ENHANCING YIELD AND QUALITY THROUGH TECHNOLOGICAL ADVANCEMENTS IN RECOVERED PAPER PROCESSING

Presenter :
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KPM JOURNEY

Incorporated in 1985

Among Top 5 Paper Producers in India

Annual Group Turnover of ₹ 3,000 Crores

The Largest Waste-Paper based Mill in India

Diversified Product Range Packaging Board, Printing & Writing, Newsprint

Single Site with 4.2 Lakh TPA Capacity

PRODUCT PORTFOLIO

PACKAGING BOARD

- VIRGIN
- RECYCLED

Capacity – 1.60 Lakhs TPA

APPLICATION

FMCG, Pharmaceutical,
F&B, E-Commerce and Liquor Carton

PAPER

- W&P
  - VIRGIN
  - RECYCLED
- COPIER

Capacity – 1.20 Lakhs TPA

APPLICATION

Publications, Notebooks, Stationery
and Commercial Printing

NEWSPRINT

- STANDARD

Capacity – 1.40 Lakhs TPA

APPLICATION

Newspaper, Magazines, Advertisement
and Brochures

PRODUCT PARTNERS

INDIAN PAPER INDUSTRY

PRODUCTION CATEGORIES IN INDIA PULP & PAPER

CATEGORY	2000	2022
RCF BASED	30%	>80%
AGRO BASED	31%	8%
WOOD BASED	38%	12%

Generation and Collection of Main varieties of paper in India

PAPER GRADE	Source of Generation	Types of waste	End use	Quantity Consumed (Million tons/Annum)	Quantity Collected (Million tons/Annum)
Writing/Printing	Printing press & notebook manufacturing unit	Press cuttings, Copy cuttings and trimmings	Paper Mills	7.18	2.87
	Household, school, office, universities Etc.	Old books, copies, examination sheets, office records etc.	Paper Mills		
Packaging Grades	Printing presses, Mono carton makers, Corrugated Box makers, House-holds ,Departmental stores, Food Seller and various shops and Market establishment.	Duplex Cuttings, corrugated Box Cutting, Old Boxes, Available out of various packing of Household and Electronic Items, Packing of food and other consumable items.	Paper Mills	10.31	6.11

Generation and Collection of Main varieties of paper

PAPER GRADE	Source of Generation	Types of waste	End use	Quantity Consumed (Million tons/Annum)	Quantity Collected(Million tons/Annum)
Newsprint	Over Issue, News Papers, Houses, Offices, Market and Various Readers- across the country	Over Issue, Newspapers, New Paper from Houses, Offices and News Paper Reader	Paper Mills, Packing of Fruits, Furniture's, Grocery Items, Packing of Hardware, roadside food vendors etc.	2.628	1.84
Specialty	Various manufacturing Units, Textile, Polymer Convertors and Various Industry	Paper Sheets and Rolls	Paper Mills, Packing of Consumer Durables, Glass Ware Crockery Items, roadside food vendors etc.	>1%	DNV

SEGMENT REVIEW

- Broadly paper making consist of four basic segments of product category i.e. Writing & Printing, packaging paper & Board, Newsprint and specialty.
- As on date packaging paper & Boards have a share of around 55% in the total Production. Their demand in future by fueled by folding & corrugated boxes as they are remained by the manufacturing and goods marketing sector.
- Out of 410 Million Tons of paper consumed globally, India consumes 22.05 Million Tons of Paper and paper board annually.
- In terms of production, the largest contribution is made by Recycle Fiber Mills, which contributed over 80% the paper being made in the country.
- In terms of volume, the highest contribution to the domestic paper production comes from the Packaging Sector followed by the writing & Printing and news print sector.
- Out of the total production of 20.61 million Tons of paper, Writing & Printing contributes 35%, Packaging board &Paper 55%, and News print 5% other varieties of paper account for 5% of Production.

