AUROBINDO

AUROBINDO PHARMA LIMITED

Unit-XIV, Parawada,

Visakhapatnam, AP.

22nd CII National Award for Excellence in Energy Management-2021

Presenting team members:

1. **Mr. S.Harshavardhan Reddy –DGM-Engg HOD.**
2. **Mr. P.Venkat Sriram Sekhar – BEE Certified Energy Manager (EM-1215).**
3. **Mr. A.Sudhakar Naidu – Manager Electrical.**
4. **Mr. B.Kranthi Kumar – Corp. Engineering.**

Company Overview

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7th Largest Generic Company by sales globally#

2nd Largest listed Indian Pharmaceutical company by revenues*

2nd Largest generic Company by Rx dispensed in the US**

Amongst Top 10 Gx companies in 4 out of Top 5 Europe Countries@

34 Years In Existence

$ 3.3 Bn
Global Revenues in FY20

27 Manufacturing & Packaging Facilities globally

155+
Markets Presence

>36 Billion
Diverse dosage forms manufactured in FY20

>23,000
Employees

Facility & Major Equipment

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Facility

Facility Details

Total Factory area	86036 m² (21 Acrs)	
Build up Area	33466 m²	38 %
Roads	16607 m²	20%
Green Belt area	27854 m²	33%
Future Expansion	8108 m²	9%

Installed Reactor Capacity 1024 KL

Process Equipment

- Rectors : 76 No's
- Centrifuges : 25 No's
- ANFD : 14 No's
- Tray driers : 20 no's

Utility Equipment

- FBC boiler : 12 TPH
- Air Compressors : 2314CFM
- Chillers(+5°C) : 1765 TR
- Chillers (-20°C) : 360 TR
- Chillers (-30°C) : 300 TR
- Nitrogen plant : 500 Nm³/hr
- Cooling towers : 8400 TR

Electrical

- HT Connected : 33 KV
- Transformer: 3 No's X 2500KVA
- DG system : 2 No's X 3000KVA

Energy Conservation Key Focus Areas

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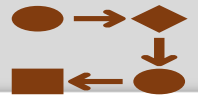
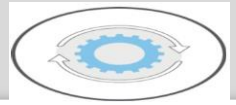
Energy cell

Major Key Focus Areas



Process Areas

- Identifying and reducing of idle equipment's running
- Identifying and reduction of waste utilization process utilities
- Identifying the efficient equipment while selection
- Identifying and reducing of waste heat in hot water generation system



Utilities

- CTW/CHB/CHW Operation
- Air Compressors
- HVAC
- Vacuum systems
- Water Distribution system
- Steam

Environment

- Reduction in fresh water consumption
- Effluent reduction
- Utilization & Recovery

Electrical

- General Lighting
- Energy Efficient equipment". Optimization of electrical power requirement.
- DG & other operations
- Technology Updating

Energy Efficient Equipment Installed In Unit-XIV

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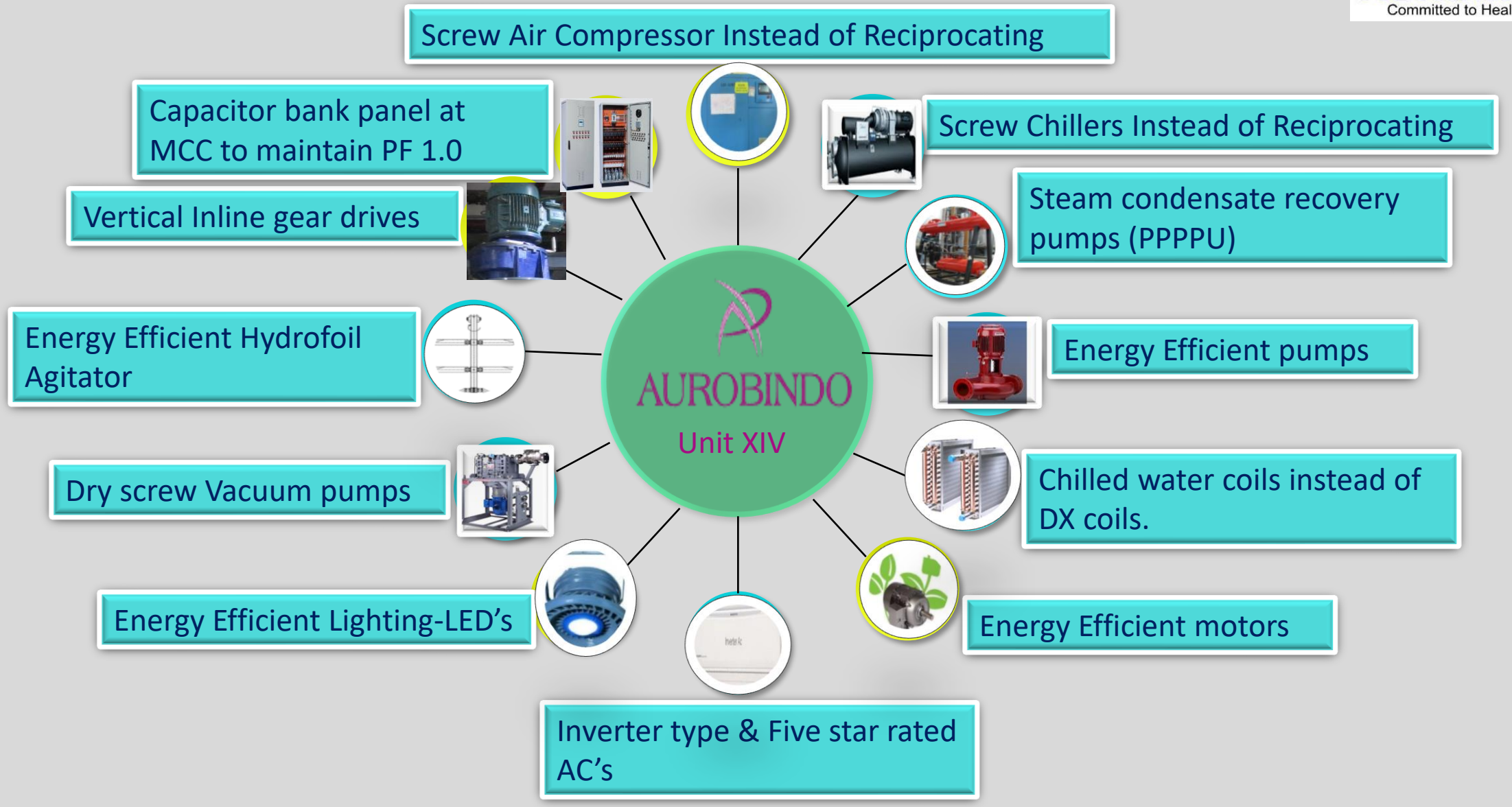

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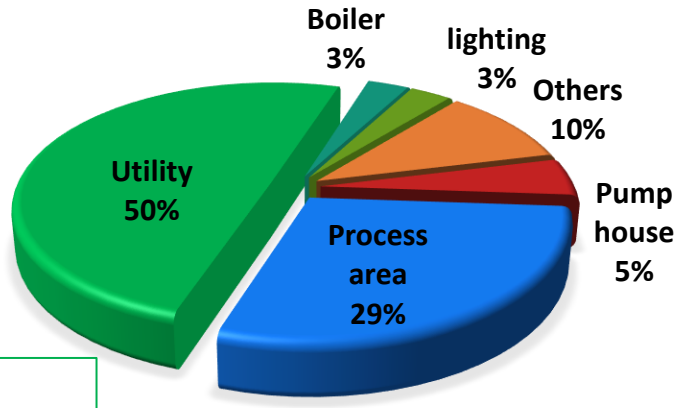
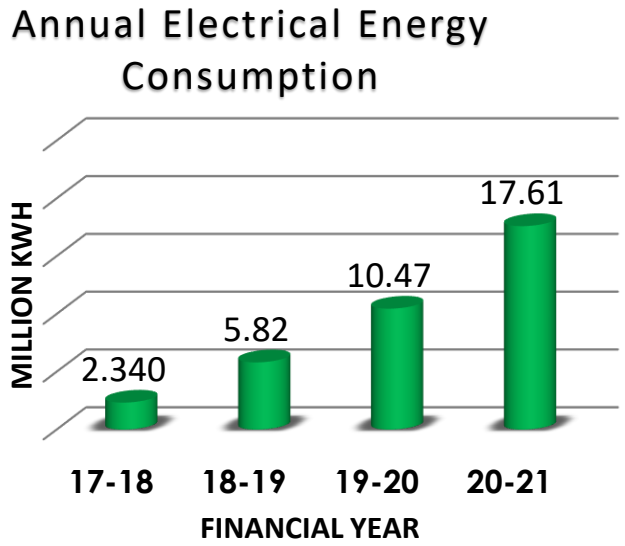
Electrical energy

- ✓ CMD approval - 3500 KVA
- ✓ Connected load HP/KW - 15525/11643

Intensive area:

1.Chilling plant, HVAC, Compressors & Process area



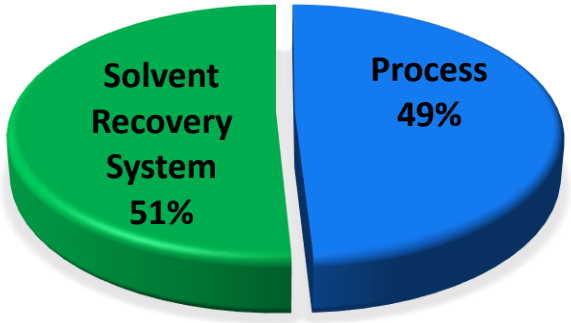


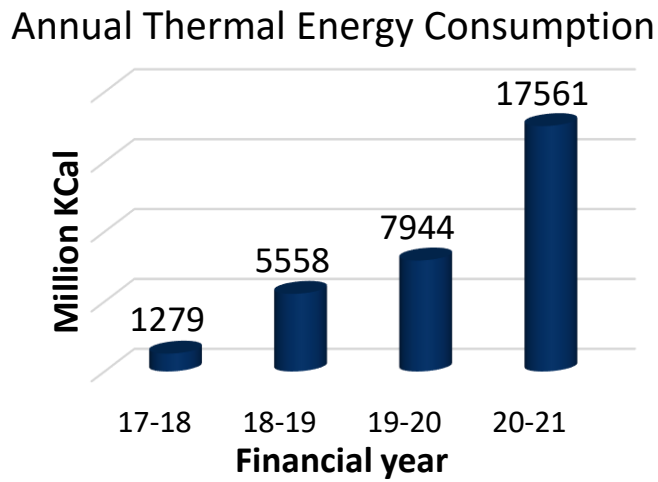
Thermal energy

- ✓ Installed Boiler – 12 TPH

Intensive area:

1.Solvent Recovery System
2. Process area (Reactors, Driers & hot water system)





Installed Reactor Capacity Vs Actual Production Vs Energy

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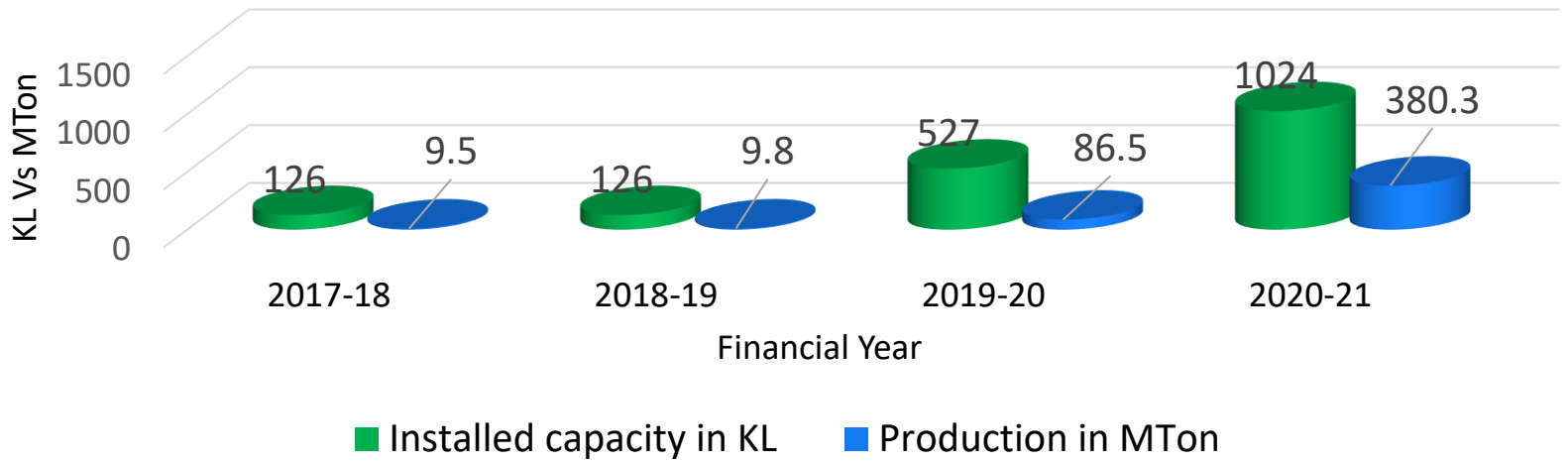
Production Overview:

FY 2017 to 2021

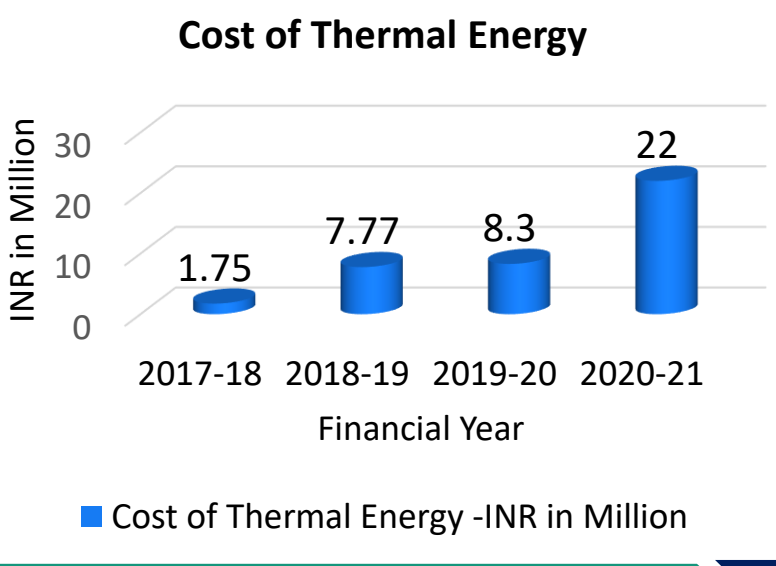
8.1 Times- Installed capacity
40 Times Production

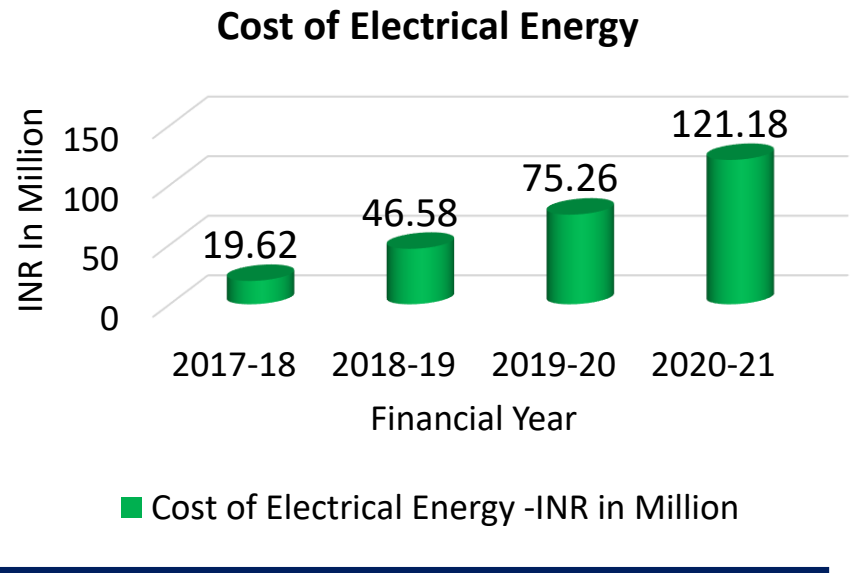


Energy Cost Overview:

FY 2017 to 2021

12.5 Times- Thermal
6 Times Electrical





Specific Energy Consumption In last 4 Years (FY 2017-21)

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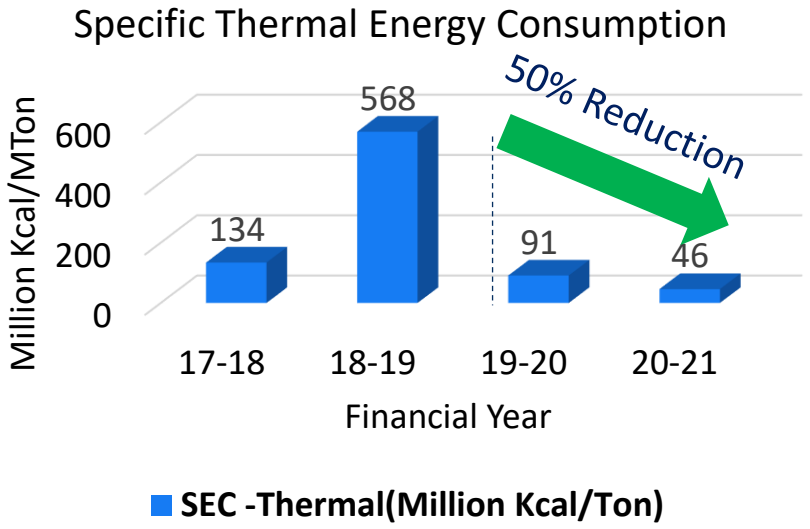
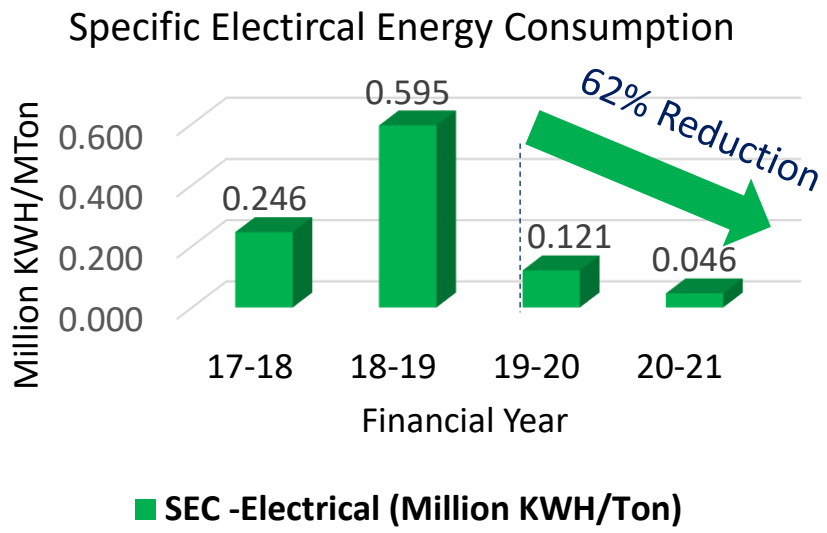
SEC w.r.t Production Overview:

FY 2019-20 to FY 2020-21

50% Thermal Energy
62% Electrical Energy

339% Production

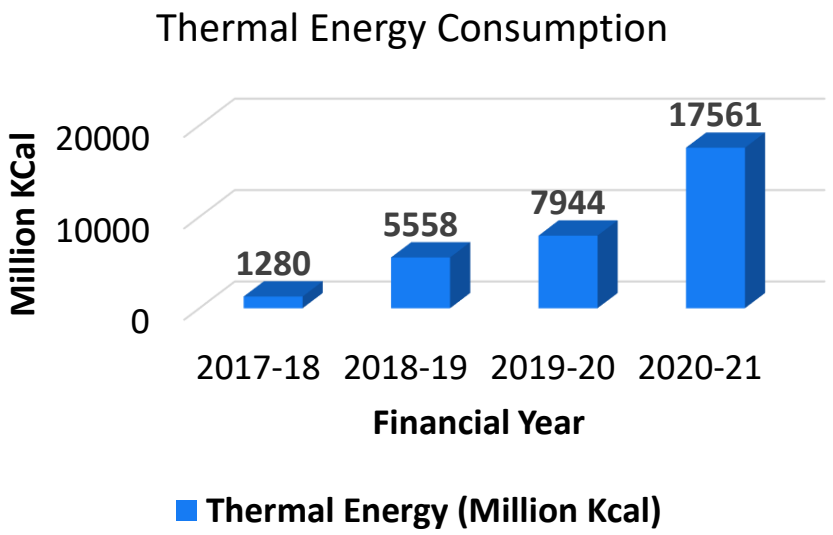


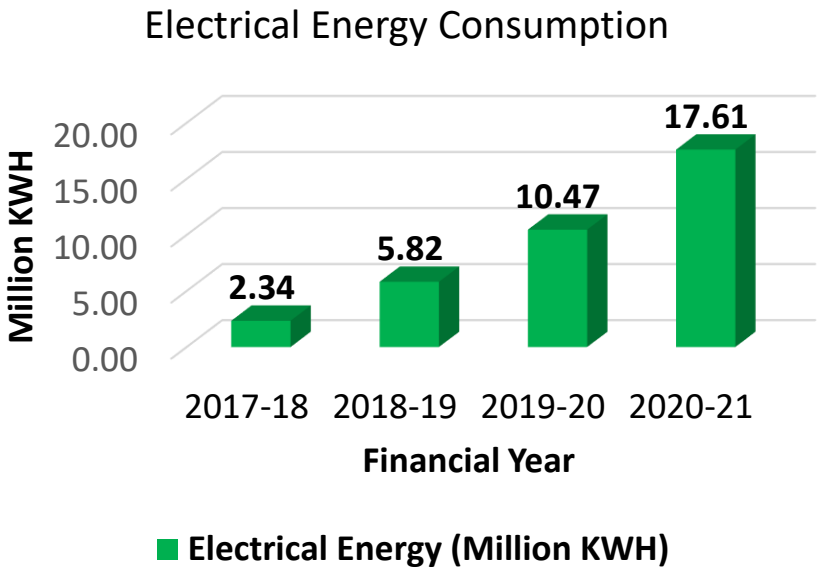


Energy Overview:

FY 2019-20 to FY 2020-21

121% Thermal Energy
68% Electrical Energy





Specific Energy Consumption (MTOE/MTON)

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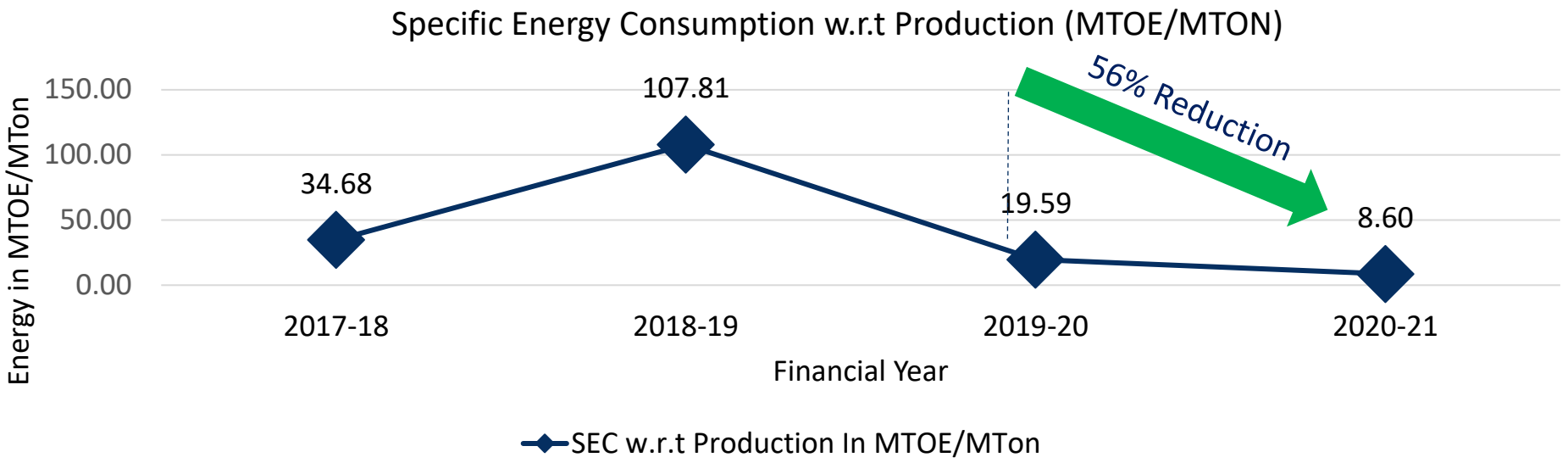
SEC w.r.t Production:

FY 2019-20 to FY 2020-21

56% Specific Energy

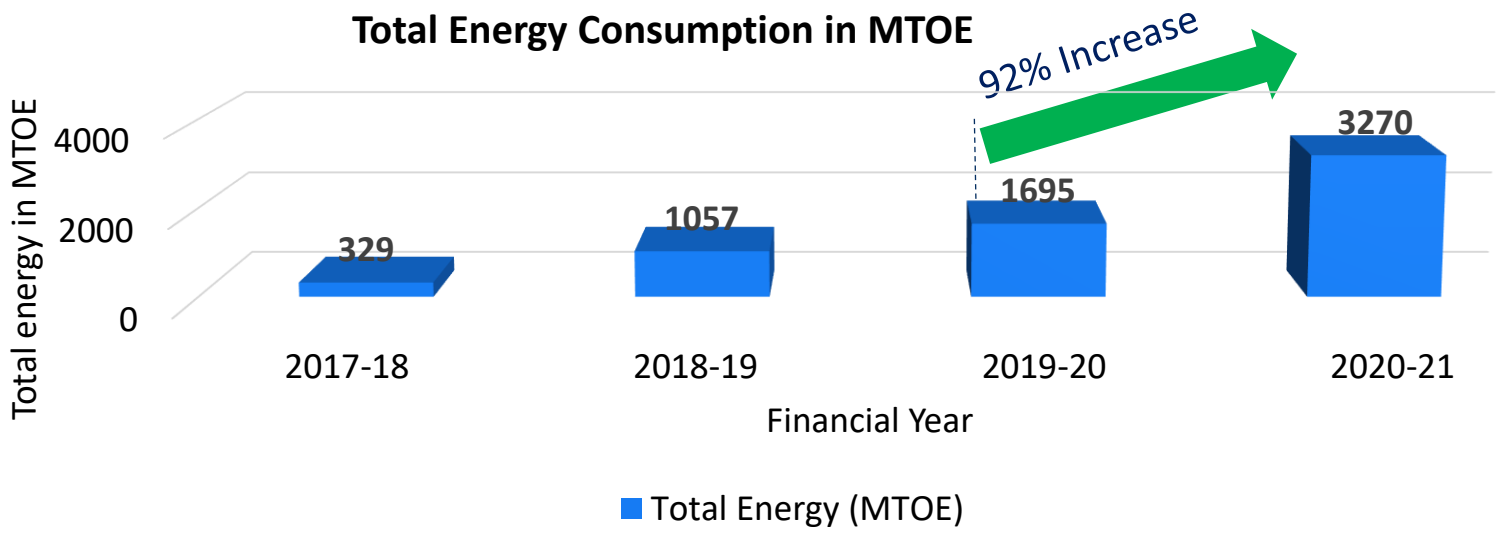


Energy Overview:

FY 2019-20 to FY 2020-21

92% Total Energy

339% Production



Refrigeration plants:

Name of the Equipment	Design Temp °C	Design SEC KW/TR	Operating SEC KW/TR	Benchmark SEC KW/TR
Reciprocating Chillers	-30	2.5	**1.5**	2.5
Screw Chiller	+5	0.65	**0.65**	0.65
	-20	1.97	**1.6**	2.0

Air Compressors:

Name of the Equipment	Design SEC KW/CFM	Operating SEC KW/CFM	Benchmark SEC KW/CFM
Reciprocating Compressor	0.17	**0.17**	0.19
Screw Compressor	0.16	**0.16**	0.19

Boiler:

Name of the Equipment	Design Steam Fuel Ratio	Operating Steam Fuel Ratio	Benchmark Steam fuel ratio
Boiler	5.5	**5.0**	6.0
Steam Condensate recovery	---	**80 %**	85%

List Of Major Encon Projects Planned in FY 2021-22

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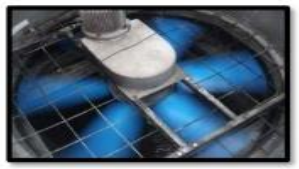
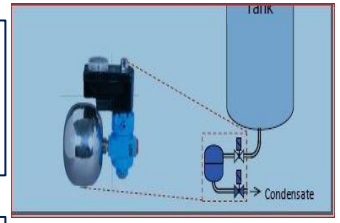
Total projects: 11 No's Investment: Rs12.2 Mn

