PRE-FEASIBILITY REPORT

NEW 60 KLPD SUGARCANE JUICE & MOLASSES BASED DISTILLERY

MARUTI SHETKARI ASAVANI LIMITED

Gat No. 3729/1 to 20, Kameri, Tal- Walawa, Dist- Sangli, State Maharashtra.

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1.0 Executive summary

M/s. Maruti Shetkari Asavani Limited at Gat No: 3729/1 to 20, village Kameri, Taluka Walawa, Dist. Sangli, State Maharashtra is proposing 60 KLPD sugarcane juice & molasses based distillery due to emerging market demand of fuel ethanol. Distillery will be operated for 150 days when sugarcane juice and molasses both will be utilized at the same time and for 180 days when only molasses will be used. In case of non-availability of molasses, the distillery will be operated for 150 days and will utilize 333 TPD crushed sugarcane juice and 144 TPD of molasses. If adequate amount of molasses will be available, then the distillery will be operated for 180 days and will utilize 240 TPD molasses. It will be sourced from nearby sugar industries. Fresh water will be sourced from Warana River. Spent wash generated will be concentrated in evaporator and will be used as a fuel in spent wash fired boiler.

2.0 Introduction

2.1 Project proponent

Shri. Shivajirao Maruti Nilkanth is a leading experienced and progressive agriculturist, active worker in social and educational field. He is popular for the innovative ideas in the field of agriculture. He is the chairman of Bombay Docking Company Private Limited (Shipping Firm). The management of Maruti Shetkari Asavani Limited is presently under the dynamic leadership of Shri. Shivajirao Maruti Nilkanth as the Chairman.

2.2 Nature of the project

Maruti Shetkari Asavani Limited have proposed to establish a new sugarcane juice & molasses based 60 KLPD distillery, molasses is one of by-products of sugar industry which is used to produce rectified spirit/alcohol for making liquor and fuel. The main raw materials for the distillery are sugarcane juice and molasses. The project is placed under item no. 5(g)-distillery, category ‘A’ project as per EIA notification 2006 (as amended in 2009) and will be appraised at central level.

2.3 Need of the Project

India is the fourth largest producer of ethanol in the world and the second largest in Asia. Most of the Indian distilleries use sugarcane molasses as raw material. The demand for potable alcohol has been ever increasing with the more liberal attitude, rising middle class and less taboo/ stigma in Indian society. With the advent of ethanol blending with petrol/ motor fuel, the requirement of ethanol/ industrial alcohol has increased manifold in the country to the extent that in case 5 % blending, if made mandatory all over the country, the sugar factory molasses available in the country shall not prove to be adequate for meeting the total requirement of ethanol including its use for potable liquors and other industrial uses. However, the notification no.G.S.R.705(E) dated 27th October, 2004, Ministry of Petroleum

and Natural Gas, Government of India, mandates that 5% ethanol-blended petrol (E5), conforming to Bureau of Indian Standards specifications which may grow to 20%. The sugarcane farmers in the region and state will be directly benefitted by assuring stability of the sugar industries, reasonable return for the molasses and then passing a significant part of the same to the farmers. Fuel ethanol is able to save valuable foreign exchange on import of fossil fuel. Apart from its use for beverage, medicinal, pharmaceutical and flavouring, alcohol constitutes the feedstock for large number of organic chemicals, which are used in manufacturing a wide variety of intermediates, drugs, rubber, pesticides, solvents etc.

2.4 Demand & supply gap

There are three main uses of ethanol in India. Of the total available ethanol, the maximum about 45 percent is used to produce potable liquor, about 40 percent is used in the alcohol-based chemical industry (as a solvent in synthesis of other organic chemicals) and the rest is used for blending with petrol and other purposes. The demand for ethanol has been continually increasing on account of the growth of user industries and use of ethanol as a fuel in the country. However, the production and availability of ethanol has largely lagged behind. India is the fourth largest producer of ethanol in the world after Brazil, the United States of America (USA) and China, producing approximately 2000 million litres of ethanol, mainly by fermentation of sugarcane molasses. However, the amount of ethanol currently produced in India is not sufficient to meet domestic demand. In the year 2008-09, there was a huge unmet demand from the industrial sector, which was met by imports. Moreover, the current government policy of blending ethanol in petrol has targeted a demand of around 266 crore litres and would go further ahead in coming years. Currently only 120 crore is blended. This has created a demand of 150 crore litres which would be a prime target of the industry.