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- Drum Pulper: A Pioneering Solution in the Paper Industry
- Enhancing Paper Recycling: The Significance of Secondary Flotation Cells in Deinking
- Revolutionizing Deinking: The Fiber Wall Fine Screening System for Stickie's Removal in the Paper Industry

RECYCLED PAPER GRADES USED IN DIFFERENT SEGMENTS

Writing and Printing

- CBS
- SOP
- SHB/HBR
- SWL
- Cup Stock
- White cuttings / shaving
- Sorted Books
- POC

Packaging Paper & Board

- Indian Records
- HWEC
- COPY
- Scan Board
- ONP(Indian / Imported)
- Mixed Waste
- Duplex Cutting
- BBC

News Print

- ONP (Indian / Imported)
- News & Pams
- News 8/9
- Magazine
- Mixed waste

Specialty Paper

- Cup stock
- HWEC
- Wet strength

“Revolutionizing Recovered Paper Sorting”: An Innovative Approach

Bale Breaker

- At Khanna Paper Mill, there is a robust system for managing the intake of both domestic and imported bales of wastepaper.
- The material undergoes meticulous sorting at our dedicated sorting station.
- The primary goal of this process is to efficiently:
  - Sort the materials
  - Separate the out throws
  - Isolate prohibitive materials

“Revolutionizing Recovered Paper Sorting”: An Innovative Approach

Bale Breaker

Key components in Bale Breaking Process:

- Bale Reception
- Sorting Station
- Bale Breaker Drum
- Feeding Conveyor
- Sorting
- Outfeed Conveyor

- The bale breaker drum is a marvel of engineering.
- It relies on the gentle power of centrifugal force.
- It operates at a low, deliberate RPM range of 12 to 13.

Bale Breaker Drum

- **A large rotating drum with various mechanisms**
- **To break apart compacted bales of paper waste**
- **Loosens and separates paper sheets and materials within the bales**

Sorting Station

- **Sorting station within the mill**
- **Designated area with specific equipment**
- **Workers responsible for the process**
- **Purpose: Segregating different types of paper waste**
- **Tasks involve separating and categorizing paper waste materials**

Feeding Conveyor

- **Connection: Bale breaker drum linked to a feeding conveyor**
- **Conveyor system purpose: Transporting bales to the bale breaker drum for processing**
- **Loading process: Could be either automated or manual, depending on the system in use**

Sorting

- **Bale breaker drum function: Effectively opens up the bales**
- **Result: Allows separation of paper waste materials**
- **Sorting process location: Occurs within the bale breaker drum**
- **Methods: Workers and/or machinery used for identifying and segregating various types of paper waste**

Outfeed Conveyor

- **Sorting process completion**
- **Outfeed conveyor engaged**
- **Transportation of sorted paper waste materials**
- **Subsequent recycling process stage**
- **May include further processing, cleaning, or baling of sorted materials**

The goal of this process is to efficiently sort and separate different types of paper waste, which can then be further processed to create recycled paper products. Recycling wastepaper is an environmentally friendly practice that helps reduce the demand for new pulp and minimizes the environmental impact of paper production.

“Khanna Paper’s meticulous wastepaper sorting practices consistently yield the dual benefits of maintaining product quality and ensuring a consistent pulp yield year after year. Our unwavering commitment to precision in wastepaper management forms the cornerstone of our sustainable production process.”

Location Wise KPML Bale Breaking & Sorting Capacity					
Sr. no	Location	Bale Breaking Capacity(TPD)	Sorting Capacity(TPD)	RPM	Dimensions (DXL) in mtr
1	Newsprint Line	800	150	11-12	3.5 X 10
2	Writing & Printing Line	400	100	10-11	3.5 X 07
3	Mix Waste Line	400	150	10-11	3.5 X 07
4	Under Top Layer Line	100	50	8-10	3.0 X 05

Drum Pulper: A Pioneering Solution in the Paper Industry

Drum Pulper

M/s Khanna paper Mills Drum pulper installed in the newsprint line. This is the robust machines have revolutionized the way papermakers handle recovered paper, contributing significantly to sustainability goals.

