22nd National Award for Excellence in Energy Management 2021

24-27 August 2021

AUROBINDO PHARMA LIMITED
UNIT IX, HYDERABAD

Sl. No.	Name	Designation	Department
01	Mr. Muralidhar Manchiganti	Associate Vice President	Operations
02	Mr. Kamalakar B	Asst. General Manager	Engineering
03	Mr. Ramesh Badeti	Manager	Engineering

1. Brief introduction on Company

$2.8B
Global Revenue

Employees	22k+
Market presence	155+
Mfg. Facilities	29

2021

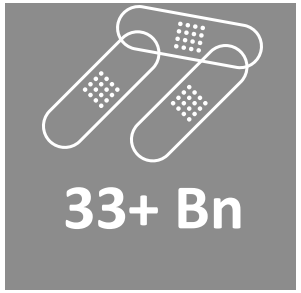
IPO 1992

USFDA cGMP compliant

2nd Largest pharma by revenue (India)

10th largest by generic sales (globally)

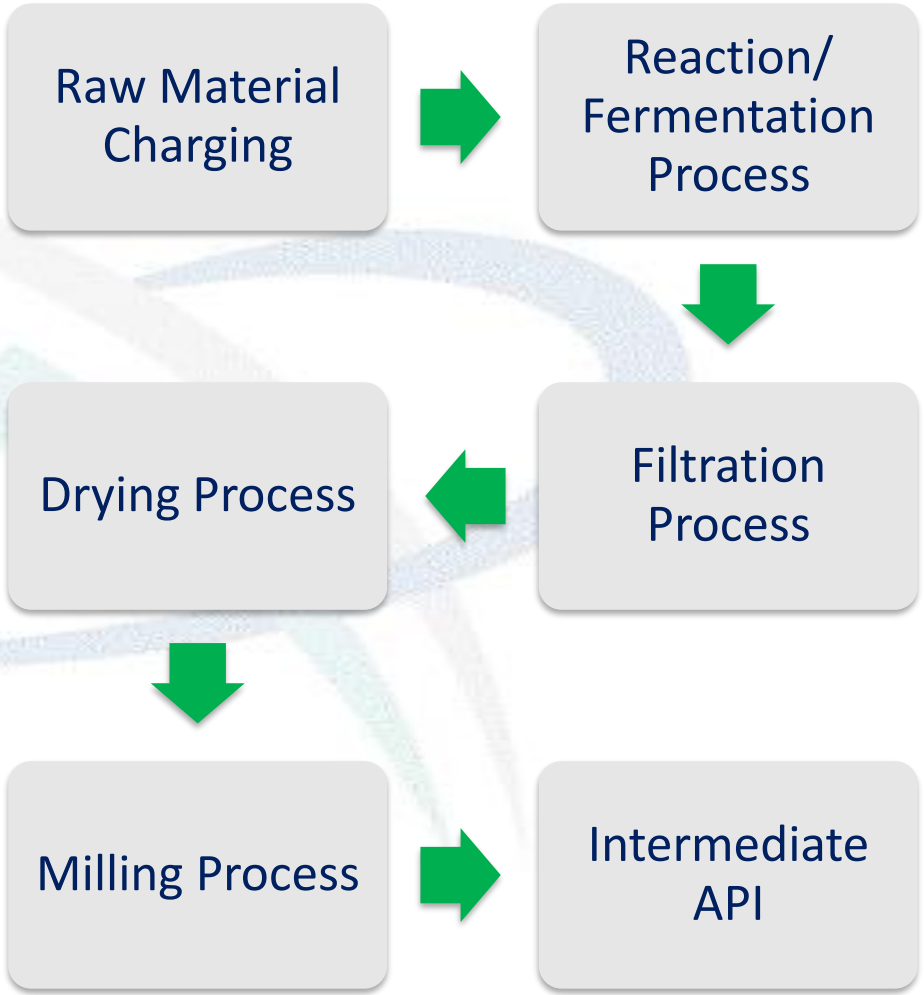
1986 Inception



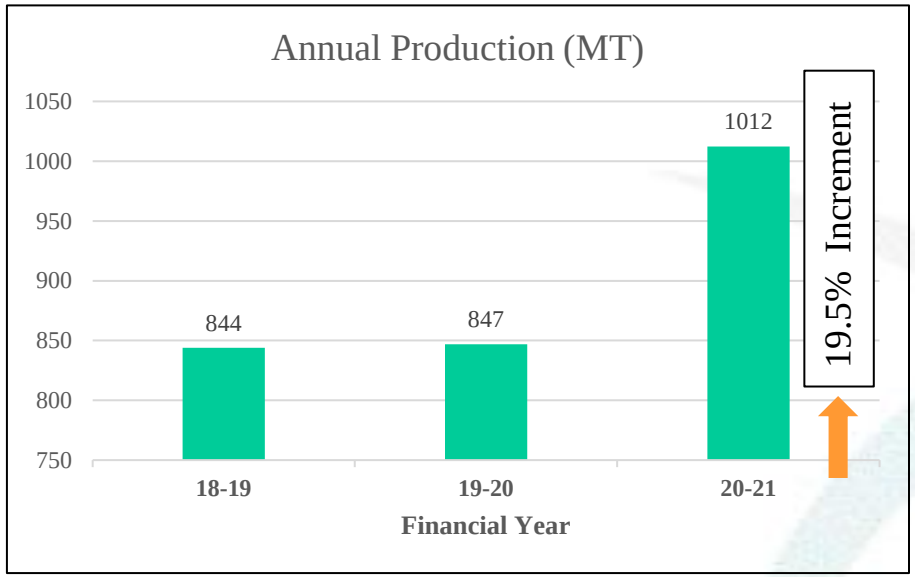
