CII National Award for Excellence in Energy Management 2023

Kothari Petrochemicals Limited

Manali, Chennai

TEAM MEMBERS

Mr. K. Srinivasan
AGM Maintenance

Mr. Anand BR
AGM Technical Service

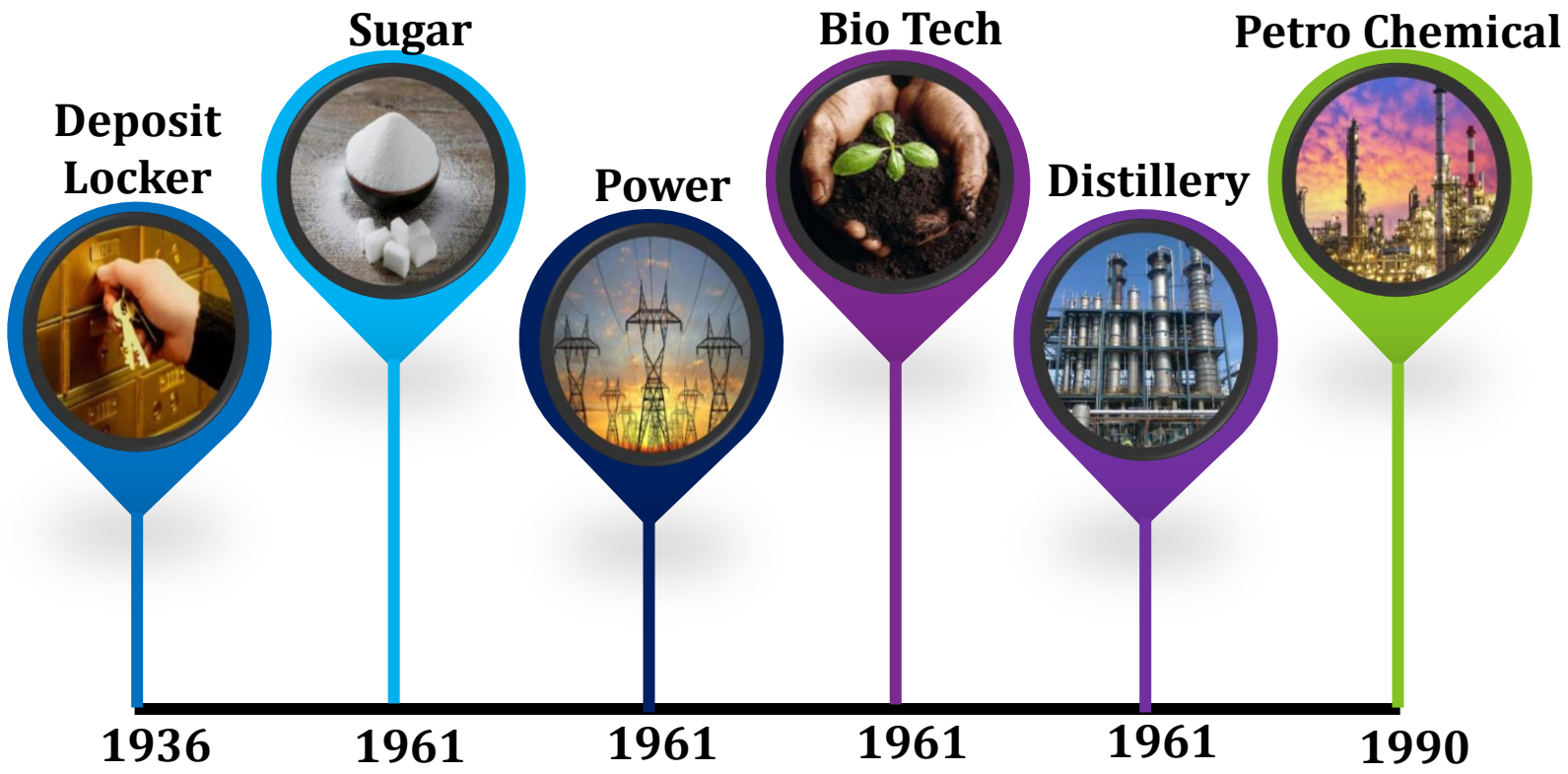
Mr. Saravanan. J
Energy Manager

Mr.Sundarakannan M
Asst. Manager – TLS

1. Kothari Petrochemicals Limited

Kothari Petrochemicals Limited, KPL, is a part of the renowned “HC Kothari Group”

