FORM-1, PRE-FEASIBILITY REPORT

FOR

PROPOSED 45KLPD MOLASSES BASED DISTILLERY

CUM ETHANOL PLANT

at

KACHIRAYAPALAYAM (VILLAGE),

CHINNASALEM (TALUKA),VILLUPURAM (DIST)

TAMILNADU - 606207

Submitted by

KALLAKURICHI-II COOPERATIVE SUGAR MILLS LTD,

Submitted to

ENVIRONMENTAL APPRAISAL COMMITTEE,
Ministry of Environment, Forests & Climate Change
Indira Paryavaran Bhavan, Jor Bagh Road
New Delhi - 110 003

Prepared by

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1.0 EXECUTIVE SUMMARY:

Kallakurichi II CSM Ltd (hereafter being referred as KCSML or simply as industry, is an existing sugar mill located in Kachirayapalayam in Taluka Chinnasalem in district Villupuram Tamilnadu 606207. It is an existing 2500 TCD sugar mill. Kallakurichi II CSM Ltd has about 100 acres of land for its manufacturing activities.

Letter of intent for installation of 2500 TCD capacity Sugar Mill under co-operative sector in Kachirayapalayam was issued by Government of India vide LOI No. 254(90). Accordingly, Kallakurichi – II Co- operative Sugar mills Ltd Kachirayapalayam has been proposed to be set- up for sugar production in Chinnasalem Taluk of Villupuram District in Tamilnadu. The Sugar mill is registered by Commissioner of Sugar and Registrar of Coop. Societies of sugar mills on 01.10.1990 under Tamil nadu Co-op. Societies Act 1983. Industrial License was received by the mill vide letter No. F22/(434)/92/ST/8, dt. 1.01.2000.

The total share capital of the mills, as on 31.03.2014, is Rs. 3488.46 Lakhs which is inclusive of Rs. 1332.50 Lakhs invested by Government of Tamilnadu. The balance Rs. 2155.96 lakhs is the share capital invested by cane growers (Including Non Refundable Deposit share capital of Rs. 489.28 lakhs).

The Sugar mill obtained ISO 9001-2008 Certificate from International Services (ICS), Mumbai on 03.02.2006 bearing Registration Number RQ91/3953, Dated 03.02.2006.

Consent for operation

The exting company has been isued consent order number 12672 on 8-5-1998 under section 21 of air (prevention and control of pollution) Act afterword is been reviewed with lates renewal valied upto 31 th march 2015.

The exting company also has been isued consent order number 2589 on 28-7-2004 for disposal of hazardous waste under rule 3 (c) and 5 (5) of hazardous waste management and handling rule and its ammendment in 2000.

The exting company has been isued consent order number 16552 on 8-5-1998 under section 25 of water (prevention and control of pollution) Act

1974 afterword is been reviewed with latest renewal valied upto 31 th march 2015.

Management

Kallakurichi – II Co-operative Sugar mills Ltd has a team of dynamic and progressive members in the Management Board. Under their leadership the sugar mill is functioning well and achieving its goals.

The Suger Mill, under the leadership of Mr. K. Kanagasundram, Managing Director has progressed consistently and looks ahead for still better performance in years to come.

Future vision

During setting up of Sugar mill, the management acquired an extra land for expansion/diversification in future. Accordingly, an adequate piece of land is available in Sugar mill premises which can be best suited for setting up of the proposed 45 KLPD Distillery.

Molasses and Press mud from sugar mill are presently being sold to nearby distilleries and to farmers. However by setting up of the proposed distillery, these sugar mill by- product shall be utilized as own resources in the form of feed for their distillery and shall earn extra profit due to value addition of these by-product in the form of Alcohol and Bio-compost.

The sugar mill management has decided to put up a 45 KLPD capacity Molasses based Distillery cum Ethanol plant. The Molasses required could be met by own molasses and by the molasses produced in the nearby sister cooperative sugar mills.

By Installation of 45 KLPD Molasses based Distillery cum Ethanol plant, the mill shall utilize their by-product Molasses and Press mud in the Distillery, which will lead to value addition.

The proposed Distillery cum Ethanol plant shall generate employment opportunity to the needy people in nearby areas.

Thus, Management feel proud in obliging the sons of soil by providing the jobs to these people and fulfilling the social commitments by extending the welfare amenities to their family.

After setting up of the proposed distillery, few ancillaries shall also come to support distillery operations and this shall also increase employment and other business activities. In short, by putting up the proposed Distillery cum Ethanol unit, there will be a further growth of sugar mill area in terms of Employment, Business, Education, Transportation, Communication and of course Standard of living of families.

The Ministry of Environment and Forests (MoEF) Government of India has issued an EIA notification, S .O. 1533 dated 14 September 2006 notification amended in 1 December 2009 wide no. 3067. Under Environmental (Protection) Act (EPA) 1986. Prior Environmental Clearance from the EIA Authorities is mandatory for the establishment of projects/activities listed in the schedule of above notification Distillery projects are categorized under 5(g) of schedule of activities and therefore, require prior environmental clearance from the Expert appraisal committee / authority. Hence project of Kallakurchi-II CSML molasses based distillery unit is classified under **5(g) category A.**

Fuel Ethanol Scenario

The total yearly fossil fuel consumption of the was 5.5 billion tons coal equivalent during the year 1966 which by the end of the year 2000 increased to 23.0 billion tons of coal equivalent. However, it is only after the commencement of 21st century , the consumption of fossil fuels have been increasing at an alarming rate, hence time has come to take major steps to minimize their use and conserve them by replacing with renewable energy fuels.

Today in India the vehicle population run on gasoline is over 60 million and is increasing at a very faster rate. The gasoline demand in India was only 7.07 million metric tons in 2001-02. Now it has shot up to 14.31 million metric tons in 2013-14. At this rate by the end of 21st century, the gasoline demand will be enormous.

In view of above threat to the fossil fuels, the ethanol is obvious choice to be considered for part substitution for fossil fuels gradually in future. Brazil adopted the above concept way back in 1970 and thus shown us the path to be followed.

Ethanol Blending Policy

Ethanol is produced in India from sugarcane molasses for blending with gasoline. Beginning in January 2003, Government of India mandated the use of 5-percent ethanol blend in gasoline through its ambitious Ethanol Blended Petrol (EBP) program.

At present there are 356 distilleries, including 160 attached with sugar factories, having a total installed capacity of only 6.0 billion liters ethanol, operational in India. However, India is producing approx. 3.0 Billion Liters of Alcohol with a capacity utilization of only about 50 %. It is a challenging task for the sugar industry, distilleries and other interested investors.

In order to meet the above mentioned challenge, following steps are needed to be taken at the earliest-

To expand the capacities of existing distilleries in sugar complexes on the basis of individual factory's requirement, keeping in view the possibility of producing ethanol from mixed juice, secondary juice, B-heavy molasses and other alternates.

All factories having a capacity of 2500 TCD and above, having no distillery and co-generation at present should install distilleries of suitable capacities in their sugar complexes and start co-generation.

Indian Government has also made mandatory 5% ethanol blending in Petrol. The Ministry of Petroleum on Friday, the 11th of January, 2013, finally issued a gazette notification making 5% ethanol blending with petrol mandatory across the country.

The recently elected Central Government has also decided to go after ethanol blending in gasoline in a big way. Accordingly the Government has announced on 23rd June 2014, a series of measures for the sugar industry, which include doubling the ethanol blending to 10%.

Due to ever increasing gasoline demand and consumption of fossil fuels at a very fast rate, "gasohol-fuel ethanol" is being viewed as an alternative to gasoline, since 1975. India is at least three decades behind Brazil in taking advantage of its potential to produce ethanol in a very big way and its use partially, if not fully to replace gasoline by gasohol.

The production and use of ethanol in a big way may solve the national oil problem to a great extent. Production ethanol from mixed juice, secondly juice and / or B Heavy molasses will result in substantial steam and Bagasse saving.

Huge Bagasse saving will enable the sugar factory to continue co-generation in off season, at least for 2-3 months.

Augmenting ethanol supply

Currently, due to very high cost of imported ethanol, the government does not wish to use imported ethanol for the ethanol blending program, hence the focus is on developing domestic production capacities .To augment supply, the government of India has permitted ethanol production directly from sugarcane juice while ensuring that the move does not constrain production of sugar or ethanol for industrial use. The Government of India offering subsidized loans (through sugarcane development funds) to sugar mills for building ethanol production units. The loans would cover a maximum of 40% of the project cost to sugar mills for development of ethanol production unit.

Oil companies have stated that during the year 2014, the distilleries could not fulfill their requirement of fuel ethanol for blending and they could get around50% fuel ethanol for blending.

Recently, for implementing 5% Ethanol Blending Program, the Oil companies have estimated their requirement of fuel ethanol as 97 Cr. Liters during the year 2015. Accordingly, Tenders have been floated mentioning the landed price of Ethanol to be Rs 49.00/liter.

On comparison between the petrol consumption and ethanol consumption, it is evident that there is a huge potential for ethanol for blending with petrol. The ethanol blended petrol program of government of India would become a reality only by increasing the capacity of fuel ethanol production in India. Kallakurchi- II is taken such an initiative which would help in achieving the fuel ethanol blending programmed and also revenue to the mill.

USE OF ETHANOL

The Potable Alcohol Industry in India

The Indian potable alcohol market can be classified into “Country liquor” and “Indian-Made Foreign Liquor” (IMFL) which account for the bulk of alcohol utilization in the country. The potable alcohol industry is estimated at a market value of approximately Rs. 300 billion and has been growing at the rate of 7-10 percent/ annum over the past few years. However, the exact shares of country liquor and IMFL manufacturing are unknown since production of Country liquor

is still being done illegally in many areas, making it difficult to arrive at a correct estimate.

Since, grain prices have remained quite stable compared to sugarcane-based molasses, cost of production using grain feedstock remains quite predictable for alcohol producers. But in general, it is more expensive to use grains unless molasses prices are very high. Thus, establishing dual substrate facilities gives distilleries flexibility to switch between molasses and grains according to price changes.

The potable alcohol produced in India is primarily made from sugarcane molasses and not from grain as in many other countries. Due to the increasing uncertainties involved in molasses availability (and the resultant increase in its prices) the industry is gradually accepting the option of grain-based alcohol. However, molasses still accounts for most of the domestically produced potable alcohol in the country. The process of manufacturing IMFL (such as whisky, rum, and brandy) includes a secondary distillation of the fermented mixture of grains and molasses that yields extra neutral alcohol (ENA) with 94.6% alcohol content, which is diluted to obtain IMFL. The IMFLs are usually of 42.8% v/v ethanol content. In the past few years, significant growth has been achieved in the production of quality spirits and the industry is now exporting these products. In terms of market players, the IMFL industry is highly consolidated with a few companies holding significant shares in the market. The production centers for IMFL are mostly located in the sugar-producing states of Maharashtra, UP, Karnataka, and Tamil Nadu and some in Haryana and Punjab. Regulation and taxation of the sector is under the jurisdiction of the state governments and is large source of revenue for the states.

