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Ref. No: Mega-Offer-25-278-R0

Date : 04 September 2025

To,
Biomethane Consult,
Kyiv region, Bucha district,
Vyshneve, st. Svyatoshynska 15,
Ukraine.

Kind Attention : Mr. Vitaliy Kucherenko

**Subject : Technical proposal for 3,000 tons/day Sweet Sorhum
based SYRUP Preparation Plant.**

Dear Sir,

We are submitting herewith the Technical Proposal for 3,500 tons/day Sweet Sorghum to Syrup Project. We reviewed and understood your requirement and accordingly prepared this document. This proposal covers the following sections / process units –

- ✓ The raw material (Sweet sorghum) handling & preparation system
(weighing, unloading, carriers, etc.)
- ✓ Sweet sorghum preparation system
(chopper, leveller, fibrizor, equaliser, etc.)
- ✓ Sweet sorghum juice extraction plant
(mills, carrier, screens, tanks and pumps etc.)
- ✓ Juice treatment and clarification
(phosphate addition, reaction, pH adjustment, flow stabilisation, etc.)
- ✓ Juice clarification and filtration
(flocculant dosing, bagacillo handling, cyclone separator, mixer, filters, etc.)
- ✓ Milk of Lime preparation
(lime handling, slacker, classifier, vibro-screen, grit washing, tank, pump, etc.)
- ✓ Juice heating and evaporation
(juice heating for raw / limed / clear juice, quintuple effect evaporation, condensate and syrup tanks and pumps, etc.)

- ✓ Condensing station
(condenser, ejector, cooling tower and its pumps, etc.)
- ✓ Apart from above mentioned process units, we have considered utilities and other auxiliaries such as mentioned below :
(bagasse handling system, steam & power generation unit, steam and power distribution system, water treatment plant, effluent treatment plant, etc.)
- ✓ The list of major bought-out / critical equipment are mentioned with its brands / makes.
Please note that MEGA will use internationally reputed makes / brands.
- ✓ A typical table of - 'Performance Parameters' are also mentioned for your reference.

MEGA scope of work will be design, engineering, procurement, manufacturing & supply. Also, MEGA has considered supervision services for installation and commissioning of above-mentioned sections.

CLIENT scope of work will be - Civil and infrastructure, site execution such as Site-fabrication, Erection and installation, etc.

MEGA will submit the Commercial Proposal on FOB - Nhava Sheva (Mumbai) basis.

Hope the proposal is in line with your requirements.

For any query, please feel free to contact us.

We assure best of our services all the time.

Thanks & kind regards

A handwritten signature in blue ink, appearing to read 'Mithil Mane', is written over a light blue rectangular stamp.

Mithil Mane - Director

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SECTION -1

TECHNICAL ANNEXURE

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ANNEXURE - I : JUICE EXTRACTION PLANT

Juice extraction plant is designed for 3,000 Tons/Day with single tandem.

Sweet sorghum will be weighed, along with trailers, before entering to the factory by electronic type weighing scales. Feeder tables will receive the weighed Sweet sorghum from trailer with the help of Sweet sorghum unloader with gantry. Truck tippler type arrangement is provided. Main Sweet sorghum carrier will receive Sweet sorghum from feeder tables. Sweet sorghum chopper will facilitate uniform feeding to succeeding preparatory devices. Three preparatory devices are used to prepare long fibrous Sweet sorghum from whole stick Sweet sorghum and these preparatory devices, consist of chopper, leveller and fibrizer, are installed on main Sweet sorghum carrier. Main Sweet sorghum carrier will deliver the prepared Sweet sorghum to prepared Sweet sorghum carrier after fibrizer.

The selected Sweet sorghum preparation system is suitable for controlled/metered feeding of Sweet sorghum with minimum load fluctuations in the preparatory devices.

Belt conveyor conveys prepared Sweet sorghum from fibrizer to 1st mill through gravity feeding chute, called as Donnelly chute. Sweet sorghum equaliser, installed on the belt conveyor, levels the prepared Sweet sorghum mat. To separate out the tramp iron pieces from prepared Sweet sorghum, a magnetic separator is mounted on belt conveyor.

Juice is extracted from prepared Sweet sorghum by three roller type mills of Ø Ø 33"x 66" size mills. Rake type inter carriers are considered to carry the bagasse from mill to mill. Extracted juice from 1st and 2nd mill will be taken to process for further processing.

Drive system of these three roller mills consist of electric motor, planetary gearbox with rope coupling which is more efficient driving system. Imbibition water will be added before last mill to extract more sugar from bagasse before entering to boiler and compound imbibition system will be followed for preceding mills. Mixed juice from 1st and 2nd mills will be screened in rotary screens with appropriate cleaning arrangement to remove foreign particles and crush. Bagasse from last mill will be transferred to boiler for steam generation.

Screened mixed juice (primary juice + secondary juice), from rotary screens, will be received in two screened juice-receiving tanks. Screened juice pumps will be provided to pump screened juice from receiving tank to mass flow meters.

SWEET SORGHUM WEIGHMENT

Sweet sorghum / general weighbridges

Quantity: 3

Sugar Sweet sorghum supply to the factory will be manually harvested. The whole stick Sweet sorghum is mechanically/manually loaded in trailers or carts. Weighbridges are provided for weighment of these trailers. Computerized pit less type weighbridges of 2 # 40 tons capacity each shall be provided for gross weighment for trailers, and 1# 60 ton capacity shall be provided for gross weighment of final product and bi-products.

SWEET SORGHUM UNLOADING

Truck tippler

Quantity: 1

1# Truck tippler shall be provided to unload the Sweet sorghum from trucks. Truck shall be parked locked in position on the platform and tilted to maximum 45° -55° angle to allow Sweet sorghum free flow on the main Sweet sorghum carrier by gravity force. Unloading capacity of truck tippler shall be 50 tons.

Sweet sorghum unloader with gantry

Quantity: 2

Sweet sorghum received through trailers will be unloaded on feeder tables by two bridges with one trolleys, each having sling bar system. Three motion unloader crane having capacity of 15 tons SWL shall be suitable for 20 lifts per hour. Height of lift shall be 11 m to unload the Sweet sorghum from trailer to feeder table.

Feeder tables

Quantity : 2

2 # feeder tables shall be provided to receive the Sweet sorghum from unloader and shall be at right angle to the primary Sweet sorghum carrier. Size of the feeder table shall be 7 m wide x 8 m long between sprocket centres installed at right angle to the primary Sweet sorghum carrier. Feeder table shall be inclined at 6° to horizontal and 10 strands of drag type chain shall be provided with 150 mm pitch having minimum 40,000 kg breaking strength.

Drive system consists of 15 kW/1500 rpm TEFC squirrel cage induction motor with ACVFD control and suitable shaft mounted planetary gearbox. Linear speed of feeder table shall be maximum 5 m/min.

SWEET SORGHUM HANDLING & PREPARATION

Main Sweet sorghum carrier

Quantity : 1

Receives whole stick Sweet sorghum from feeder table and discharges prepared Sweet sorghum in the prepared Sweet sorghum carrier (Rake Elevator) after fibrizor.

Carrier shall be of apron type, 1700 mm wide and approx. 50 m horizontal length between the sprockets. Horizontal loading length shall be approx 35 m. Carrier inclination shall be 15 degree at chopper and 6 degree for minimum 10 meter before fibrizor.

Drive for main Sweet sorghum carrier - 55 kw / 1440 rpm TEFC squirrel cage induction motor with foot mounted planetary gearbox with service factor of 2.0. Speed control shall be through variable frequency drive and maximum carrier speed shall be 10 m/min.

Sweet sorghum chopper on main Sweet sorghum carrier

Quantity :

1

Chopper shall be provided at the end of horizontal portion of Main Sweet sorghum carrier for uniform feeding of Sweet sorghum to the succeeding preparatory devices. Chopper shall rotate in reverse direction to Sweet sorghum flow. Tip diameter of chopper shall be 1800 mm and number of knives shall be 44. Clearance below chopper shall be 900 mm (+150mm adjustment shall be provided) for levelling and to fulfil the capacity requirement. Chopper final speed shall be 300 rpm.

Drive for Sweet sorghum chopper - 100 kW / 585 rpm, TEFC, Slip ring motor with Auto Slip regulator, IP55 with helical gearbox having service factor not less than 2.

Pusher for fibrizor

Quantity :

1

One pusher shall be installed along with fibrizor for uniform and force feeding of Sweet sorghum to fibrizor. Pusher shall be drum type, having 1800 mm diameter on tips. Speed of 6 rpm. Settings of pusher shall be suitable according to crush rate and power consumption.

Drive for pusher - 22 kW and 1440 rpm, TEFC, continuously rated slip ring motor, IP55, with shaft mounted planetary having AGMA service factor 2.0.

Sweet sorghum fibrizor

Quantity :

1

One swing hammer type fibrizor shall be installed at head end of main Sweet sorghum carrier with swing diameter 2200 mm having 96 swing type hammers. Weight of each hammer shall not be more than 21 kg. Anvil plate should be of pocketed design, split type wrap angle of about 120°.

Drive for Sweet sorghum fibrizor - 1 # 750 Kw / 750 rpm, high tension slip ring Induction motors, 3 Ph, 50Hz, 11 KV, 0.8 PF Star connected continuous rating, motor starting through the auto slip regulator.

ASR Panel with incomer breaker suitable for above drive shall be provided. Over load capacity 150 % for 120 seconds, 200% for 10 seconds Continuous output 100 % of rated output. Pull out Torque 225 % of full load torque.

Rake Type Elevator

Proposal for 130 TCH

Quantity :

1

One rake type carrier after fibrizor shall be provided to receive prepared Sweet sorghum from main Sweet sorghum carrier before fibrizor and delivered to belt conveyor.

Rake elevator shall be having effective width - 1700 mm, length to suit layout , inclination not more than 45°, carrier speed 25 m/min

Drive for main Sweet sorghum carrier – 45 kW / 1440 rpm, TEFC squirrel cage induction motor with foot mounted planetary gearbox with service factor of 2.0. Speed control shall be through VFD and maximum carrier speed shall be 25 m/min.

