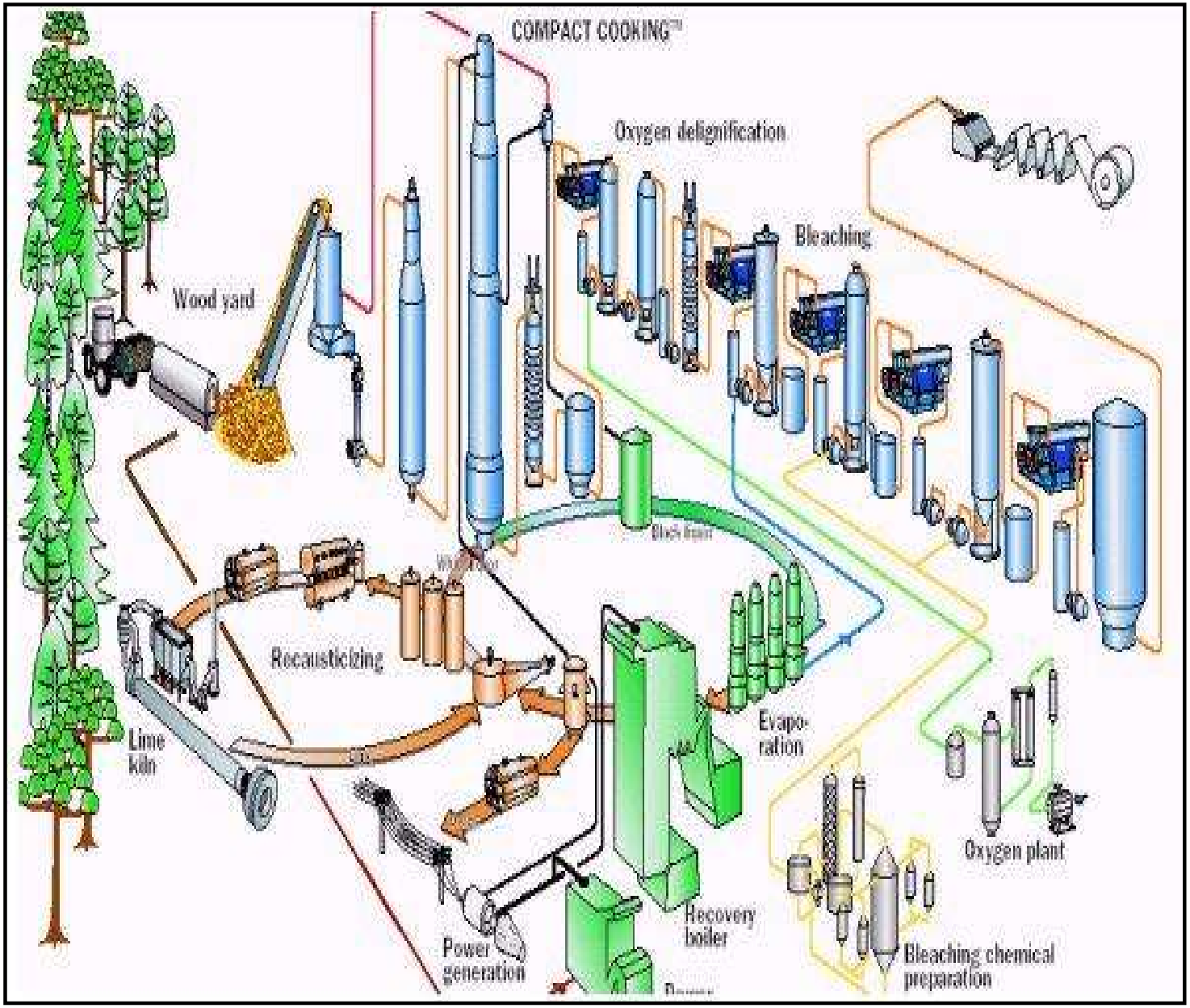
CII National Energy Award for Excellence in Energy Management

JK PAPER Ltd, Unit: JKPM,RAYAGADA

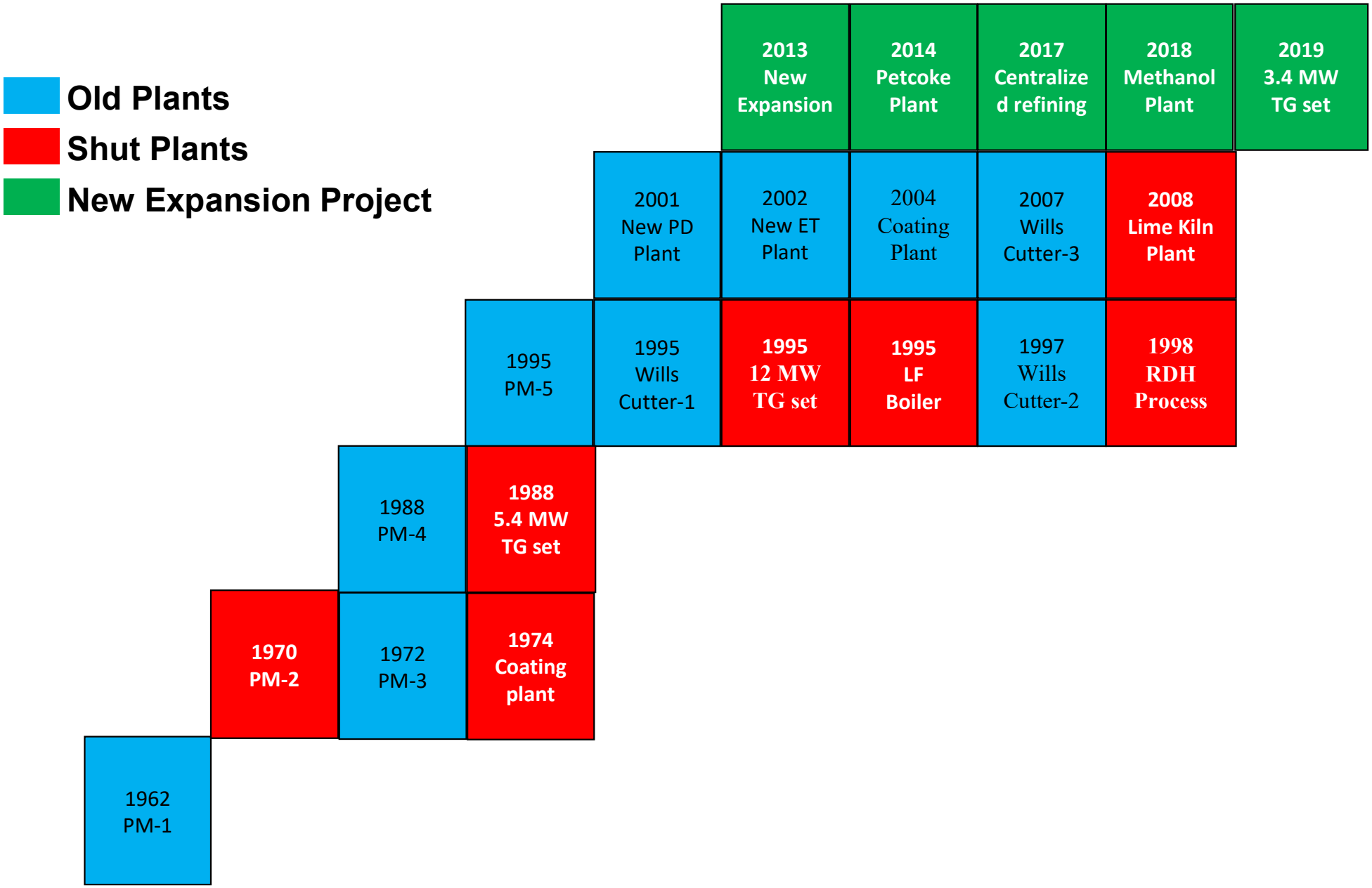
1. Company Profile- PROCESS FLOW DIAGRAM



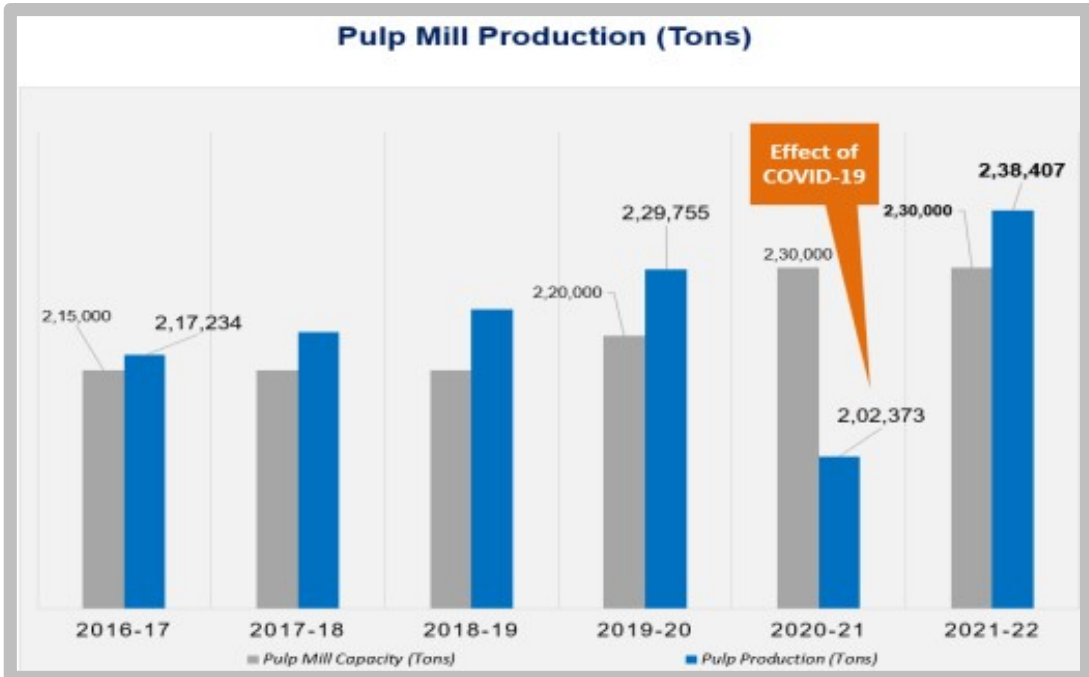
- ✓ **Pulp Mill 230,000* TPA bleached pulp**
- ✓ **Soda recovery 1400 TPD solids**
- ✓ **Paper Machine 315,000* TPA**
- ✓ **Power block 58.4 MW**

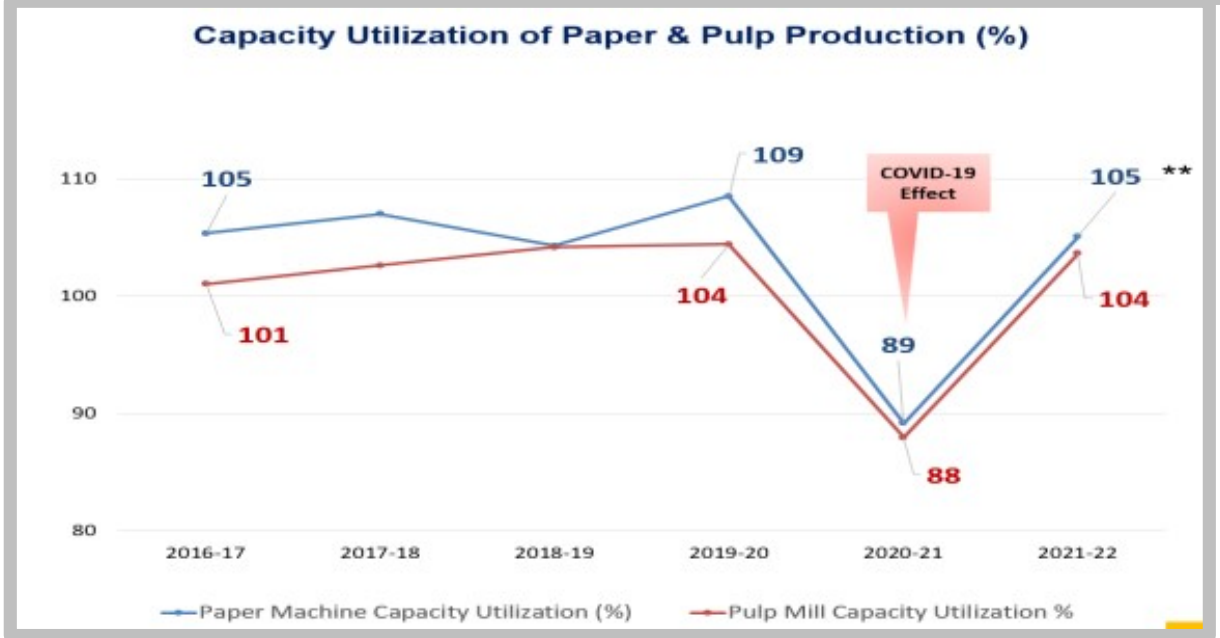
**Installed Capacity*

1. Company Profile- Technology Absorption over the year



2. Sp. Energy Consumption-Production Data



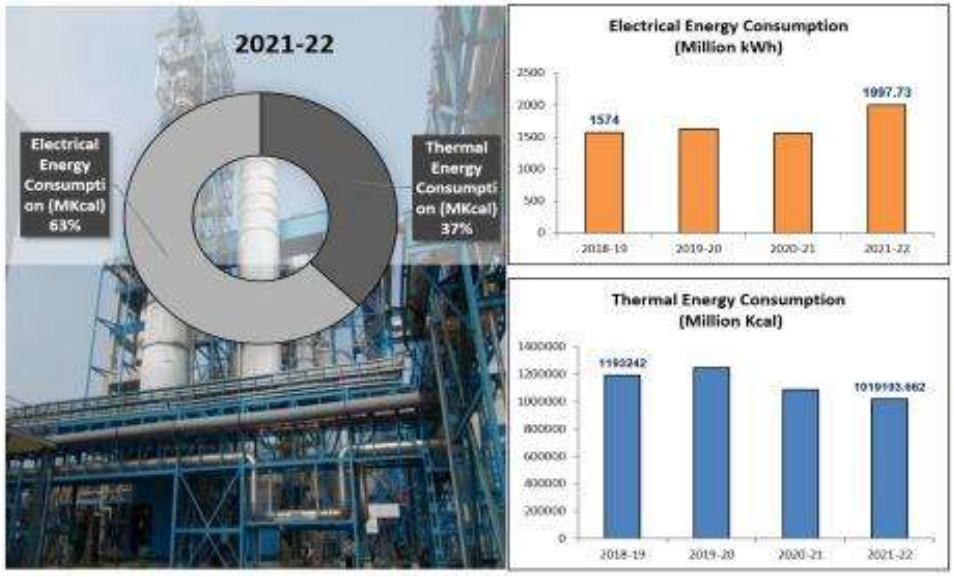


JKPM produced **PD sheet in 2021-22, to support the machines runnability at CPM & also to meet the Raw Material import Scarcity problem due to recent War broke-out at Europe.