The Chemical Alcohol-based Industry in India

Alcohol is raw material for the production of chemicals such as Acetic acid, Acetic anhydride, Ethyl acetate, Acetone, Mono-ethylene Glycol (MEG) etc. These then provide the feedstock for a variety of industries such as synthetic fibers, pesticides, pharmaceuticals, paints, dye and adhesives. Ethanol produced in the country easily met the consumption requirements of these industries until around the year 2002. However, after 2002, Blending of 5% ethanol with petrol in many of the Indian States have resulted in problems of availability of adequate quantity of feedstock for production in above industries.

Now many major units are engaged in the manufacture of chemicals. Therefore alcohol-based industry is a very important constituent of the organic chemical sector and the entire Indian chemicals industry in general. The above substantial consumption of ethanol by this sector makes it second largest consumer of ethanol in the country, behind the potable sector.

Fuel Ethanol for Blending in Gasoline

The Government of India (GOI) approved the National Policy on Bio-fuels on December 24, 2009. The policy encourages use of renewable energy resources as alternate fuel to supplement transport fuels and had proposed an indicative target to replace 20% of petroleum fuel consumption with bio-fuels (bio-ethanol and biodiesel) by end of 12th Five- Year Plan (2017) in a bid to renew its focus and strongly implement the Ethanol Blending Program (EBP), the Cabinet Committee of Economic Affairs (CCEA) on Nov 22, 2012, recommended 5% mandatory blending of ethanol with gasoline. It has also recommended that the procurement price of ethanol shall now be decided by between the Oil Marketing Companies (mostly PSU) and suppliers of ethanol. The government's current target of 5% blending of ethanol in gasoline has been partially successful in years of surplus sugar production and not fulfilled when sugar production declines.

TYPE OF PROJECT

Sr. No.	Feature	Particulars
1.	Products	Fuel Ethanol - 45KLPD ENA - 45KLPD Impure Spirit - 45KLPD
2.	Byproduct	Biogas - 14040 nm^3/day Bio-compost - 41.93 MT /day

INTERLINKED PROJECT

Sr. No.	Feature	Particulars
3.	Products	Sugar - 2500 TCD
4.	Byproduct	Molasses - 100 MT/day Bagasse - 750 MT/day Press mud - 100 MT/day

SITE LOCATION

The Distillery project including Bio-Methanation plant will require land for entire basic infrastructure. Plant equipments, storage of plant inputs and finished products. Besides this Administrative Office, Security arrangements, Fire fighting arrangements etc shall also have to be considered. Plant layout is prepared keeping in view, the above composition of project.

It shall be accommodated in a plot size of approx. 14.50 Acres.

Sr. No.	Feature	Particulars
1.	Location	Kallakuchi II CSM Ltd Kachirayapalayam Chinnasalem Villupuram Tamilnadu – 606 207
2.	Latitude Longitude	11° 45' 29.85" N 78° 52' 24.07" E
3	Nearest Highway	NH-68
4.	Nearest village	Kachirayapalayam
5	Nearest Railway station	Chinnasalem
6.	Nearest Airport	Salem
7.	Nearest Town	Kallakurichi

MANGNITUDE OF OPERATION:

Following table clearly indicates all facets of proposed project to elaborate magnitude of project:

Sr. No.	Feature	Details
1.	**Area Statement***	
	Total plot area	412500 m^2
2.	**Working days**	300
	Season	150
	Off-season	150
3.	**Products**	
	ENA	45 KLPD
	IS	2.25 KLPD
	Fuel Ethanol	45 KLPD
	By product	

	Biocompost	41.93 MT /day
	Biogas	14040 Nm^3/day
4.	**Water sources**	
	Well water	Pottiyam village
	Fresh Water required	641 m3/day
5.	Power requirement	755 KVA
6.	Backup power	750 KVA
	D G set rating	750 KVA
	Fuel used	HFO
	Power consumption	755 KW
7.	Man power	51 Nos.
	Staff	7 Nos.
	Workers	26 Nos.
	Contractual labor	18 Nos.
Total Investment		**Rs. 9000 lakhs**

Investment:

Sr. No.	Particulars	Amount Rs in Lakhs
1	Total Project Cost	9000.00
2	Own Funds @ 10%	900.00
3	Loan from Sugar Development Fund @ 40%	3600.00
4	Loan from National Coop. Development Corporation @ 50%	4500.00

ENVIRONMENTAL MANAGEMENT PLAN

Ours is an existing industry planning new unit and we have well established environmental management plan (EMP). The distillery, sugar plant and power plant utilize resource such as water, cane sugar, bagasse etc. and discharge liquid, gaseous and solid waste products. Mitigation measures are incorporated in the project to protect environment against any harm. A comprehensive environmental management plan is adopted consisting of proposed pollution control measures and additional mitigation measures for abatement undesirable impacts. Summary of these measures includes:

1. Green belt and greenery development in the factory premises.
2. Waste water management Recycle & Reuse of condensate
3. Paving and lining of roads, solid storage yards of ash etc.
4. Self monitoring system is established in the industry with man power and facilities to ascertain the compliances of environmental norms and standards.
5. Personal health care program, emergency management plan and safety management systems will be implemented in the distillery.
6. Operation and Maintenance of pollution control measures
7. Establishment of waste reduction measure.

BUDGET ALLOCATION FOR EMP

Sr. No.	Particulars	Capital cost	Annual recurring cost
		Rupees in lacs.	
1.	48 M high chimney	88	4
2.	Water pollution control equipment including R O filter and bio-digester for zero discharge	350	28
3.	Compost yard	250	26
4.	Composting equipments	78	18
5.	Spent wash storage tank	250	14
6.	Monitoring of pollution parameters	--	5
7.	Laboratory and chemicals	5	4
8.	Safety and healthcare	3	1
9.	Operation and maintenance	--	10
10.	Salary of EMP staff	--	36
11.	Development of green belt	12	3
Total		1036	149

The industry on expansion will provide direct and indirect employment to many local rural persons. In addition the manure / compost containing extra rich soil nutrients like nitrogen, potassium and phosphorus will be generated giving a boost to the agricultural produce of local farmers thus contributing to overall prosperity of the region. The project will be a boon as power will be fed to grid for other users in a power deficit state as is ours.

2.0 INRODUCTION OF PROJECT AND BACKGROUND INFORMATION

2.1 IDENTIFICATION OF PROJECT & PROJECT PROPONENT

Kallakurichi II CSM Ltd (hereafter being referred to as project proponent or simply as industry or KCSML) is an existing sugar mill located in village Kachirayapalayam falling in Taluka Chinnasalem of Villupuram district in Tamilnadu state.

KCSML is a registed unit under cooperative society's act .

It is an existing 2500 TCD capacity sugar mill producing 7500 MT/month white crystalline sugar.

Electrical power and steam requirement:

It does not produce electrical power -

For power generation KCSML has made agreement with Tamilnadu News and Paper Mills Ltd (TNPL) to supply required electrical power and steam for KSGML operations. Under the agreement KSGML supplies bagasse generated in sugar mill operation to TNPL who utilizes same for running of high pressure boiler. Steam at high pressure is fed to two turbo-generator sets each of 3 MW capacity.

Steam is first utilized to rotate the turbine of generator. Steam released at low pressure is fed to KCSML plant to fulfill its heating needs.

Under normal conditions sugar mill operation will require electrical power of 4.5 MW.

The proposed distillery will require 0.755 MW electrical power.

Hence total power requirement after proposed expansion shall be 5.255 MW which will be fulfilled by existing turbines of 6 MW generation capacity.

Dedicated Boiler and turbo-generator for proposed distillery:

As clarified power and steam requirement of existing sugar mills is being met by TNPL. For proposed distillery PP desires to install a dedicated unit of 1 MW generation capacity. For this purpose a furnace oil fired boiler will be taken, steam from it will be used to run turbine to generate 1 MW electrical power. This will be sufficient to run the proposed distillery even if TNPL supplies fail.

By products generation:

Bagasse	**-**	**21000 MT/month**
Press mud	**-**	**1875 MT/month, and**
Molasses	**-**	**3400 MT/month**

KCSML now intends to install a 45 KLPD molasses based distillery in order to increase its productivity and profitability in addition to abating pollution.

The Ministry of Environment and Forests (MoEF) Government of India has recently issued an EIA notification, S .O. 1533 dated 14 September 2006 notification amended in 1 December 2009 wide no. 3067. Under Environmental (Protection) Act (EPA) 1986. Prior Environmental Clearance from the EIA Authorities is mandatory for the establishment of projects/activities listed in the schedule of above notification Distillery projects are categorized under 5(g) of schedule of activities and therefore, require prior environmental clearance from the Expert appraisal committee / authority. Hence project of molasses based distillery unit is classified under schedule of activities **5(g)** in **category A.** Threshold limits for Distillery unit are none for all molasses based distilleries and ≥ 60 KLPD for non molasses based distilleries unit are classified under **category A.** These are appraised by EAC at MoEF New Delhi.

2.1 PROJECT PROPONENT

Profile of the Board of Directors as on 31st December 2012 is detailed below:

Board of Directors

Name	Role
Mr. S. VADIVEL	President
Mr. M. GOVINDHAN	Director
Mr. V. T. E. THIRUNARAYANAM	Director
Mr. P. N. SUBRAMANIYAN	Director
Mr. R. GURUNATHAN	Director
Mr. G. SATHIYAMOORTHY	Director
MR. M. PERIYASAMY	Director
MR. A. SAMPATH	Director
MR. A. BALASUBRAMANIYAN	Director

Name	Role
MR. A. AMMANI	Director
MR. S. JAMUNARANI	Director
MR. N.PACHAYIE	Director
MR. T. SUNDARI	Director
MR. R.VALLIYAMMAL	Director
MR. K.SELVARAJ	Director
MR. K.PERIYASAMY	Director
MR. M.MUNUSAMY	Director
MR. M.MOHANAMALA	Director

2.2 NATURE OF PROJECT

Kallakurchi Cooperative Sugar Mills Ltd is an agro based industry, manufacturing sugar from cane juice. Sugarcane is crushed @2500 TCD; juice so extracted is processed to obtain white crystalline sugar. Bagasse, molasses and press mud are byproducts.

Management has already made arrangement with Tamil Nadu Newsprint and Papers Ltd (TNPL) to utilize bagasse produced for generation of electricity and steam required for sugar mill. TNPL have installed two turbines of 3 MW capacity each. Total generation does not exceed 4.5 MW which is the power required to run the sugar mill.

There is no export of power.

Proposed distillery will require 755 KVA electrical power at full load. This power will be available from existing set up of TNPL.

In addition KCSML intends to install own power plant of 1 MW capacity.

2.3 JUSTIFICATION FOR THE PROJECT

The total yearly fossil fuel consumption of the was 5.5 billion tons coal equivalent during the year 1966 which by the end of the year 2000 increased to 23.0 billion tons of coal equivalent. However, it is only after the commencement of 21st century , the consumption of fossil fuels have been increasing at an alarming rate, hence time has come to take major steps to minimize their use and conserve them by replacing with renewable energy fuels.

Today in India the vehicle population run on gasoline is over 60 million and is increasing at a very faster rate. The gasoline demand in India was only 7.07 million metric tons in 2001-02. Now it has shot up to 14.31 million metric tons in 2013-14. At this rate by the end of 21st century, the gasoline demand will be enormous.