Components and stages:

- **The Mixing chamber**
- **The Pulping Chamber**
- **Screening Stage**

Advantages Of Drum Pulpers:

- **Enhanced Sustainability**
- **Improved Quality**
- **Energy Efficiency**
- **Versatility**

The Mixing chamber

- **Drum pulpers: Large rotating drums with blades or teeth**
- **Function: Break down baled or compacted paper**
- **Precision: Operate with surgical precision**
- **Goal: Achieve a delicate balance between efficiency and paper fiber preservation**

The Pulping Chamber

- **Drum pulper primary role: Submerging recovered paper in water**
- **Pulping process: Softens and disintegrates the paper**
- **Result: Separation of paper fibers and removal of contaminants**

Screening Stage

- Gentle treatment of paper fibers by drum pulpers
- Contrasted with more aggressive methods
- Minimization of fiber damage
- Retention of a significant portion of original fiber length
- Contribution to high-quality paper production

Advantages of Drum Pulpers:

✓ Enhanced **Sustainability**

- Drum pulpers' vital role in paper recycling
- Efficiently breaking down recovered paper into usable pulp
- Promotion of a circular economy
- Reduction of the need for virgin fiber
- Minimization of the industry's ecological footprint

✓ Improved Quality

The gentle yet thorough action of drum pulpers preserves fiber quality, resulting in higher-quality paper products. This is particularly essential for industries requiring precise paper characteristics, such as printing and packaging

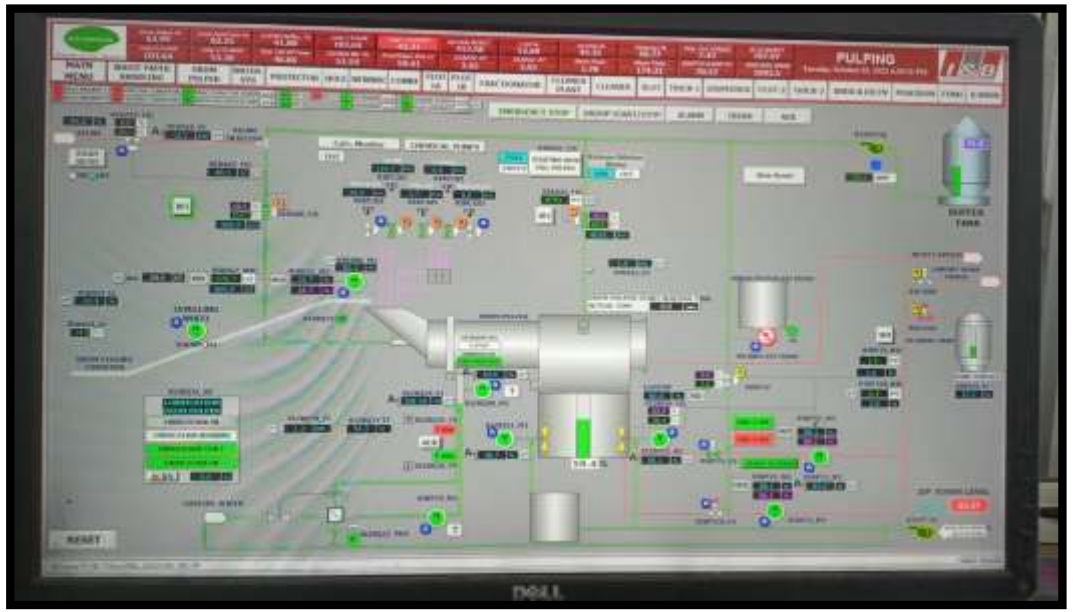
✓ Energy Efficiency

Drum pulpers are known for their energy efficiency. They require less power compared to alternative pulping methods, contributing to cost savings, and reduced environmental impact.

✓ Versatility

Drum pulpers can handle a wide range of paper types, including old newspapers, cardboard, and mixed office waste. This versatility makes them an invaluable asset in modern recycling facilities.

