Confederation of Indian Industry

Best Practices Manual for

PULP & PAPER SECTOR

Volume - 11

DISCLAIMER

While every care has been taken in compiling this Manual, CII-Godrej GBC accept no claim for any kind of compensation, if any entry is wrong, abbreviated, omitted or inserted incorrectly either as to the wording space or position in the manual.

The manual is only an attempt to create awareness on Energy, Water and Environmental management and sharing of best practices being adopted in Indian Paper industry and the international cleaner production technologies.

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Foreword

It is with great pleasure and a profound sense of responsibility that I introduce this "Best Practices Manual in Pulp and Paper Sector in India." The Indian pulp and paper industry has come a long way in its journey of growth and transformation. As the chairman of Papertech-2023, I consider it an immense privilege to represent an industry of the economy and environment that is of such significance to our country.

India's pulp and paper industry has made impressive strides in recent years thanks to technological developments, sustainability efforts, and a dedication to excellence. This manual is evidence of our collective efforts to keep this industry competitive while also being socially and environmentally responsible. It has excelled in today's globalized world where environmental concerns and sustainable practices are crucial. We have adopted advances that mitigate the impact on the environment and develop a socially responsible culture.

This publication serves as a thorough repository of the best practices that have developed within our sector. It is the result of the knowledge, commitment, and creativity of innumerable experts, organizations, and individuals who have relentlessly worked to improve our industry.

I want to take this opportunity to express my sincere gratitude to everyone who collaborated to make this manual possible. Their dedication to quality and their enthusiasm for our business are genuinely admirable. Our team at Papertech 2023, and I am also grateful for their consistent support. I also encourage all parties involved in the Indian pulp and paper industry to consider adopting the practices provided in this handbook, as per their plant conditions and cooperate in order to create a future in which our sector not only succeeds but also helps India become cleaner, greener, and more sustainable.

Mr. Ganesh Bhadti
Chairman, Papertech 2023 And
Director-Operations, Seshasayee Paper and Boards Limited

Preface

It is my distinct pleasure to present the "Best Practices Manual in Pulp and Paper Sector in India", a comprehensive resource that reflects the collective wisdom, innovation, and commitment of our industry. This manual is the culmination of extensive research, collaboration, and the dedication of numerous experts and stakeholders within the Indian pulp and paper industry.

The pulp and paper industry in India is an important part of the country's industrial structure. It has developed into a dynamic sector over time, distinguished by innovation, sustainability, and a dedication to excellence. This manual aims to compile the accumulated expertise and knowledge of individuals and groups that have aided in the development and transformation of our industry. The industry has met challenges in today's world where environmental responsibility and sustainable practices are of the utmost significance. To ensure that our industry not only thrives but also helps create a cleaner, more sustainable India, we have adopted cutting-edge technologies, eco-friendly methods, and responsible sourcing.

This manual is intended to serve as a thorough reference for professionals in the industry, students, policymakers, and anyone else interested in learning about the best practices that lead to success in the Indian pulp and paper business. It addresses a wide range of subjects, including sourcing raw materials, production procedures, mitigating environmental footprint, and energy efficiency.

I want to express my sincere gratitude to all the stakeholders who so kindly contributed their knowledge and wisdom to create this manual. They deserve praise for their devotion to developing our industry.

Finally, I would like to add that it is my sincere wish that this manual will stimulate the Indian pulp and paper industry's ongoing development, sustainability, and excellence. Let's adopt the ideas and methods presented here, since they could lead our industry to a better and more profitable future.

Pawan Agarwal
President, Indian Paper Manufacturers Association (IPMA), and
Managing Director, Naini Papers Ltd.

Acknowledgement

We wish to express our sincerest regards to the working group on "Make Indian Pulp & Paper Industry World Class" for their invaluable contributions.

We deeply express our sincere thanks to the following paper plants for sharing the technical information for the identified best practices:

- Seshasayee Paper and Boards Limited, Erode.
- ITC, Bhadrachalam
- ITC Ltd., Kovai
- J.K. Paper Ltd. Rayagada
- J.K. Paper Ltd., Songadh
- Umesh Board and Paper Mills Ltd.
- Shreyans Industries Ltd.
- Bindlas Duplux Ltd.
- Sripathi Paper and Boards (P) Ltd (SPBPL)
- South India Paper Mills Ltd.
- Emami Paper Mills Ltd., Balasore.
- Naini Tissue Ltd.

We also sincerely thank the following committee members for their contribution to bringing out the "Best Practices Manual for Pulp and Paper sector, Volume 11".

- Mr. Ganesh Bhadti (Chairman, Papertech 2023 and Director- Operations, Seshasayee Paper and Boards Limited)
- Mr. Mukesh Jain (Core committee, Papertech 2023 and Executive Director Andhra Paper Ltd.)
- Mr. C.S. Kashikar (Core committee, Papertech 2023 and Chief Operating Officer, Orient Paper & Industries Ltd.)
- Mr. Sidhartha Mohanty (Core committee, Papertech 2023 and Unit Head, ITC Ltd. PSPD, Bhadrachalam)
- Mr. Mahesh Gandhi (Core committee, Papertech 2023 and Director Venkateshwara Tirumala Paper and Board Pvt. Ltd)
- Mr. Mukesh Kumar Tyagi (Core committee, Papertech 2023 and Director, Naini Paper Ltd.)
- Mr. Anuj Kumar Tayal (Core committee, Papertech 2023 and Sr. Vice President, West Coast Paper Mills Ltd.)
- Mr. Anil Kumar Naithani (Core committee, Papertech 2023 and Sr. General Manager, Shreyans Industries Ltd.)
- Mr. P. Suryanarayana Palaparthi (Core committee, Papertech 2023 and Head-Project Management, Century Pulp and Paper)
- Mr. Nandakumar D.M. (Core committee, Papertech 2023 and President Elof Hansson India Pvt. Ltd.)

Executive Summary

The Indian pulp and paper sector has recently made number of efforts to enhance its environmental performance. However, the industry's top concerns remain to be energy, water, and the environment. Even the quantity and quality of water that the paper factories have access to present problems for everyday operation.

The latest government rules "Perform, Achieve and Trade" and "Renewable Purchase Obligation" have given the industry's efforts to increase their levels of energy efficiency and use renewable energy sources further impetus. The sector has faced various difficulties in order to comply with these standards at the same time.

The Indian paper industry has responded well to the challenges and initiated steps to deal with problems with water, energy, the use of renewable energy sources, and environmental performance.

Against this background, CII-Sohrabji Godrej Green Business Centre has been promoting the concept of "Make Indian Pulp & Paper Industry World Class" with the support of all the stakeholders in the Indian Pulp & Paper sector for the last 17 years.

The main objective is to facilitate continuous performance improvement in energy, water and environment, and help them in achieving the world class standards. This has been taken up through the following:

- Visit to the best operating pulp & paper industries in India and identifying the best practices adopted in various sections.
- Compiling the best practices in the form of a manual for information sharing amongst the paper plants.
- Identification and transfer of technologies suitable for Indian paper plants and adoption of the same.

DEVELOPMENT OF "BEST PRACTICES MANUAL"

The 11th edition of the Best Practices Manual has been developed with the support of various stakeholders. Apart from focusing on the performance of manufacturing units in the field of energy, water and environment, the 11th edition has a special focus on energy, environment and water conservation opportunities.

CII-Sohrabji Godrej GBC has prepared this "Best Practices Manual" with the intent of continuing knowledge transfer and facilitating Pulp and Paper manufacturing units to meet the benchmarking figures.

This manual contains projects, with investments ranging from Rs. 60,000/- to Rs. 10.5 Cr, with payback periods ranging from 1 month to 8.33 years. The case studies are related with savings in electrical energy, thermal energy, water conservation, process optimization, etc.

CII-Sohrabji Godrej GBC prepared a detailed questionnaire involving various key performance indicators related with energy and water consumption in the Paper industry to collect date required for this manual and shared it with relevant stakeholders in the industry.

The manual was created using data gathered from the projects implemented by top Indian technology providers and pulp and paper facilities. It contains 17 case studies, collected from 12 among the leading and most efficient paper manufacturing organizations in India.

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How to Use the Manual

The objective of this manual is to act as a catalyst to promote activities in the Indian Pulp & Paper industry towards continuously improving the performance of individual units and achieving world class levels (with thrust on energy, water & environmental management).

To set a clear goal for improving the performance and move towards international standards, the best practices adopted in some Indian Pulp & Paper plants and latest technologies from suppliers have been included as a part of the "Best Practices Manual Pulp & Paper Industry".

These best practices may be considered for implementation after suitably fine-tuning the requirements of individual units.

Suitable latest technologies may be considered for implementation in existing and future Pulp & Paper plants for achieving world class energy efficiency. Further investigation needs to be done for the suitability of these technologies for individual plant conditions.

The collated best operating parameters and the best practices identified from various plants need not necessarily be the ultimate solution. It is possible to achieve even better energy efficiency and develop better operation and maintenance practices.

Therefore, Indian Pulp & Paper plants should view this manual positively and utilise the opportunity to improve the performance and "Make Indian Pulp and Paper Industry World Class".

Best Practices Manual for
PULP & PAPER SECTOR
CASE STUDIES

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CASE STUDY - 1

MLSS Solar Dryer

Name of the project

Title: MLSS Solar Dryer, Seshasayee Paper and Boards Ltd

Introduction to plant

Seshasayee Paper and Boards Ltd. owns and successfully operates a paper mill at Erode, Tamil Nadu, India. It has an installed capacity of 1,93,450 tons per annum for manufacturing of pulp. and an installed capacity of 1,65,000 tons per annum of Writing and Printing grades of paper. SPB has received Forest Stewardship Council® (FSC®) certification. SPB is the first Indian Paper Company that has been certified under three standards of FSC viz., FSC-STD-40-005, FSC-STD-40-004 and FSC-STD-40-003. SPB is capable of manufacturing and selling FSC 100% and FSC Mix products in the domestic and international markets.

Background / Baseline Scenario

Mixed liquor suspended solids (MLSS) is the concentration of suspended solids, in an aeration tank during the activated sludge process, which occurs during the treatment of wastewater. MLSS consists mostly of microorganisms and non-biodegradable suspended matter.

MLSS is separated from the treated water by settling in a settling tank in the activated sludge process. The excess sludge has to be removed from the system. Polymer Chemicals are added to the liquid sludge to coagulate solids and improve drainability. Dewatered sludge still contains a significant amount of water—often as much as 70 percent—but, even with that moisture content, sludge no longer behaves as a liquid and can be handled as a solid material.

Different methods of handling MLSS

- Sludge-drying beds (Direct sunlight)
- The rotary drum vacuum filter
- The centrifuge
- The belt filter press.

At SPB - Secondary sludge handling and disposal the Secondary Biological Effluent Treatment System is based on Activated Sludge Process. Aeration Basin with 12 Surface Aerators of 50 hp each, Secondary Clarifier, Sludge Thickener and Decanter Centrifuge. In Aeration basin the MLSS is maintained in the range of 5500 to 6000 mg/l. The excess sludge is removed from the system through the Decanter Centrifuge. Earlier the Dewatered sludge being sent to the composting unit as a fertilizer.

Post implementation of this project, the dried MLSS is being used in power boiler as biomass (Calorific value 3260 to 3460 kj/kg)

Figure 1 Interior pictures

Figure 2 Outer pictures

The Green energy concepts

In-house trail was taken with 200kgs of MLSS material on Dt: 12/04/2022.

Based on the input, on 12/08/2022, a solar sludge drying system of 2000 square feet was installed.

The present system can handle 20% of the requirement.

Capacity augmentation is being planned for either a solar dryer or a flue gas drying system.

Figure 3 During processing

Figure 4 The output

Solar sludge dryer installation cost in Rs: 17.5 lakhs

Six tons of MLSS are being dried per batch in a cycle of six days (dried from 15% to 70%).

Contact person

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Seshasayee Paper and Boards Ltd.

CASE STUDY - 2

Energy Efficient Turbo Blower for Vacuum application

Energy saving project

Title: Energy Efficient Turbo Blower for Vacuum application, Sripathi Paper and Boards (P) Ltd (SPBPL)

Introduction of the Plant

Brief description of the plant: 'SRIPATHI' Paper and Boards (P) Ltd (SPBPL), owns and successfully operates a paper mill at Sivakasi & Sathyamangalam, Tamil Nadu, India, Capable of producing 2,00,000 tons per annum of Packaging and W&P paper grades.

Sripathi intends to expand its overall production capacity to about 2,50,000 tons per annum and to manufacture grade of packaging papers viz. Duplex board, Fusion board, Test liner, fluting paper, Newsprint and writing & printing paper.

Products manufactured: Paper machine – 2 Coated Duplex Board

Installation capacity: 300 TPD

Key Performance Index

Sripathi follows the KPI in all factors like, Production: 300 TPD, Fiber yield: >85%, Power consumption: 425 kW/Ton, Steam Consumption: 2.0 T/T, Water Consumption: 2.0 m3/Ton, Down time: <10%, Finishing Loss: <6%.

Background / Baseline Scenario

A brief about the existing system or technology and the need for the new technology/improvement -

Existing Liquid Ring Vacuum pumps which are highly energy intensive compared to Turbo Blower. Turbo Blower is the centrifugal blower which yields > 70% efficiency. Liquid ring requires sealing water to generate vacuum, whereas turbo is nil water requirement. Maintenance of the turbo is very less compared to Liquid Ring Vacuum Pump. Effect of sealing water temperature raise will reduce the liquid ring vacuum pump efficiency.

Details of the energy saving project

Detailed description of the project: Turbo Blower for Vacuum Application

Project timelines (duration & process downtime): Implemented during plant expansion.

Environmental or other benefits: CO2 emission reduction by reducing, less footprint required for turbo blower.

