



**MAJOR ENERGY SAVING PROJECTS AND
PROCESS OPTIMIZATION**

OPM (Caustic Soda Unit) Amlai (M.P)



Cross – Sector Energy Scheme Exchange



ENERGY SECTORS - PAT

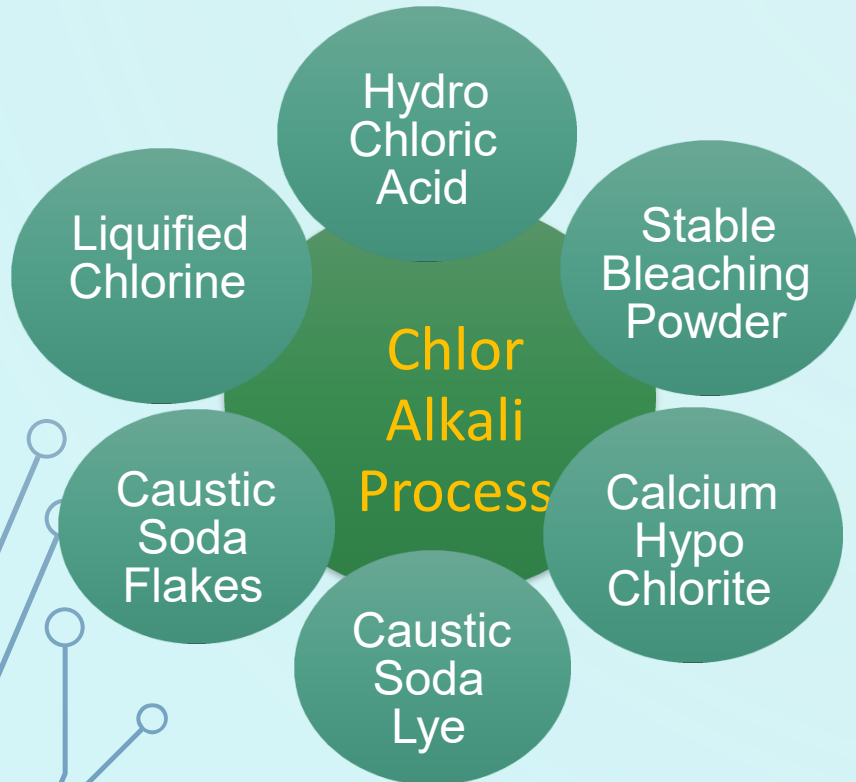
- **A. Thermal Power plants**
- **B. Iron & Steel**
- **C. Cement**
- **D. Fertilizer**
- **E. Aluminium**
- **F. Pulp & Paper**
- **G. Textile**
- **H. Chlor-Alkali**
- **I. Petroleum Refinery**
- **J. Sugar**
- **Chemicals, Zn, Cu, glass, tyre, dairy, ceramic, foundry etc**
- **Independent Captive Power Plants**

ORIENT PAPER & INDUSTRIES LIMITED

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Production capacities

- Caustic soda lye 32% 120 TPD
- Caustic soda lye 48% 115 TPD
- Caustic soda FLAKES 40 TPD
- Liquified Chlorine 100 TPD
- Hydrochloric acid 150 TPD
- Stable bleaching powder 36 TPD
- Calcium hypo chlorite 10 TPD

ENERGY USE - The Energy Sources are:-

a)Electricity- The Electricity is used in IEM Plant for Electrolysis in Membrane Electrolyzers. The 11KV AC Voltage is stepped down through **11KV, 2X10.822MVA, 12Phase Rectifier Transformer** and finally converted to DC through **12Phase ABB Rectifier** and fed to Membrane Electrolyzers.

The Electricity is also used for running of auxiliary motors of plant through 11KV/415V 3.0MVA Auxiliary Power Transformer through starter feeders of various MCCs.