Founded in 1990 KPL is the only producer of Polyisobutylene in India



Facilities

48000 MTA Polyisobutylene Production facility

2MW Captive Power Plant

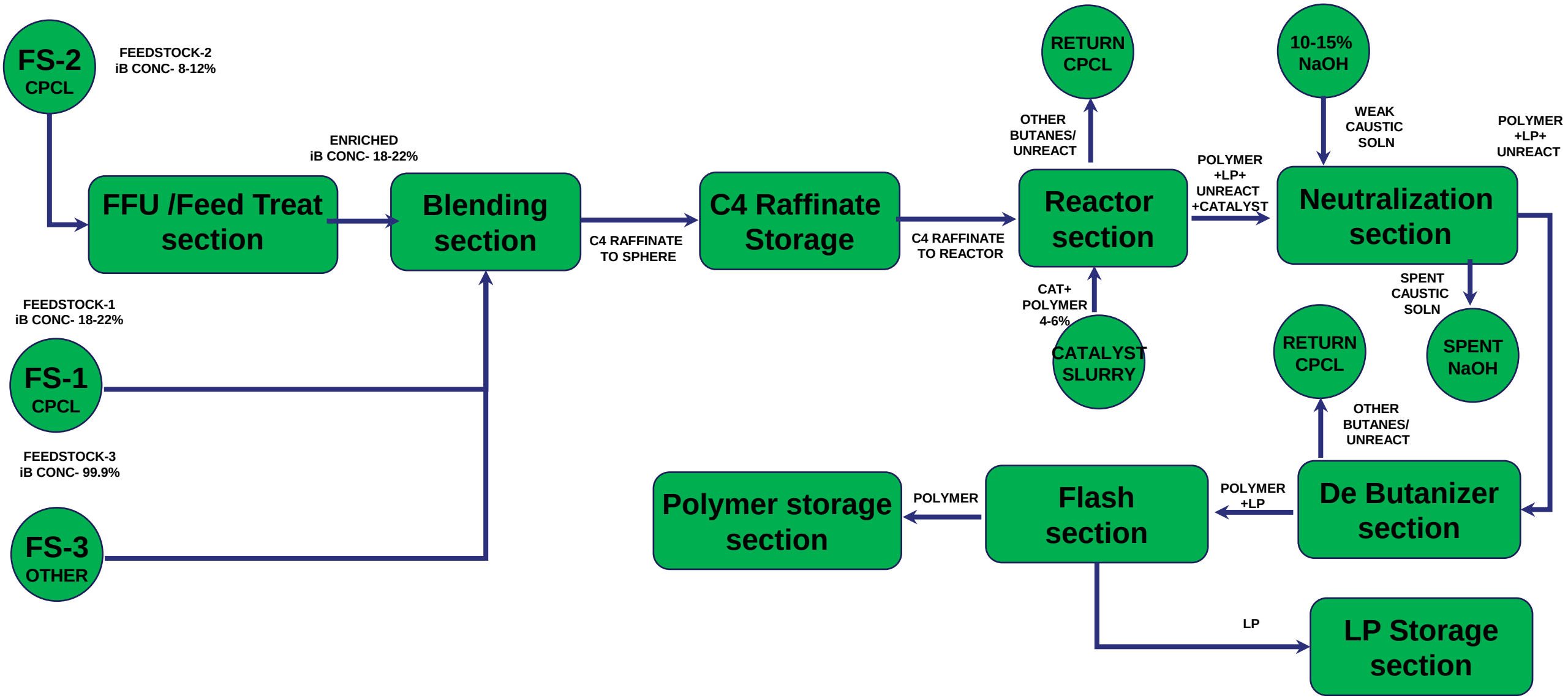
250 KW Solar Farm

210 KLD Effluent Treatment Plant

20 lakh Kcal Thermic Fluid Heater

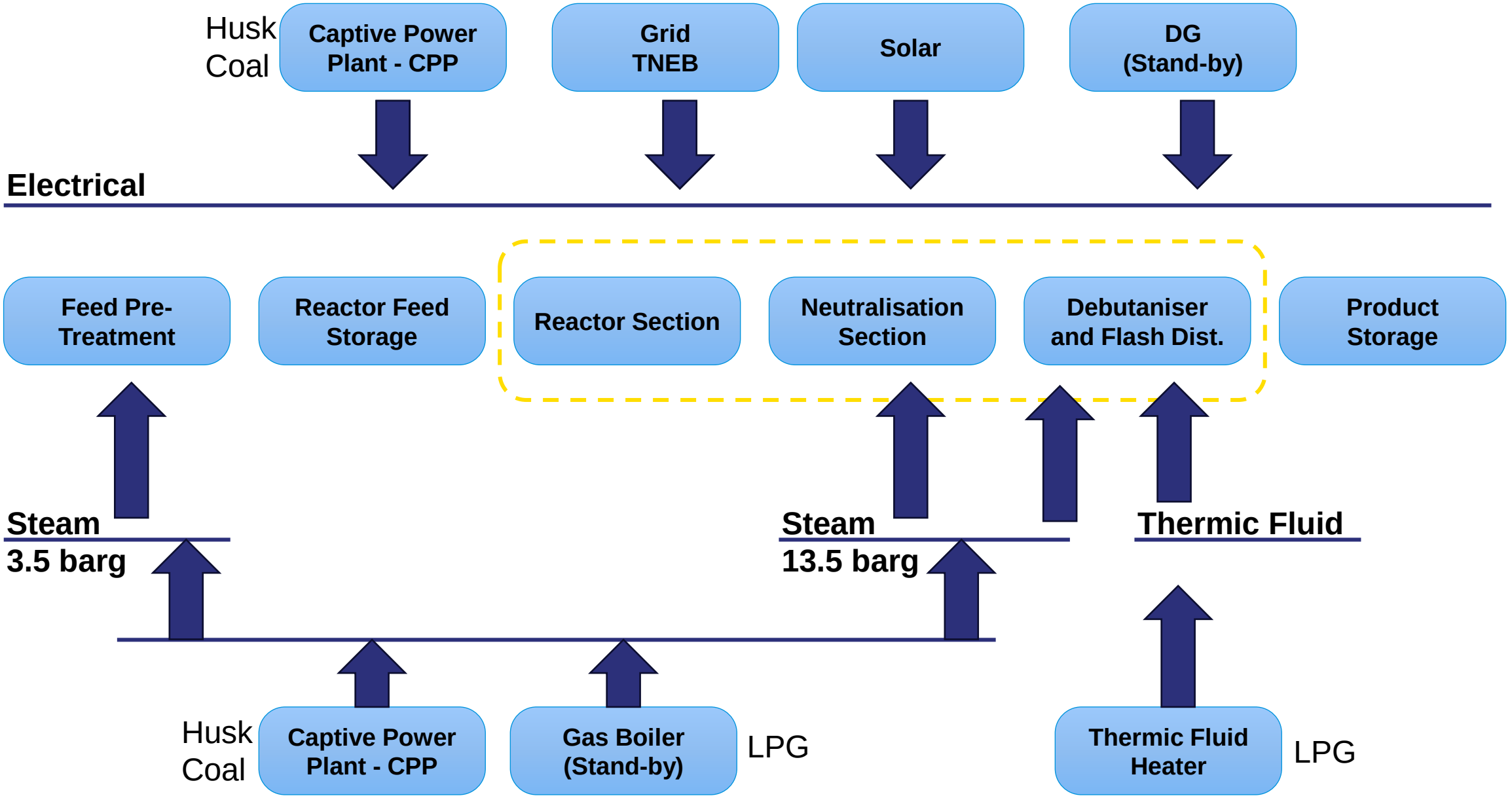
4000 KL capacity Rainwater Harvesting Pond