Auto Sweet sorghum feed control system

Proposal for 130 TCH

Quantity :

1 set

System suitable for sensing, controlling and indicating functions of Sweet sorghum feeding, preparatory devices, mills and inter carriers shall be provided. System shall be suitable to hook up to DCS/PLC control system, which shall be supplied and installed in control room in mill house. PC supervisory station with printer for report generation shall be provided. UPS system with standby should be provided.

System involves following areas/equipments:

Drag type feed table, feed Sweet sorghum carrier, secondary Sweet sorghum carrier (rake type): Sweet sorghum blanket height variation, load and speed variations.

Loads and speed of preparatory devices.

Donnelly chute level sensing device.

Mill drive motor load and speed variations.

Inter carrier tripping and sequencing with load and speed variations.

Bearing temperature indicator with audiovisual signals for motors.

Imbibition water control by 4th mill top roller lift/3rd mill motor load.

Mill roller temperature indicator.

JUICE EXTRACTION PLANT

Donnelly Chute

Quantity :

4 #

Mill shall be provided with donnelly chute to ensure positive feeding of bagasse to mill. Back plate height from under feed roller to rake carrier discharge shall be minimum 2500 mm and its inclination not less than 85 ° with the horizontal. Cross sectional area at the chute shall be suitable to handle required capacity. Chute shall be fabricated from minimum 6 mm thick SS - 409M / 3 CR 12 plates. Quick mill bypass chute shall be provided.

Mills

Quantity :

4

Four conventional mills of Ø 33"x 66" size shall be installed during phase-1. Mill shall be of three rollers, having free floating mill hydraulic system. All mechanical parts of the mill shall be designed for ultimate capacity of 160 TCH at 14 % fibre. Each mill roller shell shall have minimum pitch circle diameter 850 mm x 1700 mm length (Ø Ø 33"x 66"). Centre distance between mills shall be 12 meters. Rope coupling shall be provided in each system to transmit power from drive to mill top roller. The mills shall be provided with hydraulic system to ensure the free floating of top roller.

The apex angles of mills should not exceed the limit of 76 degrees. The mill and its trash plate geometry should be suitable to accommodate required settings at lowest possible operating speeds. Centralised oil lubrication system should be followed for lubricating mill-roller bearings and all transmission gear bearings on the mill - drive system.

Under feeder roller

Quantity : 4

Under feeder roller shall be of PCD 900 mm and 1700 mm length. UFR shall be driven from mill top roller through long teeth pinions to get surface speed 10 % higher than mill roller surface speed. It shall have arrangement to adjust the setting in axial direction by ± 25 mm (Axis joining centre line of under feeder and top roller). Grooving should be suitable to get roller packed by bagasse during working.

Mill Drives with AC-VFD Panel

Quantity : 4

Mill shall be provided with 400 kW / 1000 rpm, 415 V, TEFC foot mounted squirrel cage induction motor with AC-VFD controller and suitable planetary gearbox. Rope coupling shall be provided in each system to transmit power from drive to mill top roller.

Variable frequency Drive: Input Parameters for Variable frequency control shall be Voltage 690 V, 3 phase, AC, Voltage tolerance ± 10 %, Frequency 50 Hz, Frequency tolerance ± 5 %, Pulse 12, protection IP51, Efficiency 97 %.

Variable frequency Controller: Application Suitable for Speed control of 4 # 450 kW squirrel cage induction motors 690 V, 3 phase 50 Hz, 1000 rpm. Over load capacity 150 % for 120 seconds, 200% for 10 seconds. Continuous output 100 % of rated output. Pull out Torque 225 % of full load torque.

Planetary gear box - Mill drive

Quantity : 4

Co-axial foot mounted planetary gear box of suitable ratio to get final mill speed 5.0 rpm for mills # 1 & # 2 and 5 rpm for mills # 3 & # 4. All planetary gearboxes shall be able to transmit 450 kW continuously with minimum service factor of 2.0.

Rope couplings

Quantity : 4

Mill top rollers shall be connected to planetary gearbox by means of suitable Rope Coupling.

Rake Type Inter carriers

Quantity : 3

Three rake type inter carriers shall be provided to carry the bagasse from one mill to another mill.

Rake carrier shall be suitable to discharge bagasse at head end to Donnelly chutes with effective width 1700 mm and horizontal length between sprockets shall be suitable for 12 m centre distance of mills.

Drive for rake inter carrier - 25 kW / 1440 rpm, TEFC sq. cage induction motor, with foot mounted planetary gearbox with suitable ratio. AGMA service factor for gearbox should be minimum 2.0. Linear speed of rake carrier shall be 25 m/min.

Rotary Juice Screen Proposal for 130 TCH

Quantity : 1

Wedge bar type rotary screen for screening unstrained juice containing 50 % suspended solid / fine Cush Cush particles shall be provided. Rotary juice screen shall have aperture 0.45 mm, with 1800 mm drum/screen diameter and 3600 mm screen length to handle the juice ultimate capacity 200 m³/hr juice

Drive shall be of Geared motor with suitable kW rating, 1440 Rpm, VFD control, 40 - 100% speed variation, S1, continuous Duty.

Screened Juice Tanks

Quantity : 1

Cylindrical juice tank, with conical bottom, shall be provided for receiving screened juice from rotary screen. Juice tank shall be of capacity 15 m³, diameter 1500 mm X 2000 mm height, and thickness of tank 5 mm, material SS 409.

Unscreened juice tanks

Quantity : 2

A cylindrical whirler juice tank, with conical bottom, shall be provided for Mill 1 and 2. Juice tank shall be of Capacity 3.5 m³, diameter 1000 mm X 1500 mm Height, and Thickness of tank 5 mm, material SS 409.

Imbibition juice tanks

Quantity : 2

Cylindrical whirling juice tank, with conical bottom, shall be provided for mill # 3 and 4 to collect Juice. Juice tank shall have capacity 3 m³, diameter 1500 mm X 1700 mm Height , thickness of tank 5 mm, material SS 409.

Imbibition water receiving tank

Quantity : 1

1 # Vertical cylindrical tank with taper bottom shall be provided. Water tank shall be of capacity 4.5 m³, diameter 1000 mm X 1400 mm Height, thickness of tank 5mm, material SS 409/ 3 CR 12. Tank shall have close top with suitable outlet connections for imbibition water pumps and temperature gauge at the inlet flange.

Imbibitions water flow meter with auto imbibition control system

Quantity : 1

Install magnetic flow meter suitable up to 90 m³/hr imbibition water flow at 95 °C, to control the quantity & temperature of imbibition water automatically with variation in crush rate.

Screened juice pumps

Quantity : 2

Two pumps are installed to pump screened juice from screened juice tank through mass flow meter. Pump shall be of capacity 195 m³/h (juice), head 60 m, speed 1440 rpm centrifugal type. Drive shall be of TEFC, squirrel cage induction motor with suitable kW rating, 1440 rpm, VFD control with bypass.

Unscreened juice pumps

Quantity : **4**

Two pumps (one working and one stand by) for mill # 1 and # 2 to pump unscreened juice from common tank to rotary screen. Pump shall be of capacity 115 m³/h (juice), head 15 m, speed 960 rpm choke less type. Juice to be pumped with specific gravity of 1.06 and solids 50 % (minimum). Drive shall be of TEFC, squirrel cage induction motor with suitable kW rating, 960 Rpm.

Imbibition juice pumps

Quantity : **4**

Four pumps (two working and two standby) shall be provided to pump juice individually from respective whirler tanks of mill # 3 & # 4. Capacity of pump shall be 100 m³/h (juice), head 15 m, speed 960 rpm choke less type. Specific gravity of pumps shall be 1.06 and solids shall be minimum 50% (minimum). Drive shall be of TEFC, squirrel cage induction motor with suitable kW rating, 960 Rpm, VFD control with Bypass.

Imbibition water pumps

Quantity : **2**

Two pumps shall be provided to pump imbibition water to the last mills through water flow meter and spray nozzles. Pump shall be of capacity 90 m³/h, 60 m head, 1440 rpm and type shall be centrifugal. Drive shall be of TEFC, squirrel cage induction motor with suitable kW rating, 1440 Rpm.

Juice Gutter & Imbibition Juice Piping

Juice Gutters

Quantity : **4**

Bottom juice collection trough, outlet and connecting gutters shall be of 5 mm thick material SS 409M/3 CR 12 plates.

Imbibition juice piping

Quantity : **1 Set**

All juice piping of SS quality with fittings and supports to be provided to suit crush capacity of 160 TCH.

Juice gutters

Quantity : **1**

Bottom juice collection trough, Outlet and connecting gutters shall be of 5 mm thick material SS 409M/3 CR 12 plates for new zero mill.

Imbibition juice piping

Quantity : **1 Set**

All juice piping of SS quality with fittings and supports to be provided to suit crush capacity of 160 TCH.

Mill House Crane**Quantity :****1**

Three motion electrically operated overhead travelling crane of double girder box type construction for indoor installation, conforming to class II as per IS:3177 (1977) and IS:807 specifications shall be provided.

Capacity: 30 T + 3T SWL, electrically operated crab, with independent trolley. Mill house span is 24 m.

Mill Roller Lathe**Client scope**

ANNEXURE - II : PROCESS HOUSE

PREAMBLE

The process house shall comprise of equipment and machineries suitable to produce sugarcane syrup up to 35-40 Bx. Crushing rate is planned at 130 tch (3,000 TCD).

Following important figures are taken as basis for calculation of material balance.

Pol % cane	13
Fibre % cane	14
Imbibition % fibre	240

Material balance for the complete syrup diversion is enclosed as Annexure – III-A

Note: The material balance is calculated with normal acceptable and achievable parameters of the intermediate products based on average figures. This material balance will be helpful as a tool to control the process at every stage. Deviations are bound to occur depending upon the raw material input quality, performance of diffuser/milling, boilers and boiling house operations. However, a close watch shall be maintained to minimize the deviations as much as possible to achieve the targeted results.

EQUIPMENT SPECIFICATION AND RECOMMENDATION

Specification of individual equipment as per the Item No., Quantity and the proposals for 130 tch Boiling House are discussed in the following paragraphs.

JUICE TREATMENT AND CLARIFICATION

Juice Measurement

Quantity: 1 No.

Mass flow meter shall be installed for the measurement of juice. The flow meter shall be installed in the juice piping between screened Draft juice pump delivery from the diffuser station and the raw juice buffer tank inlet. This will facilitate the measurement independent of other control systems planned for juice flow stabilisation after the buffer tank.