2.5 Imports vs. Indigenous production

India has more than 300 distilleries, with a production capacity of about 3.2 billion litres of rectified spirit per year, almost all of which is produced from sugar molasses, and not from sugar juice, food grains or other cellulose feed stocks. The government's ethanol policy has led to over 110 distilleries modifying their plants to include ethanol production with the total ethanol production capacity of 1.3 billion litres per year. The current ethanol production capacity is enough to meet the estimated ethanol demand for the five percent blending ratio with gasoline. However, for a ten percent ethanol blending program, current ethanol production capacities will need to be enhanced by expanding the number and capacities of molasses-based ethanol plants and by setting up sugarcane juice-based ethanol production units. The import of ethanol is reduced to great extent due to adequate indigenous production of the same.

2.6 Employment generation due to project

The total man power required for the proposed sugarcane juice and molasses based new distillery unit will be approximately 150 Nos. skilled and unskilled employees.

3.0 Project Description

3.1 Type of the Project

The proposed new project involves fermentation of sugarcane juice and molasses for producing rectified spirit/ ENA/ absolute alcohol. Raw materials such as sugarcane juice and molasses will be sourced from local nearby sugar factories.

3.2 Location of the project

The proposed project is located at Gat No: 3729/1 to 20, village Kameri, Taluka Walawa, Dist. Sangli, State Maharashtra. The project falls under the geographical co-ordinates of 17°00'19.40"N, 74°14'53.98"E at 619 m MSL.