2. Manufacturing Process – PIB

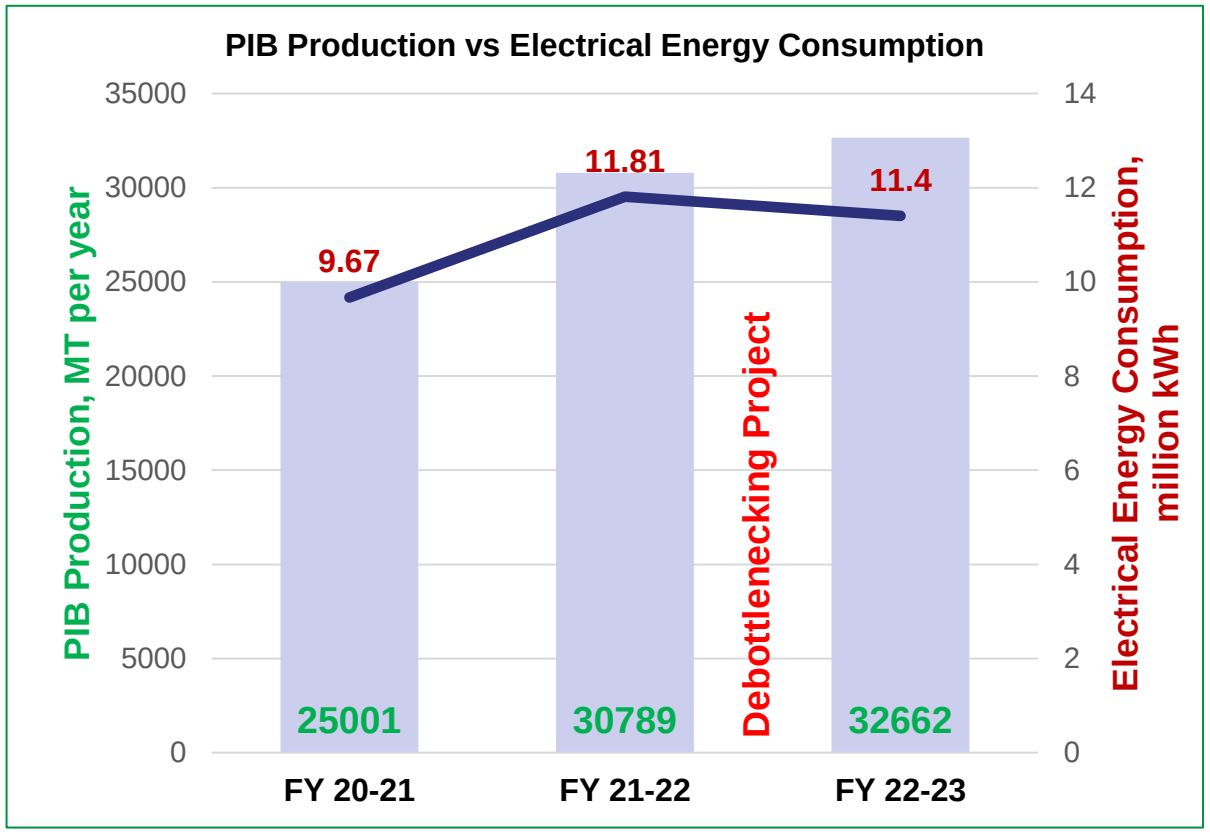


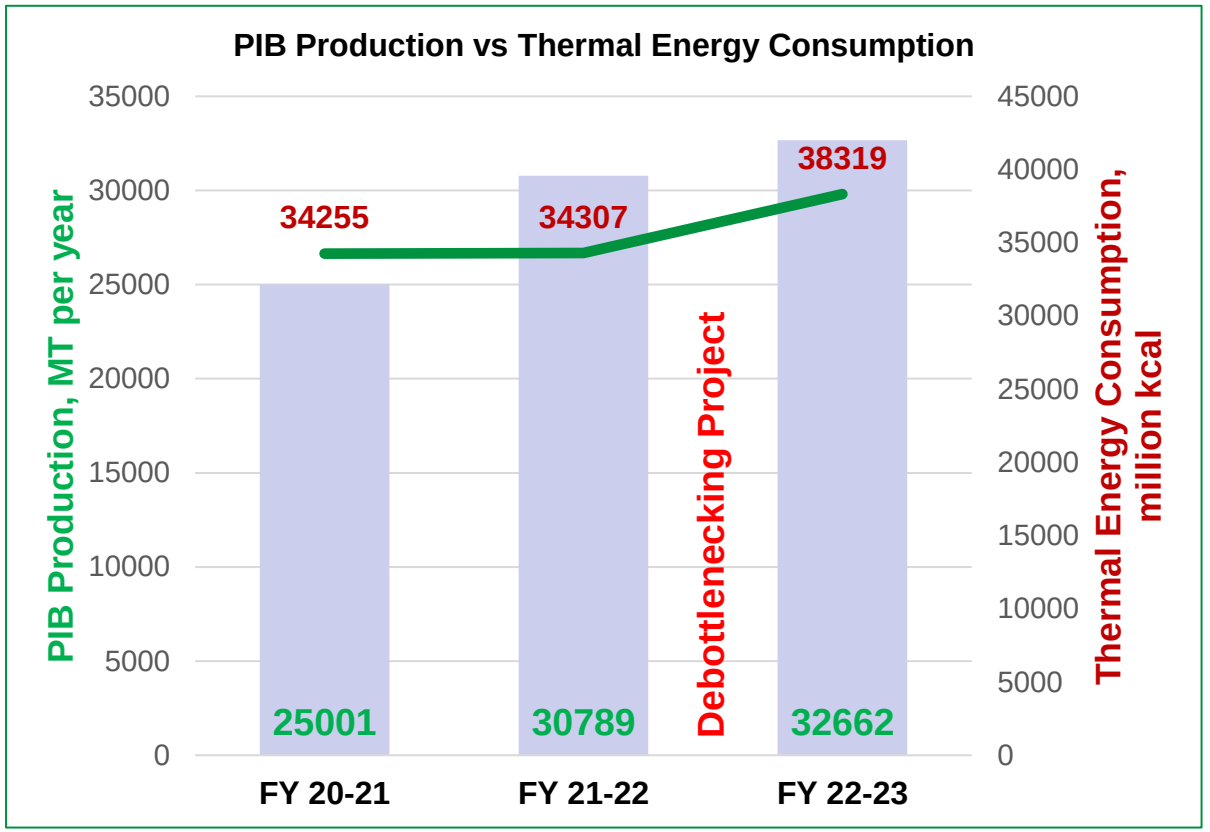
*iB- isobutylene; LP-Light Polymer; CPCL-Chennai petroleum corporation limited