DRUM PULPER DCS



OPERATING PARAMETERS OF DRUM PULPER

Sr. no	Operating parameter	Units	values
1	PH	No	7.5 – 8.5
2	Temperature	Deg C	40 – 60
3	Mode Of Operation	--	Continuous
4	Cycle Time	Minutes	13 - 17
5	Pulping Consistency	%	20 - 24
6	Screening Consistency	%	3 – 4
7	Drum RPM	No	12 – 14

Pulper Types and their Specific Consumption

No	Pulper Type	Pulper Operation	Spefific Power Consumption/ Mt	Operating Consistency	Raw Material
1	D Type Pulper	Continous	40	4.0- 4.5 %	ONP / MIX paper/ Kraft
2	Hi Con Pulper	Batch	50	14.0-18.0%	ONP / MIX paper/ Kraft
3	Drum Pulper	Continous	25	14.0-18.0%	ONP / MIX paper/ Kraft

Enhancing Paper Recycling: The Significance of Secondary Flotation Cells in Deinking

- Deinking: The process of converting used paper into clean pulp
- Objective: Suitable for high-grade paper product production
- Involves: Removing ink, adhesives, and contaminants from recycled paper
- Primary flotation cells: Initial equipment in the deinking process
- Secondary flotation cells: Optimize pulp quality in the later stages of deinking