In view of above threat to the fossil fuels, the ethanol is obvious choice to be considered for part substitution for fossil fuels gradually in future. Brazil adopted the above concept way back in 1970 and thus shown us the path to be followed. Initially, Brazil started with a blend of 10% ethanol with 90% petrol in 1975 and gradually increased it to 23% ethanol with 77% gasoline. Most automobiles in Brazil run either on hydrous alcohol (E100) or on gasohol (E25 blend), as the mixture of 25% anhydrous ethanol with gasoline is mandatory in the entire country. Since 2003, dual-fuel ethanol flex vehicles that run on any proportion of hydrous ethanol and gasoline have been gaining popularity. These have electronic sensors that detect the type of fuel and adjust the engine combustion to match, so users can choose the cheapest available fuel. Pure Petrol is not being sold at filling pumps in Brazil. The annual production of ethanol in Brazil has exceeded 20 million liters. In addition to its domestic consumption, Brazil also exports ethanol to other countries.

In Brazil, ethanol is mainly produced from sugarcane. Out of total available sugarcane, only 45% is used for sugar production and remaining 55% goes for ethanol production, directly from mixed juice. The final molasses of 45% sugarcane used for sugar production is also utilized for ethanol production. This has given Brazilian sugar industry, a flexibility to program and adjust its sugar production as per market demand and prevailing sugar prices in international market, because Brazil exports nearly 45% of its sugar production.

Inspired by the Brazilian success, other countries including Canada, Sweden, France, etc are either producing ethanol in large quantities and promoting its use in automobiles by giving incentives. Canada is offering a subsidy of 10% per liter of ethanol for promoting its use as fuel. France is producing ethanol from grapes of inferior quality, unsuitable for wine production. Sweden, by using ethanol has been able to reduce its **fossil fuel (oil) consumption by 50% since 1980**. In United States, the practice of Blending of Ethanol in petrol is since 1984. Presently in United States, more than six billion liters of ethanol is blended annually with gasoline.

The most common blends contain 10% ethanol with 90% and 85% ethanol with 15% petrol.

Indian Government has also made mandatory 5% ethanol blending in Petrol. The Ministry of Petroleum on Friday, the 11th of January, 2013, finally issued a gazette notification making 5% ethanol blending with petrol mandatory across the country.

Enough raw material is available for ethanol production in India. India has got the potential to produce over 18 billion liters of ethanol. Ethanol is cheaper as compared to gasoline and is one of the cleanest, safest and harmless automotive fuel. As compared to gasoline, it reduces the emission of CO_2 & other green house gases responsible for global warming by over 35%; tail pipe CO emission y 30%; exhaust volatile organic compound (VOC) emission by 12%; toxic emission by 30% and especially fine particulates emissions. These poses health threats to those having respiratory ailments and affects mostly senior citizens and children considerably. It also prevents "Ozone Depletion" to a certain extent. The augmented use of ethanol will give much needed relief to public exchequer, as the oil import bill will be substantially reduced.

The recently elected Central Government has also decided to go after ethanol blending in gasoline in a big way. Accordingly the Government has announced on 23rd June 2014, a series of measures for the sugar industry, which include doubling the ethanol blending to 10%.

Due to ever increasing gasoline demand and consumption of fossil fuels at a very fast rate, "gasohol-fuel ethanol" is being viewed as an alternative to gasoline, since 1975. India is at least three decades behind Brazil in taking advantage of its potential to produce ethanol in a very big way and its use partially, if not fully to replace gasoline by gasohol.

The production and use of ethanol in a big way may solve the national oil problem to a great extent. Production ethanol from mixed juice, secondly juice and / or B Heavy molasses will result in substantial steam and Bagasse saving. Huge Bagasse saving will enable the sugar factory to continue co-generation in off season, at least for 2-3 months.

Flexible approach to shift from sugar production to ethanol production & vice versa will be able to correct the production-consumption (supply-demand)

distortions presently caused. Hence in years to come Molasses based Distilleries are definitely getting advantages and shall be a profitable option.

Augmenting ethanol supply

Currently, due to very high cost of imported ethanol, the government does not wish to use imported ethanol for the ethanol blending program, hence the focus is on developing domestic production capacities .To augment supply, the government of India has permitted ethanol production directly from sugarcane juice while ensuring that the move does not constrain production of sugar or ethanol for industrial use. The Government of India offering subsidized loans (through sugarcane development funds) to sugar mills for building ethanol production units. The loans would cover a maximum of 40% of the project cost to sugar mills for development of ethanol production unit.

Oil companies have stated that during the year 2014, the distilleries could not fulfill their requirement of fuel ethanol for blending and they could get around 50% fuel ethanol for blending.

Recently, for implementing 5% Ethanol Blending Program, the Oil companies have estimated their requirement of fuel ethanol as 97 Cr. Liters during the year 2015. Accordingly, Tenders have been floated mentioning the landed price of Ethanol to be Rs 49.00/liter.

Ethanol Demand V/S Production Capacity

In India production of Ethanol is from sugarcane molasses (a by-product of sugar Industry). Traditionally, molasses has been used in India to produce rectified spirit and alcohol of about 94.5% purity for producing liquor for human consumption and for producing various chemicals but in the past few years, it has been effectively used to produce Bio- ethanol for blending with petrol as a fuel.

Despite of steady demand for ethanol from the chemical and potable liquor industries, there will be a certain rise in demand for ethanol for implementing the Ethanol Blending Programme as per the Government Policy.

Given below the Balance sheet for Production/Consumption for Ethanol in India:-

S. No.	PARTICULAR	2009	2010	2011	2012	2013
1	Beginning Stock	1672	1241	1061	757	908
2	Production	1073	1522	1681	2154	2064
3	Imports	280	92	39	34	35
4	Exports	4	14	29	22	20
5	Potable & Chemicals Industry Consumption	1680	1730	1630	1710	1755
6	Fuel Ethanol Consumption	100	50	365	305	650
7	Total Consumption	1780	1780	1995	2015	2405
8	Balance Stock	1241	1061	757	908	582
9	Petrol Consumption	18022	19954	21080	22132	22510
10	Blending Rate %	0.6	0.3	1.7	1.4	2.9

Source: GRAIN REPORT

On comparison between the petrol consumption and ethanol consumption, it is evident that there is a huge potential for ethanol for blending with petrol. The ethanol blended petrol program of government of India would become a reality only by increasing the capacity of fuel ethanol production in India. Kallakurchi- II is taken such an initiative which would help in achieving the fuel ethanol blending programmed and also revenue to the mill.

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At present there are 356 distilleries, including 160 attached with sugar factories, having a total installed capacity of only 6.0 billion liters ethanol, operational in India. However, India is producing approx. 3.0 Billion Liters of Alcohol with a capacity utilization of only about 50 %. It is a challenging task for the sugar industry, distilleries and other interested investors.

In order to meet the above mentioned challenge, following steps are needed to be taken at the earliest-

To expand the capacities of existing distilleries in sugar complexes on the basis of individual factory's requirement, keeping in view the possibility of producing ethanol from mixed juice, secondary juice, B-heavy molasses and other alternates.

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The Indian potable alcohol market can be classified into "Country liquor" and "Indian-Made Foreign Liquor" (IMFL) which account for the bulk of alcohol utilization in the country. The potable alcohol industry is estimated at a market value of approximately Rs. 300 billion and has been growing at the rate of 7-10 percent/ annum over the past few years. However, the exact shares of country liquor and IMFL manufacturing are unknown since production of Country liquor is still being done illegally in many areas, making it difficult to arrive at a correct estimate.

Since, grain prices have remained quite stable compared to sugarcane-based molasses, cost of production using grain feedstock remains quite predictable for alcohol producers. But in general, it is more expensive to use grains unless molasses prices are very high. Thus, establishing dual substrate facilities gives distilleries flexibility to switch between molasses and grains according to price changes.

The potable alcohol produced in India is primarily made from sugarcane molasses and not from grain as in many other countries. Due to the increasing uncertainties involved in molasses availability (and the resultant increase in its prices) the industry is gradually accepting the option of grain-based alcohol. However, molasses still accounts for most of the domestically produced potable alcohol in the country. The process of manufacturing IMFL (such as whisky, rum, and brandy) includes a secondary distillation of the fermented mixture of grains and molasses that yields extra neutral alcohol (ENA) with 94.6% alcohol content, which is diluted to obtain IMFL. The IMFLs are usually of 42.8% v/v

ethanol content. In the past few years, significant growth has been achieved in the production of quality spirits and the industry is now exporting these products. In terms of market players, the IMFL industry is highly consolidated with a few companies holding significant shares in the market. The production centers for IMFL are mostly located in the sugar-producing states of Maharashtra, UP, Karnataka, and Tamil Nadu and some in Haryana and Punjab. Regulation and taxation of the sector is under the jurisdiction of the state governments and is large source of revenue for the states.

The Chemical Alcohol-based Industry in India

Traditionally, the ethanol produced in the country was used primarily for potable purposes. However, the difficulties in disposing off the molasses (a waste by-product from sugar Industry), has been used as a feed to set up alcohol-based chemical industry in the country. This has facilitated the production of chemicals such as Acetic acid, Acetic anhydride, Ethyl acetate, Acetone, Mono-ethylene Glycol (MEG) etc. These then provide the feedstock for a variety of industries such as synthetic fibers, pesticides, pharmaceuticals, paints, dye and adhesives. Ethanol produced in the country easily met the consumption requirements of these industries until around the year 2002. However, after 2002, Blending of 5% ethanol with petrol in many of the Indian States have resulted in problems of availability of adequate quantity of feedstock for production in above industries.

Now many major units are engaged in the manufacture of chemicals. Therefore alcohol-based industry is a very important constituent of the organic chemical sector and the entire Indian chemicals industry in general. The above substantial consumption of ethanol by this sector makes it second largest consumer of ethanol in the country, behind the potable sector.

Fuel Ethanol for Blending in Gasoline

The Government of India (GOI) approved the National Policy on Bio-fuels on December 24, 2009. The policy encourages use of renewable energy resources as alternate fuel to supplement transport fuels and had proposed an indicative target to replace 20% of petroleum fuel consumption with bio-fuels (bio-ethanol and biodiesel) by end of 12th Five- Year Plan (2017) in a bid to renew its focus and strongly implement the Ethanol Blending Program (EBP), the Cabinet Committee of Economic Affairs (CCEA) on Nov 22, 2012, recommended 5%

mandatory blending of ethanol with gasoline. It has also recommended that the procurement price of ethanol shall now be decided by between the Oil Marketing Companies (mostly PSU) and suppliers of ethanol. The government's current target of 5% blending of ethanol in gasoline has been partially successful in years of surplus sugar production and not fulfilled when sugar production declines

2.4 EMPLOYMENT GENERATION:

Employment generation by existing sugar mills and proposed distillery is detailed below:

Employment Description	**Sugar Mill No. of Employees**	**Proposed Distillery No. of Employees**
Skilled & Unskilled Workers	55	26
Staff	87	7
Officers	16	--
Casuals	142	18
Total	**282**	**51**

3.0 PROJECT DESCRIPTION

3.1 Type of project

The proposed project is having capacity of 45 KLPD with molasses as raw material.