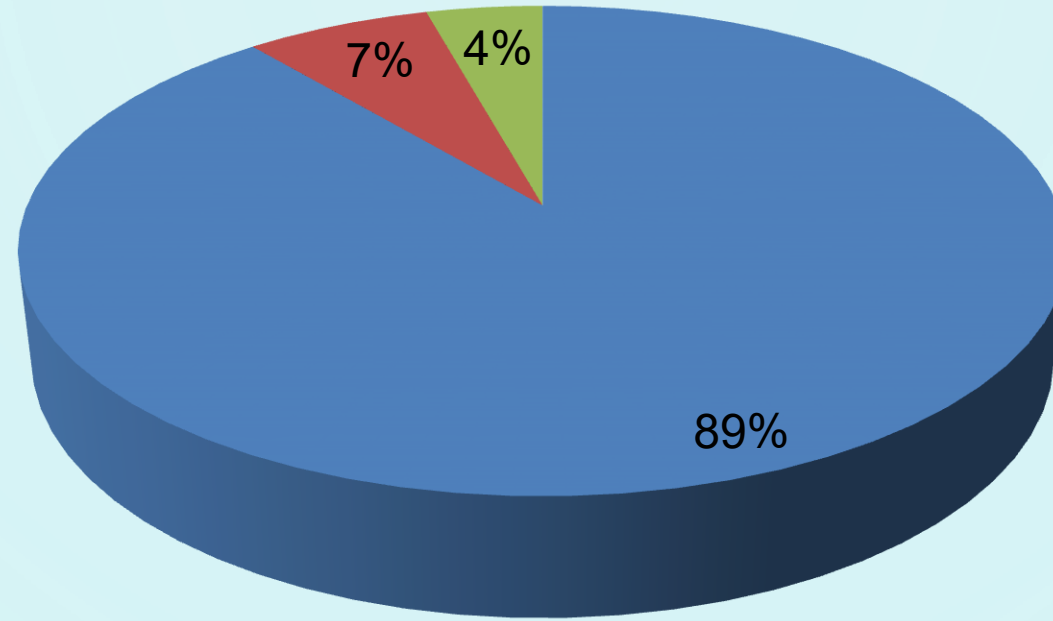
Electricity is also used for lighting in plant area and office buildings for lighting, fans and Air Conditioners.

b) Steam- Steam is used in Caustic Concentration Plant for raising concentration of caustic from 31% to 48% through evaporators. In IEM Plant Steam is required for Recycle caustic through PHE during plant starting after shut and in Chlorate decomposition. Steam is used in Caustic Pre-heater for heating of Caustic in normal operation and during plant shut, Steam is used in Salt tank to maintain the temperature of salt.

c) Diesel – Diesel is used only in 320KVA DG Set for Emergency plant lighting and payloaders.


d) H₂ Gas- H₂ Gas produced from Electrolysers during Electrolysis is reused for HCl Production and as a fuel in Burner of Fusion Plant.

