EXECUTIVE SUMMARY

Proposed Modernization cum Expansion of Sugar, Distillery and Cogeneration unit

Dr. Babasaheb Ambedkar Sahakari Sakhar Karkhana Limited

Arvindnagar, Post Keshegaon Tal & Dist: Osmanabad

Prepared By

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1.0 Introduction

Dr. Babasaheb Ambedkar Sahakari Sakhar Karkhana Ltd (DBASSKL) is a cooperative sugar factory. It is located at Arvindnagar, post Keshegaon, Taluka and District Osmanabad, Maharashtra. Geographically Osmanabad district is situated in Marathwada province of Maharashtra. DBASSKL is one of the leading cooperative sugar factories from the Marathwada region. The sugar factory is registered under Maharashtra Co-Operative Society act 1959; - registration number OSM/ORG(A)/S-75/1997, dated 27-3-1997. The factory has done a remarkable progress under the leadership of Hon. Shri. Arvind Janardan Gore. There are 9968 member farmers (share holders) from 150 villages in the surrounding. Factory holds 310 acres of land, of which 125 acres are reserved for agricultural R&D programs.

Though the sugar factory is located in draught prone area of Maharashtra it has shown significant achievements in various fields such as a) lower cost of production, b) minimum expenses on salary and non productive items, c) maximizing capacity utilization & sugar recovery, etc. However, due to time to time modernization and adopting new technologies, the factory could able to achieve operational efficiency of average 125% from a unit of 2,500Tons crushed per day (TCD) installed capacity. Factory has won an award for technical efficiency from state government.

Now the management has planned to expand the sugar unit's installed capacity to 5,000TCD. Thereby, the factory could able to fulfill the need and demands of cane grower farmers for crushing of surplus cane. This will also support to produce and sell the sugar in national and international market. Due to increase in the crushing capacity the factory expects enhancement in the production of bagasse, molasses etc. Thus, to utilize this resources it has proposed to install a DEC type10MW STG, and enhance its cogeneration capacity to 26MW. Similarly, it has planned to expand its distillery by adding new 30KLPD unit so as to have a production capacity of 60KLPD.

1.1 Project information: Geographical

Particulars	Details
Nature of the project	Expansion of a) sugar unit by modernization of 2500TCD unit to 5000 TCD (installed capacity) b) Distillery unit from 30KLPD to 60KLPD

	c) Cogeneration unit from 16MW to 26MW
Size of the project	After expansion a) sugar unit installed crushing capacity of 5,000 TCD b) distillery unit of 60KPD and c) cogeneration of 26MW
Location of the project	Within existing sugar factory premises at Dr. Babasaheb Ambedkar Sahakari Sakhar Karkhana Ltd is located at Arvindnagar post Keshegaon , District- Osmanabad
Geographical Location	76°11'2.29"E and 18°5'5.41"N. Altitude 672m above MSL
Nearest City/Town	Osmanabad 18km NW (district HQ) Tulajapur 15km SW (religious place)
Road	The site is located 3.5 km off Tuljapur -Ausa State Highway No. 3
Railway Station	Osmanabad is the nearest Railway Station 18km away
Air Port	Solapur domestic airport, 50 km Pune ~300km

2.0 Project Details

Name of the Proponent	**M/s. Dr. Babasaheb Ambedkar Sahakari Sakhar Karkhana Ltd. (DBASSKL) (Cooperative sugar factory)**
Project	Expansion of distillery, cogeneration and sugar units • Modernization of existing 2500TCD Sugar unit so as to achieve 5,000 TCD (installed capacity) • Cogeneration from 16 to 26MW • Molasses based distillery from 30 to 60KLPD
Project location	Within existing sugar factory premised
Land	Proposed site meets the guidelines for industrial site selection, prescribed by Ministry of Environment and Forest as well as local guidelines of Maharashtra Pollution Control Board No need of acquisition of land
Distillery unit	Distillery and evaporation unit 1.5acres Compost yard 2.5 acres
Sugar and cogeneration	Approx 4 acres for expansion of sugar unit and 10MW STG unit

Greenbelt	2.65 acres for entire project
Total land requirement	10.65 acres
	Products and byproducts
Alcohol (Considering 7.5% v/v alcohol in fermented wash)	i. RS Conforming to ISI Grade I, 323 (1959) Production 57KLPD + 3KLPD Impure Spirit ii. Extra Neutral Alcohol, ISI Grade I, 6613 (1972) Production 56.4KLPD + 3.60KLPD Technical spirit iii. Ethanol ISI-Grade-I, 321(1964) /IS: 15464 (2004), Production of 30KLPD Impure Spirit Conforming to ISI Grade II, 323 (1964) Fusel oil
Electricity	i. 24.5MW during cane crushing season ii. 10MW during off-season
Sugar (subject to vari according to cane variety and crushing season's conditions – considering max. crushing rate @6,250TCD)	i. White Sugar (max recovery of 12%) ~750 MT/Day ii. Bagasse (generation @28% on cane): ~1750 MT/Day iii. Molasses : 250 MT/Day iv. Press mud: 250 MT / Day
Main Raw Material	i) Sugar Cane (minimum): 6,250 MT/Day ii) Lime : 9.4 MT/Day (0.15% Cane) iii) Sulfur: 3.1MT/Day (0.05% Cane)
Water Requirement (Considering recycle/recirculation)	Sugar and cogeneration 655m3/day (for season); Cogeneration: 595 m3/day (for off-season) Distillery: 475m3/day
Source of water	Vadala Dam (Permission available)
Fuel	Bagasse for season: 1,211MT/day Off-season: 515MT/day Cane Trash: 5,000MT/annum Imported coal (optional during off-season): 70MT/day
Power	**Captive power source**
	Season **Off-season**

