammer Mill the practical size is reduced to as required by the process. From Hammer Mill the flour is pneumatically conveyed to Flour Bin (Intermediate storage for flour). From flour bin the flour is carried to Pre-masher unit. In pre-masher flour is mixed with water.

2. FERMENTATION SYSTEMS:

The complete reaction of conversion of starch into ethanol can be represented as follows:



3. LIQEUFACTION/ SLURRY PREPARATION:

Slurry from pre-masher is taken to Slurry preparation tank where slurry is further diluted by addition of water and recycles streams. Slurry is taken to initial liquefaction tank where liquefying enzyme is added. This slurry is then "cooked" in the jet cooker. The slurry is continuously pumped to a steam jet cooker where high-

pressure steam rapidly raises the slurry temperature. The mixture of slurry and steam is then passed through the holding coil which has several "U" bends in series and sufficient capacity to provide the desired retention time at a given flow rate. The cooked mash is discharged to a flash tank. The cooking process, accomplished in the above manner, converts the slurry into a hydrated, sterilized suspension (as starch molecule is solubilized) and is therefore susceptible to enzyme attack for liquefaction.

The gelatinized mash from the flash tank is further liquefied in a final liquefaction tank where liquefying enzyme is added. Then the liquefied mash is cooled in a slurry cooler and transferred to Fermentation section.

4. SACHHARIFICATION & INSTANTANEOUS FERMENTATION (SIF):

(a) Yeast Activation:

Yeast seed material is prepared in Yeast Activation Vessel (prefermentor) by inoculating sterilized mash with yeast. Optimum temperature is maintained by circulating cooling water. The contents of the yeast Activation Vessel are then transferred to Fermentor.

(b) Fermentation:

The purpose of fermentation is to convert the fermentable substrate into alcohol. To prepare the mash for fermentation, it is diluted with water. Yeast is added in sufficient quantity to complete fermentation to produce alcohol.

At the start of the cycle, the fermentor is charged with mash and contents of the Yeast Activation Vessel (Prefermentor). Significant heat release takes place during fermentation. This is removed by passing the mash through heat exchangers to maintain an optimum temperature. Re-circulating pumps also serve to empty the fermentors into Beer well. After the fermentors are emptied, they are cleaned with water and caustic solutions (CIP) and sterilized for the next batch. Carbon dioxide evolved during the process is vented to atmosphere, after passing it through a scrubber to avoid alcohol vapour losses with the gas.

5. DISTILLATION:

There are various multi-pressure (MPR) distillation process under the above systems & applies various heat integration methods, for the optimal economic operation of the plant. Multi-pressure distillation system has six to seven distillation columns operating at various pressure conditions. Heat energy from columns operating under high pressure is utilized for columns operating under low pressure to optimize the operation for energy consumption. Process description for the process is briefly explained below.

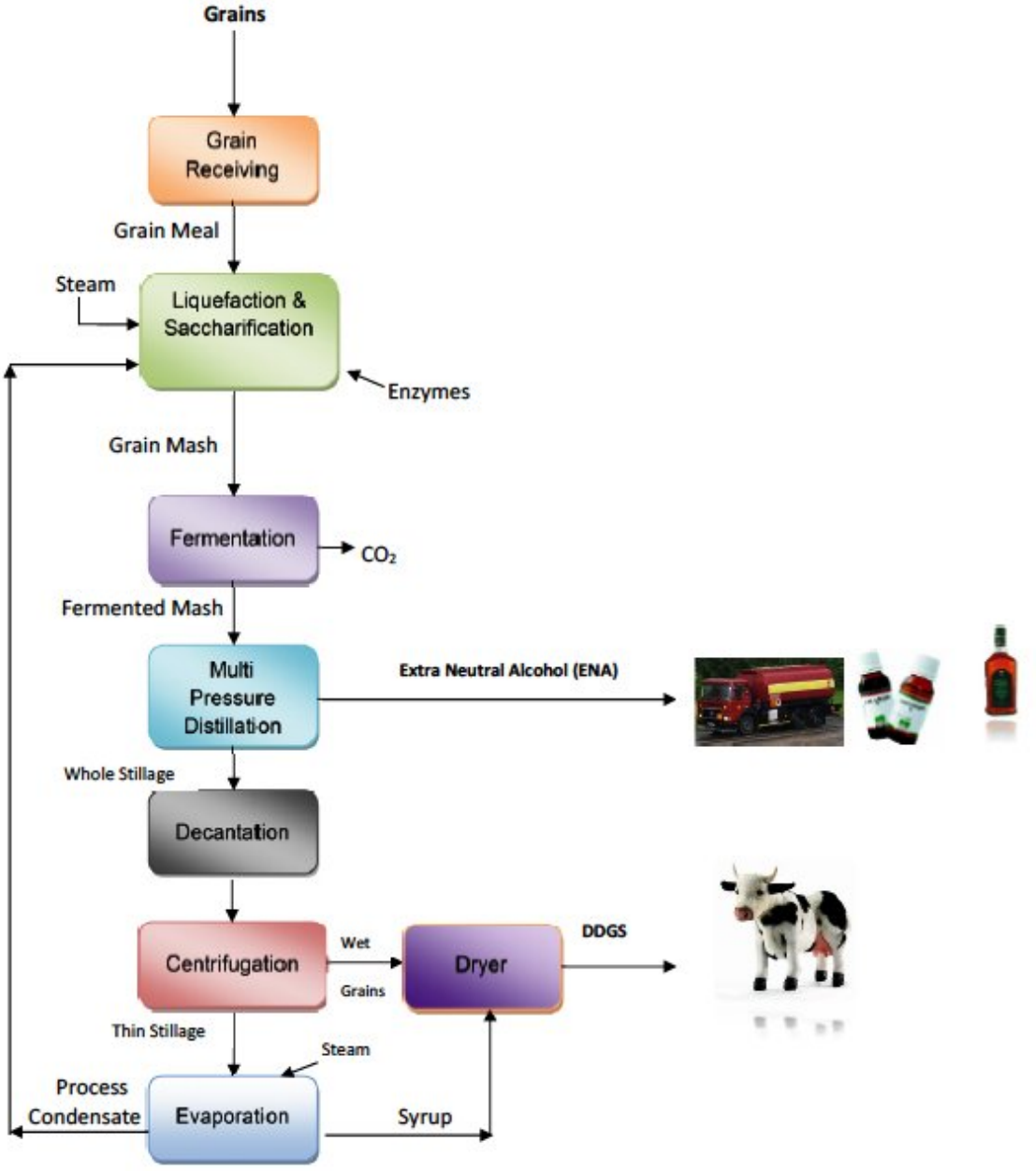
Analyser column	Operates under vacuum.
Pre-rectifier column with Stripper	Operates under vacuum
Extractive column	Operates at atmospheric vacuum
Rectifier cum Exhaust column	Operates under pressure
Recovery column	Operates at atmospheric pressure
Simmering column	Operates at atmospheric pressure

Fermented wash after partially being heated in a Beer Heater is further heated in the Fermented Wash pre heater to achieve the desired temperature and then fed at the top of the Analyzer column. Analyzer column is provided with re-boiler. Top vapours of Analyser column containing all the alcohol in the wash are sent to pre-rectifier column. Rest of the fermented wash flows down the Analyzer column and is taken out as spent wash from Analyzer column bottom. Low boiling impurities are concentrated in the pre-rectifier column. A draw of impure alcohol is taken out from the top of the pre-rectifier column.

RS draw is taken from the top of the pre-rectifier column, which further is sent to extractive column. Dilution water in the ratio of 1:9 is fed to this column. The extractive column operates on the principle of inversion of relative volatility. Low boiling impurities are separated in the purifier column & bottom is sent to Rectifier cum Exhaust column. The rectifier/exhaust column concentrates the ethanol to 96% v/v. the high-grade spirit is drawn from the upper trays of the rectification column. Fusel oil build up is avoided in the rectifier cum exhaust column by withdrawing side streams (fusel oils). These are sent to 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 recover alcohol,

The High spirit draw from the rectifier column is sent to the Simmering column where methanol is separated in the form of a cut from the top and ENA is taken out from the bottom. ENA drawn from the Simmering column is taken to the receiver after cooling in ENA cooler. The steam consumption of this set-up would be of about 3 kg/1 of total spirit and the overall impure spirit cut is of about 5% v/v of total spirit.

EXTRA NEUTRAL ALCOHOL – THE PROCESS AT A GLANCE



PLANT GENERAL LAYOUT

The plant general layout has been designed to provide a rational disposition of production facilities, material logistics facilities, auxiliary & ancillary facilities and plant utilities & services. A properly designed layout is obviously essential for operational efficiency, plant economy and saving of capital cost.

In developing the plant general layout, the factors which have been taken into consideration for appropriate flow of process materials are indicated below:

i) Economical and uninterrupted receipt of major incoming materials, in plant movement of product / by-product without hindrance and minimum counter-flow of materials particularly inside the production shop in which major equipment is located.

ii) Logical locational arrangement of the proposed Units, supporting facilities, plant services and ancillary facilities so as to ensure minimum capital and operating costs.

iii) Compactness of the plant layout minimizing inter plant building for processing materials.

A Plant Layout of the proposed plant is presented in Figure-3.0.

FIRE PROTECTION SYSTEM

A small spark of fire may result into loss of machines and the damage by fire may result high economic losses as also lose of life. These types of losses can be avoided by preventing and controlling the fire instantly for which a core emergency team will be established, consisting of personal trained in various emergency procedures including fire fighting. This team would be in readiness 24x7, since the plant would be operating round the clock in 3 shifts.

PROCEDURE FOR EXTINGUSHING FIRE

The following steps will be taken in case of an incident of fire.

As soon as any fire is detected or any alarm is triggered, the core learn will immediately rush to the location of fire and commence their emergency operation as per the standard procedure.

Key senior personal informed by walkie – talkie and the nearest fire brigade station will also be informed over telephone.

FIRE 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 has been planned to meet the above objective. The complete fire protection system will comprise of the following.

a) Detection and alarm

Automatic / manual fire detection & alarm system.

B) Ring Hydrant

Fire hydrant will be provided at all-around in the plant Norms.

c) Portable Fire extinguishers

Various areas of the plant will have one or the more of the above system depending upon the particular nature of risk involved in that area.

d) Portable Chemical Fire Extinguishers

These are intended as a first line of defense, and hence will be stationed as strategic location in different building and also for outdoor facilities. Portable fire extinguishers will be foam type, carbon dioxide type and multipurpose dry chemical (MPDC) type.

e) Fire Detection and Alarm System

Fire detection and alarm system, would be an effective means of detection visual indication of fire location and audible alarm of any fire at its incipient stage. This system will comprise fire alarm panels, automatic fire detectors, manual cell points and fire siren (hooter)
The main fire alarm panel will provide both visual and audible alarm of fire in any protected area of the plant.

Manual break glass type fire alarms will be provided at strategic locations where high hazards exit.

Automatic fire detectors will be provided for coal handling areas and in plant areas such as control rooms, switchgear rooms, cable galleries etc.

Sources of water for fire fighting

The following two sources of water have been considered for fire fighting.

- Overhead tank
- Raw water reservoir

FIRE FIGHTING WITH FIRE EXTINGUISHERS

To deal with fire – other then carbonaceous fires, which can be dealt with by water – suitable fire extinguishers are required to do the job effectively. It is therefore necessary to keep adequate number of extinguishers in readiness at easily approachable places. Adequate number of fire stations would be.

- Further other spray groups form the system will be diverted to the spot.
- In case of fire in the belt will be cut near the burning portion to save the remaining parts.

After extinguishing the fire, the area will be well prepared for reuse.

3.5 EQUIPMENT & OTHER MATERIAL SUPPLIERS

The company has already appointed the PRAJ as a turnkey supplier of plant and machinery along with the erection and installation till commercial run of the plant. PRAJ a well-known suppliers with good track record of supplying the machinery. The list of equipment suppliers of the company is as follows:

Table 2: List of Equipment Suppliers

Sl. No	Particulars	Supplier
1	Distillation	PRAJ
2	Boilers	PRAJ

3.5.1 ABOUT PRAJ

PRAJ is a well experience player

The PRAJ well experienced in this line of business. PRAJ has been into the business of manufacturing and supplying alcohol based chemical plants for the past 25 years.

Praj is a global Indian company that offers innovative solutions to significantly add value in bio-ethanol, alcohol, brewery plants, process equipment and water and wastewater treatment systems for customers, worldwide. Praj is a knowledge based company with expertise and experience in Bioprocesses and engineering.

Praj serves the entire value chain for processing of alcohol/ethanol as well as beer production, from feedstock handling to fermentation, distillation and waste water treatment and re-utilization. The solutions are end-to-end and comprehensive. Praj also offers water & wastewater treatment solutions for various applications with a

focus on recycle, reuse, reduce and recover. Praj has over 450 references in more than 60 countries across 5 continents with its own offices in Bangkok (Thailand), Johannesburg (South Africa) and Sharjah (UAE), apart from India. Praj is also present in USA, The Netherlands, Brazil, Colombia and Guatemala. The list of projects executed by PRAJ is as follows:

Table 3: Completed Projects by PRAJ

Sl. No	Company Name	Country	Liters/Day	Feed Stock	Category of Plant
1	Bajaj Hindustan Limited	India	160000	Molasses	Ethanol Plant
2	Balarampur Chini Mill	India	60000	Molasses	Ethanol Plant
3	Shakumbari Sugars and allied services	India	316000	Molasses	Multi Pressure Distillation
4	Rampur Distillery Limited	India	80000	Grains	Beverage
5	Bannari Amman Sugar Limited	India	80000	Molasses	Distillery
6	Tata Chemicals Limited	India	33000	Sweet Sorghum Juice	Ethanol Plant
1	CNT Wine and Liquor company	Thailand	75000	Molasses	Ethanol Plant
2	Danisco Sugar GmbH	Germany	220000	Beet Syrup	
3	Biowanzo S.A	Belgium	758000	Grain	Bioethanol Plant
4	British Sugar Plc	UK	206000	Beet Syrup	Bioethanol Plant
5	Consolidated Distillary Limited	Phillipines	110000	Molasses	Multi Pressure Distillation
6	La Tondena Distillers Inc.	Phillipines	225000	Molasses	Alcohol Plant
7	Pelwatte sugar Distilley Pvt. Limited	Srilanka	33000	Molasses	Ethanol Plant
8	Bilfinger Berger Services Pvt. Ltd	Australia	4400	Hydrous Alcohol	Ethanol Plant
9	Koney Seker Sanayi Ve Ticaret A.S	Turkey	280000	Beet Syrup	
10	Cilion Inc.	Keyes, USA	600000	Corn	Ethanol Plant
11	Ingenio Mayaguez S.A	Colombia	150000	Molasses	Ethanol Plant
12	Ingenio Risaralda	S.A	100000	Molasses	Ethanol Plant
13	Incauca S.A	Colombia	300000	Molasses	Sugar Cane juice/Syrup
14	Manuelite S.A.	Colombia	250000	Molasses	Sugar Cane juice/Syrup
15	Sucromiles S.A	Colombia	75000	Molasses	Fluidized Bed

Table 3: Completed Projects by PRAJ					
Sl. No	Company Name	Country	Liters/Day	Feed Stock	Category of Plant
					Evaporation Plant
16	Presscane Limited	Malawi	60000	Molasses	Ethanol Plant
17	Royal Swaziland Sugar Corporation	Swaziland	136000	Molasses	Beverage Alcohol Plant
18	Khon Kaen Sugar Co. Ltd	Thailand	140000	Hydrous Alcohol	Ethanol Plant
19	Gasohol de EL Salvador	EI Salvador	320000	Hydrous Alcohol	Ethanol Plant
20	Louisiana Green Fuels LLC	USA	250000	Molasses	Ethanol Plant

3.5.2 EPC CONTRACT

EPC (Engineering, Procurement and Construction) Contract

It is a common form of contracting arrangement within the construction industry. Under an EPC contract, the contractor will design the installation, procure the necessary materials and construct it, either through own labour or by subcontracting part of the work. The contractor carries the project risk for schedule as well as budget in return for a fixed price, called lump sum depending on the agreed scope of work.

