



## Enhancing Efficiency through Electricals, Electronics, Automation and Digital Technology at KPML



Suresh Babu  
AVP-  
Production



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DGM – E&I



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Dy. Manager –  
Envir.



F AIRNESS  
QU A LITY  
C OMMITMENT  
SUS TAINABILITY  
CUSTOMER S ATISFACTION

Incorporated  
in 1985

Annual Group  
Turnover of  
₹ 3,000 Crores

Diversified Product Range  
Packaging Board,  
Printing & Writing, Newsprint

Among Top 5  
Paper Producers in  
India

The Largest  
Waste-Paper based Mill in  
India

Single Site with  
36,000 MT p.m.  
Capacity



# MACHINE DETAILS



PM - 1

PACKAGING  
BOARD - 1

(DUPLEX & FBB)

GSM - 230 - 450

Deckle - 284 - 290 cm

Max Capacity - 8000 MT



PM - 2

PACKAGING  
BOARD - 2

(DUPLEX)

GSM - 280 - 450

Deckle - 204 - 212 cm

Max Capacity - 5500 MT



PM - 4

WRITING & PRINTING,  
COPIER AND VAP

(MAPLITHO & COPIER)

GSM - 54 - 120

Deckle - 438 - 444 cm

Max Capacity - 10000 MT



PM - 5

WRITING & PRINTING,  
AND NEWSPRINT

(W&P & NEWSPRINT)

GSM - 42 - 56

Deckle - 640 - 645 cm

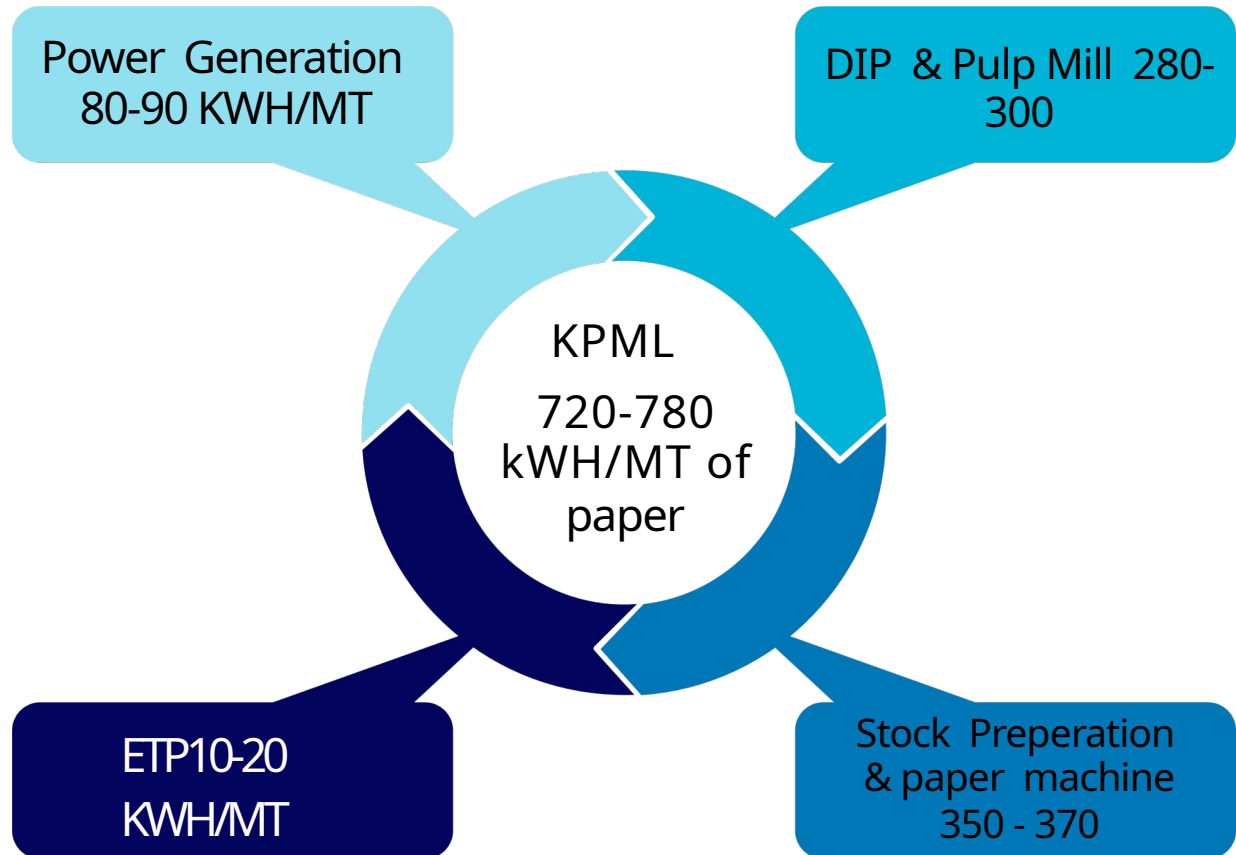
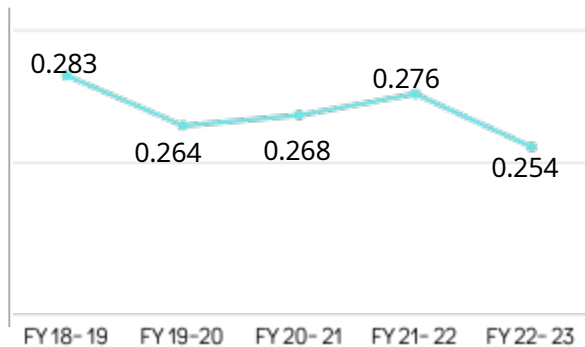
Max Capacity - 13000 MT