ENERGY CONSUMPTION SHARE

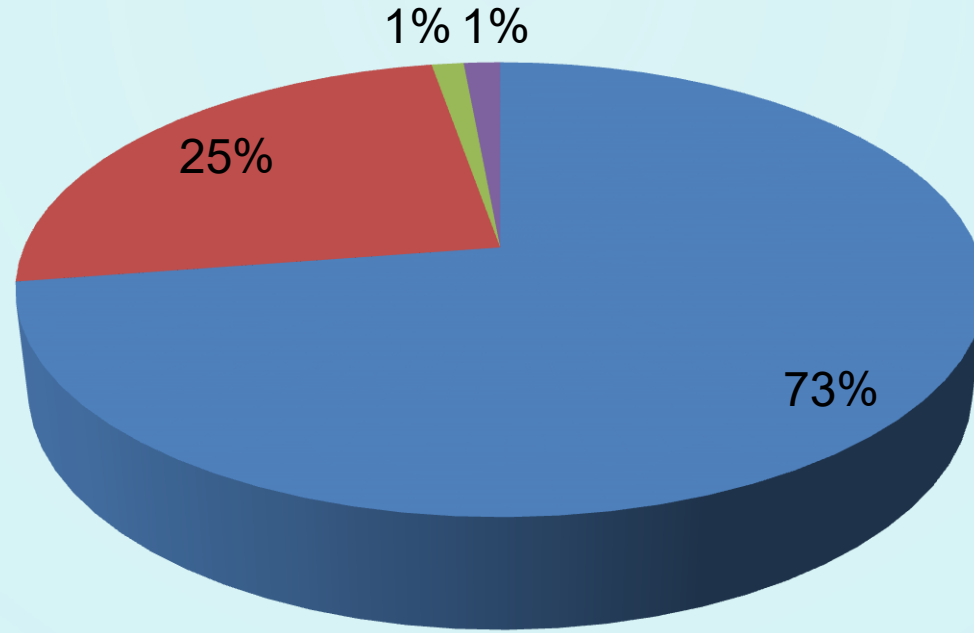


 **Electricity**

 **Steam**

 **H2 Gas**

STEAM CONSUMPTION SHARE



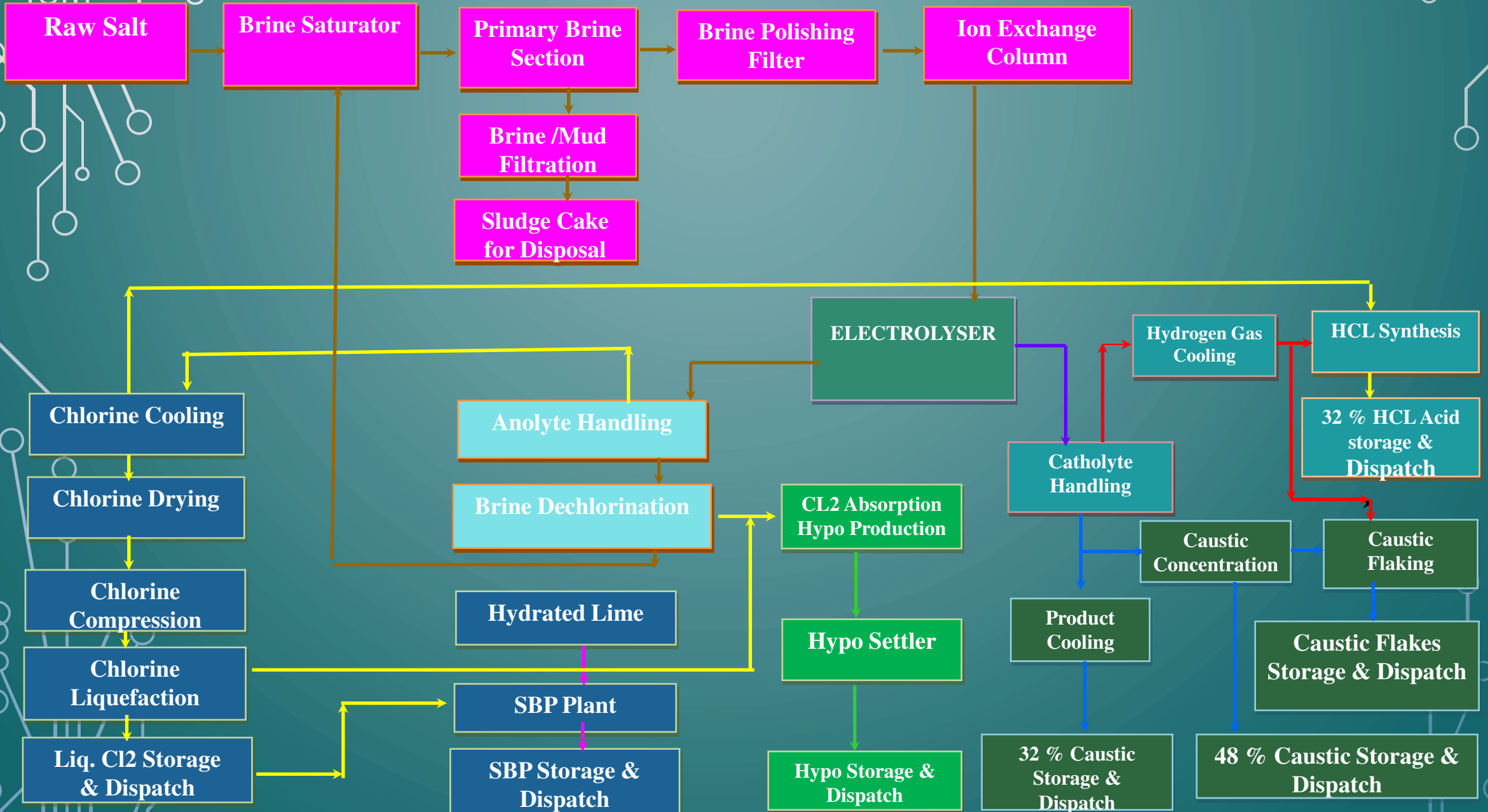
CCU

IEM+VAM

SBP

FLAKES

PLANT PROCESS



MAJOR ENERGY SAVING PROJECTS UNDER IMPLEMENTATION

PROJECT-1 (INSTALLATION OF 22 CELLS IN IEM PLANT)

- Existing No of IEM Cells (i-CME Zero Gap) is 19Nos.
- 03 Numbers of Cells are being planned to be installed in IEM Cell House.
- The Production will increase from 105.5MT/day to 119.0MT/day with reduction in AC Electrolysis Power per Ton of Caustic.