Total power Generation (in MW)		24.500	10.00
Total Captive Power Consumption (in MW)		8.500	1.85
Surplus power for export to state grid (in MW)		16.000	8.15
Manpower	Approx 95-100		
Project Cost	Rs. 101.00crores		
EMP Cost	Rs. 17.50crores		
Days of Operation per year (Maximum)	Sugar unit– 210 days Distillery: 270 days Cogeneration: 300 days		

2.1 Sugar unit expansion

The expansion of sugar unit will be due to modernization of the existing sugar unit of 2,500TCD. It is focused on reducing the captive steam and power consumption and to improve the technical performance of the sugar unit. As a result of the modernization, the factory could able to expand its Installed cane crushing capacity to 5,000TCD. Usually it is observed in sugar industry that the unit could be operated at 125 to 130% efficiency of installed capacity. Considering this fact, the modernized 5,000TCD unit is also anticipated to be operated at 125% efficiency of its installed capacity. Therefore, after expansion the sugar factory is anticipated to be operated at maximum crushing rate of 6,250 TCD (~284 TCH on 22hours basis).

SUGAR MANUFACTURING PROCESS

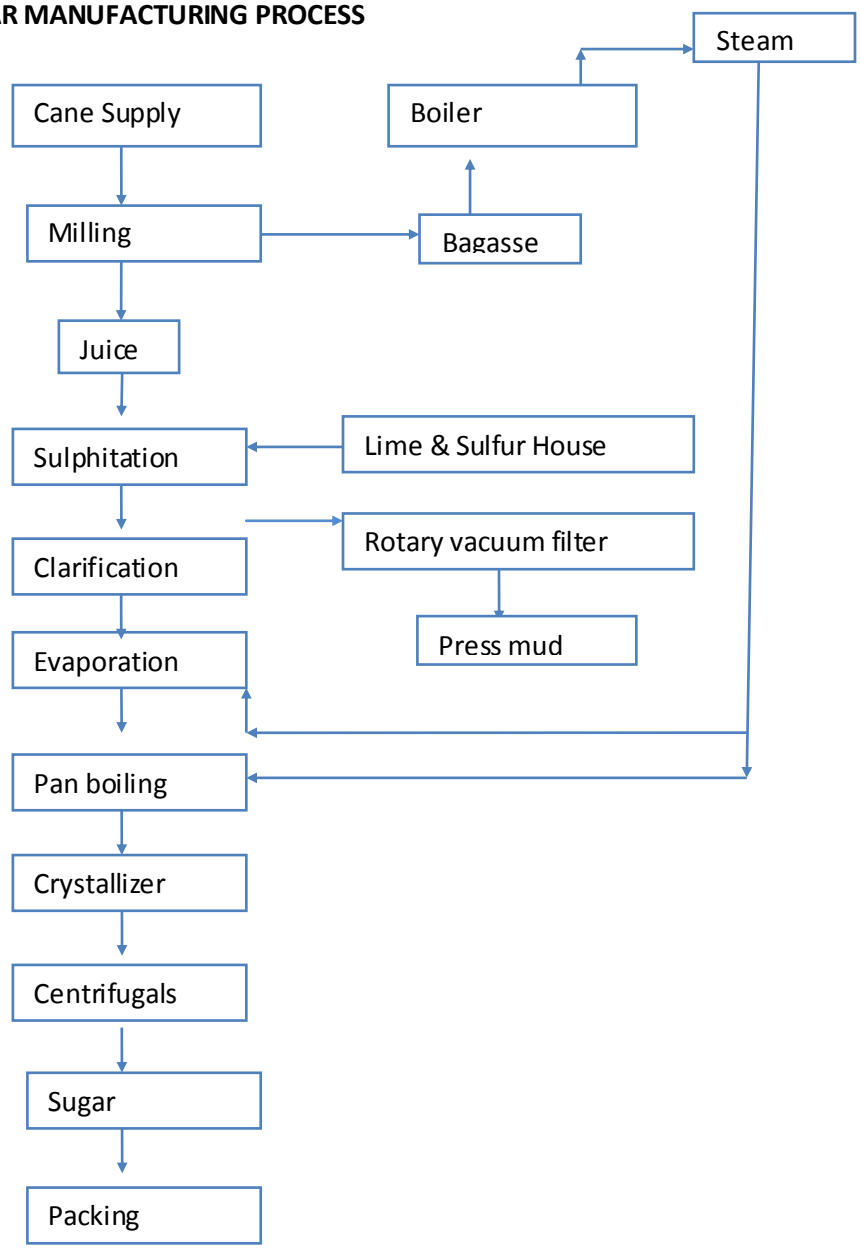

Figure 1: Flow diagram for sugar manufacturing process

Table 1: Water Balance: Sugar and Cogeneration Unit (Season)