2. Details of the Products / Processes

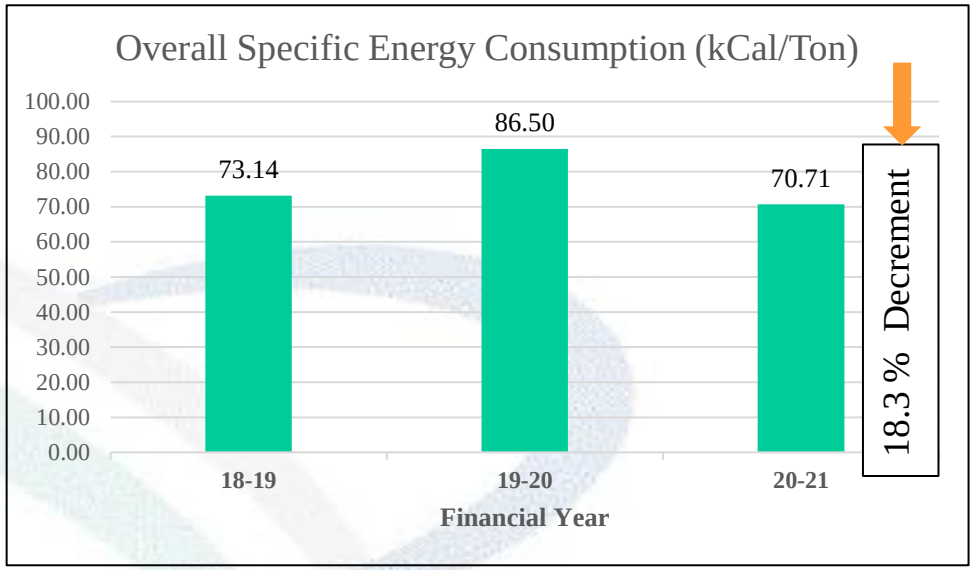
- Modafinil
- Sertraline Mandelate
- Pantoprazole
- Trandalopril
- Famaciclovir
- Dolutegravir
- Sevelamer Hcl

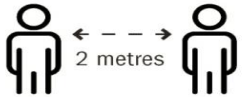
Major products :



3. Impact of Covid







Social Distancing

Masking

Regular Hand Wash

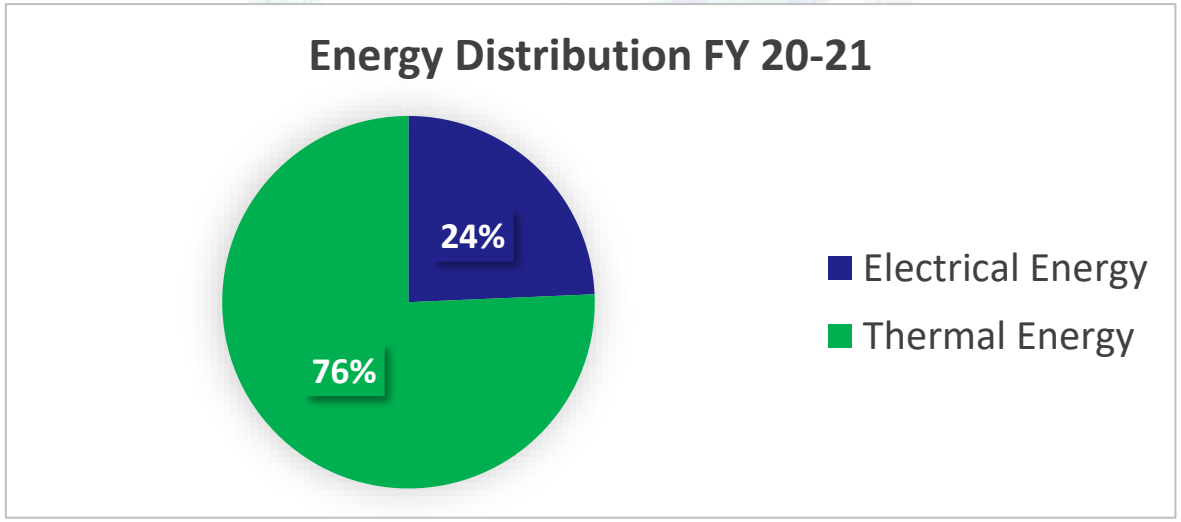
Sanitization

An increase in SEC during the FY 2019-20 was observed due to low production and non-linear nature of consumptions

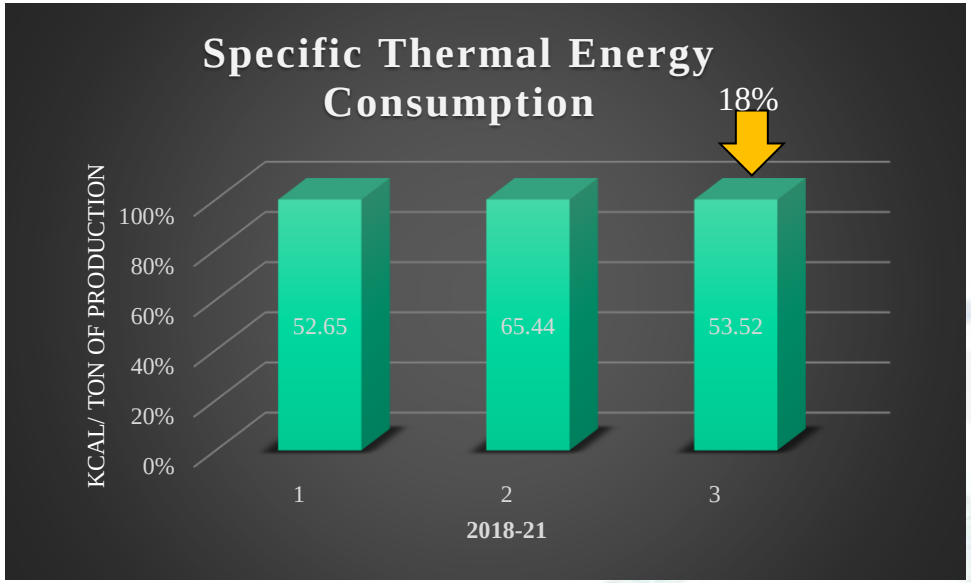
Implementation of energy conservation projects resulted in decreased SEC, increased production during FY2020-21 though limited manpower availability during Covid-19 restrictions.