VFD's for utility pumps
Investment: Rs.0.72 Mn
EE Saving Mn KWH/Year: 0.21

Energy efficient CT fan blades
Investment: Rs.0.1 Mn
EE Saving Mn KWH/Year: 0.19



No air loss drain valves
Investment: Rs.0.165 Mn
EE Saving Mn KWH/Year: 0.09



Steam operated traps (SOPT)
Investment: Rs.1.08 Mn
TE Saving Mn KWH/Year:1.5

Auto tube cleaning
Investment: Rs.2.50 Mn
EE Saving Mn KWH/Year: 0.18

Process time cycle reduction

Automation

Adopt the Energy efficient equipment

Equipment Efficiency Enhancement

Energy Resources

Solar power
Investment: Rs.1.23 Mn
EE Saving Mn KWH/Year : 0.07

IE4 Motors
Investment: Rs.1.67 Mn
EE Saving Mn KWH/year :0.33

Welding machines (Transformer to Inverter type)
Investment: Rs.0.75 Mn
EE saving Mn KWH/Year:0.09

Air compressor loading hrs reduction by installation of IFC
Investment: Rs.2.97 Mn
EE Saving Mn KWH/Year :0.26

Power reduction in DX coil by installing the Artic master
Investment: Rs.0.06 Mn
EE Saving Mn KWH/Year: 0.003

Note:
EE-Electrical Energy
TE-Thermal Energy
Mn-Million

Energy Saving Projects Implemented in Last Three Years

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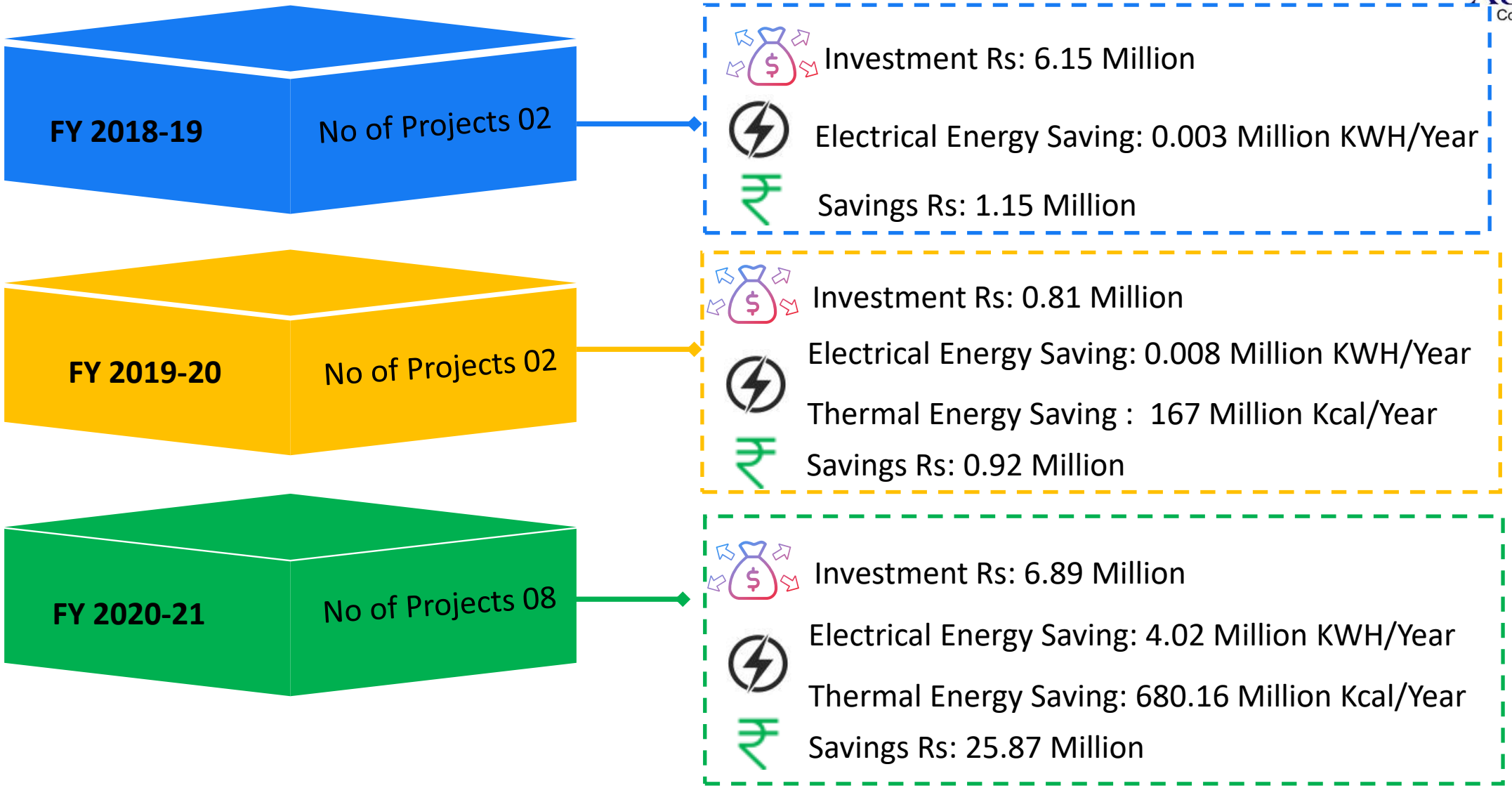

Energy Saving Projects Implemented in Last Three Years

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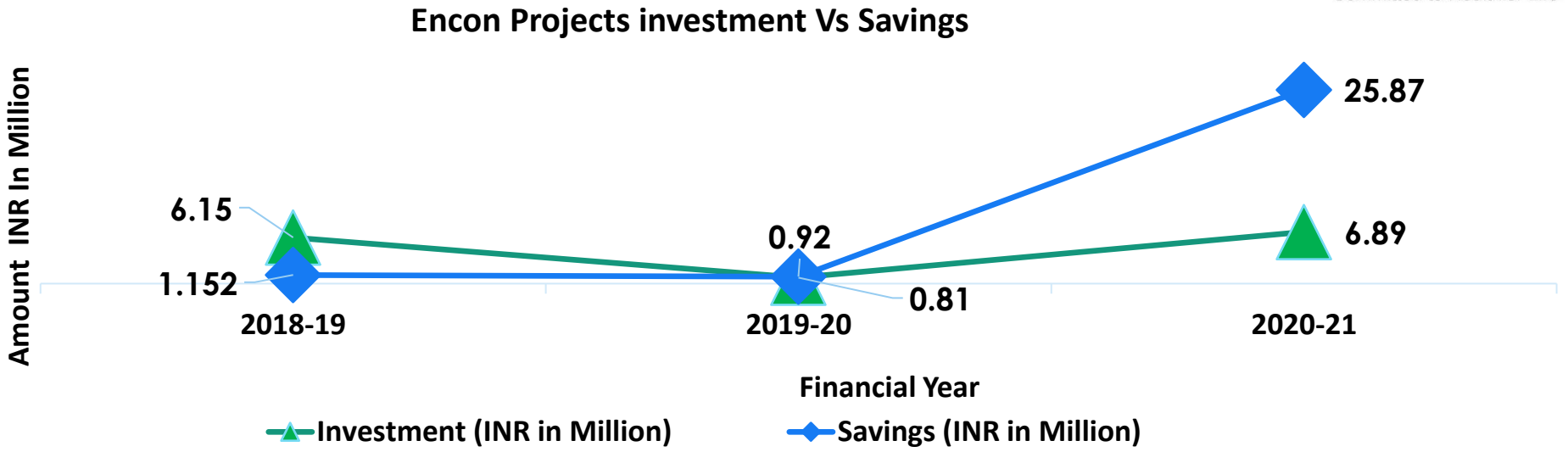
Investment Vs Savings Overview:

FY 2019-20 to FY 2020-21

8.5 Times -Investment

28 Times –Savings

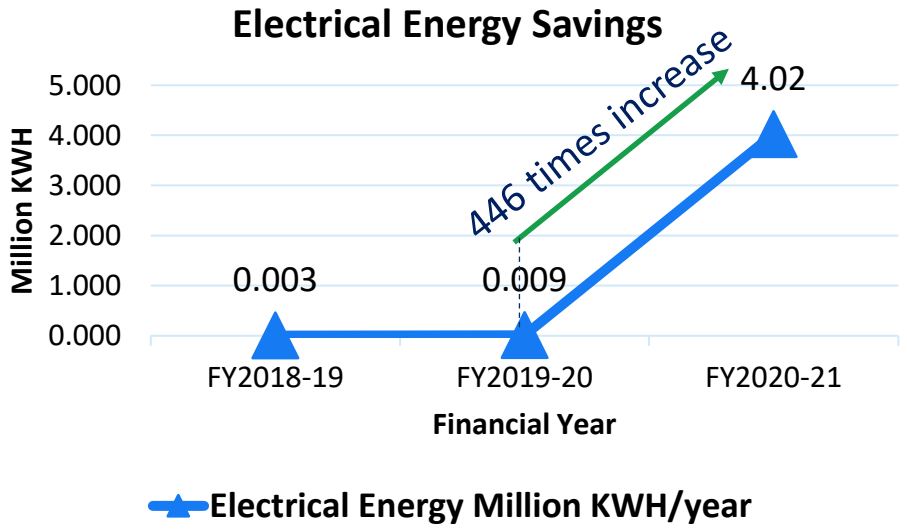


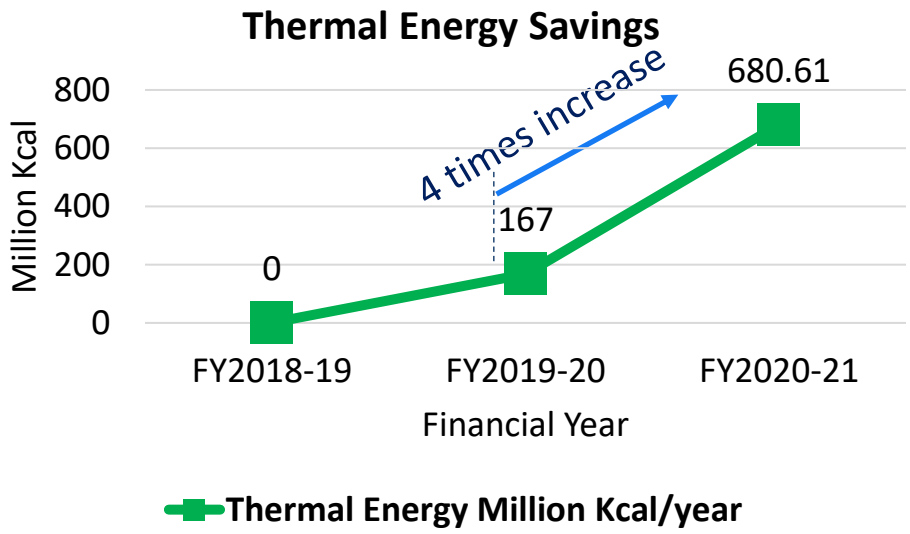
Savings Overview:

FY 2019-20 to FY 2020-21

446 Times -Electrical

4 Times –Thermal





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FY 2018-19:

S.No	Project Details	Investment INR in Million	Savings INR in Million
1	**LED lights:** Replacement of old and Energy intensive lighting appliances with Energy Efficient LED lights.	0.15	0.028
2	**Upgradation 11 KV to 33KV:** Upgradation of electrical distribution system from 11 KV to 33 KV for reduction of Energy losses.	6.0	1.12

FY 2019-20:

S.No	Project Details	Investment INR in Million	Savings INR in Million
1	**VFD Installed:** Installation of VFD control system for Boiler ID Fan to optimize the Energy consumption.	0.11	0.42
2	**Boiler Condensate Heat recovery:** Installation of Steam condensate pumps (PPPPU) for immediate transfer of Steam condensate.	0.70	0.49

Energy Saving Projects FY 2020-21

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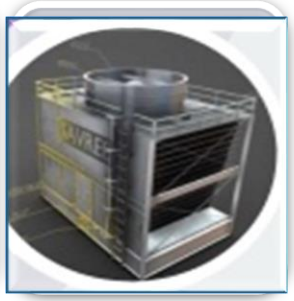
Installed Energy Efficient (IE3) Motors along with vertical inline Energy efficient pumps in place of conventional motors and inefficient pumps

Energy saving (Million KWH/Year): 1.23



Auto Temperature controllers Installed for cooling towers fan to reduce the power consumption

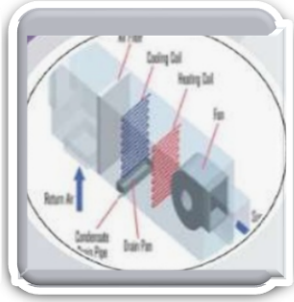
Energy saving (Million KWH/Year): 0.97

Installation of Pressure Reducing valves and Synchronisation of the Compressed air lines

Energy saving (Million KWH/Year): 0.71

Implementation of Interlocking system for RT and primary pumps of chilled water and chilled brine plants

Energy saving (Million KWH/Year): 0.36



Installed the VFD control system for AHU's to optimise the power consumption

Energy saving (Million KWH/Year): 0.33

Synchronization of Chilled brine and chilled water secondary pumps

Energy Saving (Million KWH/Year): 0.32

Installation of Centralized cooling system to dry vacuum pumps instead of individual cooling radiators

Energy saving (Million KWH/Year): 0.09

Installation of Steam condensate pumps (PPPPU) for immediate transfer of Steam condensate

Energy saving (Million KCal/Year: 680

Annual Electrical Energy Savings Million KWH /Year **4.02**

Annual Thermal Energy saving Million Kcal /Year **680.61**

Energy Saving Projects FY 2020-21

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S.No	Project Details	Investment INR in Million	Savings INR in Million
1	**Energy Efficient pumps & motors:** Installed Energy Efficient (IE3) Motors along with vertical inline Energy efficient pumps in place of conventional motors and inefficient pumps.	4.6	8.56
2	**Electrical Energy reduction -Automation:** Auto Temperature controllers Installed for cooling towers fan to reduce the power consumption.	0.2	6.70
3	**Synchronization of air compressors.** Installation of Pressure Reducing valves and Synchronisation of the Compressed air lines.	0.65	2.79
4	**Electrical Energy reduction -Interlocking:** Implementation of Interlocking system for RT and primary pumps of chilled water and chilled brine plants.	0.1	2.43
5	**Electrical Energy reduction –AHU 's VFD:** Installed the VFD control system for AHU's to optimise the power consumption.	0.36	1.54
6	**Synchronization of chilling plant secondary pumps:** Synchronization of Chilled brine and chilled water secondary pumps.	0.12	2.17
7	**Boiler Condensate Heat recovery:** Installation of Steam condensate pumps (PPPPU) for immediate transfer of Steam condensate.	0.56	0.94
8	**Energy savings in Vacuum pumps:** Installation of Centralized cooling system to dry vacuum pumps instead of individual cooling radiators.	0.3	0.74
	Total Cost Saving (FY 2020-21) INR in Million	**6.89**	**25.87**

Innovative Projects Implemented

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Synchronized the Main Air Distribution Header with Air compressor 02 No's instead of Air compressor 05 No's, Based on high unloading hrs and low loading Hrs.

FY 2020-21

Re-Usage of Purified Water Generation Plant RO-II Reject water as 12 TPH Boiler feed water instead of dedicated RO treated water plant.

FY 2020-21

The Existing +5°C utility provision used to avoid the running of individual vacuum pumps radiator.

FY 2019-20

Existing Manual operation of utilities modified into automation for crystallizer reactors

FY2018-19

₹ Annual Cost saving Million/Year 2.9

₹ Investment Million/Year 0.98

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01 # Synchronization of Air Compressors:

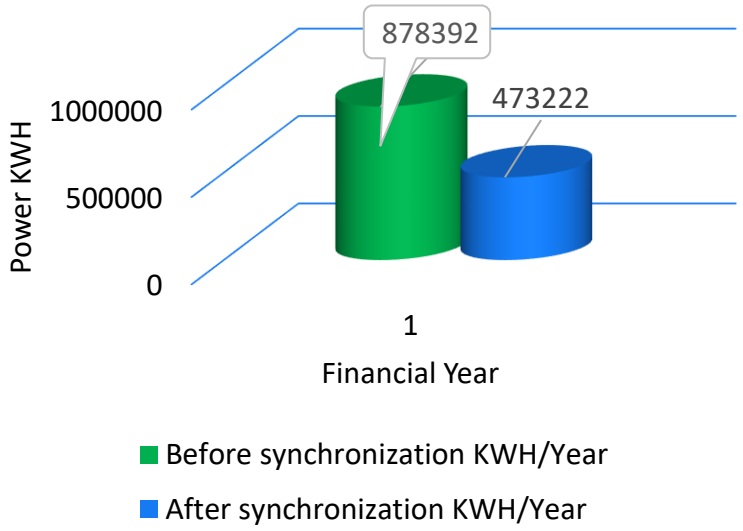
Before Synchronization Power Consumption **Million KWH/Annum- 0.87**

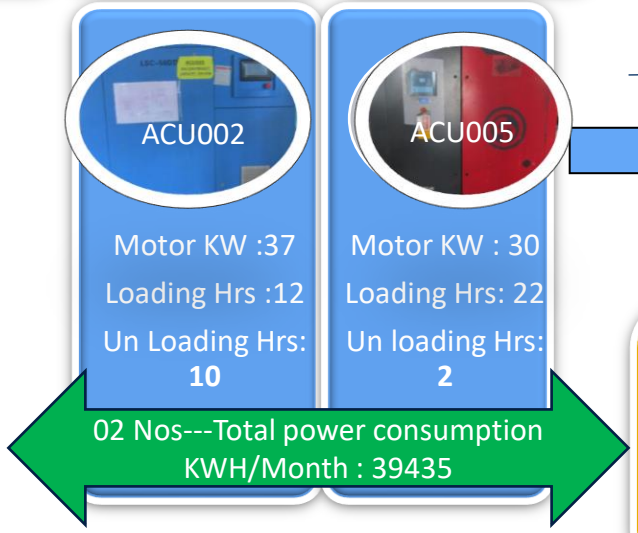
Utility

Compressed Air

Process Equipment

Synchronization of Air compressors





After Synchronization Power Consumption **Million KWH/Annum- 0.47**

Instrumentation

Benefits:

Total Power Saving (Million KWH/Year) : 0.40

Total Cost saving Rs Million/Year: 2.79

Innovative Project Implemented FY 2020-21

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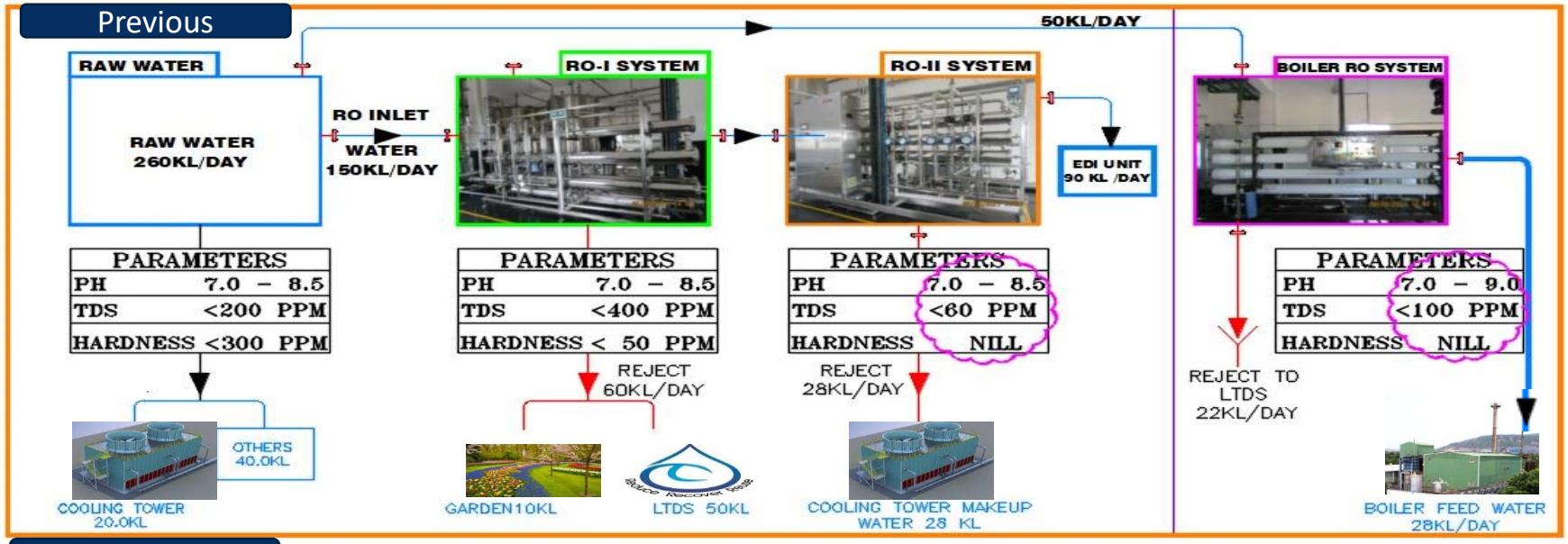
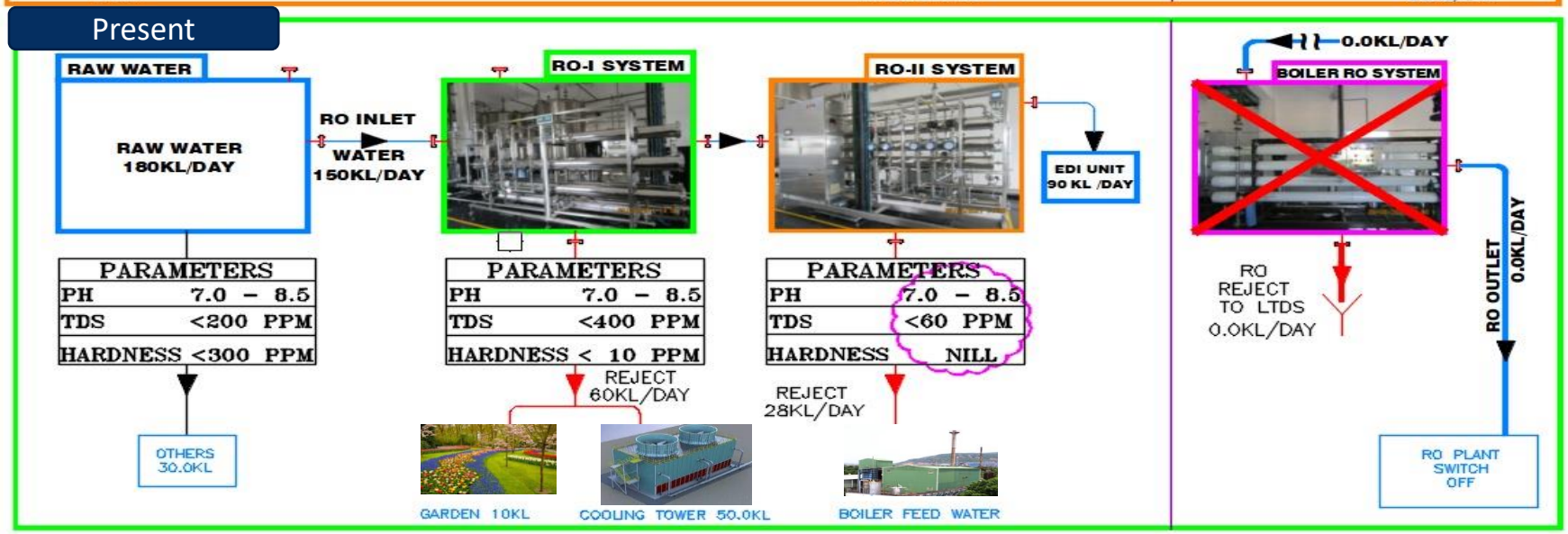
02 # Re-usage of Purified Water Generation (RO-I & RO-II) Reject Water

Previous

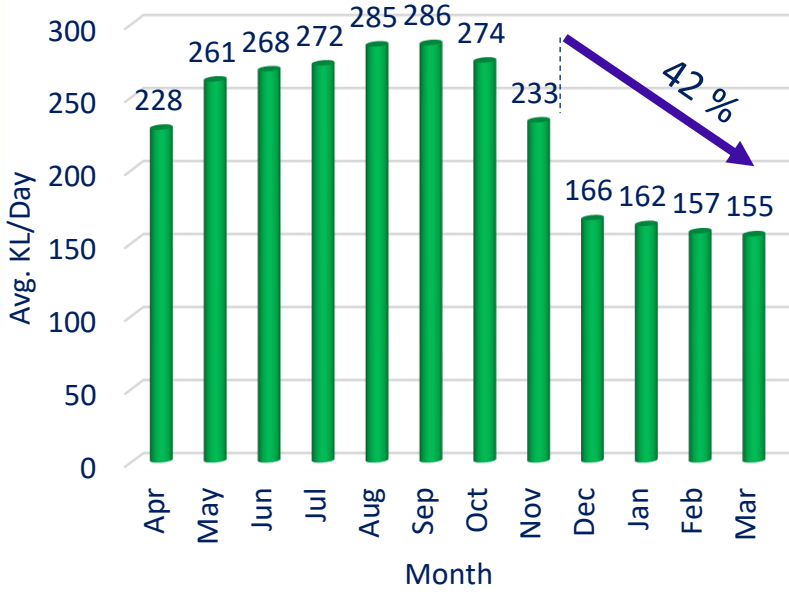


Present



- Project Was identified based on the Quality parameters of RO –II Reject water & boiler feed water are same.

Raw water Consumption FY 20-21



Benefits:

- Reduction in Raw water Consumption Avg. 80 KL/day @ 42%.
- Savings INR in Million /Year :1.11

Projects Implemented Through Kaizen

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1. Optimize the Sequential timer set time from 30 min to 04 hrs for solvent flushing of dry screw vacuum pump without impact of performance.
2. Installation of VFD's for Pumps for efficient & optimum loading operations.
3. Replacement of AHU'S DX coil Cooling Circuit with chilled water at Production offices.
4. Optimization of the operations of vacuum pumps in Solvent Recovery & Production blocks by replacing with suitable utility systems.
5. Installation of Temperature monitoring and controllers for CT Fans for power reduction.
6. Installation of Steam condensate pumps of Pressure Powered Pump Package unit type (PPPPU) for heat recovery and reduction of coal consumption.
7. Replacement of Old non working steam traps with new steam traps.

Waste Utilization and Management

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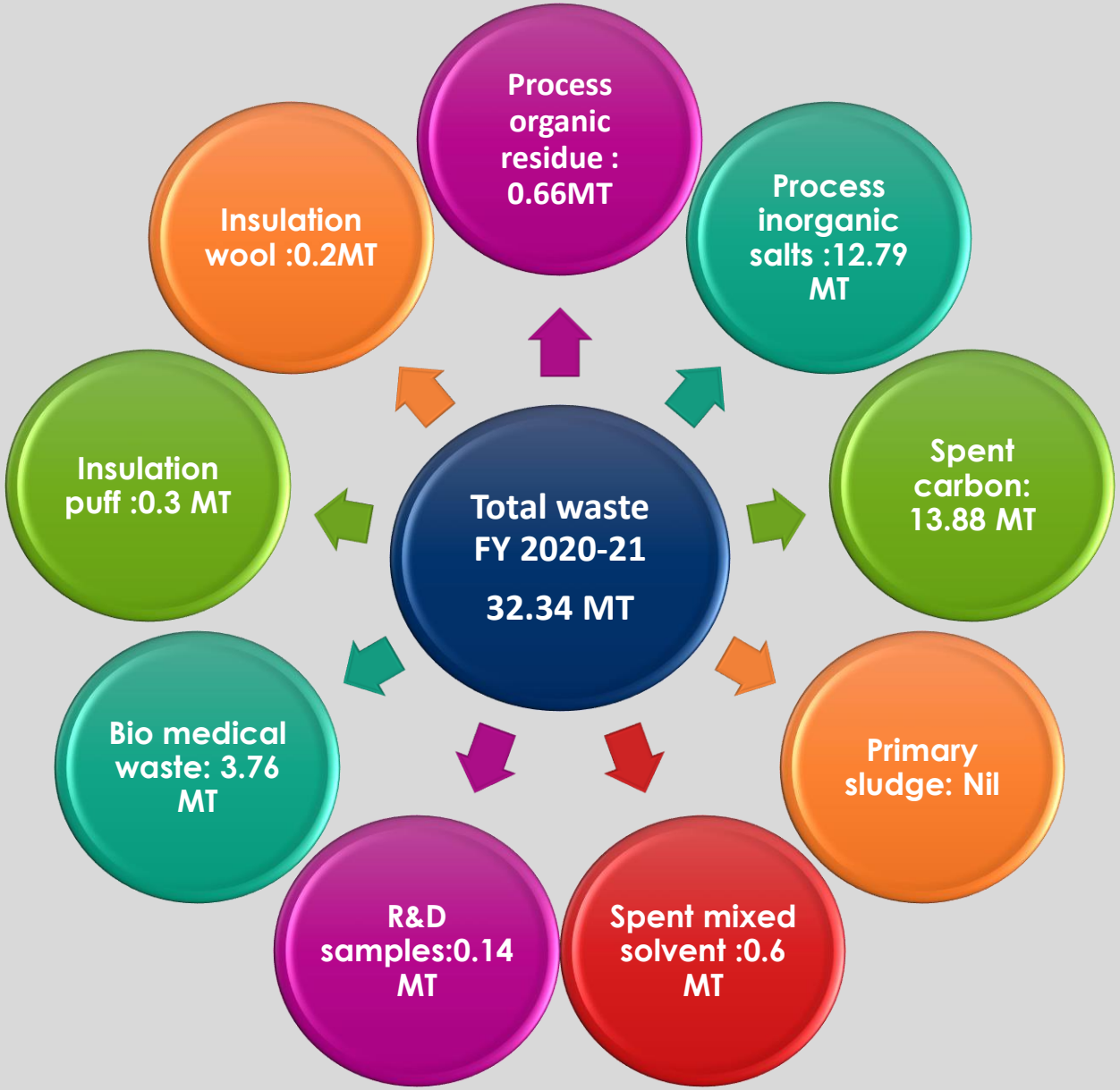