Table 1 Energy saving details

Sr. No.	Parameters	Unit	Before	After
1.	Power	kW	533	474
2.	Steam consumption	t/t	2.1	2.0
3.	Annual Energy saving			467,280 kWh savings 9240 Tons of Steam
4.	Monetary benefits Annual	INR Lakhs	226 Lakhs/Annum	
5.	Investment	INR Lakhs	400 Lakhs	
6.	Payback	Months	22 months	
7.	Any other benefits (related to environment), if any		No vacuum bleeding and vacuum modulated with VFD, Easy to control vacuum for different GSM, Less water consumption, Co2 emission reduction due to energy efficient, Lesser Maintenance compared to Liquid ring vacuum pump, Less foot print required for turbo blower	

Contact Details

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Sripathi Paper and Boards (P) Ltd (SPBPL)

Turbo Blower Make

Runtech by Gardner Denver, Finland

CASE STUDY - 3

Robo Shower for wire and Felt cleaning

Energy saving project

Title: Robo Shower for wire and Felt cleaning, Sripathi Paper and Boards (P) Ltd (SPBPL),

Introduction of the Plant

Sripathi Paper and Boards (P) Ltd (SPBPL), owns and successfully operates a paper mill at Sivakasi & Sathyamangalam, Tamil Nadu, India, Capable of producing 2,00,000 tons per annum of Packaging and W&P paper grades.

Sripathi intends to expand its overall production capacity to about 2,50,000 tons per annum and to manufacture grade of packaging papers viz. Duplex board, Fusion board, Test liner, fluting paper, Newsprint and writing & printing paper.

Products manufactured: Paper machine – 2 Coated Duplex Board

Installation capacity: 300 TPD

Key Performance Index

Sripathi follows the KPI in all factors like, Production: 300 TPD, Fiber yield: >85%, Power consumption: 425 kW/Ton, Steam Consumption: 2.0 T/T, Water Consumption: 2.0 m3/Ton, Down time: <10%, Finishing Loss: <6%.

Background / Baseline Scenario

A brief about the existing system or technology and the need for the new technology/improvement:

Robo shower is technology that uses a smart cleaning system for the wire and felt washing application.

Project Details

Project timelines (duration & process downtime) – Implemented during plant expansion.

Environmental or other benefits: Low water consumption in wire and felt rolls wash application.

Table 2 Energy saving details

Sr. No.	Parameters	Unit	Before	After
1.	Temp, pressure (if applicable) or any other parameters			100 kg/cm^{2}g
2.	Power	kW		-
3.	Steam consumption	t/t		-
4.	Annual Energy saving			Pumping energy savings: 14,840 Water savings: 133,056 m^3
5.	Annual Monetary benefits	INR Lakhs	NA	
6.	Investment	INR Lakhs	NA	
7.	Payback	Months	Payback not considered since water savings and helping to environment	
8.	Any other benefits (related to environment), if any		Efficient wire and felt wash, Minimum mist formation, Hygienic wire and location, Improved in productivity.	

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Sripathi Paper and Boards (P) Ltd (SPBPL)

CASE STUDY - 4

Process Optimization by Control Loop Tuning

Energy saving project

Title: Process Optimization by Control Loop Tuning, J K Paper Limited, Unit: Rayagada

Introduction of the Plant

Figure 5 J K Paper Ltd., Rayagada

J K Paper Limited, Unit: Rayagada - is located at Jaykaypur, District: Rayagada, Odisha which is approachable by Air / train from Vizag / Bhubaneswar to Rayagada. JK Paper Mills is the flagship company of JK Organization was established in 1938 (6th August) and JK Paper Mills, an integrated Pulp & Paper Mills was setup in the year 1962 (18th October) with initial capacity of 18000 TPA at Jaykaypur in the District of Rayagada (Odisha).

JK Paper Mills is a manufacturer of Pulp, uncoated and coated quality writing and printing papers. It is the First Pulp & Paper Industry in the country to certify with ISO-9001 Quality Management System, ISO-14001 Environment Management Systems and ISO-45001 Safety Management Systems by M/s. DNV, Netherlands.

The Mill has now adopted an integrated Quality, Environment, and Occupational Health & Safety Management System. And also J.K. Paper Mills has adopted TPM concept from JIPM, Japan as a management tool for continual improvements in all the systems. JKPM has achieved Excellence TPM Award in category 'A' in 2006 and Excellence in Consistent TPM Commitment Award in 2009.

It was expanded in stages and the present capacity is 3,15,000 TPA of coated and uncoated paper.

Energy consumption

The Energy requirement of the plant is met by various fuels i.e.

Primary energy such as Indian Coal, Imported coal, HSD and Furnace Oil, Biomass

Energy Generated from Renewable resources: The Black Liquor generated from the chemical pulp mill is being used by recovery boiler for generation of steam for turbine.

Energy Generated from Waste: The bamboo dust generated from chipper house is used as fuel in the boiler as biomass for steam generation. Rice husk is also used in coal fired boiler for resource conservation.

Secondary Energy: M/s. J K Paper Ltd. JKPM draws power from Southern Electricity Company Ltd. And has the contract demand of 10,000 KVA. The power requirement of the plant is mainly met by own captive power generation and DG set. The plant is also drawing power from the grid. The applicable tariff for the plant is under Large Industry HT – 2 (a)(ii). The plant is maintaining its power factor above 0.95 with the grid.

Plant is self-generating its energy from 25 MW, 30MW & 3.4 MW TG's and 4MW DG-set. Plant produced 99.94% of its total power consumption from both the Turbo generators.

Background / Baseline Scenario

Pioneering Industry 4.0: 1st Indian Paper industry to implement this advance analytics approach of loop tuning.

Efficiency and Timesaving: Control loop tuning software automates the tuning process, reducing the time and effort required to optimize control systems.

Accuracy and Consistency: Software-based tuning algorithms are based on advanced mathematical models and optimization techniques, ensuring a higher level of accuracy and consistency compared to manual tuning.

Adaptability: Modern control loop tuning software can handle various control system configurations and respond to dynamic changes in processes.

Data-Driven Decision Making: Control loop tuning software can leverage data analytics and historical process data to make informed tuning decisions.

User-Friendly Interface: Allowing engineers with varying levels of expertise to tune control loops effectively.

Project Details

Background:

Industrial 4.0 open opportunity of close monitoring of multiple activity.

Digitalization and data lake make all the control loop closely monitoring with analytical tools.

Loop analytical analysis done on 22 different parameters with various factors were responsible for performance of the loops.

Variables indicate that 79% of control loops were working well and balance 21% performance were degraded.

Action Taken

A technology service provider was on boarded for loop performance management system.

All control loop identified were ranked based on their major impact on process parameters, valve tuning was one of the major contributors of non-performing control loops.

Adaptive tuning was done to get the optimum response in various conditions.

Found that Recovery Boiler Deaerator LP steam pressure control loop was having high degree of variation.

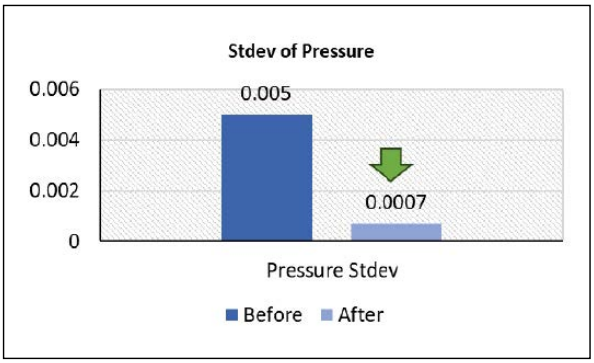

Figure 6 Stdev of pressure

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J K Paper Limited, Rayagada

CASE STUDY - 5

Methanol Plant installation

Energy saving project

Title: Methanol Plant installation, JK Paper Ltd, Unit: CPM

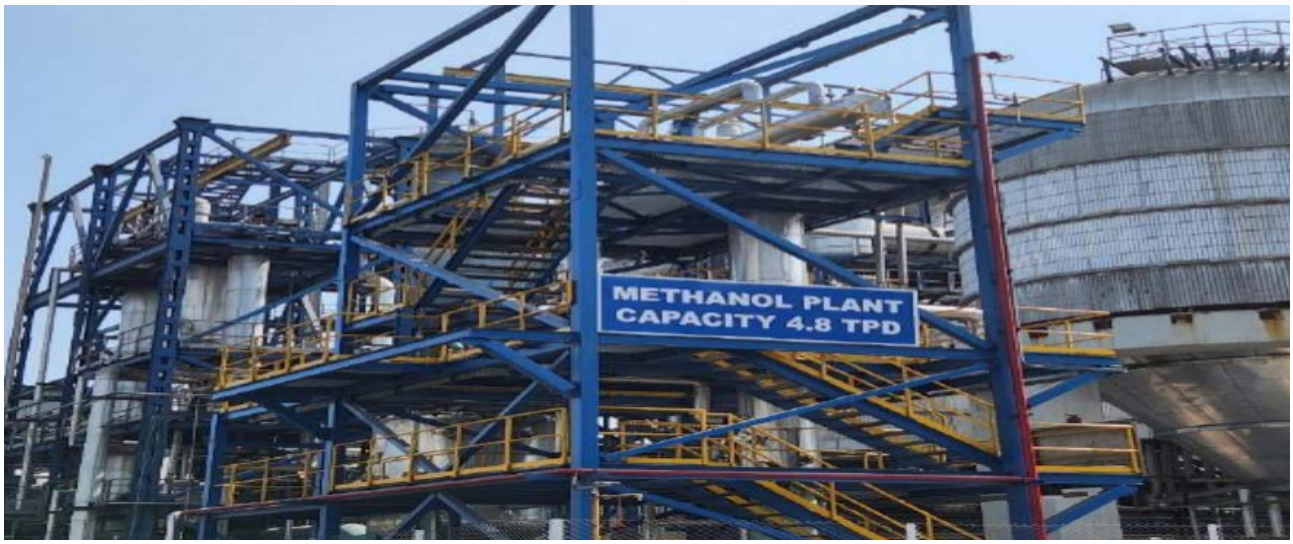

Figure 7 Methanol plant

Introduction of the Plant

Brief description of the plant:

JK Paper Ltd, leading player in manufacturing of office paper, coated paper and packaging board segments with total installed capacity of 7.61 Lac TPA. JK Paper Ltd, Unit: CPM is One of the three integrated pulp and paper manufacturing units of JK Paper Ltd. located at Fort Songadh (Gujarat). The installed capacity of the plant is 3.36 lacs TPA.

Products manufactured

The end uses of the products are:

- Packing of Food, liquid, FMCG goods, Medicine, liquor, playing cards, Cigarette packs etc
- Writing and Printing
- Industrial paper
- MICR paper for cheque books

Installation capacity

Packaging board	: 2.70 Lacs TPA
Writing & Printing Paper	: 0.66 Lac TPA
Pulp mill	: 1.5 lac BDMT/Year

Key performance indexes within one paragraph

JK Paper achieved paper and board production of 3.14 lakhs against budgeted 3.27 Lakhs MT.
Achieved 100% Pulp production of 1.5 lakh BDMT against budget.

Reached the designed rate of production in New Board and pulp mill within a year of its commissioning.

Background / Baseline Scenario

A brief about the existing system or technology and the need for the new technology/improvement

Existing system

In the BHKP wood based pulping process, many kinds of contaminants such as CH3OH (methanol) and sulphur containing gases, TRS are formed during the process. Because of the lack of oxygen in the system these gases are categorised as concentrated non condensable gases, CNCG. The contaminations are directly after the process found in foul condensate. The foul-smelling gases discharged to atmosphere causes air pollution.

Need for the for the improvement

It is required to eliminate the CNCG emission to abate air pollution and since the methanol has energy value, this can be utilized by burning in lime kiln or recovery boiler.

Project Details

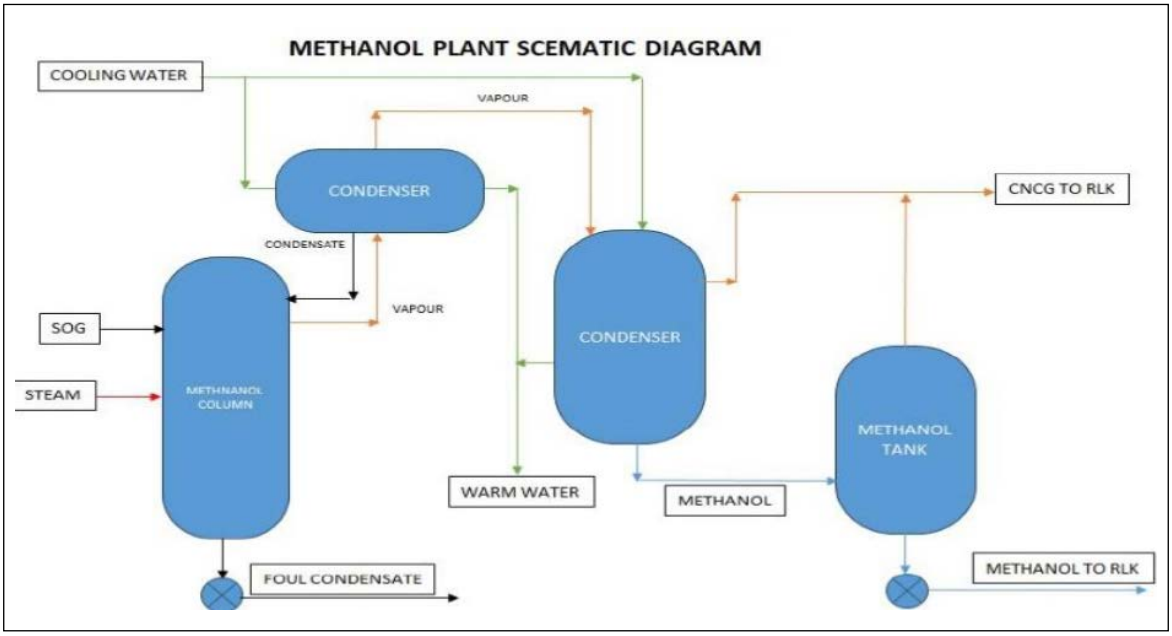

Figure 8 Schematic diagram of Methanol plant

Detailed description of the project

The foul condensate is processed in the stripper column where most contaminations are removed as Stripper Off Gases (SOG). The gases that are taken out from the stripper contain concentrated amounts of these contaminants. In the MeOH Recovery System these gases are concentrated even more, at the same time a cleaner condensate is taken back to the stripper system. The methanol after MeOH Recovery System contains about 20% weight water and different amount of TRS compounds. The methanol and the CNCG sent to lime kiln and burned. The methanol column is a very important part in the Sulphate process since it makes it possible to remove methanol and CNCG from the foul condensate which are taken to lime kiln for burning It is an environmental system.

