

EXECUTIVE SUMMARY

Proposed 19 MW Cogeneration project (Power)

Bhimashankar Sahakari Sakhar Karkhana Limited

Dattatraya Nagar, Pargaon, Taluka- Ambegaon, District- Pune



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EXECUTIVE SUMMARY

1.0 Introduction

M/s. Bhimashankar Sahakari Sakhar Karkhana Ltd (SSSKL) is located at Dattatraya Nagar, Pargaon, Taluka- Ambegaon, District- Pune, and Maharashtra. The sugar factory is registered under Maharashtra Co-Operative Society act 1961; registration number PNA/AGN/PRG/A/s-47/1994 dated 31.03.1994. Bhimashankar SSK Ltd plant was commissioned in the year 2000 and its licensed present crushing cane capacity is 2500 TCD. The management has implemented the co-generation project of 6 MW capacity with DECC turbine on the existing 45 ATA pressure boiler in the year 2006-07. Now the management plans to increase the cogeneration capacity to 13 MW by implementing modern high pressure boiler and 6 MW DECC type T G set 13 MW back pressure type T G Set. Hence the peak crushing capacity of cane will be considered for the co-generation purpose. The exhaust steam of cogeneration unit will be supplied to sugar and distillery therefore it will be the efficient utilization of available resources.

According to the notification (SO-1533), issued by the Ministry of Environment and Forests (MoEF), Government of India, in September 2006, the Power plant project of <20MW Placed under category 'B' and requires Environmental Clearance (EC) from Environment Department of Government of Maharashtra. Thus, for a preparation of EIA and development of EMP, the management has entrusted the job to **Vasantdada Sugar Institute (VSI), Manjari (Bk.), Pune.**

The prime objective of any EIA exercise is to identify and assess the adverse impacts of a project in the planning stage itself, so that necessary mitigation measures to prevent or minimize these adverse impacts can be planned early and cost-effectively. A comprehensive **Environmental Management Plan** is recommended to ensure that the environmental quality of the area would be preserved.

2.0 Project Highlights

Particulars	Details
Project Type	New Co-generation Unit (power plant)
Size of the project	19 MW co-generation project
Name of the Proponent	Bhimashankar Sahakari Sakhar Karkhana Limited

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Location of the project	Within the existing factory premises at Dattatraya Nagar, Pargaon, Taluka- Ambegaon, District- Pune, Maharashtra
Geographical Location	18°58'30.57" N and 74°05'31.68" E
Nearest City/Town	Manchar is the nearest town 16 km away from the site.
Road	The site is located off Pune-Nashik National highway No. 50. Distance- 15 km from factory site
Railway Station	Pune is the nearest railway station 55 from the site.
Air Port	Pune is the nearest airport 47 km from the site.
Land	18 acres built up area, 6 acres provided for green belt development
Product	Power (19 MW electricity)
Operational Days	Season 160 Off season 76
Main Raw Material	Water and Bagasse
Water Requirement	900 m ³ /day
Source of water	Ghod River, Kathapur KT Weir.
Fuel	Bagasse For season: 1074 MT/day Off season : 305 MT/day
Production equipment, machinery and ancillary units	Steam generating Unit (Boiler), Condensate system, Turbo-generator sets, Fire protection system, Bagasse and Ash handling system, Cooling towers etc.

Power	Power requirement will be met by their own cogeneration unit	
	Total Generation of power from T,G set of 13 MW and 6 MW	18.00 MW
	Sugar Factory power consumption	5.100 MW
	Distillery, Cogeneration unit and administration , Colony load.	0.99 MW
	Total Captive Power Consumption	6.000 MW
	Surplus power to be exported to state Grid	12.00 MW
Boiler	Existing one boiler having capacity 37 MT/hr. having pressure 45 Kg/cm² and temperature 445°C 5°C will be Utilize with 6 MW DECC type T G set. The factory decided to install 80 TPH, 88-kg/cm² pressures and 515°C-temperature capacity will be utilized with new 13 MW Back Pressure type T G Set. Hence the total capacity of boiler will be 117 TPH and the 19 MW of TG set to meet the steam and power generation.	
Manpower	Approx 35	
Project Cost	Rs. 4461.25 lakhs	
EMP Cost	Rs. 300 lakhs	

3.0 Infrastructure

3.1 Bagasse

The availability of bagasse is mainly dependent upon the crushing of cane at sugar factory. The cane crushing data of the factory for five seasons i.e. 2005-06 up to 2009-10 has been tabulated as follows.

Table 1: Bagasse production for last five seasons (i.e. 2005-06 to 2009-10)

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Year	Sugarcane Crushed (MT)	Bagasse produced (29%)
2005-06	4,20,777	1,22,025
2006-07	6,45,260	1,87,125
2007-08	6,63,415	1,92,390
2008-09	3,39,000	98,310
2009-10	5,88,909	170783

Table 2: Bagasse generation and net consumption estimates for the proposed cogeneration are as follows.