# Energy and Power consumption overview

## KPML

KPML is operating at 0.252 TOE/Tonne of paper

Specific Energy consumption year wise TOE/MT





# State Energy Conservation Award-2022-2023

(Department of New and Renewable Energy, Government of Punjab)



PEDA Award



KPML Team

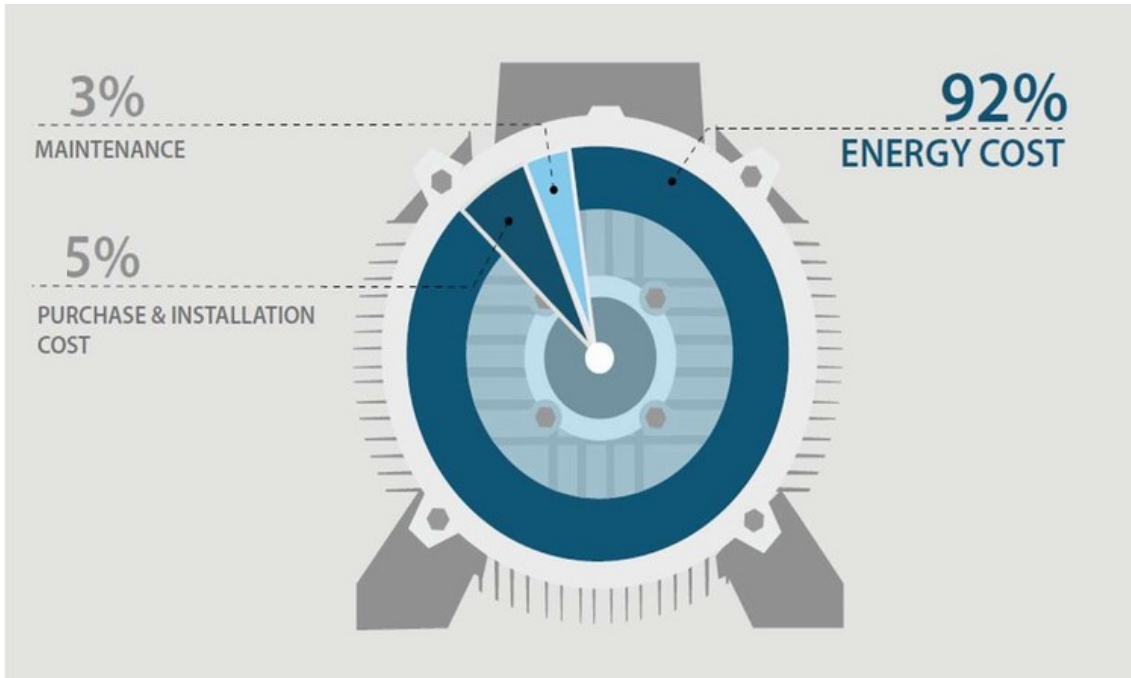
# Adoption of Higher Efficiency Motors

## Approach & its benefits (IE3 & IE4)



# Lifecycle Cost Approach

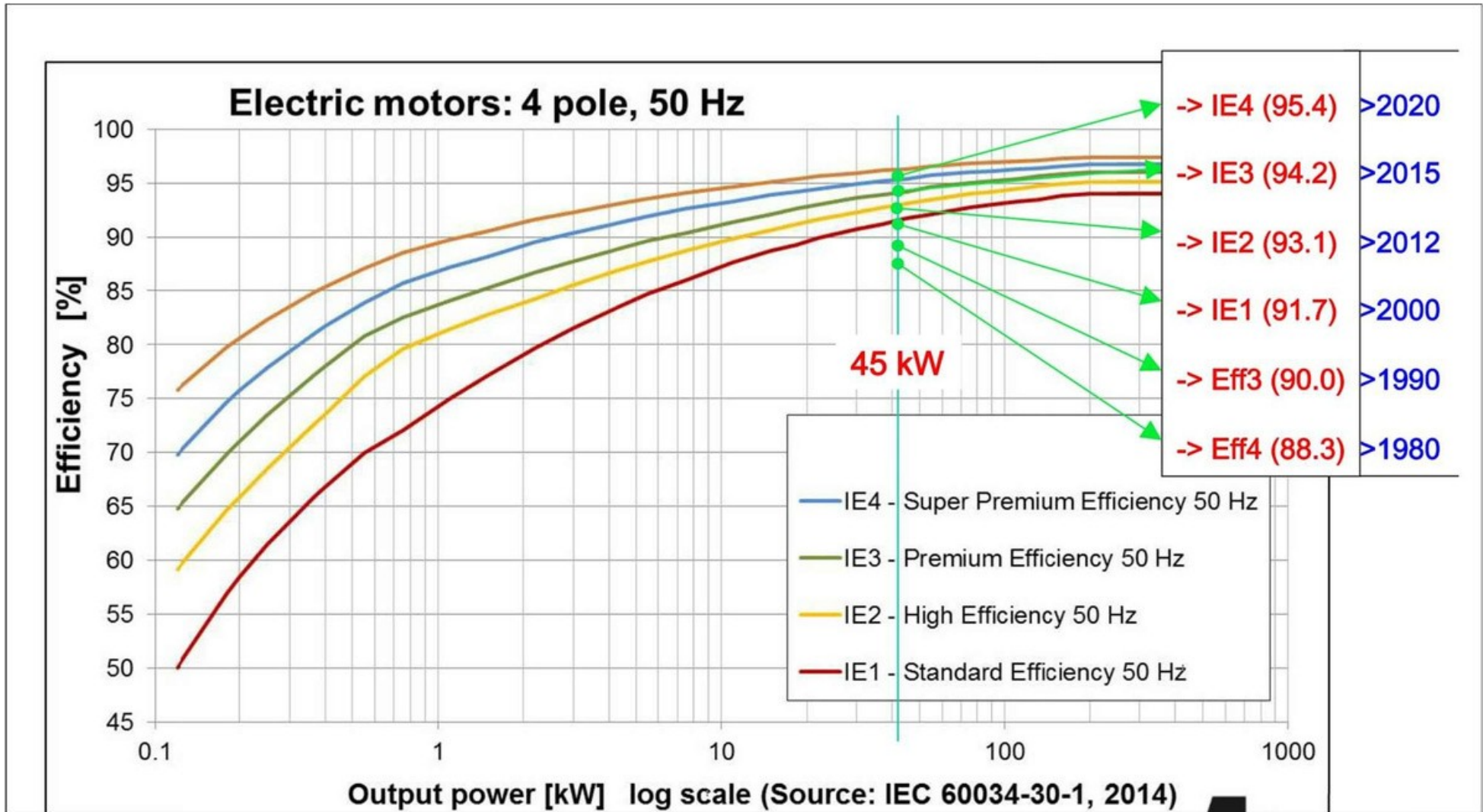
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- The cost of buying an electric motor can be deceptive
- In a single year energy cost can be up to 10x the purchase cost.