Operating principle, any other details related to the technology:

Vaporization of CNCG and methanol from foul condensate using steam and then condensing in stages to produce methanol and CNCG which can be burned in lime kiln.

Any modifications made for upgradation (in auxiliary equipment, layout, utility etc.):

No

Project timelines (duration & process downtime):

Commissioned in March-2023, required Lime kiln shut for a day to connect methanol line to the system.

Improvements achieved:

Reduced FO consumption in Rotary lime kiln.

Eliminated air pollution due to CNCG emission to atmosphere.

Environmental or other benefits:

Eliminated CNCG emission to atmosphere.

Fossil fuel substitution with renewable source.

Challenges, if any, faced during the implementation

No significant challenges

Replication Potential:

Shall be installed in Paper plants with own wood-based pulp.

Table 3 Energy saving details

Sr. No.	Parameters	Unit	Before	After
1.	Power	kwh/day	0	960 kwh/day
2.	Steam consumption		0	3 TPD @3.5 kg/cm2 and 155 deg C
3.	Energy saving		262 MT of FO will be replaced /Annum with current production rate of 40 MT methanol / Month	
4.	Monetary benefits	INR Lakhs	84 lakhs/annum (Saving from FO substitution)	
5.	Investment	INR Lakhs	700	
6.	Payback	Months	Simple pay back – 8.33 years Abating pollution is the major impact This project is considered as a substitution of fossil fuel with renewable fuel.	
7.	Any other benefits (related to environment), if any		Eliminated air pollution due to CNCG	

Contact Details

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JK Paper Ltd, CPM

Technology Supplier

Valmet

CASE STUDY - 6

Submersible Pulp Chest Agitators

Energy saving project

Title: Submersible Pulp Chest Agitators, ITC-PSPD Kovai

Introduction to the plant

ITC Paperboards and Speciality division (ITC-PSPD) is a leading paper and paperboard company in India that produces a diver se range of products for various applications. It has four world class paper manufacturing units, one of the units is ITC-PSPD Kovai. ITC-PSPD Kovai manufactures recycled boards, which are used for packaging, printing and stationary purposes. The mill has been certified by forest stewardship council and was also certified by CII GreenCo Platinum plus. The unit is an example of how ITC strives to create value for it's customers, stakeholders and society by delivering superior products and services while conserving natural resources and enhancing social capital.

Baseline Scenario

In the pulp and paper business, a mixing chest (also known as a stock chest) is a sizable, agitated tank used to combine various types of pulp, fillers, and additives in a predetermined formula for the paper machine. The mixed stock is sent to the machine chest, where it is pumped to the headbox and distributed uniformly onto the papermaking machine's moving wire. Paper is finished when the stock has been dried and de-watered.

To mitigate the severity of consistency changes in pulp manufacturing, stock chests with mixing and recirculation loops are used. A far smoother, more uniform surface and significantly better final sheet characteristics, which translate into more first-quality tons and increased savings/revenue, can be achieved by minimizing these irregularities. This outcome, which is widely accepted, is greatly influenced by stock chest blending and dilution.

To ensure that the pulp components are dispersed uniformly, the pulp tank mixer agitator is used to agitate pulp cyclically in the pulp chest and maintain pulp liquid in suspended state. Images of a typical chest agitator used in the field are shown below.

Figure 9 Conventional agitator

The proper use of the pulp tank agitator not only increases pulp processing effectiveness and reduces labour requirements, but also increases the pulp agitator's useful life. A typical chest agitator consists of the following parts:

- Electric Motor
- Belt & Pully / Gear arrangement
- Impeller

This design offers multiple challenges in ease of operation.

Proper chest mixing can be accomplished by utilizing a correctly sized top entry agitator with new impeller technology that offers 50% power savings over the more commonly used side entry mixers.

Proposed System

Compact, adaptable submersible agitators provide a cost-effective option without sacrificing a robust construction. For stirring, blending, mixing, dissolving, and suspending items in stock tanks, these small, adaptable submersible agitators are perfect. Using a variety of brackets and adapters, the submersible agitator can be simply mounted to pre-existing guiderails and lifting mechanisms without requiring any modifications. A typical underwater agitator is depicted in figure 10. Some of the major benefits of using a submersible agitator are:

- Compact, water pressure-tight design
- Reduced energy costs
- Shorter mixing times
- Minimal risk of motor overloading
- Easy installation
- Small space requirements
- Easy maintenance

Figure 10 Submersible Agitator

With improved impeller design, a new Agitator can become compact and efficient by 50%. With an effective simple paying back at around 6 Months.

Application Area

At ITC Limited, PSPD, Unit - Kovai, the submersible agitator has been installed in stock chest No. 3. The stock pulp chest agitators now in use are dated and have huge impellers. The operation team has significant challenges due to the agitators' maintenance requirements and energy usage. It was impossible to create cutouts and cure concrete during the agitators' monthly shutdown for new conventional energy-efficient agitators.

Therefore, the best option has been determined to be submersible agitators, which can be put inside the current chest without a lot of stoppage. The normal order change shutdown will be enough to complete the installation. Only chests with a lower consistency of pulp and chests where the level won't drop below 60% can use this submersible agitator.

Application Details

The following are the application details of Unit Kovai:

- Type of Chest: Square tank with inclination at bottom
- Capacity of Chest: 80 m^3

Table 4 Application Details

Application	UOM	Before	After	Energy Savings	Investment
Ch No: 3 Agitator	Connected Load	30 KW	10 KW	65%	2.5 Lakh
	Consumption, KW	17.3 KW	KW		

Direct saving by reduction of electricity usage by 70%

Cost-Benefit Analysis

The energy savings by the application 65%. The annual monetary saving for this project is INR 5.0 lakh, with an investment of INR 2.5 lakh, and the payback for the project is 06 months.

Replication Potential

Submersible Agitators can be used for a variety of applications including:

- Pulp and Paper industry
- Mixing and stirring applications in sewage treatment plants and industrial areas
- Homogenization of highly concentrated sludge and slurries
- Hazardous locations

Technology Providers

CRI Pumps

Website: https://www.crigroups.com/
https://www.cri-man.com/main-strengths/mixers

CASE STUDY - 7

Installation of white liquor Indirect Heater

Energy saving project

Title: Installation of white liquor Indirect Heater, Naini Tissues Limited

Introduction to the plant

Naini Tissues Limited, the flagship company of the Naini Group, was founded in 2002. NTL uses agricultural waste such as bagasse and wheat straw to make 100 TPD writing and printing paper. NTL has attained high-quality standards and significantly enhanced the specifications of its existing line of goods, after successfully implementing the comprehensive Mill Development Plan (MDP) in the years 2013 and 2014. Since 1995, Naini has gone a long way. Starting with a single paper machine with a capacity of 30 TPD, it has enhanced it's production capacity multiple folds.

Baseline Scenario

Soda Process is mainly involved in the plant at Naini Tissues Limited for cooking the raw material i.e., Bagasse in continuous digester. The soda process involves heating the fibrous material in a pressurized digester to 140-170°C in the presence of 12-14% sodium hydroxide (i.e., soda), also known as cooking liquor. In the process, lignin is separating from the cellulose, and is suspended in the liquid phase. The liquid phase, called black liquor due to the presence of lignin, is separated from the solid phase containing liberated cellulose, which is called pulp. Pulp is then further processed to manufacture, paper, boards, composite materials, certain polymers and so on. The black liquor contains lignin and sodium hydroxide (soda) is usually further processed to recover the soda for reuse in the process.

Figure 11 Heater in operating condition

Cooking liquor in continuous digester for Bagasse cooking was being charged at a temperature of 75 to 80°C and then being heated with direct MP steam. The direct heating in the digester was resulting in dilution of cooking liquor due steam condensate. The time required for heating and cooking was also more. These factors caused the variation in pulp quality.

PROJECT DESCRIPTION

To minimize the variation in pulp quality and reduce cooking time, the plant team installed an indirect heater for cooking liquor to raise the temperature from 80°to 120°C with LP steam before feeding to digester. Heater installed in caustic dosing pump delivery line, for temperature control the plant team installed a temperature transmitter and steam control valve. When cooking liquor temp. Increase or decrease transmitter sends the signal to control the steam accordingly.

Benefits

Qualitative

Table 5 Impact on qualitative parameters

Parameters	Unit	Without White Liquor heater	With White Liquor heater
Effect on cooking time	min	19.5-21	15.5-16.5
Kappa no. variation		13-16.5	14.5-16.5
Specks count		--	Decreased

Quantitative

Table 6 Energy saving details

Parameters		Unit	Without White Liquor heater	With White Liquor heater
Steam consumption in cooking	MP steam LP steam	MT/hr	12 Nil	10 2.5
Extra Captive power generation due to replacement of MP steam with LP steam		Units/hr	Nil	200
Steam condensate recovery for LP steam	MP steam LP steam		Nil Nil	Nil 100%

Table 7 Steam saving

Description	Unit	
Steam consumption (Before) Steam consumption (After) LP steam Cost of steam cons. (Before) Cost of steam consumption (After) Digester running hours Net Cost saving/month	MT/hr MT/hr Rs./MT per hour Rs./MT per hour per month Rs. In lakhs	12 MP steam 10 MP steam + 2.5 12528 12815 480 -1.38
Net Cost saving per annum	Rs. In lakhs	-16.53 lakhs

Table 8 Extra Captive power generation due to replacement of MP steam with LP steam

Description	Unit	
Extra Power generation per ton of LP extraction LP steam consumed No. of units generated Cost per unit Running hours Net Cost saving/month	kWh MT/hr Units/hour Rs/kWh per month Rs. In lakhs	80 2.5 200 4.5 480 4.32
Net Cost saving per annum	Rs. In lakhs	51.84 lakhs

Table 9 DM water saving due to recovery of LP steam condensate

Description	Unit	
LP Steam Condensate per hour Cost Running hours Net Cost saving/month	MT/hour Rs/ MT per month Rs. in lakhs	2.5 10 480 0.12
Net Cost saving per annum	Rs. In lakhs	1.44 lakhs

Table 10 Cost Savings Per annum

Sr. No.	Description	Saving Per Annum (Rs. In Lakhs)
1	Steam Consumption in cooking	-16.53
2	Extra Captive power generation due to replacement of MP steam with LP steam	51.84
3	DM water saving due to recovery of LP steam condensate	1.44
	Total Savings (Rs in Lakhs)	36.75

Conclusion

Continuous improvements with technology up gradation by maintaining focus on quality improvement & reduction in costs is the key to staying competitive in a fiercely challenging scenario.

CASE STUDY - 8

Auxiliary Power Consumption reduction through Energy Efficient fans integrated with uniform flow distribution using CFD related to AFBC HP Boiler -CPP

Energy saving project

Title: Auxiliary Power Consumption reduction through Energy Efficient fans integrated with uniform flow distribution using CFD related to AFBC HP Boiler -CPP, Seshasayee Paper and Boards Ltd.

Introduction to the plant

Seshasayee Paper and Boards Ltd. owns and successfully operates a paper mill at Erode, Tamil Nadu, India. It has an installed capacity of 1,93,450 tons per annum for manufacturing of pulp. and an installed capacity of 1,65,000 tons per annum of Writing and Printing grades of paper. SPB has received Forest Stewardship Council® (FSC®) certification. SPB is the first Indian Paper Company that has been certified under three standards of FSC viz., FSC-STD-40-005, FSC-STD-40-004 and FSC-STD-40-003. SPB is capable of manufacturing and selling FSC 100% and FSC Mix products in the domestic and international markets.

Baseline Scenario/Background

AFBC HP Boiler [Boiler # 10] of CPP of M/s MBEIPL design and supplied by M/s Enmas at M/s Seshasayee Paper and Boards Ltd. Erode unit was equipped with FD and ID fans (both of 2 No. 60% MCR capacity rating). The fans are designed to handle Boiler peak load [129 TPH Steam generation] with fan design margin in place. MCR and ECR ratings are 117 TPH and 106 TPH steam generation respectively at Main steam pressure of 106 ksc and temperature of 510°C. However as both the set of fans need to be operational even for Boiler start -up, it was a risky proposition to go in with just with the 2 set of F.D. fans -especially with ageing of the fans over 12 years of continuous operation.

In the extreme event of any of the FD fans going out of service, the power boiler cannot be started affecting high pressure steam and power generation from CPP. This would greatly impair productivity. Hence it was decided to go in for an additional set of fans [Fan C] to support Fans A & B.

Alongside, with the Boiler 10 being in continuous operation since 2005, there was the lurking fear of either of the existing ID Fans A & B suddenly breaking down in extreme case. This would require a longer time for setting right the failed fan unit. With only one ID fan in operation during the intervening period would lead to lowered HP steam generation from Boiler 10 and reduced Power Generation from the integrated 21 MW STG. This triggered the need of going in for 3rd ID fan to be gone in for. Ms EnergTekh -the reputed Fan supplier -was approached for best energy solution for the above facets.