The major advantages of the EPC contract are as follows

- The owner puts in minimum efforts for his project and, so, has less stress
- EPC gives the owner one point contact. It is easy to monitor and coordinate
- It is easy for the owner to get post-commissioning services
- EPC way ensures quality and reduces practical issues faced in other ways
- Owner is not affected by the market rise
- Investment figure is known at the start of the project

Besides all these in an EPC contract the owner also defining the followings:

- Scope and the specifications of the work
- Quality
- Project duration, and
- Cost

The cost that is the price to be paid to the EPCC will be negotiated and finalized and paid in mutually agreed installments.

EQUIPMENT LIST

1. GRAIN RECIEPT & CLEANING, MILLING & FLOUR HANDLING SECTION

I	SECTION	GRAIN RECEIPT / CLEANING SECTION	QTY.
		Capacity – 20 TPH No. of Hours Operation Per Day – 8-10	
1.	Receiving Hopper	Duty – To feed Grains to Chain Conveyor Bags to be dumped manually in the hopper. Safety Grill on the top Manual Slide Gate at Bottom. Provided with hood on top for deducting.	1
2.	Chain Conveyer	Duty – For feeding grains to Drum Cleaner Capacity – 20 TPH	1
3.	Drum Cleaner	Duty – For screening the impurities. Capacity – 20 TPH	1
4.	Bucket Elevator #1	Duty – For Feeding Grains to Storage Silos Capacity – 20 TPH MOC-Mild steel,	1
II	SECTION	GRAIN STORAGE SECTION	QTY.
1.	Bulk Storage GIC Silos	Flat Bottom Silos Capacity – 3500 MT	2
III	**SECTION**	**COMMON SYSTEMS FOR SECTION I & II**	
1.	Electrical MCC Panel	Starter Panel for all Electrical drives. With Necessary interlocks, Mimic, and control push button station.	1
2.	Electrical	Power cabling from MCC to field drive. Local push button station for all the drives.	LOT
3.	Ducting Chutes & Supports	All the equipment supports, ducting / piping connection between the equipment	LOT

IV	SECTION	MILL FEED, MILLING, FLOUR SIEVING	QTY.
		Capacity – 10 TPH No. of Hours Operation / Day :– 16-18	
1.	Silo Discharge Conveyor	Duty – For Discharging the grains from silos Capacity – 10 TPH	1
2.	Bucket Elevator #2	Duty – For Feeding Grains to Milling Section Capacity – 10 TPH	1
3.	Classifier	Capacity – 10 TPH With Aspiration System- Cyclone, Blower Rotary Airlock Valve at Bottom	1
4.	Magnetic Separator	Duty – For screening the ferrous material Capacity – 10 TPH	1
5.	Destoner	Duty – To remove the stones from grain Capacity – 10 TPH Make: Buhler	1
6.	Hammer Mill Feed Hopper	Duty – for Feeding Hammer Mill Accessories – High Level Switch Vibratory Feeders fitted at the bottom of hoppers for controlled feeding to the mills.	1
7.	Hammer Mill	Capacity – 10 TPH Make – Buhler Standby Mill – Local	1+1
8.	Screw Conveyor #1	Duty - To feed flour from hammer mill discharge to Bucket Elevator # 3 Capacity – 10 TPH	1
9.	Bucket Elevator # 3	Duty – For Elevating flour to feed Flour Sifter. Capacity – 10 TPH	1
10.	Sieving Machine	Duty – To remove oversize material from floor Capacity – 10 TPH (Oversize flour shall be diverted to buffer hopper of hammer mill)	1
11.	Screw Conveyor #2	Duty – To feed flour from Sifter discharge to Flour Storage Silos. Capacity – 10 TPH	1
V	SECTION	FLOUR STORAGE, FLOUR WEIGHING	QTY.
		Capacity – 7 TPH No. of Hours Operation / Day – 24	

1.	Flour Storage Silo	Duty – for Storing Grain Flour for 8 hours. Capacity – 55 Tons of Flour, MOC– Mild steel with high & Low level switch Bin activator fitted at bottom for smooth discharge.	1
2.	Screw Conveyor # 3	Duty - To feed flour to bucket elevator # 4 Capacity – 7 TPH,	1
3.	Bucket Elevator # 4	Duty – For Elevating Stored flour to Weighing system. Capacity – 7 TPH,	1
4.	Buffer Hopper	Duty – To Feed flour to Weigh Hopper.	1
5.	Weigh Hopper	Duty: To weigh Material @ 7 TPH Duty – Weighing, Accessories – Load cells with Microprocessor based programmable batch controller with built in batch counter and totalizer. Electro Pneumatic slide gate at discharge.	1
6.	Discharge Hopper with Screw Feeder	Duty – To feed Premasher Hopper Cap. – 1.0 Ton. Screw Feeder Capacity – 7.0 TPH,	1
VI	SECTION	COMMON SYSTEMS FOR SECTION I & II	
1.	Flour Dust Extraction System	Duty – To avoid dusting at various points in flour handling section and to recycle the flour to buffer hopper of flour weighing system.	1
2.	MCC Panel for Milling	Starter Panel for all Electrical drives.	1
3.	PLC Control Panel	To operate the grain milling system in desired sequence in Auto Mode. PC and PLC based Control System SCADA is considered for Display of Graphics	1
4.	Electrical	Power Cabling from MCC to field drive. Local push button station for all the drives Cable trays as per layout.	LOT
5.	Ducting Chutes & Supports	All the equipment supports, ducting / piping connection between the equipment	LOT

2 Liquefaction

Praj Scope related to Liquefaction is as given in following table

a. Critical Items :-

Praj Scope Includes :

O - Operating Quantity , S - Standby Quantity

Sr. No.	Item	Technical Specification	MOC	O	S
1	Liquefaction Tank with sparger	Type-Cylindrical/ vertical with conical Top & Bottom, Gross Volume :- 56 m^3	AISI 304	1	0
2	Caustic Dosing tank	Type : Cylindrical/ vertical with flat Top &sloping Bottom Gross Volume –1 m^3	MS	1	0
3	Recycle Stream collection tank with sparger	Type : Type-Cylindrical/ vertical Gross Volume – 4 m^3	AISI 304	1	0
4	Liquefying Enzyme Dosing Tank	Type :Vertical Gross Volume:- 0.5 M^3	AISI 304	1	0

b. Bought out Equipment :-

Praj Scope Includes :

O - Operating Quantity , S - Standby Quantity

Sr. No.	Item	Technical Specification	MOC	O	S
1.	Premasher	Ribbon Mixer Type	AISI 304	1	0
2.	Agitator for Liquefaction tank	Type :Top Entry	AISI 304	1	0
3.	Caustic dosing pump	Type :Centrifugal	CI	1	0
4.	Liquefaction tank pump	Type :Centrifugal	Wetted Parts - CF8	1	1
5.	Recycle stream collection tank transfer pump	Type :Centrifugal	Wetted Parts - CF8	1	1
6.	Slurry cooler -I	Type : Wide Gap PHE	Frame - MS, Plate - AISI 316	1	1

b. Bought out Equipment :-

Praj Scope Includes :

O - Operating Quantity , S - Standby Quantity

Sr. No.	Item	Technical Specification	MOC	O	S
7.	Liquefying Enzyme dosing pump with motor	Type :metering	Standard	1	0

3 Fermentation

Praj Scope related to Fermentation is as given in following table

a. Critical Items :-

Praj Scope Includes :

O - Operating Quantity , S - Standby Quantity

Sr. No.	Item	Technical Specification	MOC	O	S
1.	Air Filter Frame	PRAJ Standard	SS 304	1	0
2.	Antifoam Dosing Tank	Type :Cylindrical, vertical, Flat Top & Sloping Bottom Cap : 1 m^3	Mild Steel	1	0
3.	CO_2 Scrubber	Tray Type :Sieve	AISI 304	1	0
4.	Liquid Separator for Air Blower	PRAJ Standard	AISI 304	1	0
5.	Acid Dosing Tank	Type :Cylindrical, vertical, Flat Top & Sloping Bottom Cap : 1 m^3	Mild Steel	1	0
6.	Nutrient Dosing Tank	Type :Cylindrical, vertical, Dish Top & Bottom Cap : 1.5 m^3	AISI 304	1	0
7.	Saccharifying&Nutrase Enzyme Dosing Tank	Type :Cylindrical, vertical Shell with Flat Top & Bottom Cap : 0.5 m^3	AISI 304	2	0

b. Site Fabricated Equipment :-

Praj Scope Includes :

O - Operating Quantity , S - Standby Quantity

Sr. No.	Item	Technical Specification	MOC	O	S
1.	CIP Tank for Fermentation (Common for Fermentation & Liquefaction Section)	Type :Cylindrical, Vertical, Conical Top & Sloping Bottom, Capacity Gross :10 m^3	Mild Steel	1	0
2.	Pre fermenter/Yeast Activation Vessel with Air sparger	Type :Cylindrical, vertical, Conical Top & Flat Sloping Bottom, Capacity Gross : 92 m^3	SS 304	1	0
3.	Fermenter	Type :Cylindrical, vertical, Conical Top & Flat Sloping Bottom, Capacity Gross : 460 m^3	SS 304	3	0
4.	Beer well/Wash charger/ wash holding	Type :Cylindrical, Vertical, Conical Top & flat Sloping Bottom, Capacity Gross : 460 m^3	SS 304	1	0
5.	Sealing water Tank Air Blower	Type :Cylindrical, vertical, Conical Top & Flat Sloping Bottom, Capacity Gross : 0.5 m^3	Mild Steel	1	0
6.	Sealing water Tank Process Pump	Type :Cylindrical, vertical, Conical Top & Flat Sloping Bottom, Capacity Gross : 0.5 m^3	Mild Steel	1	0

c. Bought out Equipment :-

Praj Scope Includes :-

O - Operating Quantity , S - Standby Quantity

Sr. No.	Item	Technical Specification	MOC	O	S
1.	Agitator for Pre-Fermenter with Motor	Type : Side Entry	AISI 304	1	0
2.	Agitators for Fermenters with Motors	Type :Top Entry	AISI 304	3	0
3.	Agitator for Nutrient Dosing Tank with Motor	Type :Top Entry	AISI 304	1	0
4.	Agitators for Beer well with Motors	Type :Top Entry	AISI 304	1	0
5.	Fermenter Recirculation Pump	Type :Centrifugal Type	Wetted Parts - CF8	3	0
6.	Motor	Type :Non flame proof		3	0
7.	Pre fermenter/YAV transfer pump	Type :Centrifugal Type	Wetted Parts - CF8	1	1
8.	Motor	Type :Non flame proof		1	1
9.	Wash Transfer Pump	Type :Centrifugal Type	Wetted Parts - CF8	1	1
10.	Motor	Type :Non flame proof		1	1
11.	Air Blower	Type :Water Ring Air Blower	CI	1	1
12.	Motor	Type :Non flame proof		1	1
13.	Filter for Air Blower	HEPA	MS Frame	1	0
14.	Antifoam Dosing Pump	Type :Centrifugal Type	CI	1	0

c. Bought out Equipment :-

Praj Scope Includes :-

O - Operating Quantity , S - Standby Quantity

Sr. No.	Item	Technical Specification	MOC	O	S
15.	Motor	Type :Non flame proof		1	0
16.	CIP Pump for fermentation	Type :Centrifugal Type	Wetted Parts - CF8	1	0
17.	Motor	Type :Non flame proof		1	0
18.	Nutrient Dosing Pump	Type :Centrifugal Type	Wetted Parts - CF8	1	0
19.	Motor	Type :Non flame proof		1	0
20.	Acid Dosing Pump	Type :Centrifugal Type	Wetted Parts - CF8	1	0
21.	Motor	Type :Non flame proof		1	0
22.	Saccharifying&Nutrase Enzyme Dosing Pump	Type :Metering Pump	Wetted Parts - CF8	2	0
23.	Cleaning Nozzles for Fermenters	Self-Operated with 360 degree rotation	AISI 304	3	0
24.	Cleaning Nozzles for Prefermentor	Gyro Type	AISI 304	1	0
25.	Cleaning Nozzle for Beerwell/wash charger/wash holding tank	Self-Operated with 360 degree rotation	AISI 304	1	0
26.	Fermented Wash Coolers	Type :Plate Heat Exchanger	Frame: MS, Plates: SS 316	3	0
27.	Prefermentor Cooler	Type :Plate Heat Exchanger	Frame: MS, Plates: SS 316	1	0
28.	Sealing water cooler Air blower	Type :Plate Heat Exchanger	Frame: MS, Plates: SS 316	1	0

c. Bought out Equipment :-

Praj Scope Includes :-

O - Operating Quantity , S - Standby Quantity

Sr. No.	Item	Technical Specification	MOC	O	S
29.	Sealing water cooler Process pump	Type :Plate Heat Exchanger	Frame: MS, Plates: SS 316	1	0
30.	Fermenter Safety System	Breather Valve	AISI 304	3	0