Type	Mass flow meter with instrumentation suitable for DCS
Capacity	0 – 350

Phosphate addition system

Phosphate Preparation tank

Quantity:

1 No.

SS cylindrical tank fitted with stirrer.

Capacity

1.5 m³

Phosphate dosing tank

Quantity:

1 No.

SS cylindrical tank fitted with stirrer.

Capacity

3.0 m³

Phosphate Dosing Pump

Quantity:

2 Nos.

(1 working & 1 standby)

Type

Variable speed, metering

Capacity, variable

0 – 50 l/min

Head

20 m

Material of construction

Stainless steel

Drive

AC VFD

Raw Juice buffer tank

Quantity:

1 No.

The weighed juice through mass flow meter is received in a mild steel, vertical cylindrical, tank provided with top cover and vent. This tank shall be provided with local and remote level indicators hooked to DCS.

Capacity

30 m³

Material

Mild Steel

Raw Juice Pumps

Quantity:

2 Nos.

(1 working & 1 standby)

Type

Centrifugal

Capacity

250 m³/h

Head

65 m

Drive

AC VFD motor with speed locking provision.

Juice Reaction Tank

Quantity:

1 No.

Continuous juice liming tank shall be designed for a juice flow rate suitable for 130 tch. Working volume of the tank shall be designed for minimum Four minutes retention time of juice in the tank with suitable working height.

The pH of the juice from the liming tank will be maintained at 7.0 +/- 0.2. The treated juice from the tank will overflow to the limed juice receiving tank.

Auto pH control system

Quantity:

1 set

Auto pH control system shall be installed for the juice liming tank to control the juice pH, which includes pH indicating and recording system for online juice pH measurement with Lime Proportionating Unit (LPU) for milk of lime.

Limed Juice receiving tank

Quantity:

1 No.

The limed juice from the reaction tank is received in a mild steel, vertical cylindrical, tank provided with top cover and vent. This tank shall be provided with local and remote level indicators hooked to DCS.

Capacity

15 m³

Material

Mild Steel

Limed juice Pumps

Quantity:

2 Nos.

(1 working & 1 standby)

To pump juice from limed juice receiving tank to limed juice heaters. Horizontal centrifugal pump directly driven by an electric motor, both mounted on Mild Steel fabricated base frame.

Capacity

300 m³/h

Head

65 m

Flow stabilisation system, similar to raw juice, shall be provided for limed juice.

Juice Flow stabilisation System

Quantity:

1 set

Juice flow stabilisation system included under instrumentation comprises of a control valve in the bypass line on juice pump discharge, magnetic flow meter, level transducers installed on the juice tanks and controller housed in a local control panel. The opening of control valve installed in the bypass line is regulated by the controller to maintain juice flow to the process at the desired set point. In case of high juice levels in tank the crushing rate shall be controlled.

CLARIFIER AND FILTRATION

The Limed juice is pumped to clarifiers wherein the precipitate formed by action of CaO on the Phosphate content of juice, is separated with the trapped impurities as clarifier underflow or mud. The supernatant clear juice drawn from clarifier is evaporated in evaporators, whereas clarifier mud is mixed with bagacillo & filtered in rotary vacuum filters.

Flash tank

Quantity:

1 No.

To receive hot limed juice from limed juice heaters and feed to clarifier after flashing. Vertical, cylindrical, conical bottom, closed type flash tank shall be provided. The flash tank shall be of Mild Steel welded construction and fitted with vent pipe, juice inlet and outlet pipes. Juice shall enter the flash tank tangentially. Juice outlet pipe from the bottom shall be connected to juice entry of clarifier, through a 'U' bend to provide proper sealing between the flash vapour and the liquid outlet.

Clarifier

Quantity:

1 No.

The clarifier shall be of "333" type or equivalent having three compartments with separate juice inlet through the central shaft, separate juice outlet and separate mud outlet from each compartment. The clarifier shall be suitable for a crushing capacity of 130 TCH with max. 125 % Limed juice.

Flocculant dosing system

Quantity:

1 set

The poly electrolyte dosing system shall comprise of one flocculants doser, one preparation tank, one holding cum dosing tank and 2 Nos. dosing pumps (1 working & 1 standby). Compressed air shall be sparged in the preparation and dosing tanks for uniform mixing and agitation of the flocculent solution. Flocculant is added to juice before it enters the clarifier.

Bagacillo handling system

Bagacillo Blower

Quantity:

2 No.
(1 working + 1 standby)

For pneumatically conveying of bagacillo from the bagacillo chute below the bagasse elevator to the mud feed mixer

Type:

Centrifugal

Capacity

200 m³/min

Bagacillo Piping

Quantity:

1 set

To be installed from bagacillo blower up to cyclone separator above the feed mixer.

Pipe Diameter

400 mm

Material

Galvanized Iron

Thickness

18 SWG

Running length

To suit the layout.

Approx. Length

60 m.

Cyclone Separator

Quantity:

1 No.

For separating bagacillo particles from the air-bagacillo stream and discharge into the mud feed mixer.

Material

Galvanized iron 16 SWG thick

Suitable supporting structure shall be provided. The vent connection shall be

extended to above the roof at least by 1 m.

To be installed above the feed mixer.

Feed Mixer

Quantity:

1 No.

Horizontal "U" shaped feed mixer shall be provided to supply a mixture of clarifier mud & bagacillo to the vacuum filters. Feed mixer shall be suitable to feed 2 filters. The stirrer shall be driven by electric motor through planetary gear box.

Capacity

Suitable for 2 filters

Material

Mild Steel

Rotary Vacuum Filters and accessories

Quantity:

1 No.

The rotary vacuum filter shall be complete with all accessories like vacuum filtrate receivers, entrainment separator, filter condenser, filtrate and water piping etc. The drum, deck and screen shall be of stainless steel. AC VFD shall be provided for drum drive.

Size

14' x 28'

Filtering area, each

114 m²

Filtrate Collection unit

Quantity:

2 No.

Two receivers for clear and cloudy filtrates. Each receiver shall be made of 5 mm thick stainless steel plates fitted with gun metal vacuum release assembly and copper floats. One vacuum regulating valve shall be provided. The filtrates shall be discharged to the filtrate collection tank, at the FFL by gravity. The pipes shall be extended up to bottom of the tank for maintaining necessary sealing.

Filtrate pumps

Quantity:

2 Nos.

(1 working & 1 standby)

Two filtrate pumps shall be provided to transfer filtrate from filtrate collection tank to Juice reaction tank through distribution tank

Type

:

Capacity

:

Head

:

Vacuum pumps

Quantity:

2 Nos.

To create a vacuum for vacuum filters.

Each pump shall be of -

Type

Water ring type

Capacity

1200 m³/hr minimum.

Pressure

200 mm abs. suction & exhausting to atm.

Sealing water temp

32 °C

Mud re-circulation tank

Quantity:

1 No.

Cylindrical vertical tank, conical bottom, open top shall be provided to receive overflow material from vacuum filter trough.

Capacity

10 m³

Material

Mild Steel

Mud re-circulation pumps

Quantity:

2 Nos.

(1 working & 1 standby)

Two mud recirculation pumps shall be provided to transfer mud from mud re circulation tank to feed mixers.

Type

Centrifugal

Capacity

30 m³/h

Head

20 m

Cake wash water pumps

Quantity:

2 Nos.

(1 working & 1 standby)

Two cake wash water receiving tank, shall be provided to receive hot water from overhead tank. The tank shall be closed top and provided with level control and safety valve. Whenever level in the receiving tank is below the set point, inlet hot water valve to the receiver shall be opened so maintain the level in the tank.

Type

Centrifugal

Capacity

10 m³/h

Head

60 m

Mud belt conveyor

Quantity:

1 No.

To convey filter cake discharged from the filters to mud bin, length suitable for crushing capacity of 5,000 TCD.

Type

Trough type belt conveyor

Capacity

10 t/h

Belt width

600 mm

Belt speed

25 m/min

Mud bin

Quantity:

1 No.

For collection of filter cake discharged from the belt conveyor and feed to mud trailers. Conical bottom, open top, the bin is provided with a quick opening discharge valve.

Capacity

10 t

Material

Mild Steel

Filtrate Vibro screen

Quantity:

2 Nos.

2# Vibro screen shall be provided to screen the filtrate before pumping to liming reaction tank.

Type

Circular vibratory screens

Diameter

1700 mm

Screen

SS304, 60 mesh

Screened Filtrate buffer tank

Quantity:

1 No.

Cylindrical vertical tank, conical bottom, closed top with vent shall be provided to receive filtrate from Vibro screens.

Capacity

10 m³

Material

Stainless Steel grade 409 M

Screened Filtrate pumps

Quantity:

2 Nos.

(1 working & 1 standby)

Type

Centrifugal

Capacity

25 m³/h

Head

30 m

Flow Meter for Clarified Filtrate

Quantity:

1 No.

Magnetic flow meter shall be provided to filtrate line going to juice liming tank to indicate and record the filtrate flow.

Capacity

0 – 100 m³/h.

MILK OF LIME PREPARATION

Lime Elevator

Quantity:

1 No.

Inclined, chain and bucket type to elevate quick lime from factory floor level to feeding hopper of lime slacker, installed at 8 m platform level.

Capacity

: 2 t/h

Speed

: 10 m/min (maximum)

Lime Slacker

Quantity:

1 No.

Rotating drum type slacker shall be used for efficiently slaking the quick lime with hot water and discharge as milk of lime.

Capacity

1200 kg/h

Grit Belt conveyor

Quantity:

1 No.

To convey grit discharged from the MOL Vibro screens to one end for disposal, length suitable for four screens.

Type

Trough type belt conveyor suitable for Lime

Capacity

1 t/h

Belt width

450 mm

Belt speed

25 m/min

Koran type Milk of lime (MOL) Classifier

Quantity:

1 Nos.

To screen the milk of lime received from lime slacker.

Type

Koran type with revolving screen SS304, 45 mesh

Screen

MOL Vibro Screen

Quantity:

2 Nos.

To screen the milk of lime received from lime slacker.

Type

Circular vibratory screen

Diameter

1700

Screen

SS304, 60 mesh

Grit Washing System

Quantity:

1 Nos.

Grit washing system to clean MOL from the Grit stones shall be provided of suitable capacity.

