CHAPTER 11

EXECUTIVE SUMMARY

CHAPTER 11
EXECUTIVE SUMMARY

Contents of this Chapter shall be :
This chapter is intended to give overview of this report as introduction, justification, location details, resources required, process details, pollution control , and background study. It also underlines the benefits.

11.1 Introduction:

The proposed project is a modernization cum expansion project of sugar mill from 2500 TCD to 5000 TCD cane crushing capacity along with power project by co-generation of 27 MW capacity and Molasses based distillery of 30 KLPD. Sugar manufacturing unit is classified under category 5 (j) B in EIA Notification 2006 issued by MoEF and capacity up to 5000 TCD is exempted from environmental clearance. Power generation project and molasses based distillery is classified as
1 (d) & 5 (g) respectively both as category A in schedule and it requires environmental clearance from MoEF New Delhi.

The existing and proposed products are –

#	Product	Existing	Additional	Total
1	Sugar TCD	2500	2500	5000
2	Ethyl Alcohol KLPD	--	30	30
3	Co-gen Power MW	--	27	27

Table No. 11.1: Proposed Production

11.2 Justification for the project

Justification for the project

Justification of this Project can be submitted in many ways, namely –

- How this Project is economically strong by converting local farmers sugarcane of surrounding fields to serve as raw material for this unit,
- How this Project is economically strong by converting waste/byproduct baggase (and give benefit to surrounding farmers) to serve as raw material for this power generation.
- How the pollution generated from this unit can be successfully managed through EMP implementation, or in fact
- How the pollution generated from this unit can be converted to useful irrigation water with nutrients, and
- How the pollution generated from this unit can be converted to electricity, biogas and useful compost.

- India Needs sugar and power
- Foreign Exchange Saver-Earner
- Condensate water for Boiler/ process
- Irrigation water with nutrients for crop
- Consumes baggase, which otherwise is an environmental risk
- Consumes press mud, which otherwise is an environmental risk
- Consumes molasses, which otherwise is an environmental risk
- Saves petrol (additive)

Table No. 11.2. Justification of Project

Various permissions obtained and obtainable from:

1. IEM, Govt. of India
2. Central Excise, Govt. of India
3. Water permission, Govt. of Maharashtra
4. Power connection, Electricity Board under Govt. of Maharashtra
5. State Excise
6. VAT Registration
7. Grampanchyat NOC
8. District Commissioner. NA order for Industrial purpose
9. Incorporation of Company 2002

11.3 Location and Boundaries

Some part of Parbhani District is socio-economically backward and the government has a desire to improve its status. The pollution generation from this industry is finally made insignificant having taken all the precautions from raw material selection upto low or no waste generation and conversion. This site has a connecting road and has approachability. This site is connected with Maharashtra State Electricity Board power. When various sites were seen, this site appeared to be environmentally best as also from the business angle and therefore this option was finally adopted. This site is in the campus of the village Amdapur who had approached us for development and have given NOC. The earlier defunct sugar unit is now made operational by our efforts for benefit of old workers and farmers.

There is no sensitive establishment in the vicinity such as health resort, hospital, archaeological monuments, sanctuaries, etc. The normal wind direction is found to be favorable at this site. All villages grow crop and cane. These villages have road network connected. These villages will have fully satisfactory amenities like medical facilities education, employment, transportation, communication by having a running industry nearby. They would like to have this through media of this industry. All are provided with drinking water from wells or Government Water Supply Schemes RWS. Hence **TI** does not encroach upon their supply.

With all this consideration, this site was ranked first and adopted.

The proposed project is located at Gat No. 62 village Amdapur, Tehsil & District Parbhani. The project falls at North Latitude 19011'71" and East Longitude 76044'57". Total plot area of the project is 152.26 Ha.

With all this consideration, this site was ranked first and adopted. The features

1.	Project location	M/S TRIDHARA SUGAR LTD. At Amdapur Tehsil & Dist- Parbhani.
2	Registered office	1303/B, Kingston Building Hiranandani, Mumbai-400067
3	Communication office	C/o Mr Tahseen Ahmed Khan Nandkheda Road, Parbhani – 431401
4	Nearest Village	Amdapur– 3.5 KMs
5	Nearest Town	Parbhani – around 18 KMs
6	Nearest Railway Station	Parbhani – around 18 KMs
7	Nearest River Nearest Dam Water Source	Godawari Jaikwadi Dam B-68, Left Bank Canal (Jaikwadi), Gaon Tale (Amdapur), Reservoir- 65 Lakh ltrs Capacity,
8	Nearest Police Station	Parbhani – around 18 KMs

9	Nearest Post Office	Singanapur –6 KMs
10	Nearest Fire Engine	Parbhani – around 18 KMs
11	Nearest City / Big Town	Parbhani – around 18 KMs
12	Nearest Airport	Nanded 85 KMs
13	Nearest Highway	Parbhani – Osmanabad Highway- 7 KMs
14	Temperature	Max : 35 to 41 ^{0}C Min : 15 to 23 ^{0} C
18	Humidity	60 TO 70%
19	Seismic Data	As per Indian standards Is : 1889-1975, zone III
20	Climate	Tropical - dry & aired

Table No.11.3 Details

11.4 Resources:

The Industry has a plan to produce sugar, alcohol and electrical power co-generation for which already permission is available from Government of India, by way of Acknowledgement from Ministry of Commerce and Industries, Government of India, New Delhi (IEM).

TI has decided to implement the expansion of the Sugar Plant from 2500 TCD to 5000 TCD with cogeneration project of 27 MW by addition /replacing some of the equipments in the Sugar Plant and installing two nos. 70 TPH boilers of 87 ata, 515°c temperature. Two nos. DG set are proposed, one no. of 13 MW extraction cum condensing D.G. set and other 14 MW back pressure route DG both operating on new 87 ata boiler pressure. The old boilers and DG set to be discarded.

Justification of Plant Capacity: We have proposed a unit of 5000 TCD sugar, 30 KLPD Alcohol and 27 MW power. This is supported by raw material supply and by demand of product outside and hence the size is justifiable.
List of products generated from exiting as well as from proposed units are given as under.

#	**Product**	**Production Capacity**
A.	**Sugar unit**	
	White sugar	15000 MT/month
B.	**Co-generation unit**	
	Power	27MW
C.	**Distillery Unit**	
	Alcohol	30 KLPD

Table No.11.4 List of Products

By-Product

#	**Product**	**Production Capacity**
A.	**Sugar unit**	
1.	Molasses	6000 MT/month
2.	Press mud	5000 MT/month
3.	Bagasse	45000 MT/month
B.	**Co-generation unit**	
	Ash	57 MT/day
C.	**Distillery**	
	Fusel Oil	0.2 %

Table No.11.5 List of by-products

2.3.2 Raw Materials: (ToR 6)

List of main raw material along with its quantity and source is given in table

#	Raw Material	Quantity
A.	**Sugar unit**	
	Sugarcane	5000 TCD (Source: Surrounding sugar farms)
B.	**Co-generation unit**	
	Bagasse	55.55 T/hr (Source: Own sugar factory) for 27 MW
C	**Distillery**	
	Molasses	120 TPD; Source: Own sugar factory

Table No. 11.6: Raw Materials

2.3.3 Utilities

In addition to the raw material, utilities are also required. These are:

Power Requirement & Number of working days
The Karkhana is expected to operate for 160 days during season and 61 days during off season.