4 Distillation - Wash To ENA Mode

Praj Scope related to Distillation is as given in following table

a. Critical Items :-

Praj scope of supply includes following :

O - Operating Quantity , S - Standby Quantity

Sr. No.	Item	Technical Specification	MOC	O	S
1.	Analyzer Column	Operating :Vacuum, Column Dia.: 1600 mm, Tray Spacing :750 mm, Tray Type :Rh Grid	Shell :AISI 304 Trays: AISI 304	1	0
2.	Degasifying Column	Operating :Vacuum, Column Dia.:750 mm, Tray Spacing :750 mm, Tray Type :Sieve	Shell :AISI 304 Trays: AISI 304	1	0
3.	Pre-Rectifier Column	Operating :Pressure, Column Dia.:1200 mm, Tray Spacing :250 mm, Tray Type :Combination of Sieve & Bubble cap	Shell :AISI 304 Trays: AISI 304	1	0
4.	Extractive Distillation Column	Operating :Vacuum, Column Dia.:1100 mm, Tray Spacing :300 mm, Tray Type : Sieve Tray	Shell :AISI 304 Trays: AISI 304	1	0

Sr. No.	Item	Technical Specification	MOC	O	S
5.	Rectifier Cum Exhaust Column	Operating :Pressure, Column Dia.:1600 mm, Tray Spacing :250 mm, Tray Type :Combination of Sieve & Bubble cap	Shell: AISI 304, Trays: T1 T37: AISI 304, T38 T72: Dow Cu,Downcomer: AISI 304	1	0
6.	Recovery Column	Operating :Atmospheric, Column Dia.: 550 mm, Tray Spacing :250 mm, Tray Type : Sieve Tray	Shell :AISI 304 Trays: AISI 304	1	0
7.	Simmering Column	Operating :Atmospheric, Column Dia.: 850 mm, Tray Spacing :250 mm, Tray Type :Sieve Tray	Shell :AISI 304 Trays: Dow Cu	1	0
8.	Alcohol Scrubber	Operating :Vacuum, Column Dia.:450 mm, Tray Spacing :300 mm, No. of Trays :5, Tray Type :Sieve	Shell :AISI 304 Trays: AISI 304	1	0
9.	Analyzer Column Reboilers	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
10.	Pre-Rectifier Column Reboiler	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0

Sr. No.	Item	Technical Specification	MOC	O	S
11.	ED Column Reboiler	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
12.	Rectifier Cum Exhaust Column Reboiler	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
13.	Simmering Column Reboiler	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
14.	Analyzer Column Vent Condenser	Type :Shell and Tube Heat Exchanger	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
15.	AnalyzerReboiler Vent Condenser	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
16.	Degasifying Column Condenser - I	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0

Sr. No.	Item	Technical Specification	MOC	O	S
17.	Degasifying Column Condenser - II	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
18.	ED Condenser - I	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
19.	ED Condenser - II	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
20.	Recovery Column Condenser - I	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
21.	Recovery Column Condenser - II	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
22.	Simmering Column Condenser - I	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0

Sr. No.	Item	Technical Specification	MOC	O	S
23.	Simmering Column Condenser - II	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
24.	Simmering Column Condenser - III	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
25.	ED Feed Cooler	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
26.	Pre-Rectifier FO Cooler	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
27.	Pre-Rectifier PCV Condenser	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
28.	Product ENA Cooler	Type :Shell and Tube Heat Exchanger,	Shell : Dow Copper Tubes: Dow Copper	1	0

Sr. No.	Item	Technical Specification	MOC	O	S
29.	Rectifier ENA Cooler	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
30.	Rectifier FO Cooler	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
31.	Rectifier PCV Condenser	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
32.	Simmering Reboiler Vent Condenser	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
33.	TA Cooler	Type :Shell and Tube Heat Exchanger,	Shell: AISI 304, Tubes : AISI 304, Tube Sheet: AISI 304	1	0
34.	Recovery LFO/HFO Cooler	Double Pipe Heat Exchanger	AISI 304	2	0
35.	Analyzer Flash Tank	Type :Cylindrical Shell With Top and Bottom Dished End,	AISI 304	1	0

Sr. No.	Item	Technical Specification	MOC	O	S
36.	FO Washing Tank	Type :Cylindrical Shell With Top and Bottom Dished End,	AISI 304	1	0
37.	Pre-Rectifier Feed Tank	Type :Cylindrical Shell With Top and Bottom Dished End,	AISI 304	1	0
38.	Pre-Rectifier Reflux Tank	Type :Cylindrical Shell With Top and Bottom Dished End,	AISI 304	1	0
39.	Recovery Feed Tank	Type :Cylindrical Shell With Top and Bottom Dished End,	AISI 304	1	0
40.	Rectifier Reflux Tank	Type :Cylindrical Shell With Top and Bottom Dished End,	AISI 304	1	0
41.	Steam Condensate Tank	Type :Cylindrical Shell With Top and Bottom Dished End,	Mild Steel	1	0
42.	Sealing Water Collection Tank	Type :Cylindrical Shell With Top and Bottom Dished End	Mild Steel	1	0
43.	FO Decanter for PRC	PRAJ Standard	AISI 304	1	0
44.	FO Decanter for Recovery Column	PRAJ Standard	AISI 304	1	0
45.	Gas Liquid Separator C-1401 / 1402	PRAJ Standard	AISI 304	1	0
46.	Manometer Bottle for Recovery Column	PRAJ Standard	AISI 304	1	0

Sr. No.	Item	Technical Specification	MOC	O	S
47.	Manometer Bottle for Simmering Column	PRAJ Standard	AISI 304	1	0
48.	Mixing Bottle for ED Column	PRAJ Standard	AISI 304	1	0
49.	TA Mixing Bottle	PRAJ Standard	AISI 304	1	0
50.	Vapor Bottle	PRAJ Standard	AISI 304	Lot	0

b. Boughtout Equipment :-

Praj scope of supply includes following :

O - Operating Quantity , S - Standby Quantity

Sr. No.	Item	Technical Specification	MOC	O	S
1.	Pre-Rectifier Feed Preheater	Type :Plate Heat Exchanger	Frame:MS, Plates:SS 316	1	0
2.	DM Water Preheater	Type :Plate Heat Exchanger	Frame:MS, Plates:SS 316	1	0
3.	Spent Lees Cooler	Type :Plate Heat Exchanger	Frame:MS, Plates:SS 304	1	0
4.	Rectifier Feed Preheater	Type :Plate Heat Exchanger	Frame:MS, Plates:SS 316	1	0
5.	Vacuum pump Sealing Water Cooler	Type :Plate Heat Exchanger	Frame:MS, Plates:SS 304	1	0
6.	Analyser Bottom Transfer Pump	Type :Centrifugal Type,	Wetted Parts - CF8	1	1
7.	Motor for Analyser Bottom Transfer Pump	Type :Flame proof		1	1

Sr. No.	Item	Technical Specification	MOC	O	S
8.	Flash Tank Bottom Transfer Pump	Type :Centrifugal Type,	Wetted Parts - CF8	1	1
9.	Motor for Flash Tank Bottom Transfer Pump	Type :Flame proof		1	1
10	ED Bottom Transfer Pump	Type :Centrifugal Type,	Wetted Parts - CF8	1	1
11	Motor for ED Bottom Transfer Pump	Type :Flame proof		1	1
12	FO Washing Pump	Type :Centrifugal Type,	Wetted Parts - CF8	1	1
13	Motor for FO Washing Pump	Type :Flame proof		1	1
14	ENA Transfer Pump	Type :Centrifugal Type,	Wetted Parts - CF8	1	1
15	Motor for ENA Transfer Pump	Type :Flame proof		1	1
16	Pre-Rectifier Feed Pump	Type :Centrifugal Type,	Wetted Parts - CF8	1	1
17	Motor for Pre-Rectifier Feed Pump	Type :Flame proof		1	1
18	Pre-Rectifier Lees Transfer Pump	Type :Centrifugal Type,	Wetted Parts - CF8	1	1
19	Motor for Pre-Rectifier Lees Transfer Pump	Type :Flame proof		1	1
20	Pre-Rectifier Reflux Pump	Type :Centrifugal Type,	Wetted Parts - CF8	1	1

Sr. No.	Item	Technical Specification	MOC	O	S
21	Motor for Pre-Rectifier Reflux Pump	Type :Flame proof		1	1
22	Recovery Bottom Transfer Pump	Type :Centrifugal Type,	Wetted Parts - CF8	1	1
23	Motor for Recovery Bottom Transfer Pump	Type :Flame proof		1	1
24	Recovery Feed Pump	Type :Centrifugal Type,	Wetted Parts - CF8	1	1
25	Motor for Recovery Feed Pump	Type :Flame proof		1	1
26	Rectifier Lees Transfer Pump	Type :Centrifugal Type,	Wetted Parts - CF8	1	1
27	Motor for Rectifier Lees Transfer Pump	Type :Flame proof		1	1
28	Rectifier Reflux Pump	Type :Centrifugal Type,	Wetted Parts - CF8	1	1
29	Motor for Rectifier Reflux Pump	Type :Flame proof		1	1
30	Sealing Water Recycle Pump	Type :Centrifugal Type	CI	1	1
31	Motor for Sealing Water Recycle Pump	Type :Flame proof		1	1
32	Steam Condensate Transfer Pump	Type :Centrifugal Type,	CI	1	1

Sr. No.	Item	Technical Specification	MOC	O	S
33	Motor for steam Condensate Transfer Pump	Type :Flame proof		1	1
34	Vacuum Pump	Type :Water Ring Type	CI	1	1
35	Motor for vacuum Pump	Type :Flame proof		1	1

Note- Water header for condenser cleaning to be provided.

4 INTEGRATED EVAPORATION PLANT (INTEGRATED 2FF +FIN)

Sr. No.	Equipment	Description	Material of Construction	Qty
1.	Falling Film effect	Designed based on Falling film principle Construction: Shell & Tube Type.	Shell: SS 304 Tubes : SS 304 Tube sheet: SS 304	2
2.	Finisher	Designed based on Forced circulation Principle Construction: Shell & Tube Type.	Shell: SS 304 Tubes : SS 304 Tube sheet: SS 304	**1**
3.	Vapour Liquid Separator	Construction: Vertical, with tangential entry for effective vapour separation.	Shell : SS 304	3
4.	Surface Condenser	Shell and Tube heat exchanger	Shell : SS 304	1
5.	Feed Tank-Evaporation	Cylindrical / Vertical Shell with Dished Ends Cap:- 2 m^3	SS 304	1
6.	Process condensate tank	Cylindrical / Vertical Shell with Dished Ends Cap:- 1 m^3	SS 304	1
7.	Concentrated Product Tank	Cylindrical / Vertical Shell with Dished Ends Cap:- 1 m^3	SS 304	1

4 INTEGRATED EVAPORATION PLANT (INTEGRATED 2FF +FIN)

Sr. No.	Equipment	Description	Material of Construction	Qty
8.	Sealing water Tank vacuum pump	Cylindrical / Vertical Shell Cap : 0.5 m^3	MS	1
9.	Thin slop transfer pump	Type - Centrifugal Pump	Wetted Parts : CF8	1+1
10.	Feed Pump	Type - Centrifugal Pump	Wetted Parts : CF8	1+1
11.	Recirculation cum Transfer pump	Type - Centrifugal Pump	Wetted Parts : CF8	2
12.	Recirculation pump finisher	Type - Centrifugal Pump	Wetted Parts : CF8	1
13.	Transfer pump finisher	Type - Centrifugal Pump	Wetted Parts : CF8	1
14.	Process condensate pump	Type - Centrifugal Pump	Wetted Parts : CF8	1+1
15.	Product transfer Pump	Type - Centrifugal Pump	Wetted Parts : CF8	1+1
16.	Steam condensate pump -evaporation	Type - Centrifugal Pump	CI	1
17.	Vacuum pump- Evaporation	Water Ring Type	CI	1+1
18.	Vacuum pump sealing water pump	Type - Centrifugal Pump	Wetted Parts : CF8	1
19.	Vacuum pump sealing water cooler	Plate type heat exchanger	Plate : SS304 Frame : MS	1

5 DECANTATION SECTION

Sr. No.	Description	**Tech. Data**	M.O.C.	Qty
1.	Decanter Centrifuge	Cap : 11 m3/hr	AISI 304 Internals	1+1
2.	Thin Slop Holding Tank After Decanter	Gross Volume :- 10 m3	AISI 304	1
3.	Thin Slops Transfer Pump With none flame proof motor	Centrifugal Type	Wetted parts CF8	1+1

4.	Ribbon Mixer	Ribbon type	AISI 304	1

Note:

1. The above figures and quantities are indicative only and may undergo variation during detailed engineering.

6 Alcohol Storage

Praj Scope related to Alcohol Storage is as given in following table

a. Critical Items :-

Praj scope of supply includes following :

O - Operating Quantity , S - Standby Quantity

Sr. No.	Item	Technical Specification	MOC	O	S
1.	Flame Arrestor-ENA Daily Receiver Tank	PRAJ Standard	Mild Steel	3	
2.	Flame Arrestor-TA/IS Daily Receiver Tank	PRAJ Standard	Mild Steel	3	
3.	Flame Arrestor-ENA Bulk Storage Tank	PRAJ Standard	Mild Steel	3	
4.	Flame Arrestor-TA/IS Bulk Storage Tank	PRAJ Standard	Mild Steel	1	
5.	Flame Arrestor-FO Bulk Storage Tank	PRAJ Standard	Mild Steel	1	
6.	ENA Bulk Storage Tank Vent Condenser	Type :Shell and Tube Heat Exchanger	AISI 304	2	
7.	ENA Bulk Storage Tank Vent Condenser	Type :Shell and Tube Heat Exchanger	Mild Steel	1	

Sr. No.	Item	Technical Specification	MOC	O	S
8.	IS/TA Bulk Storage Tank Vent Condenser	Type :Shell and Tube Heat Exchanger	Mild Steel	1	

b. Site Fabricated Equipment :-

Praj scope of supply includes following :