Milk of Lime storage tanks

Quantity:

3 Nos.

Cylindrical vertical tank, sloped bottom, open top fitted with stirrer for storage of milk of lime.

Capacity

25 m³

Material

Mild Steel

Milk of Lime pumps

Quantity:

2 Nos.

(1 working & 1 standby)

To re-circulate milk of lime through the juice liming station

Horizontal centrifugal pump directly driven by an electric motor, both mounted on a Mild Steel fabricated base frame.

Capacity

25m³/h

Head

30 m

JUICE HEATING AND EVAPORATION

The clear juice from clarifiers is subject to evaporation so as to obtain syrup of 35 – 40 brix which is transferred to distillery. It is proposed to follow Triple effect evaporator system. Heating Surface Area (HSA) of evaporator bodies is based on bleeding to juice heaters. The vapour bleeding scheme and arrangement of evaporator bodies are discussed below.

JUICE HEATER

Raw juice heating (1st stage)

Quantity : 2 #

Two dynamic vapour line tubular juice heaters (VLJH) of 240 m² shall be provided for raw juice 1st stage heating (RJ1) from 30°C to 45°C by vapours from quintuple 5th effect.

Raw juice heating (2nd stage)

Quantity : 2 #

Two liquid-liquid type heaters suitable heating surface area shall be provided for raw juice 2nd stage heating from 45 to 60°C by process condensate. Process condensate shall be initial temperature shall be 90 °C and outlet temperature shall be 70 °C.

Raw juice heating (3rd stage)

Quantity : 1 #

One direct contact juice heaters shall be provided to heat raw juice to 72°C using vapours from 4th effect evaporator.

Limed juice heating (1st stage)

Quantity : 2 #

Two conventional tubular type heaters shall be provided 1st stage Limed juice heating (SJ1) from 68°C to 84°C using vapours from 3rd effect evaporator. Heating surface area of each heater shall be 200 sqm.

Limed juice heating (2nd stage)

Quantity : 1 #

One conventional tubular type heaters shall be provided for Limed juice 2nd stage heating (SJ2) from 84°C to 90°C using vapours from 2nd effect evaporator. Heating surface area of each heater shall be 200 sqm.

Limed juice heating (3rd stage)

Quantity : 1 #

One conventional tubular type heaters shall be provided for Limed juice 3rd stage heating (SJ3) from 84°C to 102°C using vapours from 2nd effect evaporator. Heating surface area of each heater shall be 200 sqm.

Clear juice heating (1st stage)**Quantity :****2 #**

Two conventional tubular type heaters shall be provided 1st stage clear juice heating (SJ1) from 96°C to 105°C using vapours from 1st effect evaporator. Heating surface area of each heater shall be 200 sqm.

Clear juice heating (2nd stage)**Quantity :****1 #**

One direct contact heater for clear juice 2nd stage heating from 105°C to 112°C shall be provided. Clear juice shall be heated by vapours from 1st effect evaporator. Material of construction of heater shall be SS 304. Suitable automation for outlet juice temperature control and level switch shall be provided.

Condensate extraction system for juice heaters**Condensate Receiver****Quantity :****1 #**

One vertical, cylindrical, closed condensate receiver of 2 m³ capacity shall be provided at FFL to receive condensate from RJ1 heating from VLJH. Condensate from this receiver shall be pumped to hot water tank.

Condensate Pumps**Quantity :****2 #**

Two condensate transfer pumps of 10 m³/hr capacity and 30 m head shall be provided to pump the condensate from condensate receiver to overhead hot water tank / Imbibition.

Clear juice column**Quantity :****1 #**

One vertical, cylindrical, closed top tank with 1200 mm diameter with vent shall be provided to receive the clear juice from clarifier. Height of clear juice column shall be above juice overflow box of clarifier.

Clear juice pumps**Quantity :****2 #**

Two centrifugal type, clear juice pumps of 190 m³/hr and 60 m head shall be provided to pump clear juice from clear juice column to Quintuple 1st effect through clear juice heaters. AC VFD drive along with magnetic flow meter and PLC for juice flow control shall be provided.

EVAPORATOR STATION

EVAPORATOR SET

Evaporators shall be provided for concentration of clear juice to 35-40°Bx as syrup. Triple evaporator scheme is proposed for the above duty conditions. Distribution of HSA to individual effects is given as follows:

Evaporator – Individual Effect

Quint-1st effect

Quint-2nd effect

Quint-3rd effect

Type	HTA	Qty.	
Falling film	2500 m ²	2 qty	10.0 m
Falling film	2500 m ²	1 qty	10.0 m
Falling film	2500 m ²	1 qty	10.0 m

A summary of the vapour bleeding scheme evaporator calculations is given below:

Vapour Bleeding Scheme:

Raw juice heating – 1st stage

Raw juice heating – 2nd stage

Raw juice heating – 3rd stage

Limed juice heating – 1st stage

Limed juice heating – 2nd stage

Limed juice heating – 3rd stage

Clear juice heating – 1st stage

Clear juice heating – 2nd stage

5th effect

4th effect

3rd effect

3rd effect

2nd effect

1st effect

1st effect

1st effect

Quintuple 1st effect

Quantity :

Two falling film type evaporators shall be provided of 2500 m² (each) heating surface area. FFE shall be provided with required automation with variable frequency drives for pumps, juice level control, emergency hot water connection, control valves required to operate with full automation. Recirculation pump capacities shall be suitable with tube wetting of 2000 kg/m/h.

2 #

Type
Heating surface area
Tube Length
Ligament
Tube

Falling Film Evaporator
2500 m²
10,000 mm
12 mm
Stainless steel,
annealed, conform to
standard ASTM A 249/A
249M TP-304

Re-circulation Pumps

Quantity :

4 #

Four horizontal centrifugal juice recirculation pump, two pumps for each body with AC VFD drive shall be provided to pump concentrated liquor for re-circulation to the falling film evaporator distribution system. Pump capacity shall be 400 m³/h and 30 m head or suitable to wetting number of 2000 kg/m/h.

Quintuple 2nd effect

Quantity :

1 #

One falling film type evaporators shall be provided of 2500 m² heating surface area. FFE shall be provided with required automation with variable frequency drives for pumps, juice level control, emergency hot water connection, control valves required to operate with full automation. Recirculation pump capacities shall be suitable with tube wetting of 2000 kg/m/h.

Type	Falling Film Evaporator
Heating surface area	2500 sq.m
Tube Length	10,000 mm
Ligament	12 mm
Tube	Stainless steel, annealed, conform to standard ASTM A 249/A 249M TP-304

Recirculation pumps

Quantity :

2 #

Two horizontal centrifugal juice recirculation pumps, with AC VFD drive shall be provided to pump concentrated liquor for re-circulation to the falling film evaporator distribution system. Pump capacity shall be 400 m³/h and 30 m head or suitable to wetting number of 2000 kg/m/h.

Quintuple 3rd effect

Quantity :

1 #

One falling film type evaporators shall be provided of 2500 m² heating surface area. FFE shall be provided with required automation with variable frequency drives for pumps, juice level control, emergency hot water connection, control valves required to operate with full automation. Recirculation pump capacities shall be suitable with tube wetting of 2000 kg/m/h.

Type	Falling Film Evaporator
Heating surface area	2500 m ² **
Tube Length	10,000 mm
Ligament	12 mm
Tube	Stainless steel, annealed, conform to standard ASTM A 249/A 249M TP-304

Recirculation pumps

Quantity :

2 #

Two horizontal centrifugal juice recirculation pumps, with AC VFD drive shall be provided to pump concentrated liquor for re-circulation to the falling film evaporator distribution system. Pump capacity shall be 400 m³/h and 30 m head or suitable to wetting number of 2000 kg/m/h.

Intermediate juice transfer pumps

Quantity :

2 #

Two horizontal centrifugal intermediate juice transfer pumps each of 70 m³ /hr capacity with 15 m head shall be provided for transferring concentrated juice from 3rd effect to 4th effect.

Evaporator condensate extraction system

Exhaust condensate receiver

Quantity :

1 #

One vertical cylindrical condensate receiver of mild steel construction with 1.5 m³ capacity to collect condensate coming from 1st effect falling film evaporator shall be provided. Condensate receiver shall be equipped inlet- outlet connection and drain and air vent connection.

Exhaust condensate pumps

Quantity :

2 #

Two exhaust condensate pumps shall be provided to transfer condensate from exhaust condensate receiver to boiler feed water tank through plate type heat exchanger.

Condensate flash cigar

Quantity :

1 #

One horizontal cylindrical type condensate flash cigar in stainless steel construction shall be provided to collect condensate from Q2, Q3, Q4, and Q5 effects. Flash vessel shall comprise of four compartments, one compartment for each effect. All compartments shall be interconnected with suitable siphon arrangement. Condensate from last flash vessel is to be pumped to imbibition water storage tank/overhead hot water tank through condensate Juice heater for raw juice heating.

Condensate pumps for vapour condensate

Quantity :

2 #

Two horizontal centrifugal condensate pumps shall be used to transfer condensate collected in condensate receiver of last compartment to overhead hot water tank through condensate Juice heater for raw juice heating.

Syrup extraction tank

Quantity :

1 #

One vertical cylindrical, tank of 2 m³ capacity in mild steel construction shall be provided to receive syrup from last effect of each quintuple effect evaporator set.

Syrup extraction pumps

Quantity :

2 #

Two horizontal centrifugal syrup extraction pumps shall be provided.

Syrup transfer pumps to storage

Quantity : 2 #

Two horizontal centrifugal syrup extraction pumps of 75 m³/h capacity and 50m head shall be provided.

Syrup Cooler

Quantity : 1 #

One PHE type cooler shall be provided to cool syrup prior sending to distillery.

Syrup Receiving tank

Quantity : 1 #

One vertical cylindrical, tank of 300 m³ capacity in mild steel construction shall be provided to receive syrup from syrup cooler.

Syrup transfer pumps

Quantity : 2 #

Two horizontal centrifugal syrup extraction pumps of 75 m³/h capacity and 30 m head shall be provided.

Caustic soda tank

Quantity : 1 #

One vertical cylindrical caustic soda tank of 30 m³ capacity shall be provided to prepare and store caustic soda solution being used for washing evaporator bodies during cleaning.