During season Plant consumes 2530 KW for 2500 TCD capacity operation. Additional Power requirement for sugar unit shall be 2530 KWH for expanded capacity. 2160 KWH will be required to operate co-gen facilities planned to be added and for distillery 500 KWH

Details of power requirement during season and offseason days:

During season 160 days		**During offseason 61 days**	
Sugar Mill	2530 KW	Sugar Mill	00 KW
Addition after expansion	2530KW	Addition after expansion	00 KW
Residential colony	100 KW	Residential colony	100 KW
Power required to operate cogen plant	2160 KW	Power required to operate cogen plant	2160 KW
Distillery	500 KW	Distillery	500 KW
Total power required	**7820 KW**	**Total power required**	**2760 KW**

Table No. 11.7 Details of power requirement

Back up power

For start up two HSD fired D G sets have been proposed as standby. Rating shall be 1000 KVA each.
These will be in addition to existing D G set of 320 KVA power generation capacities also, HSD fired.

Steam Requirement:

During season 160 days		**During offseason 61days**	
Power generation	27000 KW	Power generation	13000 KW
Turbine operation	1 No 14 MW 1 No 13 MW	Turbine operation	1 No 13 MW
Steam generation	140 TPH	Steam generation	70 TPH

Turbine operation	76 TPH 64TPH	Turbine operation	1 No 13 MW
HPH	13 TPH	HPH	5.6 TPH
Deareator	7 TPH	Deareator	6 TPH
Process sugar	82.6 TPH	Process sugar	0 TPH
Process distillery	8.0 TPH	Process distillery	8.0 TPH
MEE	2.00 TPH	MEE	2.00 TPH
Steam Condensed	27.4 TPH	Steam Condensed	48.4 TPH

Table No. 11.8 Details of Steam Requirement

Manpower Requirement:

The company proposes to employ additional manpower for Sugar expansion and cogeneration plant in the following manner:

#	Manpower	Sugar	Distillery
1	Staff	20	21
2	Workers	40	12
3	Contractual labors	40	40

Composting also will need workforce**.**

Heating requirement

FUEL REQUIREMENT

During season 160 days		**During offseason 61 days**	
Power generation	27000 KW	Power generation	13000 KW
Turbine operation	1 No 14 MW 1 No 13 MW	Turbine operation	1 No 13 MW
Steam generation	137.1 TPH	Steam generation	61.6 TPH
Bagasse consumption	51.58 MTH	Bagasse consumption	25.79MTH
Bagasse consumption	1238 MTD	Bagasse consumption	619 MTD
Bagasse consumption	198080 MT/season	Bagasse consumption	37757 MT/season
Total Bagasse consumption in a year	235837 MT		
Bagasse generation	240000 MT		
Shortfall	None. Still we have comfort due to use of biogas generated from bio-digester of distillery and balance by using agricultural waste from members field.		

Table No. 11.9: Details of Fuel Requirement

Storage area:

An open yard of 50 m X 200 m = 10000 sq meters has been provided for storing of bagasse. Bagasse generated from sugar mill as well as bought from neighboring sugar mills will be stored in form of bales in this area to avoid wastage.

Bagasse produced in the factory is first conveyed to bailing machines which compress the material in form of bales weighing about 13 kg - 15 kg each. These bales can be stalked and stored in the open yard.

Bagasse produced is fully consumed in 160 days of working season plus 61 days off season. No bagasse will remain stored in open during rainy season.

Cooling Tower: 300 and 350 m3/hr. wooden/ FRP. Delta T = 10^0C.
Air compressor for instrumentation.

11.5 Process :

A. Crystalline Sugar:

Most of the sugar factories in India follow double sulphitation process and produce plantation white sugar.

The major unit operations are shown in figure these are
1. Extraction of juice
2. Clarification
3. Evaporation
4. Crystallization
5. Centrifugation

1. Extraction of Juice

The sugarcane is passed through devices like knives for cutting the stalks in to chips before being subjected to crushing in a milling tandem comprising 4 to 6 three roller mills. Fine preparation with its impact on final extraction, is receiving special attention & shredders & particularly the fibrizsers are gaining popularity. The mills are of modern design, being equipped with turbine drive, special feeding devices, efficient compound imbibitions system etc. In the best milling practice, more than 95% of the sugar in the cane goes into the juice, this percentage being called the sucrose extraction or more simply the extraction.

A fibrous residue called bagasse; with a low sucrose content is produced about 25 to 30 % of cane, which contains 45 to 55% moisture.

2. Clarification

The dark-green juice from the mills is acidic (pH 4.5) & turbid, called raw juice or mixed juice. The mixed juice after being heated to 65 to 75 ^{0} C is treated with phosphoric acid, sulphur dioxide & milk of lime for removal of impurities in suspension in a continuously working apparatus. The treated juice on boiling fed to continuous clarifier from which the clear juice is decanted while the settled impurities known as mud is sent to the field as fertilizer. The clear juice goes to the evaporators without further treatment.

3. Evaporation

The clarified juice contains about 85 % water. About 75% of this water is evaporated in vaccum multiple effects consisting of a succeeding (generally four) of vaccum boiling cells arranged in series so that each succeeding body has higher vaccum. The vapours from the final body go to condenser. The syrup leaves the last body continuously with about 60% solids & 40% water

4. Crystallization

The syrup is again treated with sulphur dioxide before being sent to the pan station for crystallization of sugar. Crystallization takes place in single-effect vaccum pans, where the sysrup is evaporated until saturated with sugar. AT this point 'seed grain' is added to serve as a nucleus for the sugar crystals & more syrup is added as water evaporates. The growth of the crystals continue until the pan is full. Given a skilled sugar boiler(or adequate instrumentation) the original crystals can be grown without the formation of additional crystals, so that when

the pan is just full, the crystals are all of desired size & the crystal & syrup form a dense mass koown as 'massecuite'. The 'strike' is then discharged through a foot valve into a crystallizer.