Energy Consumption - Overview



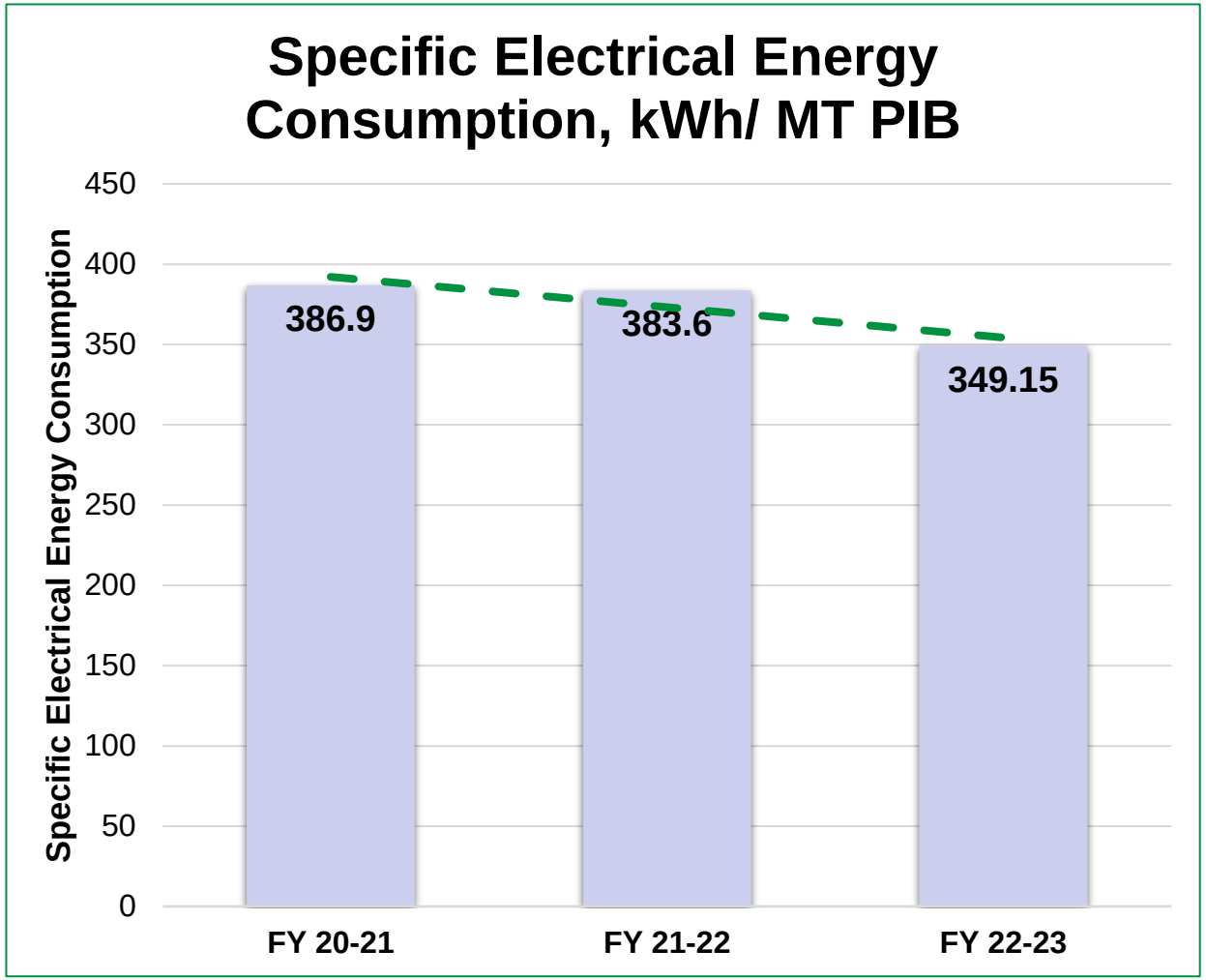
3. Specific Energy Consumption





- A major **debottlenecking project** was successfully completed in April-May 2022. **60 days S/D in FY22-23**
- Plant availability is reduced by 14% during the FY22-23, from the previous FY, as planned shutdown taken for the project
- Total PIB production **increased by 6%** from previous FY
- Absolute electrical energy consumption **reduced by 3%** from previous FY
- Absolute thermal energy consumption **increased by 11.6%** from previous FY

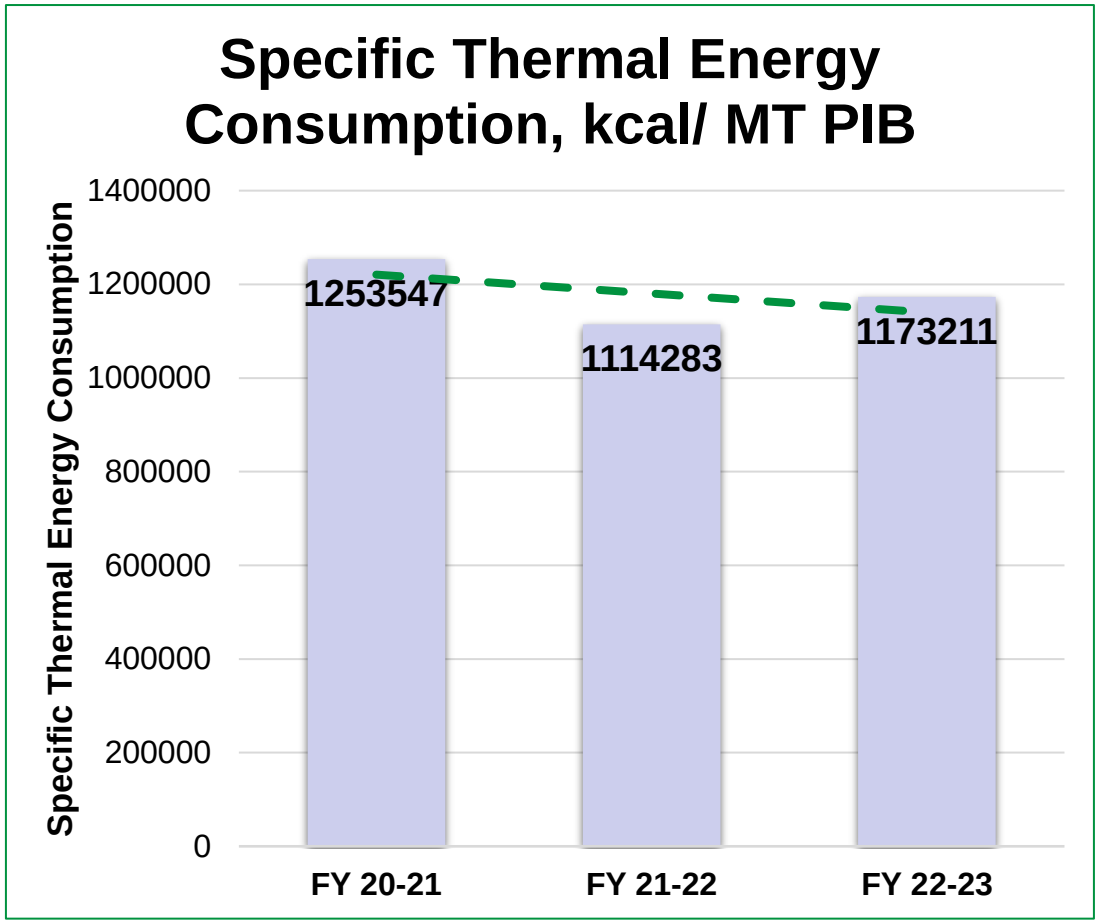
3. Specific Energy Consumption



- There has been a significant **reduction** in the specific electrical energy consumption – **9%**
- Many energy-saving initiatives are carried out during the **debottlenecking project.**
  - Process refrigeration reciprocating compressor is replaced with screw type compressor, enabled with capacity control using slide valve and VFD **(Investment - Rs. 500 lakhs)**
  - Reciprocating type air compressor is replaced with high efficiency screw type air compressor

    (Investment - Rs. 46 lakhs)
  - VFD provided process pumps **(Investment - Rs. 44 lakhs)**