Sr. No.	**Feature**	**Particulars**
1.	Products	Fuel Ethanol - 45KLPD ENA - 45KLPD Impure Spirit - 45KLPD
2.	Byproduct	Power - 1.0 MW Biogas - 14040 nm^3/day Bio-compost - 41.93 MT /day

3.2 Interlinked project

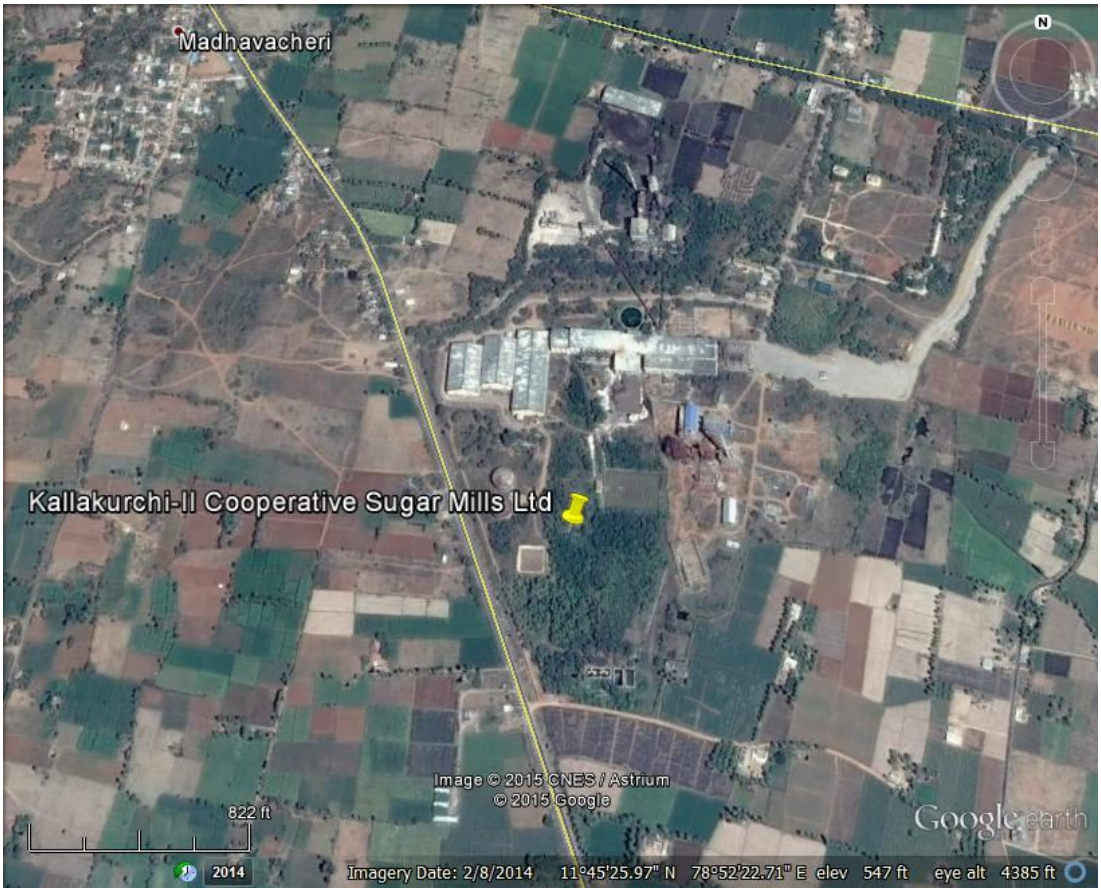
Sr. No.	Feature	Particulars
3.	Products	Sugar – 2500 TCD
4.	Byproduct	Molasses - 113.3 MT/day Bagasse - 700MT/day Press mud- 62.5 MT/day
5	Power	6 MW electrical power generation capacity from bagasse supplied by KCSML with help of two turbines of 3 MW each. Power and steam being generated by TNPL and supplied to KCSML.

3.3 SITE LOCATION

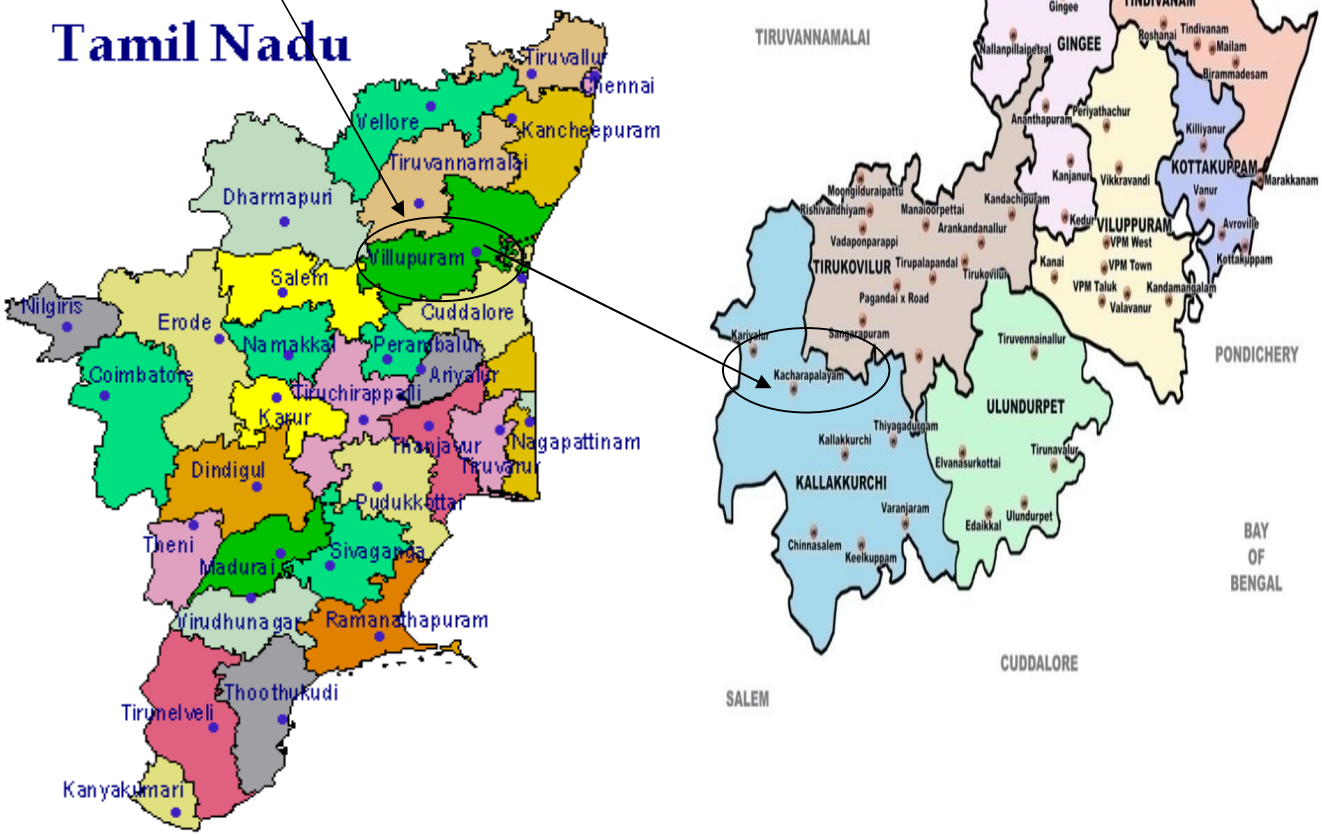
Location details are summarized in a table below:

Sr. No.	Feature	Particulars
1.	Location	Kallakuchi II CSM Ltd Kachirayapalayam village, Chinnasalem Taluka, Villupuram District Tamilnadu – 606 207
2.	Latitude Longitude	11° 45' 29.85" N 78° 52' 24.07" E
3	Nearest Highway	NH-7
4.	Nearest village	Kachirayapalayam
5	Nearest Railway station	Kachirayapalayam
6.	Nearest Airport	Salem
7.	Nearest Town	Kallakurichi

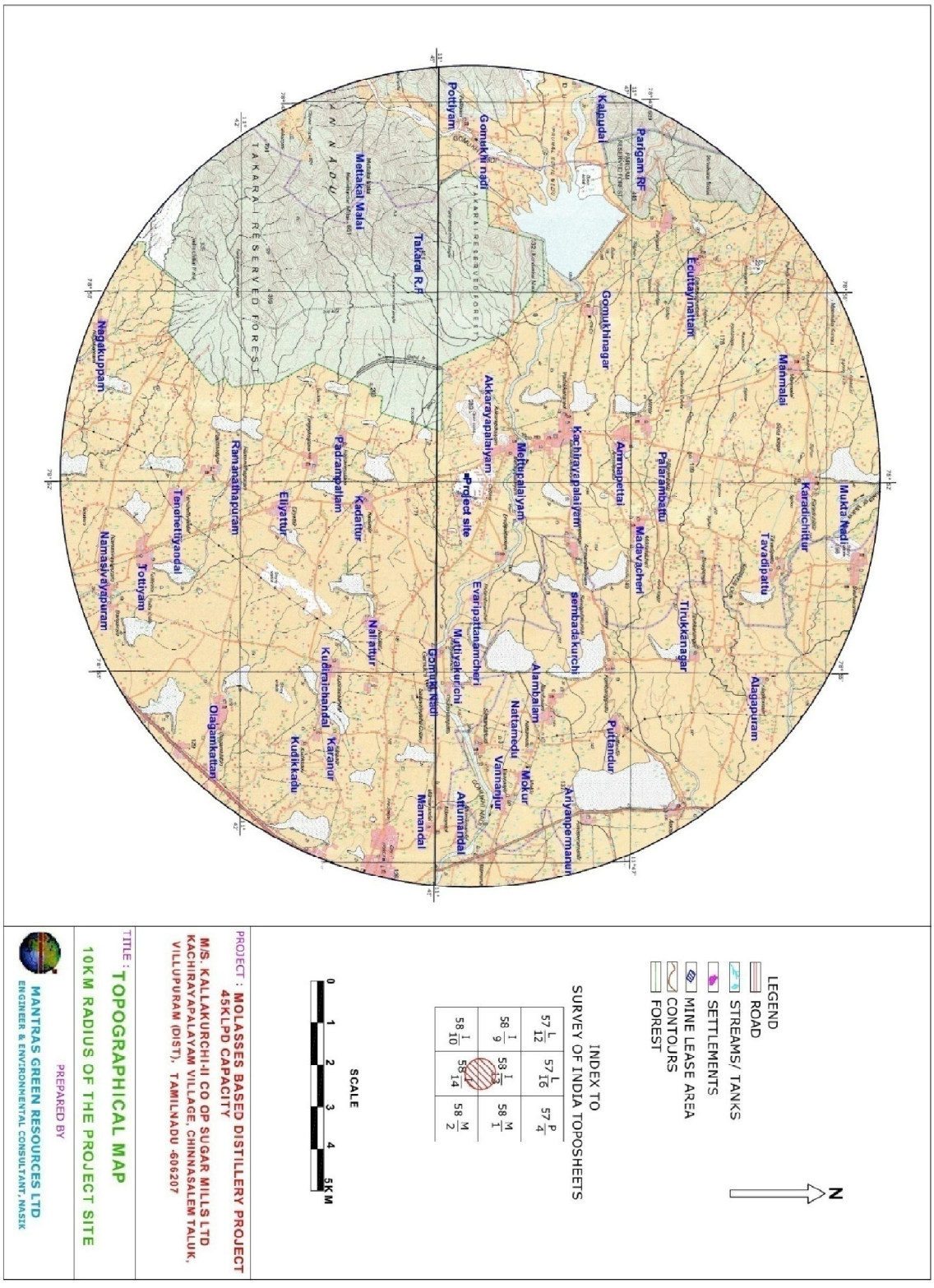
3.4 Google imagery of the location



Project Location



Topographical Map with 10KM Radius:



PLANT LAYOUT MAP :

Site selection criteria:

There is an existing sugar mill of 2500 TCD capacity which generates molasses and pressmud required for distillery. These are presently being sold to neighboring distilleries.