# Performance Curves





# EFFICIENCY VALUES COMPARISON

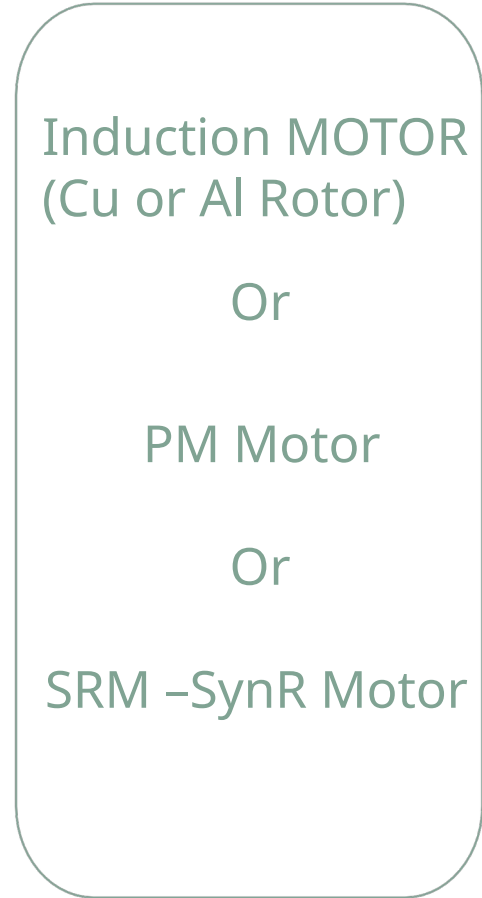
kW	IE1 – Standard Efficiency			IE2 – High Efficiency			IE3 – Premium Efficiency		
	2-pole	4-pole	6-pole	2-pole	4-pole	6-pole	2-pole	4-pole	6-pole
0.75	72.1	72.1	70.0	77.4	79.6	75.9	80.7	82.5	78.9
1.1	75.0	75.0	72.9	79.6	81.4	78.1	82.7	84.1	81.0
1.5	77.2	77.2	75.2	81.3	82.8	79.8	84.2	85.3	82.5
2.2	79.7	79.7	77.7	83.2	84.3	81.8	85.9	86.7	84.3
3	81.5	81.5	79.7	84.6	85.5	83.3	87.1	87.7	85.6
4	83.1	83.1	81.4	85.8	86.6	84.6	88.1	88.6	86.8
5.5	84.7	84.7	83.1	87.0	87.7	86.0	89.2	89.6	88.0
7.5	86.0	86.0	84.7	88.1	88.7	87.2	90.1	90.4	89.1
11	87.6	87.6	86.4	89.4	89.8	88.7	91.2	91.4	90.3
15	88.7	88.7	87.7	90.3	90.6	89.7	91.9	92.1	91.2
18.5	89.3	89.3	88.6	90.9	91.2	90.4	92.4	92.6	91.7
22	89.9	89.9	89.2	91.3	91.6	90.9	92.7	93.0	92.2
30	90.7	90.7	90.2	92.0	92.3	91.7	93.3	93.6	92.9
37	91.2	91.2	90.8	92.5	92.7	92.2	93.7	93.9	93.3
45	91.7	91.7	91.4	92.9	93.1	92.7	94.0	94.2	93.7
55	92.1	92.1	91.9	93.2	93.5	93.1	94.3	94.6	94.1
75	92.7	92.7	92.6	93.8	94.0	93.7	94.7	95.0	94.6
90	93.0	93.0	92.9	94.1	94.2	94.0	95.0	95.2	94.9
110	93.3	93.3	93.3	94.3	94.5	94.3	95.2	95.4	95.1
132	93.5	93.5	93.5	94.6	94.7	94.6	95.4	95.6	95.4
160	93.8	93.8	93.8	94.8	94.9	94.8	95.6	95.8	95.6

# Latest Developments in Indian Standards

- IS325 is withdrawn & has adopted IS/IEC60034-1
- For all S1 duty motors IS12615:2011 is adopted i.e. IE2, IE3
- IS 12615:2018 is adopted i.e IE2, IE3 & IE4



Motor Technology Changes



# Approach for replacement

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## Motor Age

- Identify the age of motors as per nameplate data or logbooks/ERP system
- Target motors which are 10-15 years old

## Motor Size

- Preparation of Motor list either rating or frame wise
- Segregation of motor list as small, medium & large motors

## Rewinding

- Prime target should be rewind motors with minimum 2 rewinds
- Each rewinding reduces motor eff. in range of 0.5% to 2% as per BEE

## Operating hours

- Motors running for at least 10 hours a day or more than 3300 hours annually
- More the running hours, lower the payback period