3. Specific Energy Consumption



- The specific thermal energy consumption is **increased by 5%** from the previous FY.
- Reason – An additional thermic fluid heat exchanger is introduced in the process **to improve the product quality.**
- Old thermic fluid heaters (65% efficiency) were replaced with high efficient thermic fluid heaters (95% efficiency), enabled with Air Preheaters, step-less burner modulation **(Rs. 126 lakhs investment)**

With this modification **6.4%** Specific Thermal Energy is conserved

- Steam boiler (12 TPH) retrofitted with energy-efficient gas burners replacing FO usage with LPG **(Rs. 33 lakhs investment)**

4. Benchmarking

	Specific Electrical Energy Consumption kWh/ MT PIB	Specific Thermal Energy Consumption kcal/MT PIB
FY 21-22	383.6	1114283
FY 22-23	**349.15**	**1173211**

Since KPL is monopoly in PIB production in India National Benchmarking is not applicable

4. ENCON project planned in FY 23-24

Title of the Project	Annual Electrical Saving (Million kWh)	Annual Thermal Saving (Million Kcal)	Investment (Rs in Million)	Comment
ISO 50001			2.9	Implementation support for ISO 50001 Energy Management System
Additional Solar Installation	0.2		60	100 kW additional roof top solar installation planned
Portable VOC meter to identify leakages			0.39	Portable VOC meter is planned for procurement, to identify LPG leaks, both safety and energy point of view
Portable ultrasonic flowmeter for water, air measurement			1	Energy Management requirement to account all significant energy consumers, direct savings in energy not applicable
Screw Type Air Compressor	0.162		4.8	The existing reciprocating type Air compressor was planned for replacement, the net energy saving from the modification is captured

4. ENCON project planned in FY 23-24

Title of the Project	Annual Electrical Saving (Million kWh)	Annual Thermal Saving (Million Kcal)	Investment (Rs in Million)	Comment
ULF Treatment for CPP Cooling Tower	0.5		1.6	Cooling water parameters are controlled by ultra low frequency technology, reducing chemical consumption and reducing blowdown water from Cooling Tower
High Efficiency Motor replacement in gas compressor	0.15		0.6	High Efficiency Motor replacement in gas compressor
Additional condensate recovery		1600	1	The condensate from the storage tank farm, to heat the tank is not being recovered. Planned to recover the same.
Replacement of Insulation in Steam Header line		792	0.4	The existing insulation material was worn out, and significant thermal energy was lost to the atmosphere
Pressure pump for condensate transfer		1463	1	Instead of electrical pump, steam powered pump is planned to transfer the condensate

5. Energy saving projects in last 3 years

Financial Year	No. of Energy saving projects	Investment (INR Million)	Electrical Savings (Million kWh)	Thermal Savings (Million kcal)	Savings (INR Million)	Impact on SEC (Electrical, Thermal)
FY 2020-21	5	1.3	0.09	1158.9	2.1	7.0% increase in total SEC (TOE/MT PIB)
FY 2021-22	6	3.24	0.06	1661.41	4.0	10.6% reduction in total SEC (TOE/MT PIB)
FY 2022-23	10	**74.97**	0.853	1789.06	44.451	2.0% increase in total SEC (TOE/MT PIB)

Rs. 75 million invested for High Energy Intensity equipment during the debottlenecking project.
Total investment for the project – **Rs. 289 million**

Energy Conservation at Design Stage

KPL had taken up a major revamp in our plant under the debottlenecking project. Energy conservation opportunities have been identified in the design stage and implemented as listed below.

- Process refrigeration system is equipped with capacity control through VFD
- Process pumps have been equipped with VFD
- Heat Exchanger Networking – Reactor feed precooling is achieved through heat exchange with reactor downstream fluid
- Cooling water utilisation was optimised with cooling water flow control
- New hot oil system is equipped with energy-efficient burners with intelligent burner management system
- Flue gas heat is also recovered by air preheater
- Reciprocating air compressor has been replaced with high energy efficient screw compressor with VFD

6. Innovative Projects Implemented

Kothari PETROCHEMICALS LTD

Project: Ultra Low Frequency (ULF) based Cooling Water Treatment System
Description: Treatment of cooling water based on the new technology (ULF) instead of conventional chemical treatment. We are the first implementor in petrochemical plant Chennai.
Investment: **Rs. 30,00,000**
Benefits Achieved: - Reduced chemical consumption for cooling water treatment - Reduced blowdown, as the COC can be maintained around 6-7 using ULF technology, compared to COC of 3-4 using conventional chemical treatment
Payback Period: 7.4 months **5.95 lakhs** (2 cooling towers – 1200 TR), monetary savings through elimination of chemical treatment, and reduced load to effluent treatment plant

Ultra Low Frequency (ULF) based Cooling Water Treatment System

- 6 Set of Emitter Coils are placed at Sump of Cooling Tower.
- 4 nos of Inductor Coils (Descaler) fixed at Cooling Tower Suction Side Sump.
- The Emitter and Descaler are Connected to Electronic Control Unit Which Produces ULF Waves