Caustic soda pumps

Quantity : 2 #

Two horizontal centrifugal caustic soda pumps of 30 m³/h capacity and 30 m head shall be provided to pump caustic soda solution from Caustic soda tank to each evaporator.

Steam pressure stabilisation system

Pressure stabilization system, for stabilizing the vapour pressure as well as exhaust steam pressure and live steam pressure shall be provided.

Overhead tanks

Hot water overhead tank

Cold water overhead tank

Quantity: 4 Nos. (2 nos. each for Hot and Cold water)

Horizontal cylindrical tank shall be of Mild Steel construction, 2 nos. for storing process hot water and 2 nos. for storing cold water. The tank shall be installed at minimum 6 m height above pan floor level on independent steel structure.

Capacity, each tank 40 m³

Drinking water overhead tank

Quantity:

1 Nos.

Horizontal cylindrical tank with closed top shall be of Mild Steel construction, for drinking water. The tank shall be installed at minimum 6 m height above pan floor level on independent steel structure. The inside wall of tank shall be coated with epoxy paint.

Capacity

30 m³

Condensate Cooler

Quantity:

1 Nos.

To cool hot condensates

Type

Cooling tower

Capacity

100 m³/h

Service water pump

Quantity:

2 Nos.

(1 working & 1 standby)

To pump cold water from main service water reservoir to cold water overhead tank

Type

Centrifugal

Capacity

200 m³/h

Head

30 m

CONDENSING STATION

Evaporator condenser / Ejector

Quantity:

1 No.

To condense vapours from last effect of evaporator.

Type

Single entry condenser with automation

Material:

Condenser

Stainless steel, grade 304

Tail pipe

Stainless steel, grade 304

Injection water pump

Quantity:

3 Nos.

(2 working & 1 standby)

It is recommended to install 3 nos of injection water pumps, each of 1300 m³/h capacity & 27 m head.

The above calculations are based on temperature difference of 8 °C between hot and cold water. If the temperature difference is less than 8 °C, the water consumption will increase correspondingly.

Cooling Tower

Quantity:

1 set

To cool hot water discharged from condensers and ejectors.

The water basin shall be of RCC structure, suitable for 3 cells all of which will be operating

Type

Induced draft, cross flow

Fill

Extended PVC 'V' bar

No. of cells	3
Capacity, each cell	1300 m ³ /h

Hot and cold water channel

Quantity:

1 set

Closed pipe system is considered for Hot water channel for discharging the water at the inlet of cooling water. The water from the closed pipe shall be discharged to an open channel before admitting to cooling tower. Hence, the closed pipe and the open hot water channel shall run at 9 m level (approx).

Cold water channel of RCC construction shall be provided from the cooling tower basin up to injection water pump pit. The injection water pump pit shall be of RCC construction for accommodating three pumps.

Length	To suit layout.
--------	-----------------

Cooling water pumps

Quantity:

3 Nos.
(2 working & 1 standby)

To suite the cooling tower cells three pumps shall be provided.

Capacity	1,300 m ³ /h
Head	12 m

Priming Pumps:

Quantity:

2 Nos.
(1 working & 1 standby)

To remove air pockets if any in suction line of injection pump and to avoid cavitations. Horizontal centrifugal /vertical turbine pump driven by electric motor, mounted on a Mild Steel fabricated base frame. 1# working and 1# as stand by.

Capacity	Suitable
Head	Suitable
Speed	1440

Note : The list mentioned above is indicative and exact specifications will be finalised during detailed engineering.

ANNEXURE - III : UTILITIES AND AUXILIARIES

BAGASSE HANDLING SYSTEM

Belt Conveyor BC 1 - 1 No.

Troughed belt conveyor, belt width 1800 mm, conveyor length 24.5 m (approx.) installed to collect excess bagasse from Mill and to convey to Bagasse Elevator. The conveyor is complete in all respect with suitable drive system & necessary supports. This conveyor shall have arrangement of in line weighing of Bagasse on Load Cell base.

Bagasse Elevator (BE)

Steel slat or rake type Bagasse elevator of steel construction of 2000 mm wide effective width & length of 25 m inclination of 45 deg to carry Bagasse about 80 Tonne /hour & driven by suitable TEFC electric motor through helical gear box to give linear speed of 25 M² /min shall be provided. It shall have two strands of chain of 229 mm pitch & conform to IS: 8466-1977. The Breaking strength of Chains shall be min 70 Tonnes.

Easy sliding screens shall be provided on the Elevator for screening of Bagacillo. The screening area shall be 20 M².

Main Bagasse Carrier / Slat Carrier

The main Bagasse carrier of double trough design & all steel construction of 2000 mm width effective & suitable length of approx. 45 m to suit to 2 boilers. It should be able to carry about 150 Tonnes of Bagasse /hr. driven by suitable TEFC electric motor through helical gearbox to give linear speed of 25 Ms /min shall be provided. It shall have two strands of chain of 229 mm pitch & conform to IS: 8466-1977.

The conveyor shall complete with feeding chute to boiler & will have arrangement to feed bagasse to the boiler from bottom portion of the carrier.

Reclaim bagasse Belt Conveyor RBC – 1 No. (Inclined)

Troughed belt Reclaim bagasse belt conveyor, belt width 1400 mm, conveyor length 87 m (approx.) installed at underground to receive bagasse from bagasse yard through dozers/de-baled bagasse and to convey to Main bagasse carrier (MBC). The conveyor is complete in all respect with suitable drive system & necessary supports.

2 # baling presses shall be installed on belt conveyor BC-2 for producing bales with hydraulic press. Bagasse chute shall be provided with suitable outlet for feeding the bagasse for bailing machine.

Capacity –	15 t /h
Type-	Hydraulic type with double acting ram

STEAM GENERATION PLANT

Brief specifications of steam & power generation plants are given in the following paragraphs:

Boiler

Quantity: 1

The steam generation plant consisting of boiler MCR 90 t/h, 45 bar (a) super heater outlet pressure and 485 °C super heater outlet temperature, will be installed.

The boiler shall be of Bi-drum, Natural circulation, balanced draft, Top supported, Water Tube type.

The furnace shall be with Membrane wall water cooled construction and Continuous ash discharge travelling grate spreader stoker type.

The boiler shall be complete with all auxiliaries and heat recovery units with suitable heating surface area for Super Heater with attemperator, Economizer and Air Pre heater, Soot blowing equipment, Cinder refining system etc. with latest art of technology.

Boiler shall be provided with One no. of Induced draught (ID) fans, One no of Forced draught (FD) fans and One no. of Secondary air (SA) fans. ID, FD and SA Fans Motors shall be provided with individual VFD drives.

To achieve the prescribed environmental norms, Electrostatic Precipitator (ESP) shall be installed for boiler to have outlet flue gas concentration of 115 mg/NM³.

Bagasse feeding to boiler shall be through the silos designed for storage capacity of 8 -10 minutes of bagasse requirement. Each silo shall be featured with drum type extractor, screw feeder and pneumatic spreader.

The drum type extractors will be driven by AC VFD for controlling the fuel firing rate. Air for pneumatic spreaders shall be supplied by separate PS fan.

Deaerator shall be Provided to supply Deaerated water @ 105 °C before reaching to the economiser.

An economiser shall be provided to recover the heat from the flue gas going to stack. The feed water will be heated to about 220°C in economiser before going to the steam drum.

Adequate heating surface shall be provided so that the specific evaporation rate shall not exceed 25 kg/M²/h

Deaerator & Deaerator cum storage tank

Quantity: 1

The feed water from transfer pump shall be fed to deaerator for removal of dissolved gasses and reduce the dissolved oxygen level to 0.007 ppm. Deaerator storage tank shall be capable of handling 80 m³/h quantity of water.

The motive steam for deaerator shall be from exhaust of the steam turbine at 2.5 bar (a) pressure.

The final temperature of water coming out from deaerator is 105° C. The deaerated water will be collected in deaerated water storage tank installed below deaerator.

Feed water pumps (Electric driven) with drive

Quantity: 2

Feed water pumps will pump the water from deaerated water storage tank to boiler through economiser. Each pump capacity shall be 100% of the total capacity required for each boiler.

Quantity: 2 #, with 100 % capacity (1 working +1 standby)

Capacity: 80 m³/h each

Head: Suitable

2 #, Feed water pumps with motors shall be provided with VFD drives for each

Feed water pump (start-up) with drive

One pump for starting-up purpose shall be provided. The pump shall be of 50 m³/h capacity each and of suitable head. 1 # Start up Feed water pump motor shall be provided with VFD drive.

Excess Condensate storage tanks

The condensate returning from process shall be stored in the 1 # surplus condensate storage tanks of capacity 500 m³.

Excess Condensate transfer water pumps – 2 Nos

Make up water pumps shall be provided to pump the water from condensate storage tank to deaerator. Two pumps shall be provided of 40 m³/h capacities each and of 60 MWC head (one working and one stand by).

Ash handling system

Ash handling system shall be designed separately for boiler. System consists of one submerged belt conveyor to convey the ash discharged below travelling grate. This SBC will convey the ash to main belt conveyor leading to ash storage bin.

Also the ash below Air heater and ESP shall be conveyed to this MBC through screw conveyer.

The Submerged belt conveyer shall be of 800 mm wide with adequate water trough. The speed of the belt shall not be more than 3 m/min.

Main belt conveyer shall be 800 mm wide and shall run at speed of 25 m/min. the ash from all the outlet points shall be carried to ash storage bin through this conveyer.

Screw conveyer below air heater shall be 650 mm wide while the same below ESP shall be 600 mm wide. The construction of screw conveyer shall be from stainless steel material.

Ash storage bin of 20 t storage capacity.

STEAM DISTRIBUTION SYSTEM

In Sugar factory applications of 2.5 bar (a) pressure and about 125 °C temperatures, in the process house are as follows:

- a) Evaporators
- b) Juice heaters

Live steam available at steam distribution Header with the 45 bar (a) pressure and 485 °C temperature.

2.5 bara Steam for process will be availed from 45/2.5 bara PRDs Station.

2.5 bara steam will be available from Back Pressure Turbine Exhaust. Deficit of 2.5 bara Steam will be availed from 45/2.5 bara PRDs Station.