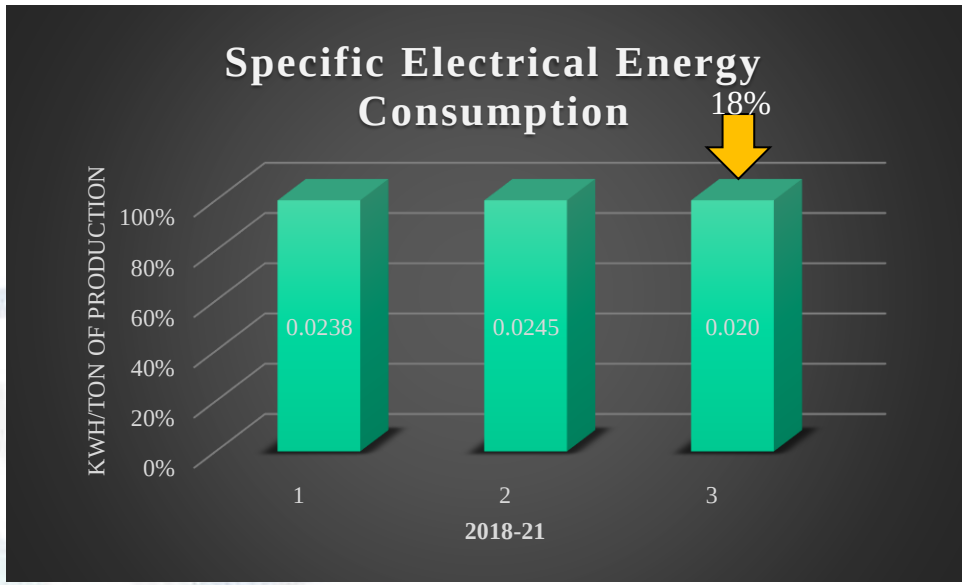
4. Energy Consumption Overview

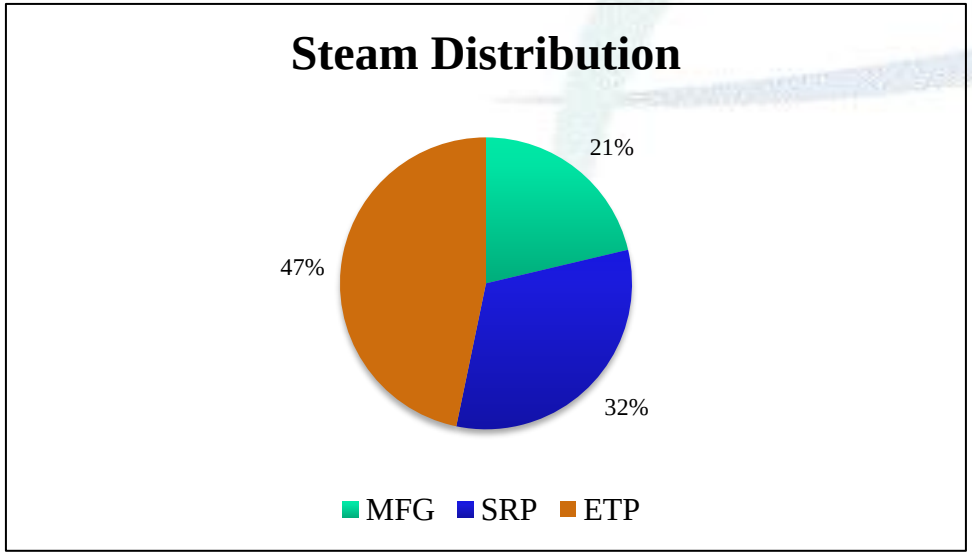
Sl. No.	Parameters	Unit of Measurement	FY 18-19	FY 19-20	FY 20-21
1	Annual Electrical Energy Consumption	Million kWh/year	20.10	20.74	20.24
2	Annual Electrical Energy Equivalent	Million kCal/year	17294.44	17845.12	17414.97
3	Annual Cost of Electricity Consumed	Million INR	136.15	134.89	131.81
4	Annual Thermal Energy Consumption	Million kCal/Year	44441	55431	54188
5	Annual Cost of Thermal Energy Consumed	Million INR	74.48	94.99	98.13
6	Specific Electrical Energy Consumption	Million kWh/Ton of production	0.0238	0.0245	0.020
7	Specific Thermal Energy Consumption	Million KCal/ Ton of Production	52.65	65.44	53.52
8	Overall Specific Energy Consumption	Million KCal/ Ton of Production	73.14	86.50	70.71