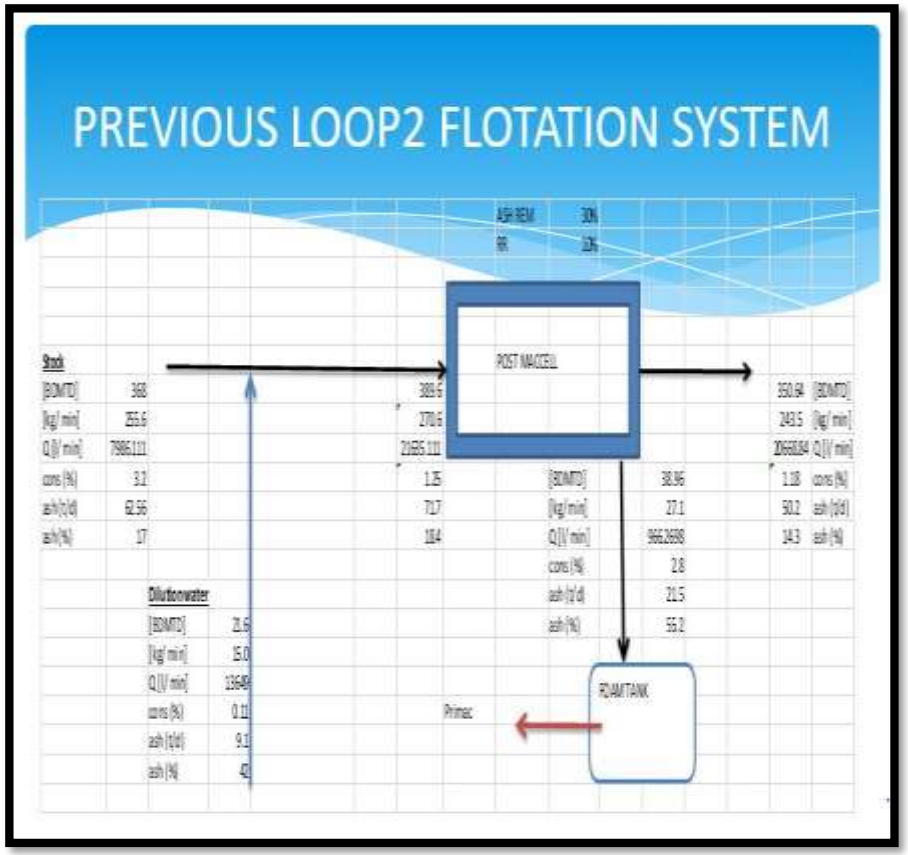
LOOP-2 SECONDARY FLOTATION CELL

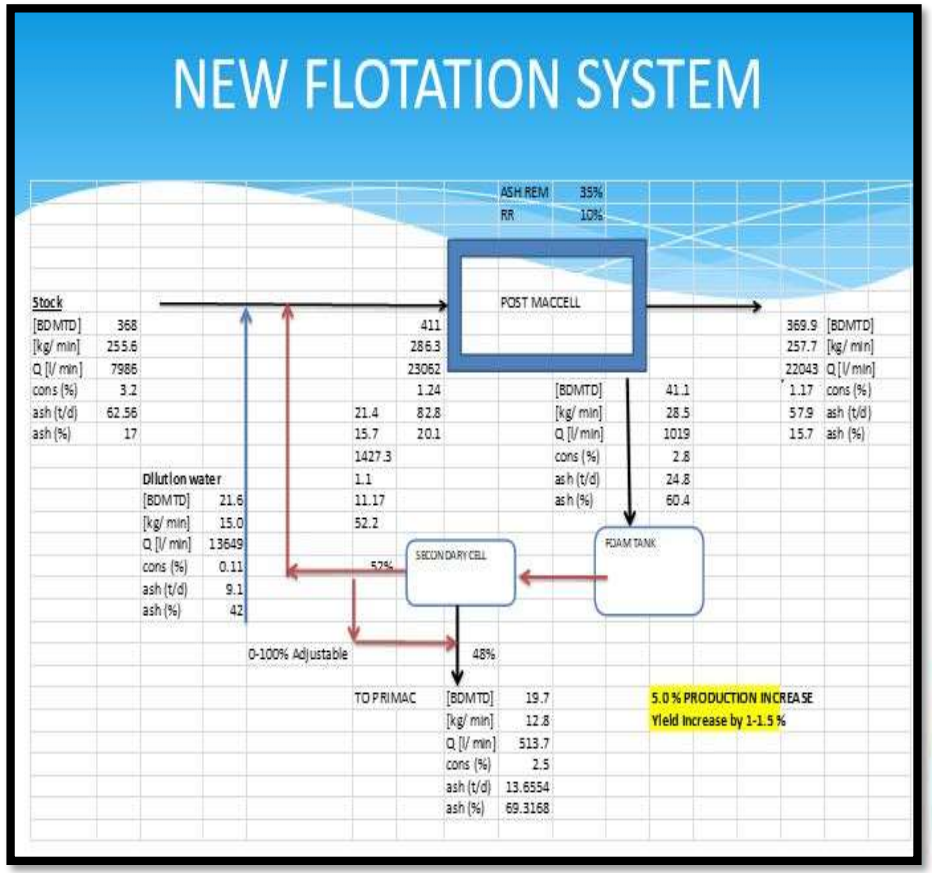
- **In Loop 2, the yield is improved by 1 % by recirculating of the recovery flotation cell accept into the primary cell feed.**
- **This improvement will be achieved through the implementation of a Secondary Cell.**
- **The process for the Secondary Cell will closely mirror the Voith- Andritz line's method.**
- **Currently, the reject material, which is discharged, will undergo treatment using this Secondary Cell.**
- **The strategic addition of the Secondary Cell is projected to boost production in Loop 2 by approximately 5%.**

DCS OF FLOTATION CELL

Sr. no	Operating parameter	Units	values
1	PH	No	7.0 – 8.0
2	Temperature	Deg C	45 – 50
3	Mode Of Operation	--	Continuous
5	Consistency	%	0.8 - 1.2
6	Foam Level WRT Feed	%	10 - 25
7	No. Of injectors	No	4(Two Chambers)

MASS BALANCE OF FLOTATION CELL:



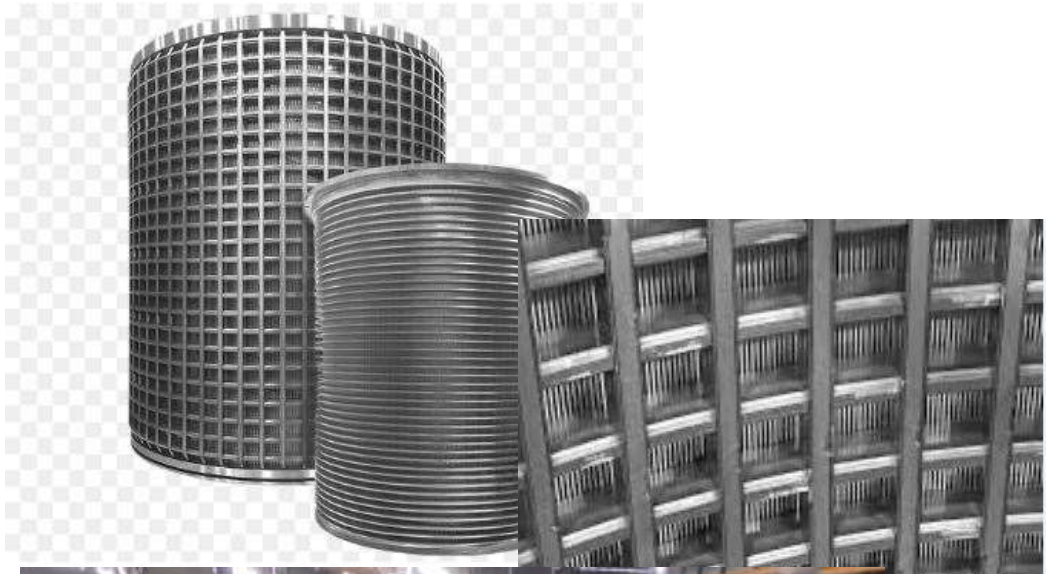


SECONDARY CELL TREATED FOAM ANALYSIS REPORT

Loop-2 Foam without Recovery cell		
PARAMETERS	UNIT	FOAM
CONSISTENCY	%	2.2
ASH	%	60
BRIGHTNESS	%	51
RESIDULE INK	PPM	930

Loop-2 Foam Recovery Cell Results				
PARAMETERS	UNIT	FEED	ACCEPT	FOAM
CONSISTENCY	%	1.8	1.1	2.5
ASH	%	60	52	70
BRIGHTNESS	%	49	60	36
RESIDULE INK	PPM	850	380	1250

Revolution Deinking: The Fiber Wall Screening for Stickie's Removal in the Paper Industry



The innovative Fiber Wall Fine Screening System has emerged as a game-changer in this regard, elevating deinking efficiency and reducing environmental impact. The world of this cutting-edge technology and its transformative impact on the paper industry.

The Challenge of Stickies in Deinking:

Stickies, such as adhesives, labels, and coatings, are persistent adversaries in the deinking process. They resist separation from fibres, leading to paper quality issues, increased downtime, and costly production interruptions. Traditional methods often fall short in effectively removing these tenacious contaminants.

- In KPML loop-2 fine screening system consist of 3 No’s fine screens named as “ SPE-15(15 x 15), VS-31(12 x 10), VS-11(5 x 5).

- All of these screens operate in a cascade loop configuration, seamlessly managed by our Distributed Control System (DCS).

- To achieve maximum recovery without compromising screen efficiency in the final stage of screening, Mill implemented a specialized device to optimize the reject flow.

- Leveraging an enhanced control system, we've successfully optimized fiber retention, contributing to a notable increase in plant yield, ranging from 0.2% to 0.3%.

DCS(DISTRIBUTED CONTROL SYSTEM)

Principles of Fiber wall Screens

1) Precision Screening

- Specially designed screen
- Microscopic openings for precision screening
- Permits only minute particles to pass through
- Effective trapping and separation of stickies
- Isolates stickies from the pulp for improved quality

2) Fibre Wall Formation

- **Key feature: Ability to create a "fiber wall"**
- **Process: Paper pulp passing through a fine screen**
- **Result: Formation of a dense fiber mat on the screen's surface**
- **Stickies capture: Stickies, less pliable than fibres, get trapped on the fiber mat**
- **Fiber passage: Fibres continue through the screen, separate from stickies**

3) Smart fibre Treatment

- **The Fiber Wall Fine Screening System is gentle on fibres, minimizing fiber loss and preserving the overall quality of the pulp.**

Fine Screens Optimization in Different plant operating Condition

- Stickie's removal efficiency is a primary concern in designing slotted screening for recycled paper fibers. Similarly, efficiency based on slot widths and velocities through the slots .
- Specific work was done the effects of consistencies, velocities and slot widths on removal of particle size rather than overall efficiency.