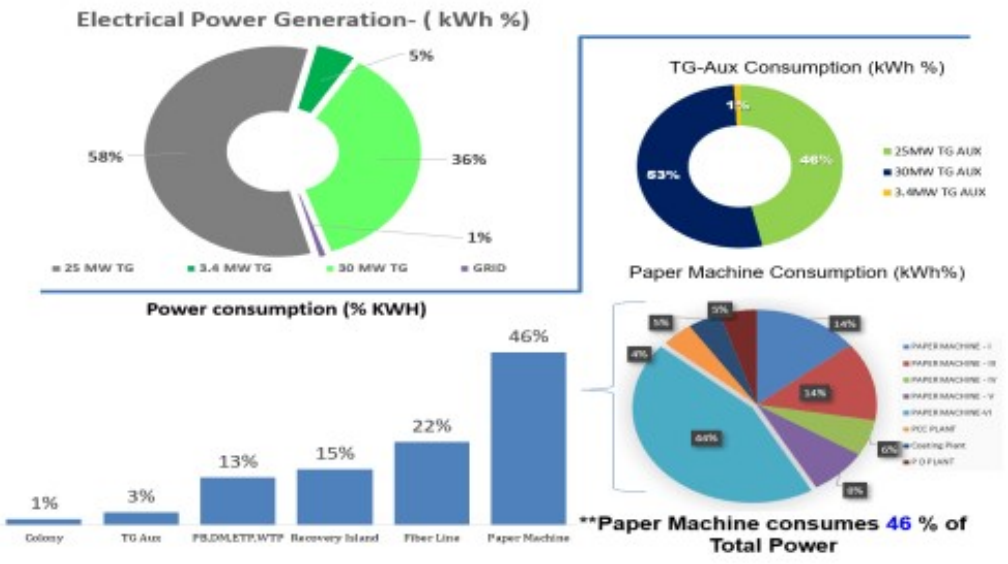
2. Sp. Energy Consumption-Overall Energy Consumption

Energy Scenario-" Generation"

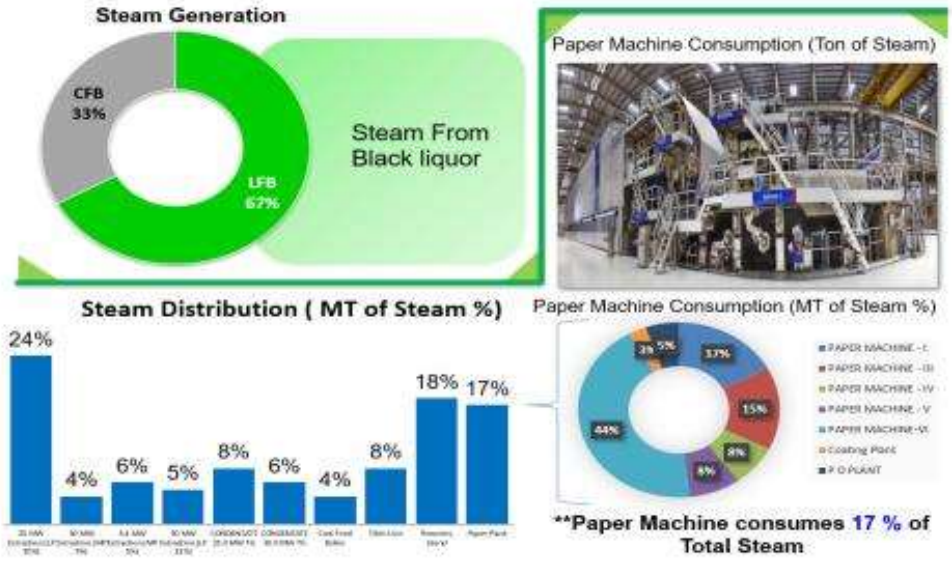
Energy Scenario-" Electrical & Thermal Power"



Energy Scenario-" Electrical Power "

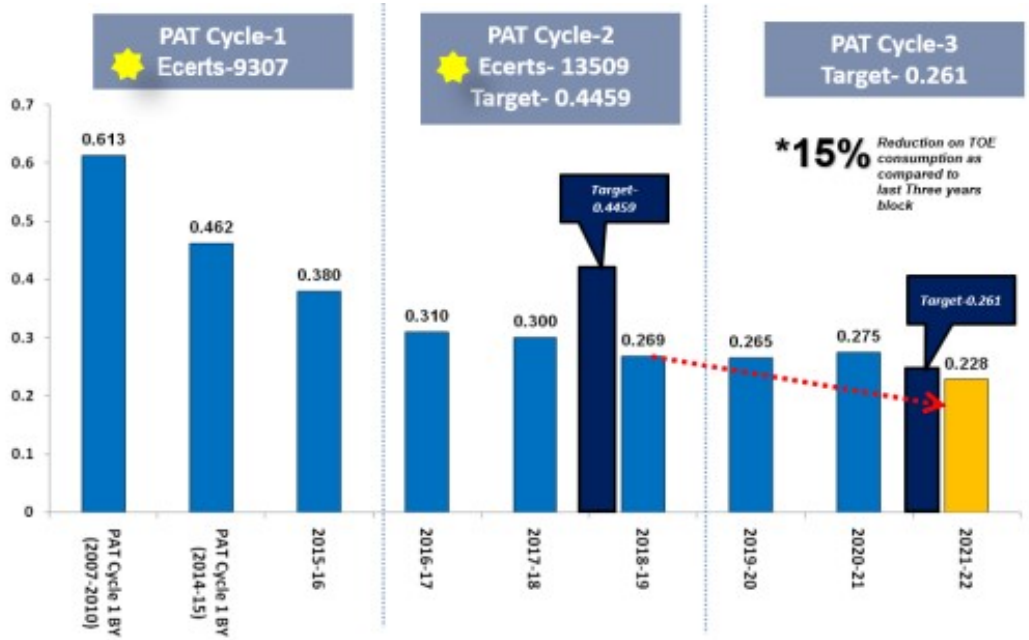


Energy Scenario-" Thermal Energy – Steam "



2. Sp. Energy Consumption-Trend

SEC-TOE

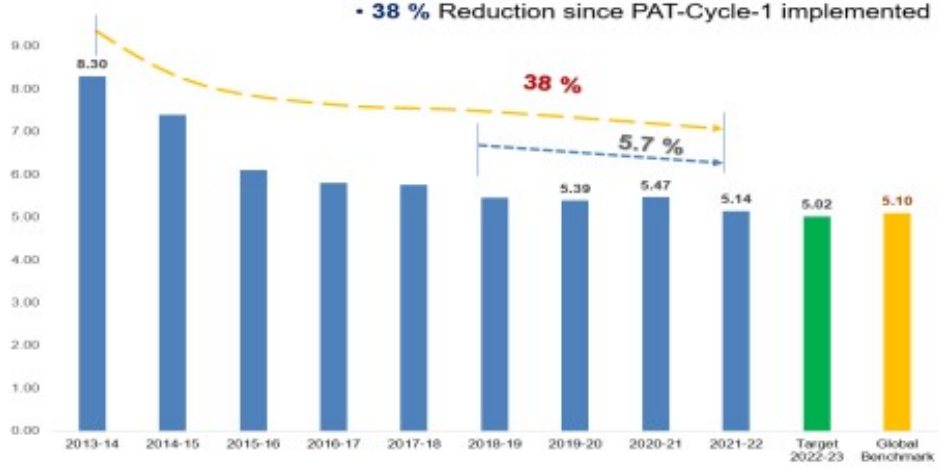


Specific Energy Consumption-KWh / Ton of Paper

- 6 % Reduction in last three year block.
- 28 % Reduction since PAT-Cycle-1 implemented

Specific Energy Consumption-Ton of Steam / Ton of Paper

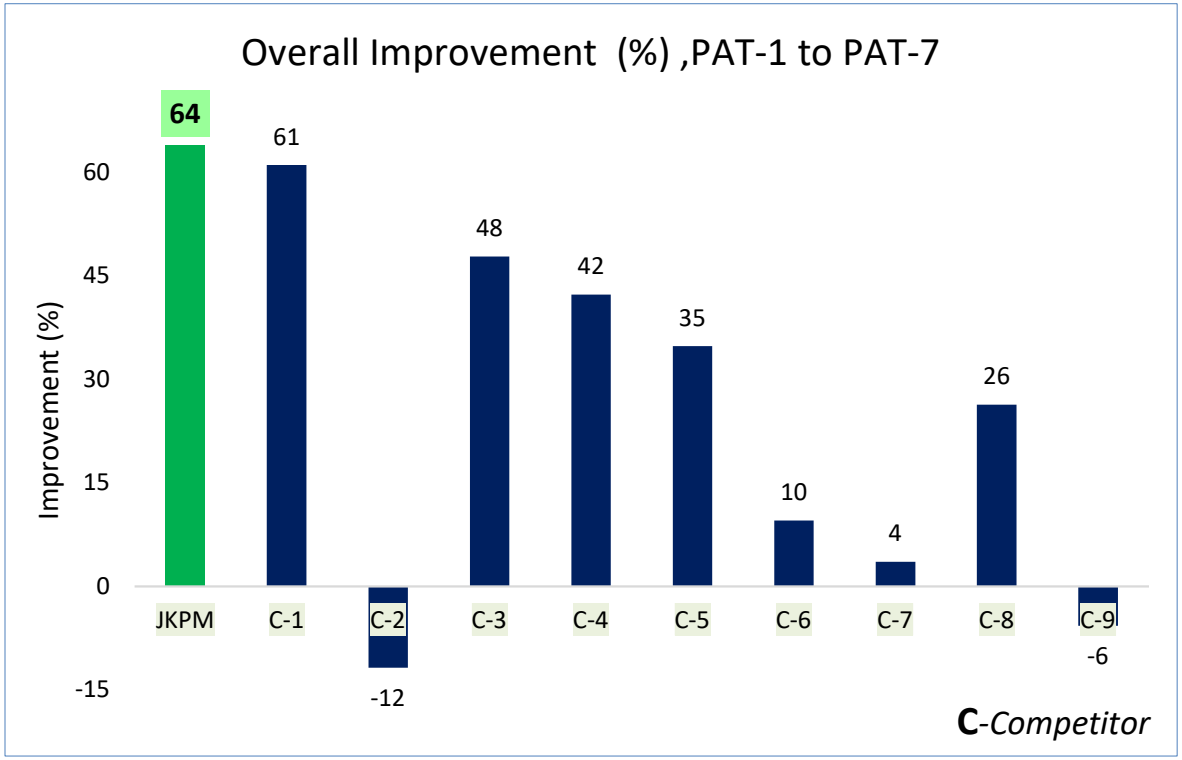
- 5.7 % Reduction in last three year block.
- 38 % Reduction since PAT-Cycle-1 implemented

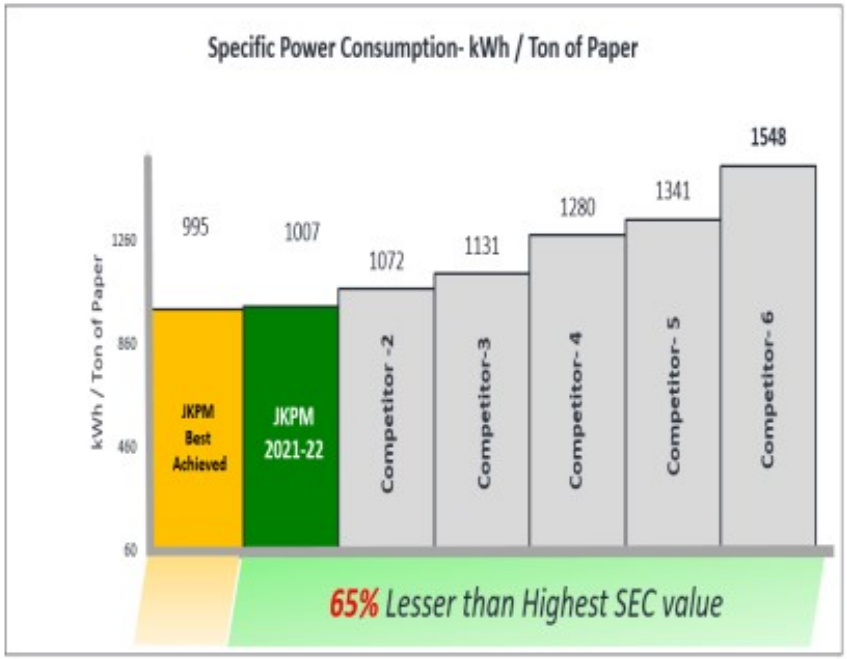


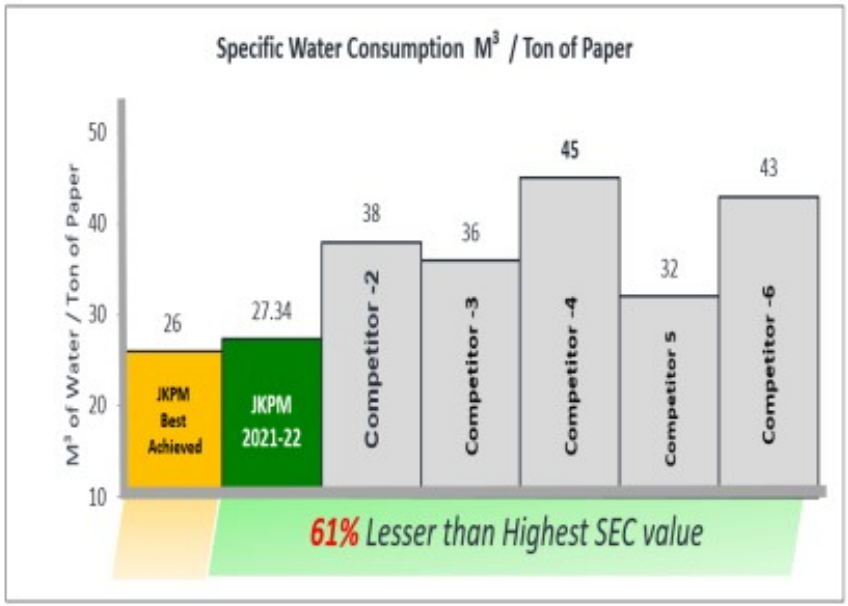
Specific Water Consumption- M^3 of Water / Ton of Paper