WATER INPUTS (Unit m³/day)	
DM Water For Boiler feed	2,720
Milling section (including washing)	1,925
Water For Turbine/boiler parts cooling, Vacuum Pump & Others	220
Water For spray pond Makeup	550
Water to Ash handling system	25
Other Domestic Usage	20
Total Water Input at start up	**5,460**
WATER OUTPUTS	
Steam Condensate	2,660
Hot water from turbine and boiler parts	220
Evaporation & Losses	550
Domestic Consumption	20
Losses at ash handling system	25
Excess condensate	1,335
Wastewater generated from various units	650
Total Water Outputs	**5,460**
RECYCLE STREAMS	
Steam Condensate Recycle For Boiler	2660
Water from boiler and turbine parts after cooling	220
Condensate total Recycle after cooling	1,335
Treated effluent	650
Total Recycling of water per day	**4,805**
Total Fresh Water Input	**655**

Table 2: Water Balance: Cogeneration Unit (off-Season)

WATER INPUTS (Unit m³/day)	
DM Water For Boiler feed	1130
Water For Turbine/boiler parts cooling, Vacuum Pump &	100

Others	
Water For spray pond Makeup	550
Water to Ash handling system	25
Other Domestic Usage	20
Total Water Input at start up	**1825**
WATER OUTPUTS	
Steam Condensate	1,080
Hot water from turbine and boiler parts	100
Evaporation & Losses	550
Domestic Consumption	20
Losses at ash handling system	25
Wastewater generated from various units	50
Total Water Outputs	**1825**
RECYCLE STREAMS	
Steam Condensate Recycle For Boiler	1,080
Water from boiler and turbine parts after cooling	100
Treated Water Recycle	50
Total Recycling of water per day	**1230**
Total Fresh Water Input	**595**

Table 3: Fuel Balance for crushing season

Sr. No.	Item	Unit	Value
1.	Crushing rate (Maximum @6,250 TCD for 22h)	TCH	284
2.	Bagasse generation at 28% on cane	TPH	79.52
3	Biogas (600m3/h) to be used in season, equivalent bagasse	TPH	1.82
4	Cane Trash to be used in season, equivalent bagasse	TPH	1.85
5	Net bagasse available	TPH	83.19
6	Bagasse consumption by boilers	TPH	50.48
7	Bagasse saved (considering average season of 160 days)	TPH	32.71
		MT	125,606

	Bagasse available for off season days operation		
8	Bagasse required for off-season cogeneration and distillery project	TCH	19.15
		TCD	459.6
9	Therefore, off-season operational days (Considering 300 days of cogeneration)	Day	140
10	Bagasse saving even after cogeneration	MT	61,262

Table 4: Boiler details

Sr. no.	Boiler	Air Pollution Control Equipment	Steam generation
1	New 50 TPH @ 72ATA Pressure and temperature 515 ± 5^{0}C Bagasse to steam ratio 1:2.35	Electrostatic precipitator	47.00 TPH
2.	Existing three boilers (32TPH x2 and 30TPH x 1) each @ 45ATA Pressure and temperature 510 ± 5^{0}C Bagasse to steam ratio 1:2.1	Mechanical dust collector followed by wet scrubber	64.00 TPH
	Total Steam generation during crushing season		**111.00 TPH**

Table 5: Power balance (Season)

Power Generation	Unit (MW)
From 10 MW DEC type STG set	9.000
From 10MW SEC type old STG	15.500
TOTAL	**24.500**
Power Consumption	
Sugar Factory	6.590
Distillery	0.600
Office, Colony, Workshop, Other	0.400
Cogeneration auxiliary	0.910
Total Captive Consumption	**8.500**

Surplus exportable power (During season only)	**16.000**

Table 6: Power balance (off-Season)

Generation/Consumption	Unit (MW)
Power generation	**10.00**
Power consumption	
Cogen auxiliaries	1.00
Sugar process	0.10
Distillery / ENA / ethanol	0.60
Colony	0.15
Total captive consumption	**1.85**
Power export	**8.15**