SCREEN OPERATING DATA:

Table:1

Screen	slot (mm)	OA%	Q	Cy	TPH	Passing velocity
SPE15	0.12	5.0	1300	1.1	14.30	1.03
VS31	0.12	4.4	400	0.9	3.60	0.72
VS11	0.12	3.6	68	0.6	0.41	0.75

Table:2

Screen	slot (mm)	OA%	Q	Cy	TPH	Passing velocity
SPE15	0.12	5.0	1600	0.9	14.4	1.27
VS31	0.12	4.4	450	0.8	3.6	0.81
VS11	0.12	3.6	75	0.55	0.41	0.83

Table:3

Screen	slot (mm)	OA%	Q	Cy	TPH	Passing velocity
SPE15	0.12	5.0	1700	0.85	14.5	1.34
VS31	0.12	4.4	485	0.75	3.6	0.87
VS11	0.12	3.6	82	0.5	0.4	0.90

ENHANCING FIBER WALL SCREEN EFFICIENCY THROUGH OPTIMIZATION

- In pursuit of enhancing screen performance, we have conducted plant trials, systematically varying the pulp consistencies at 0.85%, 0.9%, and 1.1%. This approach allows us to identify the optimal passing velocity for improved screening efficiency.
- Through these trials, we have successfully reduced both stickies and dirt counts in the final accepted pulp, thus achieving a notable enhancement in product quality.

FINE SCREENING OPTMIZATION TRIAL FOR STICKIES REDUCTION				
Quality	UNITS	CASE-1	CASE-2	CASE-3
SCREEN FEED CONSISTENCY	%	0.85	0.9	1.1
SPE-15 Feed sticky count	mm2/Kg	3168	4140	3285
SPE-15 Accept sticky count		1224	1440	1230
SPE-15 Reject sticky count		10434	12840	11322
EFFICIENCY	%	61.364	65.217	62.557
VS-31 Feed sticky count	mm2/Kg	12228	11760	11449.5
VS-31 Accept sticky count		3048	2880	3066
VS-31 Reject sticky count		62640	64260	63928.5
EFFICIENCY	%	75.074	75.510	73.222

CONCLUSION :

- Innovation in the paper industry addresses sustainability, quality, and efficiency.
- Drum pulpers demonstrate ingenuity in meeting industry needs.
- Installation of a secondary cell in the Loop-2 flotation system is pivotal.
- Benefits include enhanced yield, foam management optimization, and reduced water consumption.
- Environmental advantages with a 20 cubic meters per hour reduction in water usage.
- 25 cubic meters per hour less reject foam discharge, lightening the ETP's load.
- The Fiber Wall Fine Screening System confronts stickies and enhances fiber quality.
- It contributes to sustainable, high-quality paper production.
- Technologies like this signify progress towards cleaner and more efficient processes.

OVERALL COST BENEFITS THROUGH PROCESS INNOVATIONS

- Cost saving through bale breaker by converting low grade raw material into high grade raw material resulted in net annual saving of 2.8 Crore.

- By using of drum pulper instead of Hi-CON pulpers in DIP process net pulping energy saving by 25 Kwh/T resulted in annual saving of 2.0 Crore.

- By installing foam recovery cell in loop-2 the **yield** improvement by 1.0 % resulted in annual net saving of 5.0 Crore.

- By installing fiber wall screen in fine screening the fiber loss reduction by 0.3 % resulted in annual net saving of 1.5 Crore.

KHANNA PAPER SPECIALISED IN :

- Intelligent procurement of waste paper and other raw materials

- Successfully converting them into value added products(Paper and Paper Boards).

Thank You

…… For Patient Listening