Figure 12 Boiler 10 AFBC -Coal fired HP Boiler

BOILER BRIEF

Boiler 10 of CPP is Atmospheric Spouted Fluidized bed boiler supplied by M/s Enmas Andritz Pvt Ltd [Refer Fig 12 for view of the Boiler]. Design specifications of the Boiler are elicited in

Table-1. Imported High Moisture enviro coal is the primary fuel and the boiler is one of balanced draught and is a Natural circulation unit.

Combustion air is split into 2 parts viz., Primary [PA] for fuel feeding and balance air main [FD] for total fuel combustion. Combustion air is preheated in APH using flue gas leaving the economizer of the boiler. The flue gas is then let through ESP onto the ID fans leading to the connected stack for discharging waste flue gas to the surrounding environment.

Boiler 10 Specifications

Spouted AFBC Boiler

Supplier: EAPL

Steam Generation [ECR 106 TPH

Steam Generation MCR 117 TPH

Steam Peak genern 129 TPH

SOP: 106 ksc

SOT: 510 Deg C

FW temp 135 Deg C

FD Fan - 2 No. * 60 %

ID Fan -2 No. 60 %

PA Fan

AIR APPORTIONING & FLUE GAS LOADING

There are 2 No. FD Fans and 2 No. ID fans each designed for 60 % of boiler rated capacity. Air flow through PA fan is around 20 TPH specifically meant for fuel feeding onto the combustion chamber. Around 120 TPH of air flow is being admitted through both the FD fans at ECR load of the boiler. The flue gas discharged through both the ID fans is around 165 to 170 TPH at around 140 to 145 °C at Boiler ECR load.

ENERGY EFFICIENT FANS

Once the above decision was in place, the next right step was to go in for energy efficient fan set from M/s EnergTekh. With increased efficiency of both FD & ID fans, small power savings are to be expected on a continuous basis with new Fan C in operation in conjunction with Fans A & B.

TECHNOLOGY SUPPLIER

M/s EnergTekh selected as the manufacturer not only agreed to install the new set of fans in the existing space available, but also was able to guarantee higher efficiency of the 2 [FD & ID] fans M/s EnergTekh designed, engineered and supplied the new set of fans which were of higher efficiencies, specifically at operating boiler loads.

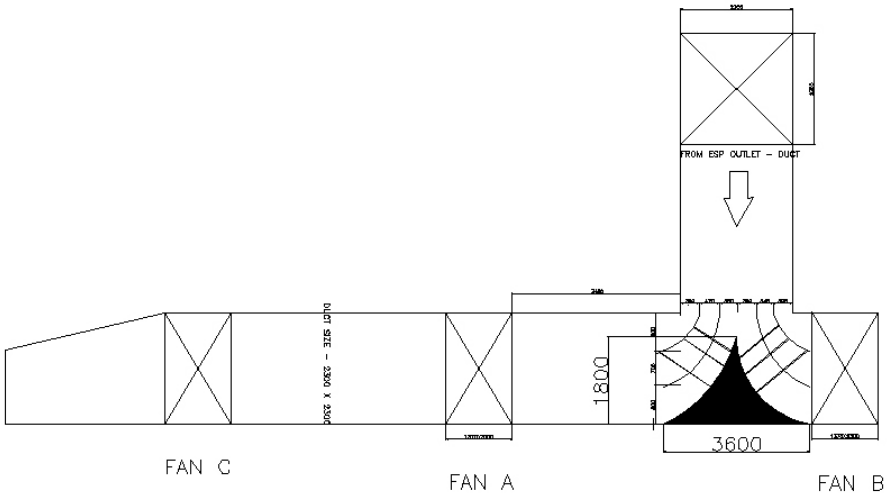

Figure 13 ID Fans A, B & C with connecting flue gas duct

Energy gains with FD fan Cs in place

With the installation of high efficiency FD Fan -C in place, the power consumption with FD Fan C operating in Conjunction with A or B in operation was measured. With FD Fans A & B as basis, net Power saving of 52 kW was obtained on a sustained basis, with the new energy efficient FD Fan C operating alongside FD Fan A

Impediment faced for ID Fan C in place

Though test results had confirmed higher efficiency of the new ID Fan C, there was problem of higher draught loss with ID Fan C with the connected duct and damper in place. Since within the restricted space available, the new ID Fan-C had to be located [Refer the Layout drawing enclosed]. It was found that the draught loss with ID Fan C in operation either with ID Fan A or ID Fan B was higher and a bit problematic.

The fan specialist [Mr Raghuraman, CEO of M/s EnergTekh] studied at site in-depth and analysed the issue; and it was decided to go in for CFD simulation of flows with all the 3 ID fans -A , B & C, so as to ensure smooth and uniform flow and reduced draught loss with ID Fan C in operation along with ID Fan A or B. [Fig.13]. View of Energy efficient ID Fan C is shown in Fig.15.

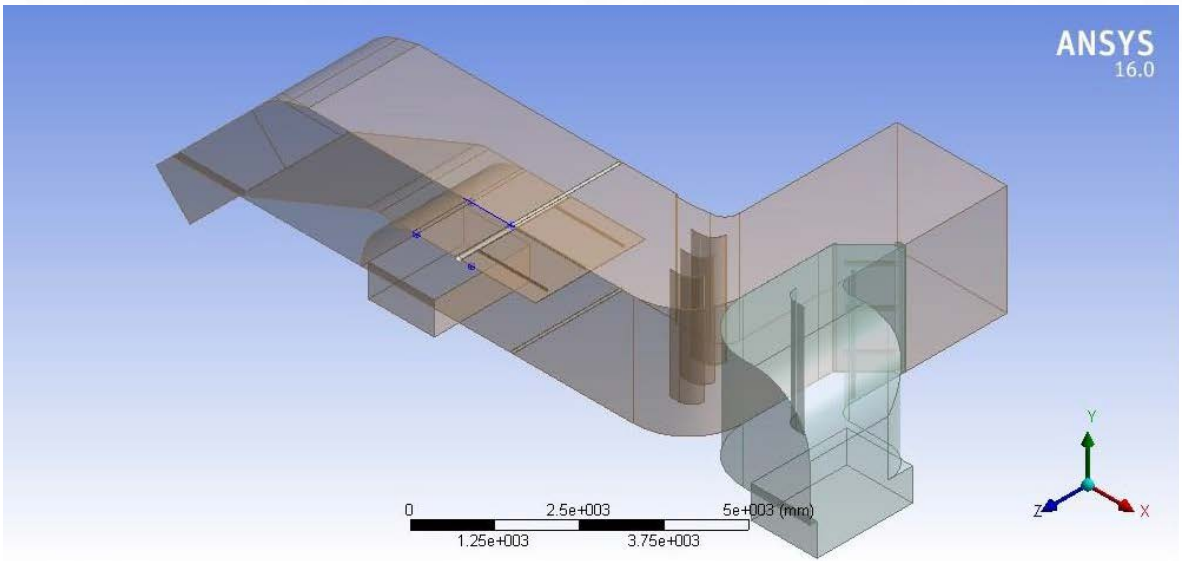

Figure 14 ID Fans A & C in operation –CFD Flow Simulation

Outcome with ID Fan C with the associate system in place

Based on the CFD modelling [simulation study & results], M/s EnergTekh decided that the flue gas flow profile with Guide vanes and Diverter damper in the flue gas duct in identified location had been studied and analysed along with fine tuning, to ensure smooth flow as also lowered draught loss with ID fan C CFD Flow Simulation with ID fans A and C in operation is elicited in Fig.15.

Figure 15 Energy Efficient ID Fan C

ENERGY GAINS

The performance results with ID Fan C in conjunction with ID Fan B or Fan A are tabulated in Table-12. Comparison is made with operational data of ID Fans A & B as basis, for power consumption reduction with ID Fan C in conjunction with ID Fan A.

Table 11 Power Cons. Comparison with Combination of ID Fans -A, B & C

Item	A&B	A&C
Draught loss reduction across the select section	Basis	25 mmWC
Power Consumption	150kW	125 kW
Power Saving with C fan online	Basis	25 kW

The results were satisfactory in that the power consumption with ID fan C operating with ID Fan A is lower by 600 units/ day when compared with ID Fans A & B in operation.

UNIQUENESS

APC reduction was achieved by going in for Energy efficient ID fan. However, the uniqueness of the scheme is with flue gas uniform flow profiling even with ID fan C being placed in the only available restricted space provided, which necessitated flue gas duct flow modelling [with gainful use of CFD simulation] along-with specially designed Guide vanes for smoothened gas flow and minimal eddy formation.

This scheme had ensured that any 2 of the 3 ID fans would be available for continuous running of Boiler-10. Since there is the 3rd fan as stand-by, there would not be any fear of drop in steam/power generation from CPP. This above Total Energy Concept is probably first of its kind.

ENERGY SAVINGS – APC Reduction

Power consumption reduction at ECR operation of Boiler: ID Fan C achieved was 25 kW

Total Auxiliary Power consumption reduction with new Fans alone = 600 kWh/day Estimated Annual monetary savings = 25 * 8400 Rs 4.50. = Rs 9.5 Lakhs

Table 12 Return on investment (ROI)

Parameter	Value
Scheme cost inclusive of Diverter, Guide vanes, CFD simulation etc.	Rs 13.1 Lakhs
Energy saving [APC reduction] gain	Rs 9.5 Lakhs
ROI*	1 year & 6 months

ID Fan C cost is not to be taken for ROI computation, as the third fan set is a process requirement [by the client].

Attractive Hidden Energy Gains

The productivity would have been disturbed without ID Fan C in place and if any of the other two ID fans had faced problem [as the Power Boiler is already 12 years in continuous operation. Any of the old ID fans going out of service would result in Boiler 10 being operated at well below rated load and would have necessitated running of the inefficient MP coal fired boiler [Boiler 6 /Boiler 7] and its connected steam turbine. Though the required steam for process could be maintained though at higher steam unit cost, the shortfall in power generation needs to be made up by reducing the power export quantity to SPB Tirunelveli unit [Impact on higher grid power cost need to be borne by SPB Tirunelveli unit accordingly].

This above hidden electrical energy saving is so high that ROI if corrected for the above would be just a few months, say < 6 months only.

REPLICATION POTENTIAL

The above Innovative concept can be easily replicated in:

Boilers in operation related to other Pulp & Paper mills. as also to all Industry sectors

Boilers being planned to be put up in any industry sector.

However, lesson derived from this innovative scheme, is one of going in for CFD simulation flow modelling studies apriori, whenever one has multiple fans involved with a boiler.

M/s EnergTekh, as Technology Supplier & System manufacturer- acknowledges the SPB Management of M/s Seshasayee Paper and Boards Limited for the successful implementation of this innovative scheme in Boiler 10 -CPP in their Erode unit.

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CASE STUDY - 9

Enhancing Black liquor Evaporation capacity through Process Reengineering

Energy saving project

Title: Enhancing Black liquor Evaporation capacity through Process Reengineering in a scientific and innovative approach to debottleneck capacity constraints, Seshasayee Paper and Boards Ltd.

Figure 16 Chemical Recovery Plant

Introduction to the plant

Seshasayee Paper and Boards Ltd. owns and successfully operates a paper mill at Erode, Tamil Nadu, India. It has an installed capacity of 1,93,450 tons per annum for manufacturing of pulp. and an installed capacity of 1,65,000 tons per annum of Writing and Printing grades of paper. SPB has received Forest Stewardship Council® (FSC®) certification. SPB is the first Indian Paper Company that has been certified under three standards of FSC viz., FSC-STD-40-005, FSC-STD-40-004 and FSC-STD-40-003. SPB is capable of manufacturing and selling FSC 100% and FSC Mix products in the domestic and international markets.

Baseline Scenario/Background

The bottleneck in any plant will change as the rate of production increases. In the Recovery plant operation, earlier lime kiln was the bottleneck which got faded away by the good measures taken by the in-house team. Slowly a day came, when the plant was not able to run the pulp mill for want of WBL space. Also wash water had to be reduced to produce more pulp to accommodate evaporation plant bottleneck. A day came, where the plant was forced to reduce Pulp production.

To counter act this, Process reengineering was taken in hand. It is a practice of rethinking and redressing the way work is done to better support an organizational requirement and to achieve significant improvements in productivity, cycle time and quality.

Why it is Innovative

Conventional approach to improve evaporation plant performance will be to add new bodies or try mixed feed concept. Then with increase in load, surface condensers will be added or for the substantial increase add separate street and run the plants in parallel.

But the plant adopted a unique route with the help of their in-house team by following a scientific approach in each stage with innovative ideas to increase the processing rate in the evaporation plant as the plant had cushion to load Recovery boiler.

Increase in Green energy generation: 2.4 %

With increase in WBL processing capacity, the COD load in Pulp mill also reduced and bleaching chemical consumption of ClO2 reduced from 25 kg to 22 kg/ ton of Pulp.

The following scheme were formulated to identify the hidden potential in the given system and to maximize production and increase solids firing in Recovery Boiler to generate more green energy.

Table 13 Details of scheme

Changes made	year	Before	After	Advantages
		m^3/hr	m^3/hr	
Arresting of surface condenser partition plate leak	2017	185	190	Increase in Pulp yield and to fire 729 tpd in Recovery Boiler.
Post condenser retrofit from PHE to SHE	2017	190	200	BLS fired - 768 tpd
Orifice changing	2017	200	202	BLS fired - 775.68 tpd
Foul condensate pot vapor recirculation	2018	202	210	BLS fired - 806 tpd
Shifting of Ash crystallization	2019	210	210	BLS fired - 806 tpd, tube jamming in 1st effect reduced from 800 tubes to 180 tubes and cleaning frequency decreased to once in 35 days from to 55 days.
Diversion of vapor from PCFT# 1 to CAL#3 vapor header	2019	210	215	BLS fired - 810 tpd.
Running CAL 2 A and B, liquor in series and vapor in parallel mode.	2020	215	260	BLS fired at 860 tpd. the plant is confident that they can fire 900 tpd of solids firing.