Table 7: Cogeneration Expansion Scheme

Particulars	Existing	Proposed
steam turbine generator (STG)	3MW x 2 Nos. 10 MWX1 No.	10 MW -1 No.
Type	Back pressure	Double Extraction cum condensing (DEC)
Steam supplying boilers	32 TPH x 2 boilers for two 3MW STG 30TPHx1 boiler for 10MW STG	New boiler of 50TPH
Steam pressure	45kg/cm2	72kg/cm2
Steam temperature	510^{0}C	510^{0}c
Bagass to steam ratio	2.15	2.40
	16.00 MW	26.00MW
Existing air pollution control device on each of the boiler	Mechanical Dust collector followed by wet scrubber	ESP
Stack Height and its connectivity with boiler	65 m; Connected to existing boilers	72 m; Connected to proposed boiler

Operational days	300 Days		
Power generation	During crushing season	24.5 MW	
	During off-season	10MW	
Fuel	Season	Bagasse :1,163MT/day Biogas: 600m^3/h	
	Off season	Bagasse= 467MT/day Biogas = 600m^3/h Cane Trash: 7,000MT/annum Imported coal as an auxiliary during off-season (if required): ~70MT/day	

Table 8: Summary of proposed distillery expansion project

#	Particulars	Existing	Proposed
1	Installed capacity	30KLPD	30 KLPD (total 60KPD)
2	Spentwash generation (L per L of Alcohol)	10L	10L
3	Primary treatment to spentwash	Biomethanation	Biomethanation
4	Secondary treatment	-	Multi-Effect Evaporation (MEE) - After expansion for 60KLPD
5	Disposal	Composting	Composting
6	Compost yard	6.75 acres RCC – 1:2:4	additional 2 acres = 8.75 acres , RCC 1:2:4
7	Ratio of pressmud : spentwash	1:2.5	1.25:1