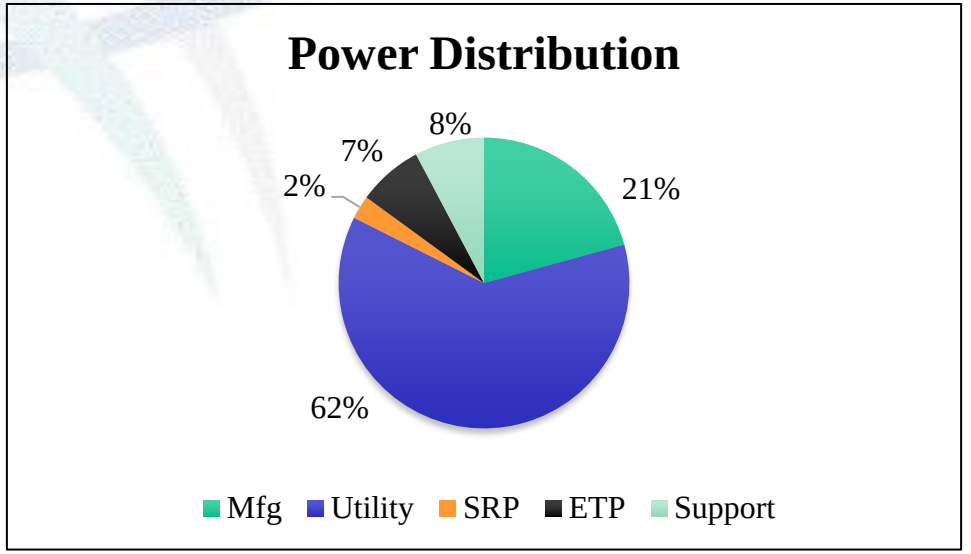


4. Specific Energy Consumption in last 3 years (FY 2018-21)

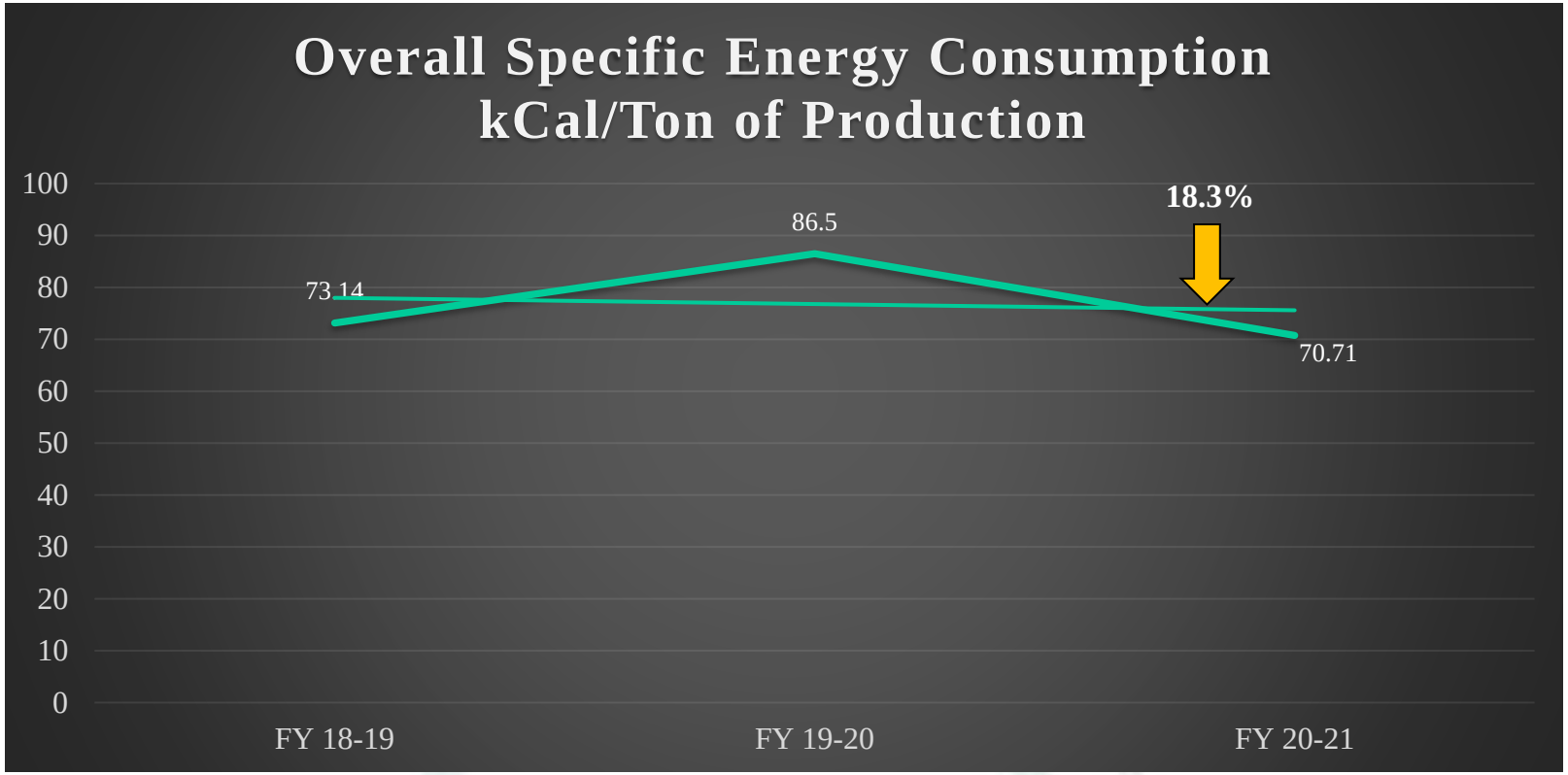








4. Overall Specific Energy Consumption in last 3 years (FY 2018-21)



An increase in SEC during the FY 2019-20 was observed due to low production and non-linear nature of consumptions

Implementation of energy conservation projects resulted in decreased SEC, increased production during FY2020-21 though limited manpower availability during Covid-19 restrictions

5. Information on Internal benchmark - Utility

Refrigeration Plants :

Description	Design Temp (oC)	Design SEC (kW/TR)	Operating SEC (kW/TR)	Target SEC (kW/TR)
Reciprocating Chillers (Water Cooled)	+5	0.86	0.90 - 0.91	0.89
	-15	1.39	1.42 - 1.44	1.41
	-20	1.58	1.61 - 1.63	1.60

Description	Design SEC (kW/CFM)	Operating SEC (kW/CFM)	Target SEC (kW/CFM)
Air Compressors	0.16	0.20 - 0.25	0.18

Description	Design SFR (KG/KG)	Operating SFR (KG/KG)	Target SFR (KG/KG)
Boiler	5.20	5.13	5.15

5. Major Encon Projects in FY 2021-22

Sl. No.	Title of Project	Annual Electrical Saving (Million kWh)	Investment Made (Rs million)	Payback (Months)
1	Installation of Micro Turbine by replacing PRV station of steam systems	0.544	3.6	13.24
2	Replacement of Liquid Nitrogen by Uber system for GI, GII and BIII Blocks	3	18.4	12.27
3	Improving the performance of CMU 801 & 802 by installing optimum condenser line size and increasing heat exchange across condenser	0.04	0.2	10.00
4	Implementation of VFD's for variable load applications, process pumps to run at optimum load	0.5	1.61	6.44
5	Implementation of VFD's for Air Compressors and Boiler Fans	0.2	0.76	7.60
6	Installation of Oil Free Refrigeration (OFR) Technology and automation of Chilling Plant	0.3	4.97	33.13
7	Implementation of Energy Efficient Pumps by replacing old inefficient pumps	0.5	1.89	7.56
	Total	5.084	31.43	

