ENERGY CONSERVATION OPPORTUNITY

IN

SUGAR INDUSTRY

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OVERVIEW OF SUGAR INDUSTRIES -1

- Sugar is produced in around 115 countries across the world.
- Of the 115 sugar - producing countries in the world, 67 produce sugar from cane, 39 from beet, and 9 from both cane and beet.
- The Indian Sugar Industry is one of largest producer of Sugar and It is also the world's largest sugar consuming country.
- The Indian sugar industry is the second largest agro-based industry, next only to the textile industry.

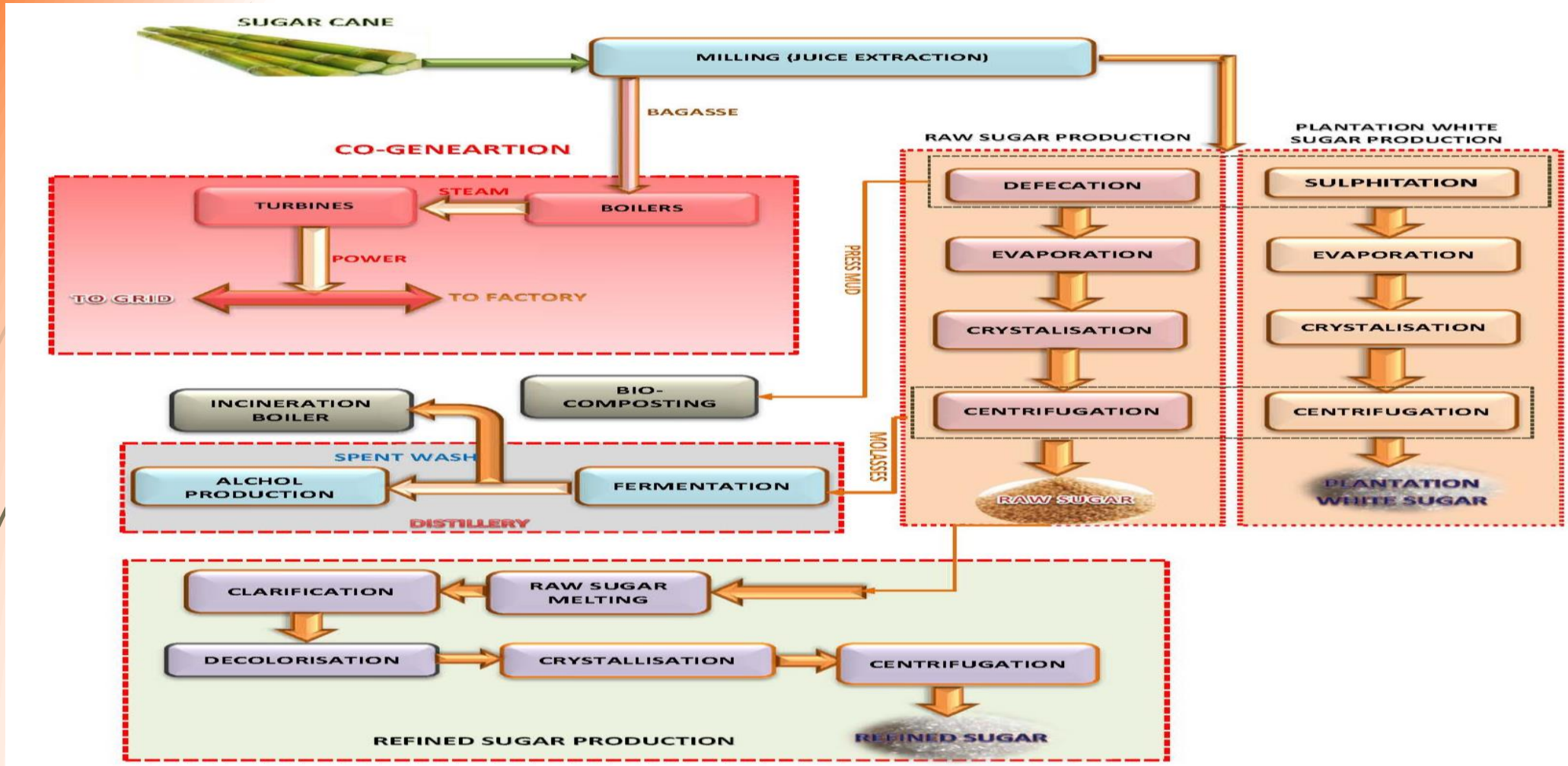
OVERVIEW OF SUGAR INDUSTRIES -2

- Over Forty million farmers and their families besides large mass of agricultural labors are involved in sugarcane cultivation and its harvesting operation.
- Over Five lakh workmen are directly employed. Employment is also generated in various ancillary activities.
- Based on 2022-23 Sugar season about 643 sugar factories are in operational conditions. Maximum numbers of sugar factories are operative in Maharashtra - 245, followed by Uttar Pradesh-134, Karnataka-76, Tamil Nadu- 44, Andhra Pradesh-26, Madhya Pradesh -21, Gujarat-21, Punjab – 17, Haryana-14, Bihar-11, Telangana -10, Uttarakhand-10, Orissa-5 etc.