Description	Per day	Per season (160 days)
Cane crushing rate @ 181.8 TCH	4,000 TCD	640,000
Bagasse production @ 28% = 50.904 TCH	1221.70 TPD	195,471
Bagasse utilization (Season) = 44.750 TPH Boiler 1) 80 TPH @ 29.35 Boiler 2) 37 TPH @ 14.80	1074 TPD	171,840
Bagasse saving @ 6.154 TPH	147.70	23,631MT

Thus, from the above data it can be inferred that the sugar factory is having adequate source of fuel i.e. bagasse. The other infrastructures available with sugar factory for the cogeneration project, is as follows.

3.2 Boilers

Presently the Karkhana is having one boiler of 37 TPH capacity working at 45 ata pressure and $445^{\circ}\text{C} \pm 5^{\circ}\text{C}$ steam temperature. For the proposed project a new boiler is of 80 TPH capacities at 88 Ata pressure and $515^{\circ}\text{C} \pm 5^{\circ}\text{C}$ steam temperature is planned to install. Operating load of the new boiler is estimate to be about 71.50 TPH during normal crushing season including the extraction of steam for process requirement, HP heater and de-aerator heating steam.

Table 3: Boiler details

Sr. no	Boiler	Pollution Control Equipment	Steam generation
1	New 80 TPH @ 88 ATA Pressure and temperature $515 \pm 5^{\circ}\text{C}$	Electrostatic precipitator	71.1 TPH

2.	Existing 37 TPH @ 46 ATA Pressure and temperature 445 °C	Multi cyclone dust collector	35.4 TPH
Total Steam generation during crushing season			106.5 TPH

Table 4: Turbine Generator set

Sr. No.	Steam Turbine Generator	Power generation (MW)
1.	13 MW (New)	12.100
2.	6 MW (Old)	5.900
Total power generation		18.000

3.3 Water

At present sugar factory drawn water from river Ghod and GSR of 5500m³ capacity reservoir, situated about 2 km from factory. The water requirement for cogeneration project is around 900m³/day. Water conservation will be achieved by recycling of water. Water from the reservoirs will be used for all plant and fire-fighting purposes diesel driven pump (capacity as per TAC recommendation) along with one electrical pump will be installed for supply to all fire hydrants and sprinklers

Table 5: Water consumption details

Activity		Consumption (M ³ /day)
1.	Domestic Use (Drinking, Toilet, etc.)	5.00
2.	Gardening*	Nil
3.	Industrial purpose	
4.	Process	Nil
5.	Washings	Nil
6.	Boiler feed**	80.00
7.	Cooling tower make -up water**	810.00
8.	Others (Pump gland sealing)	5.00
	Total	900 m³/day

* Treated water from ETP will be utilized for gardening purpose

**One time – startup - requirement for boilers and cooling towers = 20,808 m³

Table 6: Water budget for 19 MW proposed cogeneration plant

Sr. No	Station	Input m ³ /day	Loss m ³ /day	Effluent m ³ /day	Sent to	Recycle m ³ /day
1.	Boiler	85	35	50	Sugar ETP	50
2.	Cooling Tower/ Spray Pond	810	810	00	Sugar ETP	00
3.	Domestics	5	2	3	Septic Tank Soak pit	Nil
	Total	900	847	53		50

3.4 Steam

During cane crushing season, the steam will be generated from two boilers, one is of 80TPH capacity, 88 Ata pressure and 515°C ± 5° C temperature; second is of 37 TPH capacity with 46 ata Pressure and Temperature 445 °C. Produced steam will be supplied to a new TG set of 13 MW and existing 6 MW. The exhaust steam from cogeneration unit will be utilized in sugar factory, distillery and other subunits.

The temperature and pressure of exhaust steam from TG sets will be suitably altered by installing suitable PRDS (Reducing and De-superheating) station to reduce the pressure and supply the steam to the Sugar as well as other units.

Table 7: Steam Balance

	<i>For season</i>	<i>Off season</i>
<i>Total steam generation</i>	106.53 TPH	28.25TPH
<i>Steam required for Sugar process @2.5ata</i>	72.73TPH	--
<i>Steam for distillery and ENA units @ 2.5 ata</i>	6 TPH	6TPH
<i>Steam to De-aerator</i>	7.0 TPH	3.0 TPH
<i>Steam to H.P .Heater @7ata</i>	7.8TPH	--
<i>Condensing flow steam</i>	13TPH	19.25TPH
<i>Total steam consumption</i>	106.53	28.25

4.0 The Process

The proposed cogeneration, aims at improving the energy efficiency of the sugar factory significantly and enabling the plant to generate surplus power from its cane crushing operation. This surplus power will be exported to the state electricity grid. Energy efficiency and the export of power to the grid are made feasible due to the availability of high pressure and high temperature steam and by the utilization of the available bagasse.