6. Energy Saving projects implemented in last Three Years

Summary of Energy Saving Projects Implemented in the last 3 years			
Year	**No of Proposals**	**Investments (₹ Million)**	**Savings (₹ Million)**
2020-2021	17	15.22	46.5
2019-2020	10	3.5	8.5
2018-2019	09	4.8	3.8

Projects implemented in FY 20-21				
S No	Project Details	Investments (₹ Million)	Annual Savings (₹ Million)	Payback (Months)
1	Implementation of VFD's for variable loads	0.18	0.45	4.8
2	Procurement of Premium Energy Efficient Motors for replacement of old standard motors	0.40	0.56	8.5
3	Operational Improvement of Chilling Plants by line modifications to run at optimum loading	0.210	1.33	1.9
4	Implementation of Auto Cut off Temperature Controllers for Cooling Tower fans	0.08	2.90	0.3
5	Installation of VFD for Process application Pumps	0.06	0.14	5.2
6	Implementation of temperature controls and timers for AHU's	0.10	0.38	3.1
7	Installation of voltage stabilizer to conserve the energy, improving the light fittings life and reduce the failures	0.15	0.18	10.2
8	Replacement of optimum size pump for the chilling plant applications	0.20	0.98	2.4
9	Stoppage of General Vacuum pumps by arranging of Timers	0.04	1.09	0.5
10	Replacement of Condensers/Evaporators to the optimum level	1.7	1.28	16.1
11	Refurbishment of VAM 801 by replacement of tube through OEM	1.71	5.21	3.9
12	Operational Improvement of Air Compressors and Nitrogen Plants and arresting the leakages	0.1	0.87	1.4

5. Energy Saving projects implemented in last Three years

AUROBINDO

Projects implemented in FY 20-21				
S No	**Project Details**	**Investments (₹ Million)**	**Annual Savings (₹ Million)**	**Payback (Months)**
13	Installation of Pressure Powered Pump Package Unit (PPPPU) for steam condensate recovery	0.2	0.74	3.4
14	Providing dedicated Columns in SRS for campaign products solvent recovery to reduce the energy and water consumption	0.1	6.82	0.2
15	Utility lines modifications for Process, replacement of reactors to improve heat rejection rate	9.60	21.44	5.4
16	Reducing the Effluent generation at source by ensuring the effective cleaning of process equipment to reduce the energy consumption in ETP	0.20	1.41	1.7
17	Reducing the proper segregation of Effluent at source to reduce the energy consumption in ETP	0.15	0.71	2.5
Total		**15.2**	**46.5**	**3.9**

Projects implemented in FY 19-20				
S No	**Project Details**	**Investments (₹ Million)**	**Annual Savings (₹ Million)**	**Payback (Months)**
1	Condenser line modification to enable the chilling plant operations at optimum level and Operational Improvements	0.010	1.08	0.1
2	Implementation of VFD's for variable load applications to run at optimum load	0.28	0.66	5.1
3	Procurement of Premium Energy Efficient Motors for replacement of old standard motors	0.40	0.57	8.4
4	Installation of Auto Cut off Temperature Controllers for Cooling Tower fans	0.084	1.90	0.5
5	Installation of Temperature controllers for AHU's installed in Warehouse	0.00	0.39	0.0
6	Installation of voltage stabilizer to conserve the energy, improving the light fittings life and reduce the failures	0.12	0.19	7.5
7	Replacement of Evaporators to bring back the chillers to design conditions	0.90	0.68	15.9

5. Energy Saving projects implemented in last Three years

AUROBINDO

Projects implemented in FY 19-20				
S No	**Project Details**	**Investments (₹ Million)**	**Annual Savings (₹ Million)**	**Payback (Months)**
8	Refurbishment of VAM by replacement of tube through OEM	1.71	2.14	9.6
9	Operational Improvement of Nitrogen Plants and arresting the leakages	0.0	0.91	0.0
10	Modification of RT Water line based on the recommendation of Internal Energy Audit team to improve the productivity in MEE	0.20	3.17	0.0
Total		**3.5**	**8.5**	**5**

Projects implemented in FY 18-19				
S No	**Project Details**	**Investments (₹ Million)**	**Annual Savings (₹ Million)**	**Payback (Months)**
1	Installation of VFD's for Pumps for flow control based on pressure	**0.26**	**1.09**	3
2	Installation of Energy Efficient LED Lights by replacing the existing 250W & 125W MV	0.42	**0.45**	11
3	Procurement of Energy Efficient Motors	0.58	**0.89**	8
4	Installation of VFD's to Process applications (Reactor Motors)	0.41	**0.25**	20
5	Implementation of Oil Free Refrigeration (OFR) Technology and automation of Chilling Plant	2.02	**0.76**	32
6	Implementation of Double stage reciprocating Air Compressor	1.08	**0.28**	46
7	Modification of Vacuum lines in Distillation process resulted in reduction of batch time and increase in solvent output thereby reduction in vacuum pump	0.02	**0.09**	3
8	Operational Improvement of Chilling Plants by replacing the Pumps and implementing good engineering practices	0.35	**1.90**	2
9	Installation of Capacitor banks at the load end to reduce the distribution losses	0.18	**0.14**	15
Total		**4.8**	**5.9**	**10**