## Motor loading

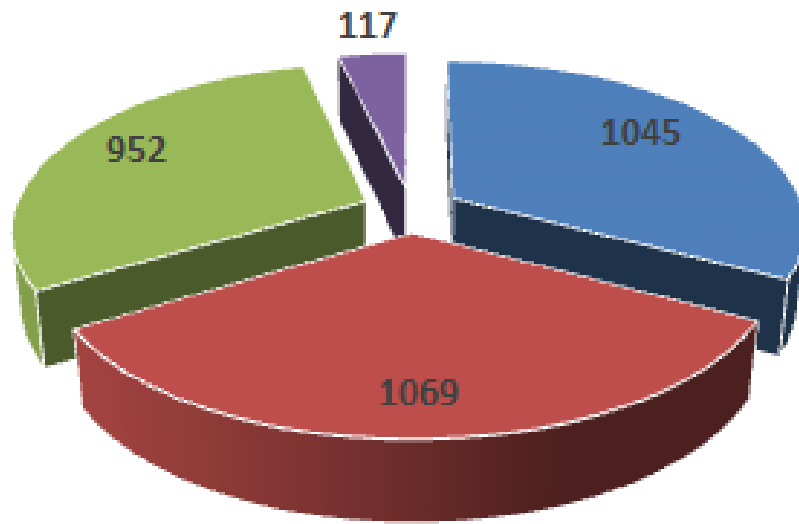
- Motors loaded (<65%) are either oversized or running at low efficiencies
- Properly loaded (>75%) run at better efficiencies & give lower payback period



# Overview of Motors in KPML

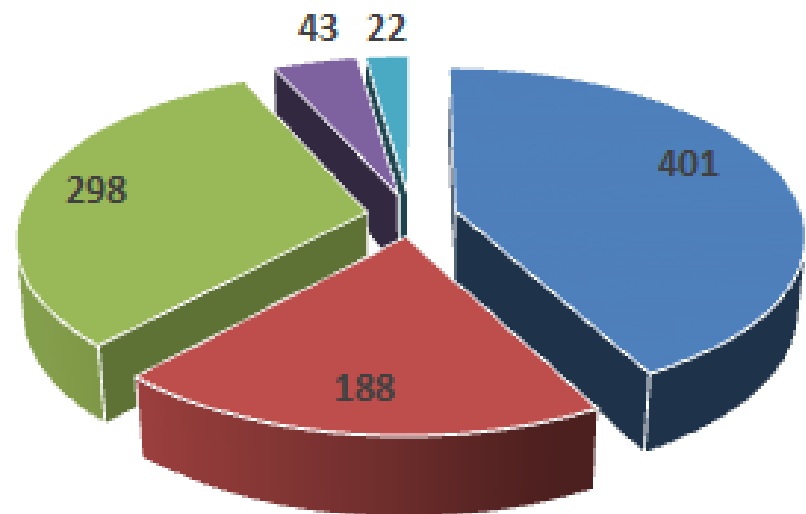
Total No. of Motors Audited : 2114 Nos.

### Overview of Motors



- No. of IE3 Motors
- No. of IE 1 Motors
- Motors to be replaced
- Motors not to be replaced

### Capacity wise Overview of the Motors



- 0-10KW
- 10-20KW
- 20-75KW
- 75-160
- >160KW

# Energy Savings & Payback Period

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Symbol	Description
E1	Efficiency of IE1 Motor
E2	Efficiency of IE3 Motor
H	Annual Working Hours
T	Electricity Tariff
L	Motor Loading (%)
P	Price of IE3 motor

Annual Energy Savings(  $E_s$ ) = kW \* [(1/E1) – (1/E2)] \* H \* L      in kWh

Annual Cost Savings =  $E_s$  \* T      in INR

Payback Period = (Price of Motor / Annual cost Savings)      in years

# Rating Wise Saving Details (As per Actual Running hrs)

Rating Wise	Total No's of Motors	Saving in KWH/Annum	COST SAVING IN Rs Lacs(Considering @ Rs 7.0/KWH)	Investment considering Rs2800/KW	ROI in Years
0 to 10 kw	401	246154	17.2	36	2.1
>10-20KW	188	353846	24.8	59	2.4
>20-75KW	298	923077	64.6	295	4.6
>75- 160 kw	43	292308	20.5	144	7.0
>160 kw	22	1046154	73.2	160	2.2
Total	952	2861538	200	693	3.5



# Replacement of Root Blower with Screw Blower



Root Blower



Screw type  
Blower

# Replacement of Root Blower with Screw Blower & Maintain D.O Level with VFD in Aeration Tank



## Background

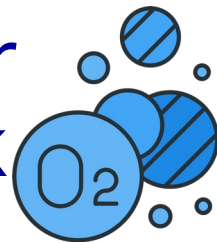
- Screw Type Blower
  - Advantages :
    - Highly energy-efficient
    - Low noise levels
    - Stable and consistent airflow
    - Versatile for a range of applications
    - Suitable for both high and low-pressure needs
  - Efficiency & Power Consumption
    - High efficiency , up to 90%
    - Lower energy consumption
  - Costs , Maintenance & Noise
    - Higher Capex cost
    - Less Life cycle cost
    - Less frequent maintenance
    - Lower operational costs over time
    - Quite operation

# Cost Saving Calculation Root Blower Vs Screw Blower

S.N.	Product Description	Capacity (M3/Hr)	Qty in No.	Power consumption in KWH/annum (Lacs)	Power Cost in Rs Lacs/Annum considering @ INR 7.0/KWH
1	Root Blower	1500	5	22	154
2	Screw Blower	4500	2	15.42	108
	Saving per Annum			6.57	46
Total Saving in Percentage					30



# Replacement of Root Blower with Screw Blower & Maintain D.O Level with VFD in Aeration Tank



- Conclusion

Screw Type Blowers combined with VFD

- Superior energy efficiency
- More stable DO level maintenance
- Earlier couldn't maintain DO level, with this technology we can maintain 2PPM DO level consistently.