Provision will be kept for 45 bara / 4.5 bara PRDs Station to provide steam to Distillery plant as and when required.

Brief specification of equipment under steam distribution system is given below in subsequent paragraphs.

Desuperheater for 2.5 bar (a) steam

Quantity: 1 #

2.5 bar (a) steam from turbine exhaust shall be taken to desuperheater for de-superheating from initial temperature to about 132 °C (5 °C above the saturation steam temperature).

Capacity of each desuperheater shall be suitable to desuperheater 65 t/h of exhaust steam.

Pressure Reducing Station PRD - 1

Quantity: 1 #

One pressure reducing station, capacity 30 t/h, shall be provided to reduce pressure of live steam from 45 bar (a) to 2.5 bar (a) to provide steam for Sugarcane processing plant process.

Pressure Reducing Station PRD - 2

Quantity: 1 #

One pressure reducing station, capacity 10 t/h each, shall be provided to reduce pressure of steam from 45 bar (a) to 4.5 bar (a) to provide steam for Distillery

Desuperheaters for PRD -1

Quantity: 1 #

Steam PRD - 1 shall be taken to desuperheater for de-superheating from initial temperature to about 132°C (5°C above the saturation steam temperature). The capacity of each desuperheater shall be suitable for 20 t/h of steam flow rate.

Desuperheaters for PRD - 2

Quantity: 1 #

Steam from PRD – 2 shall be taken to desuperheaters for de-superheating from initial temperature to about 180°C (5°C above the saturation steam temperature). The capacity of each desuperheater shall be suitable for 10 t/h of exhaust steam flow rate.

Desuperheater water pumps

Quantity: 2 #

Two desuperheater water pumps shall be provided to pump water from water receiving tank to desuperheaters for de-superheating steam to near to saturation temperature.

The capacities and head of the pumps is given below:

Quantity	:	2 #
Capacity	:	20 m ³ /h
Head	:	100 m

Out of two pumps one will be working and one will be stand by.

POWER GENERATION AND DISTRIBUTION

Steam turbines – 1 # Back Pressure Type Turbine

Back Pressure type turbine of 10 MW capacity shall be installed. The steam parameters shall be as under.

Steam pressure at TSV	-	45 Bar (a)
Steam temperature at TSV	-	485°C
Extraction	-	5 bar (a)
Exhaust pressure	-	2.5 Bar (a)

The turbine shall be complete with reduction gearbox, control and lubrication oil system, main steam stop valve, controlled steam valve, pressure reducing and de-superheating system if any for extracted steam etc.

A speed reducing gearbox shall be provided to reduce turbine speed to drive the alternator at 1500 rpm. The gears shall be of helical design.

Parallel shaft speed reducing gearbox:

Quantity: 1 #

The gearbox (Type: Single helical or straight spur hardened and ground) shall be suitable for reducing the speed to 1500 rpm for the above turbo-alternator sets with 1.3 (min.) service factor shall be installed to couple turbine and alternator.

Gearboxes for BP turbine shall complete but not limited to Reduction gear, coupling between turbine and gear and between gear and generator, Shaft vibration monitoring, Bearing temperature monitoring, Common base plate with turbine, etc.

Engaging / disengaging motorized barring drive having provision for manual operation.

The coupling between turbine and gear shall be flexible and membrane type to allow free expansion and misalignment.

The coupling between gear and generator shall be rigidly bolted. The coupling shall be designed to withstand torques developed during wrong synchronization with other machines.

POWER GENERATION AUXILIARIES

Power House Crane: Three motion electrically operated overhead travelling (EOT) crane of 20 ton with 5 ton auxiliary crane hook on single bridge with twin girder type bridge construction for indoor installation. SWL capacity shall be decided on the basis of single heaviest weight with span suitable to power house building layout.

Air Compressor: 1 #, Suitable FAD quantity (moisture and oil free air) shall be provided at the requisite pressure (required for operation of instrumentation) through a vertical air compressor and De-moisturiser

HT **power** distribution panel

Two sets, one for power plant and one for sugar plant

HT Power distribution panel consists of 06 feeders as per SLD which includes incoming and outgoing feeders for power plant & sugar plant.

- 1#11 KV feeder for 10 MW Generator Incomer
- 1# 11 KV feeder to sugar HT panel.
- 1# 11kV feeder to power plant distribution transformer.
- 1# spare feeders will be provided for future use.

HT Power distribution panel consists of 11 feeders as per SLD which includes incoming and outgoing feeders for sugar plant.

- 1#11 KV feeder for Incomer
- 1#11 KV feeder for sugar plant distribution transformer-1
- 2#11 KV feeder for sugar plant distribution transformer-2
- 2#11 KV feeder for distillery transformer
- 1#11 KV feeder to fibrizor motor-1
- 2# spare feeders will be provided for future use.

HT panel shall be rated for 3 phase, 11 kV, 1250 A, 50 Hz AC supply. Bus bars shall be of aluminium. Fault level shall be 26.3 kA for 3 sec.

Each breaker will be provided with necessary metering, protection relays and annunciation system.

In metal clad construction, free floor standing, totally enclosed, dust and vermin proof, with motorised draw-out type vacuum circuit breakers with protection and metering systems.

Distribution Transformer

1# 2.5MVA for power plant auxiliares

3# 3.15MVA for sugar plant distribution

2# 2.5 MVA for distillery

Distribution transformer of rating as stated above 11/0.433kv, Dyn11, Bi-directional transformer shall be installed for power plant and sugar plant loads.

Bus Duct

1#4000A, 415V, 50KA, 1 sec for power plant
 2# 5000A, 415V, 65KA, 1 sec for sugar plant
 415V, 3 phases, 50 Hz, Type- Partially indoor / outdoor, LT non-segregated phase aluminium
 Bus Duct between transformer and LT PCC interconnection.

LV Cables

LT 1.1 KV grade 3 core unearthed Aluminium XLPE insulated armoured cable for Mill loads from convertor duty Transformer secondary windings (690 V). Cables shall be considered as per full load current & short circuit current rating and cable de-rating shall be up to 70%.

LT PCC

1#4000A, 415V, 50KA, 1 sec for power plant
 2# 5000A, 415V, 65KA, 1 sec for sugar plant
 PCC for Distribution Transformer shall be provided. The LT power shall be supplied through suitably rated bus duct to Power Control Centre (PCC). The PCC shall consist of incoming and outgoing feeders with suitable air circuit breaker/MCCB and metering system to measure the parameters like voltage, current, power and energy etc. The PCC shall also receive power from the DG set during start up and emergency conditions.

LV PCC for Mill VFD

Mill LV PCC of 415V, 2000A, 3 Phase, 50Hz, 50 kA for 1s, shall have 2# 2000A incomer for star & Delta winding of converter Transformer. It shall be provided with suitably rated out going feeders for 12 pulse Mill VFD drive, spares for future purpose also considered in the panel. ACB's/MCCB's shall be considered for incoming and outgoing feeders.

DG set

Quantity- 01 set

DG set of 1250 kva to be used for emergency/Black starting purpose.

Diesel generator sets comprising of starting system, Cooling system, Exhaust system, Fly wheel and Fly wheel housing, Fuel system, Instrument panel, Lubrication system, Air intake system, Governor system, Mountings, Combustion air system, Ancillary equipment, Auxiliary, Alternator with digital AVR & Excitation etc.

1250 KVA prime power rating, 3 phases, 0.8 P.F (lag) with weather proof acoustic enclosure, IP 55 protection for alternator enclosure, with all necessary Aux. equipment's & accessories as specified all as per standards. DG control panel consisting of Auto/Manual synchronizing panel, AMF panel, Protection Relay panel, Metering and annunciation etc.

DG set fuel handling system which includes Diesel storage yards, Overhead tanks and day tanks etc.

Motor Control Centre (MCC)

Quantity : lot for power plant and sugar plant

As applicable and/or mentioned for supplying power to various motors of power plant, Mill and process loads Motor Control Centre's shall be used. MCCs shall be designed for 50 kA for 1s. Local push button stations / control stations shall be provided wherever required. ACBs shall be considered for 800A and above whereas MCCB's to be considered for ratings up to 630 A.

From PCC, the power shall be fed to various Motor Control Centres (MCCs) located at different sections of power plant & sugar plant. The drive motors shall receive power from the MCCs. Each MCC shall be provided with suitable ACB, MCCB, MPCB for incoming and outgoing, metering to measure various electrical parameters.

415V, 50Hz, 50kA/1Sec., LT MCC and Fuseless, non-draw-out, conventional type Motor Control Centre (MCC) required for plant with Aluminium bus bar, 415V, 50kA/1sec.

Capacitors shall be provided on MCCs to improve the power factor of the electrical system to restrict the current loading within desired limits.

Automatic Power Factor Correction (APFC) panel with microprocessor-based relay shall be provided to add or remove the capacitors from the circuit.

All MCCs shall be suitably designed to adopt DCS system of instrumentation.

APFC Panel

1 set of 300 KVAR for power plant

2 set of 600 KVAR for sugar plant

For power plant distribution transformer, total 300 kVAr APFC panel with 7% detuned reactance shall be used to maintain the power factor.

For sugar plant distribution transformer, total 600 kVAr APFC panel with 7% detuned reactance shall be used to maintain the power factor.

APFC panel shall be connected to PCC for the loads in order to maintain the power factor around from 0.7 to 0.95. APFC capacitor units may also be provided with each MCC, if required to maintain Power factor above 0.95, Capacitors shall be APP type with detuned 7% reactors and Capacitor duty contactor, controlled through APFC relay. Capacitor duty contactors should be used in the panels. Panel shall be connected suitably at the PCC panel.

AC VFD Panels

Quantity - Lot

The drives shall be fuse less type panels. VFD drives shall be of 12 pulse suitable for Mills & 6 pulse VFD's for other applications 45 °C design ambient temperature, current rating FLC plus 10 % additional margin and voltage variation of 690 V $\pm 10\%$ Motors for Mills, 415 V $\pm 10\%$ for other applications and frequency variation of 50 $\pm 5\%$. The drives shall be properly selected for the specified duty of the driven equipment. The drive selection shall be based on motor full load current.

Motors

Quantity - Lot

All the new motors shall be suitable for operation at 3 phases, 50 Hz, 415 ($\pm 10\%$) V for pump applications, 690 ($\pm 10\%$) V for Mill applications & 11kv for fibrizor application, AC supply and shall confirm to following specifications.