PLANT PROFILE – CAPACITY & CO GENERATION

- Up to to 2500 TCD = 262
- 2501 TCD to 5000 TCD = 230
- 5001 TCD and above = 151
- No. of Plant with Co Gen = 357
- Total Installed Co Gen Capacity =7828MW(Approx)

PLANT PROCESS FLOW DIAGRAM



BRIEF ABOUT SUGAR PLANT-1

- Bagasse is used as a major fuel which is a residue of sugar cane after extraction of sugar juice.
- Steam generated in plant is used in steam turbine for power generation as well as in cane preparation and milling.
- Power generated in plant is used for fulfilling plant requirement and surplus power if available is exported to grid.
- LP steam used in process is extracted from steam turbine as well as de superheating station installed in plant.
- Mostly back pressure turbine used in plant, For surplus power generation now extraction cum condensing turbine is also used. Here extraction is based on plant requirement and rest is goes to condenser.

BRIEF ABOUT SUGAR PLANT-2

- Major Product is White sugar, raw sugar and refined sugar.
- Double Sulphitation process is used for white sugar manufacturing.
- Defco Phosphotation Process. is used for raw sugar manufacturing
- Defco-Remelt Phosphotation Process is used for refined sugar manufacturing.
- Press mud which generated during filtration processes is used as a fertilizer.
- Molasses generated in plant is used by distillery for ethanol production

Energy Performance Parameters

Presently Sugar Industries Plant Performance Criteria In Term Of Energy Are As Under:

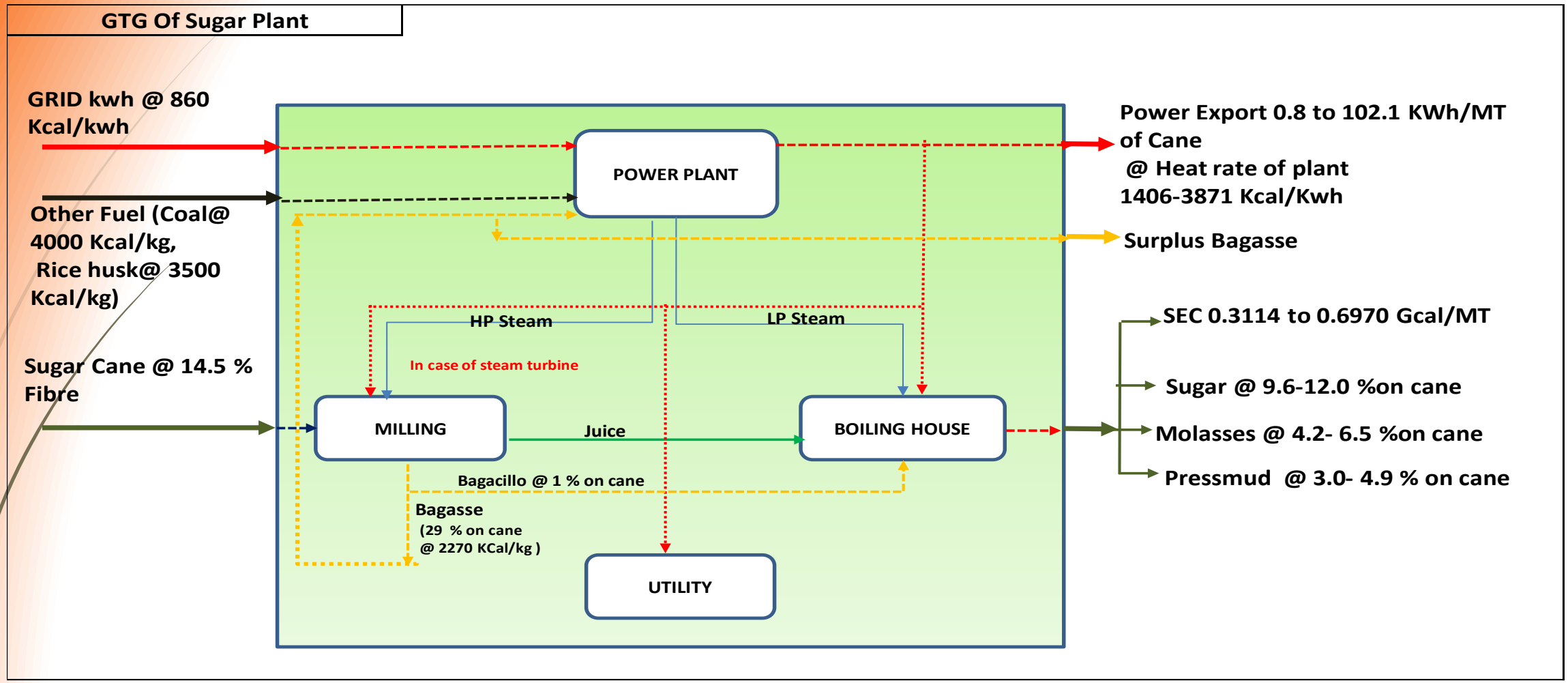
- **Steam Consumption % Of Cane**
- **Kwh Consumption Per Mt of Cane.**

Based On Earlier Experience Of PAT In Other Sector BEE Has Prepared A Methodology To Calculate SEC Of Plant.