- 22 % Reduction in last three year block.
- 56 % Reduction since PAT-Cycle-1 implemented

3. Information on Competitors & Benchmark







Company	PAT-1 Baseline	PAT-2 Baseline	PAT-7 Baseline	Improvement %		
				PAT-1 to PAT-2	in Last PAT Cycle	Overall Improvement (%)
JKPM	0.736	0.462	0.2653	37.2	42.6	**64**
C-1	0.655	0.252	0.2552	61.5	-1.3	**61**
C-2	0.457	0.569	0.5109	-24.5	10.2	**-12**
C-3	1.058	0.57	0.5523	46.1	3.1	**48**
C-4	0.555	0.443	0.3205	20.2	27.7	**42**
C-5	0.609	0.557	0.3971	8.5	28.7	**35**
C-6	0.572	0.768	0.5174	-34.3	32.6	**10**
C-7	0.636	0.321	0.6132	49.5	-91.0	**4**
C-8	0.684	0.64	0.5038	6.4	21.3	**26**
C-9	0.591	0.777	0.6248	-31.5	19.6	**-6**

* Data source- PAT gadget

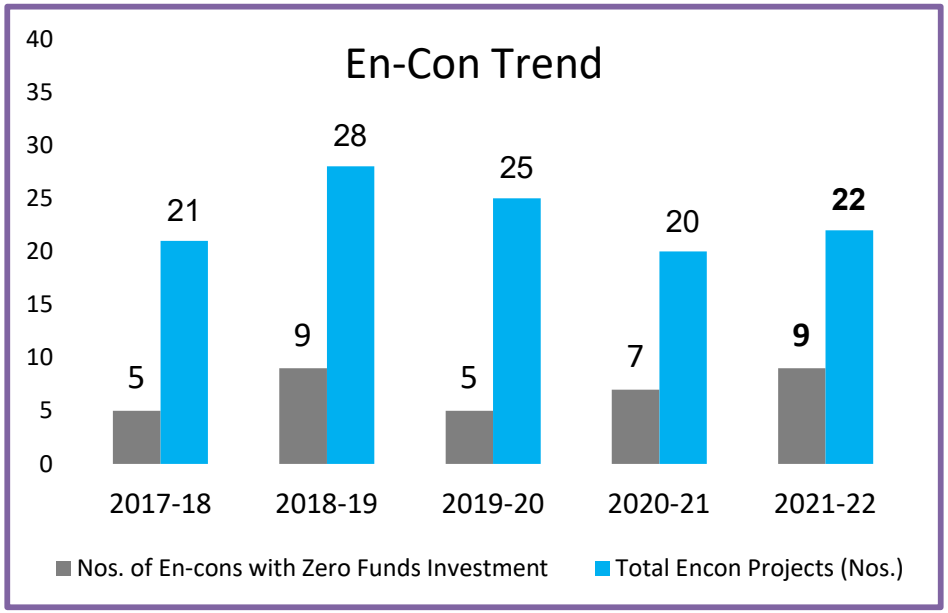
*CII

3. Major Encon Projects planned in FY 2022-23

Sl.No.	Proposed EnCon	Project description	Power savings (kW)	Annual Electrical Savings (Million kWh)	Annual Thermal Saving (MT of Steam/ Year)	Thermal Saving (Million kCal)	Total Annual Savings (Rs. Million)	Investment Rs. Million
1	Approach Flow Modification in PM1. Total 32 number of motor will be taken in auto control	Sequence operation control through process interlock	32	0.27	NA	0.000	1.441	0.8
2	PM 3 & Recovery low efficiency motor to be replace with IE4 energy motor	Motor up-gradation of different rating (total 709 KW, 17 nos.) will be replace with IE 4 grade	103	0.87	NA	0.000	4.637	1.4
3	Leap 200- Liquor Recirculation Temperature Model.	The model generated through python's Sklearn module – PLS Regression. In this module, a partial least square regression is set up to estimate the values of Cooking Circulation Temperature, which lead to steam saving by constant temperature control. The saving will be 0.05 Ton.	NA	NA	14.175	11.709	27329.4	0.4

The mentioned Major Projects are under nascent stage , the values are tentative and indicative only.

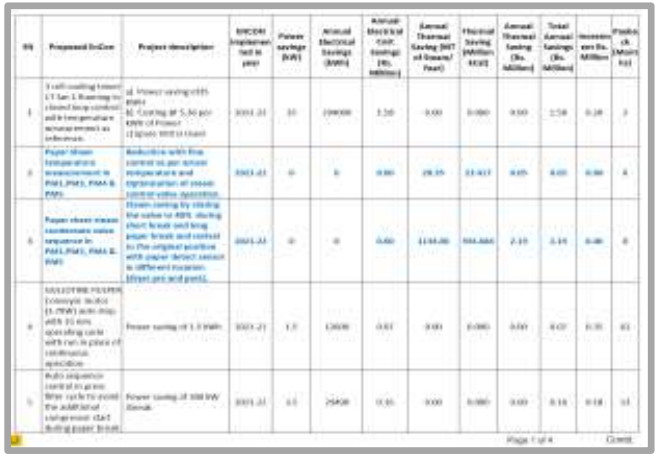
4. Energy Saving Projects implemented in last three years

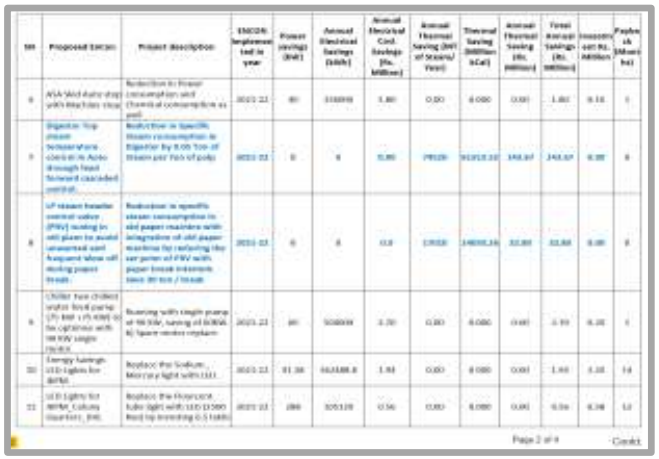


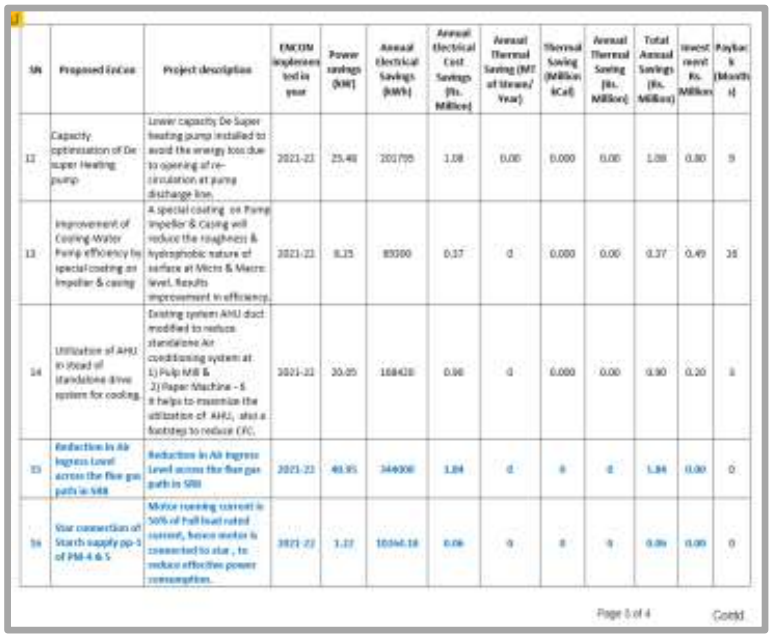
Year	Nos. of En-Con Projects	Nos. of En-cons with Zero Funds Investment	Total Encon Projects (Nos.)
2017-18	16	5	21
2018-19	19	9	28
2019-20	20	5	25
2020-21	13	7	20
2021-22	13	9	22

Year	No of Energy saving projects	Investments (Rs. Million)	Electrical savings (Million kWh)	Thermal savings (Million Kcal / MTOE)	Savings (INR Million)
2019-20	25	12	46.89	18168.87	43
2020-21	20	65	9.78	8976.45	23.1
2021-22	**22**	**80**	**26.55**	**76563.88**	**193**

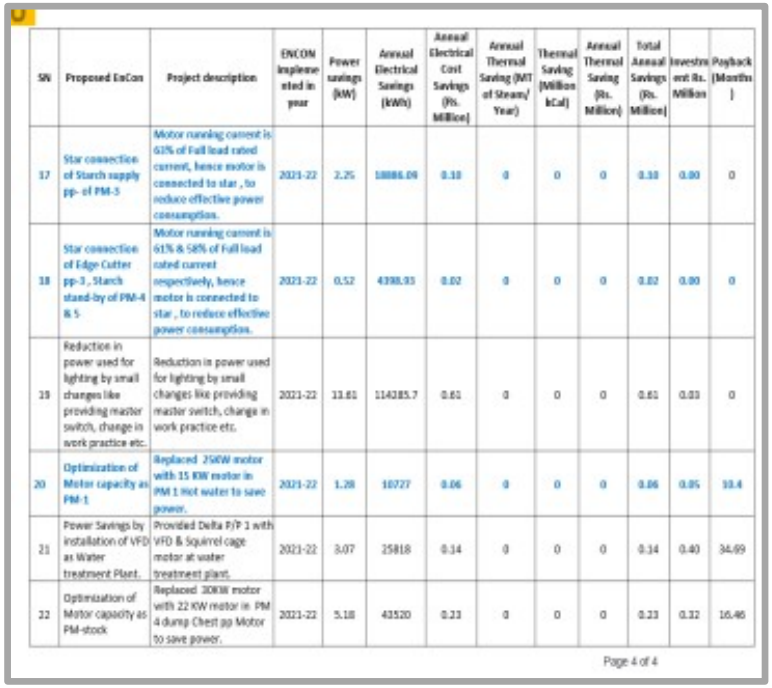
4. Energy Saving Projects implemented –FY 2021-22







Type of Project	Title	Savings & Benefits
Major En-Con Project-1	Steam Saving in Digester	Approx. 26 TPD of steam saving corresponding to INR 90 lacs/ year.
Major EnCon Project-2	Reduction in steam loss by eliminating steam venting in PM-1 to 5	Approx. 11 TPD of steam saving corresponding to 38 lacs/ year savings .(considering the capacity of 55 tph of the vent valve)
Innovative Project	Chemical and steam optimization through APC by ITOT System	Approx. 2.0 Cr / year savings corresponding to net energy, and coal saving
Environment Project	Minimize the usage of GHG – R22 / R134 by optimizing the utilization of AHU in place of standalone AC unit.	Approx. 14.48 Lacs / year savings corresponding to net energy and savings of CFC approx.- XXXXX Kg/Year

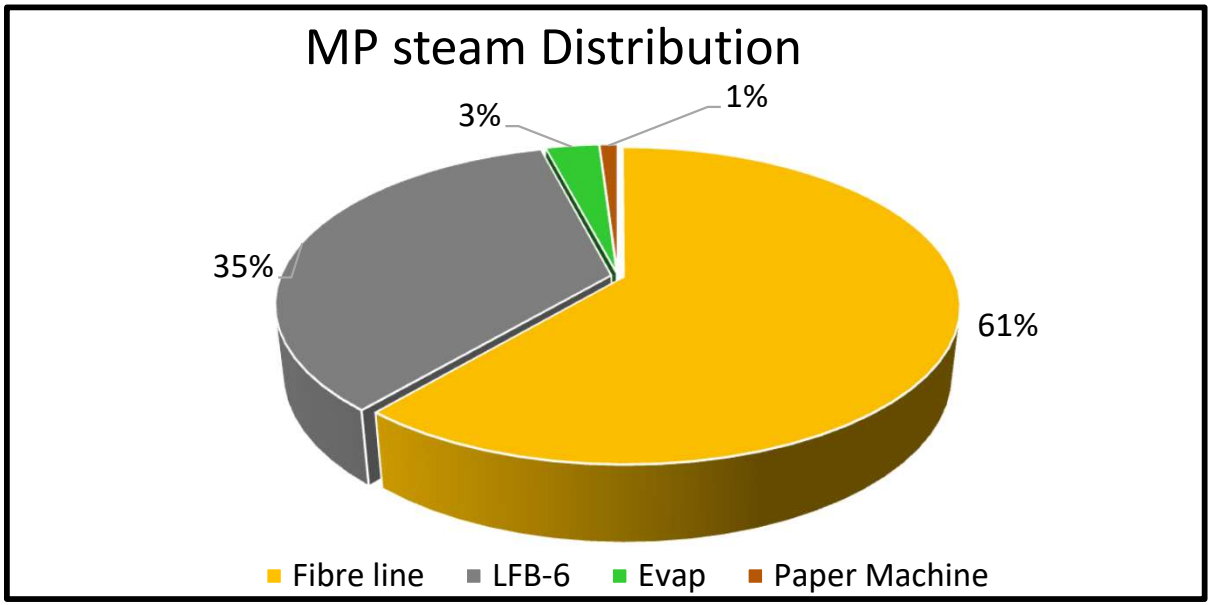


4. Major En Con Project– 1

Title : Steam Saving in Digester

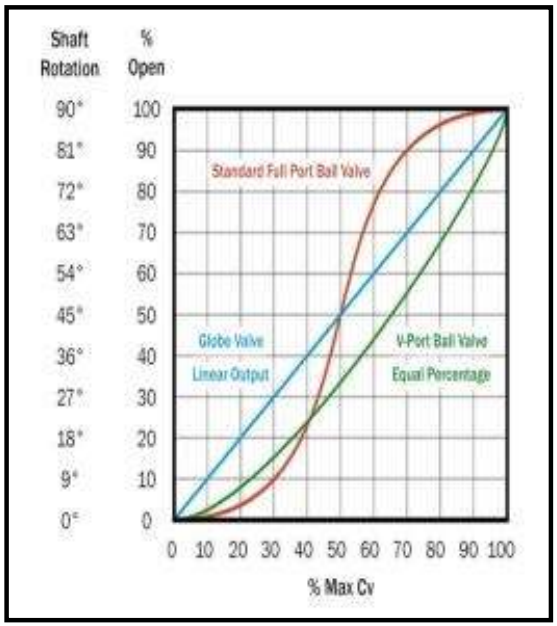
Background:

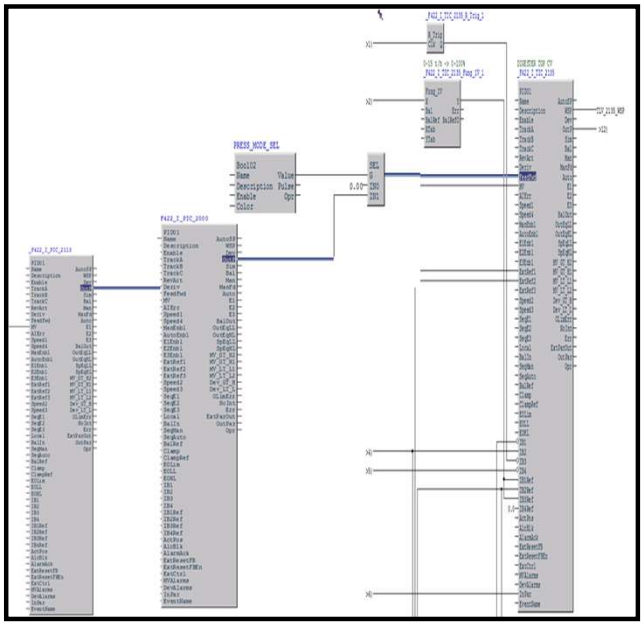
- Pulp-mill contributes 60% to total MP Steam Consumption.
- Digester process consumes 80% of pulp mill MP steam.



Need for Innovation:

- Steam Saving.
- Process stability.





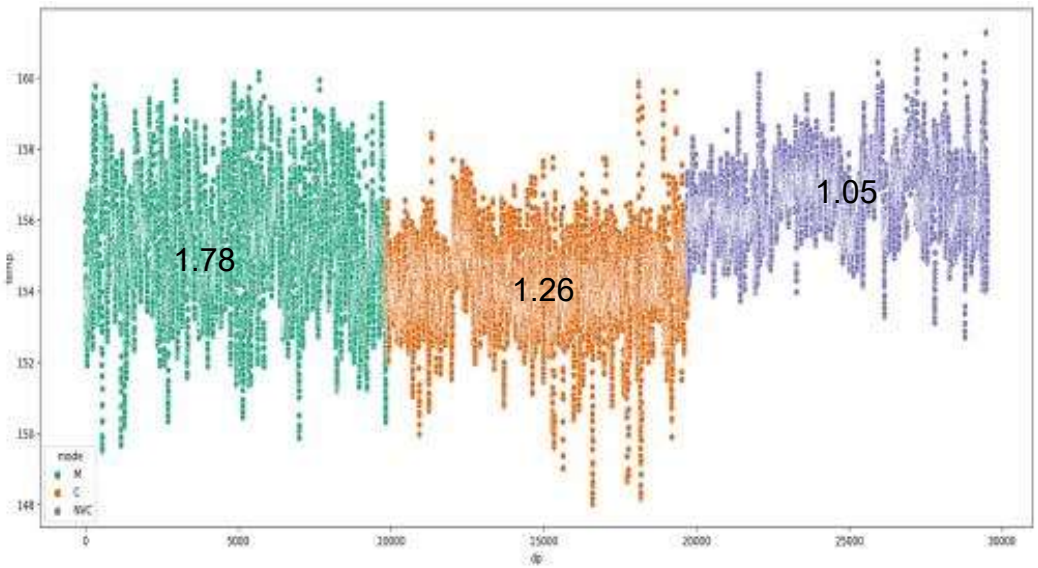
Action Taken:

- Multilevel cascade feedforward control.
- Design change of steam control valve.

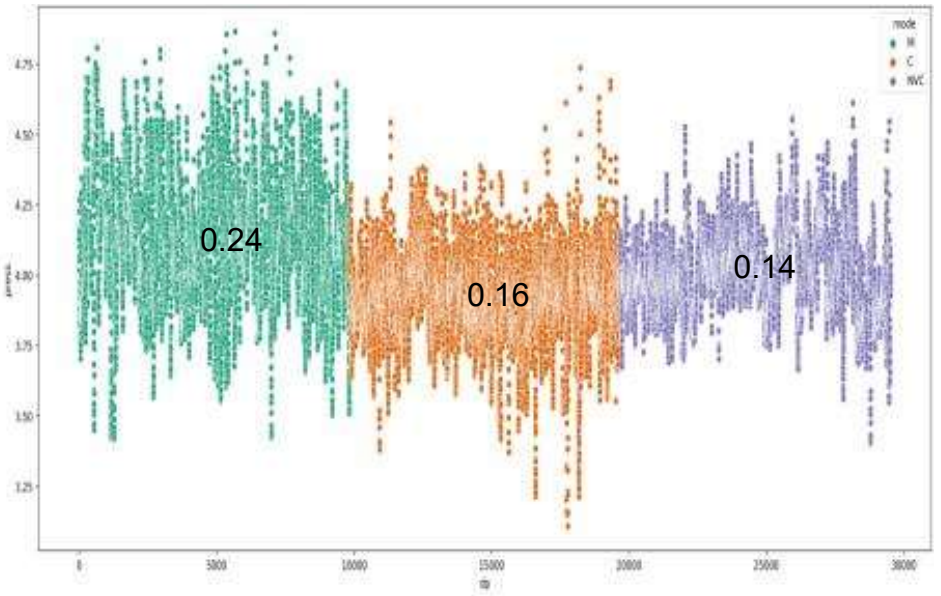
4. Major En Con Project– 1

Title : Steam Saving in Digester

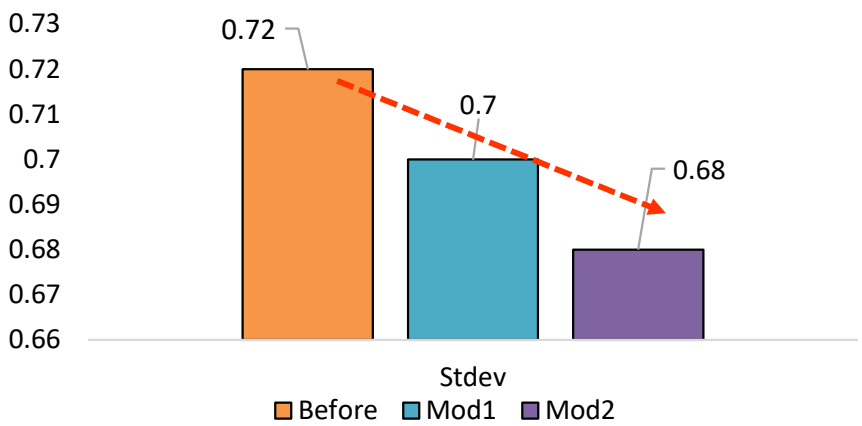
41.01 % reduction in stdev of digester temp



41.6 % reduction in stdev of digester pressure



Specific steam Consumption



Savings & Benefits:

Approx. **26 TPD of steam saving corresponding to INR **90 lacs/ year.

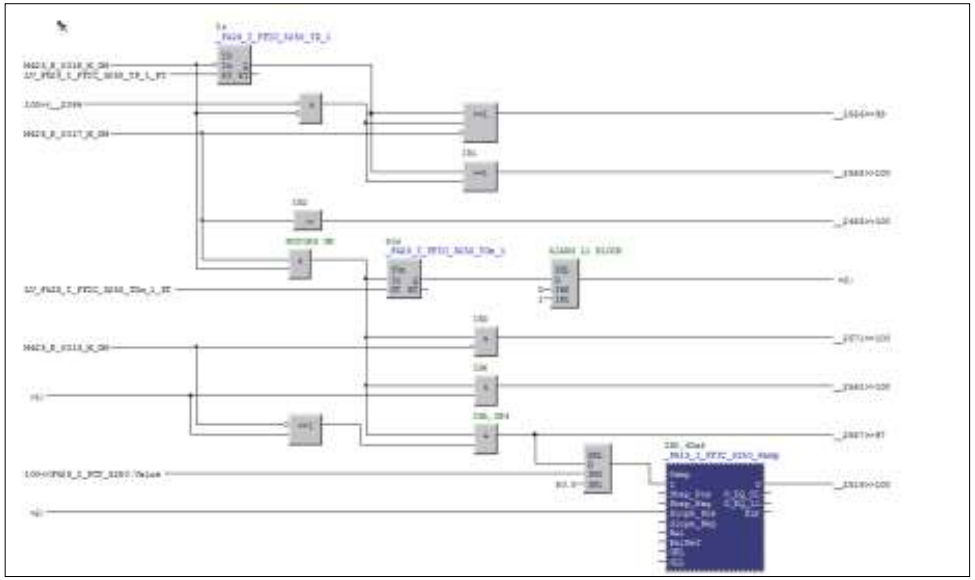
Operation stability leading to reduction in kappa number.

4. Major En Con Project– 2

Title : Reduction in steam loss by eliminating steam venting in PM-1 to 5

Background:

- Paper machines 1,3,4& 5 are major contributor of unaccounted steam due to steam venting in PRDS station.
- Steam was venting any time when there was a paper break or grade change due sudden change in pressure setpoints.
- Scope of improvement was there to minimize these losses

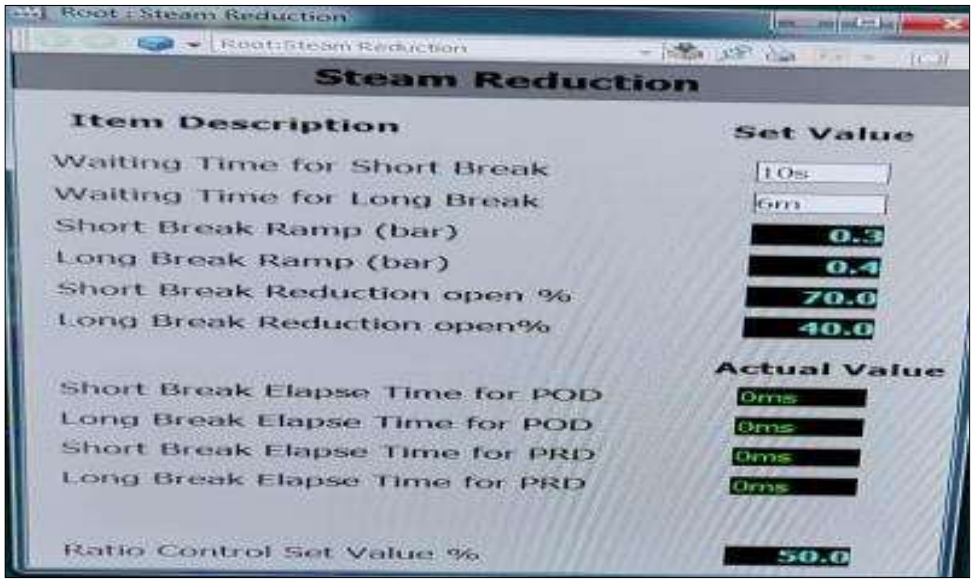


Need for Innovation:

- Resource conservation.
- Making future ready.

Action Taken:

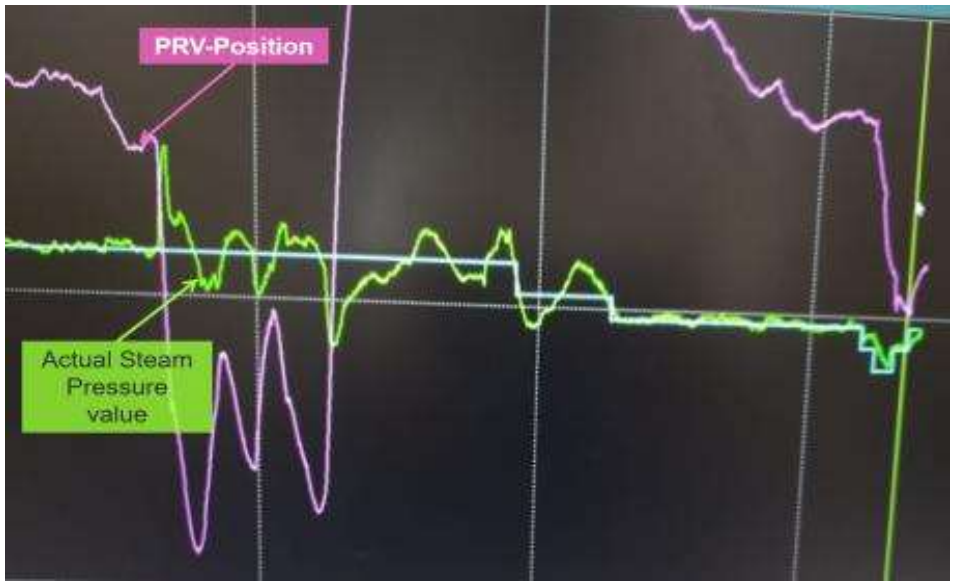
- Logic was prepared to ramp up and down at slow rate whenever there was a Pressure setpoint change due to paper break.
- Interactive Operator HMI was created for altering the ramp rate.