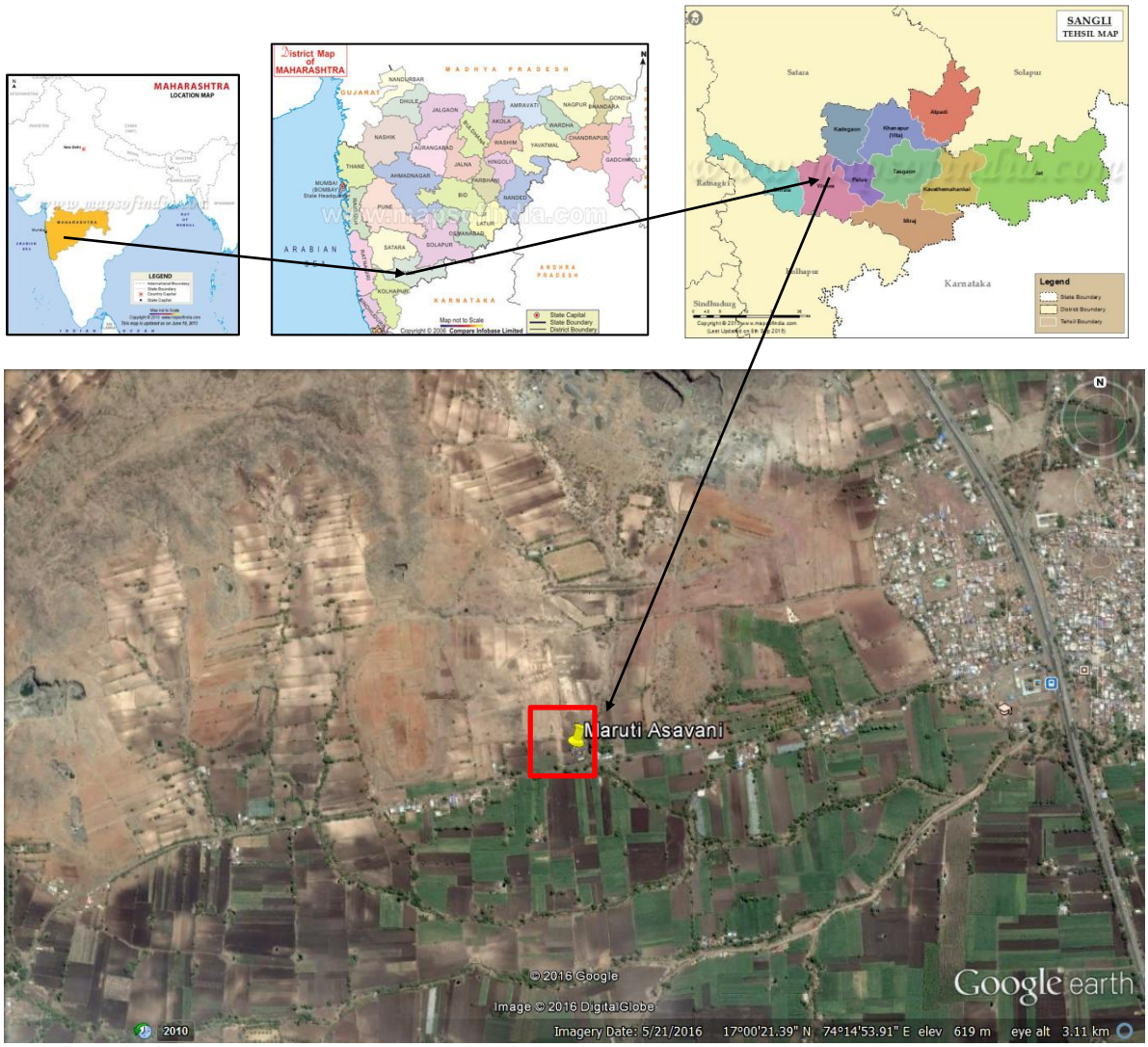

Figure 1: Map showing proposed distillery location with project boundary

3.3 Details of the alternate sites

No alternate sites have been examined.

3.4 Size or magnitude of operation

The company proposes to install new 60 KLPD distillery to manufacture 60 KLPD ENA/ RS/ AA and 3.2 KLPD Impure Spirit from sugarcane juice and molasses as raw materials.

3.5 Manufacturing process details

The process of converting molasses to RS can be divided into following sub sections:

- Feed preparation and weighing
- Yeast propagation and fermentation
- Multi-pressure distillation

FEED PREPARATION AND WEIGHING

Molasses stored in a storage tank is first weighed in a tank with load cells so that accurate quantity can be fed to the fermentation section. The weighed molasses then transferred from tank to the dilutor in fermentation section where it is diluted with water and fed to the fermenter.

YEAST PROPAGATION AND FERMENTATION

The Yeast from Slant is transferred to Shaker Flasks and grown to the required volume. This "genetically marked" yeast strain is then further propagated, under aseptic conditions, in yeast culture vessel. These vessels are equipped with educators which are designed to achieve enhanced efficiencies through better sugar / yeast contact by shearing and mixing, efficient oxygen transfer etc. The ready yeast "seed" is then transferred from culture vessel to fermenter. The molasses is diluted by process water. The glucose in the feed media gets converted to ethanol, in each of the four fermenters operating in batch mode. A Plate Heat Exchanger (PHE) and a circulation pump are provided to each fermenter, which will continuously re-circulate the fermenting wash through PHE for maintaining the fermenters at 30 ^{0}C. The nutrients, biocide, acid and anti-foam agents are fed to the fermenters as per process requirement. The CO_2 liberated during fermentation is sent to CO_2 scrubber for recovery of ethanol otherwise being lost in vent. The fermented wash is then sent to the clarification tank equipped with lamella separator. The settled sludge is then sent to sludge washing tank for recovery of alcohol.