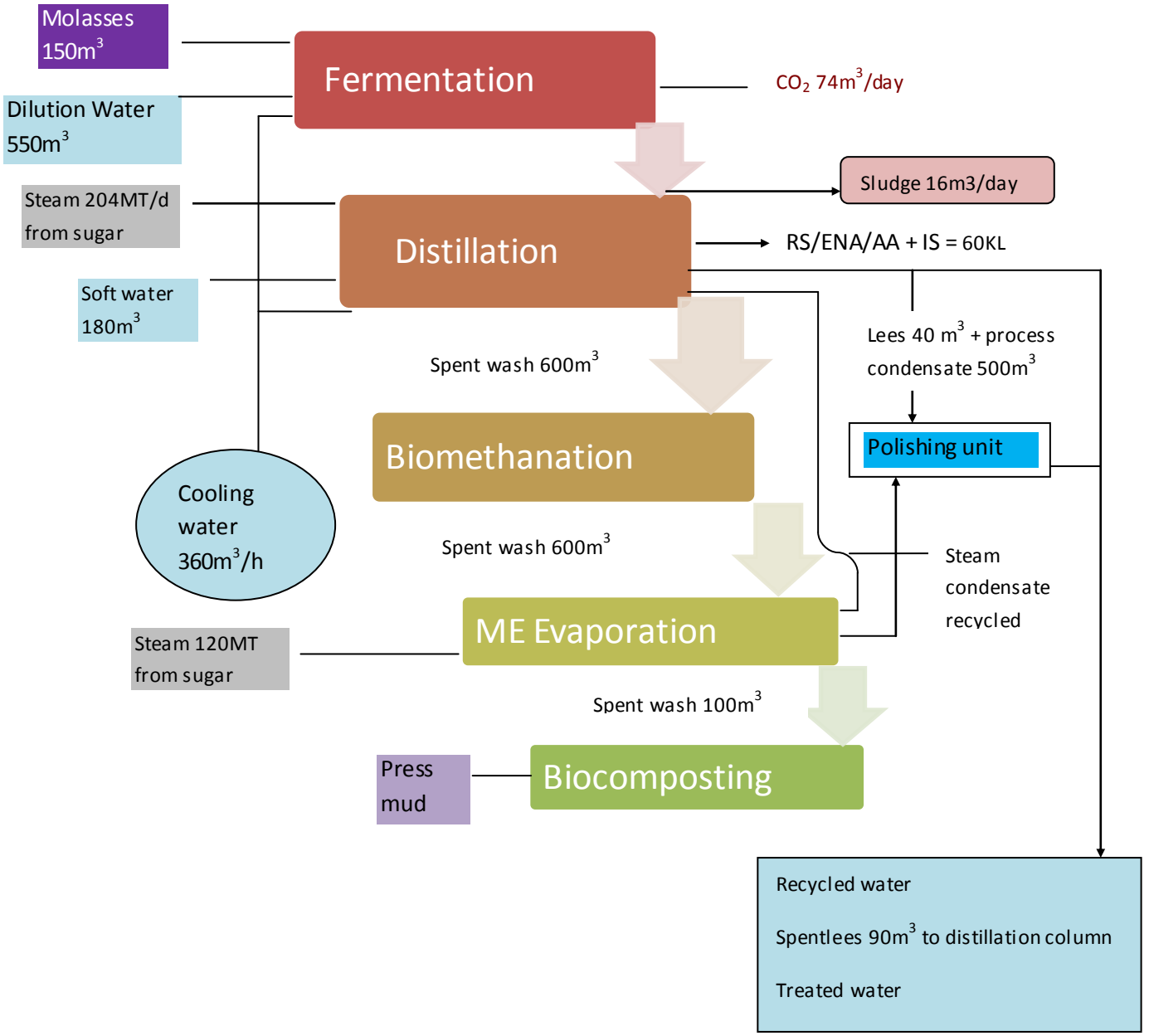

Figure 2: Process and Water Balance for 60KLPD Unit

Table 9: Summary of Environmental Setting in 10km radius area

Facet	In brief
Characterized	General dryness, except monsoon
Rainfall	Average 700 mm
Precipitation	Mainly in July-Aug
Temperature	Summer temp 24^{0}C to 38^{0}C. Sometimes + 40 ^{0}C. Winter temp 14^{0}C to 22^{0}C rarely <8^{0}C
Humidity	High in Monsoon 85 %, In summer it decreases up to 30 %
Wind	Calm 22.6%, Predominant direction East, North- East
Air Quality	Within NAAQS
Noise	Within Noise standards prescribed by CPCB
Soil	Brown (Various tings), Texture clay to loam
Within 10km Area	There is no tropical forest, or biosphere reserve, or national park Or wildlife sanctuary

Table 10: Pollution sources and types

Environment	Activity/Process/Source	Pollutant/measures if any
Air	Bagasse as fuel	Mainly particulate matter (fly ash as SPM)
	Ash and bagasse handling	Minor fugitive dust
	Biogas	Methane and CO2
	Fermenters	CO2
	Bio-composting	Odour, methane
Water	Process	Sugar Effluent = 600 -650 m^3/day – sent to ETP Spent wash from distillery 600m3 treated by biomethanation followed by multi-effect evaporation followed by composting Spent lees, process condensate & other ~ 550m^3
	excess condensate	Condensate of 1,200m3 day cooled and recycled
	overflow blow down from	other sources ~750 m^3/day - mildly polluted

Environment	Activity/Process/Source	Pollutant/measures if any
	cooling tower and boiler	effluent – recycled after treatment
	Sewage	Sewage = 16 m^3/day – disposed by septic tanks and Sock pit
Land	Boiler ash	Ash 24.24 MT/day Non-toxic; non-hazardous Mixed with biocompost
	Hazardous oil	Scrap oil from DG set- very minor since DG will be used only in case of captive power failure
	Sludge from biodigester, fermenter, ETP units	Collectively 200-250MT per month Mixed with biocompost
	Wastewater discharge	Effluent of 650 m^3/day treated in sugar ETP used for irrigation
Noise	Mill house, Bagasse & Ash handballing, Power house and boiling house, Sugar house, transportation etc.	Noise levels between 80-90 dB(A) at few work places