O - Operating Quantity , S - Standby Quantity

Sr. No.	Item	Technical Specification	MOC	O	S
1.	ENA Daily Receiver	Type :Cylindrical, Vertical Shell with Conical Top and Flat Sloping, Capacity Gross : 60 m^3, Thickness, Shell :6 mm, Top Thickness :6 mm, Bottom Thickness :6 mm	Mild Steel	3	
2.	TA/IS Daily Receiver	Type :Cylindrical,Vertical Shell with Conical Top and Flat Sloping, Capacity Gross : 10 m^3, Thickness, Shell :6 mm, Top Thickness :6 mm, Bottom Thickness :6 mm	Mild Steel	3	
3.	ENA Bulk Storage Tank	Type :Cylindrical,Vertical Shell with Conical Top and Flat Sloping, Capacity Gross :800 m^3, Thickness, Shell : 6 mm, Top Thickness :6 mm, Bottom Thickness : 8 mm	Mild Steel	2	

Sr. No.	Item	Technical Specification	MOC	O	S
4.	ENA Bulk Storage Tank	Type :Cylindrical, Vertical Shell with Conical Top and Flat Sloping, Capacity Gross :400 m^3, Thickness, Shell : 3 mm, Top Thickness :3 mm, Bottom Thickness : 3 mm	AISI 304	1	
5.	IS/TA Bulk Storage Tank	Type :Cylindrical,Vertical Shell with Conical Top and Flat Sloping, Capacity Gross : 200 m^3, Thickness, Shell :6 mm, Top Thickness :6 mm, Bottom Thickness :6 mm	Mild Steel	1	
6.	FO Bulk Storage Tank	Type :Cylindrical,Vertical Shell with Conical Top and Flat Sloping, Capacity Gross : 20 m3, Thickness, Shell :6 mm, Top Thickness :6 mm, Bottom Thickness :6 mm	Mild Steel	1	

c. Boughtout Equipment :-

Praj scope of supply includes following :

O - Operating Quantity , S - Standby Quantity

Sr. No.	Item	Technical Specification	MOC	O	S
1.	ENA Transfer Cum Issue Pump	Type :Centrifugal Type	Wetted Parts - CF8	1	1
2.	Motor for ENA Transfer Cum Issue Pump	Type :Flame proof		1	1
3.	IS/TA Transfer Cum Issue Pump	Type :Centrifugal Type	Wetted Parts - CF8	1	1
4.	Motor for IS Transfer Cum Issue Pump	Type :Flame proof		1	1
5.	FO Transfer Cum Issue Pump	Type :Centrifugal Type	Wetted Parts - CF8	1	0
6.	Motor for FO Transfer Cum Issue Pump	Type :Flame proof		1	0
7.	Cooling Water Pit Recirculation Pump	Type :Centrifugal Type	Wetted Parts - CF8	1	0
8.	Motor for Cooling Water Pit Recirculation Pump	Type :Flame proof		1	0

7 Cooling Tower

Praj Scope related to Cooling Tower is as given in following table

a. Boughtout Equipment :-

Praj scope of supply includes following :

O - Operating Quantity , S - Standby Quantity

Sr. No.	Item	Technical Specification	MOC	O	S
1.	Cooling Tower Liquefaction Section	Type :Induced Draft, Heat Duty : 1800 M Cal / hr	Wooden/FRP	1	0
2.	Cooling Tower Fermentation Section	Type :Induced Draft, Heat Duty : 1200 M Cal / hr	Wooden/FRP	1	0
3.	Cooling Tower Distillation & Evaporation Section	Type :Induced Draft, Heat Duty : 6400 M Cal / hr	Wooden/FRP	1	0
4.	Cooling Water Recirculation Pump Liquefaction Section	Type :Centrifugal Type	CI	1	1
5.	Motor for Cooling Water Recirculation Pump Liquefaction Section	Type :Non flame proof		1	1
6.	Cooling Water Recirculation Pump Fermentation Section	Type :Centrifugal Type	CI	1	1
7.	Motor for Cooling Water Recirculation Pump Fermentation Section	Type :Non flame proof		1	1
8.	Cooling Water Recirculation Pump Distillation Section	Type :Centrifugal Type	CI	1	1

Sr. No.	Item	Technical Specification	MOC	O	S
9.	Motor for Cooling Water Recirculation Pump Distillation Section	Type :Non flame proof		1	1
10	Cooling Water Recirculation Pump Evaporation Section	Type :Centrifugal Type	CI	1	1
11	Motor for Cooling Water Recirculation Pump Evaporation Section	Type :Non flame proof		1	1
12	Mesh for Cooling Tower	PRAJ Standard		1	0
13	Emergency Diesel operated system	Emergency cooling water system (Diesel operated)Praj standard	CI	1	0

8 Instrument air compressor

Praj Scope related to Instrument air compressor is as given in following table

a. Bought out Equipment :- Praj scope of supply includes following :

O - Operating Quantity , S - Standby Quantity

Sr. No.	Item	Technical Specification	MOC	O	S
1	Instrument Air Compressor	Lubricated, Screw type with refrigerated type dryer		1	1
2	Motor for Instrument Air Compressor			1	1

9 Process condensate Treatment Plant

In grain operation, some process condensate will be recycled back to process without treatment and only remaining condensate will be treated in treatment plant.

For Biological System

Sr. No.	Equipment Description	MOC	Specifications	Qty.
1.	Dosing tank & Pumps	HDPE	Std	Lot
2.	Transfer pump for Equalization tank	CI	Horizontal Centrifugal	1+1
3.	Anaerobic Reactor feed pump with motor	CI	Horizontal Centrifugal	1+1
4.	Manually ignition type Flare unit	MS with internal epoxy paint & external enamel paint	Cylindrical vertical shell with flat bottom and conical top	1
5.	MBBR media	PP rings	Floating media	1 Lot
6.	Air blower	CI	Twin lobe type	1+1
7.	Tube settler media & internal supports	Media-PVC Internals -MS	Suitable	1 Lot

For UF & RO System

Sr. No.	Equipment Description	MOC	Specifications	Qty.
1.	MGF/MF feed pump	CI	Horizontal Centrifugal	1+1
2.	Multi Grade Filter	MSEP	Cylindrical vessel	1
3.	UF System	Pressurized UF, hollow fiber Membrane Elements & Pressure tubes	Suitable	1 Lot
4.	Dosing tank & Pump	HDPE	Std	Lot
5.	RO feed Pump	CI	Horizontal Centrifugal	1
6.	RO Membrane & System	Polyamide	Spiral wound membranes	Lot

Sr. No.	Equipment Description	MOC	Specifications	Qty.
7.	RO permeate transfer Pump	Impeller: SS 316	Centrifugal,	1
8.	Instrumentation	Local Indicating Panel		Lot
9.	Piping & Valves	As per PRAJ Standards		Lot
10.	Electrical	As per PRAJ Standards		Lot

Civil work to be done by Client

Sr. No.	Description	Qty	MOC
	For Biological System		
1.	Equalization Tank	1	RCC
2.	Buffer Tank	1	RCC
3.	Anaerobic Reactor	1	RCC
4.	Anaerobic Reactor Foundation	1	RCC
5.	MBBR Tank	Lot	RCC
6.	Flash Mixer	1	RCC
7.	Flocculation Chamber	1	RCC
8.	Tube Settler	1	RCC
9.	Sludge Drying Bed (Each Basin)	Lot	RCC
	For UF & RO System		
10.	Filter Feed Tank	1	RCC
11.	UF Permeate Tank	1	RCC
12.	RO Permeate Tank	1	RCC
13.	RO Reject tank	1	RCC
	Common for All		
14.	RO/UF Shed	1	As per requirement
15.	Equipment Foundations	1 Lot	Foundations for Pumps, DMF Dosing tanks etc.
16.	Equipment Foundations	1 Lot	Foundations for MF,RO Skid, Filters, Tanks etc.
17.	Laboratory cum MCC room	1	Brick Masonry

Note:

- The above parameters given are indicative and the exact parameters shall be confirmed after detail engineering.
- Intermediate storage tanks will be in civil and details of the same will be provided after detail engineering.

10 DWGS Dryer

S. N.	Equipment	MOC	Qty
(I)	DDGS DRYER		
1.	Dryer Housing	Dyer lower & upper trough in SS 304. End cover of trough Mild Steel with SS304 cladding Outer supports are in Mild Steel Base frame in Mild Steel	1 Set
2.	Rotating Steam Tube Bundle with shovels & shovels carrying angle	Tubes in Mild Steel, Tube Sheet in Mild Steel, dish ends in Mild Steel, Shovels are in SS304 and shovel carrying angles are in MS.	1Set
3.	Set of Rotary Joints	Housing in Cast Iron with standard rotary joints for steam inlet & outlet	1
4.	Steam Trap	Cast Steel with standard supply	Lot
5.	Drive Arrangement	Gear Wheel & Pinion arrangement driven by a set of drive comprising Gear Box & Motor mounted on MS base frame	1 Set
6.	Feed screw	Main screw flight with trough and end covers in SS 202 and support parts in MS	1 Set
7.	Feed conditioner	Main screw flight with trough and end covers in SS 202 and support parts in MS	1 Set
8.	Conveying screw	Main screw flight with trough and end covers in SS 202 and support parts in MS	1 Set
9.	Dosing screw	Main screw flight with trough and end covers in SS 202 and support parts in MS	1 Set
10.	Haul off Screw	Main screw flight with trough and end covers in SS 202 and support parts in MS	1 Set
11.	Discharge screw	Main screw flight with trough and end covers in SS 202 and support parts in MS	1 Set
12.	Vapour ducting	MS / SS 202 as per application.	Lot
13.	Cyclone Separator	SS 202	1 Set
14.	Rotary Air lock Valve	Mild Steel	1 Set
15.	Exhaust Vapour fan	Mild Steel	1 Set
16.	Rupture Discs	SS 304	1 Set
17.	Steam Condensate Tank	MS	1

18.	Steam Condensate transfer pump	Centrifugal MOC: CI	1+1
19.	Instrument Air Compressor	Screw Type with refrigerated Air Drier	1
20.	Insulation & Cladding	As per design requirement	Lot
21.	Instrumentation Control	PLC –SCADA based	1
22.	Electrical MCC Panel	MCC Panel & MCC onwards electrical along with cabling	1
(II)	COOLING AND CONVEYING		
1.	Cooling & Conveying	System comprising Air Blower with Rotary Valve, etc. in Mild Steel	1 Set
(III)	DDGS STORAGE		
1.	Product (DDGS) Storage Silo along with required Accessories and bin activator	Capacity :- 20 MT ; MOC : MS	1
(IV)	SEMI Automatic DDGS Bag filling System		
1.	Semi-Automatic DDGS Bag Filling system (Comprises of weighing, bagging, and stitching)	Type :- Semi Automatic	1

11 Electrical MCC & Onwards

Praj Scope related to Electrical MCC & Onwards is as given in following table

Section Name	Design Engg	Supply	Erection	SE	SC
Grain Silo, Handling & Milling	✓	✓	✓	✓	✓
Liquefaction	✓	✓	✓	✓	✓
Fermentation	✓	✓	✓	✓	✓
Distillation	✓	✓	✓	✓	✓
Decantation	✓	✓	✓	✓	✓
Integrated Evaporation	✓	✓	✓	✓	✓
Alcohol Storage	✓	✓	✓	✓	✓

Section Name	Design Engg	Supply	Erection	SE	SC
Process condensate Treatment Plant	✓	✓	✓	✓	✓
Dryer	✓	✓	✓	✓	✓
Cooling Towers as per Praj scope	✓	✓	✓	✓	✓
Instrument air compressor as per Praj scope	✓	✓	✓	✓	✓
Only above ground earthling - for Praj scope sections	✓	✓	✓	✓	✓

12 Structure

Praj Scope related to Structure is as given in following table

Section Name	Design Engg	Supply	Erection	SE	Model Description
Grain Milling, Flour Handling	✓	X	✓	✓	MS Structure, MS Grating, Hand Rail, Chequered Plate, Roof & Truss, Staircase, etc., as required, as per PRAJ design norms.
Liquefaction & Fermentation.	✓	X	✓	✓	MS Structure, MS Grating, Hand Rail, Roof & Truss, Staircase, etc., as required, as per PRAJ design norms.
Distillation Section & Thin Slops Evaporation section -	✓	X	✓	✓	Distillation columns supported on RCC slab and covered under roof without side cladding. - Distillation columns on civil slabs and condensers on 13.5 mt level and roof on 18 m All bay height will be as per Praj process requirements.

Section Name	Design Engg	Supply	Erection	SE	Model Description
Alcohol daily receiver	✓	X	✓	✓	Daily receivers building in RCC and completely covered with roof. Bulk storage open to atmosphere without any roof. Structure for Issue platform, Shed for Loading platform and staircase. Shed of 5 m X 5 m for tanker Loading Area
Decantation section	✓	X	✓	✓	MS Structure, MS Grating, Hand Rail, Roof & Truss, Staircase, etc., as required, as per PRAJ design norms
DWGS Dryer Section	✓	X	✓	✓	MS Structure, MS Grating, Hand Rail, Roof & Truss, Staircase, etc., as required, as per PRAJ design norms
Process condensate Treatment Plant	✓	X	✓	✓	Shed for RO plant with Roof will be provided, Side will be open to atmosphere.
Cooling water piping support as per Praj scope & battery limit	✓	X	✓	✓	
Instrument air piping support as per Praj scope & battery limit	✓	X	✓	✓	

Section Name	Design Engg	Supply	Erection	SE	Model Description
Praj scope inter connecting piping support as per battery limits	✓	X	✓	✓	

13 Civil

Praj Scope related to Civil is as given in following table

Section Name	Design Engg	Supply	Erection	SE
Grain Silo	✓	X	X	X
Grain Milling, Flour Handling	✓	X	X	X
Liquefaction & Fermentation.	✓	X	X	X
Distillation Section & Thin Slops Evaporation section	✓	X	X	X
Alcohol daily receiver & Bulk storage	✓	X	X	X
Decantation section	✓	X	X	X
DWGS Dryer Section	✓	X	X	X
Process condensate Treatment Plant	✓	X	X	X
All civil work required for Dyke/Brick Wall or Chain Link Fencing for the Alcohol Bulk Storage. laboratory, compressor room, Control room , MCC room, etc.	✓	X	X	X
Civil for Praj scope inter connecting piping support as per battery limits	✓	X	X	X

14 Piping, fitting & valves

Praj Scope related to Piping, fitting & valves is as given in following table

Section Name	Design Engg	Supply	Erection	SE	SC
Piping supports for piping within sections	✓	✓	✓	✓	✓
Painting for piping as per Praj scope & battery limit	✓	✓	✓	✓	✓
Insulation to piping as per Praj process requirement	✓	✓	✓	✓	✓
Liquefaction	✓	✓	✓	✓	✓
Fermentation	✓	✓	✓	✓	✓
Distillation	✓	✓	✓	✓	✓
Decantation & Integrated Evaporation	✓	✓	✓	✓	✓
Alcohol daily Storage & Bulk storage	✓	✓	✓	✓	✓
Process condensate Treatment Plant	✓	✓	✓	✓	✓
Dryer	✓	✓	✓	✓	✓
Cooling water piping, fitting & valves as per Praj scope & battery limit	✓	✓	✓	✓	✓
Compressed air piping, fitting & valves as per Praj scope & battery limit	✓	✓	✓	✓	✓
Praj scope inter connecting piping, fitting & valves as per Praj scope & battery limit	✓	✓	✓	✓	✓

15 Instrumentation

Praj Scope related to Instrumentation is as given in following table

Section Name	Design Engg	Supply	Erection	SE	Scope

Section Name	Design Engg	Supply	Erection	SE	Scope
Liquefaction & Fermentation	✓	✓	✓	✓	PLC Based
Distillation	✓	✓	✓	✓	PLC Based
Integrated Evaporation & Decantation	✓	✓	✓	✓	PLC Based
Dryer	✓	✓	✓	✓	PLC Based
Alcohol daily storage	✓	✓	✓	✓	No Interface with control system

Exclusion from PRAJ scope :

(Design, engineering, construction & execution of following sections will be in CLIENT scope)

- Admin. Office buildings, Security / Time Office, Workshop, Gates, Labs, MCC rooms,
- Internal Roads, Compound Wall, Drainage, Green Belt, Parks, etc.
- Guest House, Canteen, Residential quarters, if any, other building mentioned above.
- Water Treatment Plant
- Boiler section Steam pipe racks, Cable Racks, etc.
- Transformer sub-station, Cable-racks, etc.
- Any other item not specifically mentioned in Praj scope.