#1 OPERATIONAL IMPROVEMENTS

AUROBINDO

Start 01/04/20

Improvement of Heat rejection rate in Process Equipment, SRP and MEE areas

Finish 31/03/21

Solution Implemented

- Utility lines modifications for Process
- Replacement of Reactors

Advantages

- Improved heat rejection rate
- Reduced batch timings thereby energy savings

32.8 *Lakh kWh*

SAVINGS: ₹ **214.4** *Lakh/Year*

INVESTMENT: ₹ **9.6** *Lakh*

MOTNHS 5.4

#2 EFFICIENCY IMPROVEMENTS

AUROBINDO

Start 01/04/20

Refurbishment of VAM by replacement of tube through OEM

Finish 31/03/21

Solution Implemented

- Replacement of VAM tubes which are Corroded
- Arresting the leakages of tubes

Advantages

- Arrived Effective Maintenance
- Improved efficiency, output thereby reduced running hours

1088.7
Tons of Coal

SAVINGS: ₹ **73.5** *Lakh/Year*

INVESTMENT: ₹ **34.2** *Lakh*

MOTNHS
5.6

#3 Dedicated Columns in SRS

AUROBINDO

Start
01/04/20

Dedicated Columns in SRS to reduce the energy and water consumption

Finish
31/03/21

Solution Implemented

Arrived Effective Maintenance

- Provided dedicated Columns in SRS for campaign products

Advantages

- **Increased Solvent recovery**
- **Reduced energy and water consumption**

1010
Tons of Coal

SAVINGS: ₹ **68.2** *Lakh/Year*

INVESTMENT: ₹ **1.0** *Lakh*

MOTNHS
0.2

#4 OIL FREE REFRIGERATION (OFR)

AUROBINDO

Start 30/11/18

To Improve the Efficiency of Chilling plant

Finish 20/03/19

Solution Implemented

- Replacing compressor oil with Specially Designed oil for better lubrication
- Magnetic Catalytic Filter and Magnetic Oil Separator

Advantages

- Smooth start & Optimum Loading of Compressor
- Removal of NH_4OH and generate turbulence in Refrigerant flow

1.16 *Lakh Units/Year*

SAVINGS: ₹ 7.6 *Lakh/Year*

INVESTMENT: ₹ 20.2 *Lakh*

MOTNHS 32.0

#5 OPERATIONAL IMPROVEMENTS

AUROBINDO

Start
01/04/20

Installation of Pressure Powered Pump Package Unit (PPPPU)

Finish
31/03/21

Solution Implemented → **Arrived Effective Maintenance**

- Installation of Pressure Powered Pump Package Unit (PPPPU) for steam condensate recovery
- Steam operated to reduce power consumption
- Reduction of maintenance cost

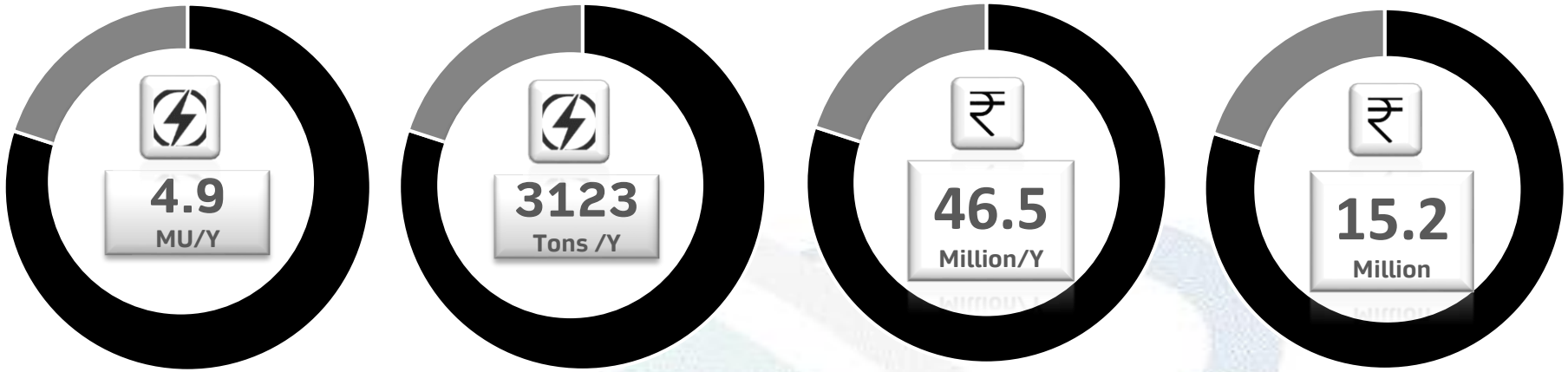
108
Tons of Coal

SAVINGS: ₹ **7.4** *Lakh/Year*

INVESTMENT: ₹ **2.0** *Lakh*

MOTNHS
3.4

Results Achieved FY2020-21



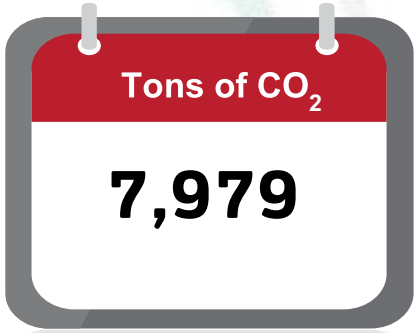
TOTAL ELECTRICAL SAVINGS

TOTAL COAL SAVINGS

TOTAL MONETARY SAVINGS

TOTAL INVESTMENT

PAYBACK PERIOD



CO_2 REDUCTIONS

7. Innovative Projects implemented

Start
Jan 2021

I. Reduction of Liquid Nitrogen Consumption by implementing alternate method of Product Cooling

Trigger for implementation :

- To reduce the Liquid Nitrogen consumption
- Avoid dependency on third party vendors

Replicability :

- Yes, huge replication opportunities
- All process areas
- Taken up for implementation

Safety Requirements :

- Installation of Receiver and fabrication of line arrangement is risky

Results :

- Monetary Savings = 79.4 Lakh / Y
- Investment = 2.0 Lakh
- Payback = 0.3 Months

7. Innovative Projects implemented

Start
June 2020

II. Implementation of Helical type agitator by replacing existing Anchor type agitator

Trigger for implementation :