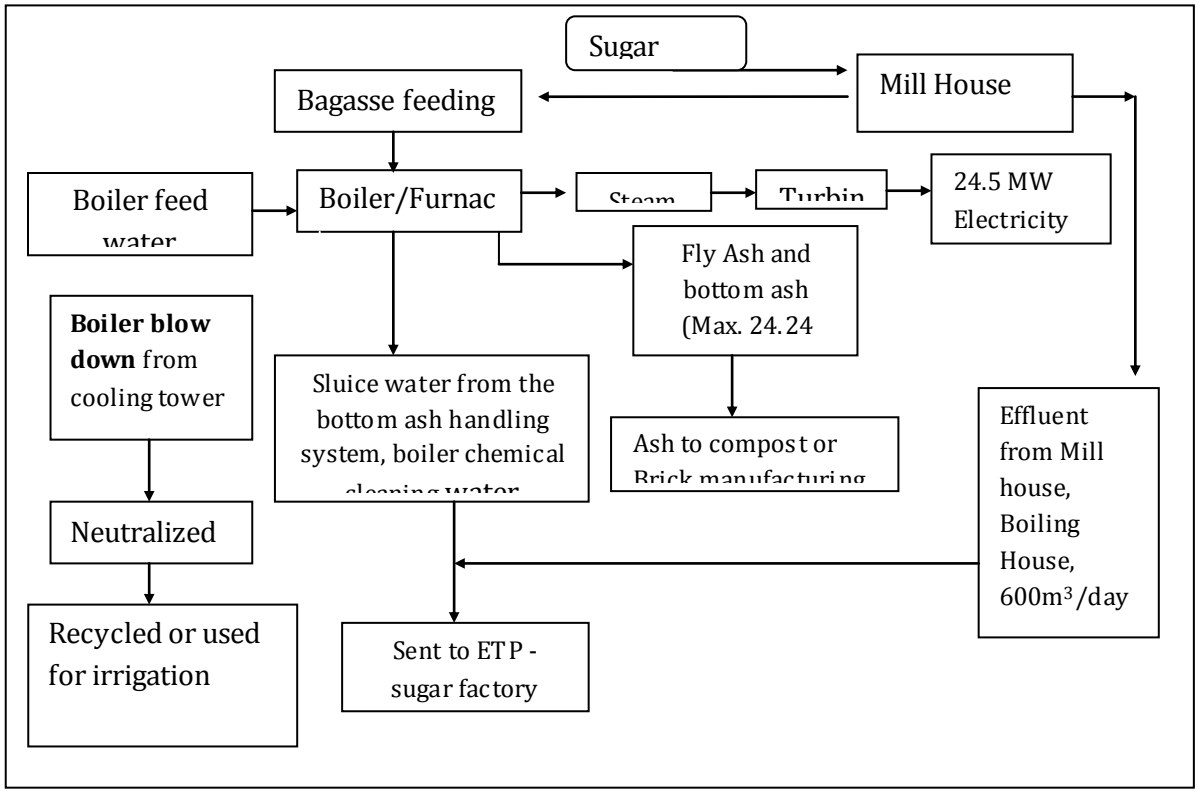

Figure 3: Schematic of waste management at sugar and cogeneration project

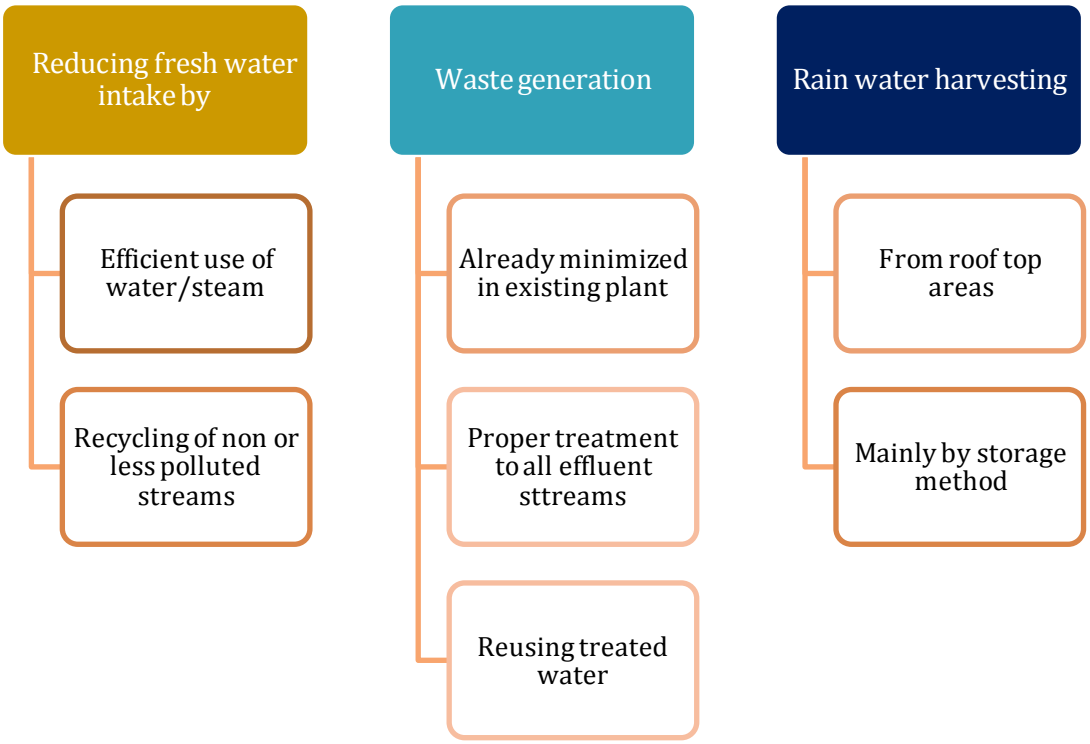

Figure 4: Schematic of water management

3.0 CREP Guidelines and its compliance mechanism

The sugar factory has implemented Bio-methanation as primary treatment followed by bio composting for the safe disposal of spent wash in its existing 30 KLPD unit. For the proposed distillery expansion it has decided to install multi-effect evaporation as a secondary treatment after biomethantion. By this the factory not only going to reduce spentwash volume but also it will help to meet press mud balance. The guidelines recommended through CREP, which will be implemented by the project proponent, are as follows.

- Spentwash storage lagoon of ≤30 days and five days capacity
- Impervious lagoons, constructed leak-proof, lined with HDPE sheets and protected by brick lining
- The compost yard of 6.5 acres lined with HDPE sheets and protected with Reinforced cement concrete(RCC), it will be extended by two acres with RCC
- Provisions for leachate collection gutter and sump well as well as spentwash sprinkling pipeline network.
- Provision of modern machinery for turning of wind rows and spraying of spentwash

3.1 Polishing Unit for Condensate, spent lees and other minor distillery effluents

Wastewater sources such as spent lees, steam condensate and blow-down water will be treated through polishing unit. Treated water will be reused for dilution of molasses, cooling tower make-up water, water for the gardening/irrigation activity. Steam condensate will be recycled back as a boiler feed water to sugar factory. Thus, the industry is determined to put its sincere efforts for the recycle/reuse of water.