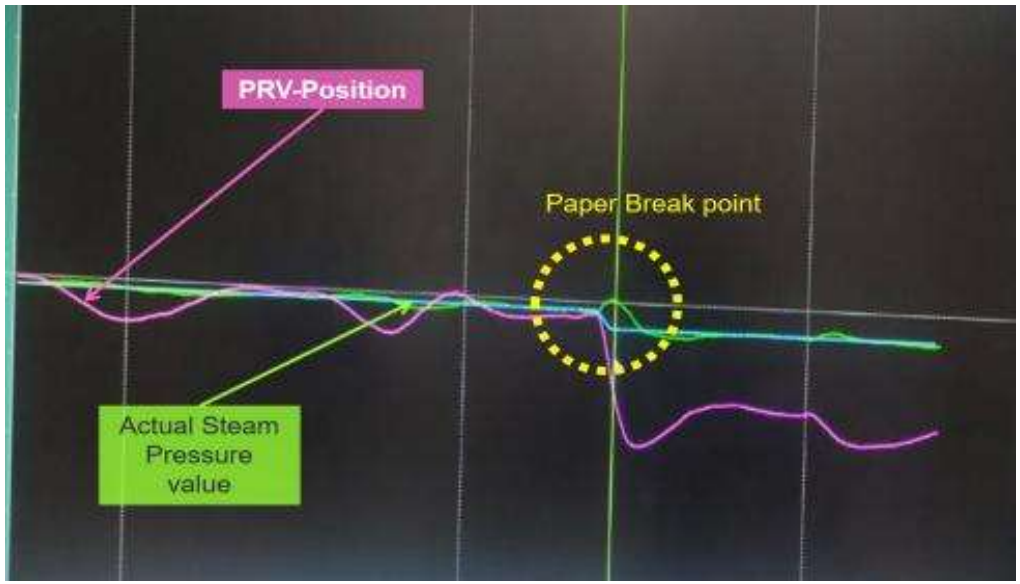
4. Major En Con Project– 2

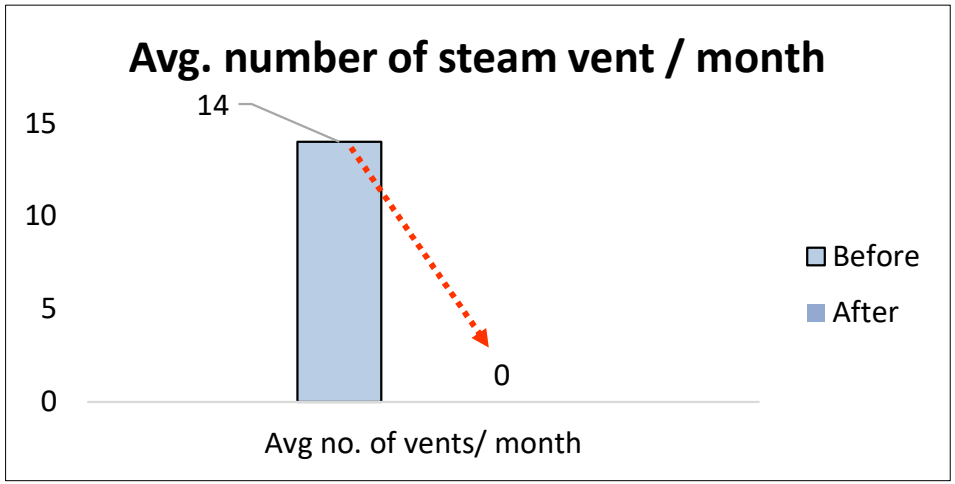
Title : Reduction in steam loss by eliminating steam venting in PM-1 to 5

Before trend



After trend





Savings & Benefits:

Approx. **11 TPD of steam saving corresponding to **38 lacs/ year savings . (considering the capacity of 55 tph of the vent valve)

LP steam Pressure variation was reduced in other machines due cascading impact of abrupt venting of steam.

Title : Chemical and steam optimization through APC by ITOT System

Background:

- The dosage of chemicals in the Bleaching process is manually driven .
- Set proportions of required chemicals are decided by operators based on their experience, leading to variability in finished product.

	ON	MV	TGT	PRED	REC	INP	ACT	HI	LO	MAX CHG	RAW
D0 CLO2		50.47%			20.00	19.00	19.6	20.00	12.00	0.7	22.8
EOP H2O2		80.22	80.50	80.01	8.24	7.00	7.29	17.00	2.00	0.5	
D0 NAOH		10.50	10.50	10.84	10.56	12.50	12.8	17.00	8.50	0.3	
D1 CLO2		88.93	91.0	89.80	16.00	16.00	16.6	16.0	14.0		

Need for Innovation:

- Resource conservation.
- Making future ready.

Action Taken:

- Predictive models for each key metric of the process to recommend optimum chemical dosage & air flow to get optimum brightness and steam generation respectively.
- Interactive dashboard for quick decision making.

4. Innovative Project

Title : Chemical and steam optimization through APC by ITOT System

- Bleaching Chem. - Predictive models were build using python sklearn module- PLS regression which will predict chemical dosage as per the target brightness and pH level.

- LFB steam- Multi variable clustering through K-means was done to identify the golden batch i.e. highest specific steam generation. Pls model was build using python Sklearn module as per golden batch to predict required SA flow , which was identified as the key modulator.

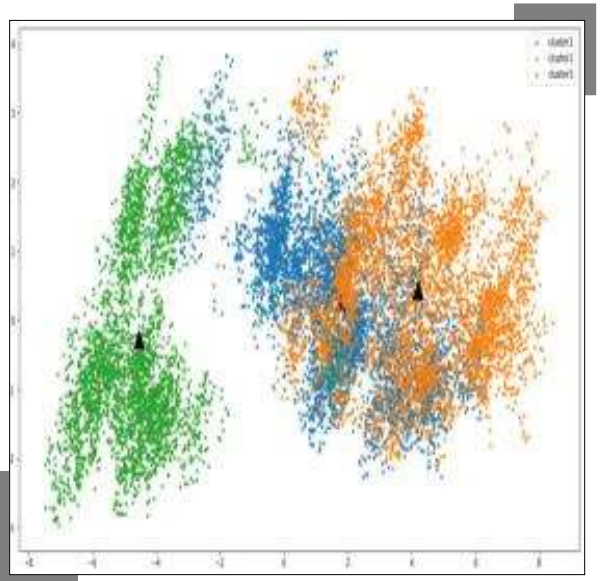
- The PLS model built was tested to have an R^2 accuracy of more then 90%

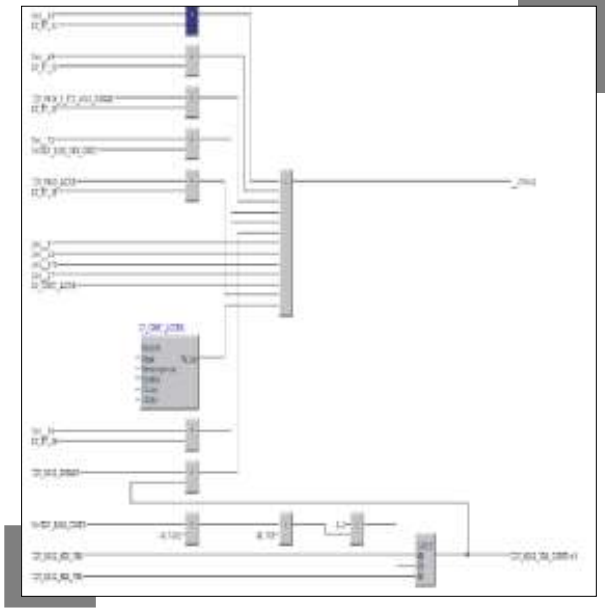
- The coefficient generated from PLS regression was extracted using a python command and used build logic in DCS.

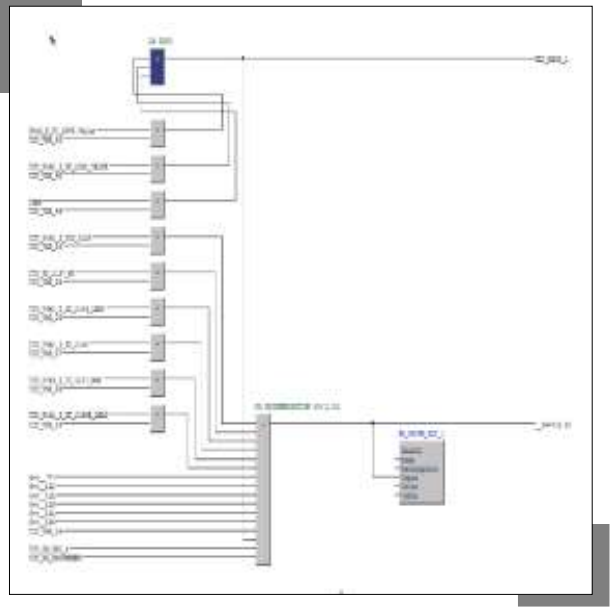
```
from sklearn.cross_decomposition import PLSRegression
train_X_linear = train_X.loc[:,linreg_xcols].copy()
train_y_linear = train_y.copy()
test_X_linear = test_X.loc[:,linreg_xcols].copy()
test_y_linear = test_y.copy()

pls2 = PLSRegression(n_components=3)
pls2.fit(train_X_linear, train_y_linear)
pred_linear = pls2.predict(test_X_linear)

# RMSE Computation
rmse = np.sqrt(MSE(test_y_linear.values, pred_linear.reshape(-1,)))
print("RMSE : % f" %(rmse))
```

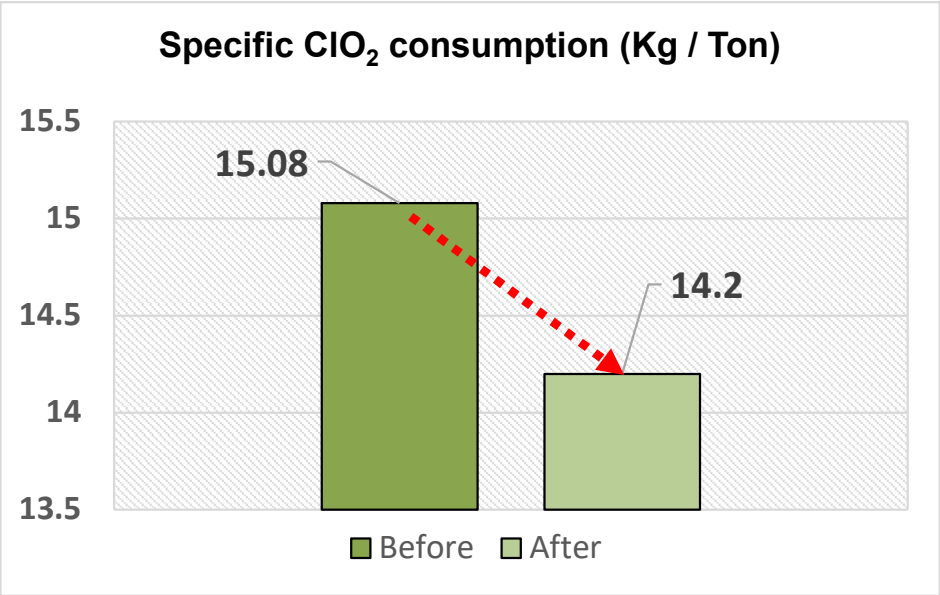


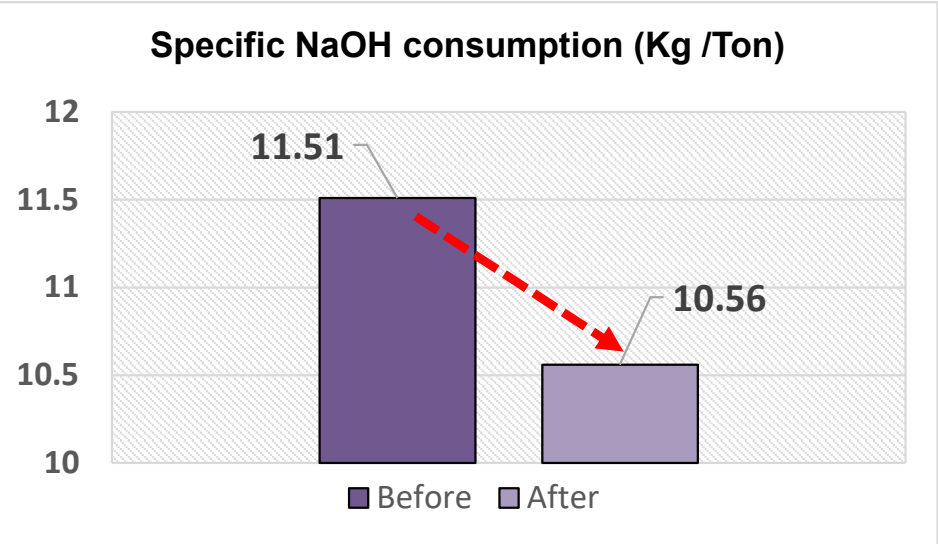


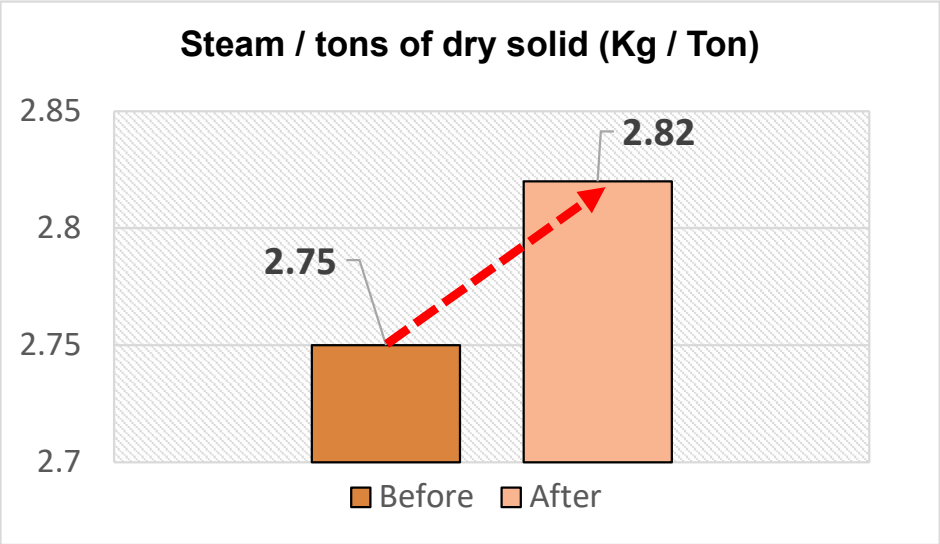


4. Innovative Project

Title : Chemical and steam optimization through APC by ITOT System







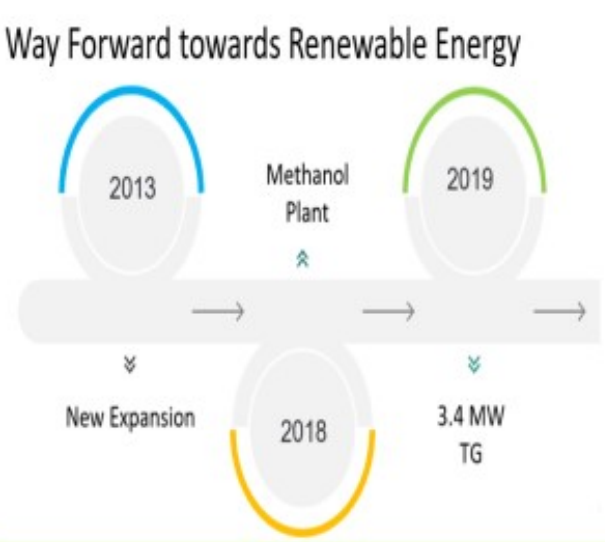
Savings & Benefits:

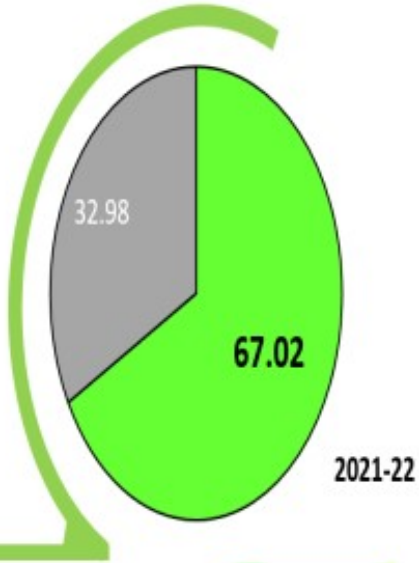
Approx. **2.0 Cr / year savings corresponding to net energy, and coal saving.

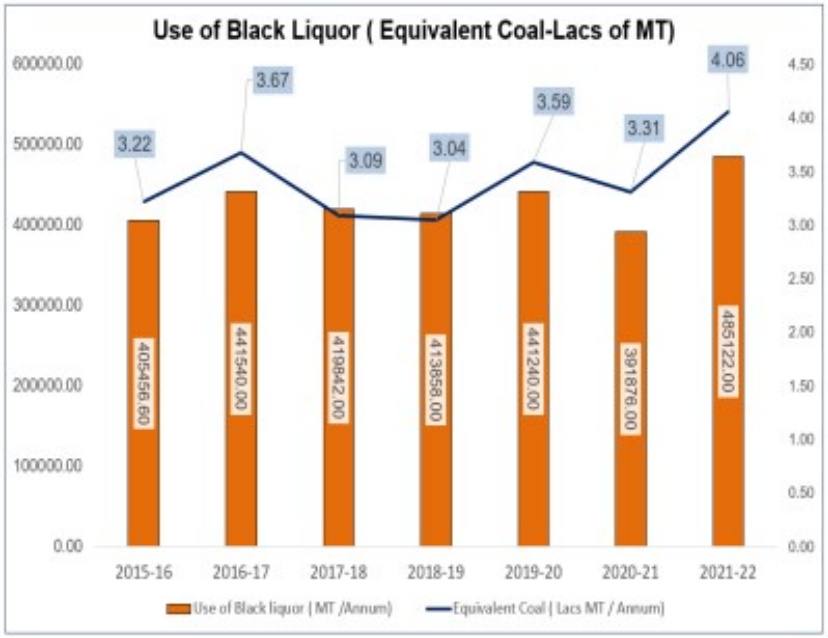
Operation stability .

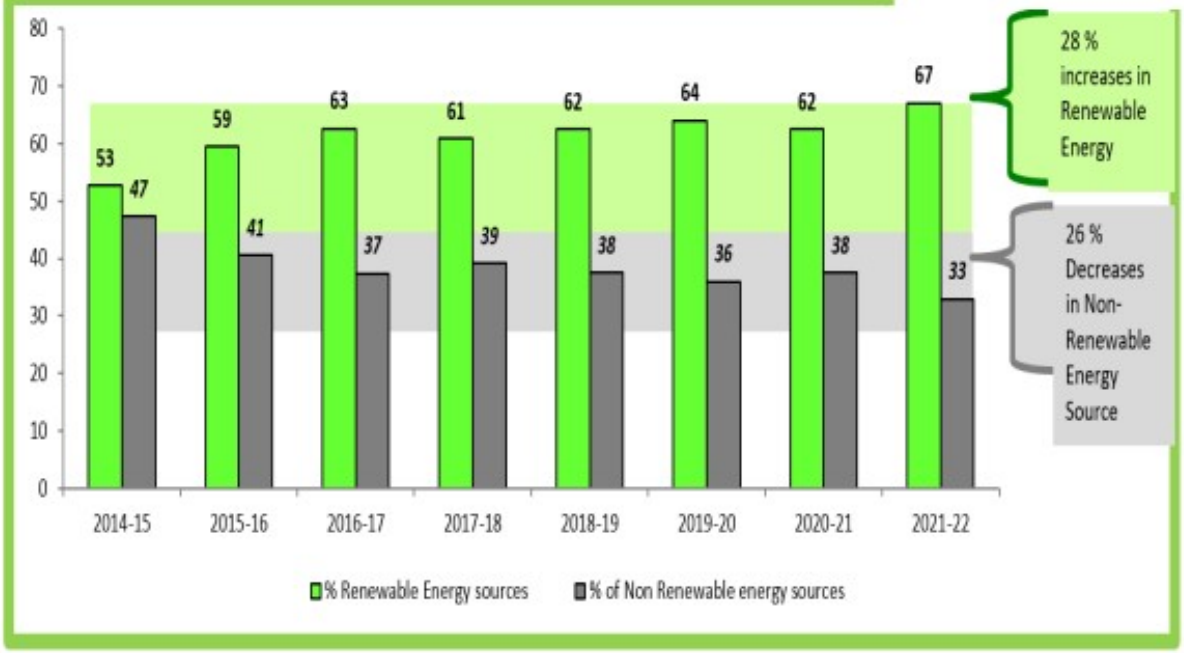
6. Utilization of Renewable Energy sources

Utilization of Renewable Energy % of Total Energy

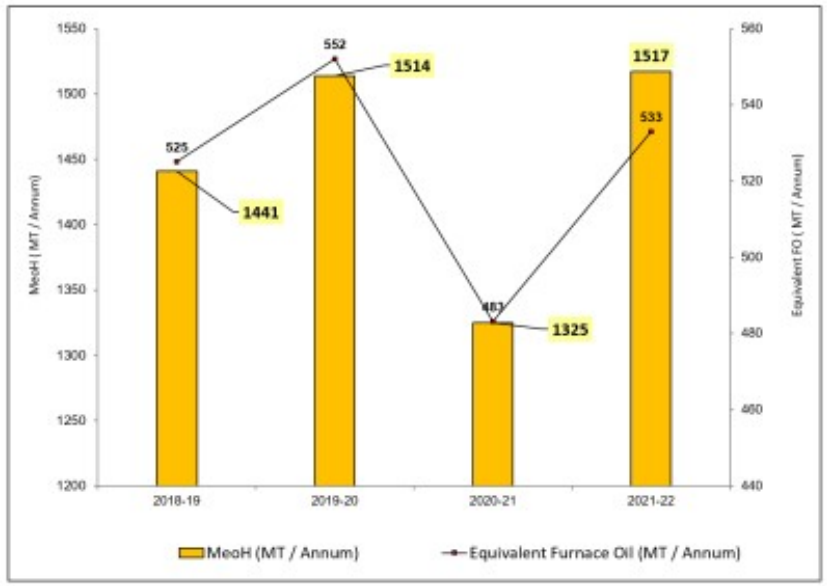








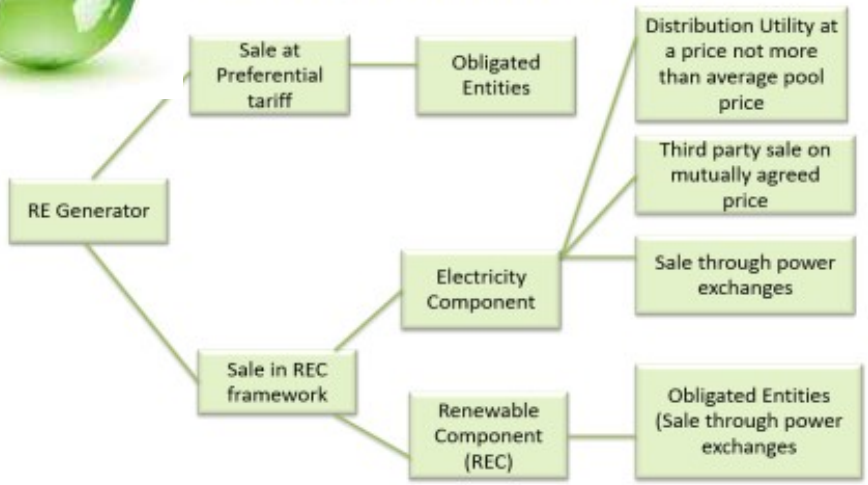
Utilization of Renewable Sources – " Methanol (MeOH) "