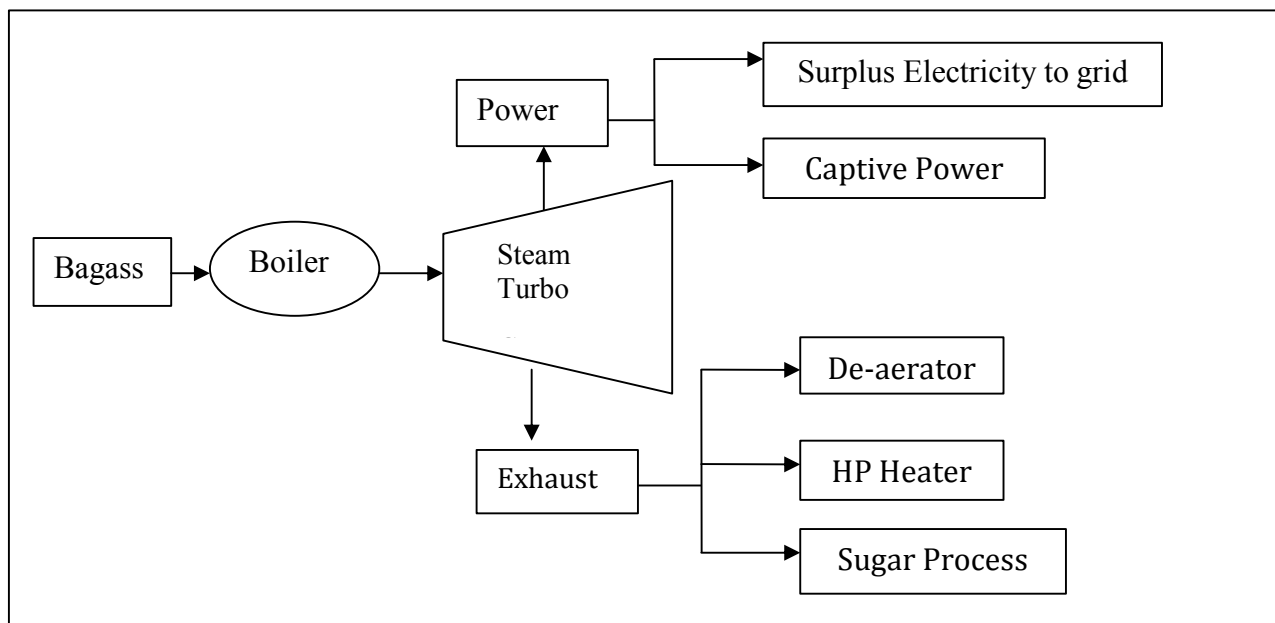


Figure 2.3 Process flow diagram of Cogeneration power plant

4.1 Cogeneration scheme for crushing season

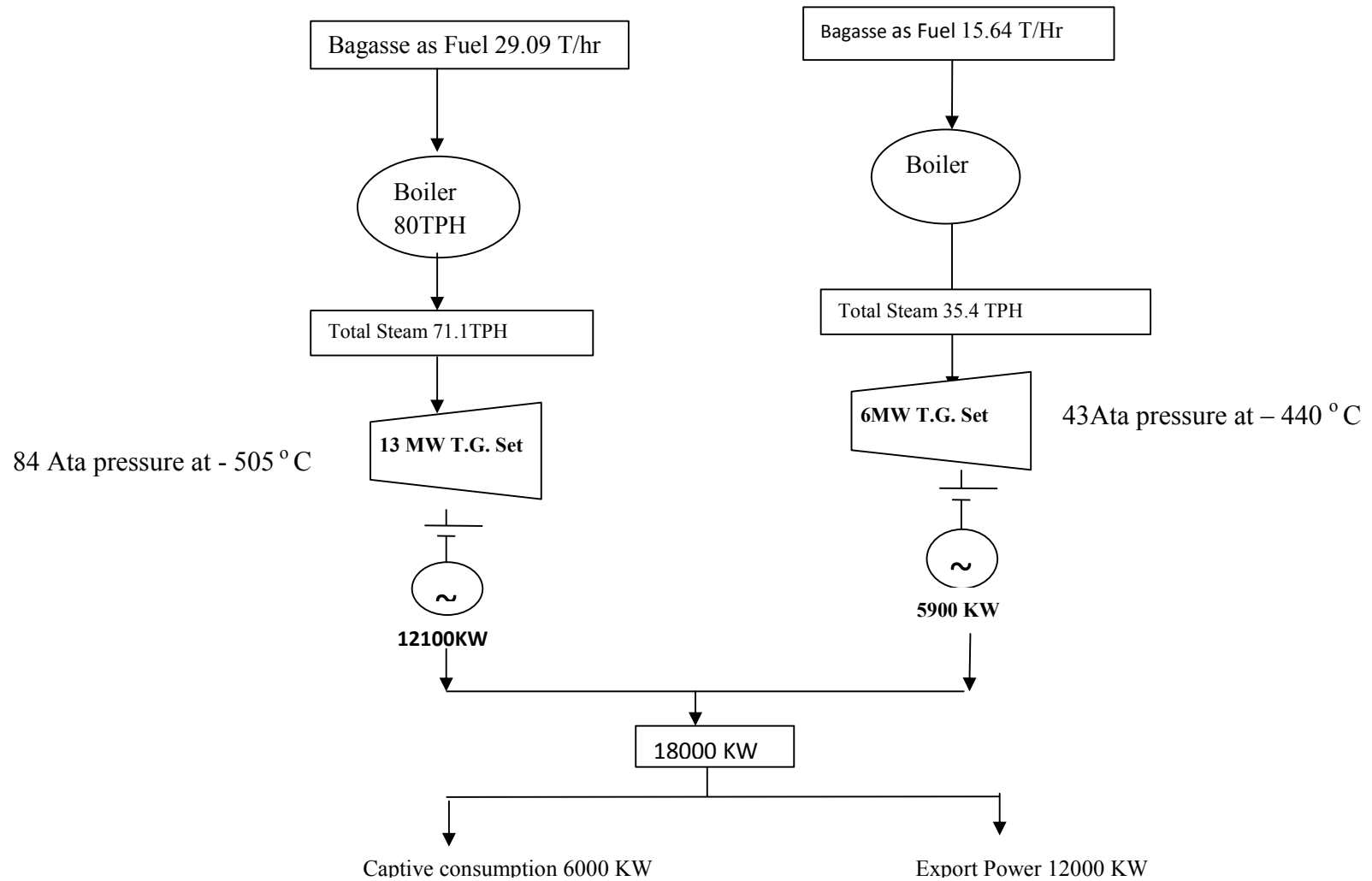
The co-generation schemes operations during crushing season (160 days) are designed to use bagasse as a biomass fuel, which is as per the guidelines and qualifying norms stipulated by MERC.