Outcome and achievement by this Project Implementation

Able to process more BL generated, thereby enhancing Pulp production capacity from 360 TPD to 450 TPD of unbleached pulp.

Immediate necessity of up gradation of evaporator by huge investment was avoided by Process reengineering.

Impact on GreenCo Parameters

Increase in green energy by -

2017-18	**Thermal**	**51.69 %**
	Electrical	36.64 %
2018-19	**Thermal**	**57.50 %**
	Electrical	41.42 %
2019-20	**Thermal**	**57.69 %**
	Electrical	41.16 %

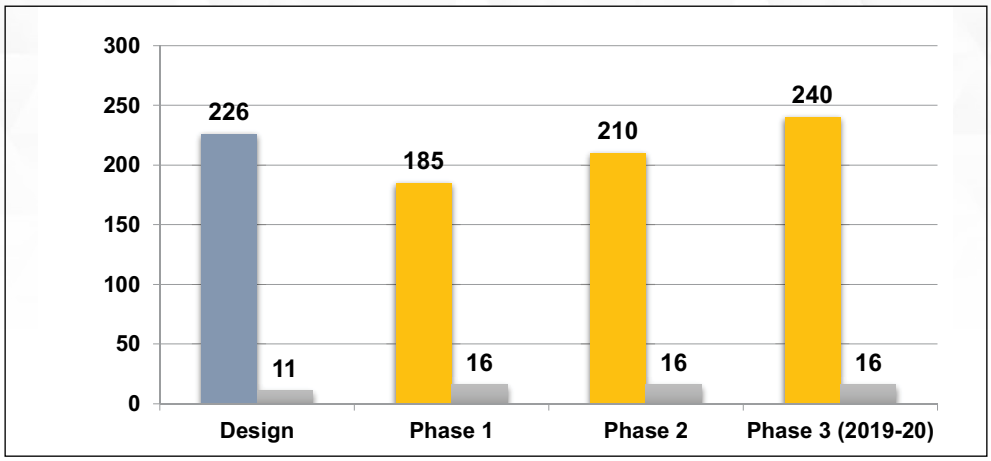

Figure 17 Increase in WBL Processing Rate (m^3 / Hour) with % Inlet solids

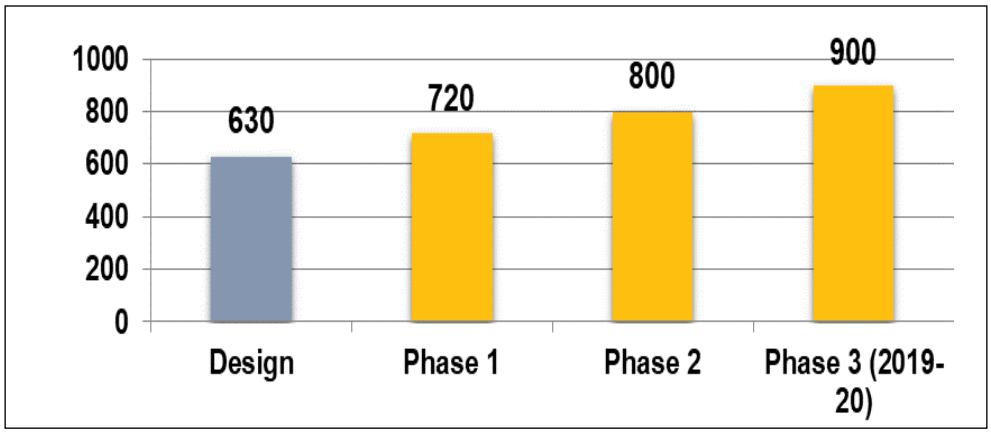

Figure 18 Increase in BLDS / Day

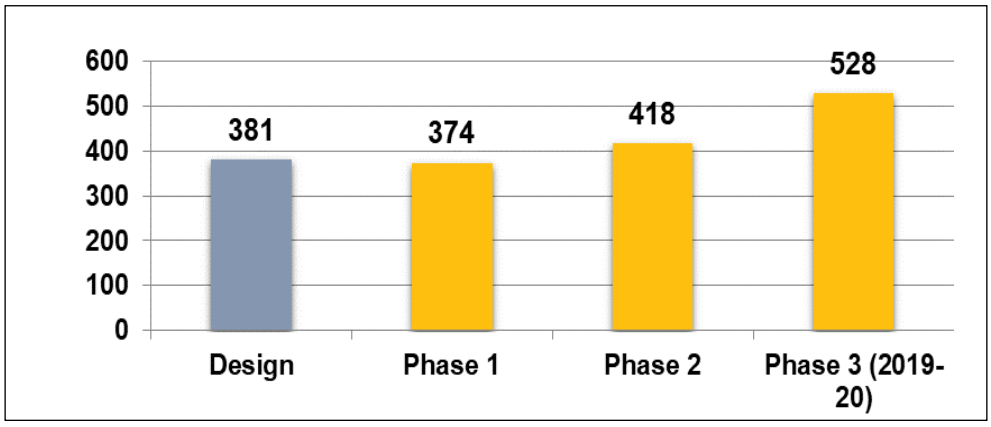

Figure 19 Increase in Pulp Production / Day

Date of implementation All the modifications were done over a period of 6 months, time in phases

Annual Savings Rs 8.15 crores

Investment Rs 24 Lakhs

CASE STUDY - 10

High-pressure steam used in ejector

Energy saving project

Title: High-pressure steam used in ejector, JK Paper Ltd, Unit: CPM

Introduction of the Plant

JK Paper Ltd, a leading player in manufacturing of office paper, coated paper and packaging board segments with total installed capacity of 7.61 Lac TPA. JK Paper Ltd, Unit: CPM is One of the three integrated pulp and paper manufacturing units of JK Paper Ltd. located at Fort Songadh (Gujarat). The installed capacity of the plant is 3.36 lacs TPA. This includes:

- Packaging board : 2.7 Lacs TPA
- Writing & Printing Paper : 0.66 Lac TPA
- Pulp mill : 1.5 lac BDMT/Year.

The end uses of the products are:

- Packing of Food, liquid, FMCG goods, Medicine, liquor etc.
- Writing and Printing
- MICR paper for cheque books

Background / Baseline Scenario

In JKCPM two Captive Cogen plants of capacity 28MW & 18MW are running to meet 40MW plant power requirement. In both the TG's auxiliary steam used in main ejector for maintaining TG vacuum is supplied after reducing HP steam pressure by Auxiliary PRV. As per design each TG requires 600kg/hr of auxiliary steam at Pressure 10 Ata and temp 280°C.

As in every integrated paper mill both TGs have MP extraction and LP extraction at pressure 11ata and 5.5 Ata.

Project Details

The high-pressure steam used in ejector after pressure reduction is going to condenser without generating power. Since the TG already has MP extraction at pressure and temperature range required by Ejector OEM, The MP extraction steam can be used as motive steam in ejector. This will produce power @60 kW and thus reduce steam to condenser required for that much power.

Investment & Savings

Investment : Being a small in-house modification, no capital investment.

Savings : Rs 58 lacs/Annum

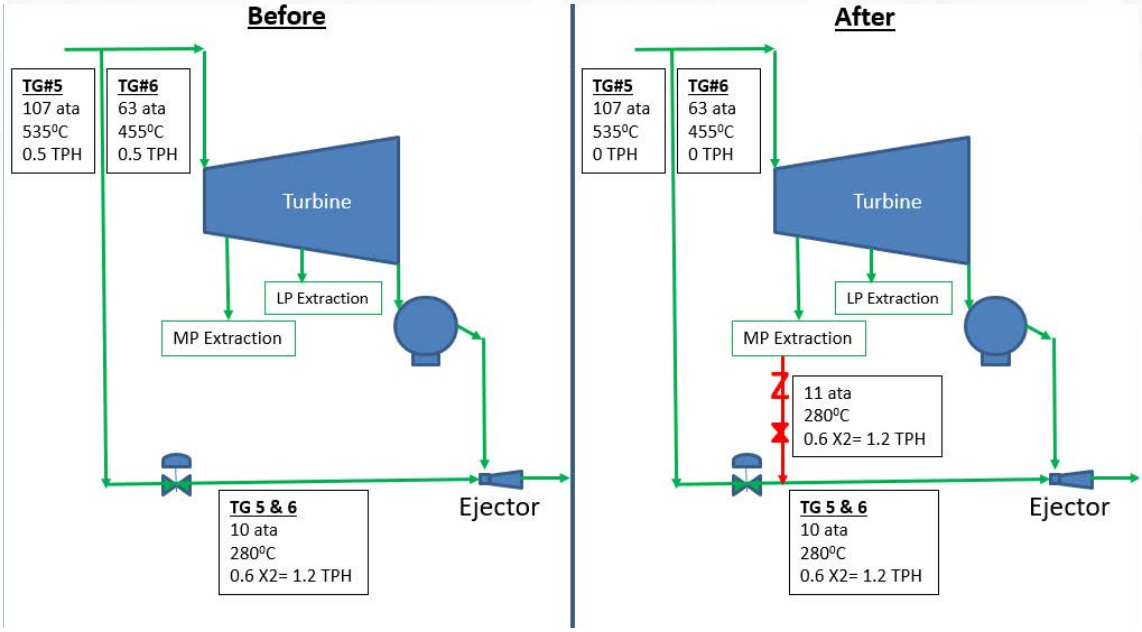

Figure 20 Comparison between before and after scenario

Table 14 Energy saving and cost beneficial analysis

Sr.no.	Description	Unit	Qty TG#5	Qty TG#6
1	Qty of steam	kg.hr	600	600
2	Inlet Enthalpy	kcal/kg	826	791
3	MP Enthalpy	kcal/kg	717	712
4	Stage efficiency	%	90	90
5	Power produced through M.P Steam	kWh / Ton	114	82
6	Power generation with 0.6 Ton	kWh	68	49
7	Coal saved through Modification. =(kWh * Heat rate)/GCV)*24	Ton / day	2.0	
8	Coal cost	Rs / Ton	8500	
9	Annual saving @ 350 days	Lac / annum	57.75	
10	Coal saved/Year	MT	834	

Replication Potential

Every integrated paper mill will have MP extraction at pressure 11ata. Hence this can be replicated after consulting with Turbine/Ejector OEM.

Contact Details

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JK Paper Ltd, CPM

CASE STUDY - 11

Multiplate Settler

Energy saving project

Title: Multiplate Settler, JK Paper Ltd, Unit: CPM

Introduction of the Plant

Figure 21 Micro-plate settler

JK Paper Ltd, leading player in manufacturing of office paper, coated paper and packaging board segments with total installed capacity of 7.61 Lac TPA. JK Paper Ltd, Unit: CPM is One of the three integrated pulp and paper manufacturing units of JK Paper Ltd. located at Fort Songadh (Gujarat). The installed capacity of the plant is 3.36 lacs TPA. These include:

Packaging board : 2.7 Lacs TPA

Writing & Printing Paper : 0.66 Lac TPA

Pulp mill : 1.5 lac BDMT/Year.

The end uses of the products are:

- Packing of Food, liquid, FMCG goods, Medicine, liquor, etc
- Writing and Printing
- MICR paper for cheque books

Background / Baseline Scenario

In JKCPM, the excess back from PM#4 clarified tower was going to ETP. Specific water consumption of PM#4 was 8.5 m^3/MT (FY 2019-20).

Project Details

To install multi plate settler and reuse machine back water for Pumps/refiner sealing, centri-cleaner and use as make up in vacuum pump CT. The settler reject will be sent to fibre recovery chest.

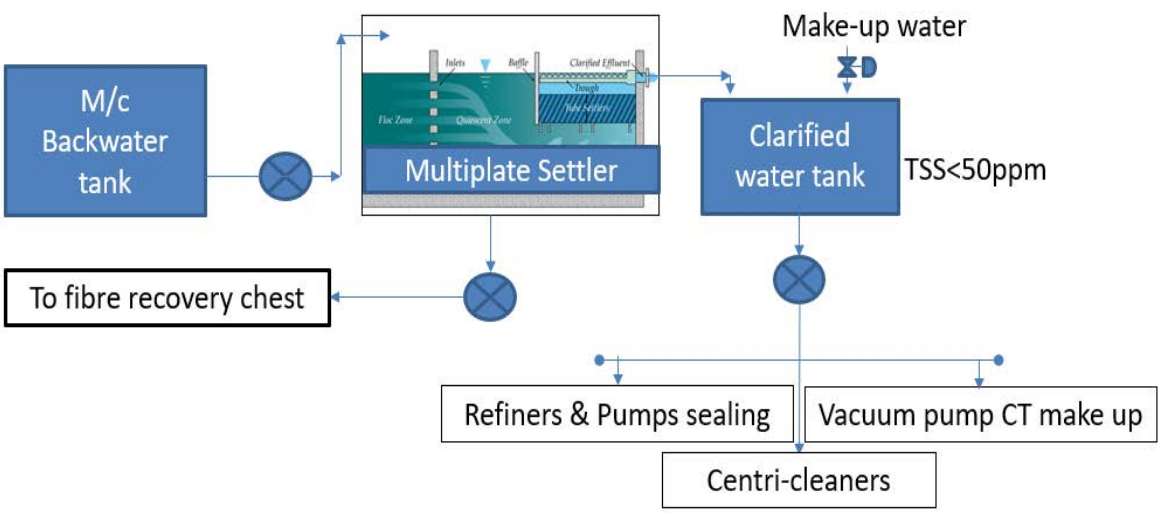

Figure 22 Flow diagram for multi-plate settler

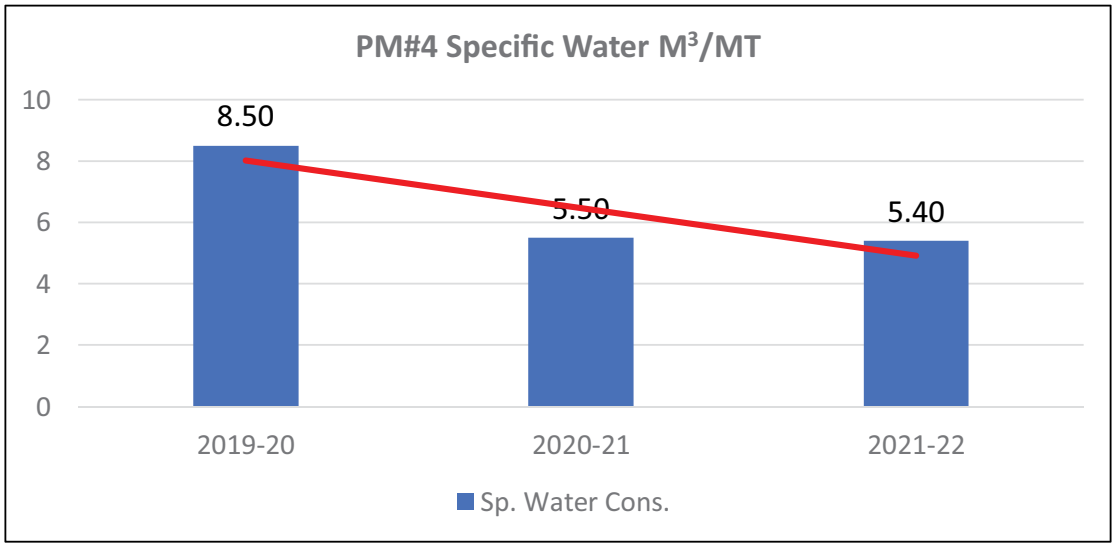

Figure 23 Specific water consumption trend

Investment & Savings

Investment : Rs 110 Lacs.
Savings : 30 m^3/hr
Monetary saving : Rs 62 lacs/Annum

Replication Potential

Low capital cost solution for reuse of Machine excess back water compared to Disc filter and clarifier.