Picture Of Online DO Analyser with feedback signal to Drive.

# Adopting Online Packing In Converting And Finishing House

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- Background

- Area : Conversion & Finishing House
- Manpower dependent operations
- Operators assigned for bundling, labelling etc.
- Delays, congestion on floor due to manual involvement

- Initiatives

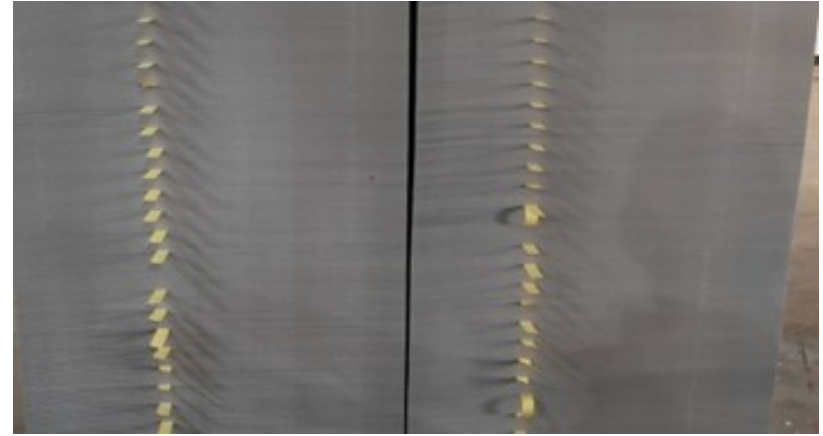
- Automation of Bundle packing & integration with Ream packing
- Collating bundles based on weight
- Feeding them into an online bundling machine
- Automatic Bundle packing with 90 micron thick shrink film
- Trial made for packing with 70 – micron thick shrink film also.

# Adopting Online Packing In Converting And Finishing House

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Infeed Conveyors of Ream



Reams with Auto tabs



Ream Feeding through Auto  
tabs



Ream Shrink Packing

# Adopting Online Packing In Converting And Finishing House

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HDPE Bundle packing



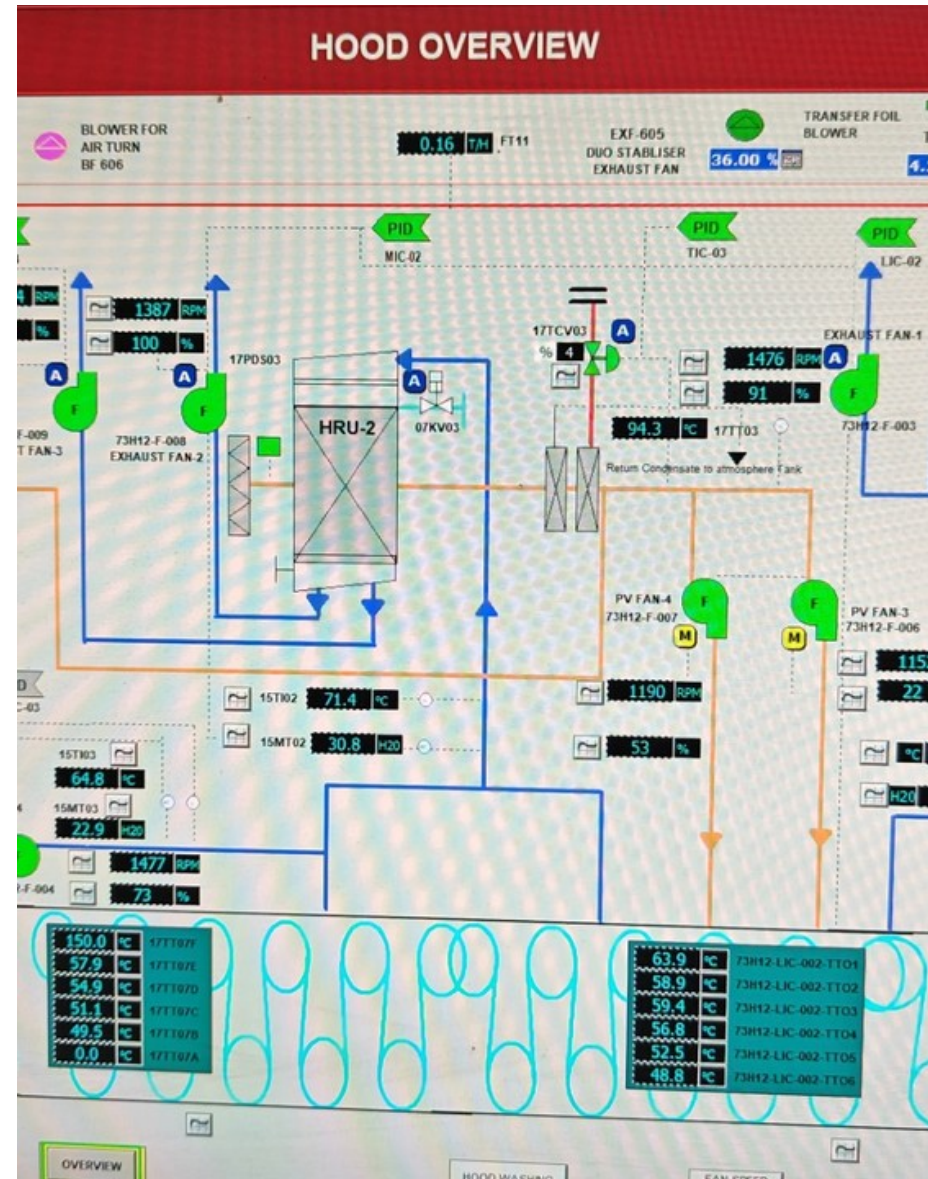
Bundle Shrink Wrapping Station



# PV Hood Automation and Use of Waste Heat

- Salient features
- Specially designed hood by Brunschweiler, Spain
- Utilization of heat generated by Turbo Blower
- DCS controlled.

