

REPORT ON 10 DAYS INTERNSHIP ON SUGAR MILL

STUDY OF PROCESSING OF SUGAR AND CO-GENERATION PLANT IN SUGAR MILL

Submitted in partial fulfilment of the requirements for the subject
of

PROFESSIONAL TRAINING

Bachelor of Engineering Degree in
Electrical and Electronics Engineering

By

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**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
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**SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bona fide work of **KEERTHANA V (REG NO. 41140044)** who carried out the project entitled "**STUDY OF PROCESSING OF SUGAR AND CO-GENERATION PLANT**" in partial fulfilment of the requirements for the subject **PROFESSIONAL TRAINING-1** of the Degree of Bachelor of Engineering in Electrical and Electronics Engineering under my supervisor.

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CHAPTER 1

INTRODUCTION ABOUT THE COMPANY

INDUSTRY PROFILE:

India, which is regarded as the original home of sugarcane being the largest producer of sugarcane has considerable potential for the development of the sugar industry to meet domestic demand and parts of the overseas demand. The sugar industry provides direct employment to a large number of people and sugar machinery manufacturing, distilleries confectionary, etc is linked to the development of the sugar industry. The Sugar industry is also responsible for the development of a large number of people in the transport and other service sectors. About 50 million farmers are estimated to be engaged in the sugar cane cultivation.

The VCSM Ammundi was registered and established under Tamil Nadu Co-operative societies act in May 1970. It was commenced its erection during 1976 and commissioned with a crushing capacity of 1250 TCD in March 1977. Trial crushing was taken from March 1977 to May 1977 by crushing 15,000 M.T. as a maiden crushing season.

Based on the cane potentiality and as per the recommendation of government of India, the crushing of mills was expanded from 1250 TCD to 2500 TCD with a view to have the uniform and standard economical crushing capacity of 2500 TCD during the year 1989-1990. Now the sugar mill is still running more than 39 yrs and above.

1.1.1 FACTORY LOCATION: The factory is located in Ammundi village, Gudiyatham Taluk of Vellore District on the Katpadi-Ranipet, State Highways.

1.2 ORGANIZATION PROFILE:

1.2.1 CANE CARRIER AND PREPARATORY DEVICES:

We are having 2 numbers of cane unloaded of each 5 ton capacity to unload the cane from the trucks. The cane will be unloaded from the truck to the feeder table and from the Feeder table, gradually it will be fed to the cane carrier. The carrier having the Horizontal length of 30 meters and inclined length of 30 meters of slat type carrier to carry the cane to the mill. The unloaded cane from the feeder table, first enters into the cane kicker where it will level the cane in the cane carrier and then the cane passes through a cane cutter which is having 44 knives. In cane cutter, the cane will be partially and the chipped cane then moves to the fibrizor which is having 90 numbers of swing type hammers. The fibrizor prepares the partially prepared cane into very fine fibers in the range of 75 to 80 plus Preparatory Index. The finely prepared Cane will then enter into the mill for compression.

1.2.2 MILLS:

The sugar mills having 6 mill tandem of 30"x60" Rollers of 18 Nos. Every 2 mills are driven by 600 HP steam turbine. The prepared cane passes through each mill and finally the Bagasse is emerged out from last mill to Boiler through Bagasse Elevator and Bagasse Carrier. The extracted juice from the mills is screened and collected in a sump and pumped to juice weighing scale for process.

1.2.3 BOILER:

We are having 2 Nos. of 20 T Capacity 20 Kg/cm² pressure Boilers and 30 T Capacity 32 Kg/cm² pressure boiler having total capacity of 70 tones steam production per hour. The fuel for the Boiler is our own Bagasse which is emerged out from the mills after juice extraction. The excess Bagasse i.e. the Bagasse surplus after our own consumption will be sent to the Bagasse yard and the same will be sold to TNPL or any other Powerplants.

1.2.4 BOILING HOUSE:

The juice pumped from the mill house has been first weighted juice Weighing scale. The Weighted juice then pumped to raw juice heater where it is heated up to 70°C and passing to juice sulphitor where the sulphur dioxide and lime is mixed with the juice. Then the treated juice is pumped again to the juice Heaters and heated up to 100°C. Thereafter, the juice is pumped to clarifier for setting the mud. After about 2 to 3 Hrs waiting at clarifier, the clear juice is drained from the clarifier and pumped to semi ketteners and evaporators for thickening the juice into syrup. The syrup coming out from the last body of the last body of the Evaporators will be around 55 to 60°C Bricks.