Table 8: Power balance for crushing season is as follows,

Total Generation of power from T,G set of 13 MW and 6 MW	18.000 MW
Sugar Factory power consumption	5.100 MW
Distillery, cogeneration unit and administration, colony load.	0.900 MW
Total Captive consumption	6.000 MW
Surplus power to be exported to state grid	12.000 MW

The total energy exported by the cogeneration power plant during the crushing season would be 41.472 MU (12.00 MW X 160 days X 24 hrs/day X 0.9) @90 % factor.

Figure 2.4: Process flow chart for season



4.2 Off-Season Scheme (Non-crushing – for 76 days)

Bagasse saved during crushing season will be utilized for the production of power during non- crushing season i.e. off season. For regular operations during this period old boiler of 37TPH and DECC type T.G set of 6MW will be utilized. To generate 6 MW power at the generator terminals the steam generation in the boiler will be 28.50 TPH. During off Season, there will not be any requirement of the process steam at sugar factory, For the distillery operations, steam requirement will be same i.e. 6TPH

The steam for distillery and HP heater is extracted from the steam turbine at lower pressures as required. Process steam for distillery is supplied at 2.5ata pressure reduced and de-superheated before use. The steam to heat feed water in deaerator is extracted from the turbine at 2.5 Kg/cm²