Industries	Molasses (KLPD)	Distance (KM)
Salem CSM Ltd	53	90
Amaravati CSM Ltd	55	400
Dharani Sugar	100	25
EID Perry	-	100

- Company intends to increase its profitability by adding more products generated from by products.
- Company has enough land for installing manufacturing facilities along with composting facility to ensure a zero discharge project.
- Infrastructure facilities like communication and electricity are also closely available.
- The proposed project provides employment opportunities to a large number of rural populations.

3.4 ALTERNATIVE SITES:

Alternative sites have not been considered as this is an expansion project to be executed at existing location based on above site selection criteria.

3.5. MANGNITUDE OF OPERATION:

Following table clearly indicates all facets of proposed project to elaborate magnitude of project:

Sr. No.	Feature	Details
1.	**Area Statement**	
	Total plot area	58679.42 m2
	Composting area	20234.3 m2
2.	Working days	300

	Season	150
	Off-season	150
3.	**Products**	
	ENA	45 KLPD
	IS	2.25 KLPD
	Ethanol	45 KLPD
	By product	
	Bio-compost	41.93 MT /day
	Biogas	14040 Nm^3/day
4.	**Water sources**	
	Well Water	Pottiyam village
	Fresh Water required	**641 KLPD**
5.	**Power requirement**	755 KVA
6.	**Backup power**	
	D G set rating	750 KVA
	Fuel used	HSD
7.	**Man power**	51 Nos.
	Staff	7 Nos.
	Workers	26Nos.
	Contractual labor	18 Nos.
8.	**Total Investment**	**Rs. 9000 lakh**
9.	**Utilities**	1 No
	Boiler capacity	10 TPH @ 45 kg/cm2
	Fuel	Antifoam required / KL of alcohol production – 0.5KG DAP/Urea required /KL of

		Alchol production – 0.5KG
	Fuel consumption	750 kg/hr
	Biogas	14040 nm3/day
	Gross Calorific Value	8000Kcal/nm3
	Equivalent steam generation	84.0 MT/day
	Reduction in F O consumption	5.3 MT/day
10	**Total ash generated**	Nil
	Total SO_2 generated	1440 kg/day
	Height of chimney	48 m
	H_2S generation	0.2 %
	SO_2 generation due to H_2S	56 Kg/day
11	**Effluent generation**	Spent wash 360 KLPD
	Disposal	Composting with press mud after biomethanation and concentration
12.	**Solid waste**	41.93 MT/day bio-compost (By product)

3.6 MANUFACTURING PROCESS:

3.6.1 Manufacturing Process of 45 KLPD molasses based distillery:

PROCESS DESCRIPTION

Proposed Distillery shall be set-up based on latest Design, Engineering and Supply technology for Molasses handling, Fermentation, Distillation, Molecular Sieve Dehydration, Evaporation, Bio-composting, Bio-Methanation, Water treatment plant and Effluent Treatment Plant so as to have the Plant compliance to Zero Discharge. Latest Technology ensures incorporation of High efficiency Design, Higher fermentation efficiency and Effective heat integration in distillation and evaporation. The Process Technology adds value to overall plant engineering by incorporating global standards for Design, on safety norms and

adherence to local design codes. The distillery process can be either with Continuous or Fed Batch Fermentation.

Continuous Fermentation

Series of fermenters of identical size capacity will be provided equipped with agitators for mixing of fermenter mass & facilitate release of CO_2 produced. Molasses, diluted with water to the desired concentration is metered and fed continuously into Fermenter I. Additives like urea and de-foaming oil are also introduced in the Fermenter I. There is an automatic foam level sensing and dosing system for de-foaming oil, in both the Fermenters.

Fermentation

Every Kilogram of alcohol produced, generates about 290 Kcal of heat. This excess heat is removed by continuous circulation of the fermenting wash through an external plate heat exchanger called the **Fermenter Cooler I.** The Fermenter temperature is always maintained between 32 and 34°C, the range optimum for efficient fermentation. The conversion of 80% sugar approximately in to ethanol is completed in Fermenter I. The fermenters are provided with a provision for stillage recycle for maintaining high dissolved solids concentration in the Fermenters. The temperature in the Fermenters is maintained between 32 to 34°C for optimum fermentation. Conversion of sugar to ethanol is instantaneous, and the residual sugar concentration in Fermenters is maintained below 0.2 % w/w as glucose. This usually corresponds to a residual reducing substances concentration of 2.0 to 2.5% w/w in wash.

The yeast for the fermentation is initially (i.e. during start-up of the plant) developed in the Propagation Section. Once propagated, a viable cell population of about 300-500 million cells/ml is maintained by **yeast recycling and continuous aeration of the fermenter.** Fluctuations in the yeast count of ±20% have little effect on the overall fermenter productivity. Yeast cell vitality which is usually above 70 % may, in times of stress (such as prolonged shut-downs) drop to 50% without affecting the fermentation. The aeration rate in both the Fermenters is adjusted for desired yeast cell vitality.

All the nutrient elements necessary for yeast growth exist in adequate quantities as impurities in molasses. Occasionally, Nitrogen may have to be supplemented. De-foaming oil (DFO), say Turkey Red Oil is added to the fermenter by an

automated DFO dosing system, to control foaming. Usually no other additives are required.

Fermented wash from Fermenter II passes through a series of hydro-cyclones , which remove grit, iron filings and heavy particulate matter. The overflow from the first set of hydro-cyclone is taken to Yeast Separator, which clarifies the wash. The hydro-cyclones protect the separator from erosion damage by removing grit and hard particles. The reject from 1st stage hydro-cyclone is fed to 2nd stage hydro-cyclone for further separation. The reject from 2nd stage hydro-cyclone containing sludge along with some wash, is fed to **Decanter Centrifuge for separation of sludge** which is sent to composting. The clear wash recovered from the Decanter Centrifuge is fed to wash column for **alcohol recovery**. The overflow from 2nd stage is recycled back to Fermenter I.

Yeast recycling

The yeast in the fermented wash is removed as 40% to 45 % v/v slurry, and is returned to the Fermenter I. This feature ensures a high yeast cell concentration is achieved and maintained in the fermenters. By re-circulating grown, active yeast, sugar that would have otherwise been consumed in yeast growth is made available for ethanol production, **ensuring high process efficiency and extra alcohol yield.** The clarified wash from separators is collected and sent to distillation section.

Propagation

The propagation section is a feeder unit to the fermenters. Yeast is grown in 3 stages. The first two stages are designed for aseptic growth. Propagation vessel III develops the inoculums using pasteurized molasses solution as the medium. Propagation is carried out only to start up the process initially or after very long shutdowns during which the fermenter is emptied.

CO_2 Scrubbing and recovery

The carbon-di-oxide produced during fermentation from Fermenter I is scrubbed with water in sieve tray scrubber to recover alcohol from vent gases. The vent gases from Fermenter II mainly air and carbon dioxide are also scrubbed in sieve tray scrubber for alcohol recovery. The water from both the scrubber is returned to respective Fermenters. About 1% of the total alcohol production is saved by scrubbing the Fermenter off gases.

The CO_2 produced from fermenters after scrubbing will be bottled to avoid air pollution.

FED- BATCH FERMENTATION

Fermentation technology is operated in Fed batch mode depending on molasses composition. This gives the Flexibility to operate the system with the same efficiency parameters even with varying quality of molasses.

Molasses Handling and Distribution

Screened molasses transferred to molasses receiving tank and molasses is weighed. Weighed molasses is distributed to cell mass propagation, fermentation and yeast activation section.

Yeast Propagation

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

Dilute molasses media are prepared in yeast vessel by re-circulating media through molasses diluter. Laboratory propagated cell mass is scaled up in series of yeast vessels. Filtered air is sparged in pasteurized and cooled dilute molasses medium for optimum growth of yeast. Temperature is maintained at 30-32°C by recirculation cooling water through jacket of yeast vessels. Cell mass from Yeast vessel is transferred to yeast activation vessel to build up cell mass required for fermentation by cell mass transfer pump.

Choice of Fermentation Process

The choice between Fed-Batch and continuous fermentation technology in a distillery is determined based on the quality of the molasses, the climatic condition prevailing, the type and purity of strain used for fermentation, the capacity and number of fermenters available etc. As the quality of molasses and the climatic conditions are not under the control of distillery it is advisable to have both options available in the distillery unit and switch over of technology to be adopted by the distillery from time to timer as per requirement to achieve optimal efficiency of the plant.

MULTI-PRESSURE DISTILLATION

Multi-Pressure distillation scheme has distillation columns operating under different pressures. Heat energy from columns operating under high pressure is recycled back to columns operating under low pressure to conserve energy. The plant can be operated under 2 different modes to produce RS or ENA as desired.

ENA PLANT DISTILLATION COLUMNS

OPERATIONAL MODE - 1:

WASH TO ENA PLANT

This scheme has total seven distillation columns.

The columns in order of flow are: -

1. Analyzer Cum Degasifying Column – vacuum.
2. Aldehyde Column – vacuum.
3. Pre-rectifier column – vacuum.
4. Pre-rectifier Stripper column – vacuum.
5. Purification Column – atmospheric pressure.
6. Rectification cum exhaust column – pressure
7. FOC (Recovery) Column – atmospheric pressure
8. Simmering Column – atmospheric pressure

Fermented wash is preheated in fermented wash pre –heater. The preheated wash is fed to analyzer column, to remove light impurities, dissolved gasses etc. Vapor from this column are passed to the bottom of the pre –rectifier and aldehyde Column. The Spent wash from the bottom of analyzer column is sent through a PHE to heat the incoming fermented wash and taken for further treatment or recycle to fermentation section.

In Pre-rectifier column the alcohol is concentrated and in the top tray and a small impure sprit cut is taken out. RS draw is taken from few trays below the top of Pre rectifier column, which is sent to purification column.

Purifier 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 while the top vapor draw is fed directly to Fusel oil concentration column. The Rectifier/Exhaust column concentrates the ethanol to 96% v/v. The high-grade spirit is drawn from one of the upper trays of the rectification column and fed to the Simmering Column.

Simmering Column removes methanol, di-acetyls from the top and ENA draw is taken from the bottom. A small head cut is removed from the overhead stream to withdraw impurities. Fusel oil build up is avoided in the Rectifier cum exhaust column by withdrawing outside streams (fusel oils).

These are sent to the fusel oil concentration column where these fusel oils are concentrated and sent to decanter where these streams are diluted with water and fusel oil rich layer is separated. In this mode, rectifier column drives the analyzer and pre –rectifier column while purifier column partially meets the heat requirement of simmering column, thus achieving maximum heat integration and minimum steam consumption.