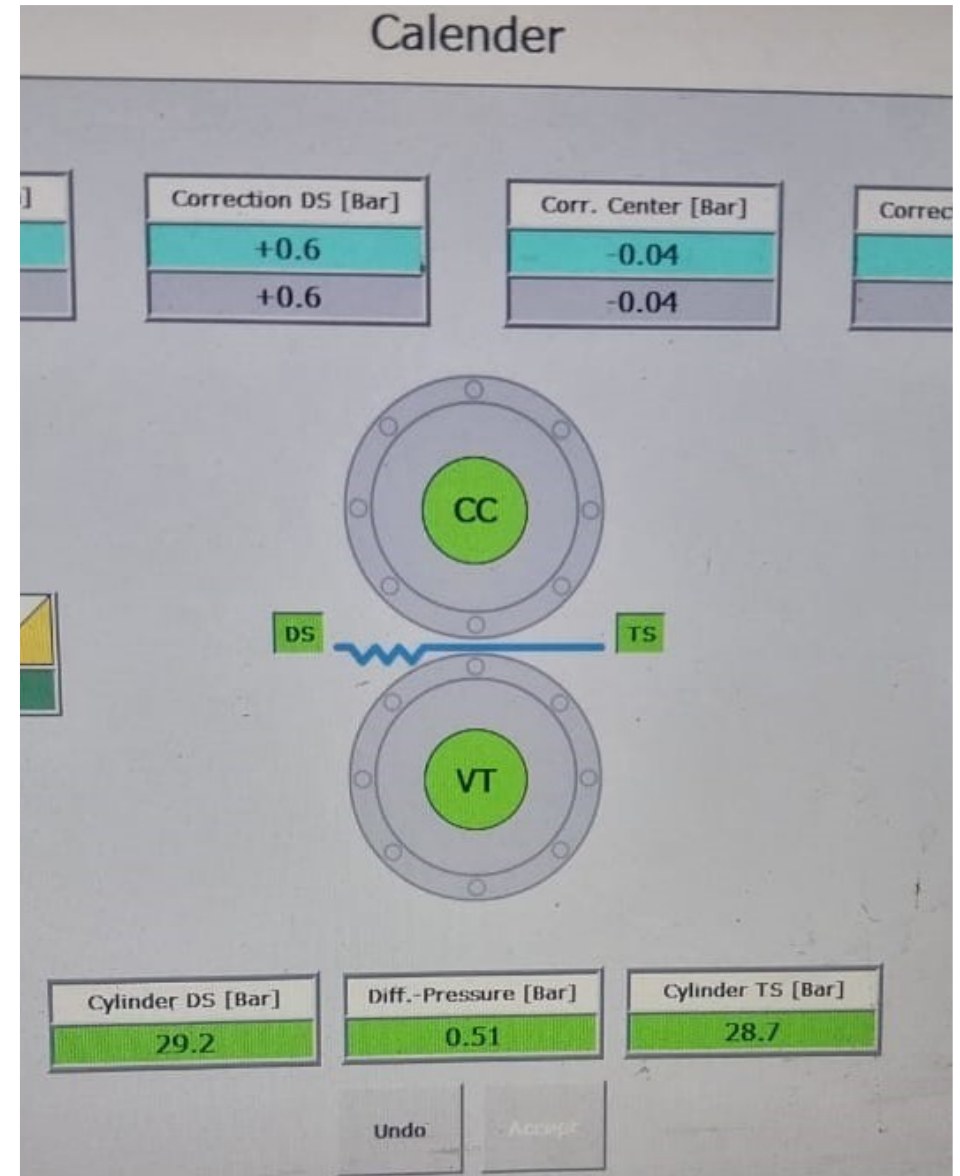
Achieved saving of 0.2ton/ton of paper  
Steam