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CASE STUDY - 12

12 Bio-methanation Plant

Energy saving project:

Title: Bio-methanation Plant, South India Paper Mills Limited (SIPM)

Introduction of the Plant

The South India Paper Mills Limited (SIPM) is about 64 years old. The management of SIPM carried out necessary renovation and modernization continuously over year and year. The new machine PM-6 started its operation from the end of 2022. Presently SIPM is the oldest unit in Mysore District.

The management has modernized the mill continuously to ensure survival and progress. The current capacity is 146000 tons per annum. The manufacturing process is based entirely on recycling of wastepaper.

SIPM went into forward integration about two decades back with a Corrugation unit. It has the converting and printing capacity of about 3000 tons per month.

Location

The Mill is located at Chikkayana Chatra (Thandavapura) near Nanjangud Town, about 20 kms form Mysore City on Mysore Ooty Road. The extent of land is 22 acres. It is well connected with all the important cities and towns where its products are consumed.

Manufacturing Process

Our manufacturing process is based entirely on recycling wastepaper. The basic raw material for manufacture of paper is imported and local wastepaper. Broadly the operations of production are pulping, Stock Preparation & Paper Making

Products Manufactured

High performance Fluting Kraft, Liner board and Special application papers

SIPM manufactures High grade Fluting and Liner boards suitable for Food grade applications. It has the capabilities to manufacture for specific end use as per the customer requirement.

Background / Baseline Scenario

The new machine PM-6 is a state-of-the-art machine. Pulping to approach flow system was designed and supplied by VOITH which is a well-known supplier in the paper manufacturing sector. Critical equipment in paper machines is imported from Europe. All the processes and parameters are monitored and controlled through DCS.

ETP Project Details

Keeping in view of capacity expansion and growing industrial demands SIPM decided to upgrade ETP in 2019 for the future expansion capacity and to meet the future demands.

In a rapidly changing world, humanity is confronted with challenges like global warming, depletion of valuable resources, and the most threatening, water scarcity. Water is a bare necessity of life and essential in the production of food, goods and energy, for socio-economic development and for maintaining healthy ecosystems.

Integration of water purification, sustainable energy generation and reuse of resources is becoming more and more essential.

Integrated solutions

Anaerobic followed by Aerobic system helps to:

- Meet safe water discharge requirements
- Reduce water consumption
- Reuse water
- Produce green gas
- Upgrade biogas
- Recover valuable elements from waste/process water

ANAEROBIC WASTEWATER TREATMENT IN THE PULP AND PAPER INDUSTRY

Anaerobic treatment is considered as a pre-treatment before aerobic treatment in order to achieve the highest possible results. Anaerobic treatment followed by an aerobic post-treatment has many advantages such as:

(1) strong reduction of power consumption

(2) significant reduction of wasted bio-sludge

(3) smaller overall space requirement

(4) production of energy rich biogas.

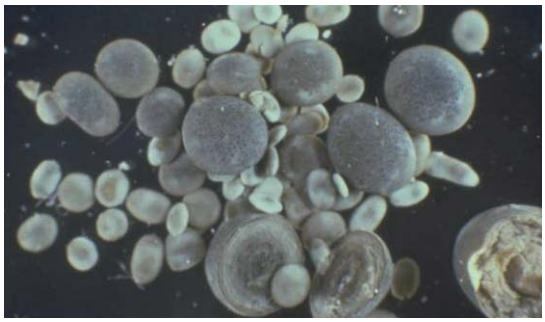


Figure 24 Granular Anaerobic Biomass

Process description of Biopaq®IC reactor

In the BIOPAQ® Internal Circulation (IC) reactor, anaerobic granular biomass converts organic components (COD) from wastewater into biogas. The generated biogas is separated from the treated wastewater and is discharged from the reactor.

The ICR contains two reactor compartments on top and middle. The lower compartment contains the expanded sludge bed and is under high load; most of the biodegradable COD is converted here. The upper compartment serves as a polishing step for optimal COD removal.

The influent is pumped into the bottom of the reactor, where it is immediately mixed in the mixing section (see ICR diagram) with recycled water from the downer. The influent then flows to an expanded bed of granular sludge (the biomass) in the lower reactor compartment. Here most of the biodegradable COD is converted into biogas. This biogas is collected in the lower separation module. This causes a gas lift, during which water and sludge in the riser are also carried to the gas/liquid separator on top of the reactor. The biogas leaves the reactor via this separator, and the water/sludge mixture flows via the downer back into mixing section at the bottom of the reactor, where it is again mixed with fresh influent internal circulation.

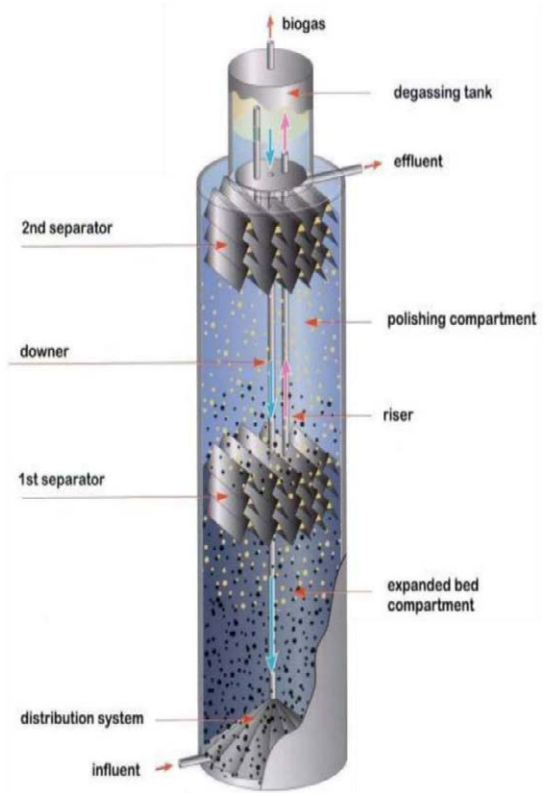
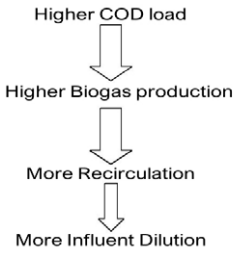


Figure 25 ICR Reactor

The effluent from the lower compartment flows through the separation module to the upper compartment, which is low loaded for final treatment. Here the remainder of the biodegradable COD is converted into biogas. This biogas is separated in the upper effluent separation module, after which it is discharged via the gas/liquid separator together with the biogas from the lower compartment. The polished effluent leaves the reactor through the top.

The internal circulation is powered by the difference in gas hold-up between the riser and the downer. A high loading requires more dilution of the influent. The internal recirculation flow rate depends on the quantity of biogas produced and hence depends on the biodegradable COD load. This principle makes the system self-regulating.



Advantages of Anaerobic pre-treatment

The combination of anaerobic treatment and aerobic treatment has many advantages such as reduction of energy consumption, reduction of wasted sludge production, less space requirement and additional energy production. Further the aerobic plant will mostly have a more stable operation due to less filamentous aerobic sludge. An impression of the anaerobic/aerobic treatment plant is shown in the figure below.

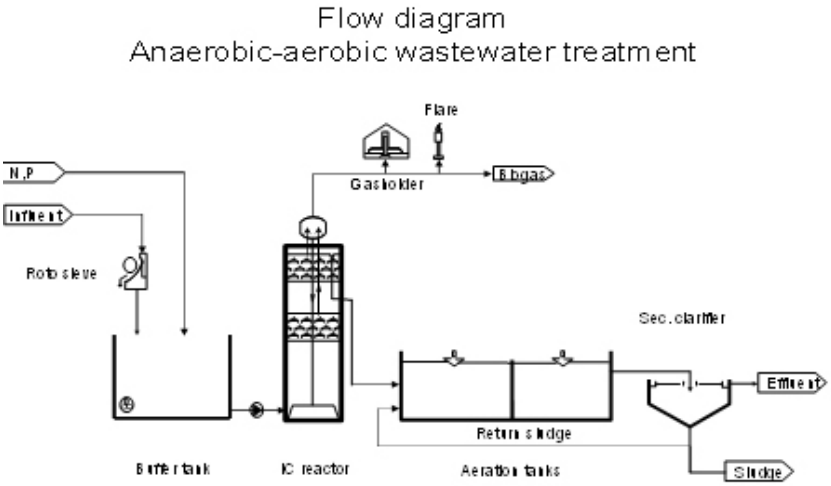


Figure 26 Flow diagram anaerobic-aerobic wastewater treatment

Waste Sludge production

Typical bio solids production for aerobic treatment is approximately 0.5 kg of solids per kg of BOD (or 0.25 kg per kg COD). In the case of anaerobic treatment, this is only 0.02 kg per kg COD converted, so it is a factor of more than 10 lower.

In below Figure a Sankey diagram shows the difference in COD balance between aerobic treatment by activated sludge and anaerobic treatment.Comparison of COD balance of aerobic and anaerobic treatment. (Ratio of BOD: COD would be 1: 2)

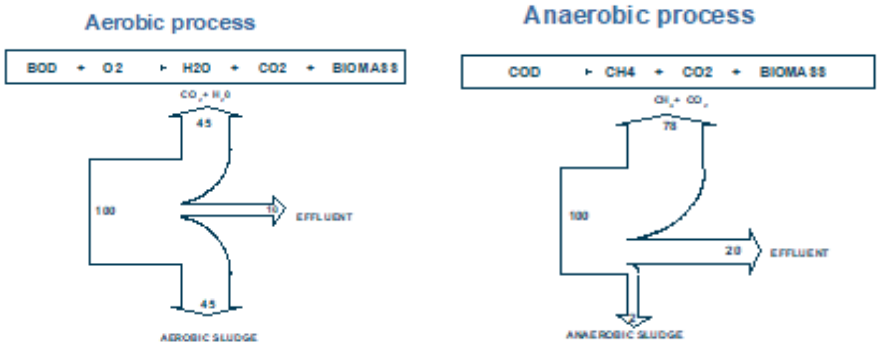


Figure 27 Aerobic & Anaerobic Process

Environmental Benefits: Energy production and greenhouse gas reduction

Besides important savings on fossil fuel consumption, "green" energy is produced in the form of methane gas. For each kg of COD removal, the gas production is approximately 0.4 to 0.45 m3 of biogas. This biogas usually contains 70 to 80% methane (CH4), 20 to 25% carbon dioxide (CO2) and a small quantity of 0.5 – 1.5 % of hydrogen sulphide (H2S). This H2S can be removed if needed by caustic scrubbing.

The project was designed, supplied and executed by "M/S Paques Environmental Technology India Pvt. Ltd."

The project was executed parallel to the old ETP. The switchover to the new ETP did not affect production.

Challenges faced during implementation

Maintaining the required quality parameters of influent would be challenging. Project success depends on the quality of influent and it should be as per the recommendations.

Replication Potential

The replication potential needs to be accessed on a case-to-case basis.

Table 15 Energy Saving Details

Sr. No.	Parameters	Unit	Before	After
1.	Mill Production Capacity	Tons/day	200	400
2.	ETP Treatment		Aerobic	Aerobic Anaerobic
3.	Power Consumption	kW/t	13	09
4.	Specific Water Consumption	kl/t	8-10	3-5
5.	Energy saving	kW/day	--	1600
6.	Saleable Seed Sludge Production	kg/day	Nil	>1000
7.	Monetary benefits	INR Lakhs	About 5 Lakh/month from Anaerobic seeds sales. Energy produced from Biogas generator will be sufficient to operate entire ETP. (Biogas is being flared at present)	
8.	Investment	INR	About 10.5 Cr	

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Technology Supplier for ETP:

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CASE STUDY - 13

Centrifugal Vacuum Blower

Energy saving project

Title: Centrifugal Vacuum Blower, Umesh Board and Paper Mills.