1.2.5 SYRUP:

The syrup emerged out from the last body of the Evaporator is taken to pans and the first sugar boiling is made at pans and the A- Masecutive is prepared. The A-masecutive is then cooled at Crystallisers and then it is passes to centrifugals, the white sugar is separated and passes to the hoppers for drying and then passes to graders for sieving and finally the sugar is weighted and bagged and sent to sugar godowns. In centrifugals, after separating the sugar particles, the mother liquid (Molasses) coming out from the machines are again taken to re-process and B- Masecutive and C-Masecutive are prepared. The B and C-Masecutive are centrifuged at the continuous centrifugals and finally the final Molasses coming out from the continuous centrifugal machine are sent to final Molasses storage Tanks. The B-Sugar and C-Sugar are again re-processed and finally the white sugar is prepared.

CHAPTER 2

2. NATURE OF WORK DONE

The operation of a sugar mill that produces both sugar and electricity involves a multifaceted process. Here's an overview of the nature of work done in such a facility:

Sugar Cane Reception: The process begins with the arrival of sugar cane from the fields. The cane is weighed, and samples may be tested for quality.

Cleaning and Washing: The sugar cane is cleaned and washed to remove dirt and impurities, which is essential for both sugar and electricity production.

Cutting and Shredding: The cleaned cane is then cut into small pieces and shredded to extract the juice for sugar production.

Juice Extraction: The shredded cane is passed through rollers to extract the sugar-rich juice, which is used to produce sugar.

Clarification: The juice is clarified to remove impurities and solid particles, ensuring high-quality sugar production.

Evaporation: The clarified juice is heated and evaporated to concentrate the sugar content for sugar production.

Crystallization: Sugar crystals are formed from the concentrated juice through cooling and seeding for sugar production.

Centrifugation: The sugar crystals are separated from the liquid using centrifuges for sugar production

Drying: The separated sugar is dried to remove any remaining moisture for sugar production.

Packaging: The dried sugar is packaged into various forms, such as granulated sugar, powdered sugar, or sugar cubes for distribution.

By-Product Processing: Some sugar mills process by-products like molasses, which can be used in various industries, including the production of ethanol, and some of this by-product may be used for electricity generation.

Electricity Generation: Sugar mills have cogeneration systems. Bagasse, a fibrous residue left after juice extraction, is burned in boilers to produce steam. This steam is then used to drive turbines, generating electricity for both the mill's needs and sometimes for sale to the grid.

Maintenance and Quality Control: Continuous maintenance of machinery and equipment is crucial for both sugar and electricity production. Quality control measures are in place to ensure the sugar meets established standards.

Environmental Considerations: Sugar mills often deal with wastewater and environmental concerns related to waste disposal and emissions. Many mills implement eco-friendly practices in both sugar and electricity production.

Seasonal Work: Sugar mills typically operate during the sugar cane harvesting season, which can vary by region. The work intensity is high during this period, both for sugar and electricity production. A thermal power plant in a sugar mill is an auxiliary facility designed to generate electricity by utilizing the heat energy produced during the sugar production process. A thermal power plant in a sugar mill is an auxiliary facility designed to generate electricity by utilizing the heat energy produced during the sugar production process.

- The hot flue gas from the boiler is fed to super heater which increases the temperature of the super heater and removes the moisture content.
- The flue gas flowing through super heater flows through economizer and air pre-heater. The main function of the economizer is that it will increase the temperature of the feed water by utilizing the heat from the hot flue gases.
- The feed water is again sent to the boiler for conversion of steam .The air pre-heater increases the temperature of the air supplied for coal burning by deriving heat from flue gases.
- By preheating the air there will be an increase in thermal efficiency and increase in steam capacity per square meter of boiler surface. The super saturated steam from super heater is fed to the impulse reaction turbine by means of the main valve.
- The valve placed in between super heater and the turbine is for limiting the excess flow level of steam to the turbine. The turbine converts steam energy into mechanical energy .The turbine is coupled with the Turbo Alternator with the help of couplings.
- The Turbo Alternator converts mechanical energy into electrical energy. The generated electrical energy is stepped up by using power transformer and feed to bus bar with various protection systems.

3.2 COGENERATION PLANT ACCESSORIES EQUIPMENT:

- In a sugar mill cogeneration plant, several accessory equipment and systems are essential to efficiently generate both electricity and process heat from the waste heat produced during sugar production. Here are some common cogeneration plant accessories and equipment:
- Boilers: High-pressure boilers are used to convert bagasse (sugar cane waste) into steam. This steam is then used to drive a steam turbine for electricity generation and also for various sugar processing operations.