Table 11: Polishing unit for condensate and other minor distillery effluents

#	Unit	Purpose
1	Primary Settling Tank	To remove suspended and colloidal settle able solids and BOD
2	Buffer Tank	To adjust pH by recycling alkaline returns sludge
3	Aeration Tank	For final oxidation of Organic matter using suspended growth principle
4	Final Clarifier	To settle and return the Bio-Sludge for efficient Aerobic performance

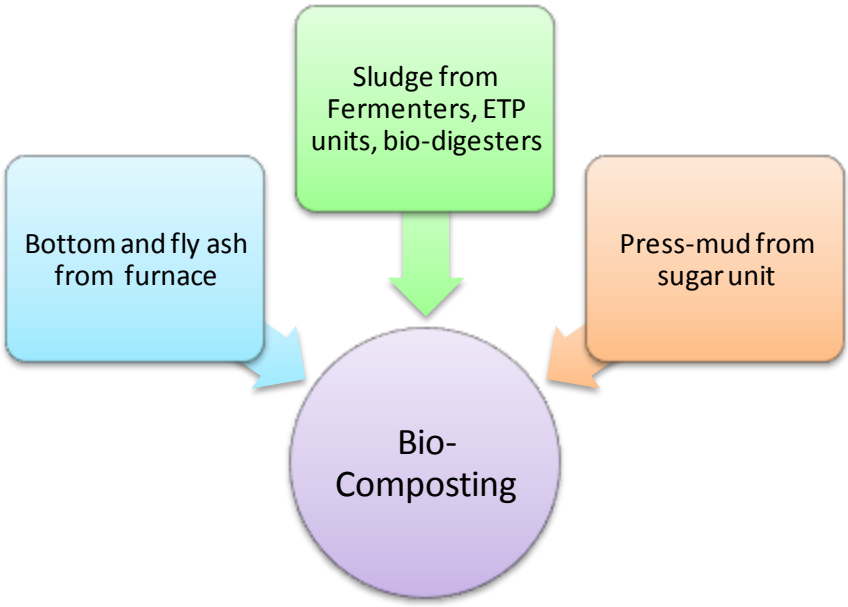

Figure 5: Schematic of waste management

4.0 Greenbelt development

The Major objectives of the proposed green belt development will be –

- Mitigate impact due to fugitive emissions
- Control the noise levels
- Create an aesthetic environment
- Enhance the bio-diversity of the vicinity
- Prevent soil erosion and surface run-off

Trees interspacing	tree density per 100m^2	Size/type	Location
3 x 3m	25	Shrubs and small trees	Boundary of sugar and cogeneration, Garden/landscape areas
5 x 5m	09	medium to large size trees	Boundary of plot area –
10 x 10m	04	Large size trees	Road side large size trees

There is already a good green belt developed around 5,000 trees present around the factory premises. The greenbelt development for proposed actvity will be done as per the requirement i.e. type of activity performed at a particular area/plot, thus the tree spacing will vary from plot to plot. Therefore, an average 2500 –3,000 plants (including shrubs and trees) are proposed for the greenbelt development.

5.0 Safety, occupational health management

- Suitable operating procedures shall be adhered for overall safety and health
- Use of flameproof electrics
- Smoking and igniting activities shall be strictly prohibited in the entire unit
- The plant and buildings should meet the corresponding provisions of statutes regarding inter-distances, exits, ventilation, illumination, etc.
- Fire fighting system shall be provided as per the statutory requirement

- Regular medical checkup of workers, contractual workers and employees
- Regular medical check-up, Group insurance and medical aid facilities should be provided as per the statutory requirement

6.0 Social environmental Aspects

- No rehabilitation/resettlement issues are involved
- The proposed project on implementation will generate 90-100 direct employment opportunities
- The project proponent is a cooperative sugar factory, which is owned by about 10,000 farmers, hence the revenue generated through proposed project will directly beneficial to all share holder's and their families
- Activities such as primary school, school for cane harvesting labours, etc will be continued
- Compost produced from the spentwash, pressmud and other filler material will be sold to member farmers at very nominal cost; it will help in recycling the soil nutrients and help in improving the soil conditions
- Project proponents are already engaged with many activities under various sectors such as public health educational, cultural as well as welfare activities, they will continue their activities with updated mechanisms

Table 12: Budgetary allocations for environment management

	for sugar and cogeneration project	**Cost (in lakhs Rupees)**
Sr. No.	**Category**	**Capital**
1	Air pollution control equipments (ESP)	150.00
2.	Ash & bagasse handling	250.00
3.	Fire protection	25.00
4.	FD/ID fans	25.00
5.	Greenbelt	10.00
6.	ETP Up-gradation	90.00
	Total (Sugar and Cogen)	**550.00**
Sr. No.	**Distillery unit**	

1	Multi-effect evaporator	400.00
2.	Bio gas plant and machineries	300.00
3.	Condensate polishing unit (mechanical)	125.00
4.	Molasses storage tank	97.50
5.	Spent wash storage lagoons	115.50
6.	Bio-compost yard	135.00
7.	Fire protection system	25.00
	TOTAL (distillery unit)	**1,198.00**
	GRAND TOTAL	**1,748.00**