Waste generated materials are utilized/disposing through Agreement/PO to third party ,which are used as alternate fuel

- ✓ Process Organic and Inorganic salts sending to Cement plant for Co-processing instead of disposal.
- ✓ Insulation waste sent to Century Eco solutions for recycling..
- ✓ Biomedical and thermocol waste sending to Vasista enviro care instead of disposal.

S.No	Year	Qty of waste generated in MTon	% of Land filling	% of Co-Processing
1	2018-19	12.12	0	100
2	2019-20	17.89	0	100
3	2020-21	32.34	0	100

GHG Inventorisation

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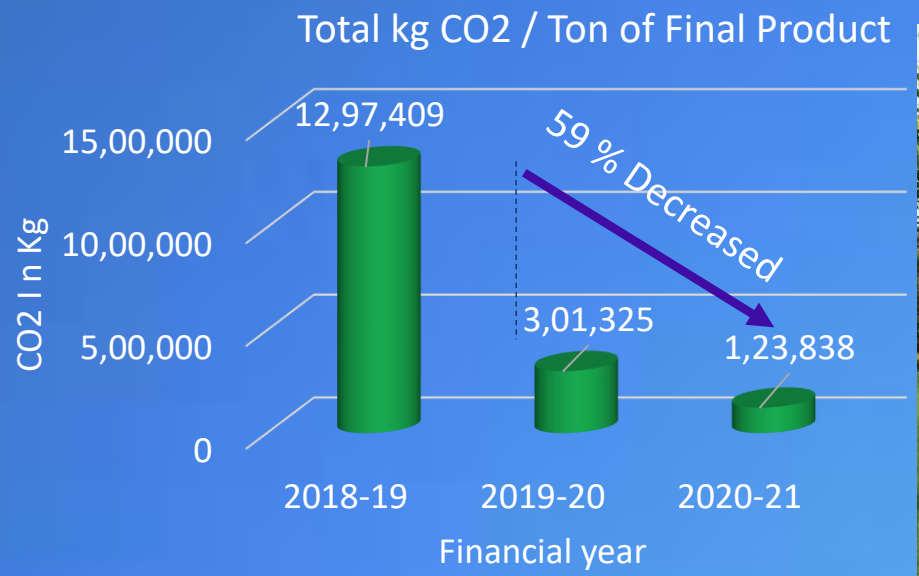
Year	Total kgCO2 / Ton of Final Product
2018-19	12,97,409
2019-20	3,01,325
2020-21	1,23,838



S.No	Type of system installed	Supplier	Investment (Rs in Millions)	Operating Cost (Rs in Millions)	Running Hours
1	Air quality, Sox, Nox & etc. are Monitoring with Third party system for every month	M/s. Savant Envitech Pvt.Ltd	0	0.06	24
2	Double Stage Scrubber with pH monitoring and data logging	M/s. SVDC Reinforcement Pvt.Ltd	4.3	0.05	24
3	Ammonia gas detection system	M/s. Mohan Marketing Associates	0.1	0.03	24
4	VOC monitoring	M/s. Swan environment	0.8	0.15	24
5	Coal ash handling system	M/S. Global Enviro Pvt.Ltd	1.00	0.12	24
6	Bag filters for boiler	M/s. Thermax Limited	1.6	0.05	24

Green Supply Chain Management

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S.No	Project Implemented	Benefits achieved
01	Installed Chilled water system instead of conventional AC's.	Elimination of R22 Refrigerant
02	Paperless / Digital Logistics Execution – OTM Project	Implemented ERP towards electronic documentation
03	AIR vs SEA – Mode Control	Decreased Carbon Emissions
04	IMO 2020 Adoption for less pollution-free marine ecosystem.	Less Pollution Free - Marine eco System
05	GST e-Invoicing	Decreased Paper consumption and paper less / Digital transactions
06	Installed Energy Efficient (IE3) Motors along with vertical inline pumps in place of conventional motors and inefficient pumps	Less power consumption
07	Chilled water coil System installed instead of DX coil for HVAC	1. Less power consumption(CHW SEC 0.6 KW/TR Reciprocating 2. DX coil SEC : 1.2 KW/TR)
08	Water Conservation	Cost saving on Raw water by Reducing the raw water consumption . Reduction of raw water consumption & Cost saving on Raw water

Energy Management Team

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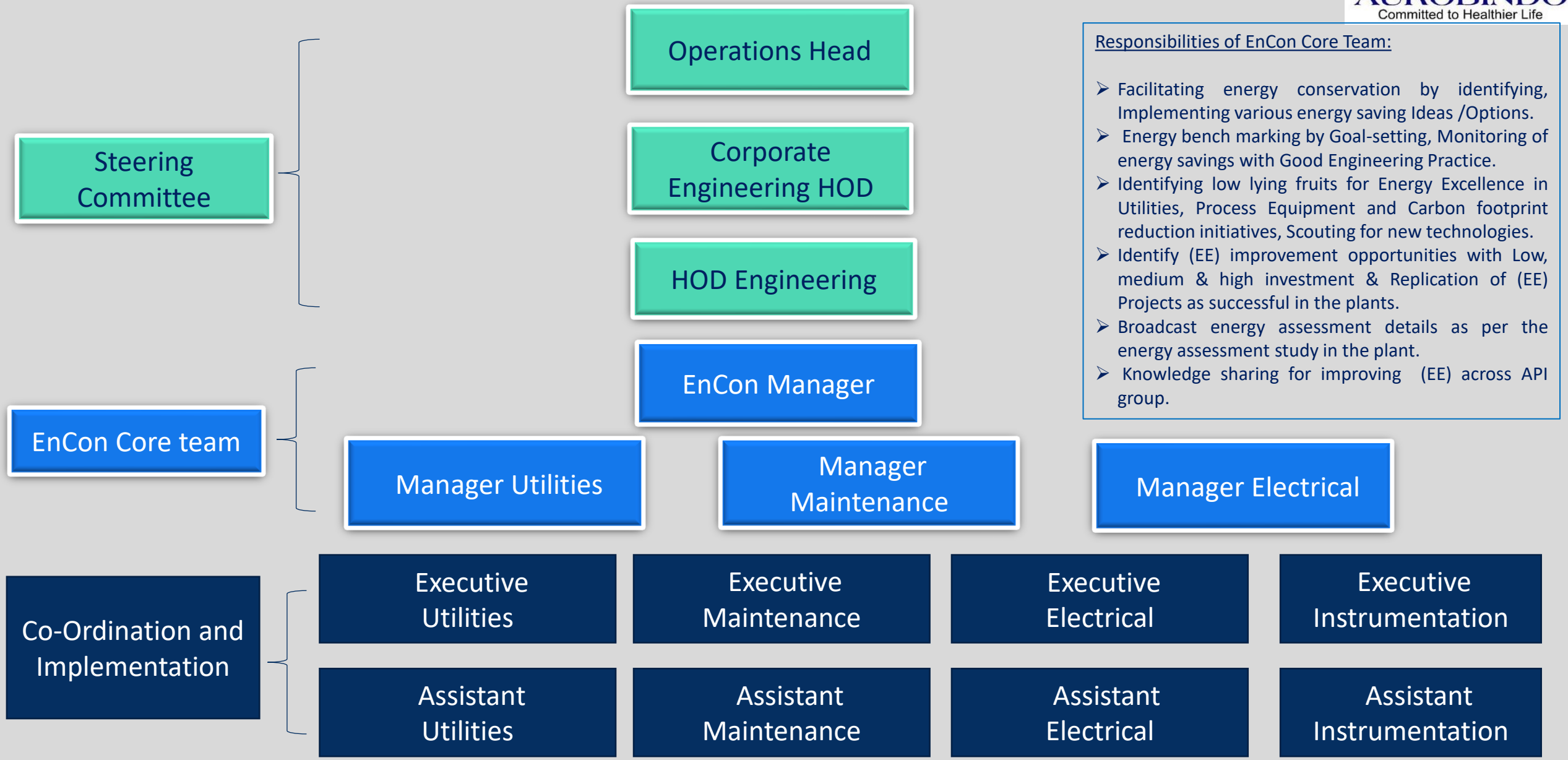

Responsibilities of EnCon Core Team:

- Facilitating energy conservation by identifying, Implementing various energy saving Ideas /Options.
- Energy bench marking by Goal-setting, Monitoring of energy savings with Good Engineering Practice.
- Identifying low lying fruits for Energy Excellence in Utilities, Process Equipment and Carbon footprint reduction initiatives, Scouting for new technologies.
- Identify (EE) improvement opportunities with Low, medium & high investment & Replication of (EE) Projects as successful in the plants.
- Broadcast energy assessment details as per the energy assessment study in the plant.
- Knowledge sharing for improving (EE) across API group.