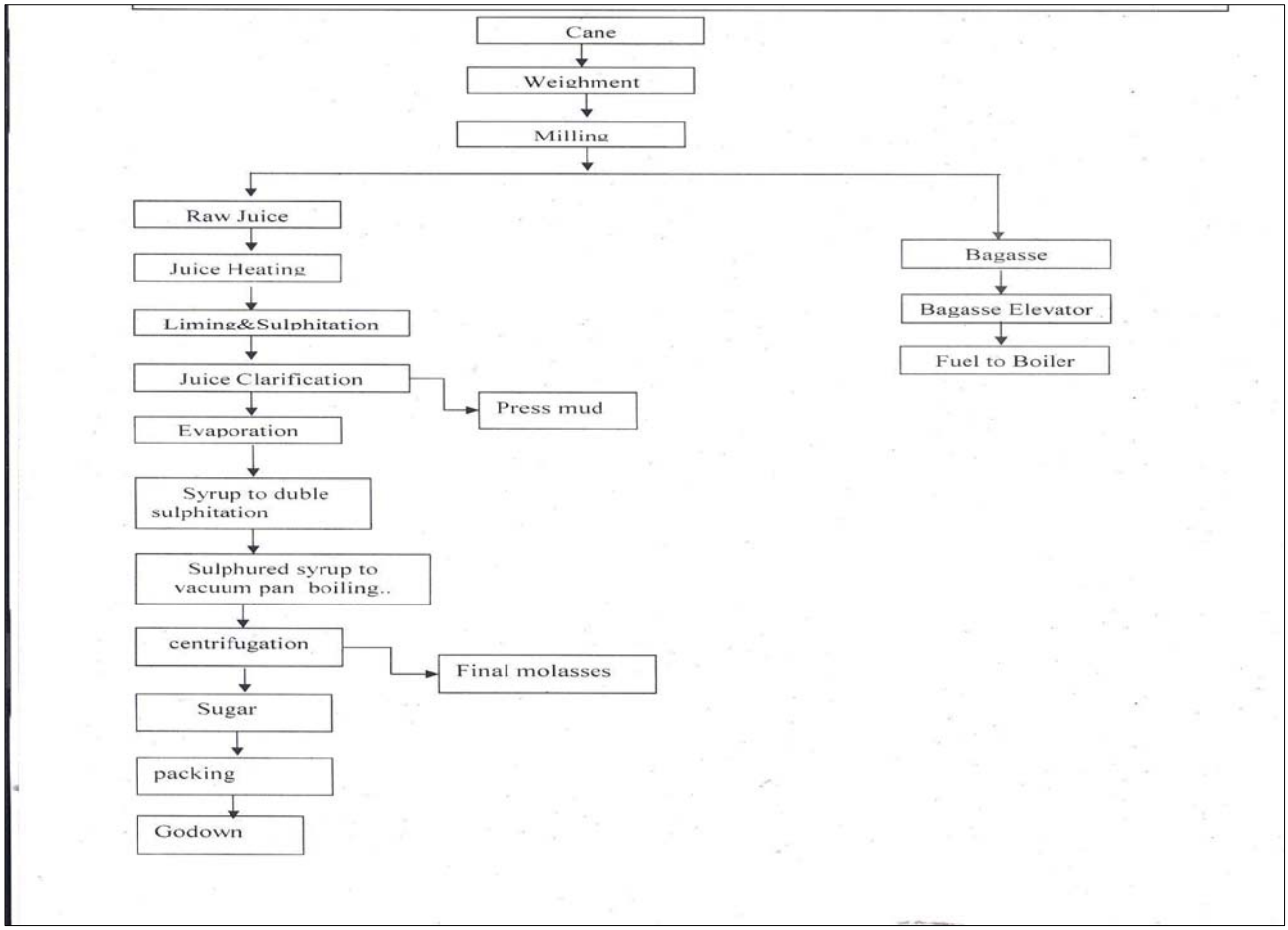
5. Centrifugation

The massecuite from crystallizer is drawn in to revolving machines called centrifuges. The perforated lining retains the sugar crystals, which may be washed with water if desired. The mother liquor 'molasses' passes through the lining because of the centrifugal force exerted & after the sugar is 'Purged' it is cut down leaving the centrifuge ready for another charge of massecuite . Continuous centrifuges may purge low grades . The mother liquor separated from commercial sugar is again sent to pan for boiling and recrystallization. Three stages of recrystallization are adopted to ensure maximum recovery of sugar in crystal form. The final molasses is sent out the factory as waste being unsuitable for recovery of sugar under commercial condition from economical point of view.

Flow sheets

(A) Sugar Unit

Fig. 11.3 Sugar Unit Flow sheet



B. Power Generation:

Power generation

The basic requirement is high quality water is 500 MT /day. The total water requirement is 411 MT/day. It is additional fresh water. Other water input is the condensate water. What is needed to be added is only to make-up the loss by steam and by boiler blow down. It is proposed to provide high efficiency. Electrostatic precipitator (ESP) to mitigate emission in air.

The steam produced in the high-pressure boiler will be used to run two turbines of 14 MW and 13 MW capacities. These turbines will provide power for its own working, the 30 KLPD distilleries, ETP as well as for sugar factory use.

During off-season this turbine will provide power for distillery, ETP use as well as for sugar factory housing colony & other off-season requirements. The exhaust steam of turbine shall have a pressure of about 3.5 kg/cm^2, which will be used for distillery.

Power for idle days around 100 KWH per day will have to be purchased from State Electricity Board.

FUELS

During sugar season, the principle fuel will be bagasse and the steam generator will be designed for 100% MCR on bagasse. During sugar off-season, the boiler will operate on stored / procured bagasse.

Fuel Analysis

Analysis:

Parameter	Bagasse
Carbon	23.5 %
Hydrogen	3.25 %
Oxygen	21.75 %
Moisture	50 %
Ash	1.5 %
GCV	2270 Kcal/Kg
Sulfur	

Parameter	Biogas
CO2	40 %
CH4	58 %
H2S	2 %
GCV	4500 Kcal/ Nm3

(B) Co-gen :

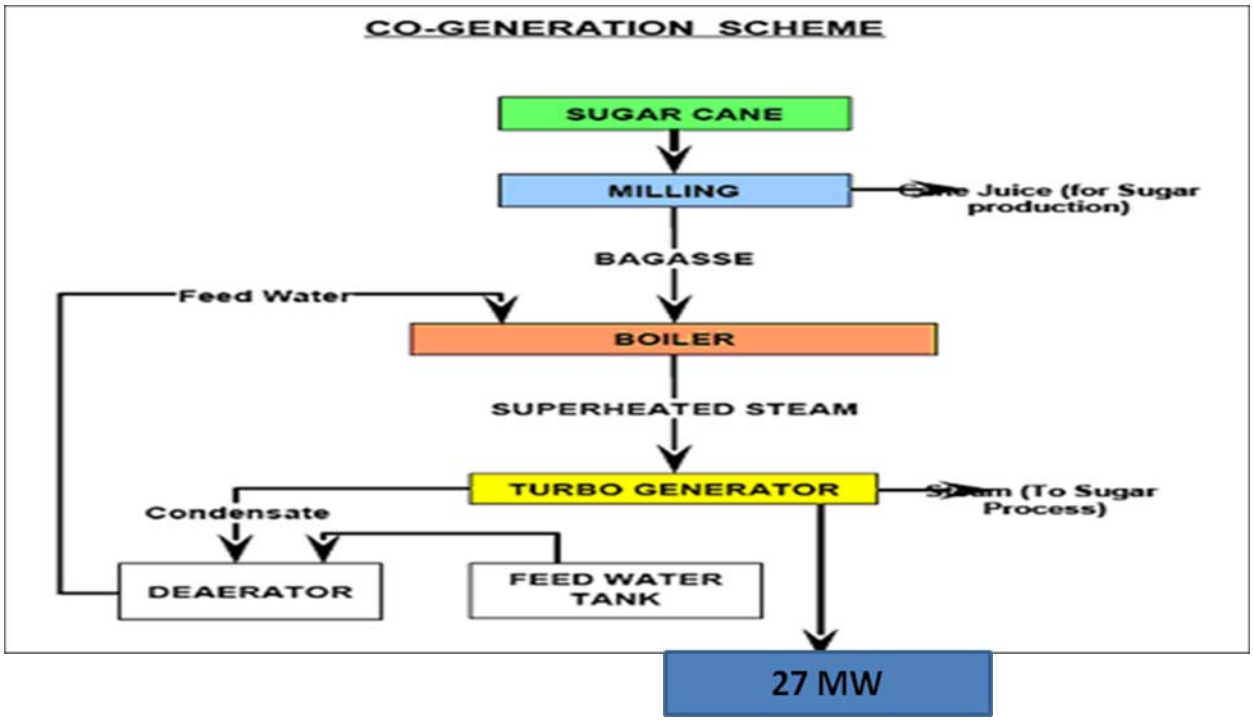


Fig. 2.4 Co gen Unit Flow sheet

C) Distillery

Alcohol

I. Substrate (Feed) Preparation for Fermentation

Molasses is procured carefully with good contents. 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 diluter in fermentation section where it is diluted with water and fed to the fermenters or culture preparation vessels.