- To Replace the Anchor type Agitator with Helical type Agitator
- To Decrease the batch time without affecting the Batch Quality
- To reduce the load on refrigeration
- Increase the batch size

Replicability :

- Yes, huge replication opportunities
- All process areas
- Taken up for other areas implementation

Safety Requirements :

- Installation of Reactor and fabrication of line arrangement is risky

Results :

- Monetary Savings = 124.3 Lakh / Y
- Investment = 43.91 Lakh
- Payback = 4.24 Months

8. Utilisation of Renewable Energy sources

AUROBINDO

Start
13/12/16

Installed 30MW Solar Power Plant

Finish
01/05/17

Technology (electrical)	Type of Energy	Onsite/Offsite	Installed Capacity (MW)	Generation (million kWh)	% of overall electrical energy
Solar PV	Solar	Off Site	30	44.2010	-

442.01
Lakh Units/Year

SAVINGS: ₹ **24.3** *Crore/Y*

INVESTMENT: ₹ **130** *Crore*

YEARS
5.3

9. Waste utilization and management

S.No	Type of waste generated	Quantity of waste generated (MT/year)			Disposal method
		2018-19	2019-20	2020-21	
1	Plastic waste (Poly bags)	6.36	19.47	18.89	Disposed through authorized scrap dealers for recycling
2	Hazardous waste	3,060	3,338	1,988.5	TSDF / Landfill

S.No	Particular	2018-19	2019-20	2020-21
1	Name of the Fuel	Hazardous waste (Organic Waste)		
2	Quantity of waste Fuel used (MT/year) - disposed to cement units (Used as alternate fuel)	837.00	544.00	593.90

Waste with heat value is not utilised directly in the plant,

Sending to the Cement industry / Co- Processing units where it is used as an alternate fuel

10. GHG Inventorisation

- Sustainability report under progress of preparation
- As a part of the continual improvement, the company has initiated monitoring of the CO2 emissions for public reporting.
- Carbon footprint, reduction targets and action plans yet to be established.

Year	Total Emissions ($kgCO_2e$)	Total kgCO2 / Ton of Final Product
2018-19	12,05,48,147	1,42,829.56
2019-20	13,70,43,376	1,61,798.55
2020-21	12,64,16,500	1,24,861.02

11. Green Supply Chain Management

S.No	Projects Implemented	Benefits Achieved	Description
1	Shipper Stuffing Project	Rs 190 Million	▪ Increased loading by 30% to 33% ▪ Extra optimization in container with shipper stuffing, ▪ Saved freight on additional container had it not been shipper stuffed. ▪ It enabled no dependency on the wooden pallets.
2	Double Stacking Injectable Project		▪ Successfully implemented with 50% extra space
3	Paperless / Digital Logistics Execution – OTM Project	Decreased Paper consumption and paper less / Digital transactions	▪ First Pharma company in India to adopt OTM. ▪ Cloud based Solution ▪ Freight Payments linked from OTM to ERP.
4	AIR vs SEA – Mode Control	Decreased Carbon Emissions	▪ Increased Sea transportation over Air transportation by pallet systems. ▪ Decreased air Tonnage from 572 Tonnage to 456 Tonnage
5	GST e-Invoicing	Decreased Paper consumption and paper less / Digital transactions	▪ Invoices are authenticated electronically and hence paperless ▪ Invoice information will be transferred from the portal in real-time. ▪ Govt. Initiatives for ease of doing business of exporters/importers

11. Teamwork, Employee Involvement & Monitoring

1. Daily Energy Monitoring System

Block wise daily/weekly power Consumption for the month of Jun'21

S.No	Block	Benchmark(20% reduction on actuals) (April to Dec'20)	1	2	3	4	5	6	W1 Ave/Day
1	A blok	715	659	810	784	682	717	832	748
2	B Block MI	607	777	727	925	654	751	1023	809
3	B Block MII	741	1565	1312	1353	1306	1298	1530	1394
4	B Block MIII	995	1122	1000	1656	1025	1535	1686	1337
5	B Block MIV	114	247	364	271	294	255	126	259
6	E Block	949	1426	1326	933	839	652	634	968
7	F Block	326	112	214	169	143	178	184	167
8	G Block M I	1452	1442	1496	1405	1377	1445	1483	1441
9	G Block M II	1809	640	524	268	476	336	200	407
10	H Block	96	64	72	133	51	78	79	79
11	I Block	263	538	483	391	466	554	453	481
12	J Block	489	667	426	641	682	630	582	605
13	K Block	1069	1156	979	732	649	614	585	786
14	B Block Utilities	10189	12007	12648	12843	12637	13000	13694	12805
15	E & K Block Utilities	4107	5074	4932	4762	4356	5499	5198	4970
16	G Block Utilities	3095	2784	2899	2465	2794	2206	2446	2599
17	I&J Block Utilities	3472	4340	3942	4397	4348	4313	4412	4292
18	K Block Utilities	170	211	179	156	166	182	99	166
19	Central Utilities	7851	8329	7826	8450	8754	8697	8781	8473
20	SRP	1240	309	352	412	376	360	346	359
21	RO plant	181	195	185	237	193	176	184	195
22	Others (QC)	764	1253	1284	1092	958	1066	1215	1145
23	ETP	3318	1954	2110	4673	3574	3187	2514	3002
24	RM Warehouse	1601	2315	2279	1956	1957	2137	2123	2128
25	Lighting	1098	1345	1440	1425	1335	1385	1400	1388
Total Consumption per day		46709	50530	49810	52530	50090	51250	51810	51003
Percentage %			108	107	112	107	110	111	109