- ULF Treatment controls:
  - Hard Scale
  - Bacteria
  - Algae
  - Corrosion

7. Utilisation of Renewable Energy Sources

Kothari PETROCHEMICALS LTD

Financial Year	Technology (Electrical)	Type of Energy	Onsite/ Offsite	Installed Capacity (MW)	Generation (million kWh)	% of overall electrical energy
FY 2020-21	Captive power plant, Solar Farm	Husk Biomass as fuel to CPP, Solar Energy	Onsite	2 MW CPP 249.6 KW Solar	10.07	91.8 %
FY 2021-22	Captive power plant, Solar Farm	Husk Biomass as fuel to CPP, Solar Energy	Onsite	2 MW CPP 249.6 KW Solar	9.67	91.9 %
FY 2022-23	Captive power plant, Solar Farm	Husk Biomass as fuel to CPP, Solar Energy	Onsite	2 MW CPP 249.6 KW Solar	9.287	79.9 %

- Coal consumption during the month of Jan 2023 due to less availability of husk
- During the debottlenecking S/D and CPP S/D in Dec’22, Electricity sourced from TNEB grid

7. Utilisation of Renewable Energy Sources

Financial Year	Technology (Thermal)	Type of Energy	Installed Capacity (Million kCal)	Generation (million kcal)	% of overall thermal energy
FY 2020-21	CPP – Steam	Husk Biomass as fuel	20 Million kCal	32064	84.2 %
FY 2021-22	CPP – Steam	Husk Biomass as fuel	20 Million kCal	34307	84.6 %
FY 2022-23	CPP – Steam	Husk Biomass as fuel	20 Million kCal	31655	81.0 %

- Coal consumption during the month of Jan 2023 due to less availability of husk

8. Waste Utilisation and Management

Financial Year	Type of Waste	Quantity (MT/year)	GCV	Waste as percentage of total fuel
FY 2020-21	Off-gas	890.5	4550 kcal/kg	12.6 %
FY 2021-22	Off-gas	762.8	4550 kcal/kg	10.1 %
FY 2021-22	Off Spec product recovery and reprocessing	10.2	-	-
FY 2022-23	Off-gas	798	4550 kcal/kg	17.0%
FY 2022-23	Off Spec product recovery and reprocessing	10.2	-	-

9. GHG Inventorisation

Scope of emissions considered

Scope 1 – Captive power plant, Thermic Fluid Heater

Scope 2 – Power from Electricity Board (EB)