- a. Type: Totally enclosed, fan cooled, squirrel cage/slip ring, energy efficient induction motor (IE3) for all VFD / non VFD applications.
- b. Enclosure: IP55, indoor/outdoor
- c. Insulation: Class F
- d. Temperature rise: Limited to Class B
- e. Design ambient temperature – 50 deg. C.

11 kV HV Cables and Termination Kits

Quantity - Lot

11 kV Un Earthed XLPE armoured aluminium cables shall be provided for HT power distribution. 11 kV termination kits of indoor type and outdoor type as per requirement shall be provided with glands for proper termination with phase segregation.

All cables will be selected to carry the load current under site conditions, with voltage drop below permissible value. In addition, high voltage cables will be sized to withstand the short circuit current.

LV Power Cables with Glands and Termination Lugs

Quantity - Lot

All cables of 1.1kV grade, XLPE insulated, armoured, and copper / Aluminium conductor cables shall be provided. Copper conductor is considered up to 6sqmm above 6sqmm conductor shall be Aluminium only. Cable glands shall be nickel plated brass double compression type. Cable lugs / sockets shall be of tinned copper/Aluminium as per conductor material.

All cables will be selected to carry the load current under site conditions, with voltage drop below permissible value.

LV Control Cables with Glands and Termination lugs

Quantity – Lot

1.1 kV grade, XLPE insulated, armoured copper conductor cables of 3, 7, 12 and 19 cores shall be provided for control connections as per requirement. Cable lugs / sockets shall be of tinned copper.

PLANT WATER SYSTEM

The plant water & treatment plant capacity are based on make-up requirement of sugar factory, steam generation plant & drinking water requirement. All the make-up requirements shall be met through raw water after suitable treatment.

The Plant water system shall use raw water into the raw water reservoir in factory premises and then after required treatment for various applications.

The water from raw water reservoir will be pumped to various required stations such as injection water pumps, fire-fighting water pumps, raw water clarifiers and accessory equipment, service water storage, pressure filters and accessory equipment, potable water treatment plant, DM plant, etc.

Equipment description	Qty	Specifications
Raw Water Reservoir	1	1# raw water reservoir cum settling pond, Cap : 3500 m3 (RCC)
Raw Water Pumps	2	2 #, 100 cu m/hr, suitable head Raw water Pumps. (1W+1S).
Sodium Hypochlorite dosing tank	1	1# HDPE tank, Capacity :500 Lit
Sodium Hypochlorite dosing pumps	2	Capacity: 50 lph, 30 m head
Poly electrolyte dosing tank	1	1# HDPE tank, Capacity :1000 Lit with stirrer
Poly electrolyte dosing pumps	2	Capacity: 125 lph, 30 m head
Lime dosing tank	1	1# MSEP tank with stirrer
Lime dosing pumps	2	Capacity: 250 lph, 30 m head
Lime preparation tank	1	1# MSEP tank with stirrer
Online Static mixture	1	1# one suitable for clarifier.
Raw water Clarifier	1	High rate solid contact, MOC: RCC/construction
Sludge collection sump	1	Rectangular in shape, RCC
Sludge disposal pumps	2	Cap: 20 cum/h, 20 m head
Clarified water storage tank	1	1# Cap: 500 cum, MOC: RCC construction
Filter Feed Pumps	4	2 # 100 cum/h to filtration plant 2 # 10 cum/h for drinking water plant
Bearing cooling water pumps	4	Cap : Suitable
Cooling tower for bearings cooling	1	Type : FRP
Sodium Hypochlorite dosing tank	1	1# HDPE tank & 2# Metering pumps
Poly electrolyte dosing tank	1	1# HDPE tank & 2# Metering pumps
Multi grade Filter	1	Suitable for 100 cum/ hr flow rate
Activated Carbon Filter	1	Suitable for 100 cum/ hr flow rate
Filtered water storage tank	1	1# Cap: 500 cum, MOC: RCC construction
Filtered water transfer pumps	2	2 # 100 cum/h to process plant
DM Plant	1	DM Plant of 20 m3/hr comprising Cation exchanger, Anion exchanger and MB with regeneration system and pH correction system
DM water storage tank	1	Capacity: 150 cum, MOC: MSEP
Potable water treatment plant	1	Cap : 5 m3/hr
Potable water pumps	2	2# 5 cum/hr

Equipment description	Qty	Specifications
DM Water Transfer Pumps to Boiler	2	2# 15 cum/hr, with suitable head for Boiler makeup water
Effluent Collection /neutralization Pit	1 lot	RCC with acid proof tiling, capacity: 30 m ³
Effluent transfer pumps	2	Cap: 25 cum/hr (1W+1SB), MOC: MSRL

EFFLUENT TREATMENT PLANT

The quality of raw effluent will be:

S. No	Parameter	Unit	Value
1	Flow	m ³ /day	500-1000
2	PH	-	4.0 – 6.5
3	COD	mg/lit	3000 (max)
4	BOD	mg/lit	1000 – 1200
5	Oil & Grease	mg/lit	20 – 50
6	Total suspended solids	mg/lit	600 (max)
7	Temperature	°C	30 – 45 °C
8	TDS	mg/lit	1000-2000

PROCESS DESCRIPTION

Brief description of the process to be followed while treating raw liquid effluent is given in the following paragraphs.

Total raw effluent, from sugar factory, shall be directed by gravity to bar screen chamber (BSC) to arrest large floating particles entering into effluent treatment plant. After screening effluent flows by gravity to Oil and Grease Trap for removal of floating oil and grease. Effluent will be collected in the equalization tank to achieve a steady organic and hydraulic loading on the downstream treatment units. The equalization tank will have two compartments – one for normal effluent flow and second for storing the high COD effluent generated during mill cleaning operation. Alum and/or lime solution will be added to the effluent just before entering to the primary clarifier.

From the equalization tank the effluent will be pumped at an average flow rate to anaerobic bio-filter for organic bio-degradation followed by aeration tanks and clarifiers where suspended solids will be allowed to settle. The settled solids will be removed from time to time and disposed on the Sludge drying beds.

The effluent will overflow from the Primary clarifier into the Aeration tank where it will be subjected to Activated Sludge Treatment. In this process, the effluent is treated due to biological degradation of organic matter by aerobic microorganisms resulting into effective reduction in BOD and COD values. Fine bubble diffused aeration system is proposed instead of surface aerators. This system has the advantages of high oxygen transfer efficiency at lower power consumption, thereby resulting in substantial saving in power. Oxygen is supplied at Aeration Tank by air from air blowers. At aeration tank diffusers are provided with effective length for an even distribution of air. Nutrients will be dosed at aeration tank for growth of bacteria.

The fine bubble diffused aeration system comprises of air blowers, air distribution pipes and membrane diffusers for aeration and keeping the biomass (MLSS) in suspension in the aeration tank. The mixed liquor (effluent & biomass) from aeration tank enters the secondary clarifier by gravity where the biomass is separated from the treated effluent by settling. Constant Mixed Liquor Suspended Solids (MLSS) will be maintained in aeration tank in definite proportions by recycling the bio-sludge trapped by the secondary clarifier. Recycling of bio-sludge will be done by non-clog, centrifugal, semi open type continuous duty suitable sludge re-circulation pump. Excess sludge will be dewatered on the Sludge Drying Beds.

The treated, clear effluent overflowing from the secondary clarifier will be sent to multi-grade filter and treated water tank.

S. No	Parameter	Unit	Value
1	Temperature raise	°C	+3 °C above ambient
2	pH	-	5.5 – 8.5
3	BOD 5 days at 20 °C	mg/lit	30
	COD	mg/lit	250
4	Total suspended solids	mg/lit	30
	Total dissolved solids	mg/lit	2100
8	Oils and grease	mg/lit	10

TECHNICAL SPECIFICATIONS OF EFFLUENT TREATMENT PLANT

Description	Unit	Recommendation for 130 TCH
Bar screen Chamber with bar screen	1 set	Capacity: To suit 20 m ³ /hr flow rate. MOC: RCC chamber with MSEP bars
Oil & Grease chamber	1	5 M ³ , RCC
Oil Skimmer	1	Suitable
Equalization tank	1	200 m ³
MOL addition system	1 set	Set of Dosing pump (1+1) & MS preparation & dosing tanks with agitator.
Primary clarifier	1	Dia: 6 meter X 2.6 SWD
Bio-filter Feed Pump	2	Capacity: 25 m ³ /Hr
Anaerobic Bio-filter	1	Suitable capacity
Aeration tank feed pumps	2	Capacity: 25 m ³ /Hr
Aeration tank-I	1 set	Capacity: 500 m ³ , MOC: RCC, Type: Diffused Aerators.
Air blower for Aeration tank-I	2	Capacity: 800 m ³ /Hr
Secondary clarifier	1	Dia: 7.5 meter X 2.6 SWD
Sludge recycle pumps for Clarifier-I	2	Type: Centrifugal, Capacity: suitable
Filter feed tank	1	Existing Aeration tank after partition wall (100 m ³)
Coagulant dosing system	Lot	STD, set of dosing pumps & PP tank
Filter feed pumps	2	Capacity: 25 m ³ /Hr
Multi greade filter	1	Capacity 25 m ³ /hr
Treated effluent tank	1	7500 m ³
Treated effluent transfer pumps	2	Capacity: 25 m ³ /Hr
Sludge Drying beds	Lot	Existing 200 m ² will be suitable
Nutralization pit for effluent from WTP & cooling tower (CT) blow down	1	Capacity 50 m ³ , RCC with acid proof tiling shall be constructed
WTP & CT effluent feed pumps to Clarifier	2	Type: Centrifugal, Capacity: 25 m ³ /Hr
pH correction system for WTP & CT effluent	1	STD, set of dosing pumps & PP tank
Clarifier for cooling tower blow down	1	Dia: 6 meter X 2.6 SWD
Clarified water transfer pumps	2	Type: Centrifugal, Capacity: 25 m ³ /Hr

Solid Waste Management

Stream	Estimated Quantity	Disposal
Sugar ETP & CPU	2 TPD	Proposed for land application & green belt development
Boiler Ash	15 TPD	Proposed to sell to brick manufacturers
CPU Sludge	20 TPD	Proposed to Use for land application
Yeast sludge	20 TPD	Proposed to Use for land application
Boiler Ash	10 TPD	Proposed to sell to brick manufacturers

Note : The list mentioned above is indicative and exact specifications will be finalised during detailed engineering.