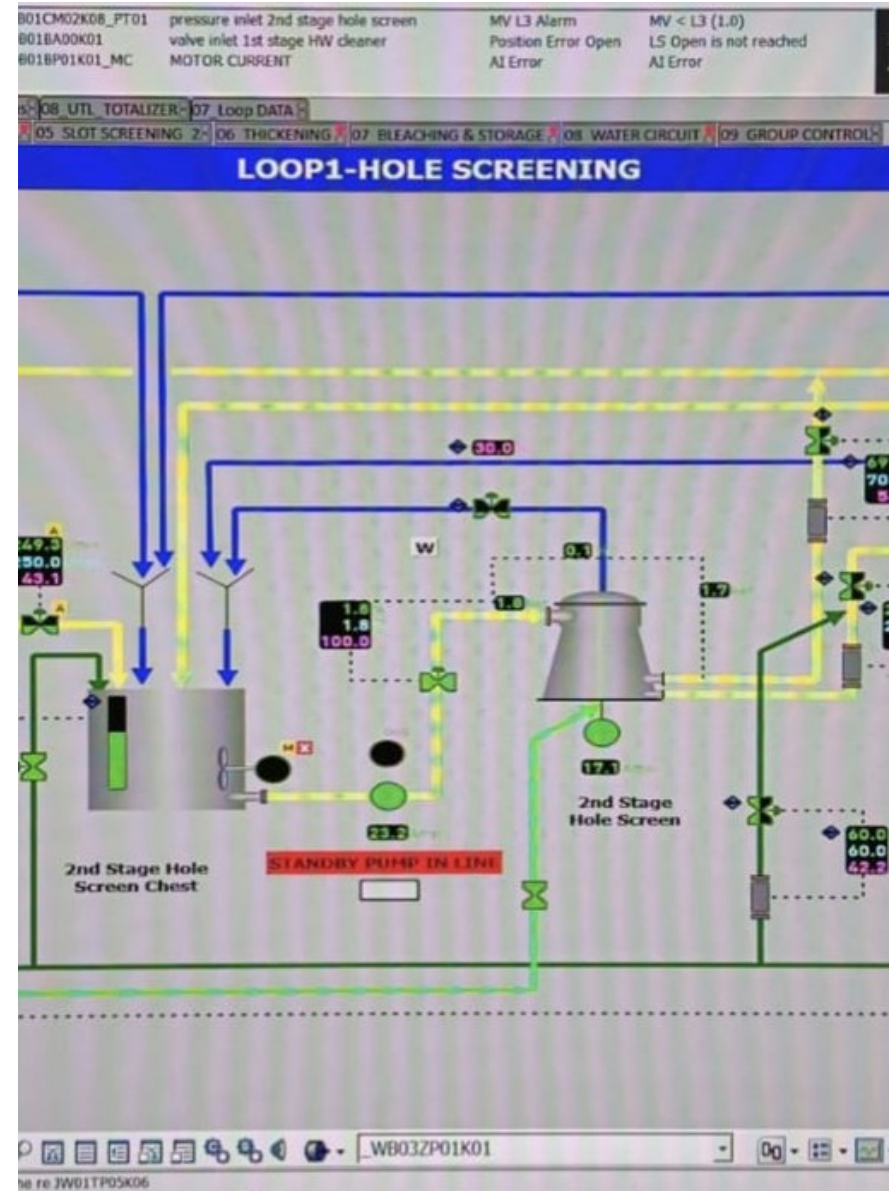
# Calendar Automation

- Salient features
  - Upgradation of Calendar control from manual to electronic nip control
  - Calendar loading time reduced from 2.5minutes to 30 sec after each break.
  - Reduced rejections by 0.3% after each break.



# Under Top Layer Upgradation & Automation

- Salient features
- Under Top layer Pulp Production Capacity increased from 60 TPD to 90 TPD.
- Plant yield increased by 0.3 %.
- Power Consumption reduced by 15 KWH/ Mt.
- Plant Fiber loss Less then 3.0 %.
- Fully DCS controlled VOITH plant.



# Load Management System

## Salient Features

- Load shedding based on source failure
- Frequency base load shedding
- Grid MDI control option
- Grid overcurrent load shedding
- One of TG is controlling the Grid PF to 0.995 through LMS system

FREQUENCY SETPOINTS			FREQUENCY SETPOINTS INDIVIDUAL TG-1		
FEEDER NAME	FREQ.	TIME DELAY	FEEDER NAME	FREQ.	TIME DELAY
PM-1 FILLER	48.90	1.00	GI FIBER	48.90	1.00
DIP-1	47.80	1.80	GI SFT	48.90	1.00
SFT	49.00	0.50	PM-2 TG1 BUS	48.40	1.20
KPM-2	48.40	1.20	GI LDIP	48.90	1.20
KPM-1	48.40	1.50	ADIP	48.80	1.20
KPM-4	47.80	2.00	PM-4	47.80	2.00
KPM-5	47.90	1.20	BOARD LT LOAD	49.00	0.50
DIP-1 (415V)	47.70	0.50	FREQUENCY SETPOINTS INDIVIDUAL TG-2		
DIP-2 (415V)	47.70	0.50	FEEDER NAME	FREQ.	TIME DELAY
KPM-2 (415V)	47.70	1.00	FILLER	48.90	1.00
KPM-1 (415V)	47.70	1.00	PM-5	47.80	1.80
KPM-4 (415V)	47.70	0.00	PM-2	48.40	1.20
KPM-5 (415V)	47.60	1.50	PM-1	48.40	1.20
FIBER LINE	48.80	1.70	ADIP	48.60	1.25
GI LDIP	48.90	1.20	FIBER	48.80	1.00
BOARD LT LOAD	49.00	0.50	SFT	48.90	0.50
			GI LDIP	48.50	0.50

INDIVIDUAL TIMERS WILL OPERATE INDEPENDENTLY AFTER THE FREQUENCY REACHES THE SET POINT (IT WILL NOT ADD THE PREVIOUS DELAYS)

# Installation of VFD at Various Plant Areas

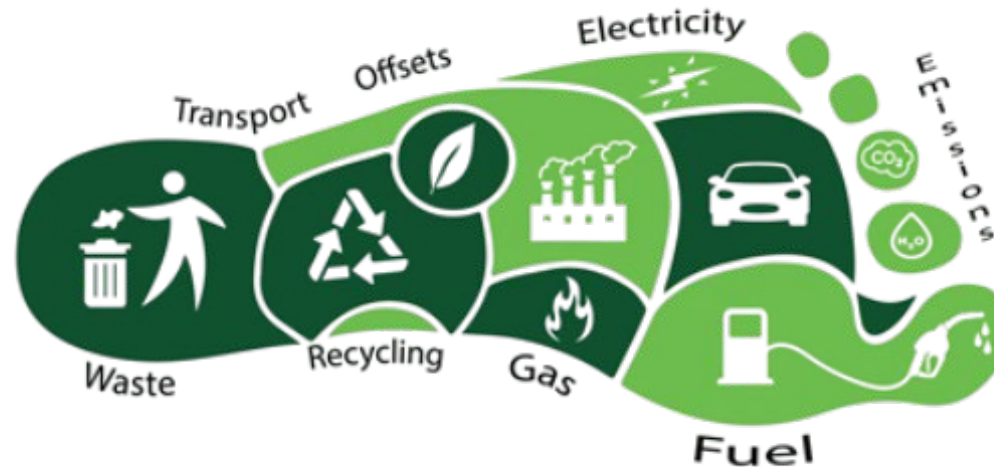
Project Description	Savings (kW)	Monetary Savings (Lacs)	Investment (Lacs)
Optimisation of differential Pressure across Air Dryer in ZHC 630+ HT Compressor	63.0	31.75	7.0
Installation of Turbo Blowers and replacement of Liquid Ring Vacuum Pumps in PM1	176.0	88.70	278.1
Installation of Turbo Blowers and replacement of Liquid Ring Vacuum Pumps in PM4	170.0	85.68	643.6
Installation of VFD to Sec. screen Feed Pump at PM4	30	15.12	5.0
Installation of VFD to NP-01 Floatation Cell Feed Pump	70	35.28	7.5
@7200 hrs & Rs. 7.0 / kWh cost.			