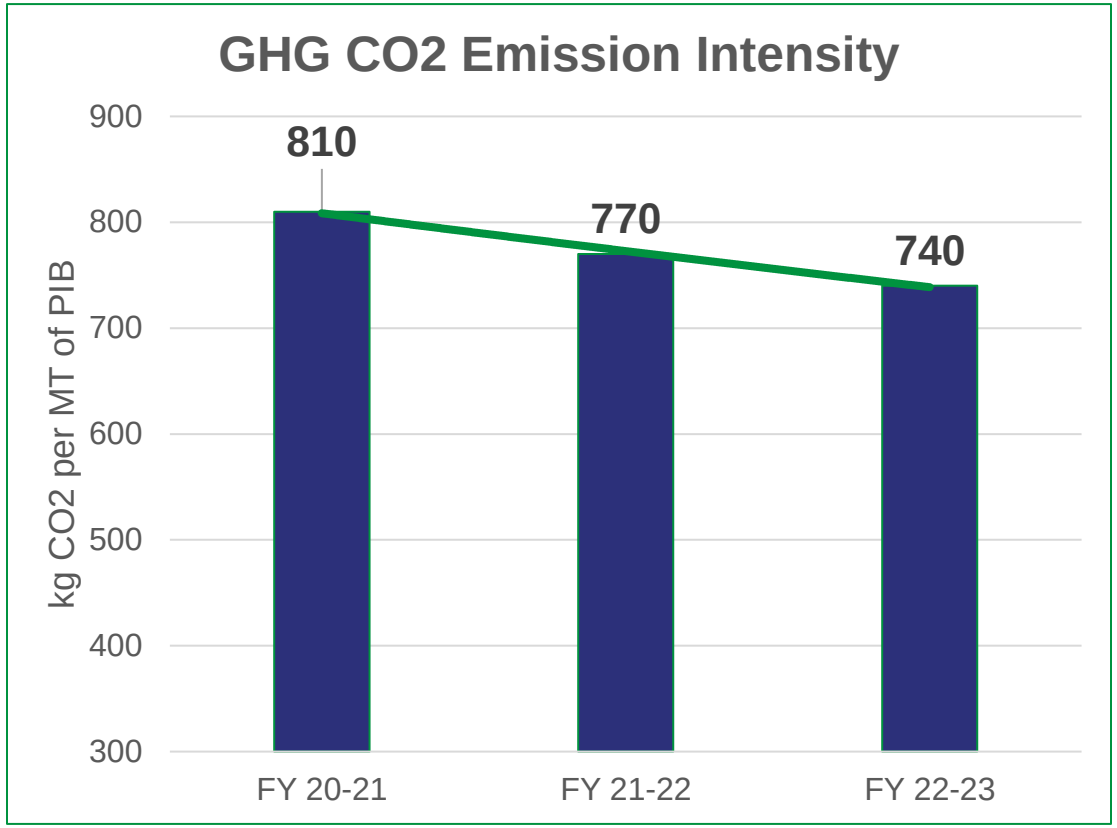
Absolute CO2 Emissions

FY 20-21 : 20240 ton CO2

FY 21-22 : 23790 ton CO2

FY 22-23 : 24192 ton CO2

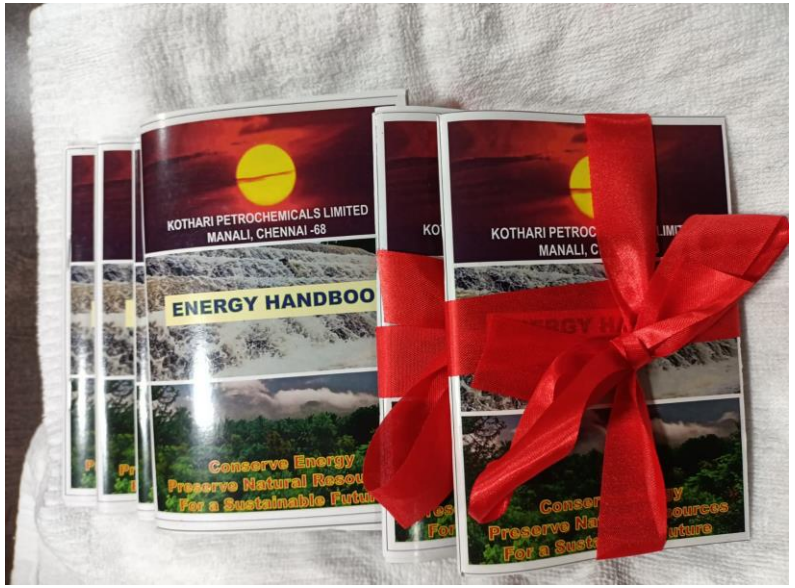
4% reduction in specific CO2 emission

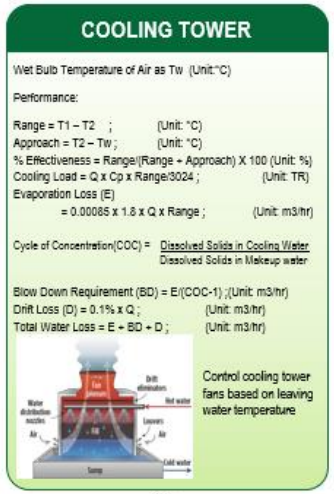


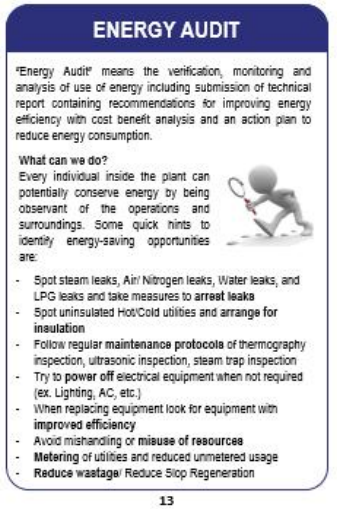
11. Teamwork, Employee Involvement & Monitoring

An energy handbook was prepared by our Energy Committee team and handed over to all the employees to encourage identification of energy conservation points at workplace.

The Energy handbook was released by our Board of Directors.







Sample pages

12. Implementation of ISO 50001

Level 1 audit for ISO 50001 was successfully completed on July 2023.

Level 2 certification audit was scheduled for September 2023

Key points:

1. Energy Management Policy was reviewed and communicated
2. Energy review and Energy Baselines (EnB) were defined
3. Targets and objectives were defined for plant level and individual sections
4. Significant Energy Consumers (SEC) were identified and monitored with Energy Performance Indicators (EnPI)
5. Energy Management Program (EnMP) with action plans were framed to meet EnMS goals

13. Learning from CII Energy Award

Kothari PETROCHEMICALS LTD

- Implementation of **ISO 50001**, with commitment from the management, we have made our sincere efforts towards implementation of ISO 50001, and have successfully completed the stage 1 audit.

- To strengthen the energy review on a continual basis, digitalization of the **Energy Management System** was planned. We have approached several vendors and discussions under progress for implementation.

- **Energy Cell** with members from all departments have been active in contributing towards implementation of ENCON projects, and to increase awareness among all level of employees on Energy Conservation.