Introduction of the Plant

Figure 28 Umesh Board and Paper Mills

A concrete infrastructure consisting of four successful units having modern machinery, a well-equipped quality control wing, experienced and trained staff, and above all a hard-earned expertise of quarter of century in the field are the major assets of Umesh Board and Paper Mills.

With a humble start of corrugated box manufacturing under the name and style of M/s Kailash Industries at M.I.D.C. Chikalthana (Aurangabad) in 1974; the organization expanded themselves and started another unit in M.I.D.C Area of Paithan; named M/s Nath Packaging in the year 1986, then one more unit titled M/s Mahesh Industries; at M.I.D.C. Chikalthana, Aurangabad in year 1999.

To meet requirement of raw material the organization started it's own M/s Umesh Board & Paper Mills Pvt. Ltd., at Chite - Pimpelgaon (Beed Road) in the year 1996 where the organization produces paper required for corrugated boxes, later M/s Suruchi Enterprises, Aurangabad (Paper Trading Firm) for paper that cannot be produced within our premises.

Later on, the organization started M/s Harisharnam trade link Pvt. Ltd. at Pharola Tal. Paithan in the year 2009 and within a short period we also started M/s Shiva solar Pvt. Ltd.

Products manufactured: Packaging grade paper, 80-150 gsm, BF 18-35

Installation capacity: 80 TPD

Background / Baseline Scenario

In a paper machine, water in the pulp is removed to get a roll of paper. The dryness of paper at the pope reel should be around 95-96%. This dewatering in Paper machine takes place by three different methods:

- Gravity & vacuum dewatering in wire part
- Mechanical dewatering in press part
- Thermal drying in Dryer

In Umesh board and paper Mills Pvt. Ltd., in the wire part the traditional process of dewatering through gravity and vacuum is taking place. For the creation of vacuum conventional liquid ring vacuum pumps were being used. The old arrangement consisted of 2 liquid ring vacuum pumps creating vacuum in wire part for ultra low vac, low vac, trivac and bugly boxes. The intensity of vacuum created was around 200-250 mmHg

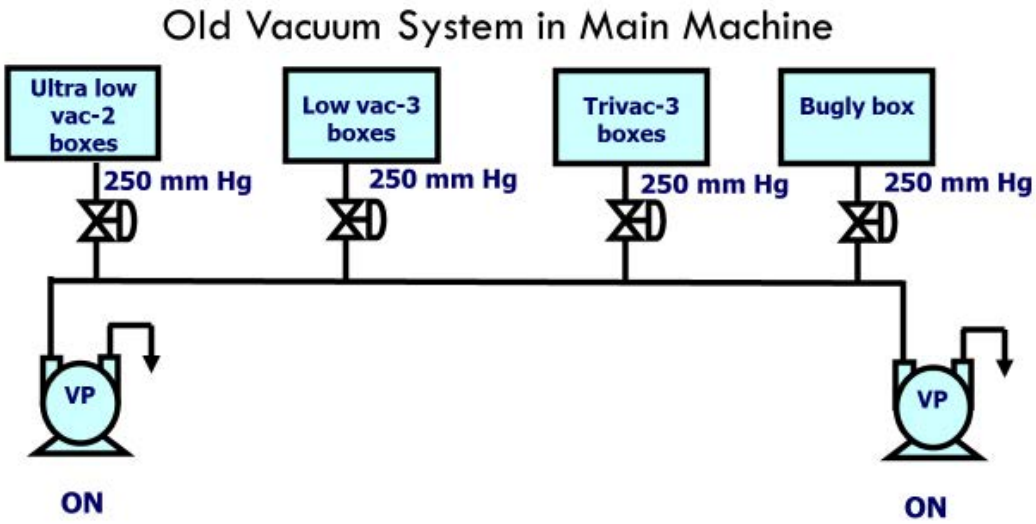

Figure 29 Wire part vacuum old configuration

Details of the energy saving project

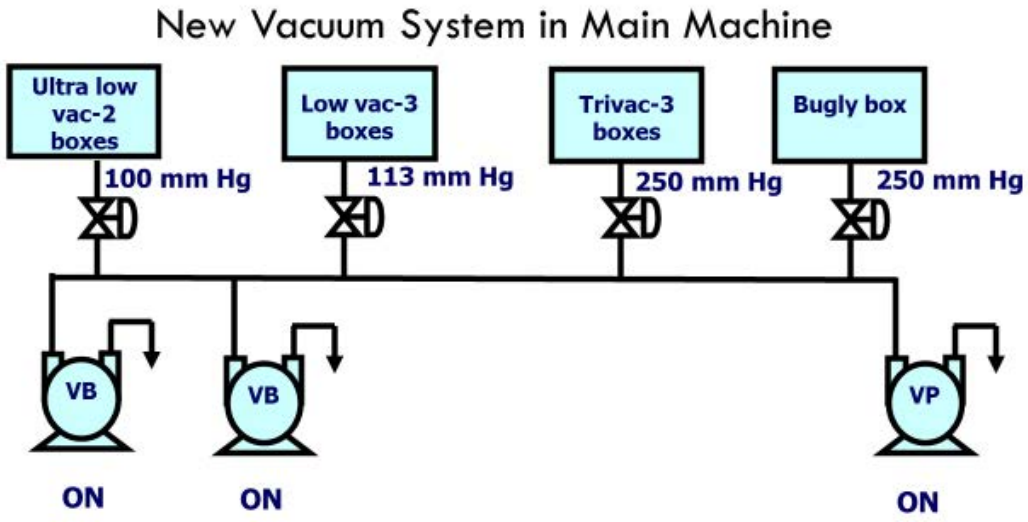

Figure 30 New Vacuum system in wire part with vacuum blowers

The plant team realized that the intensity of vacuum required in the ultra-low vac boxes was around 100 mmHg and in the low vac boxes was around 150 mmHg. Hence, the plant team recognized an opportunity to reduce the power consumption of the vacuum creation system by lowering the supply vacuum to required demand levels. This was achieved by replacing one of the liquid ring vacuum pumps with two centrifugal vacuum blowers. Hence, one of the liquid ring vacuum pumps of 40 HP and 60 m^3/hr capacity having design vacuum intensity of 450 mmHg was replaced with two centrifugal vacuum blowers, each of 7.5 HP with flow of 1000 m^3/hr at 37.5 mmHg. After replacement, the supply vacuum for the ultra-low vac boxes and the low vac boxes was maintained at 100-113 mmHg to match the demand requirements at these points of usage.

Figure 31 Centrifugal Vacuum Blower

The each of the vacuum blowers, at present, are consuming 3.0 kwh of electrical energy. This has led to a significant reduction in electrical power consumption in the vacuum generation system in the wire part leading to a significant reduction in variable cost of manufacturing.

Table 16 Technical comparison before and after implementation of project along with cost beneficial analysis

Sr.no.	Description	Unit	Before	After
1	Supply vacuum to ultra-low vac boxes	mmHg	250	100
2	Supply vacuum to low vac boxes	mmHg	250	113
		Unit	**Liquid ring vacuum pump**	**Centrifugal vacuum blowers**
3	Design Power	kw	30	5.5+5.5= 11KW
4	Design vacuum intensity	mmHg	450	37.5
5	Design flow	m^3/hr	60	1000+1000=2000
6	Actual power consumption	kW	22.5	3+3=6
7	Energy saved	kWh	16.5	
8	Investment	Rs	30,000*2= 60,000	
9	Simple payback period,	Months	~ 1 month	
10	Other benefits		Centrifugal vacuum blowers are dry type of equipment and hence do not require sealing water. This sealing water can be used elsewhere in the plant. Space requirement is also very less for centrifugal vacuum blowers.	

Contact Details

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Umesh Board and Paper Mills

CASE STUDY - 14

High Nip Press

Energy saving project

Title: High Nip Press, Bindlas Duplux Ltd.

Introduction of the Plant

Bindlas Duplux Ltd. owns and successfully operates a paper mill at Muzaffarnagar, Uttar Pradesh, India. The organization is involved in the manufacture and supply of various types of Kraft paper, packaging paper, Kraft roll paper, designer kraft paper and colored kraft paper. The organization uses eco-friendly agro-waste materials to produce it's paper products. The company also provides customized production and packaging to meet the needs of it's clients. It is a highly progressive unit and takes the lead in activities related to energy conservation and energy efficiency.

Products manufactured: 325 tpd

Installation capacity: Kraft paper, packaging paper, Kraft roll paper, designer kraft paper and coloured kraft paper

Background / Baseline Scenario

To manufacture a roll of paper, water in the pulp is removed in a paper machine by applying 3 different methods of dewatering. The paper at the pope reel should be between 95 and 96% dry. To achieve these levels of dryness, the three different ways of dewatering used are as follows:

- Gravity & vacuum dewatering in wire part
- Mechanical dewatering in press part
- Thermal drying in Dryer

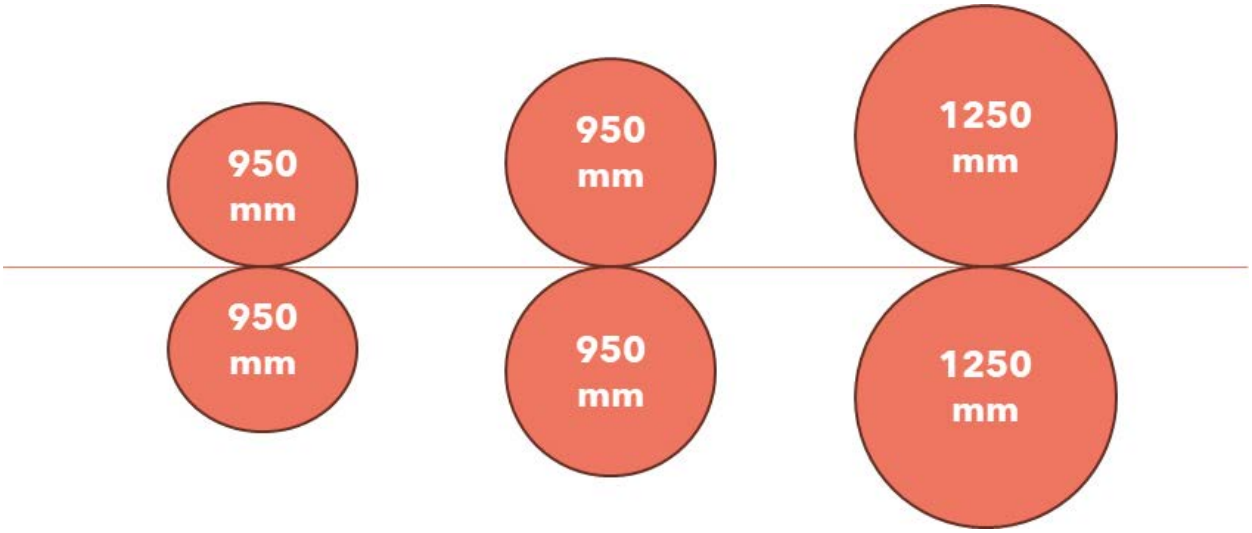

Figure 32 Previous press part arrangement

Traditionally solid press rolls with rubber coating were used for mechanical dewatering of water before the thermal drying process in the dryers. The unit in Bindlas Duplux Ltd. Was using 3 sets of press rolls for this mechanical removal of water from pulp. Earlier the moisture after press part used to be 49%, bulk was 1.38 mm, machine speed

used to be around 360-370 mm with a steam consumption of 1.55 t/t of finished product at 150 tpd production. The roll diameters were 950, 950 and 1250 mm respectively (moving in machine direction from headbox to felt part as reference).

Details of the energy saving project

Being of a very progressive mindset the plant team has continuously been working to improve on their productivity, bringing down the energy cost and improving upon the quality parameters of paper. The plant team identified that increasing the diameter of press roll can lead to an improvement in all the above. But faced challenges in the form of vendor availability, lesser number of Polyurethane (PU) coating facilities, etc. After putting in efforts to find and identify the right vendors the organization managed to import press rolls of 1650 mm of Chinese make through Annapurna imports and could also identify Zenith rubber rolls as the right vendor for PU coating to be applied on the high nip press rolls. Thus, installing a High Nip Press (Jumbo Press) for the first time in a Kraft manufacturing paper machine in India.