MULTIPRESSURE DISTILLATION (RS)

The fermented wash is fed to CO_2 stripper column to remove CO_2 gas present in wash. Alcohol is stripped off water in stripper column. The top vapours [alcohol + water] are fed to Beer Heater & Condenser. Distillate from Beer Heater & Condenser is pre-heated by steam

condensate and spent leese before being fed to rectifier column. In rectifier column RS is taken out from top tray. The impure spirit from top of CO_2 stripper column, rectifier column, is fed to fusel oil column. The final impure spirit cut is taken out from the fusel oil column and partly alcohol is recycled to rectifier column. The alcohol containing fusel oil from rectifier column is fed to fusel oil column. Rectification column works under pressure. The CO_2 stripper, stripping column, works under vacuum and fusel oil column works under atmospheric condition. The top vapours from rectifier column are condensed in Stripper Reboiler. The alcohol water vapours from stripping column are partly sent to CO_2 stripper bottom for heating. The Rectifier column and fusel oil column gets heat from steam. The distillation process is operated through PLC.

DEHYDRATION

Rectified Spirit at azeotropic concentration is pumped by feed pump. This pump takes care of the entire backpressure of the system. The pump is of stainless steel material of construction for wetted parts complete with flameproof motor and mechanical seal.

The rectified spirit will first pass through feed pre-heater, which will pass through vaporizer cum super heater which will convert the rectified spirit feed to superheated alcohol vapour stream ready to feed to the molecular sieve bottles. The degree of superheat is control via a temperature control loop and the flow rate to the plant is control via flow control loop. The superheated vapours will pass through a sieve bottle, which is already regenerated, and pressurize to working pressure via. Bleed flow from an operating sieve bottle. After the drying cycle the flow will be shifted to the next sieve bottle, which is ready after duly regenerated and pressurize. This sequence minimizes the rate of rise and fall of pressure through the molecular sieve. Thus minimizing the attrition of the sieve beads. The sieve column after completion of drying cycle is evacuated to remove the adsorb water through an evacuation system via a condenser.

The mixture of alcohol and water is preheated by anhydrous alcohol vapour in plate heat exchanger before being feed to recovery column, which enriches the stream back to azeotropic composition. The bottom of recovery column gets heat from partly by condensing anhydrous alcohol vapour in plate heat exchanger. The anhydrous alcohol vapours condensed in product cooler. A flow indicator indicates the rate of anhydrous alcohol going to the anhydrous alcohol receivers.