6. Utilization of Renewable Energy sources

Renewable Energy Certificates / RPO

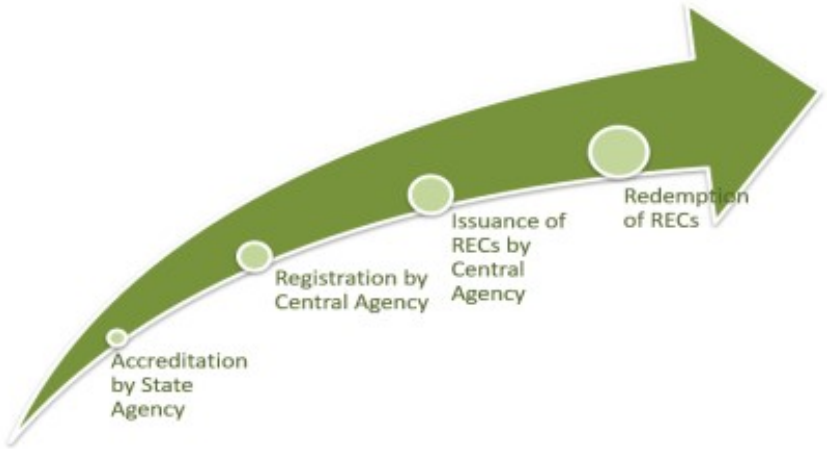
Conceptual framework



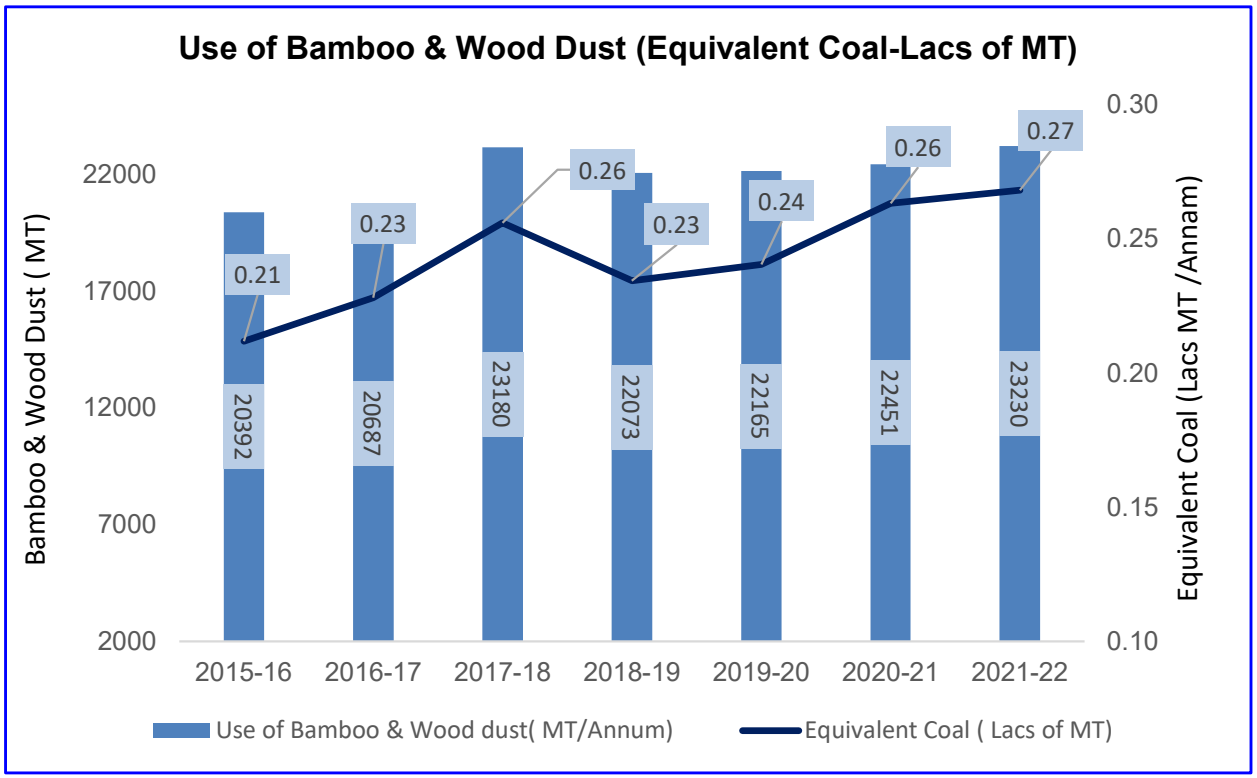
FY 2021-22

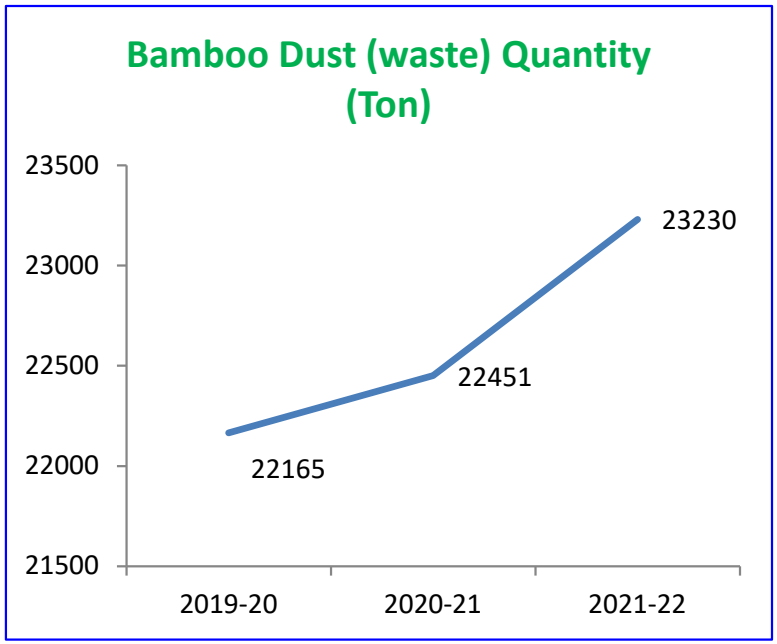
- REC Issued-149867 MWH
- REC Claimed-180586 MWH
- REC Traded-281896 MWH

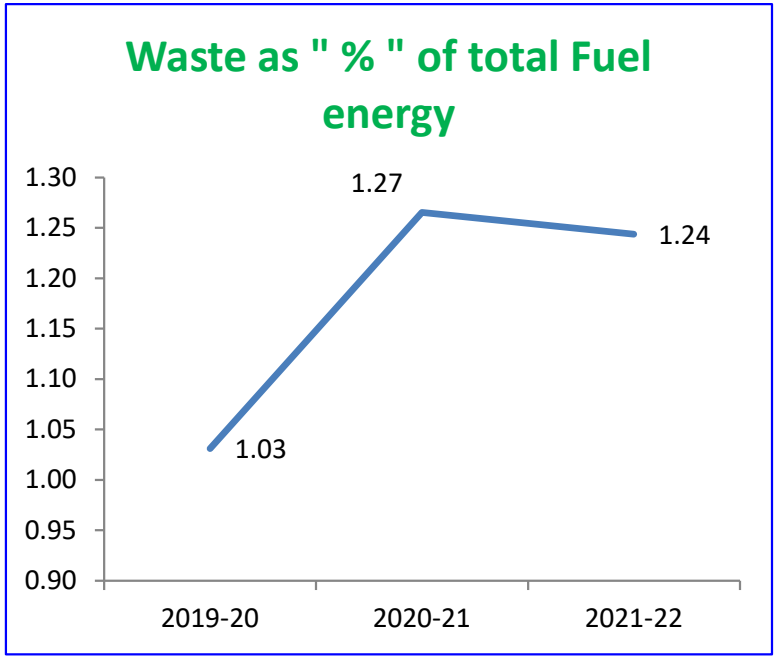
Operational framework



7. Waste Utilization and Management







Year	Type of Waste as fuel	Bamboo Dust (waste) Quantity (Ton)	GCV (Kcal/Kg)	Waste Fuel energy (Million Kcal /kg)	Total Thermal energy (Million Kcal /kg)	Waste as " % " of total Fuel energy
2019-20	Bamboo & Wood Dust	22165	4120	9132	885478.16	1.03
2020-21		22451	4275	9598	758424.31	1.27
2021-22		23230	4300	9989	803231.90	1.24

High purity purged lime sludge.

Usage of High Purity lime sludge

Before

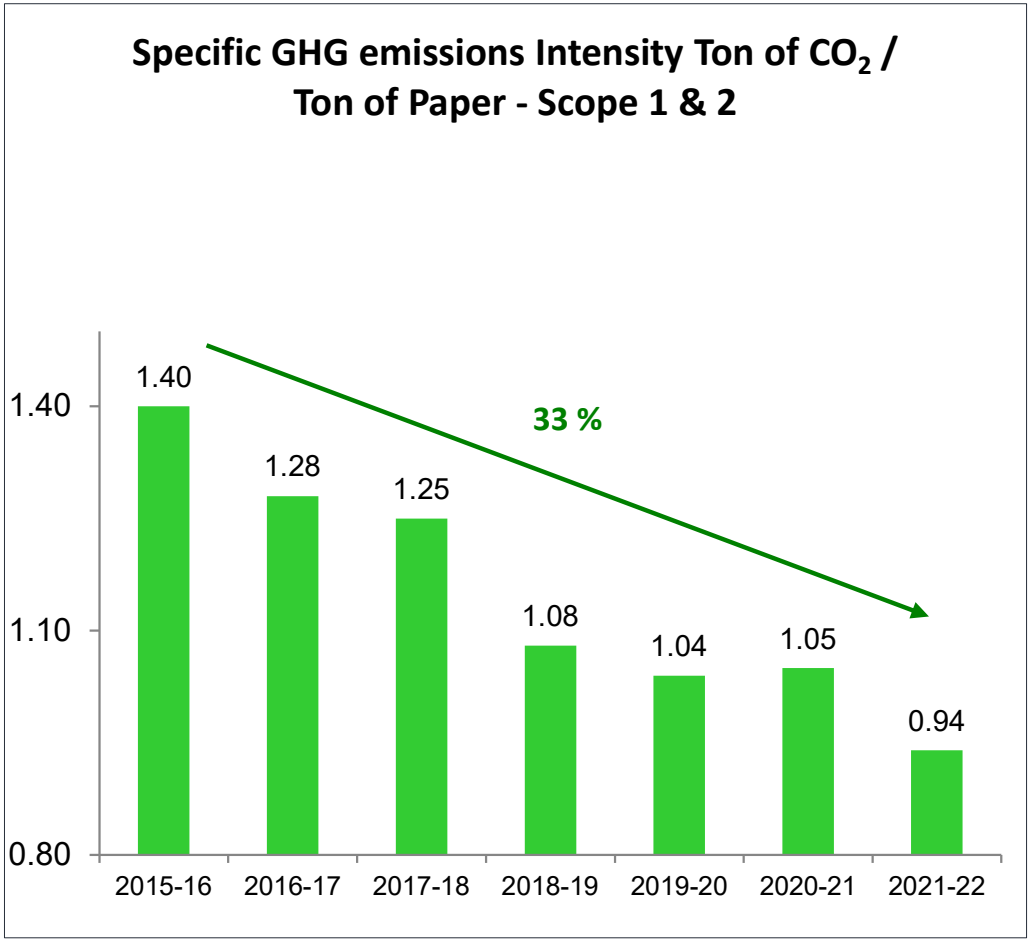
High purity purged lime sludge which was generated from the process was disposed of at low lying areas or landfill. There was no proper mechanism to feed the same in our system, resultant effect was wastage of resources and thereby increasing the cost. The landfill was a big challenge due to space constraint.

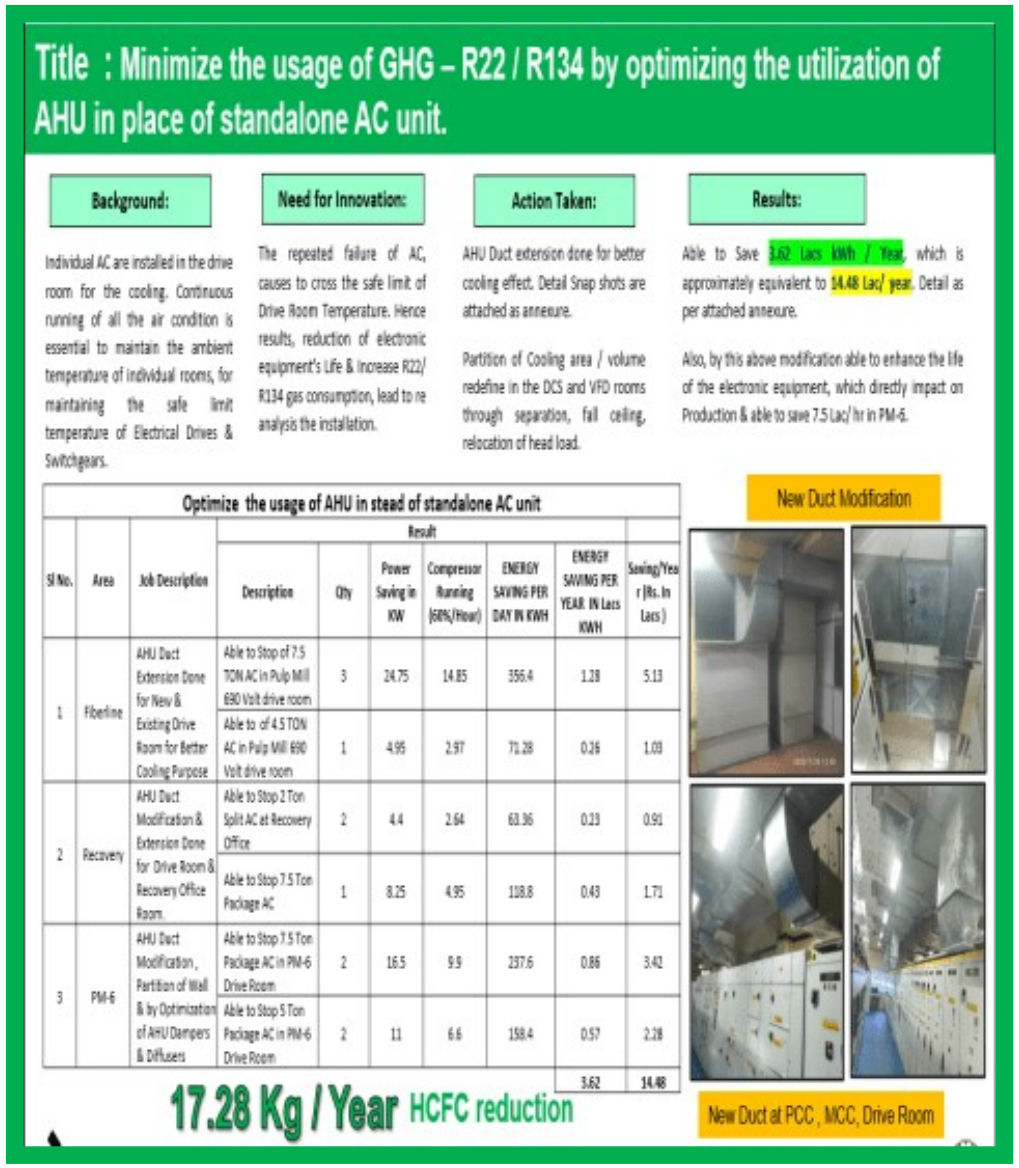
After

Built up the mechanism to utilize the high purity lime sludge back in our system which serves the purpose of 3R concept, and thereby reduction of cost and reduction of load on landfill. A total of 4763 MT was re used during the year. Some part of the sludge is also used by fish horticulture people.

Month	Lime sludge Feeding (MT)
Q1-21-22	1200
Q2-21-22	323
Q3-21-22	2387
Q4-21-22	853

8.GHG Inventorisation



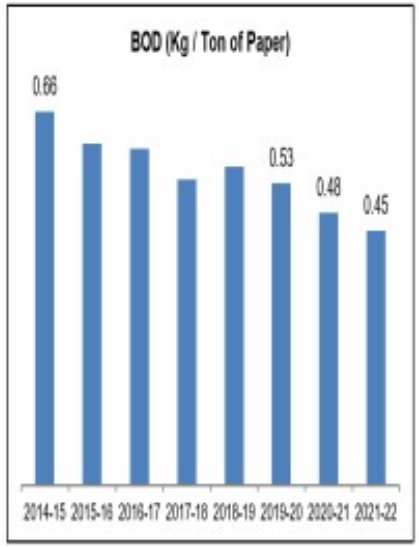


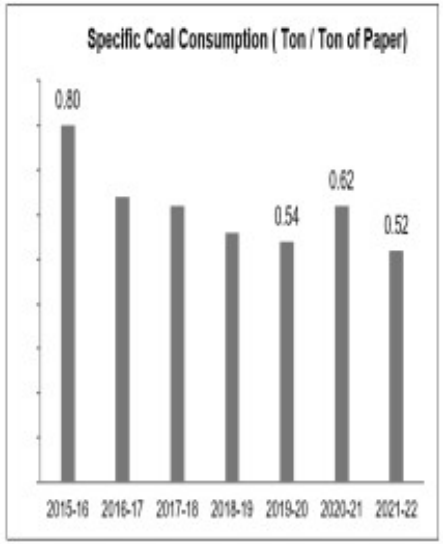
- Targeting for 75 % renewable energy by 2025.