OPERATIONAL MODE – 2:

WASH TO RECTIFIED SPIRIT PLANT

In this mode**,** system will consists of three columns:

1. Analyzer Column
2. Pre –rectification Column
3. Pre –rectification Stripper Column
3. Rectification cum Exhaust Column
4. FOC (Recovery) Column

After preheating fermented wash in fermented wash pre-heater, the wash is fed at the top of the Analyzer column in which alcohol is stripped from the wash. Spent wash is removed from the bottom of the column. The vapors from uppermost tray Analyzer column are fed directly to the Pre – rectification column, A top cut is taken out from the Pre – rectification top to remove low boiling impurities.

The RS draw from Pre-Rectification is fed to the Rectification cum Exhaust Column. Rectification cum exhaust column concentrates the ethanol to 94.68 % v/v. The high-grade spirit is drawn from one of the upper trays of Rectification cum exhaust column.

A small heads cut is removed from the overhead stream to withdraw impurities. The lees from the column are drained out. Lower side draw streams are taken from Rectification cum Exhaust column to avoid fusel oil build up. The fusel oils

are fed to the fusel oil concentration column. In this mode rectifier column drives the analyzer and pre –rectifier column. fusel oil concentration columns are operating stand-alone.

De-Hydration Technology for Fuel Ethanol

Molecular sieve technology works on the principle of pressure swing adsorption. Here water is removed by adsorbing on surface of `Molecular Sieves' and then cyclically removing it under different conditions (steaming).

Molecular sieves are synthetic Zeolite typically 3A Zeolite. Zeolites are synthetic crystalline Alumino silicates. This material has strong affinity for water. They adsorb the water when heated (and pressurized) and desorbs the water under vacuum. This principle is used to dehydrate ethanol. The crystalline structure of Zeolite is complex and gives this material the ability to adsorb or reject material based on molecular sizes. Water molecule can enter the sieve and be adsorbed, but larger alcohol molecule will not be retained and will go through the bed. There can be two beds in parallel. Once a particular bed is saturated with water, the anhydrous alcohol is re-circulated to remove water from the bed under vacuum. The operation is called regeneration of bed; so that adsorbed water is desorbed from the bed. Till that time, other bed is used for dehydration.

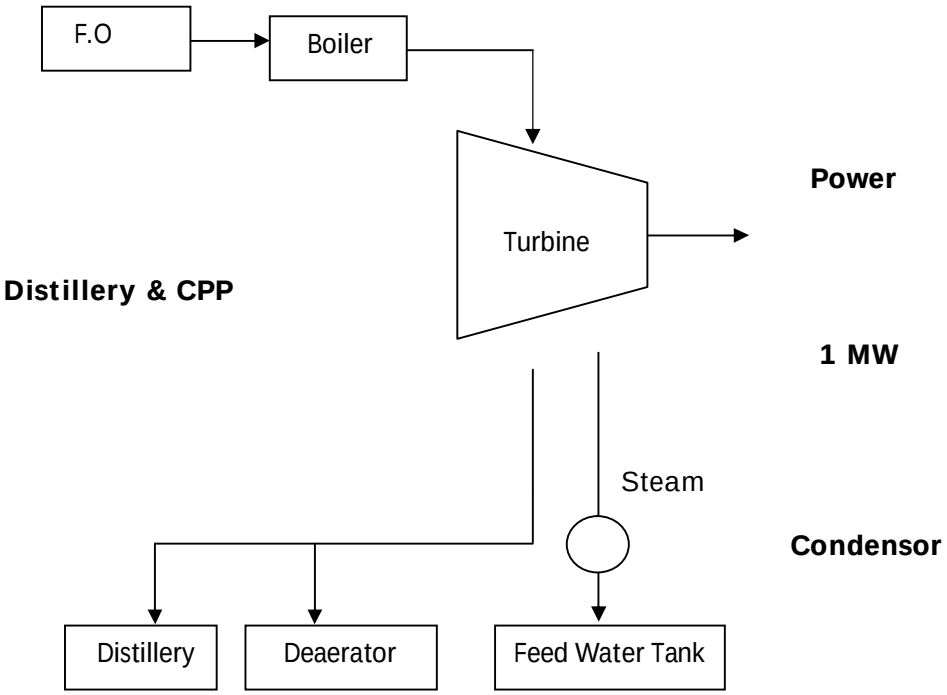
3.6.2 Process for power generation:

Electricity in all power stations originates in the spinning of electrical generators with the help of turbines. The heat necessary for the production of steam, which drives the turbine, is obtained by burning of biogas, oil, coal or biomass.

The existing power and steam requirements of sugar unit are being met by power generation unit managed by TNPL.

However the Company has decided to put up a 1.0 MW captive power plant.

For this purpose a boiler will be taken which will be Furness oil fired. Steam from this boiler will run a turbo-generator set to produce 1 MW electrical power.



Ash handling system

Since the proposed boiler shall be furnace oil fired, there will be no ash generation.

3.7 RAW MATERAL & FINISHED PRODUCTS

Raw material:

This is a molasses based distillery unit so raw material required is molasses. Required quantity of molasses is 3.64 MT/KL which will be made available from attached sugar unit. Electricity demand will be fulfilled by own cogeneration unit.

Raw Material Consumption Norms for Distillation and Bio-Fertilizer & CPP

Sr. No.	Feature	Norm of consumption	Total quantity
A.	**Distillation**		
1.	Molasses	3.64 MT/KL	164 MT
2.	Sulphuric Acid	0.03 Kg/KL	1.35 Kg
3.	Sodium Metabiosulphate	0.06 Kg/KL	2.7 Kg
4.	Magnesium Sulphate	0.05 Kg/KL	2.23 Kg
5.	NaCl	0.85 Kg/KL	38.2 Kg

6.	Defoaming Agent	1.00 Kg/KL	45.0 Kg
7.	Descaling Chemicals	0.34 Kg/KL	15.3 Kg
8.	Other Chemicals (Urea/ DAP)	0.06 Kg/KL	2.7 Kg
B.	**Bio Composting**		
1.	Press Mud	0.72 MT/KL	32.4 MT
2.	Bagacillo	0.28 MT/KL	12.6 MT
3.	Boiler Ash	Nil	Nil
4.	Culture	0.0018 MT/KL	0.081MT
C.	**Captive Power Plant**		
1.	Furnace oil	--	750 kg/hr

Molasses storage:

The proposed Distillery will be having its own molasses (about 45 % T.R.S.) to the extent of about 120 MT/day. As the proposed Distillery is of 45000 Lit / Day capacity, the Molasses produced from own sugar mill shall not be sufficient. For producing the above mentioned quantity of Alcohol, the requirement of Molasses will be 180 - 190 MT/Day at 100% capacity utilization of the plant. The Approx. additional requirement of 60 - 70 Mt/Day of Molasses shall be purchased from nearby sister cooperative sugar factories. Two molasses storage tank having capacity 6,000 MT each will be installed in distillery premises. Therefore, total molasses storage capacity will be 12,000 MT.

Product and byproducts:

Sr. No.	**Feature**	**Particulars**
4.	Products	Fuel Ethanol - 45KLPD ENA - 45KLPD Impure Spirit - 45KLPD Electrical power : 1 MW
5.	Byproduct	Biogas - 14040 nm^3/day Bio-compost - 41.93 MT /day

3.8 RESOURCES OPTIMIZATION/ RECYCLING /REUSE:

Total water required at the time of commissioning of unit will be 695 m3/day. The water will recycled in the different sections as per need. ENA manufacturing process generates spent wash. It will be disposed using method of evaporation followed by composting. The composed will be used in open land for the development of green belt within own factory premises.

Water budget of existing sugar mill @ 2500 TCD

Sr No	Water use	All values in KLPD	Remarks
1.	Cooling water make up	144	
2.	Mill bearing cooling	5	
3.	Boiler feed water gland cooling	0	Not required
4.	Air compressor cooling	0	Recycle water
5.	Sulphur burner	0	Recycle water
6.	Crystallizer cooling	0	Recycle water
7.	Power turbine cooling	0	Recycle water
	Total	149	
8.	Laboratory use	25	
9.	Make up water for service tank	50	
10.	Domestic use	30	
	Total	254	
11.	Water requirement of TNPL cogen plant	500	
	Total	754	

3.9 AVAILABILITY OF WATER / POWER / SOURCES OF SAME

Total water required for the proposed project is 641 m^3/day and will be made available through jack well from the well in village Pottyam.

Water budget for 45 KLPD molasses distillery and 1 MW captive power plant

S.NO.	WATER IN-COMING M³/DAY		WATER OUT-GOING M³/DAY	
1	For Fermentation	338	Drift + Evaporation + Purge from Cooling Tower.	240
2	For E.N.A. Dilution (After considering recycle)	27	Spent Lees	5
3	For Cooling Tower make-up of 1000M³/Hr circulation @1.0% (As per Standard)	240	Spent Wash	360
4	For Boiler – 10 TPH make-up water @15%	36	Steam condensate Evaporation Losses	36
	TOTAL	**641**	**TOTAL**	**641**

Above table represents maximum fresh water requirement with molasses as raw material during season.

3.10 Power Requirement:

The company has decided to put up a 1.0 MW captive power plant. So the power requirement of distillery will be meet from own CPP.

Distillery operations will consume about 0.755 MW of electrical power when molasses is used.

Distillery operations will consume about 1.5 MW of electrical power when grain is used For back up 750 KVA HSD fired generation will be installed.

Given below the details of section-wise power requirement for 45 KLPD Capacity Distillery:

Sr.No	Section particulars	Operating load (kwh)
1	Molasses Handling + Fermentation	150
2	Multi Pressure Vacuum Distillation	50
3	Fuel Ethanol Dehydration Section	45
4	Bio-Gas Section	55
5	Reverse Osmosis Unit	150

6	Bio-compost section	20
7	Water Treatment Plant	40
8	Alcohol Receiver and Storage Section	20
9	Cooling towers pumps for, Fermentation, Distillation and Fuel Ethanol De-Hydration.	100
10	Plant Lightning within Battery Limit	25
11	Boiler	100
	TOTAL	**755**

The above figures are tentative and shall be finalized after detailed engineering.