*****

BALANCE OF PLANT

(A) BOILER

DESIGN PARAMETERS

Sr. No	Specifications	Unit	Value
1	Capacity		
1.1	Maximum continuous rating (MCR) Inclusive of deareator steam	TPH	20
2	Pressure		
2.1	Steam pressure at Main steam stop valve outlet at MCR	Kg/cm2(g)	45
3	Fuel data		
3.1	Main fuel for MCR generation		Coal

BRIEF SCOPE OF WORK

1. Coal handling system.
2. Main Boiler 20 TPH @ 45 kg/cm2 (g)AFBC Boiler
3. Microprocessor based control system.
4. Bag filter/ESP as pollution control Equipment.
5. Ash handling system
6. Feed water storage tank, chemical dosing Tank.

Steam Piping

Sr. No.	Description	MOC	Appx Distance	Qty.
1.	HP piping from Boiler to PRDS	-	35 m	Lot
2.	LP piping from PRDS Exhaust to Distillery (@ 4.5 kg/cm2)	-	100 m	Lot
3.	Steam condensate piping from distillery plant to Boiler feed tank	MS C class	100 m	Lot
4.	PRDS from 45 kg/cm2 (g) to 4.5 kg/cm2	-	-	1

	(g)			
5.	Piping supports within plant & Yard piping	MS	-	Lot

Note: HP Steam piping will be of ASTM A106 grade B (CS seamless)

(B) TURBINE

DESIGN BASIS

Type : Straight Back Pressure Turbine

Rated Capacity : 2.0 MW

Steam Inlet Pressure : 44 Kg/ Cm2 (g)

Steam Inlet Temperature : 415 (+/- 5) degree centigrade

Exhaust Steam Pressure : 4.5 Kg/Cm2 (g)

(C) LAB EQUIPMENTS, WEIGH BRIDGE

Lab equipments will include following Lab equipments.

Tentative list is as given below

Laboratory Glass Wares-

Sr. No.	Specification	Quantity In Nos.
1.	Beakers 1060 "Borosil" make.	
	i.) Capacity 50 ml	6 Nos.
	ii.) Capacity 100 ml	10 Nos.
	iii.) Capacity 250 ml	10 Nos.
	iv.) Capacity 500 ml	6 Nos.
	v.) Capacity 1000 ml	6 Nos.
2.	Beakers -Plastic	
	i) Capacity 250 ml	6 Nos.
	ii) Capacity 1000 ml	10 Nos.
3.	Erlenmeyer conical flask with narrow mouth 4980 "Borosil" make.	
	i.) Capacity 100 ml	6 Nos.

	ii.) Capacity 250 ml	10 Nos.
	iii.) Capacity 500 ml	10 Nos.
	iv.) Capacity 1000 ml	6 Nos.
4.	Measuring cylinder 3022 "Borosil" make.	
	i.) Capacity 25 ml.	6 Nos.
	ii.) Capacity 50 ml.	6 Nos.
	iii.) Capacity 100 ml.	6 Nos.
	iv.) Capacity 250 ml.	6 Nos.
5.	Measuring cylinder -Plastic.	
	i) Capacity 250 ml	6 Nos.
	ii) Capacity 500 ml	4 Nos.
	iii) Capacity 1000 ml	4 Nos.
6.	Pipette transfer volumetric 7100 "Borosil" make.	
	i.) Capacity 5 ml.	6 Nos.
	ii.) Capacity 10 ml.	6 Nos.
	iii.) Capacity 25 ml.	6 Nos.
	iv.) Capacity 50 ml.	6 Nos.
7.	Pipette serological graduated 7079 "Borosil" make.	
	i.) Capacity 1 ml.	6 Nos.
	ii.) Capacity 2 ml.	6 Nos.
	iii.) Capacity 5 ml.	6 Nos.
	iv.) Capacity 10 ml.	6 Nos.
	v.) Capacity 25 ml.	6 Nos.
8.	Round bottom boiling flasks(distillation assembly)	
	i) Capacity 500 ml (Long neck size- B24)	6 Nos.
	ii) Capacity 1000 ml (Long neck size-B24)	6 Nos.
9.	Condenser adapter and bend for distillation assembly, above size B24. "Borosil" make.	10 Nos.
10.	Liebig condenser both cone sizes B-24	6 Nos.
11.	Still head coil condenser size B-24	6 Nos.
12.	Volumetric flask with stopper 5640 "Borosil" make	
	i.) Capacity 100 ml.	6 Nos.
	ii.) Capacity 250 ml.	10 Nos.
	iii.) Capacity 500 ml.	10 Nos.

	iv.) Capacity 1000 ml.	6 Nos.
13.	Flat bottom flask 4100 "Borosil" make.	
	i.) Capacity 500 ml	6 Nos.
	ii.) Capacity 1000 ml	6 Nos.
	iii.) Capacity 2000 ml	6 Nos.
	iv.) Capacity 5000 ml	6 Nos.
14.	Burette with straight glass stop cock 2122 "Borosil" make.	
	i.) Capacity- 25 ml	6 Nos.
	ii.) Capacity- 50 ml	6 Nos.
15.	Reagent Bottles, "Borosil" make.	
	i.) Capacity 250ml.	12 Nos.
	ii.) Capacity 500ml.	12 Nos.
	iii.) Capacity 1000 ml.	6 Nos.
16.	Pycknometer with thermometer for specific gravity Determination with capacity 25ml.	2 Nos.
17.	Funnel 6140 "Borosil" make.	
	i.) Long stem 75 mm.	6 Nos.
	ii.) Short stem 125 mm.	6 Nos.
18.	Test tubes with ring 9800 "Borosil" make, size : 25 ml capacity	12 Nos.
19.	Test tubes with ring 9800 "Borosil" make, size : 50 ml capacity	12 Nos
20.	Silica crucible capacity 50ml.	2 Nos.
21.	Glass rods - assorted.	1 kg.
22.	Glass beads (neutral glass)	1 kg.
23.	Brix hydrometer with thermometer, Calibrated at 27.5deg. C (German make) with range:	
	i.) Range 0 to 10 Brix.	4 Nos.
	ii.) Range 10 to 20 Brix.	4 Nos.
	iii.) Range 20 to 30 Brix.	4 No.
	iv.) Range 30 to 40 Brix.	4 No.
	v.) Range 30 to 60 Brix.	4 No.
24.	Sykes hydrometer "zeal" England Make.	
	i.) Range 0 to 20A	4 Nos.
	ii.) Range 0 to 20	1 Nos.

	iii.) Range 20 to 40	2 Nos.
	iv.) Range 40 to 60	2 Nos.
	v.) Range 60 to 80	2 Nos.
	vi.) Range 80 to 100	4 Nos.
25.	Thermometer - "zeal" England	
	i.) Range 0 to 100deg.c. (white mercury)	6 Nos.
	ii.) Range 0 to 250deg.c. (white mercury)	6 Nos.
	iii.) Range 0 to 220deg.f. (white mercury)	12 Nos.
26.	Specific gravity hydrometer with range	
	i.) Range 1.000 to 1.100	6 Nos.
	ii.) Range 1.100to 1.200	4 Nos.
27.	Iron burette stand with clamp	6 Nos.
28.	Test tube stand 18 tubes of 25mm Dia.	2 Nos.
29.	Pipette Stand.	2 Nos.
30.	Petri plates Anumbra make 7 cm Dia. X 1cm ht	20 Nos.
31.	Iron tripod stand	4 Nos.
32.	Wash bottle (IDFP) plastic) 500ml.	4 Nos.
33.	Stainless steel spatula 8” long	10 Nos.
34.	Wire gauze with asbestos (for heating purpose of glassware during analysis)	6 Nos.
35.	Pair of tongs 8” long	6 Nos.
36.	Rubber bulbs of Pipetting 10ml,25ml,50ml capacity	6 Nos each.
37.	What man filter paper no. 1	1 Packet.
38.	Filter paper – Filtrol make.	25 Packets.
39.	Glass slides 75x25mm x 1mm thick.	1 Packet.
40.	Cover slips 22mm square.	1 Packet.
41.	Neubaur chamber – German make.	2 Nos.
42.	Spirit lamps with wick.	2 Nos.
43.	Watch glass 9985 “Borosil” make	6 Nos.

44.	Cotton – Non absorbent.	6 Rolls.
45.	Forceps	2 Nos.
46.	Rubber tubing for distillation condensers	10 Meter
47.	Aluminum foil	2 Packets.
48.	Kjeldahl digestion flask LAB Conco make or equivalent	1 No.

Laboratory Instruments-

Sr. No.	Instrument	Specification	Qty (Nos.)
For Liquefaction, Fermentation and Distillation Section			
1.	pH meter to measures pH.	Range: 0.00 to 14.00 pH , resolution: 0.01 pH. Accuracy: ±0.01 pH temperature 0 to 100.00 ^{0}C. Make : Mettler Toledo, Control dynamics or equivalent	1
2.	Weighing Balance for weighing chemicals	Digital electronic balance. M. No. Jl -1503 capacity 210g accuracy 0.1 mg Make :Mettler or equivalent	1
		Digital electronic balance (capacity-5 kg) Make :Mettler or equivalent	1
3.	Autoclave for sterilization and starch estimation.	Vertical autoclave-standard equitron advantages. Working chamber size- 45 x 71cm (18 x 28"). Capacity liters-113 carrier in cm-2 of 40 x 33. Heater-3.50 kw Automatic purging for efficient sterilization comes with an additional safety valve & low water level indication. Make : Equitron or equivalent	1
4.	Laminar air flow for sterile environment.	Horizontal laminar air flow. Work area in ft: 4' x 2' x 2', SS-304 table with all accessories, eg. manometer, castor - wheels, manometer UV, light tubes, provision of gas cocks, front cover etc. Make: Microfilt or equivalent	1
5.	Hot air oven for drying .	Temp. range: 50°c to 250°c Temp. control : by thermostat Inner chamber : stainless steel Outer chamber : mild steel duly powder coated Size : 45 x 45 x 45 cm Electronic digital display temp indicator with suitable sensor. Make :Raut Scientific or equivalent	1
6.	Microscope for microbial observations.	Compound microscope. Binocular research microscope standard set complete with inbuilt 6 v 20 w halogen light illuminator, with anti fungus achromatic objectives I NEA 4x10 x,40x (spring) &100 x (oil, spring), paired eye pieces wide	1
7.	Centrifuge	"REMI" make, model – R-4C, with speed	1

	machine for determination of suspended solids.	regulator, safety lid lock, digital speed meter, and timer, with rotor head. R-41: 8 x 15 ml swing out head with graduated glass tubes R-42: 4 x 50 ml, swing out head with graduated glass tubes. Centrifuge tubes-15 ml capacity graduated plastic tubes with conical bottom	12 Nos.
8.	Refrigerator for preservation.	Capacity: 265 liters, Frost free.	1
9.	Heating Mantles For estimation of Volatile acidity and alcohol conc.	Capacity 500 ml	2
		Capacity 1000ml Make :Raut Scientific or equivalent	2
10.	Desiccators for drying test.	" BOROSIL" make- Capacity 1000ml	1
11.	Steam distillation assembly with water condenser & bend for estimation of volatile acids and alcohol conc.	" BOROSIL" make Total height of assembly 30cm Outer jacket OD 14cms Sample container 250ml Condenser length min 30cms	2 sets
12.	BOD Incubator for incubation.	Temp. range 5 deg c to 60°c Temp. control: digital temp. controller Inner chamber : stainless steel Trays : S.S. adjustable trays 55/55/90 cm Raut Scientific or equivalent	1
13.	Distilled water apparatus for preparation of Distilled Water.	"MEDICA" make. Stone – Fin water still with distillate collector. 4 lit /4 hr.	1
14.	Magnetic stirrer cum heater for mixing of reagents and solutions.	Magnetic stirrer with hot plate "REMI" make Model : 2MLH - 2 liter capacity	1
15.	Constant temperature water bath for estimation of starch content.	Constant temperature water bath. Rectangular, double walled in construction. Inner chamber made of stainless steel and outer body made of mild steel duly powder coated. Temperature range 5 ^{0}C. Above ambient to 99.9 ^{0}C.Fitted with immersion type heater, digital temp. Controller cum indicator, accuracy +/-0.5 ^{0}C. Operating on 230V AC. Fitted with circular pump with stirrer to re-circulate water at constant temperature. Size : 40 x 35 x 30 Cm. Rating Watts : 2000	1

16.	Hot Plate for heating of solutions.	Temp. range: 50°c to 250°c "SPINOT" make.	2
17.	Sieve shaker with Sieve for determination of flour analysis.	Mechanical sieve shaker with following sieves 300 u, 450 u, 600 u, 850 u, 1100 u, 1200 u Make: Jayant	1
18.	Anton Parr Densitometer for estimation of alcohol concentration.	Model no. DM A 35N, Portable. Make: Anton par	1
19.	Muffle furnace for determination of ash content.	Range – 900 deg. C Make: Thermo lab	1
For Distillation & Evaporation Section			
20.	Hand refractometer to determine brix.	"ERMA" make Range-0 – 32 ^{0}Brix Range-28 - 62^{0}Brix	1 1
21.	Direct Moisture analyzer for determination on total solids.	Make- Mettler& Toledo, Class : 6 plus model Model # HB 43/S Halogen	1

WEIGH BRIDGE

Weigh Bridge one number of Capacity: 20 Tons.