- A dedicated **online portal** is in place, such that employees can provide their **suggestions** related to energy conservation measures related to their work place.

NATIONAL ENERGY CONSERVATION DAY 2022 celebration

For every National Energy Conservation Day KPL committed to raise awareness of energy conservation.
The primary purpose of the celebration is to reduce energy consumption and encourage efficient energy use.
In the KPL plant, we organized events such as Slogan Contests, Poster Contests, Quiz Contests, Energy Suggestion Contests, etc.
To improve awareness on energy conservation to the public, cycle rally was conducted by KPL employees

Winner of National Energy Conservation Award 2022 by BEE

• On December 14, 2022 (National Energy Conservation Day), Kothari Petrochemicals Ltd received **First Prize** in **National Energy Conservation Awards (NECA) 22** conducted by **Bureau of Energy Efficiency** (**BEE**), in **Petrochemical Sector**.

• The Award was received by Mr. M. Rajavel, Whole Time Director, and Mr. Premapiriyan, VP Operations, from **the Honourable President of India, Smt. Droupadi Murmu** in presence of Honourable Union Minister of Power and New & Renewable Energy Shri. R.K. Singh and the Honourable Minister of State of Power and Heavy industries, Shri. Krishnan Pal.

Other Prestigious awards received by KPL for Energy Management in FY 22-23

National Award for Excellence in Energy Management by CII

FIICI Chemicals & Petrochemicals Awards – Efficiency in Energy Usage

Excel Industries Award for Excellence in Energy Conservation & Management by ICC

“Silver Award” of the CII-SR EHS Excellence Awards 2022