ANNEXURE - IV : LIST OF VENDORS FOR CRITICAL EQUIPMENT (STEAM & POWER GENERATION PLANT)

SR.	CRITICAL EQUIPMENT	BRAND(S) / MAKE(S)
A.	MECHANICAL	
1.	FANS	FLAKT / TLT / BATLIBOI / AIROCHEM/FAN INDIA
2.	TRAVELING GRATE ASSEMBLY	OEM
3.	FEED WATER PUMPS	KSB / SULZER / FLOWSERVE / KIRLOSKAR EBARA
4.	GEAR BOX	ELECON / PREMIUM / TOP GEAR
5.	COUPLINGS	FENNER / LOVE JOY / GBM / SWASTIKA / RESOFLEX / MEGA STANDARD
6.	BEARINGS	SKF / FAG / NTN / MEGA STANDARD
7.	CHEMICAL DOSING SYSTEM	
	- DOSING PUMP METERING	SWELORE / XL PUMPS/ MEGA STANDARD
	- TANK	MEGA STANDARD
	- AGITATOR GEARED MOTOR	BONFIGLIOLI / GREAVES LTD / MEGA STANDARD
8.	REFRACTORY & INSULATING BRICKS	ABS REFRACTORIES / TATA REFRACTORY / MEGA STANDARD
9.	INSULATION	
	- CERAMIC BLANKETS	MURUGAPPA / ORIENT CERWOOL
	- LRB	MIN WOOL / ROCK WOOL INDUSTRIES / LLOYD ROCK FIBRES / ROCKWOOL (I) LTD
	- ALUMINIUM CLADDING	BALCO / INDALCO / HINDALCO
10.	STEAM TRAPS	J.N. MARSHALL / MEGA STANDARD
11.	ORIFICE PLATES	MEGA STANDARD
12.	ESP	ELEX / THERMAX /
13.	SOOT BLOWER	GD WORKS / SITSON / MEGA STANDARD
B.	VALVES	
14.	STEAM VALVES	KSB / AUDCO / MEGA STD.
15.	CONTROL VALVES	MIL / DRESSER / FISHER XOMOX / ARCA / SAMSON
16.	SAFETY VALVES	TYCO SANMAR / FAINGER LEASLER
17.	BLOWDOWN VALVES	FORBES MARSHALL / LEVCON / INDITECH
18.	SOLENOID VALVES	AVCON / ASCO / ROTEX / VELJAN / EL-OMATIC / NUCON / MEGA STANDARD
19.	SOLENOID OPERATED BALL & BUTTERFLY VALVES	EL-O-MATIC / ROTEX / VIRGO

SR.	CRITICAL EQUIPMENT	BRAND(S) / MAKE(S)
20.	NON-IBR VALVES	BDK / KSB / AUDCO/ XOMOX / MEGA STD.
21.	SOLENOID GANGS	AVCON / NUCON / ROTEX
C.	CASTINGS	
22.	MANHOLE DOOR	MEGA STANDARD
23.	CLEANING HOLE DOOR	MEGA STANDARD
24.	OTHER CASTINGS	MEGA STANDARD
D.	ASH HANDLING SYSTEM	OEM
E.	TG SET	TRIVENI/SIEMENS/MAN/IB TURBO
F.	MECHANICAL AUXILIARY	
25.	CRANE	OEM
26.	COMPRESSOR	INGERSOLL RAND / ELGI / CHICAGO PNEUMATICS / ATLAS COPCO
27.	PRDS	MAZDA / STEAM & FUEL / MARSHALL / FORBES MARSHALL / CHEMTROLS/FISHER SANMAR/EQVT.
G.	ELECTRICALS	
28.	BUS DUCT	OEM
29.	H.T PANEL	SIEMENS / ABB / SCHNEIDER
30.	HT SWITCH GEAR	ABB / SIEMENS / AREVA
31.	LT SWITCH GEAR	L&T / SIEMENS / GE / ABB
32.	TRANSFORMER	VOLTAMP UNIVERSAL / KIRLOSKAR / CGL / AREVA / MEGA STANDARD
33.	LT PANELS	OEM
34.	MOTORS	CROMPTON / ABB / SIEMENS / WEG
35.	VFD	SIEMENS / ABB / AMTECH / VACON / DANFOSS
36.	POWER & CONTROL CABLES	FINOLEX / KEI INDUSTRIES LTD / POLYCAB
37.	THERMAL OVERLOAD RELAYS	L&T / SIEMENS / ABB
38.	AMMETER/VOLTMETER	AE / MECO / RISHAB / ENERCON
39.	SELECTOR SWITCH	SALZER / KAYCEE
40.	INDICATING LAMPS	ESBEE / SIEMENS / TEKNIK
41.	CABLE LUGS	MULTI / DOWELLS / 3'D
42.	CABLE GLANDS	CABEND / PRABHAT / BALIGA / COMET / EXPROTECTA
43.	BATTERY & BATTERY CHARGER	AMARA RAJA / EXIDE / AMARON
44.	LIGHTING	PHILIPS / BAJAJ / GE / CGL
45.	UPS	HIREL / DONVEY / CONSUL / POWER COM
H.	INSTRUMENTS	
46.	TEMPERATURE GAUGES	H. GURU / WAAREE INSTRUMENTS / FORBES MARSHALL / RADIX MICRO SYSTEMS / RADIX SENSORS / PYRO ELECTRIC / MEGA STANDARD

SR.	CRITICAL EQUIPMENT	BRAND(S) / MAKE(S)
47.	PRESSURE GAUGES	H. GURU / WAAREE INSTRUMENTS / FORBES MARSHALL / RADIX MICRO SYSTEMS / RADIX SENSORS / PYRO ELECTRIC / MEGA STANDARD
48.	THERMOCOUPLES	NUTECH ENGINEERS / TEMPSONS / THERMAL INSTRUMENTS / PYRO ELECTRIC / MEGA STD.
49.	PRESSURE SWITCH / TEMPERATURE SWITCH	SWITZER / INDFOSS
50.	LEVEL SWITCH (FLOAT TYPE)	LEVCON / CHEMTROLS / MEGA STANDARD
51.	LIMIT SWITCH	PNEUMATIC CONTROLS / JAI BALAJI / BCH / SIEMENS / HONEWELL / MEGA STANDARD
52.	DRAUGHT GAUGE	SWITZER / BELLS / MEGA STANDARD
53.	TRANSDUCERS	ELSTER / MECO / MASIBUS / RISHABH
54.	TRANSMITTERS	ROSEMOUNT / SIEMENS / ABB / YBL / SMAR/ EMERSON/MEGA STANDARD
55.	AUTO MANUAL LOADER	MICROMAX / MASIBUS
56.	I/P CONVERTORS	SHREYAS / CG HARTMAN & BRAUN / MOORE / MEGA STANDARD
57.	DIGITAL INDICATOR	TELETHERM / MCIH / MASIBUS
58.	AIRFILTER CUM REGULATOR	PLACKA / VELJAN / SHAVO
59.	POWER CYLINDER (ON/OFF)	VELJAN / NUCON / ROTEX
60.	REGULATING POWER CYLINDER	IL / KELTRON / R.K. CONTROLS / MEGA STD.
61.	DCS	SMAR / SIEMENS / ABB / HONEYWELL / EMERSON / SUPCON
62.	COMPENSATING CABLES	THERMOPADS / ECI / ASSOCIATED CABLES / CORDS / TECHNOCAB
63.	INSTRUMENTATION CABLES	THERMOPADS / ASSOCIATED / CORDS / TECHNOCAB / TC COMMUNICATIONS

ANNEXURE - V : LIST OF VENDORS FOR CRITICAL EQUIPMENT (JUICE EXTRACTION & BOILING HOUSE)

SR.	CRITICAL EQUIPMENT	BRAND(S) / MAKE(S)
1.	MILL, CANE UNLOADER, CANE CONVEYING SYSTEM, PREPARATORY DEVICES & MILL HOUSE CRANE	HI-TRANSE / HALLMARK CRANES / DEMECH / MEGA STD. (OEM)
2.	L.T MOTORS	SIEMENS / CROMPTON / ABB
3.	VFD PANELS	SIEMENS / ABB / DANFOSS / VACON / AMTECH / CG / L&T
4.	MILL HOUSE PUMPS	SINTECH / MATHER / PLATT / PSP
5.	ALL CHAINS	SWAJIT / SATISH
6.	PLANETARY GEAR BOX (UP TO 100 HP)	ELECON / TOP GEAR / DYNASPEED / MAGTORK
7.	PLANETARY GEAR BOX- MILL DRIVE	ELECON/GAYATRI EXIM/ DINAMIC OIL / PREMIUM
8.	ELECTRIC CABLES	GLOSTER / POLYCAB / CCI / UNISTAR / FINOLEX
9.	SWITCH FUSE UNIT	SIEMENS / L&T
10.	ACBS & CONTACTORS	SIEMENS / L&T
11.	C.I. VALVES	CALSENS / THORAT / KIRLOSKAR
12.	ROPE TYPE COUPLING	MEGA (OEM)
13.	ROTARY JUICE SCREEN	SUVIRON
14.	MAGMA & MOLASSES PUMPS	PSP / ACRO / GITA / RISANSI
15.	BUTTERFLY VALVE	THORAT / PURI / LEADER / CRANE / AEROTECH
16.	STAINLESS STEEL TUBES	RATNAMANI / APEX / DIVINE TUBE / MAXIM TUBE
17.	EVAPORATOR, JUICE HEATER	MEGA (OEM)
18.	JUICE CLARIFIER	UNIVERSAL / HITECH MIRUT
19.	VACUUM FILTER	UNIVERSAL / HITECH MIRUT

ANNEXURE - VI : PLANT PERFORMANCE PARAMETERS

Sr. No.	Performance parameter	Value
A.	Crushing rate	3,000 TONS/DAY
B.	Juice extraction by POL	90 %
C.	Bagasse moisture	51 - 52 %
D.	Imbibition% fibre	250
E.	Process steam	25 % on cane