		Recurring cost (Rs. In Lakhs)
1.	Air, noise and odour Pollution Control	17.00
2.	Water Pollution Control	24.50
3.	Environment Monitoring and Management	1.50
4.	Occupational Health	5.00
5.	Greenbelt	0.50
6.	Solid waste management	8.00
7.	Others	
	▪ Fire Protection	1.0
	▪ Ash handling and disposal	15.00
	Total	**72.50**

Table 13: Summary of Impact Assessment and mitigation measures

Source	Pollutant	Control/Mitigation	Impact Assessment
AIR ENVIRONMENT			
Stack emissions due to burning of bagasse, biogas	Main pollutant SPM	Stacks 72 m height (for proposed boiler) ESP to control fly ash particles (for new boiler) Greenbelt of 33% of the plot area i.e. 2.5 acres	Minor negative impact due to stack emissions
	SOx , NOx and H_2S	Bagasse contains traces of N and S In bagasse fired boilers, the temperature encountered is <1000^{0}C due to 50% moisture in the bagasse; hence NO_x emissions from combustion in the form of NO_2 will be in traces H_2S scrubbers for biogas	Negligible impact due to installation of H_2S scrubber
Handling and transport of bagasse and ash	SPM	Mechanized system for handling of bagasse and ash Asphalted internal roads, Adequate parking places for goods and private vehicles	Minor negative impact due to fugitive dust

Source	Pollutant	Control/Mitigation	Impact Assessment
D.G. sets	NOx, HC	Less utilized due to captive power Regular maintenance; compliance of statute and guidelines	Insignificant impact
Fermentation unit	CO_2	Tank covered Provision of CO2 scrubber	Insignificant impact
Bio-compost unit	CH_4; H_2S Odour	Mechanized system for aeration and spentwash spraying Proper operation process	Use of modern machines for maintaining oxygen supply will reduce the odour; hence minor negative impact
ETP unit	HC	Proper operation process	Minor negative impact
WATER ENVIRONMENT			
Manufacturing Process	Major source – Distillery Spentwash	Biomethanation followed by Multiple effect Evaporation (MEE) followed by Bio-composting	Minor negative impact
	Minor – effluent from sugar & cogen unit, Spent lees, steam condensate, Blow down from, cooling tower, Pump Sealing, floor	• Steam will be utilized twice, before condensing and condensate will be recycled • Other effluents will be treated in ETP and treated water will be reused • Process condensate from sugar as well as distillery unit will be	Overall impact reduction due to recycle and reuse of water, rain water harvesting scheme, hence minor negative impact

Source	Pollutant	Control/Mitigation	Impact Assessment
	washing and other cleaning activities **Thermal pollution** Sources: boiler blow down and cooling tower blow down.	recycled; due to which the fresh water drawl will get reduced considerably • spent lees and other distillery effluents will betreated in Condensate Polishing Unit (CPU) • Hot water will be collected and cooled in separate ponds/tanks and recycled after cooling • Zero Liquid Discharge will be achieved for sugar, distillery as well as cogeneration • Treated water will be reused as a cooling tower make-up or gardening	
Sewage	Domestic wastewater	Local acceptable practice of septic tank and soak pit system will be followed	Minor negative impact
SOLID WASTE			
Boiler	Ash	Enriches soil– as a source of Potash hence mixed with bio compost	Minor negative impact on air quality, positive impact on soil due to return of nutrients
		Dust generation will be localized and dust particles will get arrested due to the greenbelt	Mechanized handling will reduce the impact, significantly

Source	Pollutant	Control/Mitigation	Impact Assessment
Process	Pressmud (from sugar)	Used for making compost as a basic material for spraying spent wash	Improve soil organic matter hence positive impact on soil
	Yeas sludge from fermentation unit of distillery	Organic and degradable hence, mixed with compost	Improve soil organic matter hence positive impact on soil
ETP (Sugar& Cogen), Bio-digesters and CPU(distillery)	Sludge	Organic and degradable hence, mixed with compost	Improve soil organic matter hence positive impact on soil
OTHER WASTE			
Process	Molasses	Though, it is a waste, it is considered as a by-product since it is used as a raw material for distillery. Utilized fully in own distillery for production of RS/ENA/AA	Proper storage and use in distillery will reduce the negative impact
NOISE			
Process machineries	Mainly Boiler, milling, STG, pumps and motors	Noise sources/ noise generating activities will be under roof/covered area Regular maintenance of machinery Provisions of personal protective equipments Job rotation at high noise work places Regular health check up Walls, trees, and ample open space in surrounding will support to mitigate noise propagation to outside area	Minor negative impact

Source	Pollutant	Control/Mitigation	Impact Assessment
		Greenbelt development	
	Transportation	Regular maintenance of vehicles Well maintained internal roads and adequate parking will reduce traffic congestion and noise due to it	Minor negative impact