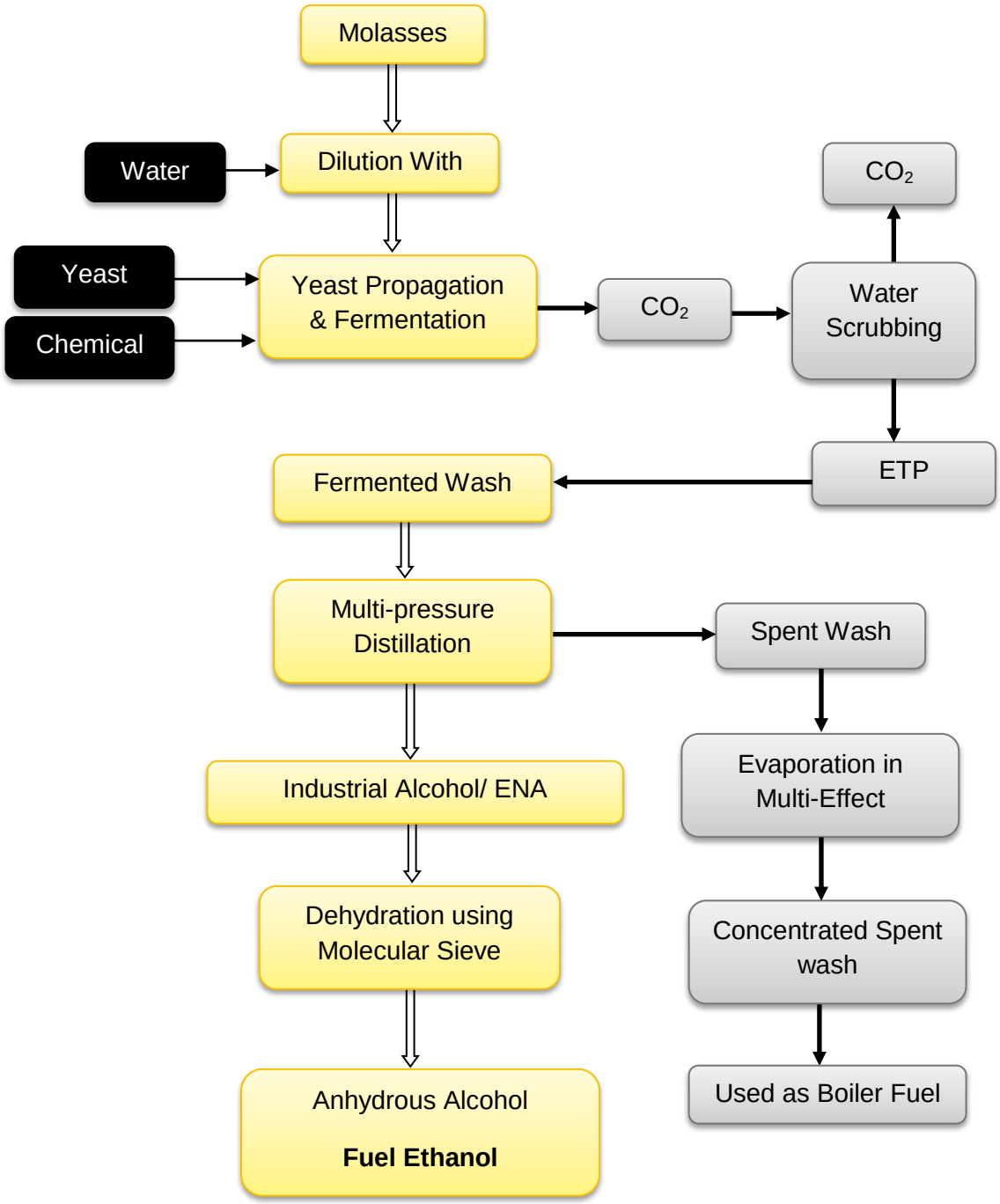

Figure 2: Process flow chart

MANUFACTURING PROCESS OF ETHANOL FROM SUGARCANE JUICE

- Sugarcane is directly taken as per the availability of the cane area, which is being transported through trucks, or bullock carts, which is then weighed for records and then cut into specified sizes.
- These sizes are treated with lukewarm water treatment so as to give maximum outputs with lower contamination.

- The cane is further crushed in the mill in three phases in order to extract more juice percentage say about 95%. This juice is carried to the storage tank for further process. Before taking the juice into fermentation house a specific study of mass balance and chemical composition is studied. Few chemicals (activators) & nutrition are added to the juice to activate the juice and prepare for fermentation.
- The unwanted suspended material is then separated. The juice is then taken to the fermentation house for fermentation. Here it is kept in the fermentation process. By adding microorganisms' culture as per availability, the fermented juice is prepared for further process. The water content in the fermentation column is reduced and thus the juice is prepared for distillation.
- The distillation column converts the juice by reducing the water content of it for getting rectified spirit / special denatured spirit.
- First rectified spirit/special denatured spirit which is 94.68% alcohol, and rest is water is produced in the distillation column. In order to get Ethanol, which has to be nearly 100% pure and water free alcohol, further steps to remove the 6% of water is taken. It is not possible to remove remaining water from rectified spirit / special denatured spirit by straight distillation as ethyl alcohol forms a constant boiling mixture with water at this concentration and is known as Azeotrope. Therefore, special process for removal of water is required for manufacture of absolute alcohol.
- In order to extract water from alcohol it is necessary to use some dehydrate or restrainer, which is capable of separating, water from alcohol.

3.6 Raw material required

The following will be the raw material requirement.