DESCRIPTION	19No. MEMBRANE CELLS	22No. MEMBRANE CELLS
Total Running DC KA	82.5	78.5
Total DC Voltage (DC V)	119.5	137.0
DC Power Consumption KWh/day	236610	258108
Average AC Power Consumption KWh/day	246468	268862
Caustic Lye Production per Day in MT	105.50	119
AC Electrolysis Power KWh per MT of Caustic Lye Production	2336	2260

Investment : Rs 3 Crores

Annual Power Saving= 32,55,840 Units/ Rs 2.4 Crores.

Emission Reduction : 2700 tCO₂e / annum



MAJOR ENERGY SAVING PROJECTS UNDER IMPLEMENTATION

Project-2 Installation & Commissioning New Sodium Hypo Plant replacing discontinued Calcium Hypo Process for Process Optimization & saving of 900Units/day

Investment in Rupees: Rs 5 Crores

Annual Energy Saving-32,40,00 Units/ Rs 24 Lakhs.

Emission Reduction : 270 tCO₂e/yr.



MAJOR ENERGY SAVING PROJECTS IMPLEMENTED

PROJECT-1 (Installation of New 200KW IE3 CL2 Compressor D Motor and Stopping of CL2 Compressor A). Before both the CL2 Compressors D & A was run to maintain CL2 gas for 78KA Load.

Investment in Rs 18 Lakhs

<u>Details</u>	<u>Old Motor</u>	<u>New Motor</u>
Voltage	415V	415V
Rated Current	300Amps	354Amps
Rated Power	167KW	200KW
Frame Size	355L	355L
RPM	738	737
Efficiency	----	IE3, 94%

DESCRIPTION	BEFORE	AFTER
RUNNING LOAD OF CL2 COMPRESSORS	CL2 Comp A-117KW CL2 Comp D-167KW	CL2 Comp D-170 KW
TOTAL RUNNING LOAD KW	284	170

ENERGY SAVINGS :114 KW.

ENERGY DAVING PER DAY=2740 Units

YEARLY ENERGY SAVINGS =9,86,688 Units /Rs 69 Lakhs.

Emission Reduction : 810 tCO₂e/yr

MAJOR ENERGY SAVING PROJECTS IMPLEMENTED

PROJECT-2 (50HP New Chicago Compressor installed and 2Nos 40HP Old Khosla Compressors Stopped)

Energy Consumption Before	50.50KW.
Energy Consumption After replacement	38.50KW.
Yearly Energy Saving	1,03,680Units.
Total Investment	Rs 10,44,225.
Net Saving Yearly	Rs 6,98,803

MAJOR ENERGY SAVING PROJECTS IMPLEMENTED

PROJECT-3 (100KWp Rooftop Solar System)

100KWp Solar System installed in Guest House and Colony with guaranteed solar generation of 1,47,700Units per year in 2018. Solar Panel with Inverter Panels installed with net metering from MPPKVCL.

Monthly Energy Saving = 3750 KWh

Average Monthly Saving in Electricity Bill of Colony=Rs 30,000.

100KWp Rooftop Solar System



PROCESS OPTIMIZATION AND SYSTEM IMPROVEMENTS

PROJECT-1 (OPTIMIZING 132KV GRID PF FROM 0.9732 TO 0.9987)