3.6 RAW MATERIALS/PRODUCT DETAILS

INPUT SPECIFICATION

Feedstock – Grain

Clean grain should be free from Fermentation Inhibiting substance and micro-organism producing side products, sand and other foreign particles. The raw material should be of quality as mentioned below;

Sr. No.	Description	Specifications
1	Convertible Starch	60% Min. to 70% Max
2	Total Solids	88 -90% w/w
3	Moisture Content	10% w/w (Average)
4	Others	20-28% w/w

Utility Specifications :

i. Dry Saturated Steam Specifications :

Dry, Saturated, De-superheated & Regulated Steam should be available at the inlet of steam header as per details given below with respect to battery limits.

☐ Liquefaction Section:

Steam pressure should be 3.5 kg/cm^2 g +/- 0.05 at temperature of 145^{0}C at the inlet of steam header in Liquefaction section.

☐ MPRDistillation Section:

Steam pressure should be 3.5 kg/cm^2 g +/- 0.05 at temperature of 145^{0}C the inlet of steam header in distillation section.

Evaporation Section:

Steam pressure should be 1.5 kg/cm^2 g+/- 0.05the inlet of steam header in evaporation section.

Dryer Section

Steam pressure should be 3.5 kg/cm^2 g +/- 0.05 at temperature of 145^{0}C the inlet of steam header in dryer section.

ii. Electricity

Electricity Power Supply-

- ☐ Supply condition-3 phase/ 4 wire
- ☐ Voltage- 415 V AC
- ☐ Frequency-50 Hz

For control system: 230 V, 50 Hz (3), 1-phase, 2-wire supply

iii. Instrument air

Air should be available at 7.0 kg/cm^2 (g) with dew point of 5-6 ^{0}C.

iv. Water specifications

☐ Process water

Sr.No.	Parameter	Unit	Value
1	pH	-	6 - 9
2	Chloride (Cl-) (Expressed as NaCl)	mg/lit	< 250
3	H2S	mg/lit	Nil
4	Residual free chlorine	mg/lit	< 1
5	Silica (SiO2)	mg/lit	<75
6	Turbidity	NTU	<10

Sr.No.	Parameter	Unit	Value
7	Total germs	Nos./ml	<100 CFU
8	Coliform Bacteria	Nos./ml	Nil
9	E. Coli	Nos./ml	Nil

Note:

Water shall be of potable grade quality

Mg/lit – Parts per Million (PPM).

☐ Soft water (For Cooling tower make up, Dilution water for fusel oil decanter, Alcohol scrubber water, vacuum pump sealing)

Sr.No.	Parameter	Unit	Value
1	pH	-	6 - 9
2	Chloride (Cl-) (Expressed as NaCl)	mg/lit	< 250
3	H2S	mg/lit	Nil
4	Residual free chlorine	mg/lit	< 1
5	Silica (SiO2)	mg/lit	<75
6	Total Hardness (Expressed as CaCO3)	mg/lit	<5
7	Turbidity	NTU	<10
8	Total Dissolved Solids	mg/lit	<750

Note:

Water shall be of potable grade quality
Mg/lit – Parts per Million (PPM).
Water should be free from any microbiological contamination.

☐ Dilution water for Extractive Distillation Column in Distillation Section.

Sr. No.	Parameter	Unit	Value
1	pH	-	6 - 9
2	H2S	mg/lit	Nil
3	Residual free chlorine	mg/lit	< 1
4	Total Hardness (Expressed as CaCO3)	mg/lit	<5
5	Turbidity	NTU	<1
6	Total Dissolved Solids	mg/lit	<50

Note:

Water shall be of potable grade quality.

Water should be free from any smelling / odour components.

Mg/lit – Parts per Million (PPM).

Chemicals specifications :

The Specification and Consumption Details for Auxiliary and Chemicals required are as below

i. Urea

Urea is used as nutrient to supplement Nitrogen source to maintain desired level of FAN (Free Amino Nitrogen) content in the Fermented Mash.

The consumption of Nutrient depends on the FAN (Free Amino Nitrogen) content in Feed Stock.

Sr. No.	Parameter	Unit	Value
1	Nitrogen	% w/w (Min)	46
2	Moisture	% w/w (Max)	0.5
3	Arsenic	% w/w (Max)	0.0001
4	Iron	% w/w (Max)	0.01
5	Lead	% w/w (Max)	0.001

ii. Sodium Hydroxide (Caustic Lye):

Sodium Hydroxide is used in CIP solution for CIP of Yeast Propagator, Pre-fermentation vessels, Fermenters and beer well.

Consumption of Sodium Hydroxide Lye depends on the Frequency of Cleaning.

Sr. No.	Composition	Unit	Concentration
1.	Sodium carbonate (as Na_2CO_3)	% w/w (Max)	2.00
2.	Sodium Hydroxide (as NaOH)	% w/w (Min)	50.00

iii. Antifoam Agent (Silicone Based):

Sr.No	Characteristics	Unit	Value
1.	Appearance	Visual	Milky off white Emulsion

Sr.No	Characteristics	Unit	Value
2.	Active Chemical composition	--	Dimethyl Poly Siloxane
3.	Viscosity by Ford cup(B5)	%	300
4.	Solid Content % @110 □C / 1 Hour	% W/W	30 Minimum
5.	Antifoaming & De foaming Activity	Seconds	Seconds clear spot <1.0
6.	pH of Neat Emulsion	--	6.0 – 8.0
7.	Suitable Dilutant	--	Soft Water
8.	Diclofumation	--	Non Ionic

Note:

1. Defoamer content should be competent for yeast and should not be inhibitory / adverse effect on yeast growth and yeast activity
2. Defoamer should be free from Bacterial contamination
3. It should be free from chemical Odour (Petroleum or Kerosene)

iv. Input Specification for Active Dry Yeast (ADY) :

Make: Lallemand, Fali

OUTPUT GENERATIONS FOR ENA PLANT:

NO.	PARAMETERS	WASH TO ENA
1.	Main Product (ENA)	55,515 LPD of Extra Neutral Alcohol (ENA) of 96% v/v strength.
2.	Theoretical CO_2 at the outlet of CO_2 scrubber in Fermentation section	25 - 30 TPD
3.	DDGS at Outlet of DWGS dryer	55 - 58 TPD with. 88 - 90 % w/w solids (Approx. for grains containing 60% w/w convertible starch.) (Qty. will depend on the non-starch solids content in the grains)
4.	Cooling Tower Blow down	230 – 250 m^3/day (Subject to water quality)

*****

Note:

- Please note that the actual raw water analysis has to be provided and there may be a variation in output depending on the actual quality of the raw water with respect to that assumed in the proposal.
- Quantities & solids content in dried cake depends on grain quality.
- Above mentioned quantities are tentative. Actual quantities & solids content will be confirmed only after detailed engineering.
- These quantities are indicative in nature and may vary depending on Process Fluid Management (which can be confirmed only after detailed engineering) and feedstock composition.
- Spent Lees generation from Rectifier Column is related to alcohol concentration in fermented wash and hence quantity may vary depending on feedstock quality. Also for the use of soft water, spent lees recycle quantity may reduce and hence the purged quantity would increase.
- Depending on the feedstock quality and desired final product quality, TA cut and FO draws to be taken would vary and hence the quantities would also vary.

PRODUCT SPECIFICATION : EXTRA NEUTRAL ALCOHOL

EXTRA NEUTRAL ALCOHOL (ENA) :

Sr. No.	Characteristics	Specifications
1.	Ethanol content, % v/v at 20 deg C, min.	96
2.	Relative density at 15 deg C	0.80692
3.	Miscibility with water	Miscible
4.	Acidity, as Acetic acid, ppm, max	15
5.	Residue on evaporation, ppm, max	15
6.	Aldehydes, as Acetaldehyde, ppm, max.	5 – 10
7.	Esters, as Ethyl acetate, ppm, max	13
8.	Copper, as Cu, ppm, max	0.02
9.	Lead, as Pb, ppm, max	1
10.	Methanol, ppm,	5 – 10

11.	Furfural	Not Detectable
12.	Permanganate Decolorization Time, minutes, min.	45 – 50

Important Note :

- Constant availability of inputs like feed Raw Materials and Utilities at desired specifications are essential for the consistent quality of product extra neutral alcohol.

3.7 RESOURCES OPTIMIZATION/ RECYCLING AND REUSE ENVISAGED IN THE PROJECT, IF ANY, SHOULD BE BRIEF OUTLINED.

Efforts will be made to harvest rainwater in the plant. Run-off water from the office areas, shop roofs will be collected and stored for future use.

The plant will be designed as a zero discharge plant as far as the process effluents are concerned. The water will be re-circulated through cooling and treatment. No plant effluent will be discharged outside the plant premises. The entire waste water will be recycled for various purposes inside the plant.

3.8 UTILITIES

❖ Water

The plant will need 550 KLD of water to work at 100% capacity. The total requirement of water will be made from bore wells at the factory site. This will be further reduced while using the recycled water to the plant.

Table 4: water Requirement per day

Segment	Kilo Liter/Day
Cooling water	103
Process Water	337
Boiler	86
D M plant regenerate	20
Domestic water	4
Total	550

❖ Water treatment

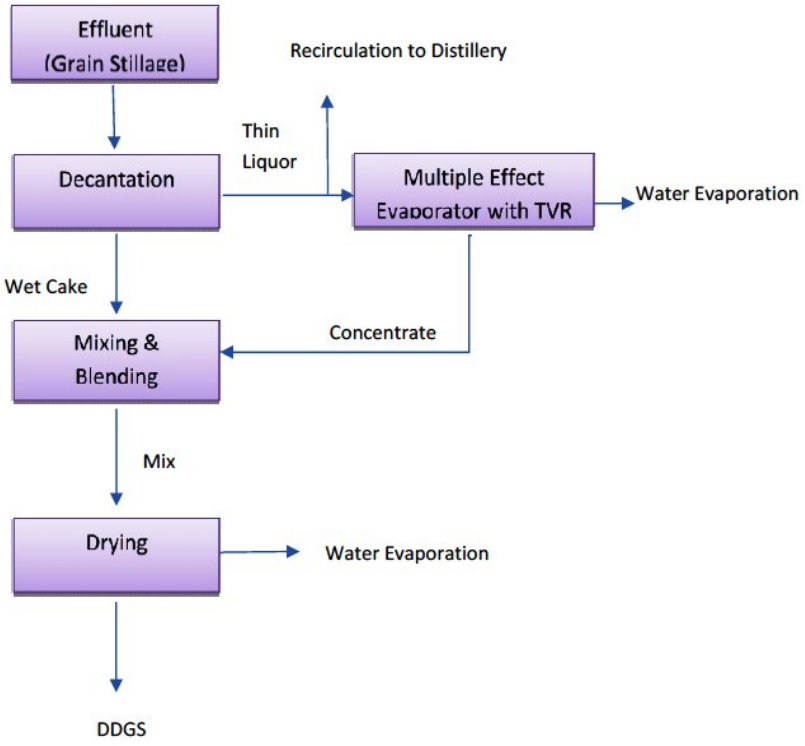
The plant will be designed as a zero discharge plant as far as the process effluents are concerned. The water will be re-circulated through cooling and

treatment. No plant effluent will be discharged outside the plant premises. The entire waste water will be recycled for various purposes inside the plant. Domestic wastewater will be treated in Septic tank – Soak pit system.

It is proposed to set up an Effluent Water Treatment Plant (ETP). All units of the ETP shall be impervious to prevent ground water pollution. The ZERO DISCHARGE SYSTEM for effluent Treatment consists of the following main processors:

- Decantation – To separate the suspended particles and thin liquor
- Evaporation – To concentrate the thin liquor in vacuum evaporator
- Mixing & Blending – To mix the wet cake & the concentrate
- Steam Tube Drying – To dry the mix to get dried powder (DDGS)

EFFLUENT TREATMENT - ZERO DISCHARGE SYSTEM



❖ Central Control Room

A CCR building is envisaged to be constructed. Operation of entire plant from Raw Material unloading to Packing Plant is carried out from the Control room.

❖ Fire Fighting System

In order to combat any occurrence of fire in plant premises the fire protection facilities have been envisaged for the various units of the plant. All plant units, office buildings, stores, laboratories etc. will be provided with adequate number of portable fire extinguishers to be used as first aid fire appliances.

❖ Communication

Suitable communication network has been envisaged for quick transmittal of information within the plant. To reduce the communication gap with in the factory site Firm will establish an automatic internal telephone system as well as two-way audio communication system.

❖ Workshop

A mechanical and an electrical workshop are envisaged to take care of the regular maintenance/ repair jobs in the plant.

❖ Machinery stores

A store building needs to be constructed for storing tools, spare parts, consumables, etc. Open area to be earmarked for storing machinery and construction materials for the proposed factory.

❖ Technical & Administrative office

A suitable technical office & administrative office shall be constructed for the project activities and operation phase.

❖ Time and Security office

At the entrance of the main factory, a time office and a security office shall be constructed.

❖ Dispensary

The main dispensary shall be located in the colony. However, a small dispensary with first aid facilities should be provided in the plant premises.

❖ Weigh bridge

One electronic weigh bridge is envisaged to take care of the incoming and outgoing materials at the plant. These may be located near the main entrance of the plant.

❖ Parking

Adequate parking space shall be provided in the factory premises for the parking of vehicles.

❖ Internal Roads & Drainage

The internal roads will be generally 6.0 M wide. A drainage system will be provided along the roads and buildings for disposal of garbage & contaminated water.

❖ Green Belt

Firm has planned to install a Green Belt area as per the guidelines by the Pollution Control Authorities Surrounding the periphery of the land. Company has purchased sufficient land for this purpose.