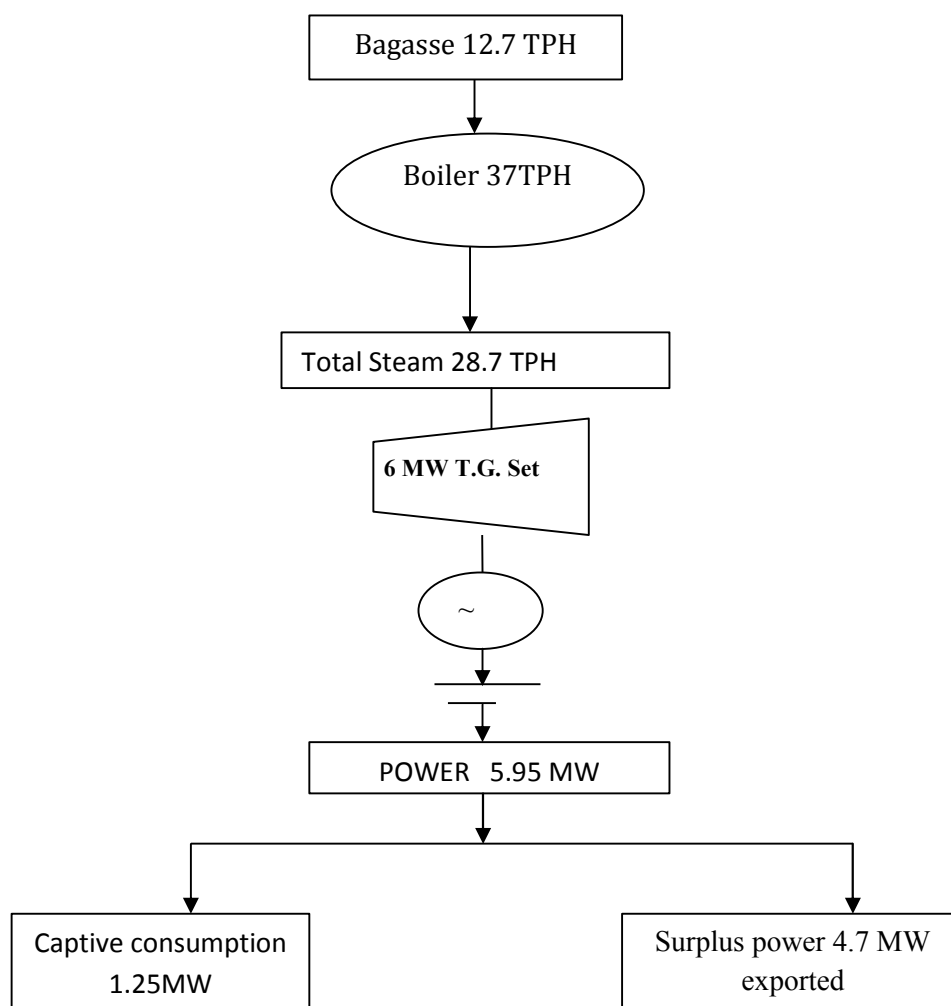


Figure 2.5: Process flow for off-season

Table 9: Power balance for off- season

Captive consumption	
Distillery, Sugar factory administration, Cogeneration Plant auxiliaries	1.250 MW
Exportable Power	4.700 MW
Total Power generation	5.950 MW

Table 10: bagasse Balance

B.	Bagasse balance	
	Bagasse to the cogeneration plant from sugar plant	1,95,471 Tons
	Less Bagacillo used for process (Less)	4,880 Tons
	Less bagasse required to generate 106.53TPH steam @ 44.74TPH for 160 days	1,71,840 Tons
	Bagasse saved during season	18,750 Tons
	Less Bagasse for Misc , emergency Start/ cleaning use	2,000 Tons
	Cane Trash collection (Plus)	6,500 Tons
	Total Saved Bagasse	23,250 Tons
C.	Bagasse balance for non-crushing season	
	Bagasse reqd. to generate 28.5 TPH steam @ 12.7 TPH	305 TPD
	Number of operational days for off-season (bagasse saved/daily bagasse requirement)	76
	Bagasse reqd. for 76 days of operation	23,165 Tons

5.0 Baseline Environment and Pollution Sources

Table 11: Baseline Environment Data

Climate	Ambegaon taluka falling in the moderate rainfall intensity zone. Average rainfall is around 800.44mm. The annual average temperature is varies from 19-33°C Relative humidity - Early summer (January to March)42-55% o In monsoon it ranges 75-81%
Wind	The predominant wind direction observed during the study period is west direction; with 22 % of the 0-7 kmph Calm conditions constituted about 27.78 % of the total time observed.

Geology	The district forms part of Western Ghat and Deccan Plateau. This Taluka falls to the foothill of Sahyadri Mountain range and which is towards the west side of Pune city. The study area largely falls in the Basin of Bhima-Ghod River.
Hydrology	The district has three major drainage system namely, Bhima - Ghod . River system in the northern, north eastern and eastern part, of which Bhima River has a total length of about 355 km. and Ghod River has a drainage of about 196 km. River Ghod at 1.2 km away from the factory site in North direction.
Soil	The type of soil in the area is black to calcareous soil. Deep black soils have good water holding capacity due to rich humus content. Excepts certain packers, the soil have good drainage. These soils contain less 'Humus' Organic Matter. The pH of the soil is 8.0 to 8.9.