- Steam Turbine: The steam turbine is connected to a generator and converts the energy from high-pressure steam into electricity.



- Condenser: After the steam passes through the turbine, it is condensed back into water in a condenser. This process allows for the efficient operation of the steam turbine.
- Generator: The generator is responsible for converting the mechanical energy produced by the steam turbine into electrical energy.



- Cooling Towers: Cooling towers are used to cool the water that is used as a cooling medium in the condenser. They help maintain the temperature and efficiency of the condensation process.
- Switchgear and Transformers: These components are necessary to control the electrical output from the generator and step up the voltage to the appropriate levels for distribution.
- Feed water System: A feed water system is used to preheat the water before it enters the boiler to improve energy efficiency.
- Ash Handling System: In biomass-fired boilers, like those using bagasse, an ash handling system is required to remove and dispose of the ash generated during combustion.

- **Electrical Panels and Control Systems:** These systems are essential for monitoring and controlling various aspects of the cogeneration plant, including the boiler, turbine, and electrical output.
- **Fuel Storage and Handling*:** This includes storage facilities for bagasse and systems for transporting it to the boiler.
- **Safety Systems:** Safety equipment such as fire detection and suppression systems, pressure relief valves, and emergency shutdown systems are critical for safe operation.
- **Emission Control Systems:** To comply with environmental regulations, emission control systems may be required to reduce air pollutants from combustion.

These accessories and equipment are integral to the operation of a cogeneration plant in a sugar mill, allowing for the efficient utilization of waste heat and the generation of both electricity and process steam.

3.3 STANDARDS TO GENERATE POWER IN SUGAR MILL BY USING BAGASSE/COAL:

As per the industrial records, some of the standard values are mentioned below,

- If one tone of bagasse is burn, 2.2 tone of steam is produced.
- If one tone of coal is burnt, 4 tone of steam is produced as per the calorific value of coal.
- To generate 1MW of power, 4 tone of steam is required.
- To generate 20MW of power, 80 tone of steam is required. .
- If one tone of a cane is crushed 300Kg of bagasse is produced.
- In a day to generate 20MW of power, 50 tone of de-mineralized water is used
- To generate 1MW of power, 6.55 tone of water is required.

4. KNOWLEDGE AND EXPERIENCE:

- During my internship, I gained valuable hands-on experience in sugar production processes, steam generation processes, including boilers, turbines and other equipment used to produce steam for both electricity generation and industrial processes.
- I have learnt how things work there and how the machines are used technology behind it.
- I've had the opportunity to work alongside dedicated professionals and gain insights into the challenges and opportunities in the industry.
- As I move forward in my career, I will carry the lessons learned and experiences gained during this internship with me, and I am confident that they will serve as a strong foundation for my future endeavors in the field of sugar production or related industries.

5.CONCLUSION:

Bagasse otherwise a refuse, if used as cogeneration fuel is proved to have been technically feasible, economically viable for the competitive industrial environment of sugar industries, environmentally friendly because of greenhouse neutral emissions and acceptable regarding social matters. By using this type of plants we save natural resources like coal, water because the product of sugarcane i.e., bagasse is used as raw material for combustion. By erecting the plant as per the design it results in the reduction of atmospheric pollution and increases the power generation and the efficiency of the plant increases. By these designs, the step by step process of power generation will be in a progressive level such that interruption in power generation will not happen and fault identification and rectification will be easy for any working individual.

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CERTIFICATE:



THE VELLORE CO-OP. SUGAR MILLS LTD.,

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Rc.No.079/Project/2023/A2

Date: 10.06.2023

PROJECT COMPLETION CERTIFICATE

This is to certify that V.KEERTHANA, Registration No.41140044, B.E.(EEE)
Second Year student of Sathyabama Institute of Science and Technology, Jeppiaar Nagar,
Rajiv Gandhi Salai, Chennai – 600 119, undergone Internship on “A STUDY ON
COGENERATION PLANT IN VELLORE SUGAR MILL BY USING BAGASSE
AS A FUEL” for a period of 10 days from 24.05.2023 to 02.06.2023 and completed the
same successfully.

During the training period, the level of commitment, involvement and attitude
were found to be satisfactory.

For Vellore Co-op. Sugar Mills Ltd.,
Sd/- A.Meena Priya Darshini,
Managing Director.

// by order //

10/6/23
for Managing Director.

To

Selvi. V.KEERTHANA,
Registration No.41140044,
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