3.9 QUANTITY OF WASTES TO GENERATED (LIQUID AND SOLID) AND SCHEME FOR THEIR MANAGEMENT AND DISPOSAL

The plant will be designed as a zero discharge plant as far as the process effluents are concerned. The water will be re-circulated through cooling and treatment. No

plant effluent will be discharged outside the plant premises. The entire waste water will be recycled for various purposes inside the plant.

The main solid waste generated from the unit is Distillers' Dried Grains & Solubles (DDGS) that would be generated as by-product will be sold as animal feed. Boiler ash will be sold to the local brick manufacturers. ETP sludge will be used for land filling. Septic Tank sludge will be disposed off suitably in consultation with the concerned Civic body. Solid waste generation and its disposal from the proposed unit are presented in Table-5.0.

TABLE – 5.0
SOLID WASTES AND THEIR UTILIZATION

Sl. No.	Type	Quantity in Tons/Year	Utilization
1.	DDGS	6000	To be used for Animal Feed.
2.	Ash	45000	To be used for brick making.

3.10 SCHEMATIC REPRESENTATIONS OF THE FEASIBILITY WHICH GIVE INFORMATION OF EIA PURPOSE.

As per MoEF notification dated 14th September'2006, All cane juice / Non-Molasses based Distillery with capacity of ≥ 30,000 KLD will be considered as "A" category project, which will entail EIA study and will be considered by MoEF, Govt. of India for grant of EC.

Thus, the project under consideration (which will have the production capacity of 60 KLD ENA) will be considered as A category project.

4.0 SITE ANALYSIS

4.1 CONNECTIVITY

The project site is located on NH-117 (Diamond Harbour Road). The nearest railway station is Kulpi, which is around 1.5 km from the project site. River Hooghly is passing at a distance of around 2.0 km from the project site in the west direction. Kulpi & Diamond Harbour Town is around 1.0 km & 15 km from the project site respectively. Alipore, the district Head Quarter is around 51.5 km from project site. Kolkata city is around 57 km in the northern side w.r.t. the project site. The nearest airport "Netaji Subhash Chandra Bose Airport", Kolkata is located about 67 km from the project site. The nearest Port is Haldia. In all, the project site has excellent connectivity with other parts of the country.

4.2 LAND FORM, LAND USE AND LAND OWNERSHIP

The proposed distillery project, will come up on the vacant land just on the right hand side of the NH-117 (Diamond Harbour Road). The land which is meant for industrial use, is by and large flat and is available with the project proponent.

4.3 TOPOGRAPHY (ALONG WITH MAP)

The land is generally flat and does not come under flood zone. No earth filling is required.

4.4 EXISTING LAND USED PATTERN

Available vacant and un-used land as acquired by TEPL, which is classified as industrial land, will be used for installation of the proposed units.

Proposed plant site does not falls under the CRZ area or notified industrial area. There is no Reserve Forest, National Park, Wildlife Sanctuary & eco-sensitive areas within 10 km radius of the Project Site. River Hooghly is passing at a distance of around 2 km from the project site in the west direction.

4.5 EXISTING INFRASTRUCTURE

The proposed distillery is a green field project. The land which is meant for industrial use, is by and large flat and is available with the project proponent. The project site is located on NH-117 (Diamond Harbour Road). The nearest railway station is Kulpi, which is around 1.5 km from the project site. The proposed site area is well developed and has all necessary infrastructure facilities such as motorable road upto the plant site, nearness to rail head, telephone facilities etc.

4.6 SOIL CLASSIFICATION

South 24 Parganas district lies in Gangetic alluvial plains and the predominant group of soil is sandy loam to loamy soils. The soil of South 24 Parganas district is generally fertile in nature. Due to favourable rainfall, climate, texture and fertility of the soil, rice, vegetables and fruits are extensively grown in the district.

4.7 CLIMATE DATA FROM SECONDARY SOURCES

The average temperature in the district varies from a maximum around 38°C to a minimum of around 13.5°C. The annual rainfall average 1800 cm, more than 75 percent of which comes during the monsoon. Nor ‘westers from March to May and the Bay Cyclones from mid June to mid November ravage the land every year.

4.8 SOCIAL INFRASTRUCTURE AVAILABILITY

All basic infrastructure facilities such as education, health facilities and other social facilities are available in the vicinity of the project site.

5.0 PLANNING BRIEF

5.1 PLANNING CONCEPT (TYPES OF INDUSTRIES, FACILITIES, TRANSPORTATION ETC.) TOWN AND COUNTRY PLANNING / DEVELOPMENT AUTHORITY CLASSIFICATION

The project under consideration is a green field project, wherein 60 KLD capacity distillery will be installed. The project site is located on NH-117 (Diamond Harbour Road). The nearest railway station is Kulpi, which is around 1.5 km from the project site. River Hooghly is passing at a distance of around 2.0 km from the project site in the west direction. The nearest Port is Haldia. In all, the project site has excellent connectivity with other parts of the country.

The project site, being located close to the urban centre, no housing facilities will be needed for this project. As far as possible, local people will be utilized for the day to day operation of the plant.

5.2 POPULATION PROJECTION

The establishment of the proposed unit would aid in the overall social and economic development of the region. The plant will give direct employment to about 53 people; in addition there will be indirect employment to many more people in the form of out sourcing jobs, business opportunities, service facilities etc. This will enhance the economic status of the local region.

5.3 LAND USE PLANNING

The proposed installation of distillery project is a green filed project. The proposed project will be installed on the available land of 13.0 acres. Out of the total plant area of 13.0 acres, around 4.5 acres (over 33% of the total plant area) shall be covered under green belt in the project area. The overall land break up is as follows:

Break up of Land Use		
Sl. No.	Description of Facilities	In acres
1	Truck Parking & Movement Area	1.00
2	Raw Material / Product Storage	3.00
3	Plant area	2.50
4	Waste Disposal & ETP	1.00
5	Green Belt	4.50
6	Admn. & Office, Stores & Canteen etc.	0.50
7	Internal roads	0.50
Total		13.00

5.4 ASSESSMENT OF INFRASTRUCTURE DEMAND

Adequate physical and social facilities are already available in this area.

5.5 AMENITIES / FACILITIES

Basic infrastructure facilities such as education, health facilities, water supply, electricity, power and other social facilities are easily available in the neighbourhood.

6.0 PROPOSED INFRASTRUCTURE

6.1 INDUSTRIAL AREA

For smooth functioning of the proposed Unit, infrastructure in the form of raw materials and product storage yard, main substation, weigh bridge, truck loading bay, compressor room, laboratory and technical office, general store, workshop, time & security office etc.

6.2 RESIDENTIAL AREA

Residential colony is not required for the proposed unit.

6.3 GREEN BELT

A green belt will be developed within the plant area.

The green belt is a set of rows of trees planted in such a way that they form an effective barrier between the plant and the surrounding.

Open spaces, where tree plantation is not possible shall be covered with shrubs and grass. The plantations shall match with the general landscape of the area and be aesthetically pleasant. Attempts will be made to plant native species which are pollution tolerant and fast growing. Proper attention will be given for their maintenance and protections. Out of the total plant area of 13.0 acres, 4.5 acres (over 33% of the total area) shall be covered under Green Belt. The plant layout showing the proposed facilities with Green Belt area has been shown in Figure - 3.0.

6.4 SOCIAL INFRASTRUCTURE

In the proposed project, the infrastructure support during the construction and operation phases will be developed. Regular sprinkling of water around vulnerable areas of the construction sites from trucks or through installation of water sprinklers or any other suitable

methods, to control fugitive dust as and when required will be maintained by the company.

The project site is located very close to the urban centers, where proper social infrastructures are already in place. These infrastructures are being fully utilized by the existing plant and will be utilized for the expansion programme as well.

6.5 CONNECTIVITY

The project site is located on NH-117 (Diamond Harbour Road). The nearest railway station is Kulpi, which is around 1.5 km from the project site. River Hooghly is passing at a distance of around 2.0 km from the project site in the west direction. Kulpi & Diamond Harbour Town is around 1.0 km & 15 km from the project site respectively. Alipore, the district Head Quarter is around 51.5 km from project site. Kolkata city is around 57 km in the northern side w.r.t. the project site. The nearest airport "Netaji Subhash Chandra Bose Airport", Kolkata is located about 67 km from the project site. The nearest Port is Haldia. In all, the project site has excellent connectivity with other parts of the country.

6.6 DRINKING WATER MANAGEMENT

The raw water will be sourced from borewell. Domestic water requirement for the proposed project is around 4 m^3/day.

6.7 SEWERAGE SYSTEM

Domestic effluent from the various buildings/sheds of the plant is conveyed through separate drains to septic tank. The effluent from the septic tank is disposed of through soil percolation by providing dispersion trenches/soak pits.

6.8 INDUSTRIAL WASTE MANAGEMENT

- The plant will be designed as a zero discharge plant as far as the process effluents are concerned. The water will be re-circulated through cooling and treatment. The entire wastewater after necessary treatment will be recycled for various purposes inside the plant.
- The main solid waste generated from the unit is Distillers' Dried Grains & Solubles (DDGS) that would be generated as by-product will be sold as animal feed.
- Boiler ash will be sold to the local brick manufacturers.
- Hazardous wastes like spent oil from construction equipment, DG sets etc generated in small quantities during construction and operational phase would be appropriately stored & handled and properly disposed of in accordance with the provisions of the Hazardous Waste Management Rules, 2010.

6.9 SOLID WASTE MANAGEMENT

The main solid waste generated from the unit is Distillers' Dried Grains & Solubles (DDGS) that would be generated as by-product will be sold as animal feed. Boiler ash will be sold to the local brick manufacturers. ETP sludge will be used for land filling. Septic Tank sludge will be disposed off suitably in consultation with the concerned Civic body. Solid waste generation and its disposal from the proposed unit are presented in Table-6.0.

TABLE – 6.0
SOLID WASTES AND THEIR UTILIZATION

Sl. No.	Type	Quantity in Tons/Year	Utilization
1.	DDGS	6000	To be used for Animal Feed.
2.	Ash	45000	To be used for brick making.

6.9 POWER REQUIREMENT & SUPPLY / SOURCE

Requirement of power for the proposed project is around 2140 KWH, which will be sourced from West Bengal Power Distribution company

Limited. However, the company in near future planning to generate the required electricity in its own if it is financially viable for them.

7.0 REHABILITATION AND RESETTLEMENT (R & R) PLAN

The company has already made the proper compensation to all affected families as per the applicable Govt. Policy. In the project area, there is no homestead population. The company will make provisions to comply with the applicable R&R policy.

8.0 PROJECT SCHEDULE & COST ESTIMATES

8.1 LIKELY DATE OF START OF CONSTRUCTION AND LIKELY DATE OF COMPLETION (TIME SCHEDULE FOR THE PROJECT TO BE GIVEN).

The factors which are responsible for timely implementation of the project are:

i) Arrangement of proper finance for the project.
ii) Finalization of layout of the proposed plant.
iii) Design of utilities and services.
iv) Placement of orders for plant and machinery.
v) Arrangements for Govt. sanctions and supply of power.
vi) Recruitment of personnel.

As per an initial estimate, around eight (8) months will be needed for implementation of the project from the starting date i.e., from the date of receiving all the statutory clearances for starting the project.

8.2 ESTIMATED PROJECT COST ALONG WITH ANALYSIS IN TERMS OF ECONOMIC VIABILITY OF THE PROJECT

The Capital costs have been worked out on the basis of prices prevailing today and do not include any provision for future escalation in costs during implementation period. As per initial estimate, the cost of the project works out to around Rs. 120.82 Crores.

The focus of proposed project is cost reduction by producing quality material as per the required specification. The estimated cost of the project is expected to be around Rs. 120.82 crores. There will be substantial savings due to the said project as company will also be eligible for various incentives. The company has good track record of implementing and commissioning capital project as per schedules. The total expansion project is expected to be commissioned over a period of 8 months. The benefit from the project planned will start accruing from year one only.

After examining the Environmental feasibility and Commercial & financial feasibility, it may be inferred that the project will have a positive feasibility.

9.0 ANALYSIS OF PROPOSAL (FINAL RECOMMENDATIONS)

9.1 FINANCIAL AND SOCIAL BENEFITS WITH SPECIAL EMPHASIS ON THE BENEFIT TO THE LOCAL PEOPLE INCLUDING TRIBAL POPULATION, IF ANY IN THE AREA.

The proposed project is expected to bring significant socio-economic and environmental benefits both at local level as listed below:

SOCIAL INFRASTRUCTURE:

- Social awareness programmes will be improved by the local authority such as sanitation and hygiene, HIV Prevention Program.
- Adult education and female education programme is planned to the illiterate adults and backward females of the villages in the project surrounding area.

EMPLOYMENT POTENTIAL:

The project is going to create some employment. Due to this project activity, some persons in the project area will be recruited as skilled and semi skilled workers by the company as per its policy. Therefore, some employment and income are likely to be generated for the local people. So, the project will contribute in a positive manner towards direct employment in the project area. Some employment potential benefits are given below:

- Long term employment of up to 53 people in the operation phase.
- Plus indirect employment shall be generated substantially.

BENEFITS TO THE REGION

The company will supply its product to the domestic market which is likely to improve the regional economy.

PERIPHERAL DEVELOPMENTS:

The Company intends to take up developmental work in the periphery area. The activities that have been considered include the following:

- Support existing schools for development of education in the area.
- Help in imparting vocational training to local eligible youth.
- Provide health facilities by way of medical check up, by holding medical camps etc. in the neighbourhood.

Thus, the proposed project shall usher in the social and economic up-liftment of the persons living in the vicinity of the Project i.e. of society at large.

10.0 COMMERCIAL ANALYSIS

10.1 Industry overview

India is a dominant alcohol producer in South-East Asia

India is one of the largest producers of alcohol in the world and there has been a steady increase in its production over the last 10 years. India is a dominant producer of alcohol in South-East Asia, with 65 per cent of the total share, and contributes to around 7 per cent of the total alcohol beverage imports into the region. The overall industry is growing at a CAGR of about 10%. In 2010-11, the total alcohol consumption in India was around 2,946 Kilo liters which is almost double of 2001-02 consumption of 1,338 Kiloliters.