II. Yeast Propagation and Continuous Fermentation

In this process the culture containing highly efficient yeast strain is propagated in yeast culture vessel under aseptic conditions,

The ready yeast seed is then transferred from culture vessel to fermenter. The sugar/glucose in media gets converted to Alcohol in the fermenters operating on continuous cascade mode. CO2 gas liberated during reaction is contaminated with traces of alcohol vapours. It is sent to CO2 scrubber for recovery of Alcohol .After fermentation the sludge containing spent yeast is separated from the wash in a thickener consisting of settler cum decanter tank and then concentrated in a decanter centrifuge. The yeast sludge in the form of cake with 25 % solids is disposed for use as manure.

Choice of technology

It would be seen that though the initial investment for modern process of continuous mode fermentation appears to be on much higher side, the advantages occurring are spectacular.

Volume of effluent discharged is less than that of total effluent discharged in conventional distillation process.

To adopt continuous process of fermentation is an appropriate step towards the updating technology of alcohol production for efficient performance.

III. Multi-Pressure Distillation

The distillation plant consists of multi pressure vacuum distillation and columns operate at different pressures to save steam. The plant operated with exhaust steam obtained from co-gen steam turbine. The distillation consists of following stages Distillation of clarified fermenter product (wart) in distillation columns to separate aqueous alcohol (40 %) and spent wash Rectification of aqueous alcohol to separate rectified spirit (RS) containing 95 % alcohol and spent lees water.

Dilution and rectification of rectified spirit to produce extra neutral alcohol (ENA) The fermentation wash containing Alcohol, non-fermentable solids and water is supplied to distillation to separate the alcohol and other impurities, as a continuous flow. The distillation system is designed for quality . The system details are as below. The system consists of 7 columns, namely CO2 stripper, analyzer column, Pre-rectifier column, Extraction column, Rectification Column, Refining Column, Fusel Oil column. Wash is fed to de-gassifier cum analyzer column. CO2 and other non condensable gases are removed at the de-gassifier unit. Distillate containing 40 % alcohol from top of analyzer column is sent to RS column for further purification and concentration. Alcohol free aqueous solution containing non fermentable matter is discharged as spent wash from the bottom of analyzer column. Dilute alcohol is concentrated in RS column from where distillate containing 95 % of alcohol is removed as Rectified Spirit (RS) from top and aqueous waster containing trace impurities is discharged from bottom as effluent. In case of ENA (Extra Neutral Alcohol) production, the RS along with dilution water is sent to extraction column. Most of the high boiling impurities are removed from top of this column and from bottom aqueous alcohol is obtained. The latter is taken to ENA column, and from where 95 % alcohol and spent lees water are obtained as distillate and bottoms, respectively. 95 % alcohol is further distilled in refining column to remove low boiling impurities (mainly methanol) along with bottoms. ENA from from top of purification is sent to storage tanks.

The Alcohol with high boiling impurities (mainly aldehydes) removed from top of RS, extraction, rectifier and refining columns are taken to aldehyde column. Impure spirit is recovered from top of aldehyde column and the balance alcohol with moderate purity is recycled to RS column for further distillation. Low boiling alcohols such as propyl and amyl alcohol are removed from appropriate locations of the RS and ENA columns. These are concentrated in fuel oil columns and recovered as fuel oil.

Following columns will be under operation

Analyser Column	(Partial Vacuum)
Degasifying Column	(Partial Vacuum)
Rectifier cum Exhaust Column	(Under Pressure)
Recovery Column	(Atmospheric)

Following are the advantages of pressure vacuum distillation.

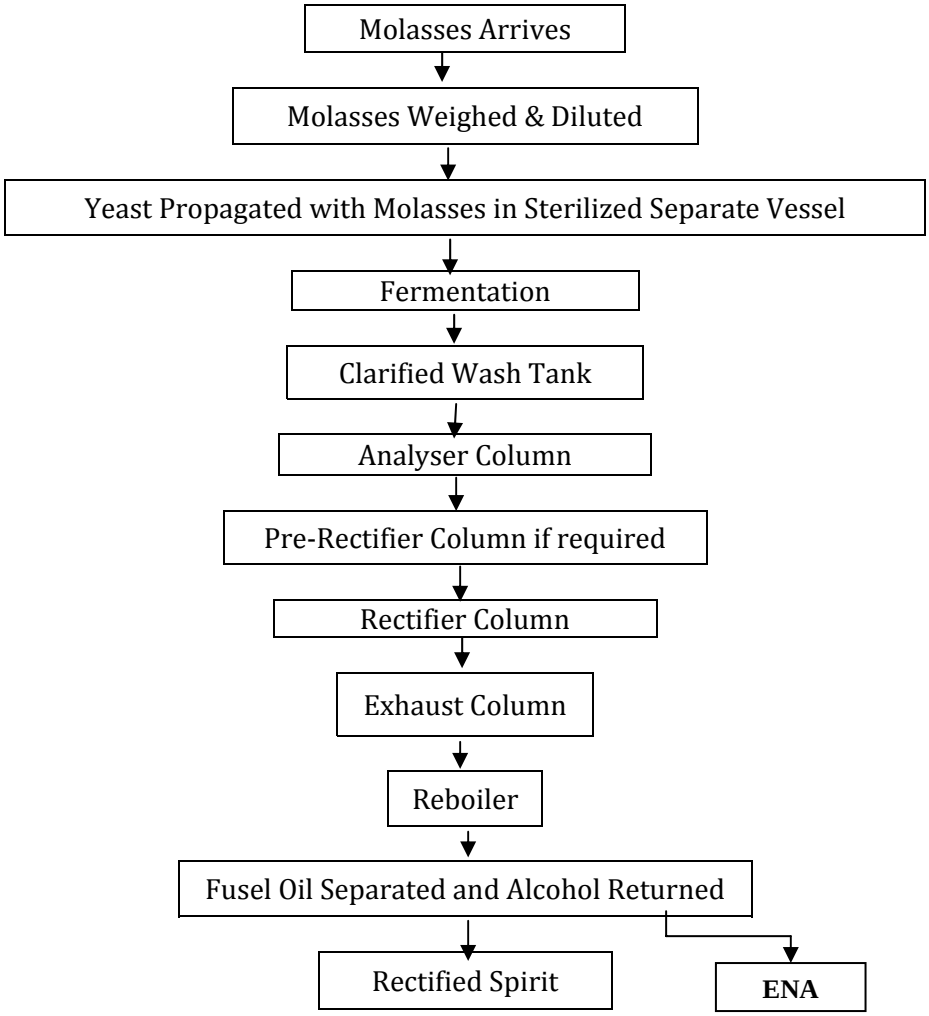
- Since the analyzer column operates under vacuum, the formation of by—products such as acetal may minimize there by improvement in quality of alcohol.
- Pre-rectification column ensure removal of sulfur compounds/mercaptans and also reduces load of lower boiling volatile compounds passing on to Rectifier cum exhaust column.
- The chances of scaling due to invert solubility of certain precipitating inorganic salts are minimized in vacuum distillation.
- Vacuum distillation requires low steam consumption with re-boiler i.e. 2.2 Kg/lit, of Recited Spirit and 2,8 Kg/lit.
-