SEC CALCULATION

- Conversion Factor for
  - Bagasse is 2270 Kcal/Kg @ 50% Moisture
  - Purchase Power is 860 Kcal/Kg
  - HSD is 9873 Kcal/Lt
  - Export power is 2717 Kcal/Kg or/Heat Rate Of Plant Generated Power
- All energy in put to plant added to plant energy consumption.
- Energy content of export/saved bagasse is deducted form plant energy consumption.
- Energy content of export steam and power is deducted form plant energy consumption.

GATE TO GATE DIAGRAM OF SUGAR PLANT



Performance Parameters

Parameters	UOM	Minimum	Maximum
Crop Day	No	108	213
Steam Pressure	Kg/Cm2	11	110
Steam Temperature	Degree C	260	540
Process Steam	% of Cane	39.5	62.6
Export Power	KWh/MT of Cane	0.8	102.1
Power Consumption	KWh/MT of Cane	20.6	53.3
Heat Rate	Kcal/KWh	1406	3871
Sugar Recovery	% of cane	9.6	12.0
Molasses	% of cane	4.2	6.5
Press Mud	% of cane	3.0	4.9
SEC	Gcal/MT of Cane	0.3114	0.6970

Factors Affecting SEC

- Mill & Fibrizor : Motor (HT/LT) Vs Steam Turbine
- Boiler Performance And Operating Pressure
- Power Turbine : Condensing, Back Pressure, Extraction Cum Condensing
- Power Export
- Evaporation System ; FFE Vs Conventional
- Condensate : CIGAR, Flash Steam Recovery System
- B/C Molasses

ENERGY CONSERVATION

- Sugarcane is an Energy crop and it is a renewable source. It is the nature's gift to mankind. Sugarcane synthesizes energy from the SUN and Man extracts it from sugarcane in the form of *Sugar, Heat Energy, Mechanical Energy And Electrical Energy*. The production of electrical energy from sugarcane fiber which is termed as Cogeneration is assuming great importance day by day because of its renewable nature and attractive economics it offers to the sugar industry.
- Energy conservation is highly relevant to the sugar industry and if properly harnessed can take the organization to the path of prosperity.

MAJOR SECTION IN SUGAR INDUSTRY

- Boiler & Auxiliaries
- Steam Distribution
- Cogeneration & Turbine
- Mill House
- Boiling House
- Utilities

BOILER & AUXILIARIES

- Boiler Performance Optimization
- Boiler Aux. Power Consumption
- Boiler Automation
- Boiler – Increase In Generation Temp.
- Bagasse Drying
- Flash Steam Recovery From Boiler Blow Down
- Sensible Heat Recovery From Boiler Blow Down

STEAM DISTRIBUTION

- Steam Leakage
- Steam Trap Monitoring
- Steam Flow Monitoring
- Steam Line insulation
- Steam Pressure & Temperature Monitoring
- Condensate Recovery System

Cogeneration & Turbine

- Monitoring Of Steam Parameters (Flow, Pressure & Temperature) At The Input Of Turbine.
- Monitoring Of Specific Steam Consumption Of Power Turbine.
- Mill Drive - Steam Driven Vs. Motor Driven
- Fibrizor/ SHREDDER Drive- Steam Driven Vs. Motor Driven
- Turbo Feed Pump(BFP) - Steam Driven Vs. Motor Driven

Mill House

- Mill Automation
- Use of Planetary Gear
- Installation of VFD on cane carriers
- Mill Pumps Recirculation
- Juice Stabilization System with installation of VFD
- Performance of various pump used in Mill house for imbibition water and Juice.

BOILING HOUSE

- Steam Optimization In Evaporation System.
- Waste Heat Utilization In Juice Heating.
- Monitoring Of Steam, Vapour And Condensate Distribution System.
- Automation In Boiling House.
- Use Of Planetary Gear In Crystallizer
- Installation Of VFD For Various Pumps
- Sugar Centrifugal Machine-PLC/DC Motor/AC Motor
- Sulphur Furnace

Utilities

- Spray Pump /Cooling Tower Performance
- Compressed Air Management
- Cold Water Distribution System
- Hot Water Distribution System
- Lighting Optimization
- Performance Of HVAC System
- Section Wise Energy Monitoring System

Our Believe

Save Energy

Save Future

Thank You