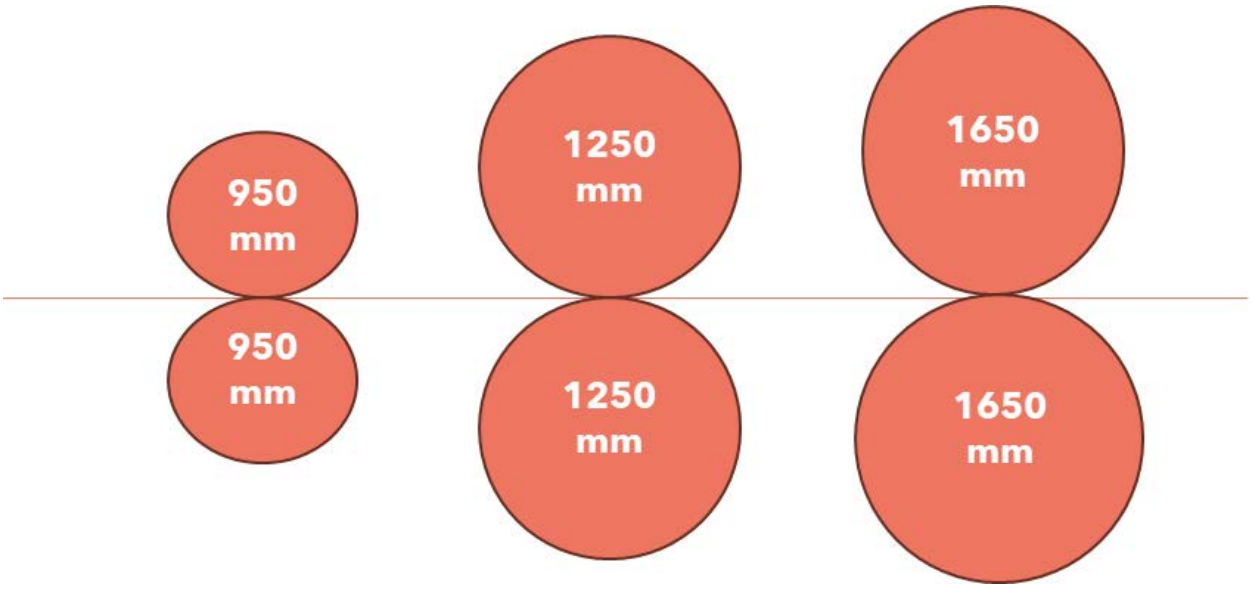

Figure 33 New Press part arrangement

Challenges

During implementation of the project, several challenges were faced by the plant team which were successfully addressed by the plant. Some of the challenges that were addressed by the plant team, for installation are as follows:

- Modification in old paper machine
- Extra Soleplate had to be installed
- Existing gearbox was found to be elevated and had to be replaced
- The new high Nip Press Roll's handling was found to be difficult due to the massive 25 ton of weight that it possessed. So, for installation a larger crane had to be arranged.
- Frame, roll, gearbox, motor, etc. had to be replaced
- There was a need for better load carrying bearing because of higher load

Table 17 Technical comparison before and after implementation of project along with cost beneficial analysis

Sr.no.	Description	Unit	Before	After
1	Moisture after press	%	49	44-45
2	Machine speed	mpm	360-370	390-400
3	Production	tpd	150	165
4	Specific Steam consumption,	Tonne/Tonne	1.55	1.4
5	Specific Power Consumption	Kwh/Tonne	360	330
6	Bulk	mm	1.38	1.3
7	Nip load	Kg/cm^2	90-150-250	100-230-380
8	Coating		Rubber	Polyurethane
9	Investment	Rs	~ 3.5 Cr	
10	Payback period	Months	~ 11 months	
11	Other benefits		Expected increase in BF. There is more margin to increase the Nip load.	

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High Nip Press Supplier
Annapurna imports India

PU coating vendor
Zenith Rubber Rolls

CASE STUDY - 15

High Pressure recovery boiler

Energy saving project

Title: High Pressure recovery boiler, ITC Bhadrachalam

Introduction of the Plant

- ITC PSPD unit Bhadrachalam is India's largest integrated Pulp, Paper Board and Specialty Papers manufacturing facility. Pioneers in Ozone bleaching and BCTMP in India.
- ITC PSPD Division maintains leadership in board market catering boards for various packaging applications like Cigarette packaging, playing cards, FMCG/skin care, pharma, soap cartons, paper cups/tubs, book covers, printing paper, liquid packaging, deep freeze foods, blister packs, liquor cartons etc.
- Installation capacity 8 lacs tons per annum
- Best in industry: Breaks per month in board: 9 no's, in paper: 29 no's
- Best in industry: Process steam consumption: 5 tons/ton of saleable production

Figure 34 ITC Bhadrachalam

Background / Baseline Scenario

- In pulp and recovery area, there are three soda recovery boilers SRB3, SRB5 & SRB5 of steam generation capacity 93, 134 and 56 TPH respectively. They generate high pressure steam at 64 Ata pressure and 460 °C temperature. The three boilers have capacity to burn 1975 TPD solids.
- In power plant (Utilities section), during latest project the high-pressure system was upgraded to 105 Ata pressure and 505 °C temperature. The organization benefited by higher specific output power generation for same input steam or lower input specific steam consumption for same output power in the turbine.
- The specific steam generation per ton of Black liquor solids fired is 3.25 tons/ton.
- Hence it was decided to upgrade the SRB 3/4/5 boilers with single High pressure recovery boiler which will generate more power for same solids burnt in old boilers.

Project Details

- The high-pressure recovery boiler was taken up by ITC partnering with M/s Valmet. The boiler was designed for 2700 TPD solids firing with 440 TPH maximum steam generation at 105 ATA pressure and 505°C temperature.
- The project started in 2019 and completed in 2022.
- The boiler started steam generation in May 2022.
- Key benefits in this project:
- Support pulp mill in production of additional 31000 MT hardwood pulp, thereby reducing equivalent import.
- Increase in renewable energy share in PSPD by 5.9%

- The specific steam generation per ton of Black liquor solids fired increased to 3.7 tons/ton from 3.25 tons/ton.
- Reduction in coal consumption by 1.36 lac tons per annum.
- Reduction of solids waste generation and disposal by 55000 Tons per annum, due to reduction in fly ash disposal.
- High pressure recovery boiler will be able to meet the proposed emission norms for suspended particulate matter, SOx, NOx at stringent levels considered in design itself (Lower compared with existing SRB3/4/5 boilers).
- Improved manpower productivity in HPRB (100%).
- No additional land and water required.
- The boiler is connected to ATFD (Agitated thin film dryer) which is separating potassium and chloride salts, solidifying, bagging and disposing it to detergent manufacturers. Earlier this was causing unnecessary load on Effluent Treatment Plant and potassium and chloride salts getting wasted.

Contact Details

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ITC Bhadrachalam

Technology Supplier

M/s Valmet

CASE STUDY - 16

Digitalization of mill equipment – I4.0 (Historian)

Energy saving project

Title: Digitalization of mill equipment – I4.0 (Historian), ITC Bhadrachalam

Introduction of the Plant

- ITC PSPD unit Bhadrachalam is India's largest integrated Pulp, Paper Board and Specialty Papers manufacturing facility. Pioneers in Ozone bleaching and BCTMP in India.
- ITC PSPD Division maintains leadership in board market catering boards for various packaging applications like Cigarette packaging, playing cards, FMCG/skin care, pharma, soap cartons, paper cups/tubs, book covers, printing paper, liquid packaging, deep freeze foods, blister packs, liquor cartons etc.
- Installation capacity 8 lacs tons per annum
- Best in industry: Follow TPM as business excellence tool and record about 4000 kaizens (innovations) every month in Productivity/Quality/Cost/Delivery/Safety/Morale

Background / Baseline Scenario

- Unit Bhadrachalam started its journey in 1979 with best-in-class industrial automation infrastructure such as Distributed Control System (DCS), Supervisory Control and Data Acquisition (SCADA), PLCs (Programmable Logic Controllers), hosted on an OT (Operations Technology) network.
- It is used for basic control of process, alerts and notification and safety interlocks in their respective areas of adoption on a standalone basis.
- The MES (Manufacturing Execution System) is hosted on an independent IT (Information Technology) network which is not connected to the industrial automation infrastructure.
- Therefore, when it comes to usefulness in terms of contextualizing data generated from various systems and subsequently generating manufacturing intelligence and insights over time, the existing data acquisition and archival systems are disparate and do not support collection of high frequency data, a vital necessity for application of new tools such as Advanced Analytics.

Project Details

- ITC's PSPD division stands out as the pioneer in digitalizing data among the ITC group, having initiated the "Historian" project as part of their Industry 4.0 effort.
- As a part of this project, Historical data are stored and archived for a defined period from various sources such as DCS, PLC, MES, etc.

Key benefits

- Provided single source of truth i.e to collect, compress and store data from available IT & OT data sources of each asset to a common platform which has storage up to 10 years compared to the DCS storage limitations of 1-3 months
- Visibility of historical and real time data to various stake holders utilizing Dashboards
- Product Traceability across the supply chain
- Reduced data retrieval and Data Stitching time for Advanced analytics projects
- Derive Golden batches for various grades of Products and achieved sustained improvement in throughput.
- Advanced analytics (AA) models that were previously in standalone systems were now integrated into the mill-wide Tech stack, easing up the monitoring of key parameters and enabling real time monitoring of adherence to deploy AA models.

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ITC, Bhadrachalam

CASE STUDY - 17

Installation of Turbo Oxy Jet Aerators Cum Mixers in place of existing surface aerators and diffusers

Energy saving project

Title: Installation of Turbo Oxy Jet Aerators Cum Mixers 30 hp+3hp X 10 Nos. in place of existing surface aerators and diffusers, Shreyans Industries Ltd, Ludhiana

Introduction of the Plant

Over the years number of modernization-cum-expansion schemes were undertaken and the present installed capacity of manufacturing writing & printing paper, from agro-based raw materials, is 37000 Mt per annum. The company had been the winner of Best Productivity Awards for number of years.

The company operates with a wide product mix with well accepted quality in the market based on non-conventional raw materials. Major consumers of the company's products include Major Publishers, Copy Manufacturers, Job Printers, Various states Textbook Boards, Exporters of Notebooks & Diaries, Printing & Stationary Dept., Railways, P&T Dept., Security Press etc.

Background / Baseline Scenario

Issues in existing Floating aerators and Diffused aeration system

The Effluent Treatment Plant is equipped with Floating aerators and Diffused aeration system. The oxygen transfer efficiency of floating aerators is generally 1.2kg oxygen/kilowatt hour; however, mixing of effluent is limited to 1.2 to 1.8 meters depth. The diffusers are much more efficient than floating aerators, but the life of diffuser membranes is limited to 3-4 years. If any membrane ruptures inside the aeration basin, it resulted in liquor entry in diffuser network and entire system become nonfunctional. In fixed type diffusers, to replace the membrane, aeration tank to be emptied out or modify it with retrievable diffuser system with lifting arrangement which is very cumbersome process.

Figure 35 Old Surface Aerators and Turbo Oxy Jet Aerators cum Mixers 30+3 hp in aeration basin

Project Details

Fine bubble air dispersion

The advanced high efficiency Oxy Jet Aerators cum Mixers dramatically increases Oxygen transfer efficiency @ 2.1 – 2.3 kg. oxygen / kilowatt hour with excellent Mixing. Air is pressurized using a high efficiency regenerative blower and forced down the hollow shaft. The air is then sheered into fine bubbles with average bubble size of 2.2 mm. while the large mixing propeller forces the air in a downward direction. It incorporates higher fine bubble oxygen dispersion with superior mixing to maximize and control the biological nutrient removal in waste-water systems.

The Turbo Oxy Jet Aerators Cum Mixers can independently control mixing and aeration. By simply turning on and off the on-board regenerative blower, this provides unprecedented operational control, allowing the aeration system to be tailored to the process conditions with no negative impact to the mixing within the system. Operating all or some of the units in the system in mixing only mode during off peak loading allows for electrical power savings while maintaining the dissolved oxygen concentration.

Benefits

Ease of Operations and Maintenance

The Aerator is designed for minimal operator attention. These are floating in aeration basin tied with rope to move easily for routine maintenance. This greatly reduces the potential for mechanical failure of the equipment and significantly reduces operational and maintenance costs. Moreover, the units are designed for easy maintenance without removing them from the basin. The only wear point on the Aerator is the water lubricated bearing and sleeve near the propeller at the discharge end. The jet aerators do not use gear boxes or speed reducers like other aeration and mixing equipment in the industry.

Capital expenditure: Rs.77. 63 Lakh

Power saving:

Due to growing stringent environmental norms, the up gradation of effluent treatment system is need of the hour. By incorporating the best available technology (BAT), efficiency of Effluent Treatment Plant improved substantially. However, after installation of Turbo Oxy Jet Aerators, a net saving of power achieved 70 HP. Total cost saving per year estimated Rs.21 Lakh/ year after calculating the power cost @ Rs.7.50 per unit. Payback period is roughly 4 years with improved effluent discharge parameters.

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About CII:

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering Industry, Government and civil society, through advisory and consultative processes. CII is a non-government, not-for-profit, industry-led and industry-managed organization, with around 9000 members from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 300,000 enterprises from 286 national and regional sectoral industry bodies. For more than 125 years, CII has been engaged in shaping India's development journey and works proactively on transforming Indian Industry's engagement in national development. CII charts change by working closely with Government on policy issues, interfacing with thought leaders, and enhancing efficiency, competitiveness and business opportunities for industry through a range of specialized services and strategic global linkages. It also provides a platform for consensus-building and networking on key issues. Extending its agenda beyond business, CII assists industry to identify and execute corporate citizenship programmes. Partnerships with civil society organizations carry forward corporate initiatives for integrated and inclusive development across diverse domains including affirmative action, livelihoods, diversity management, skill development, empowerment of women, and sustainable development, to name a few. As India completes 75 years of Independence in 2022, it must position itself for global leadership with a long-term vision for India@100 in 2047. The role played by Indian industry will be central to the country's progress and success as a nation. CII, with the Theme for 2022-23 as Beyond India@75: Competitiveness, Growth, Sustainability, Internationalisation has prioritized 7 action points under these 4 sub-themes that will catalyze the journey of the country towards the vision of India@100. With 62 offices, including 10 Centres of Excellence, in India, and 8 overseas offices in Australia, Egypt, Germany, Indonesia, Singapore, UAE, UK, and USA, as well as institutional partnerships with 350 counterpart organizations in 133 countries, CII serves as a reference point for Indian industry and the international business community.

About CII-GBC:

CII-Sohrabji Godrej Green Business Centre (CII-Godrej GBC) was established in the year 2004, as CII's Developmental Institute on Green Practices & Businesses, aimed at offering world class advisory services on conservation of natural resources. The Green Business Centre in Hyderabad is housed in one of the greenest buildings in the world and through Indian Green Building Council (IGBC) is spearheading the Green Building movement in the country. The Green Business Centre was inaugurated by His Excellency Dr. A. P. J. Abdul Kalam, the then President of India on 14 July 2004. The Services of Green Business Centre include- Energy Management, Green Buildings, Green Companies, Renewable Energy, GHG Inventorization, Green Product Certification, Waste Management and Cleaner Production Process. CII-Godrej GBC works closely with the stakeholders in facilitating India emerge as one of the global leaders in Green Business by the year 2025.

Confederation of Indian Industry

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