IV. Dehydration of RS to Anhydrous/Fuel grade ethanol:

There are various dehydration routs such as Azeotropic Distillation, Evaporation, Membrane Technology and Molecular sieve Technology. Environmentally best is selected.Rectified spirit at Azeotropic concentration is pumped by a feed pump to the dehydration plant. The rectified spirit containing 95 % alcohol and 5 % water will first pass through feed economizer, then through a vaporizer cum super heater which will convert the rectified spirit feed to superheated vapors. The superheated vapour will pass through a sieve column, which is already regenerated and pressurized to working pressure. All the water vapors present in vapor mixture are adsorbed in the column. Along with alcohol traces of alcohol are also adsorbed in the column. The Anhydrous alcohol vapors free from water vapors exhausted from the column are duly condensed in the re-boiler at the recovery column and is further passed through feed economizer to preheat the incoming feed and then to a final product cooler. After saturation of sieve column with water, the flow will be shifted to the next sieve column, which is already regenerated and pressurized. After completion of dehydration cycle, the sieve column saturated with water is regenerated by evacuation of adsorbed water and alcohol. The evacuated vapors are condensed. The condensed mixture of alcohol and water is then fed to a recovery column, which enriches the stream back to azeotropic composition. This sequence of adsorption and regeneration of sieve column continues.

It is note- worthy that

- Rectified spirit feed is pretreated by product vapour.
- Evaporator column gets energy from free boiler
- Steam condensate is feed back to boiler
- Twin adsorbents beds. One in dehydration mode, other is regeneration mode.
- Switching of beds by Automation.



The chemistry behind this with controlling equations can be presented as

Controlling Equations:

1. $C_{12}H_{22}O_{11}$ + H_2O ⟶ $2C_6H_{12}O_6$
   Sucrose + Water ⟶ Reducing Sugar
   342 + 18 ⟶ 360
   1 + 0.05263 ⟶ 1.05263

2. $C_6H_{22}O_6$ ⟶ $2C_2H_5OH$ + $2CO_2$
   Reducing Sugar ⟶ Ethyl Alcohol + Carbon Dioxide
   180 ⟶ 92 + 88
   1 ⟶ 0.5111 + 0.4889
   1.05263 ⟶ 0.53978 + 0.51462

Thus,

#	In	Output Alcohol
1.	1 kg Reducing Sugar	0.511 kg by Equation
2.	463.68 kg Reducing Sugar (Say 1 Tonn Molasses)	236.98 kg by Equation
3.	463.68 kg Reducing Sugar	298.23 Lit. by Equation
4.	463.68 kg Reducing Sugar	259.46 Lit. Actually (87% η)

For the sake of eco-friendly considerations continuous fermentation and multi-pressure distillation will be practiced. The CO_2 will be scrubbed in water and the water that entraps escaping alcohol fumes will be recycled for molasses preparation.

11.6. POLLUTION CONTROL
Water Environment

Introduction

It will be a logical analysis of any situation if a study is undertaken in following way:

- Incoming water quality.
- Water budgeting to estimate effluent quantity and quality.
- STP/ETP and its performance evaluation.
- Expected impact.

Key Central Legislation:

A comprehensive statute viz. Water (Prevention and Control of Pollution) Act stands promulgated in 1974 (amended twice in 1978 & 1988). The Statement of Object and Reasons annexed to the Bill, interalia states:

"Having considered the relevant local provisions existing in the country and recommendations of the aforesaid Committee, the Government came to the conclusion that the existing local provisions are neither adequate nor satisfactory. There is, therefore, an urgent need of introducing a comprehensive legislation which will establish unitary agencies in the Center and States to provide for the prevention, abatement and control of pollution of rivers and streams, for maintaining and restoring wholesomeness of such water courses and for controlling the existing and new discharges of domestic and industrial wastes".

The scope of the Act is quite wide. The object of this Water Act, 1974 is (1) to prevent and control of pollution of water as defined therein and (2) to maintain or restore wholesomeness of water.

The objective also appears to provide penalties after conviction that it will be deterrent to others who might indulge or tend to indulge in polluting the waters. The definition of water pollution, therefore, is kept quite wide and encompasses welfare of not only human beings but also the plants, animals and aquatic organisms. The definition is too comprehensive to allow anyone to escape the hands of this Act on pure technicalities. This Act considers the principle of vicarious liability in Section 47, and thus where the offense has been committed by a company (a body corporate, a firm or association of individuals), every person who at the time of offense was committed, was in-charge of and was responsible to the company, as well as the company, shall be deemed to be guilty of the offense. Furthermore, if it is proved that the offense has been committed with consent or connivance of or is attributable to any neglect on the part of any director, manager, secretary or other officer of the company then such person also shall be deemed to be guilty of the offense and shall be liable to be proceeded against.

The Scope of this Act is kept quite wide as to cover in Section 48, the offenses by the Government departments or undertakings and the head of the department shall be in normal course deemed to be guilty of offence, where an offense under this Act is committed. With the sole object to empower the Pollution Control Boards, (establishment of which is yet another object of this enactment), to keep the waters wholesome, the legislature have offered a wide scope under Section 60 which sanctions an over-riding status viz. "The provisions of the Act shall have effect not-with-standing anything inconsistent therewith contained in any other enactment other than this Act."

Therefore, in conclusion it can be said that in order to prevent and control pollution of water, to avoid nuisance, harm, injury to public health and safety and to maintain or restore quality of water, this Act confers a number of powers on Pollution Control Boards and expects specific functions from them. To protect a guilty person against double jeopardy, the Act puts a bar by Section 49 on cognizance of offence, that no Court shall take cognizance of any offense under this Act except; (1) on a complaint made by or (2) on a complaint made with previous sanction in writing of the State Board. By a recent amendment public participation is encouraged and prior sanction is not insisted.

Water Quality:

Raw Water:

The water used for this Unit plant is already available, assured and dependable, treated to a reasonable extent by us, and it has good characteristics. The present sample results also confirm this. As it is earmarked for this industry, we are not encroaching on anybody else's water source. Our source is granted by Govt. of Maharashtra from Jaikwadi dam.