Table 7: statement showing production and consumption of alcohol in India

	Total Availability (Kilo Liters)	Consumption (Kilo Liters)			Total Alcohol Consumption (Kilo Liters)
		Potable	Industry	Others	
2000-01	2,226	559	667	60	1,286
2001-02	2,312	573	702	63	1,338
2002-03	2,474	620	757	68	1,445
2003-04	2,598	673	773	71	1,517
2004-05	2,753	797	925	76	1,798
2005-06	2,891	852	987	80	1,919
2006-07	3,007	882	1,091	83	2,056
2007-08	3,127	921	1,287	92	2,300
2008-09	3,252	1,166	1,378	101	2,544
2009-10	3,382	1,229	1,445	112	2,786
2010-11	3,459	1,305	1,522	119	2,946

Source: AABIDA

India's per capita alcohol consumption is only 2.6 litres

India is still low in alcohol consumption than other countries. The consumption is only 2.6 litres per capita compare to the 10.2 per capita weighted average consumption of alcohol to the 30 major countries in the world. Luxemburg, France and Ireland stood first, second & third respectively by consuming 15.9, 14.8, 14.1 liters alcohol on per capita basis. Here is the brief description of the per capita alcohol consumption of different countries in the world.

Table 8: Per capita Alcohol consumption		
Rank	Country Name	Per capita Alcohol Consumption
1	Luxemburg	15.9
2	France	14.8
3	Ireland	14.1
4	Hungary	13.5
5	Czech Republic	12.5
8	Portugal	11.6
6	Spain	11.5
9	United Kingdom	11.5
7	Denmark	11.4
10	Austria	11.13
12	Belgium	10.7
13	Germany	10.6
11	Switzerland	10.1
14	Australia	10.1
15	Netherlands	9.9
17	Finland	9.4
18	South Korea	9.4
19	Greece	9.3
20	New Zealand	9.1
21	United states	8.7
22	Poland	8.3
23	Italy	8
24	Canada	7.9
25	Japan	7.8
26	Slovakia	7.7
27	Sweden	7
28	Iceland	6.8
29	Norway	6.6
30	Mexico	4.7
31	India	2.6
32	Turkey	1.8
	Weighted Average Alcohol Consumption	10.2

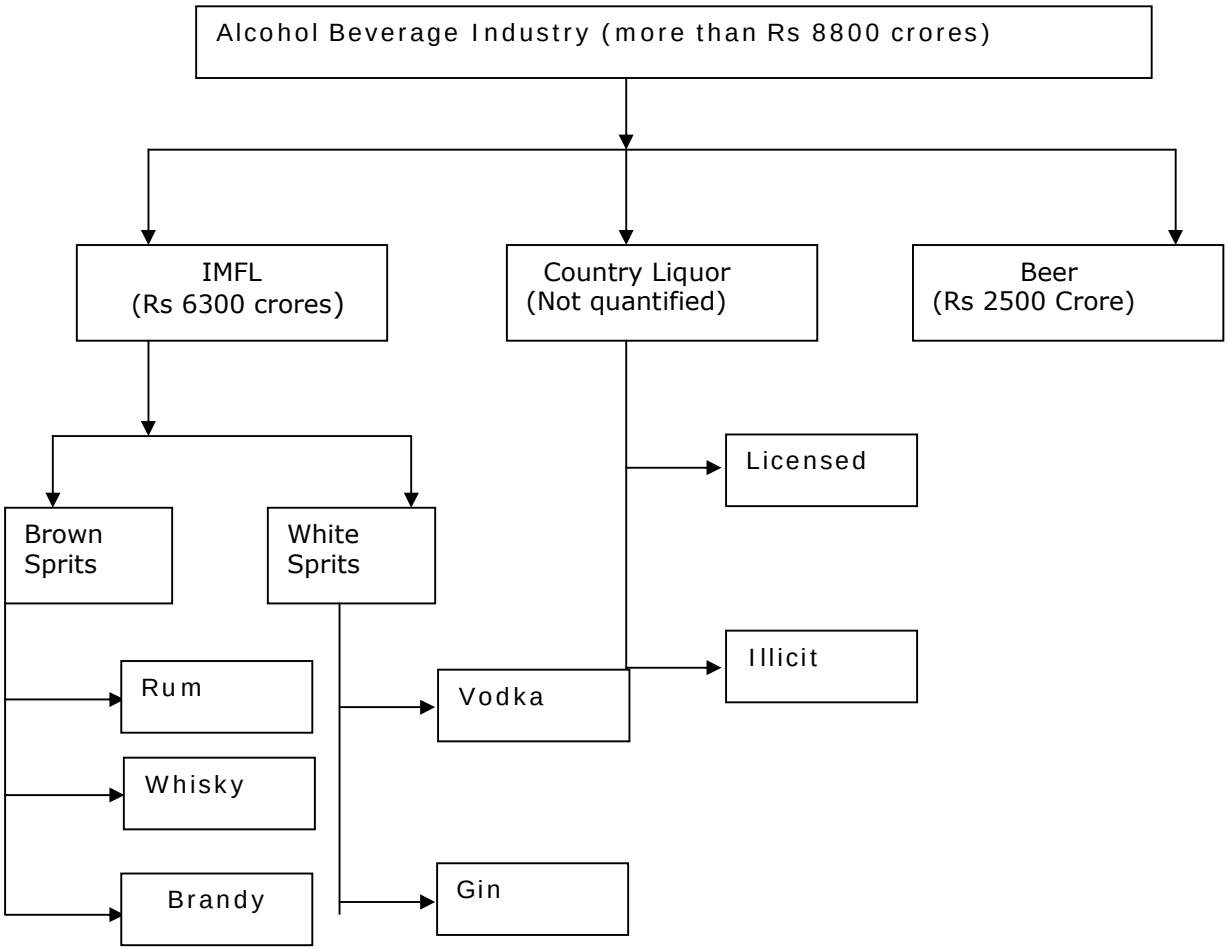
Rising income levels: Various research studies have shown that there is a direct positive correlation between rise in the income levels and alcohol consumption. With the growth in income levels, Indian alcohol consumption is expected to continue growing at the growth rates which has been in the last decade. *The rise in income level can be assessed by the level of tax collection in the country*. The net direct tax collection went up to Rs 3.17 lakh crore for the first 10 months between April 2010 and January 2011, registering a growth of more than 20% as the collection during the same period last year was Rs 2.64 lakh crore. The personal I-T, including securities transaction tax and residual fringe benefit tax and banking cash transaction tax grew at 12%, to Rs 1 lakh crore as against Rs 90,000 crore last year.

Changing age profile: A large proportion of the Indian population is in the age group of 15-49 years. This age group is the most appropriate target for Industry Players. This population trend will give a further boost to the growth of alcohol consumption in India. As per Indian Statistical Survey it is found that 65% of the populations are under the age of 15-49 years which acts as a leading indicator for the high demand in the luxury goods.

Changing lifestyles: Indian consumers are becoming more exposed to western lifestyles, through overseas travel, media, and attraction towards alcohol. Social habits are undergoing a transformation as beer consumption among women is increasing. Due to rise in income in the hand of young population and the change in life style the demand for the luxury goods are ramping up. It is estimated that by 2015, about 240 million populations will use smart phones, 50 million populations will have laptops, 250 million populations will have access to internet, 1200 new multiplex screens are likely to be added which leads to a nearly three fold increase in ticket sales, 165 million domestic travelers per year –an increase of 50%, 15 million international travelers per year –an increase of 40% and 40 million new Digital TV connections will be added in the next 5 years. This change in life style indicates about the growth in the luxury market and also in beer industry as it is a part of luxury market.

Growth in liquor industry- driving demand for ENA

The distillery industry consists of two major components on the basis of usage, one industrial alcohol and the other potable alcohol. Industrial alcohol finds usage in manufacture of chemical solvents and intermediates while potable alcohol is used in IMFL and country liquor. In India, the production ratio of industrial to potable alcohol is 48% and 52% respectively. The potable alcohol that is directly sold to state government is marketed as the licensed country liquor. The consumption of IMFL has increased by 53%. IMFL is divided to brown spirits (Whisky, Brandy and Rum) and White spirits (Vodka and Gin)



10.2 Demand & Supply

Center's 'Gasohol Program' boost the demand of Alcohol

The Center's 'Gasohol Program' of blending 5% ethanol in petrol has given an assured scope for ethanol industry in the country. The Center's Kisan-friendly imitative has definitely been a boost to the venture. Following statistics could show how there is definite market potential for such industry.

Table 9: Ethanol demand in India		
Petrol consumption in India	1,00,00,000	Kilo Liters/P.a
Ethanol Require as per GOI Policy	5,00,000	KILO Liters - 5% ALCOHOL required
Ethanol demand/ P.a	50,00,00,000	Liters
Source: Ministry of Petroleum and Natural Gas		

The demand supply gap for liquor beverages in the state of West Bengal is as follows:

Table 10: Demand-Supply Gap in Liquor in West Bengal			
Year	West Bengal (In KL)		
	Production	Demand	Gap
2007-08	135164	162000	26836
2008-09	152388	181440	29052
2009-10	168031	203213	35182
2010-11	181414	227598	46185
2011-12 (E)	193923	254910	60987
2012-13 (E)	207468	285499	78031
2013-14 (E)	221113	319759	98647
2014-15 (E)	234458	358130	123672

Similar factors that are mentioned above are driving the demand for the alcoholic beverages in the country as well. The past and estimated demand for demand for IMFL and country liquor in the country is as follows:

Table 11: Past & Estimated demand for IMFL & Country Liquor			In KL
Year	IMFL	Country	Total
2004-05	186591	139285	325876
2005-06	233400	142673	376073
2006-07	273579	155341	428920
2007-08	277057	173489	450546
2008-09	320096	187865	507961
2009-10	360927	199176	560102
2010-11	399362	205350	604712
2011-12 (E)	434434	211977	646411
2012-13 (E)	470082	221479	691561
2013-14 (E)	501101	235941	737042
2014-15 (E)	534532	246995	781527

10.3 Marketing Plan

The promoters of the company will take care of the marketing

The promoters of the company will take care of the marketing activity of the company. The promoters of the company have long presence in the diversified industrial activity. As the demand for ENA is very high in the market the company is unlikely to face any problem in the selling its product. Further, the company is in the process of marketing its products with other manufacturers of the IMFL in W.B including UB group, Seagrams, Khaitan, Radico, McDowell etc.

11.0 FINANCIAL ANALYSIS OF THE RPOJECT

ESTIMATED INVESTMENT:

Estimated Prices for Design, Engineering, Manufacture, Supply, Erection and Supervision of commissioning for 60 KLPD Grain Based Distillery Plant as per the sections mentioned below are as follows:

S.N	SECTION	INR in Lacs
1	HARD COST	
A	PROCESS PLANT (PRAJ SCOPE)	
i.	Grain storage, handling, cleaning and milling and Flour storage section : Consisting of Grain storage silos,pre cleaners, Hammer Mill 2 no (Buhler + Local) , Flour storage silo along with dust extraction systems, elevators, conveyors, Piping & Valves, Electrical & Instrumentation etc. as per Praj Specifications.	4160.00
ii.	Liquefaction Section : Consisting of SS 304 Liquefaction tanks, along with Site fabricated, Shop Fabricated, Bought outs, Piping & Valves, Electrical & Instrumentation etcas per Engineering specifications.	
iii.	Fermentation Section Consisting of 3 No's SS 304 Fermenter, 1 No's of SS304 Pre-fermenter, Wash Holding Tank, Site fabricated, Shop Fabricated, Bought outs, Piping & Valves, Electrical & Instrumentation etc. as mentioned in our technical offer as per Engineering specifications.	
iv.	Multi Pressure Distillation Section Consist of shop fabricated Distillation Columns along with Reboilers , Heat Exchangers, Coolers, Condensers, Site fabricated, shop fabricated, Bought outs, piping & valves, Electricals & instrumentation etcas per Engineering specifications.	
v.	Integrated Evaporation Section up to 35 % w/w solids Consist of FF evaporator calendria along with VLS, Surface Condenser, Site fabricated, shop fabricated, Bought outs, piping & valves, Electricals & instrumentation etcas per Engineering specifications.	
vi.	Decantation and Dryer Section Consist of Decanter, Drier along with Site fabricated; shop fabricated, Bought outs, piping & valves, Electricals & instrumentation etcas per Engineering specifications.	
vii.	Process Condensate Treatment Section Consist of Biological system, MF and RO system along with pumps, tanks, piping and valves, electrical & Instrumentation etc. as per Engineering specifications.	

viii.	Receiver and Bulk Storage Section for 35 days Consist of site fabricated Bulk Storage 3 No's, daily receivers, TA receiver, TA bulk storage, FO Storage, Bought out Items, Electrical, Instrumentation, Piping and valves as per Engineering specifications	
ix.	Utility Section Cooling Tower for Liquefaction ,Distillation ,Integrated Evaporation Fermentation Section, Air compressor along with pumps, Piping, valves, electrical & Instrumentation etc as per Engineering specifications	
x.	Yard Piping	
xi.	Civil and structural Design	
xii.	Erection and Supervision of Commissioning	
xiii.	Transportation for above scope	
	TOTAL FOR PROCESS PLANT	*4160.00*
B	BALANCE OF PLANT (CLIENT SCOPE)	
i.	Multi Fuel Fired Boiler (20 TPH /45 kg/cm2(g)) with accessories	1845.00
ii.	Back pressure turbine (2.0 MW) for captive consumption with all auxiliaries, HP/LP piping, PRDS etc.(To be used as an Back up device)	
iii.	Water Treatment Plant	
iv.	Fire Fighting	
v.	Lab Equipment ,Weigh Bridge and Miscellaneous	
vi.	Balance of Electrical (Bus duct, PCC, Cabling, Transformer, power distribution DG, Plant, Yard Lighting etc.)	
vii.	Transportation for above scope	
viii.	Estimated Civil and structure for Entire Plant Scope	1650.00
	TOTAL FOR BALANCE OF PLANT	*3495.00*
	TOTAL FOR PLANT AND MACHINERY (A + B)	*7655.00*
C	OTHERS (CLIENT SCOPE)	
i.	Estimated Taxes and Duties for P& M @ 11 %)	833.00
ii.	Land and Land Development	1250.00
iii.	Miscellaneous fixed assets	745.00
	TOTAL FOR OTHERS	2828.00
	TOTAL HARD COST(Process Plant +Balance of Plant + Others)	*10483.00*
2	SOFT COST	
i.	Preliminary & Preoperative expenses	1599.00

ii.	Contingencies	
iii.	Working capital requirement	
iv.	IDC	
	TOTAL SOFT COST	*1599.00*
	TOTAL PROJECT COST (HARD COST + SOFT COST)	*12082.00*

Price: Rupees Twelve Thousand and EightyTwo Lacs only/-