# Conclusion

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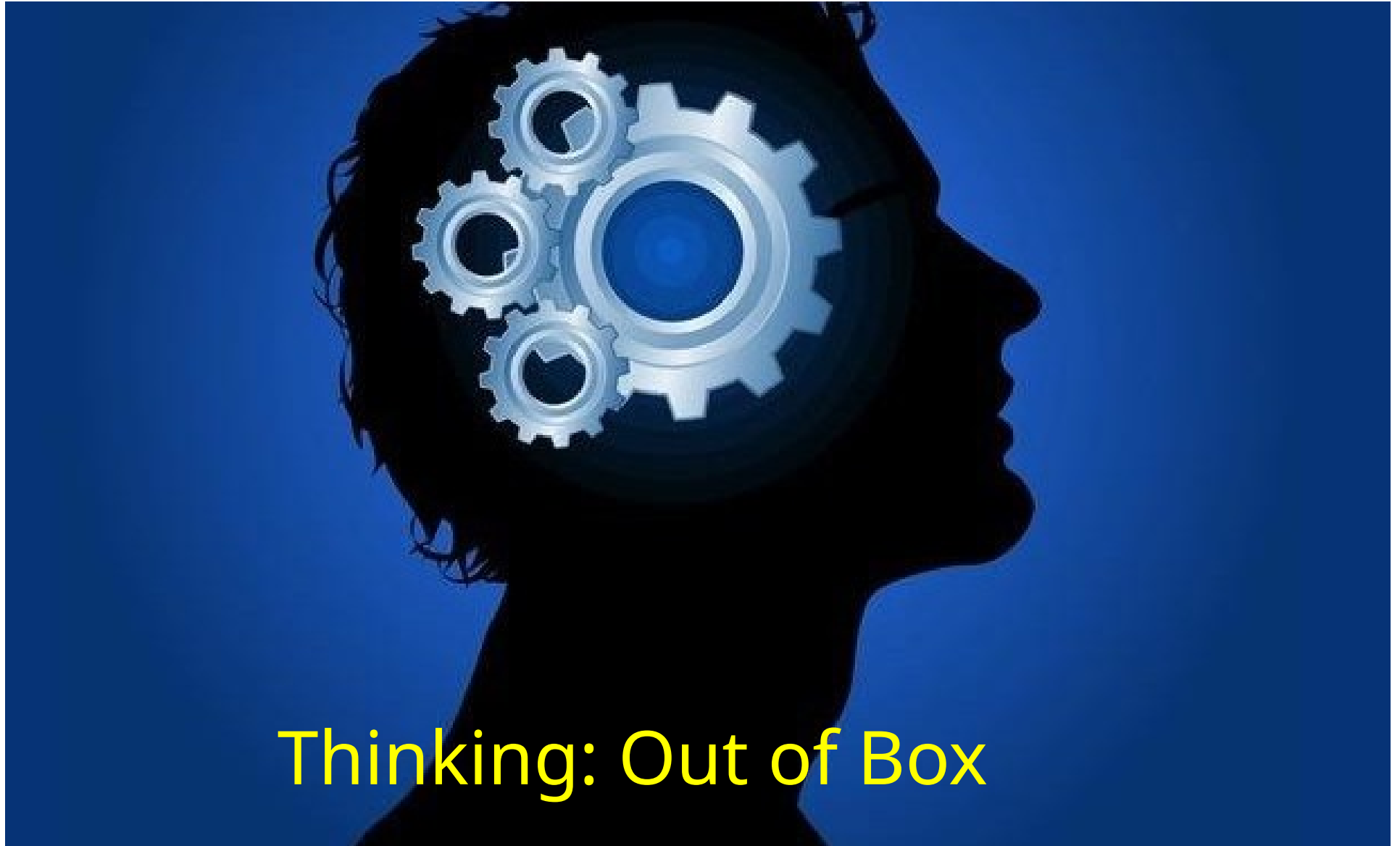
- ✎ KPML is dedicated to continuously upgrading technology across its operations and focusing on sustainable practices.
- ✎ To ensure environmental compliance and maintain a clean eco - system. We have adopted efficient blower technology for our aeration basin and achieved Energy saving of 46 lac INR/Annum.
- ✎ We have saved around INR 256.53 lacs due to other Energy conservation Initiatives.
- ✎ KPML is working towards the sustainable future





# Conclusion

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Thinking: Out of Box

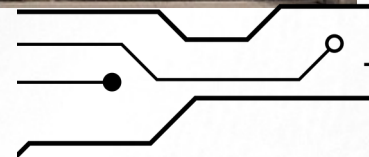


# THANK YOU

In Khanna, Nothing is a waste/reject,

but a Byproduct.

## KHANNA PAPER MILLS LTD.



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