Water is used at various stations like heating, cooling, process, floor washing, vessel washing, laboratory and for human heigen. In heating water is used for boiler, imbibitions, milk of line, filter cake, pan movement, centrifugal machines, wash water. For cooling water is used as cooling tower splash, mill bearing, mill side pump, compressor, vaccum pump, sulphur burner, vertical crystallizer etc.

Water Budgeting: (ToR 21) Distillery unit

#	Step	Water input cum/d	Loss	Wastewater out cum/d
1	Cooling	Fresh = 100 (Make-up)	80	Sober to ETP = 20
2	Fermentation	Feed = 24 Fresh = 168 Recycled from ETP =46 Recycle Spent lees =87 Recycle scrubber = 10	6	To Distillation = 329
3	Distillation	From Fermentation = 329	-	Moisture in product = 2 High BOD Spent wash = 240 Spent lees to recycle = 87
4	CO2 Scrubbing	Fresh = 10	-	Sent to Fermentation = 10
5	Pump Blower Sealing water	Fresh = 40	2	Sober to ETP = 38
6	Floor & vessel washing	Fresh = 10	2	Mod. To ETP = 8

Table No.11.10: Details of water balance

Input side (Industrial):

a.	**Fresh Water for Industry, (Distillery)**	**- 328 cum/d**
b.	**Recycle Sober & Mod.**	**- 46 cum/d**
c.	**Water from Feed**	**- 24 cum/d**
	Total Input	**- 398 cum/d**

ToR 21: In addition to this water is needed for domestic use (worker's personal hygiene and canteen / colony) & Greening drive. The recovered waste water is treated and recycled. 20 m3 as domestic for workers hygiene and 100 m3 fresh for greening.

If we consider only industrial water, the fresh water is only is 77 % of the requirement. This becomes 9.37 Ltr/Ltr as fresh water.

Output side :

a.	Loss from Industrial Use	- 90 cum/d
b.	Effluent sober nature sent for ETP	- 28 cum/d
c.	Effluent Moderately polluted sent to ETP	- 38 cum/d
d.	Effluent Highly polluted spent wash sent for composing	- 240 cum/d
e.	Moisture in product	- 2 cum/d
	Total Output	**- 398 cum/d**

Internal recycling is Condensate water, CO2 scrubbing and spent lees.
In addition to this water is needed for domestic use (worker's personal hygiene and canteen / colony) &Greening drive. The recovered waste water is treated and recycled. 20 m3 as domestic for workers hygiene and 100 m3 fresh for greening.

ToR 23: The industrial effluent is 360 m3/day or 8 lit/lit. at generation point and then controlled.

Water Budgeting: (ToR 21) Cogen unit

#	Step	Water input cum/d	Loss	Wastewater out cum/d
1	Regeneration De-min	Fresh = 8	1	Moderate BOD to ETP = 7
2	Boiler	Fresh = 216 (Make-up)	194	Sober to ETP = 22
3	Cooling	Fresh = 450 (Make-up)	428	Sober to ETP = 22
4	Pump Blower Sealing water	Fresh = 114	3	Sober to ETP = 111
5	Floor & vessel washing	Fresh = 15	2	Mod. To ETP = 13

Table No.11.11: Details of water balance

Input side (Industrial):

a. Fresh Water for Industry, (Cogen) - 803cum/d

Total Input - 803 cum/d

The Sober & moderately polluted effluent after ETP will be recycled collectively as175 m3/day

Output side :

a. Loss from Industrial Use - 628cum/d
b. Effluent sober nature sent for ETP - 155cum/d
c. Effluent Moderately polluted sent to ETP - 20cum/d

Total Output 803 cum/d

Water Budgeting for Sugar Unit

#	Use station	Input Fresh	Loss	Effluent	
				Sober	Moderate
1	Cooling	2061	1814	247	
2	Boiler	86	28	58	
3	Floor & vessel washing	40	15		25
4	Process	570	50		520
5	Lab	8	3		5
6	Pump cooling	50	3	47	
	Total	**2815**	**1913**	**352**	**550**

Input side (Industrial):

a. Fresh Water for Industry,(Sugar) - 2815 cum/d

Total Input - 2815 cum/d

The Sober & moderately polluted effluent after ETP will be recycled collectively as175 m3/day

Output side :

d.	Loss from Industrial Use	- 1913cum/d
e.	Effluent sober nature sent for ETP	- 352 cum/d
f.	Effluent Moderately polluted sent to ETP	- 550cum/d
	Total Output	**2815 cum/d**

Thus collectively the input is

Fresh water 328 + 803 + 2815 = 3946
Sober & Moderate 46 + 175 + 902 = 1123

ToR 23: In addition to this water is needed for domestic use (worker's personal hygiene and canteen / colony) & Greening drive. The recovered waste water is treated and recycled. 40 m^3 as domestic for workers hygiene and 70 m^3 fresh for greening.

If we consider only industrial water, the fresh water is only is 78 % of the requirement.

Attempts are made for water minimization by recycling and reusing as

Segregation:

As MoEF desires, **TI** has decided to bring the segregation principle in practice. Now, the streams are segregated first in five branches (and then combined in two) as follows. It shall help in many ways for ease of treatment.

Stream (A)
The Sober wastewater stream comes from boiler blow down, pump cooling and cooling purging water. Except temperature, it has little other objectionable characteristic. This is can be treated by physic-chemical treatment, lowering the temperature to ambient, giving detention for some time and recycle either for industrial purpose or gardening or using as diluent to moderately polluted waste water before treatment. This effluent is from three units as 352 + 155 + 28 = 535 m3/day.

Stream (B)
Moderately polluted wastewater comes from de-min plant regeneration, process, and floor- vessel washings. This needs Biological treatment. The quantity from three units is 550 + 20 + 38 = 608 m3/day.

The Characteristics of these effluent streams are expected to be:

#	Parameters	Sober	Mod. Polluted
1	pH	5.5-6.5	5.5-6.5
2	BOD(5 days at 20 C)	60-70	1620-1800
3	COD	200	2800-3000
4	Suspended Solids	800-1500	1300-1600
5	Oil & Grease	<20	50-70
6	Flow cum/day	305	550

Table No.4.10 Characteristics of Effluents

(All Values except pH are in mg/l)

Treatment scheme (ToR 23)

The sober effluent 535 m3/day after initial PCT pretreatment is mixed with moderately polluted effluent of 608 m3/day, totally 1143 m3/day. This is treated by biological oxidation. The units will be

Screen Chamber
Screening is the first unit operation during the effluent treatment. Screening necessarily involves interception of the coarse solids by means of a bar rack inclined at 45-60 deg. in the flow direction. The screened material will be removed by manually.

Oil & Grease Trap
After screening the effluent will enter a Oil & Grease Trap. The floatable free oil & grease shall rise to the surface and removed by means of a mechanical skimmer. The skimmed oil & grease will be collected into an oil trough and disposed off as per requirement.

Aerobic System
Overflow of primary clarifier will be sent to an **Aeration Tank** operating on the principle of Extended Aeration process. In the aeration tank, an aerobic bacterial culture is maintained in suspension. The aerobic environment in the tank is achieved through a mechanical surface aerator, which also ensures that the contents remain in a well mixed regime of effluent and aerobic sludge.