Distillery Steam consumption

A detail of Quantity wise Steam requirement for Distillery is as below:

S.NO	PARTICULAR	QTY	REMARKS
1	Wash to E. N. A.	6.30 MT/Hr	3.2 Kg/Lit of Alcohol.
2	Fuel Ethanol De-Hydration Plant	1.08 MT/Hr	0.55 Kg/Lit of Alcohol.
	Total	177 MT/day	

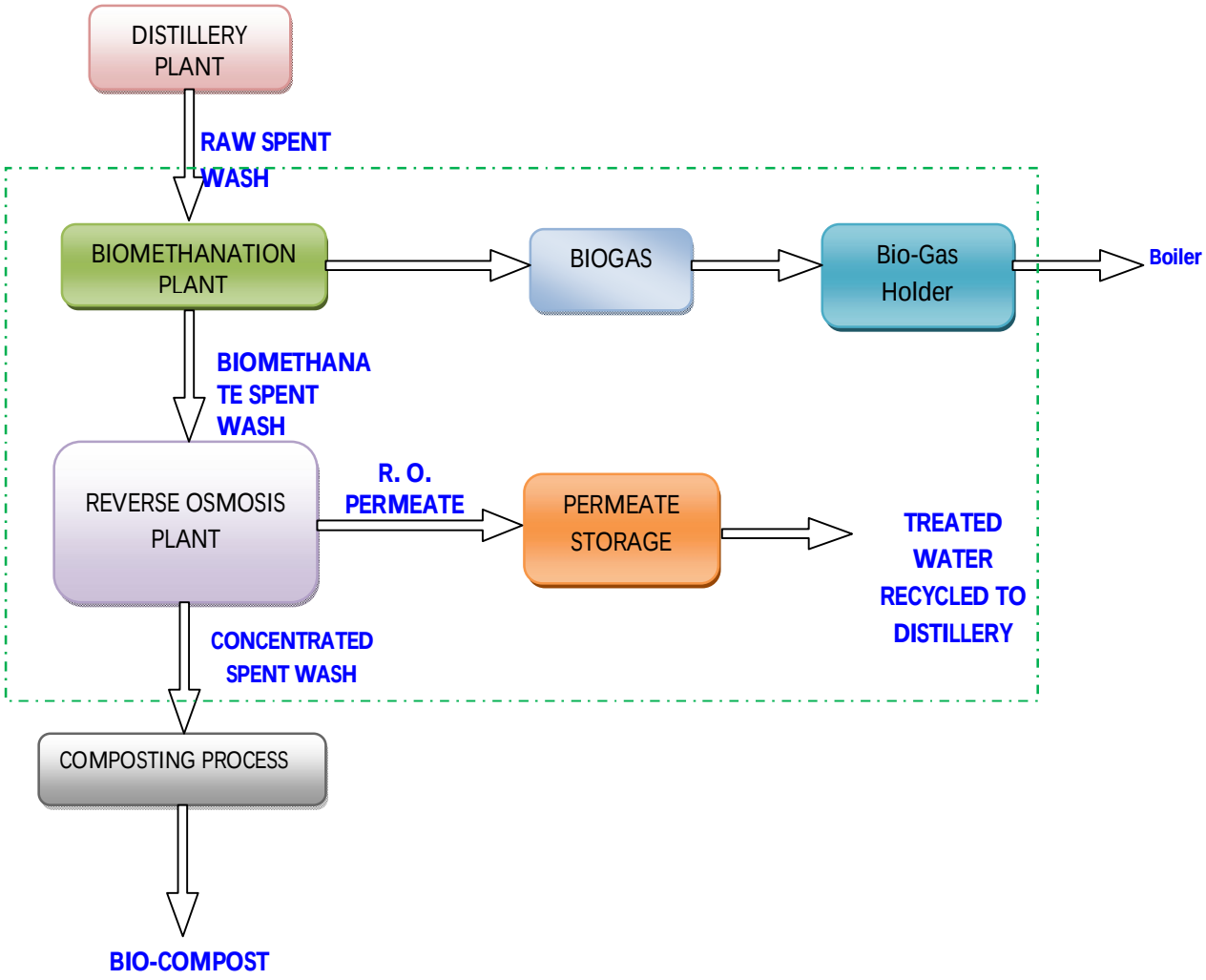
3.11 WASTE GENERATION:

i) Effluent Treatment System

Bio-Methanation

"CSTR" Continuous Stirred Tank Reactor process is used for Bio-methanation which convert organic matter into biogas. The process of conversion of organic matter into biogas occurs through group of bacteria

BIO-METHANATION BLOCK DIAGRAM



Basic principle of Bio-methanation process is anaerobic digestion in the MESOPHILLIC range of temperature wherein the pH inside the reactor is usually kept around 7.2 while proper ratio of volatile acid and alkalinity is maintained.

The spent wash coming out of Distillery is passed through heat exchanger to reduce the incoming temperature from 50°-60° C to 30°-40° C. This is necessary, as the major culture grouping is in mesophillic range. The initially neutralized spent wash is then taken to the 1st phase process of Acid Formation. The basic operation is divided into two phases as it is necessary to have a two phase operation which gives greater stability in 2nd phase operation I.e. a Methane Phase.

The spent wash after acid formation enters the 2nd phase reactor, wherein it is conditioned with return sludge/supernatant. Multiple entry inlet and weir outlet combined with higher flow through jet mixers and sparger mechanism with high velocity gives the 'Up flow sludge blanket reactor with 'complete mix' facility.

The effluent after methane phase reactor is subjected to flash degasification to release entrapped gases. This is thereafter subjected to settling operation to avoid Carry-over of biomass/solids which is recycled back to the digester for maintenance of biomass. The supernatant is also partially recycled to maintain inlet conditions as per design. The biogas is collected in to a Bio-Gas holder with pressure maintenance facility and is used in the Boiler as Fuel for combustion.

Spent Wash Treatment by Reverse Osmosis:

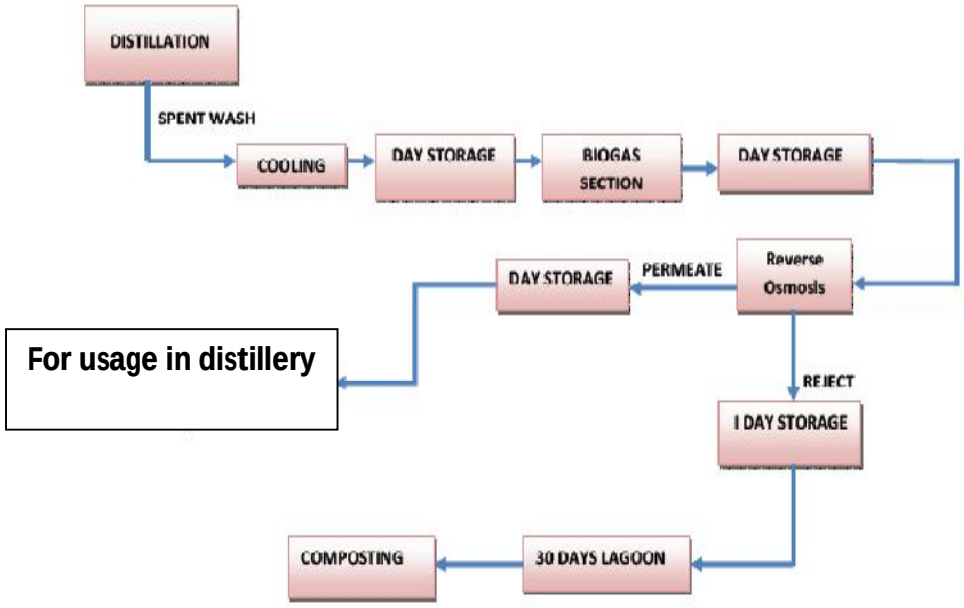
Spent wash from Bio-methanation section shall be fed to **Membrane Bio-reactor with Nano filtration & Reverse osmosis plant**. This section comprises of the following:

Membrane Bio Reactor

Bio Reactor is a combination of the following

- Bio polisher designed to remove suspended overflow of floating Bio mass from Anaerobic Digester
- Physio-chemical unit with Clarifier using Coagulation and Flocculation process for reduction of TSS. Special aeration and in house developed polymers are used to coagulate, the colloidal and particulate matter present in form of Solids, in spent wash. These are further separated in a Clarifier wherein Organic and suspended mass gets converted in form of slurry with high solid contents and sent to Bio composting yard

EFFLUMENT TREATMENT SYSTEM



Slurry is sent to Bio-composting while clarified spent wash is transferred to Nano filtration followed by a Reverse Osmosis System

Reverse Osmosis

Osmosis is a natural phenomenon, which takes place when two solutions at different concentrations are separated by a semi permeable membrane. Under the atmospheric pressure, the solvent diffuse through the membrane from dilute solution (high solvent concentration) to concentrate solution (low solvent concentration). This movement of pure solvent is called osmosis and a pressure at which it occurs is called osmotic pressure. When a pressure is applied gradually to the concentrated solution a stage is reached when there is no flow of pure solvent through the membrane and as we apply excess pressure the pure solvent starts flowing through the membrane from concentrated solution to the diluted solution. This movement of pure solvent separation from the concentration solution is called reverse osmosis.

The above principle is used in the construction of reverse osmosis systems for the separation of spent wash through a semi permeable membrane called reverse osmosis membranes. Under pressure the RO membrane separates the streams into two namely:

i) Salt free product stream (For Recycling to Cooling Tower make-up)
ii) Concentrated spent wash (For Bio-compost production)

Treatment Method

The spent wash after primary treatment at Room temperature will be fed by gravity to a Bio-Reactor with Bio-Float Unit. Here Floating Bio Mass is removed. This is further fed to a clarifier wherein concentrated Bio mass / Sludge will be bleed off for feed to Digester. The clarified water will be stored in intermediate buffer tank.

Chemical dosing is effected on feed line to high pressure pump to avoid fouling of the membranes. The treated water is pumped at pressure through the membranes wherein the organic and suspended solids are rejected in the reject stream and treated purified water is collected in product water storage for feed to RO unit. Permeate is further treated in a Reverse Osmosis plant for final reduction of Inorganic and organic contents for acceptance of water. This water

is further treated in degasser & GAC column unit to get desired quality of water suitable for its use in distillery.

Composting Process

Concentrated Spent wash as reject from Reverse Osmosis Plant is used for Composting process. This is first stored in Spent wash Storage Lagoon.

Details of Composting Cycle

Composting process takes about 8 weeks (60 days) to complete one cycle and involves following activities.

WEEK 1

Collection & handling of press mud, formation of windrow of Dimension 3.5 X1.5 X 250 Meter and then first pass of Aero tiller to reduce the moisture content in windrow from 70% to 50%. It is inoculated with microbial culture (30% suspension in water) and Aero tilling for proper mixing of inoculants.

WEEKS 2-7

During this period, Effluent spraying is done and Aero tilling to maintain the moisture between 50 to 60 %. The above Effluent spraying is done thrice a week.

Aero tilling operation to enhance the composting reaction

Aero tiller is passed after every effluent spray. Trimming of windrow is required after every aero tilling to re-shape the windrow in triangular position.

WEEK 8

During this week the Curing, Aging & Drying takes place, wherein optimum moisture content is maintained. No effluent is applied during this stage. Leachate BOD & COD gets reduced. Aero tilling is continued twice a week till the compost is stabilized and finally dispatched to end user farmers.

Construction of Compost yard

To construct the compost yard, the ground is properly leveled and compacted by using heavy-duty roller to get 95 % C.F compaction and the compost yard is prepared layer by layer as follows.