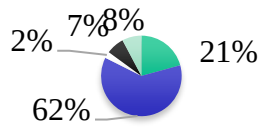
DAILY

- Performance Reports
- KPIs
- Overall Consumption

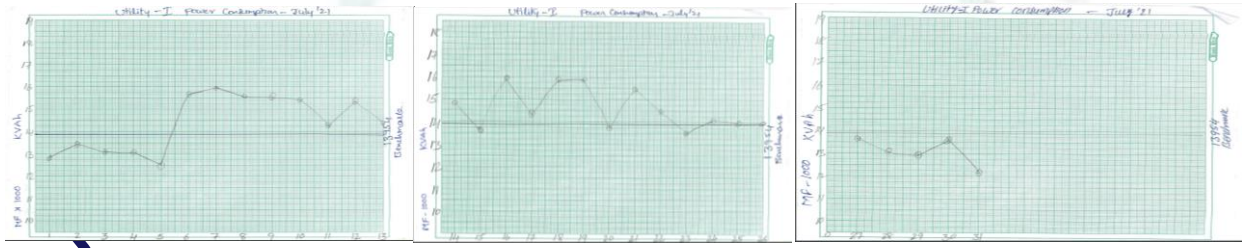
MONTHLY

- Avg. Monthly Report
- Recommendation for any service / Maintenance
- Inter - Unit Comparisons

Power Distribution



Mfg Utility SRP



Implemented across all blocks and utility

Daily Monitoring, Reporting and Reviewing

12. Energy Management System

Senior Management	• Driving Energy Management System • Approval & Budget Sanctions • Allocation of all required resources
Vice president (Corporate Engineering)	• Providing Technical Inputs • New and Innovative Energy Conservation Ideas • Review and Submissions to Senior Management
Energy Cell (Corporate)	• Energy Assessments with all portable instruments • Review and of Energy Conservation Proposals • Coordinating with all stake Holders for Implementation
Engineering Head (Unit wise)	• Support in Energy Assessments (Allocation of all Resources) • Prepare and submission of energy conservation • Seeking approvals at plant level
Energy Team - PoC (Unit Wise)	• Daily data monitoring and reporting on energy projects • Participate in Energy Assessments along with Energy Cell • Ground level implementation of energy conservation proposals

13. Energy Audit Instruments

S No	Instruments	Make
1	Power Quality Analysers (2 Nos)	Krykard
2	Flue Gas Analyser	Kane(NEVCO)
3	Thermal Imager	Testo
4	Ultrasonic Flow Meter	Eesiflo
5	Ultra Sonic Thickness Gauge	Eqinox
6	Pitot tube	Nevco
7	Digital Manometer / Pressure meter	Comark
8	Hotwire Anemometer	Testo
9	TDS / pH Meter	Aquisol
10	Stroboscope / Tachometer	Extech
11	Humidity, DBT & WBT Meter	Testo
12	Digital Pressure Guage	Testo
13	Lux Meter	Extech
14	Stop watch	Extech
15	Psling Psychrometer	Dimple

14. Learning from past CII award programs

AUROBINDO

i) Procurement (New & Replacements) of energy efficient motors

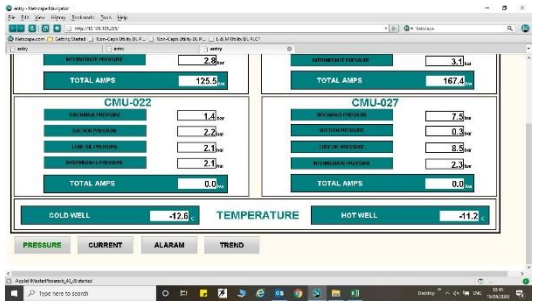
Procurement of Energy Efficient Motors yearly around 300 motors with tentative savings of 6 -7 Lakh units in a year

ii) Replacement of old & Reciprocating Chilling plants with new Screw Chilling plants

- Reciprocating Chilling plant having excess energy
- Replaced new screw type energy efficient Chillers

iiI) Implementation of IoT Based (Industry 4.0) Online Energy Monitoring System

- Implemented across all 25 No's of Chilling Plants –
- Daily monitoring and attending the discrepancies



15. Adoption of Energy Efficient Equipment

Implementation of OFR Systems – Refrigeration Systems

- Improved reliability & safety in Refrigeration Systems
- Savings to the tune of 32-48% observed in the existing plants

Procurement of No Air Loss Drain Valves in Compressed Air Systems

- Avoided loss of compressed air to atmosphere
- Attractive payback period of 3 months

Procurement of Double Stage VAMs

- Reciprocating Chillers are energy intensive – 38 % excess consumption
- Replaced Old reciprocating type Chilling Plants

Procurement of Vertical Inline Pumps – Replacements & New projects

- Energy Efficient and reduced power consumption by 18 %
- Low foot print , Less maintenance and down time

16. ENERGY WEEK CELEBRATIONS - API

Organised for the first time in Aurobindo during 11th to 19th Dec 2020.

Around 1000 participants across all API units

309 Energy Conservation Ideas received from plants

Competitions held -Poster making on Energy Conservation, Best Energy Conservation Idea and Essay Writing etc

Few Best Ideas Received

- Adiabatic Cooling for Air Cooled Refrigeration plants
- The highly efficient Power Economy agitator systems for process Reactors
- Reactor drain collection using three way valve controlled TDS transfer system
- Plastic waste to Energy Conversion through Boiler(incenerator)
- Shuffling / integrating of Cooling Towers based on Load
- Implementation of Auto on /off lighting system for Warehouse

17. Awards & Recognitions

Operational Excellence Company of Year 2021

- Organized by Energy & environment Foundation (EEF)
- Under Global Health Care Conference Awards Competitions
- Event was held during 15 -16 April 2020, New Delhi (Virtual)

Best Energy Efficient Organization -– 2nd Runner Up

- Under Large Scale Industry Categorization
- 4th edition CII National Energy Efficiency Circle Competition 2020
- Event was held during 14 – 15 May 2020, New Delhi

18. CSR Activities

- 14 Villages Adopted
- 48 Water Drinking Plants
- 350 + Healthcare Programme
- 21 Educational Institutions

Thank You

AUROBINDO
Committed to healthier life!

SY.NO. 305, 369 to 371, 373, 374 AND 377,

GUNDLAMACHANOOR VILLAGE, HATNOOR MANDAL,
SANGAREDDY DISTRICT, TELANGANA -

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