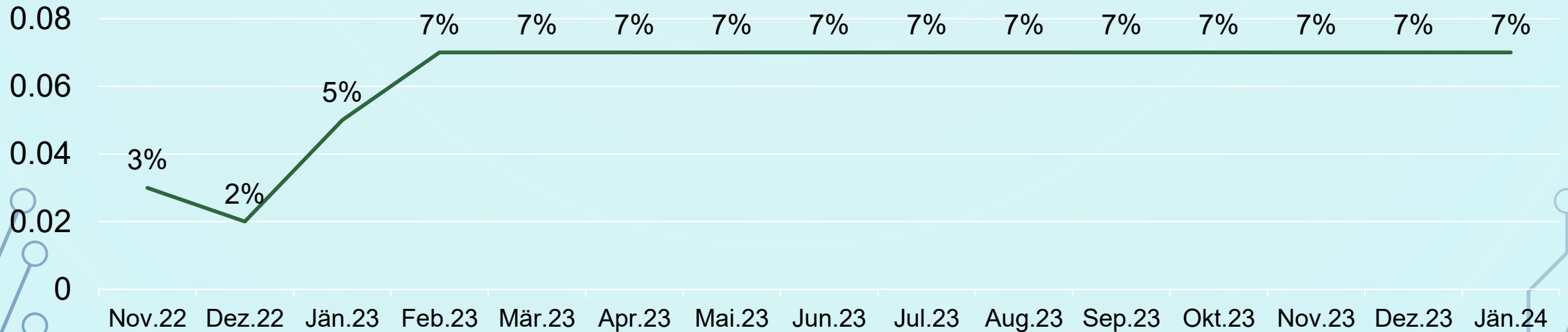
DESCRIPTION	BEFORE	AFTER
PF OF 132KV GRID	0.9732	0.9987
PF INCENTIVE	Rs 11.10 Lakhs/ month	Rs 38.0 Lakhs/month

2Nos 3860KVAR 11KV HT PASSIVE PF IMPROVEMENT CAPACITOR BANKS INSTALLED AND 1000KVAR APFC PANEL INSTALLED TO OPTIMIZE GRID POWER FACTOR.

GRID POWER FACTOR OPTIMIZATION

MONTH	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24
PF Incentive	3%	2%	5%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
PF	0.9718	0.9732	0.9895	0.9984	0.9995	0.9993	0.9992	0.9989	0.9989	0.9987	0.9987	0.9967	0.9987	0.9980	0.9987
Incentive in Lacs	14.47	11.10	28.45	40.27	39.68	43.22	41.76	41.65	36.64	38.37	40.39	37.23	36.73	37.25	38.48

MPEB PF INCENTIVE 2022-24



NEW 3860KVAR 11KV SHREEM MAKE CAPACITOR BANKS INSTALLED & COMMISSIONED ON OCT 2023



PROCESS OPTIMIZATION AND SYSTEM IMPROVEMENTS

PROJECT-2 (SYSTEM OPTIMIZATION BY REPLACING NEW RECTIFIER TRANSFORMER WITH TAPPINGS IN PRIMARY WITHOUT AUTO TRANSFORMER)

MANUFACTURER	M/s Transformer & Rectifier.
YEAR OF MFD	2018
RATED CAPACITY AT TAP 1	2X10822 KVA
RATED CAPACITY AT TAP 2	2X9334 KVA
RUNNING LOAD	11,500 KW.
POWER FACTOR	0.750
RUNNING KVA	15333 KVA
POWER FACTOR MAINTAINED (By 11KV HT Capacitor Banks)	0.9980
Loading Percentage	82.15%
Operational Efficiency of Transformer	98.2%
Operational Efficiency of Rectifier	98.4%
Overall Efficiency of the Rectifier	96.6%
Auto Transformer Losses Eliminated	15KW.

2X10.822MVA 11KV RECTIFIER TRANSFORMER



Loading Percentage-82.15%, Operational Efficiency of Transformer -98.2%

PROCESS OPTIMIZATION AND SYSTEM IMPROVEMENT

PROJECT-3 (Installation of 36TPD Stable Bleaching Plant)

INVESTMENT : Rs 21.83 Crores.

RAW MATERIAL USED:

Hydrated Lime @ 90% Pure:	725 kg/Mt of SBP
Liquid Chlorine @ 99.5% Pure:	425 kg/Mt of SBP

3)UTILITIES:

Power (Electric)	150 kWh/Mt of SBP
Steam(LP)	140 kg/Mt of SBP
Caustic soda	10 kg/Mt of SBP
Cooling Water (for circulation)	50 kl/h
Chilled water (for circulation)	40 kl/h
Air (Dry) for Bag filters	15 m ³ /h