- First Layer – Well compact soil Layer to achieve 95% C.F. compaction.
- Second Layer – 50 mm thick fine sand layer.
- Third Layer – 250 Micron thick HDPE film.
- Fourth Layer – 50 mm thick fine sand layer.
- Fifth Layer – 100 mm thick self-finishing reinforced concrete (1:4:8) Using 8 mm Dia. Tor steel 300 mm apart both ways

Facilities Required at Compost Yard as per CPCB guidelines

S.NO	PARTICULARS	UNIT	QTY
1	Bio-Composting Cycle time	Days	60
2	No. of Bio-Composting Cycle		4
3	Press mud requirement / Cycle	MT	3086
4	Bio-composting /Acre of Land	MT	850
5	Bio-compost Yard requirement	Acre	3.6
6	Additional space for Storage / Lagoons	Acre	1.4
7	Total land Requirement for Bi-composting	Acre	5.0
8	Equipments required		
	Aero Tiller	No	1
	Loader / Excavator	No	1
	Tanker for Spent wash Spray @ 12 KL Capacity	No	2
9	Storage Lagoon Capacity for 1 month	M^3	3600
10	Storage Lagoon size is 40 M x 30 M x 3.5 M (0.5 MTR Free Board)	No	1
	ASSUMPTIONS		
11	Max. Rain in a single Day	mm	25
12	Possible Run-off	M^3	900
13	Dimension of Storm Water Tank 20 M x 15 M x 3.5 M (0.5 MTR Free Board)	No	1

Features of the Composting Process

- This is a zero pollution process.
- The BOD of effluent is destroyed.
- All the degradable organic material is oxidized to humu
- There is no air Pollution.
- The product is dry, bagging is possible and has a high nutritional value for all crops, and is applicable on all types of soils.
- Compost is free from weed seeds and pathogens.

The composting process is carried out on scientifically designed concrete yard and no ground water pollution/percolation is envisaged.

Proposed Concrete Compost Yard

4. SITE ANALYSIS:

4.1 CONNECTIVITY:

The Factory Site is located on National Highway No.68 and 50 the nearest railway station Chinnasalem railway station is at a distance of 14 Km from factory site.

Sr. No	Feature	Particulars
1.	Location	Kallakuchi II CSM Ltd Kachirayapalayam Chinnasalem Villupuram Tamilnadu- 606207
2.	Nearest railway station	Chinnasalem railyway station
3.	Nearest air port	Salem / Banglore
4.	Nearest village	Kachirayapalayam
5.	Nearest major city	Kallakurichi
6.	Nearest water body	NIL
7.	Nearest industry	Dharani Sugars
8.	Sensitive locations	NIL
9.	Places of religious importance	NIL

4.2 LAND FORM / LAND USE / LAND OWNERSHIP

The details of factory area, built up area and the area reserved for green belt development is given below

Kallakurichi II CSM Ltd has about 41.25 Ha of N. A. land in its possession to conduct its for manufacturing activities. Utilization of land has been as follows:

Sr no	Land utilization	Area in Hectares
1	Total Plant area	41.25
2	Built up area	10
3	Solid Waste storage/ disposal area	5
4	Green Belt area	15
5	Proposed Distillery area	5.86

Facilities Required at Compost Yard as per CPCB guidelines

S.NO	PARTICULARS	UNIT	QTY
1	Bio-Composting Cycle time	Days	60
2	No. of Bio-Composting Cycle		4
3	Press mud requirement / Cycle	MT	3086
4	Bio-composting /Acre of Land	MT	850
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	ASSUMPTIONS		
11	Max. Rain in a single Day	mm	25
12	Possible Run-off	M^3	900
13	Dimension of Storm Water Tank 20 M x 15 M x 3.5 M (0.5 MTR Free Board)	No	1

4.4 EXISTING LAND USE PATTERN:

The geographical location of Tamil Nadu is such that the climatic condition shows only slight seasonal variations. Due to close proximity to the Sea, the temperatures and humidity remain relatively high all the year round. During the Month of April to June, is the hottest summer period having the temperature around 40ºC. The winter period is from November to February and is the coolest winter period having temperatures around 20ºC.

At present the area under sugarcane cultivation vary from 4.5 million hectares to 5.0 million hectares. This area is less than 2% of the total cultivable area and about 3% of the irrigated area in the country. Sugarcane being a cash crop and more profitable than other crops, there are ample chances of substantial increase in area under sugarcane.

4.5 SOIL CLASSIFICATION:

The Land required for setting up the Distillery had been earlier envisaged during Sugar Mill set-up and accordingly, they had made for provision for Distillery in their tentative Sugar mill layout as Future Expansion. Hence the proposed Distillery site is within the Sugar Mill Plant Layout.

Sub-soil Testing has already been done at The site of Kallakurichi-II Co-operative Sugar Mills during the year April 2008 to April 2009, wherein 5 boreholes of 150 mm Dia. have been drilled from 1.2 Mtr to 1.6 Mtr Depth respectively till the hard rock is noticed. Hence as per that report Soil at the Distillery Layout is Hard and Rocky below 1.6 meter from Ground Level.

The Design of Civil and Structurals shall be as per Seismic Zone III, Parameters and Soil condition as mentioned above.

4.6 CLIMATIC DATA:

Broadly there are two distinct agro-climatic regions of sugarcane cultivation in India, viz., tropical and subtropical. Tropical region which includes the states of Maharashtra, Andhra Pradesh, Tamil Nadu, Karnataka, Gujarat, Madhya Pradesh, Goa and Puducherry shared about 45% of the total sugarcane area and production of 55% Sugarcane in the country with average productivity of 77

MT/hectare (2011- 12). Similarly Sub-tropical region which includes the states U.P, Uttaranchal, Uttarakhand, Bihar, Haryana and Punjab accounted for about 55% of the total sugarcane area and production of 45% Sugarcane in the country with average productivity of 63 MT/hectare (2011- 12).

Tamil Nadu gets most of its rains from the North-east Monsoons between October and December. The average annual rainfall in Tamil Nadu ranges between 25 and 75 inches a year. During summer, i.e. between April to June, the coastal area of Tamil Nadu becomes very warm and humid, but during the nights it becomes cool.

The above said agro climatic conditions are highly conducive for cultivation of sugar cane.

4.7 SOCIAL INFRASTRUCTURE AVAILABLE:

Benefit to society and economy

Proposed Distillery plant shall definitely improve the total environment of surrounding areas. Society will get benefited by improved basic necessities, communication and Transport. Distillery Plant will bring many opportunities for local people like employment, small contract jobs/services, thereby increase in source of income.

Educational institutes shall augment their facilities or even new school may also come-up, where children can have good education. Again due to increased earnings of nearby families, children could go out for higher education in future.

In brief, the proposed Distillery plant, there will be an overall development of the surrounding areas and people will be benefited in terms of better living standards, better education, better medical facilities, better transport and better communication.

Direct and indirect employment

Distillery Plant shall require a total manpower of about 52 personnel directly for plant. However it shall be the management's Endeavour, that how best the local people would be utilized in plant operation. This would be achieved by imparting basic and regular training to the people.

Besides direct employment, during plant installation many local people are engaged by various contractors executing the plant jobs. Here also people are properly trained and deployed for various jobs. By this, people once trained for particular job, will certainly get opportunity in future for similar jobs.

Also once the Distillery comes in to operation, there will be many allied activities which will require the provision of additional facilities like transport for materials / people, small canteen facilities, Medical Aid / Dispensaries, small shops etc. Therefore in general there shall be many direct / indirect employment opportunities for local people.

5.0 PLANNING BRIEF:

Sugar is the major product of sugarcane. The domestic demand of sugar is varying from 22-23 million tonnes annually, where as the production of sugar in India during last 5 years is around 24.3 to 26.3 Million ton. Maharashtra is the largest producer of sugar contributing about 34% of sugar in the country followed by Uttar Pradesh.

Proposed integrated sugar complexes with distillery and co-generation will enable sugar industry and cane growers to earn additional revenue. This will be a big boost for substantial increase in cane area.

There are about 568 Sugar factories operational in India, having a total cane crushing capacity of 2.12 million M.T. of cane per day. 112 new licenses have been issued till date. It is projected that total crushing capacity at the end of 2017 will be about 2.5 million M.T. per day.

5.1 PLANNING CONCEPT:

Molasses is the by-product in processing sugar cane for production of sugar. In general he molasses production is about 4.5% on cane crushed. The Carbohydrates in Molasses are already in the form of Sugars. Hence molasses does not need any pre-treatment for production of Alcohol. Repeated evaporation and Centrifugation decreases the sugar content of molasses and increases the viscosity and concentration of salts and other impurities. The residual syrup thus becomes thick, viscous and brown in colour and is very heavy. The concentration of molasses is normally measured in Brix.

Molasses Scenario of India

Details of Molasses Production in India (Source-Indian Sugar Mills Association)

Fig. in Million Tons

Season	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Molasses Production	6.542	8.40	10.97	11.824	11.744	10.881

PROJECT DETAILS

Sr. No	Feature	Particulars
1.	Location	Kallakuchi II CSM Ltd, Kachirayapalayam, Chinnasalem Villupuram, Tamilnadu- 606207
2.	Project,	45 KLPD molasses based distillery cum ethanol plant
3.	Working days per year	150 days in season. 150 days off season.
4.	Products	**Main Product**- ENA/ ETHANOL -45 KLPD IS - 2.25 KLPD Electric power - 1 MW **Co-Product**- Bio-compost : 41.93MT/day Biogas : 14040 nm^3/day
5.	Main raw material	**Distillery:** In season Molasses – 189 MTD **CPP:** Fuel (Furnace oil) – 750 kg/hr
6.	Man power in the industry Workers/Staff/Contractual workers	51
7.	Total land area	14.5 Acres for the distillery project.
8.	Boiler	Steam for distillery use will be taken from TNPL boiler.
9.	Power requirement	Distillery - 1 MW (Molasses based)
10.	Source of water	Well Water from pottiyam vilage 641 KLPD required
11	D G set	750 KVA
12.	Dust collector	N.A.

MAN POWER

Employment generation by existing sugar mills and proposed distillery is detailed below:

Employment Description	Sugar Mill No. of Employees	Proposed Distillery No. of Employees
Skilled & Unskilled Workers	55	26
Staff	87	7
Officers	16	--
Casuals	142	18
Total	**282**	**51**

5.2 Amenities:

About 4 acres of land has been year marked for residential Colony at proposed site

To treat sewage generated septic tank with soak pit will be provided.

6.0 PROPOSED INFRASTRUCTURE:

i) Residential area for factory staff will be provided
ii) Green belt : 33% of open area will be developed as green belt
iii) Social infrastructure: Residential community center, play ground will be constructed.
iv) Connectivity: NH-68 is available at a distance of 9.5KM and NH-7. Nearest railway station is Chinnasalem railway stationis at a distance of 13.5 Km from factory site. Nearest village is Mettupalaiyam which is 1.1km from project site.
v) Drinking water management: Water source is from well of Pottiyam village.

7.0 REHABILITATION AND RESETTLEMENT:

Rehabilitation or resettlement will not be required in case of proposed project as the site is a barren land with no human settlement.

8.0 ANALYSIS OF PROPOSAL:

a. The project falls under schedule of activity 1(d)

b. Proposed cogeneration plant 1.0 MW is below the threshold limit specified in EIA notification hence exempted from environmental clearance

c. Project for 45 KLPD molasses based distillery is classified under schedule of activities 5 (g) falls under category “A” and will require environmental clearance from MoEF.

9.0 SOURCES OF POLLUTION AND MITIGATION MEASURES

Adequate environment protection systems will be put in place for the treatment of all liquid, solid & gaseous discharges from the power plant to achieve the required emission levels well within the permissible limits of state pollution boards.

As a result there shall be no adverse impact on either the air or water quality in and around the sugar cogeneration distillery complex.

100% spent wash will be composted in impervious compost yard designed as per CPCB guidelines. Unit will be a zero discharge unit.

In distillery, air pollution and noise pollution are insignificant.