After a specified time, the mixture is passed into a **Secondary Clarifier**, where the cells are separated as sludge from the wastewater. The settled activated sludge is recycled to the Aeration Tank to maintain the desired concentration of MLSS (Mixed Liquor Suspended Solids).

Excess Sludge Disposal & Treatment
The excess activated sludge from the Aerobic system will be taken to Sludge Drying Beds for necessary dewatering. During the drying period, the moisture will evaporate and also filter through the filtering media. The sludge cakes to be used as manure while the filtrate will be taken to Equalization cum Buffer Tank.

Pressure Sand Filtration
Treated effluent from the secondary clarifier will be put to sand filtration to remove all the suspended impurities.

Activated Carbon bed
Filtered effluent will be passed through carbon bed to remove color, odor and part of the organics.
Treated effluent will be used for irrigation and discharged to the land area.
The typical characteristic of treated effluent is as below.

#	Parameters	Value mg/liters except pH
1	pH	7.5-7.8
2	BOD(5 days at 20 C)	100
3	COD	<250
4	Suspended Soilds	<100
5	Oil & Grease	<10

Disposal: **(ToR 26)**

The matter is very simple in the present case. The stream of domestic sewage 40 m3/day comes from various shops and sheds separately placed. Therefore treatment is given at respective places in dedicated Septic tanks. This is used by sub surface irrigation for local greening.

The treated effluent of above characteristics after tertiary treatment is recycled back and is also usable for greening.

Stream (C) High BOD Spent wash

We have considered the sober and moderate effluents above. However in case of distillery we have high BOD effluent spent wash as well. This needs more careful treatment and disposal.

The Industrial wastewater from distillery is acidic in pH, has deep color, and has high BOD, COD and TDS. However, it is neither poisonous, nor toxic, nor hazardous, is highly biodegradable, and has good calorific value. It is proposed to treat the effluent. This basically will be in two stages, by Anaerobic Methane Bio-Digestion, and followed by Bio-composting (with or without an intermediate step of volume reduction using MEE).

The Characteristics of this effluent stream are expected to be:

#	Parameter	(C) Spent wash
1	.pH	4.0 – 4.5
2	Temperature	90-95 C
3	Color	Yellowish
4	Total Solids	92600- 98800
5	BOD	50000-55000
6	COD	120000-130000
7	Quantity CMD	336

Table No.4.8 Characteristics of Effluents

(All Values except pH are in mg/l)
The treatment trains will be

For stream (C) high BOD spent wash, 240 m3/day

Anaerobic Methane bio-digester will have following units

#	Unit	Specification	MoC
1	Biogas Digester	Type- Cylindrical, Vertical shell, Diameter 32m, Height 18m, 20 day HRT	MS
2	Degassing Pond	Type- Cylindrical, vertical shell Bottom- Conical	MS
3	Parallel Plate Clarifier	Type- Vertical shell, pack of plates in Bottom-Conical	MS / Plates SS
4	Gas Holder Floating Drum	Type- Cylindrical, vertical shell about 300 m3 capacity	MS
5	DAP Dosing tank	Type- Cylindrical, vertical shell Bottom- Conical	MS
6	Sediment traps	Type- Cylindrical, Vertical shell, to remove moisture from gas line. Bottom- conical	MS
7	Central Agitator	Top entry, variable speed of 40-125 rpm	SS
8	Lateral Agitator	4 Nos. Side entry, speed 350 rpm	SS
9	Inter-Piping		MS/ SS

Table No. 11.12 : Bio-Digester Units.

After the first stage treatment, the post-biodigester has the Characteristics of this effluent stream as expected:

#	Parameter	Values mg/l
1	pH	7.5 to 7.65
2	Temperature	Room
3	Colour	Blackish brown
4	Total Solids	5600-5900

5	BOD	11000-16000
6	COD	36000-40000

Table No. 11.13: Characteristics of Post-digester Spent Wash

The next step will be the bio-composting. CPCB and MoEF has given considered guidelines and the same will be followed.

Solid Waste

Based on above working, the summary is per day

#	**Waste**	Quantity	**Treatment**	**Disposal**	**Remark**
1	Canteen	2.0 CuM	Compost	Own garden	Organic
2	Colony	5 CuM	Compost	Own garden	Mixed
3	Office	2 CuM	--	Sales	Non-Haz.
4	Packing Sec.	1 CuM	--	Sales	Non-Haz.
5	ETP	400 kg	Treated already	Own garden	Organic, Non-Haz
6	Ash	**20 MTD**	Silos	Sales	Takers available
7	Press mud	**200 MTD**	dewatered	use	Filler material
8	Baggasse	**1500 MTD**	balad	use	Power
9	Molassess	**200 MTD**	stored	use	Distillery
10	Lube Oil	**35 kg/day**	Floatation	Cart lubrication	
11	Yeast sludge	**15 kg/day**			
12	Digester sludge	**5 m3/day**			

Table 11.14 : Solid Waste Per Day

Note A: For ash handling precautions are taken as

The ash handling system for boiler shall comprise of:

1) SUBMERGED BELT CONVEYOR
   It includes Idlers, Pulleys with bearing and Plummer block ,skirting, complete drive assembly ,Belting of all conveyor, Structures such as stringer with short Supports Head, Tail, Drive Base Frame, Take up Frames, Drive Base Frame, connecting chutes, both side walkways ,safety switches ,water inlet & outlet drain nozzles.
2) ASH BELT CONVEYOR
   It includes Idlers, Pulleys with bearing and plummer block, skirting, complete drive assembly, Belting of all conveyor, Structures such as stringer with short Supports ,Head ,Tail, Drive Base Frame ,Take up Frames, Discharge chute, connecting chutes.
3) SCREW BELT CONVEYOR
   It includes complete drive assembly, screw flight pipe shaft, trough, trough cover, end seals, Structures, drive Base Frame, inlet chute, Discharge chute, connecting chutes.

Ash Handling System:

Bagasse contains very little ash of about 1.5% of its weight. Nevertheless a good system for handling of ash from the boiler ash outlets to the disposal point is required in order to eliminate the pollution hazard to the plant with the ash.

The furnace bottom ash from the hoppers shall be handled by the water impounded submerged belt conveyor, which will be discharged directly in to the tractor trolley, which will convey the ash to the disposal place.

The fly ash coming from the hoppers of Air heater and ESP will be discharged in to the screw conveyers placed below the respective hoppers. These screw conveyers will convey the ash to a common screw conveyer, which will discharge the ash in to another inclined screw conveyor. The tractor trolley placed below this conveyor will collect the ash and transport it to the disposal place.

Bagasse Handling

The loose bagasse yard is located at the place of existing bagasse yard adjacent to the proposed boiler. The closed bagasse shed of size 75m long X25m wide, will be located in the place available between proposed boiler and factory fencing. However, the bailed bagasse will be stored behind the existing store in the space available with the factory.

Note B:

Not being an Engineering Industry, use of oil-grease, lubricants, or hydraulic/ system oil is extremely limited. Recovered and used oil for lubricating cane carrying bullakcarts or burnt in boiler with baggasse.