Encon Projects Strategy for Action Plan

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Level -1	• Direct Implementation which is not requiring CAPEX & major change in system. It can be done in Revenue budget..
Level-2	• Modification is required & Payback period is less than 3 months.
Level -3	• Modification is required & Payback period is 3-12 months.
Level-4	• Modification is required & Payback period is 12-36 months.
Level -5	• Modification is required & Payback period is more than 36 months.

The Way Forward

- ISO 50001:2018 Energy Management System : Targeted By 2023
- Green Pro or IGBC rating : Targeted By 2024

Learn from CII

- Automatic power factor controllers.
- IE3 motors Instead of conventional motors.
- Energy efficient CT fan blades.

CII
Confederation of Indian Industry
125 Years - Since 1895

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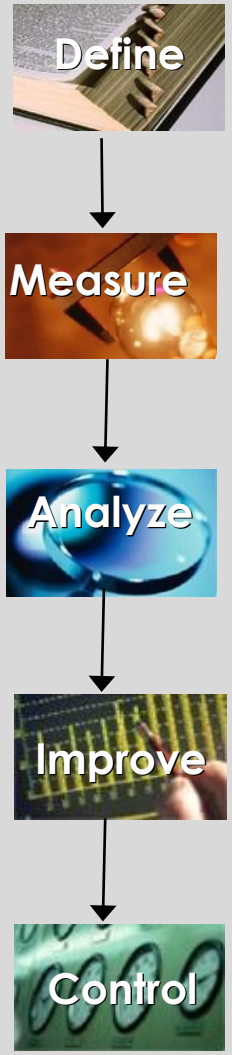
Training

- ✓ Conducted Knowledge based training matrix on monthly basis
- ✓ Training on Energy conservation giving to Employees every month by Energy Manager
- ✓ Employees involve & taking ownership for successful implementation of energy conservation opportunities
- ✓ Knowledge sharing for improving Energy excellence
- ✓ Conducted External trainings on Advanced Energy Efficiency

AWARENESS
IS POWER

Methodology

Define	• Empower & Educate
Define	• Identification of improvement area
Define	• Target setting & benefit evaluation
Measure	• Data Collection
Analyze	• Analysis of data
Improve	• Formulate action plan & feasibility
Improve	• Implementation
Control	• Corrective actions
Control	• Savings evaluation, Closure & Monitoring



UNIT XIV Won the "Energy conservation week" APL cluster.

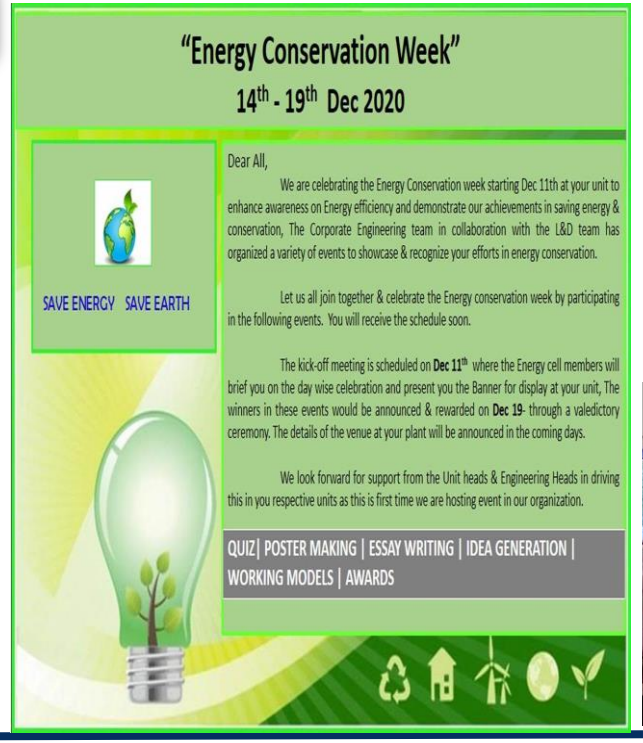
Bets energy conservation idea.

Best energy conservation idea Implemented group/unit level.

Best participation- Vizag cluster

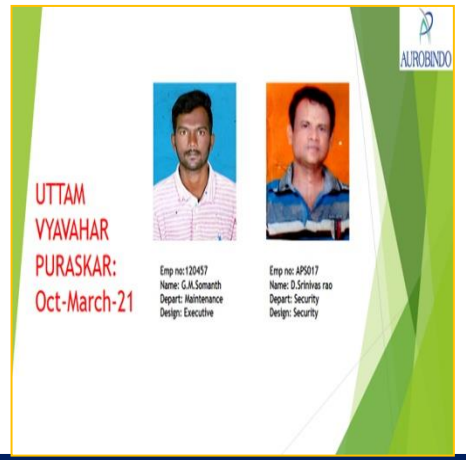
"Energy conservation week 14th - 19th Dec-20

Best assessment on energy conservation



Plant Level Rewards

Category	Frequency
Talent of the Month	Every Month
Rewards & Recognition	3 Months
Uttam Vyavahar Puraskar	6 Months



Daily Energy Monitoring System

Unit-XIV

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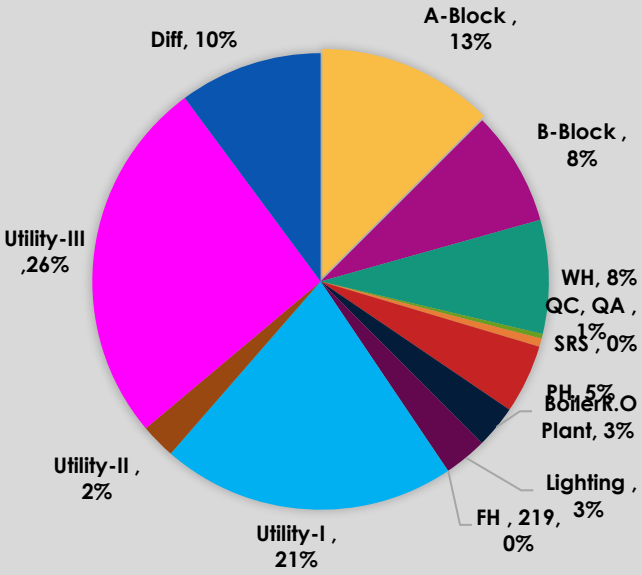
- ✓ Power monitoring Plant /block wise with EL Measure Software.
- ✓ Stem demand monitoring Plant /block wise.
- ✓ Reports/Trends (hourly / Daily/Monthly/Annual)
- ✓ Hourly based Real time parameters recording
- ✓ Daily report sharing & analysis (Plant/block wise)
- ✓ Monthly Energy Analysis for Area/block wise

EL Measures software for energy monitoring.

POWER CONSUMPTION IN KWH



Energy measuring devices

Lux meter

Tacho Meter

pH & TDS Meter

Clamp Meter

Ultra Sonic Flow Meter

Anemometer

CSR Activities

Existing Nitrogen plant converted to Oxygen generation plant.

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Description:

We (Unit XIV) converted the existing 75 Nm^3/hr Nitrogen plant to 22 Nm^3/hr @ 98% purity Oxygen generation plant and which has Installed in MB. Hospitals (100 beds) as recommended by Central and State Pollution Control Board during the COVID19 2nd wave pandemic.

Aurobindo installs oxygen plant in Vizag hospital

₹1-cr plant with 0.75 tons per day capacity is a CSR initiative of Aurobindo Pharma

HANS BUSINESS
HYDERABAD

HYDERABAD-BASED Aurobindo Pharma has erected an oxygen plant with 0.75 tons per day capacity at MB hospitals in Arilova locality of Visakhapatnam. This initiative is part of Aurobindo pharma's CSR activity to support government's efforts to fight against Covid. The 100 bed hospital with 40 ICU beds is one of the 22 listed hospitals in the Vizag district to treat Covid patients.

"Aurobindo Pharma through its philanthropic arm Aurobindo Foundation has spent Rs 1 crore on procurement of machinery, equipment and converting the nitrogen plant into an oxygen generating plant," Raja Reddy, GM admin said. The equipment and purity certificate are formally handed over to the hospital authorities by the Aurobindo pharma team led by Vice President Suresh Raman on Tuesday in presence of District nodal officer KMP Sarathi. Dr Vishnu Prasad, AVP Aurobindo, Demudu participated.

Amidst the severity of the Covid second wave, the demand for medical oxygen is growing phenomenally across the country. "Aurobindo Pharma through the foundation has taken various measures to support government hospitals across AP and Telangana to meet the demand for medical oxygen," K Nithyananda Reddy Aurobindo Pharma Vice-Chairman and foundation director said. Foundation has donated 100 oxygen concentrators worth Rs 1 crore to the hospitals in Nellore, Srikakulam, and Vizianagaram districts last month. The foundation donated Rs 10 lakh to Anakapalli hospital to increase the number of oxygen beds.

Company Achievements

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Organization with Innovative HR Practices

Operational Excellence Company of the Year Award - 2021

Best Company for the year -Global generic and Bio-Similars

Promoting Health in the Workplace

Aurobindo Pharma Foundation – Best CSR Award

National Energy Efficiency circle competition-2020

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APL CORPORATE VALUES

Business Care	People Care	Organization Care
Operational Excellence	Fairness, Humility & Respect for individuals	Accountability
Stakeholder Orientation	Teamwork, Synergy	Integrity
Quality, Innovision	Applied Learning	Achievement