Land-use Pattern	It is observed from the available data that, the project surrounding land is mainly used for agricultural purposes, followed by residential purpose agricultural activities, partly for the pasture and other uses.
Ecology	The wild vegetation in the study area consists of semi-aiared with significant thorny species. Mainly agricultural (cultivated) vegetation is dominant in the study zone. There is no wildlife sanctuary or national park or biosphere reserve exists in the 10 km radius area. Also, there are no rare or endangered floral or faunal species recorded in the 10 km radius zone.
Scio-Economic Environment	The infrastructure such as school, college, medical centers, roads, electricity and supply of drinking water is available to the local people. The Karkhana is actively involved in several socio-economic developmental activities of the region, finance for cane development, housing facility to its workers, helping the member farmers for various purposes such as educational, social, health, and cultural.
Historical Sites	No historically important sites are present in the study zone of the proposed site
Ambient Air	The levels of PM ₁₀ , PM _{2.5} , SO _x and NO _x monitored at eight locations - well within National Ambient Air Quality (NAAQ) Standards
Noise Environment	The noise level recorded at all locations were well within the limits for day as well as night time
Water Environment	Nine water samples (including ground and surface water) collected from different locations of study zone. The pH varies from 7.7 to 8.1

Table 12: Pollution Sources and Pollutants

Environment Aspect	Activity/ Process / Source	Potential form of pollutant/ Quantity of Pollutant
Air	Burning of Bagasse as fuel in boiler – Fly ash	Suspended Particulate Matter (SPM) And SO ₂ , NO _x in minor quantity.
Water	Effluent from ion-exchange Blow down from the cooling tower and Boiler	Collectively approx 50 – 60 m ³ /day Minor thermal pollution
Noise	Boiler and handling, transportation machinery	Minor noise pollution - localized
Land	Solid waste in the form of Ash from boiler	Non pollutant

6.0 Impact Assessment

6.1 Air Environment

Bagasse will be the main fuel going to use for generation of 19 MW power. From the analysis of fuel, it can be seen that the sources of pollution are the SPM and SO₂ from the boiler stack.