Hazardous Waste:

The relevant summary of above reads as :

S. No.	List of Processes Generating Hazardous Waste	Waste stream		Remark Please vide Note
18	Production of acids and fertiliser	18.1	Acid-conaining Residue	No. 1 below
		18.2	Spent catalyst	
		18.3	Sulfur Containg Residue	
38	Cleaning of barrels which have held chemical substances	38.1	Chemicals containing residues from barrel cleaning	No. 2 below
		38.2	Sludge from waste-water purification	
41	Waste treatment processes e.g. distillation, separation and concentration technique.	41.4	Distillation residue from the work-up of contaminated halogen-free organic solvents	No. 3 below
44	Every action relating to and every use of lubricating and system oil	44.1	Spent oil	No. 4 below
		44.2	Other spent lubricating and system oil	

Table 11.15 Summary of Hazardous Waste

Note 1: In the proposed case, spent wash wastewater is converted into Power. Thus there is no Compost making or Fertilizer-making and none of the three sub streams 18.1, 18.2 or 18.3 of wastes are applicable.

Note 2: The number of barrels containing Turkey Red Oil are only few, as the substance is not a raw material. It is merely an anti-foam agent. These are on returnable basis to suppliers. So also can be said for the yeast supplement substances, like nutrients, which comes in bags only.

Note 3: The activity is bound to remain inside, as no organic solvents are involved anywhere in the line of process reaction or work-up.

Note 4: Not being an Engineering Industry, use of oil-grease, lubricants, or hydraulic/ system oil is extremely limited. The steps like fermentation, distillation do not involve any rotating machines, hence it is not applicable. Recovered and used for lubricating rice husk carrying carts.

11.7. Background Study:

This is important part of study.

(A) **Natural Environment :** We have undertaken to do the sampling as –

No.	Media	Stations	Parameters	Frequency
1	Surface Water	4	25	1
2	Ground Water	6	20	1
3	Ambient Air	5	5	3
4	Ambient Noise	5	2	1
5	Soil	5	22	1

Table No.11.16: Summary of Sampling

The stations are selected in all the directions from the factory and in 10 km radius. The Environmental quality is generally found satisfactory.

(B) Manmade environment

This includes existing land-use, demography, employment, socio-economic aspects and community development needed and proposed. This is for entire area both rural and urban in this study zone.

- Socio-Economic Status in Influence Zone will include the study of Non-Workers percentage whether high, from the percentage employed population on Agricultural, how far is the scope for other avenues of livelihood like Live Stock, Forestry, Fishing, Hunting, Orchards, Mining, Trade Commerce.
- Further out of Total Land what percentage is already under Cultivation and Out of Total Land what percentage is already under Irrigation.
- If the land is not likely to support more people, then whether Industrialization is necessary to improve the situation. All this is studied as cost benefit ratio.

It was found that industrialization is the only solution.

11.8. Safety

Safety and Occupational Health will be dealt carefully. A disciplined approach is natural to this industry. Safety policy will be in place. The unit will be registered under Factory Act and are bound by State Factory Rules. Thus, First aid trained and Fire-fighting trained person will be available in every shift. Safety Officer will be appointed, as also the competent person retained. Where necessary, provisions of other Acts, where required like Petroleum act, Explosive Act, etc. will be obeyed. Fire fighting system is kept as per norms of Insurance Company and CIF.

DMP (Disaster Management Plan) and off-site emergency plan will be in place. Accordingly, Personal protection equipment will be given and use will be insisted. Consulting Physician is retained to attain the factory.

11.9. Benefits

This industry will provide Alcohol as useful material for India, which will not only save but also earn foreign exchange. We shall also generate some power for the State. This will not disturb the present land use because our area occupied is already sanctioned by Government for industrial purpose, with only small % of Influence zone 10 km and already is in possession.

Compatible Architecture will be adopted and No Prime Agriculture Land will be put to this industrial use. Trees will be maintained and not razed down. No Rehabilitation is involved because the land is already in possession of the Industry. The problematic waste materials like solid waste will be reused or taken care of, Wastewater will be reused to grow greenery, and air pollutants will be arrested. Water harvesting will be done and greenery will be increased. People will get some jobs here. Some incidental small employment like eatery, canteen, tyre repairs, garage too will become available to genuine people.

In the final analysis, it is the endeavor of the Proponents to give benefits --

- To keep transparent relations with the neighbors in the area
- To strengthen the Gram panchayat democratic set up by assistance to community.
- Not to disturb any prime agricultural land
- Not to encroach on others' existing water source
- Not to overload the existing power supply, causing load-shedding to the villagers
- To remove the barren-ness of the land and prevent wasting of rainwater.
- To Recharge the groundwater
- To strengthen the physical infrastructure
- To create greenery within our premises and even outside to some extent
- To reduce the wastewater pollution created by this new activity by utilizing it in our own fields as water to grow plantation and landscaping.
- To reduce the solid waste pollution created by this new activity by utilizing it in the fields of our own community land development..
- This could be a win-win situation with benefit to Proponents, benefit to the Public and no (or low) harm to the environment.
- All this is possible for which Environment Management Plan as worked out in next Chapter is scrupulously obeyed.

11.10. EIA Study Report

This is finally prepared and submitted as per guidelines given by MoEF as --

Chapters	Contents	
I	Proponents, ToR, Purpose	
II	Project explained. Why this, Why needed, Why here, What priorities, What options	
III	Environment Setting	Natural & Man-made
	Material, Method, Approach	Delphi technique
IV	High Significant Impact → Low Insignificant Impact & Shield	
	Proper Site → Prevention → Abatement → Treatment → Mitigation → Smooth Disposal	
V	Alternate Analysis	
	Selection of Raw Materials, Site, Process, Machinery- Hardware, Collaborators, Staff & Team	
VI	Monitoring = Stations, Parameters, Frequency, Statistics, Rectify	
VII	Risk	To Environment, To Health, To Bankers
	Public	Community, Rehabilitation, Others- Assistance
VIII	Benefits = Physical, Social, Employment, Other Tangible. Sustainable??	
IX	Cost-Benefit. If Project Done? If No-Project??	
X	EMP = Plan, Cell, Schedule, Watch-dog, Monitoring, Documentation, Reporting	
XI	Summary, Conclusion, Justification, Mitigation.	

XII	EIA Team = Proponent, Consultant, Associates, Future

Table No. 11.17: EIA Study Report

The preparatory drill for above was on the background of our thinking –

11.11. Conclusion:

This industry will manufacture Alcohol and Power which are in good demand for growing infra-structural facilities in India and abroad. This will not disturb the present land use because our area occupied will be only small % of Influence zone 10 km and is already permitted for industrial use. No Prime Agriculture Land will be put to this industrial use. Trees will be maintained and not razed down. No Rehabilitation is involved. There will be no problematic waste materials as all will be utilized.

- This project is very necessary in view of making useful material available to Indian developmental activity for community, defense and as a foreign exchange saver/ earner product.
- The local people desire that industries should come here on existing plot.
- The candidate site is suitable from general MoEF expectations.
- Water, power, Raw material, and Market is assured and found available with ease.
- Full precautions will be taken for Pollution Control, Resource Conservation and Environmental Protection.
- This is cost effective and Sustainable Development.

The Report gives the details and finds that the impact overall is favorable to the country, to the people and to the environment as a sustainable development.

--0--