PROCESS OPTIMIZATION AND SYSTEM IMPROVEMENTS

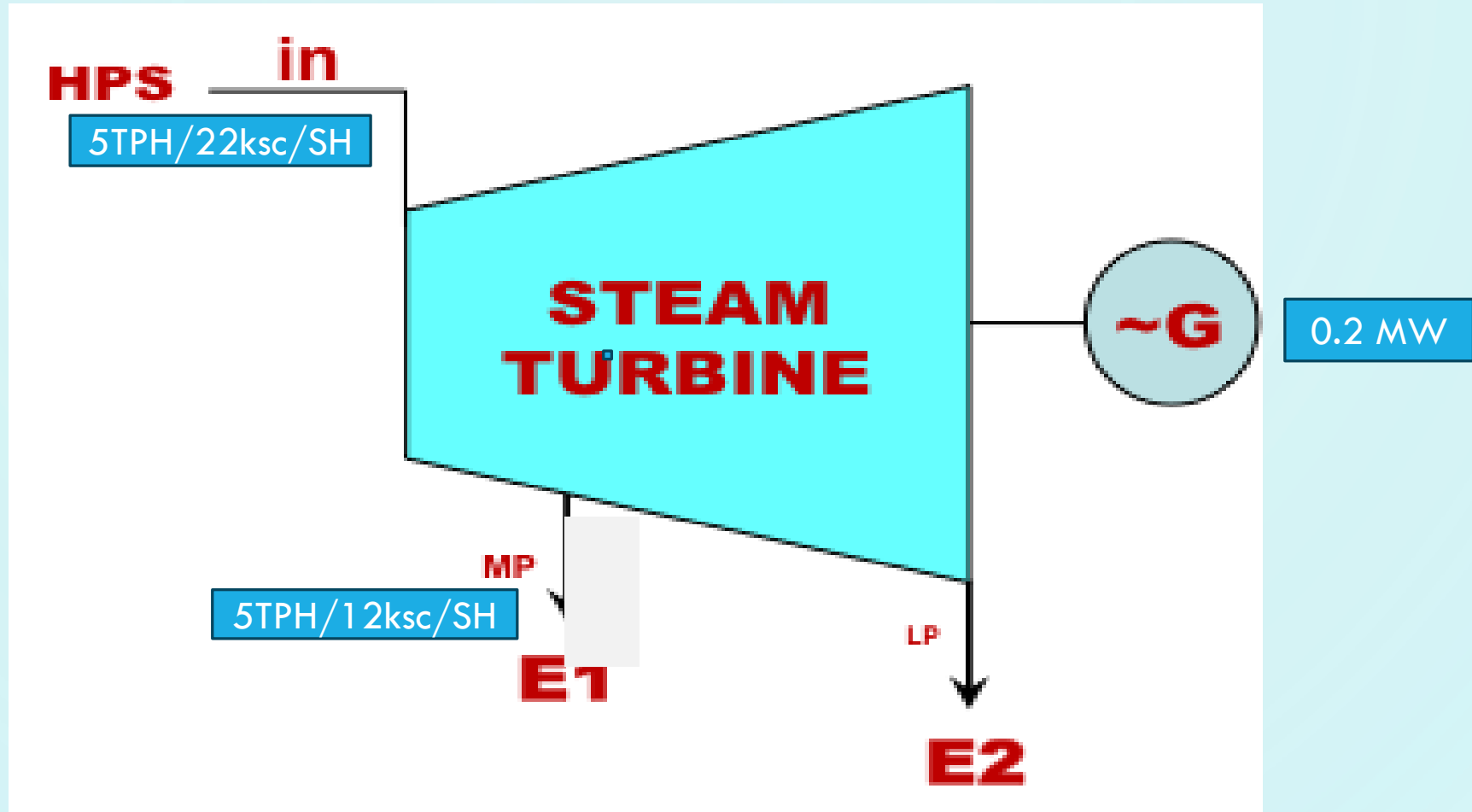
PROJECT-4 (Installation of 350TR Thermax Vapour Absorption Machine for Chilled Water Requirement of Process and Stopping of Old 50HP Screw Kirloskar Chillers). **Investment : Rs 60Lakhs**



BEST PRACTICES ADOPTATION

- 1) Implementation of ISO 50001-2018 (Energy Management System), ISO: 9001:2015, ISO: 14001:2015, ISO: 45001:2018 & RC: 14001:2015.**
- 2) Emphasizing on Procurement of Energy Products as per BEE Star Rating.**
- 3) Initiated Agreement with EESL (Energy Efficient Services Ltd) for replacement of old inefficient Motors with Energy Efficient IE3 Motors.**
- 4) Planning for Implementation of 0.2 MW Power Generation replacing PRDS with micro turbine (at Inlet 5TPH 22 ksc Superheated Steam Extraction line of 30MW STG).**
- 5) Minimization of Radiation heat losses by applying Altic Nano Insulation Paint on Hot /Warm/Cold Lines and Equipment.**

ENERGY CONSERVATION MICRO-STEAM TURBINE





THANKS

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