Table 2: Raw material required

Raw material	Quantity	Source	Mode of Transport
Molasses	240 TPD	Local nearby sugar factories	Tankers
Crushed sugarcane juice + molasses	320 TPD + 144 TPD	Nearby farms	Tractors
Urea	55 kg/day	Local area	Trucks
Antifoaming agent	190 kg/day	Local area	Trucks
Diammonium phosphate (DAP)	40 kg/day	Local area	Trucks
Biocide	13 Liters/day	Local area	Trucks
Sodium-Meta-Bi-Sulfite	45 kg/day	Local area	Trucks
Coal	38 TPD	Local area	Trucks

3.7 Resource optimization / recycling and reuse

Spent wash generated during the process of distillation will be treated in multiple effective evaporators to concentrate and use in boiler as a fuel. The condensate generated during the process of multiple effective evaporators will be reused in the process consequently decreasing the net water requirement.

3.8 Availability of Water

The total fresh water requirement for the proposed project will be 600 KLD after recycling of the process condensate. Water will be sourced from River Warana which is approximately 11 km from the proposed site.

3.9 Power and Steam requirement

The company will install one boiler of 22 TPH capacity with 2.0 MW T.G. set for the captive power generation. The total power required for the proposed project will be 1.80 MW/ hr. The steam required will be 18 TPH which will be required for various processes like distillation, dehydration, evaporation, boiler de-aerator etc. Two D.G. sets of capacity 250 kVA each will be installed as a stand-by facility.

3.10 Fuel requirement

Coal will be used as a fuel in 22 TPH boiler at the rate of 38 TPD. Similarly, diesel will be used as a fuel in the proposed D.G. set.

3.11 Quantity of waste generated

Wastes generated during whole process are described in below Table 3.

Table 3: Quantity of waste generated

Sr. No.	Aspect	Pollutant	Quantity	Treatment
1.	Waste water	Spent wash	184 KLD	Spent wash concentration (through MEE) and concentered Spent wash burnt in boiler.
2.	Air Emission	PM_{10}, $PM_{2.5}$, SO_2, NO_x and CO_2	--	Electrostatic precipitator (ESP). CO_2 scrubber.
3.	Hazardous waste	Ash from Coal	22.4 TPD	Ash will be sold to brick manufacturer.
		Spent Oil	Negligible	Will be burnt in boiler along with the fuel/ will be sent to authorize recycler.
4.	Solid	Yeast sludge	2.24 TPD	Used as Manure
		Ash of spent wash	24.30 TPD	Used as Manure

3.12 Schematic representation of the feasibility drawing which give information of EIA purpose

4.0 Site analysis

4.1 Site connectivity

Details of connectivity towards proposed site is given below

Road	Pune-Bangalore road i.e. NH-4: Approx. 1.25 km (East)
Railway	Bhilavadi Railway station: Approx. 29 km (South-East)
Air port	Kolhapur Airport: Approx. 38 km (South)
Nearest town/city	Kameri Village: Approx. 0.97 km (East)

4.2 Land form, land use and land ownership

The total land is in possession with management. Land will be used for industrial purpose only. It is roughly a plain land with some undulations. NOC from gram panchyat of Kameri is attached as **Annexure 1**.

4.3 Topography

The surrounding area of the site has a general downward slope from west to east and from north to south. On the north side of the site, small hillocks exist, which are being used for quarry purpose. Topo-sheet is attached as **Annexure 2.**

4.4 Existing land use pattern

The existing land is barren land with no vegetation.

4.5 Existing Infrastructure

Maximum resources like electricity, water supply, road connectivity, availability of raw material etc. are available in the area of the proposed site.

4.6 Soil classification

The top soil of the crust is composed of reddish brown silty sand.

4.7 Climate

Sangli district has a semi-arid climate with three seasons, a hot, dry summer from the middle of February to the middle of June, a monsoon from the middle of June to late October and a mild cold season from early November to early February. The maximum temperature in summer is 37.5 °C and minimum temperature in winter is around 22.7 °C. In winter, maximum temperature is about 29.5 °C and minimum temperature is 14.3 °C. The average annual rainfall in the district is ranges from 500-800 mm.