To control the particulate emission and bring them to the standards stipulated by the Central Pollution Control Board (CPCB), air control equipment in the form of Electrostatic precipitator will be provided.

Dispersion Modeling Study using ISCST3 software shows the following results.

Model Input Data

Parameters	Unit	Stack Attached to Boiler
Stack height	m	60
Stack diameter at exit/top	m	4.0
Stack exit gas velocity	m/s	0.2572
Stack gas temperature at exit	Deg. C	210
Emission rate of SPM*	g/s	1.99*

* Ash content 2%

Electrostatic precipitator of efficiency 98% is the pollution control equipment

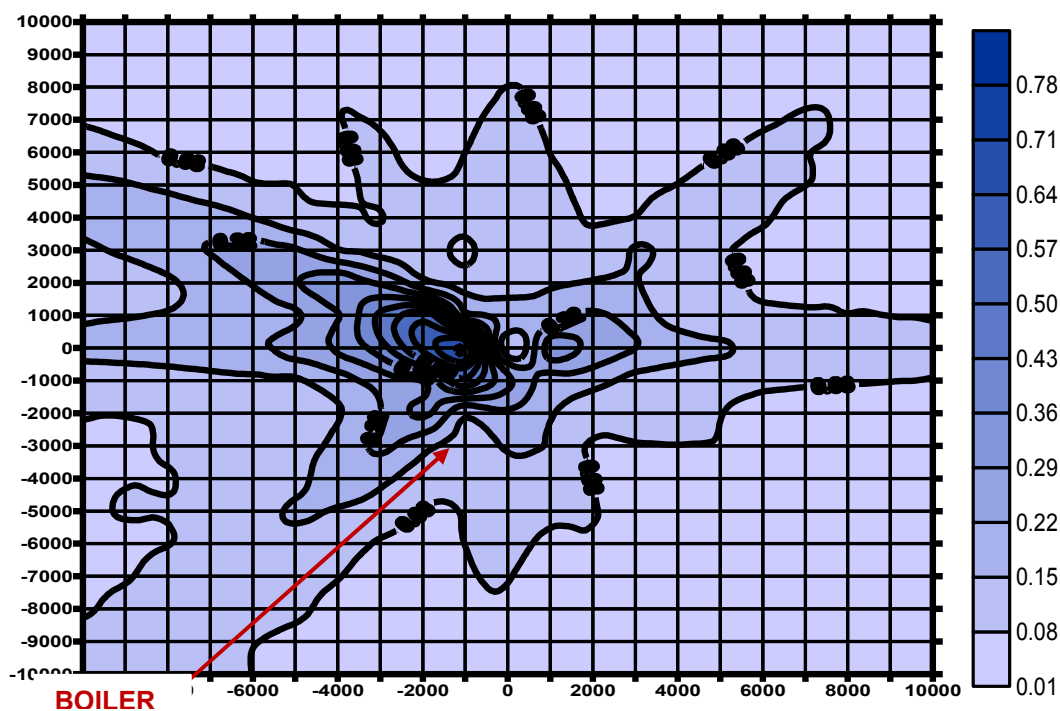


Figure 1: Short Term 24 Hourly GLCs of SPM

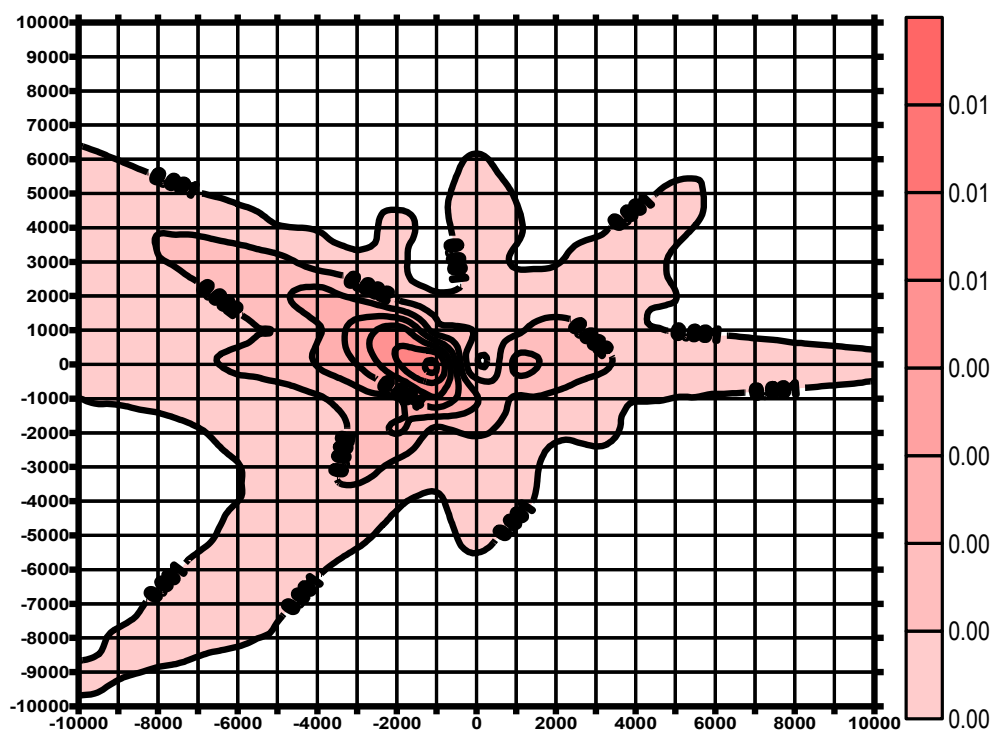


Figure 2: Short Term 24 Hourly GLCs of SO₂

Prediction: The predicted results with baseline concentrations are tabulated below in Table 11 while incremental dispersion trend is shown as isopleths.

Table 13: Resultant Concentrations Due To Incremental GLC's of SPM and SO_x

Scenario	Incremental Concentration, g/m ³	Baseline Concentration* g/m ³	Resultant Concentration, g/m ³	CPCB Limit for Residential & Rural Areas, g/m ³
SPM	0.78	70.66	71.44	100
SO ₂	0.008	18.58	18.588	80

*The baseline concentration (maximum) recorded in downwind direction 2.5 km -east of the site (i.e village Kathapur)

Observations: The resultant GLC values indicate that, after operation of boilers at above stated capacity and fuel consumption, will be within the prescribed National Ambient Air Quality Standards (NAAQS) for Residential & Rural Areas.

6.2 Water Environment

The sugar Factory is operating an ETP, which is adequate (1000m³/day capacity) to treat effluent from cogeneration unit. Wastewater from various sources will be collected and properly treated so as to reutilize it and thus conserve the fresh water resources. The treated water shall be mainly reused as cooling tower make up water as well as for gardening activity. Proper implementation of the proposed mitigation measures will result into an overall negligible negative impact on surrounding water as well as land environment.

6.3 Solid waste

The solid waste expected would be ash from boiler. It is estimated to be about ISMT/day. The boiler ash is generally rich in potash, hence, it could be sold to farmer as manure or it could be sold to the local bricks maker. Since, the solid waste is non-toxic and non-hazardous, it is anticipated that the solid waste will have very negligible impact environment impact.