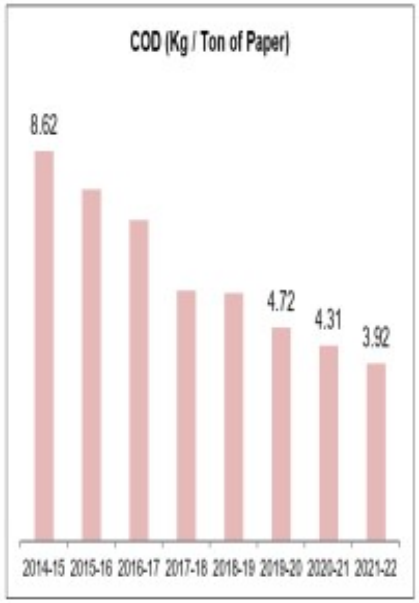
- Digital Transformation journey.
  - Pilot project started in 2018 -19 , covering Pulp mill, Recovery and Power block.
  - This year it is expanded to entire JKPL across value chain.

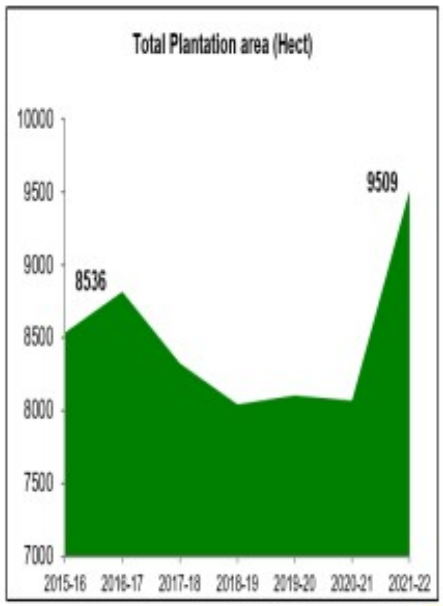
8.GHG Inventorisation

Environment Initiatives









Water Saving Projects

S.NO	Title of water saving project implemented	year of implement ation	Annual Water Saving		Investm ent cost	Payback (Month)
			m^3/ annum	Rs. Lacs	Rs in Lakh / year	
1	Reduce freshwater consumption by substituting hot water with back water in EOP & D1 washer spray in bleaching.	2021	170400	1.8	1	6
2	To use reclaimed water in SO_2 plant.	2021	76680	8.2	1.25	1.8
3	To replace the existing low capacity pump with higher capacity pump to avoid return cooling water pit overflow in Chlorine Dioxide plant.	2021	17040	1.8	0.50	3.3
4	O_2 plant Compressor heat exchanger outlet freshwater collection and its recycling to Cooling Tower.	2021	25560	2.7	0.2	0.9
5	Reduction of Hot water consumption in D-stage by using Reclaimed water through heat exchanger.	2021	230040	2.5	10.0	48.0

9.Green Supply Chain Management

- ***Green Supply chain* policy is integrated with our Environment Management Policy**

Procurement

- IE4 motors
- BEE star rated
- Critical supplier visits
- Local Procurement

Logistics

- Inbound
- Outbound
- Internal

Manufacturing

- Energy efficient technology
- Continuous improvement through TPM

Products to replace plastic

- Straw paper
- Coated Cup stock paper
- Carry bag paper
- Food Product-Divine Ns
- Matchbox stick
- OGR-Oil and Grease Resistance Paper

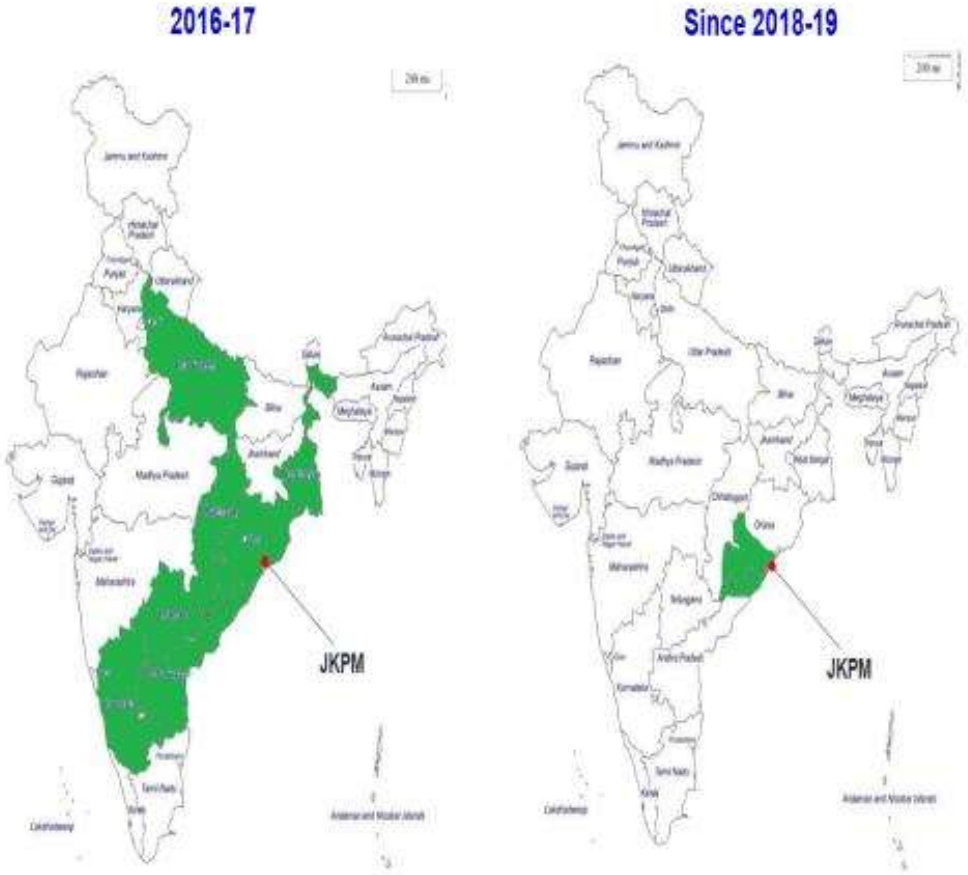
New Product Development , FY 21-22

	Coated Cup Stock	DIVINE NS	Straw ECOSIP	Oil & Grease resistance OGR	Match box Stick HSMT
Q1-21-22	243	16	59	18	65
Q2-21-22	998	60	0	69	32
Q3-21-22	829	47	116	146	39
Q4-21-22	1721	22	44	138	121
Total	3791	145	219	371	257

116T-Carry Bag Paper despatch in July-2022

9.Green Supply Chain Management

Green Supply Chain- Raw Material Procurement



- Average Truck distance has come down from 700 KM to 150 KM.
- GHG emission reduction by **18413** MT CO_2 per year.

Green Supply Chain- New Product Development

Energy Conservation Policy

1. **Optimization** of plant and equipment efficiency

2. Elimination and prevention of all type of losses in the use of water, power, steam,coal,compressed air.

3. Maximize condensate recovery and use process heat recovery , waste minimization

4. Increasing the co-generation of system and power

5. Improved utilization of natural resources leading to environmental benefits.

6. Energy conservation through total employee involvement.

JK PAPER LTD.

Energy Conservation Policy

We are committed to reduce the energy consumption and cost by :

- Optimization of plant and equipment efficiency
- Elimination and prevention of all type of losses in the use of water, power, steam, coal, compressed air
- Maximizing condensate recovery and use, process heat recovery, waste minimization
- Increasing the co-generation of steam and power
- Improved utilization of natural resources leading to environmental benefits
- Energy conservation through total employee involvement.

We believe that
"Energy Saved is Profit Earned"

(HARSH PATI SINGHANIA)
MANAGING DIRECTOR

January 25, 2002

10. Team work, Employee Involvement & Monitoring

En-Con Cell & Monitoring system

Energy Conservation Monitoring Approach

Daily Energy Consumption & Production Report

Monthly Energy Report

Daily Specific Energy Consumption Report

Energy Manager | HEAD (BD) | E.V.P. (Works)

Monthly ENCON Meeting

Morning Performance Meeting

Idea Generation

H.O.D. of other functional Dept.

Action Plan

Implementation

Energy Conservation Cell Structure

Constituting the organization Chief and General Managers

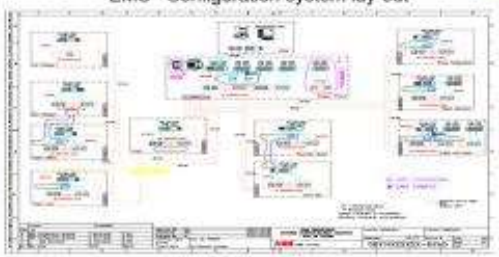
DGMs and Line Managers of Process , Electrical & Instrumentation

Dy. Mgrs. / Asst. Mgrs. / Supervisors / workmen

Energy-Monitoring

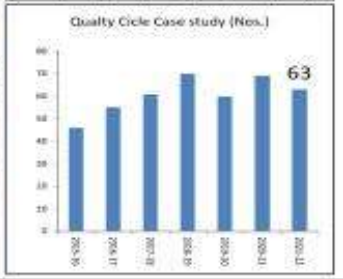
SEC- reporting format

EMS –Configuration system lay-out



PMS-Screenshot

Energy conservation through total employee involvement-Suggestion & QC



11. Implementation of ISO 50001/Green Co/IGBC rating

ISO 50001 implementation under process

IMPLEMENTATION OF CORRECTIVE AND PREVENTIVE ACTIONS FROM ISO 9000& ISO 14000 CERTIFICATIONS

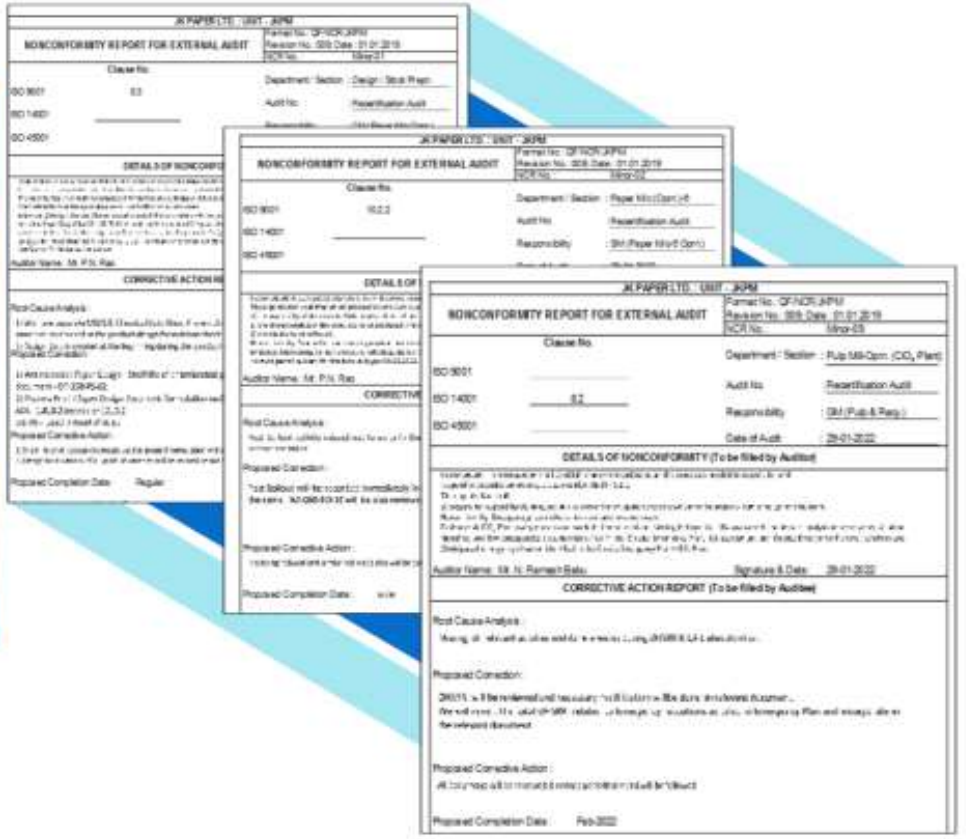
JK PAPER LTD. : UNIT - JKPM

16-Feb-2022

M/s. DNV Recertification Periodic Audit 25th to 29th January 2022 Minor NCN / OBS / OFI Distribution List

Sl. No	Category / NCN No.	Department	Standard
1	Minor-01	Stock Preparation	ISO 9001:2015
2	Minor-03	Stock Preparation	ISO 9001:2015
3	Minor-02	Paper Machine-6 (Oprn.)	ISO 9001:2015
4	Minor-04	Paper Machine-6 (Oprn.)	ISO 45001:2018
5	Minor-04	Instrumentation	ISO 45001:2018
6	Minor-05	Finishing House PM-6	ISO 45001:2018
7	Minor-06	Electrical	ISO 45001:2018
8	Minor-07	Soda Recovery (Mech.)	ISO 45001:2018
9	Minor-08	Purchase (HO, NO)	ISO 9001:2015
10	Minor-09	Pulp Mill (Oprn.)	ISO 14001:2015
11	Minor-10	Coating Plant	ISO 14001:2015
12	Minor-10	Canteen	ISO 14001:2015

Legend :
NCN : Non Conformity Note-Minor
OBS : Observation
OFI : Opportunity for Improvement



Approximately **0.30%** Investment of (80 Million of Rs.) energy saving projects on total turnover (27685 Million of Rs. FY-21-22)

12. Learning from CII Award or any other Award program

Maximize the usages of Natural Resource
Light pipe project is already under proposal stage to mitigate the lighting issue at various sheds of the Plant.

Use Energy Efficient Equipment
PM-3 all old motors are going to change with new IE rated motor to achieve better efficiency.

Implementation of ISO 50001, the implementation is under progress

4 capital projects from the learning of Energy award program in 2018-19 & 2017-18

Networking with other Energy managers has improved and it is helping to reduce the time gap

Greenco document is of great help to implement best practices

Recent Awards , Acknowledgement & Major Achievement

National Awards for Excellence in Manufacturing - Mill Manager of the Year - EVP (W)

National Safety Award" for the year 2018 from Ministry of Labour & Employment, Government of India under two distinct categories- an Accident-Free Year & maintenance of Lowest Average Frequency Rate.

22nd National Energy Management Award 2021 from CII- ''Excellent Energy Efficient Units''.

Overall Digitalization, Industry 4.0

Best Green Practitioner Award 2022

State Level Electrical Safety Awards , Best Electrical Safety Practices.

Thank You