4.8 Social infrastructure available

Social infrastructure like community centre, hospital and medical centres, banks, education facilities, museum and botanical garden, electricity etc. is available in Sangli.

5.0 Planning Brief

5.1 Planning concept

The proposed sugarcane juice and molasses based distillery will be manufacturing rectified spirit/ absolute alcohol/ impure spirit viz. fermentation, multi pressure distillation, spent wash evaporation through MEE. Concentrated spent wash will be used as fuel in boiler.

5.2 Population projection

The proposed activity will generate total 150 Nos. of skilled and unskilled employee opportunities. No influx or migration of population is expected as local candidates will be preferred.

5.3 Land use planning

Total plot area of the plant will be 129503 m^2. Out of which, green belt area will be 69303 m^2. The area for proposed distillery will be 60200 m^2. Out of which, total built-up area will be 16000 m^2. The plant layout is attached as **Annexure 3.**

5.4 Assessment of Infrastructure demand (Physical & Social)

The basic infrastructure such as roads, electricity, transportation, drinking water facilities, health centres and hospitals, schools, sanitation facilities are available in the vicinity. The proposed project is not going to exert any unbearable load on the available resources.

5.5 Amenities/ Facilities

Facilities like canteen, rest rooms, drinking water facilities and recreation facilities will be provided for the proposed project.

6.0 Proposed infrastructure

6.1 Industrial area

The major plant & machinery required for the proposed project is as given below,

List of machinery and equipment's

1.	Fermentation section
2.	Distillation section
3.	Steam condensers
4.	Air compressor
5.	Spent wash fired Boiler
6.	Storage section
7.	Multiple Effect Evaporation Section
8.	Raw water treatment plant
9.	Fire protection equipment's
10.	Laboratory instruments
11.	Condensate polishing unit

12.	Electrostatic precipitator

6.2 Residential area

Facilities like canteen, rest room and indoor games facilities will be provided in the nearby residential area.

6.3 Green belt

Approximately 69303 m^2 (53% of total plot area) of green belt will be developed in the proposed project premises.

6.4 Social Infrastructure

All type of infrastructure is already available in the vicinity. Apart from that, factory will identify the need of the villagers and execute the CSR activity.

6.5 Connectivity

Site is well connected with by National Highway-4 (Pune-Bangalore road) 1.25 km; Local village road is approximately 0.03 km away from the project site which ultimately meets the National Highway-4.

6.6 Drinking water management

Drinking water will be provided after proper treatment. The source of drinking water will be Warana River.

6.7 Sewerage system

Domestic waste water generated will be sent to septic tank followed by soak pit.

6.8 Industrial waste management

Spent wash generated from the distillery will be treated in multiple effect evaporators to concentrate and use as fuel in spent wash fired boiler.

6.9 Solid waste management

Yeast sludge mixed with ETP sludge will be used as manure. Ash generated will be given to brick manufacturers.

6.10 Power requirement

Total power required for the proposed project during operation phase is 1.80 MW/hr and would be generated through the spent wash fired boiler (22 TPH).

7.0 Rehabilitation & resettlement plan

No rehabilitation or resettlement plan is proposed as proposed plant will be located on the open non-agricultural land.

8.0 Project schedule and cost estimate

The cost of the proposed project has been estimated at Rs. 85.325 crore, which comprises of land and land development, civil and building, plant and machinery, margin money of working capital. Cost for environment management has been estimated to 2.16 crore. The estimated time of completion of project will be one and half year after getting Environmental Clearance from the respective authority.

9.0 Analysis of Proposal

Proposed project will help to increase the socio-economic status of the local people. Proposed project will provide following benefits,

- This industry will provide RS, IA, ENA and anhydrous alcohol which will earn & save foreign exchange in the potable alcohol cadre as well blending in petrol.
- Project will create direct & indirect employment opportunities within the surrounding region.
- With the implementation of the proposed project, the socio-economic status of the local people will improve substantially.
- Corporate Social Responsible (CSR) program shall be executed on need base.