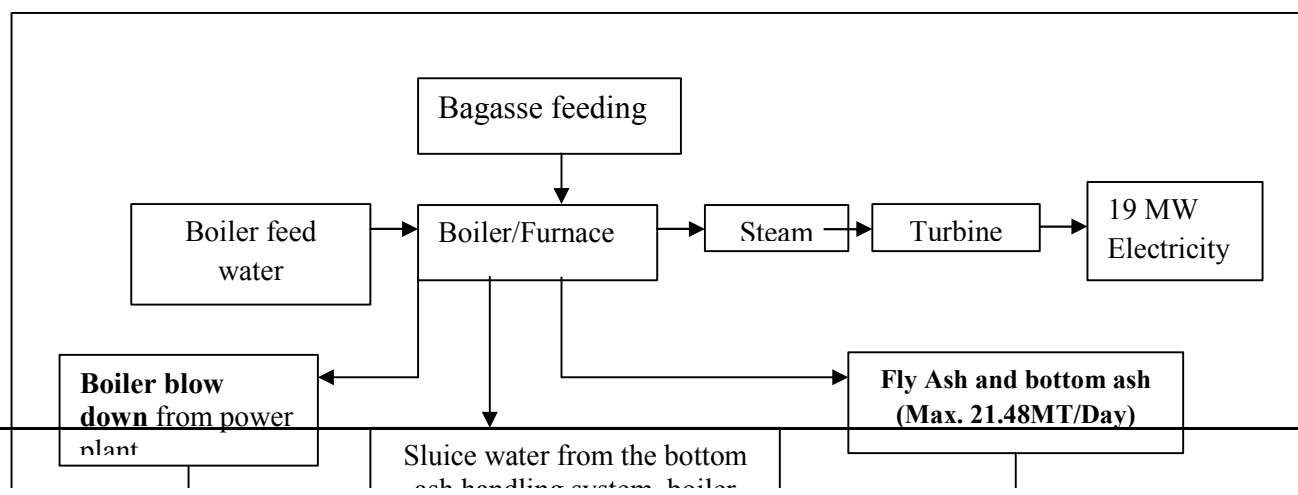


Figure 3: Flow chart for solid and liquid management

7.0 Environment Management Plan: Operation Phase

Activity	Impact	Mitigation Measure/Remark
Steam generation through boiler (emissions from stack)	Minor negative impact on air quality	Pollution control equipments Electrostatic precipitator should be properly maintained and its efficiency must be checked periodically Handling ash properly and recycling it by using it as manure or selling it to brick manufacturer Enhancement of existing greenbelt
Disposal of Effluents	Minor negative impact on water (surface and ground) and soil environment	Effluents shall be treated in the ETP of sugar factory and partially reused for cooling activity, remaining shall be reused for gardening activity
Solid waste Ash	No negative impact on soil environment	It could be directly applied to soil – as a source of Potash
	Minor negative impact on air due to dust	Dust particles will get arrested due to the greenbelt

Transportation and material handling processes	a) Very minor Increase of gaseous pollutants	Maintenance of factory vehicles regularly
	b) Minor increase in the noise level	Adequate personal protective equipments should be provided as per the requirement
	c) No negative impact due to traffic	No increase in traffic
Noise due to different operations	Minor negative impact within factory premises	No major noise generating activities Increase in noise level will be minor and localized

8.0 Environment monitoring program

In order to maintain the environmental quality within the standards, regular monitoring network to maintain environmental quality will be implemented. The sugar factory already has a full-fledged laboratory and technical manpower for the pollution matters. The same can be extended to the cogeneration and ETP, since the cogeneration unit is proposed to be within the sugar complex.

Table 14: The environment, safety and health monitoring program

Air Quality Monitoring	
Parameter Ambient and stack emission	SPM, RPM, SO ₂ , NO _x ,
Sampling Method	High volume air sampler to be located 50 m from the plant in the downwind direction. Use method specified by CPCB for analysis
Standards	Air (Prevention and Control of Pollution) Rules, CPCB, Dec 2009
Frequency	Monthly
Measures	Wherever air pollution parameters increase above specified standards, additional measures as decided by the engineer shall be adopted
Water quality Monitoring	
Parameters	pH, BOD, COD, SS, TDS, Oil & Grease etc.
Sampling Method	Grab sample collected from source and analysis as per Standard Methods for Examination of water and Waste water
Standards	Indian standards for Inland Surface Water (IS; 2296, 1982) and for Drinking water (IS; 10500,1991)

Frequency	Monthly
Measures	All inflow channels shall be checked for pollution loads. Channel delivering higher pollution loads and channel delivering higher pollution load shall be terminated from disposal into the water source and other methods of disposal shall be adopted.
Implementation	All approved monitoring agencies
Ecology	Plantation
Noise Level Monitoring	
Parameter	Noise level on dB (A) scale noise levels on dB (A) scale
Special guidance	Free field at 1 m from the equipments whose noise level are being determined. Equivalent noise levels using an integrated noise level meter kept at a distance of 15m from edge of pavement
Standards	MoEF Noise Rulers, 2000
Frequency	Monthly
Duration	Reading to be taken at 15 seconds interval for 15 minutes every hour and then averaged
Location	At sensitive location such as school, dispensary etc
Measures	In case of noise levels causing disturbance to the sensitive receptors, management measures as suggested in the EMP shall be carried out.
Implementation	Approved monitoring agencies
Supervision	Noise level on dB (A) scale noise levels on dB (A) scale
Soil Quality Monitoring	
Parameter	pH, Alkalinity, Organic carbon, oil and grease etc
Standards	Threshold for each contaminated set by IRIS database of USEPA until national standards are promulgated
Frequency	During the pre monsoon post monsoon seasons each
Duration	Grab sampling
Measures	At location of increased in pollution levels, source shall be identified and shall be diverted from future disposal
Implementation	Approved monitoring agencies
Health, Safety and Occupational	
Frequency	Yearly

9.0 Environmental Benefits of Cogeneration

Cogeneration offers energy, environmental, and economic benefits, including:

Saving money

Improving power reliability for factory

Reducing environmental impact due to reduction in GHG at some other place

Conserving limited resources of fossil fuels

No odor nuisance since entire process is in closed vessels.

Reduced air and water pollution – a clean and environment friendly means of waste disposal.

Generation of Green Electricity thereby reduced in release CO₂ in atmosphere.

10.0 Conclusion

By-product bagasse will be effectively utilized as a fuel

Power independence as well as generation of revenue by export of power

Saving of transportation cost as well as fuel (for transportation)

The project will generate direct and indirect employment opportunities,

The shareholder farmers will be benefited by the project and thus it will boost the local economy

The industry will follow the guidelines prescribed for the control and prevention of pollution by state and central pollution control board. The impact assessment indicates that the negative impact of the proposed project are minor and will be reduced/ nullified by proper implementation of environment management plan and disaster management plan, proposed in the report. The project will have overall positive impact on socio-economic environment of the vicinity.