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ENHANCING YIELD AND QUALITY THROUGH TECHNOLOGICAL ADVANCEMENTS IN RECOVERED PAPER PROCESSING

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Abstract:

Wastepaper has become a major raw material for paper making all over the world now and many new plants are coming based on wastepaper. The recycling rate has also improved substantially over a period considering the benefits it can provide to the consumers on one hand and ecology and environment on the other.

Due to stringent pollution norms and the concept of a clean environment, all expansion as well as new greenfield projects in Paper industry are focusing on recycled Fibre, and therefore, the availability of recycled fibre for export will continue to dwindle on account of excessive reliance on recycled fibre for paper making in the exporting countries. Countries like India which are fibre deficient depend largely on imported wastepaper to supplement their raw material requirements which will feel the heat from now on as the export is getting dear and dear on value terms and less in quantity.

M/s. Khanna Paper Mill Limited (KPML) is highest consumer of imported recycled paper in India and its annual consumption of recycled paper is 4.0- 4.5 Lakhs MT. In which domestic material is coming mostly in loose form and imported material is coming in bale form. The recycled paper contains of out throw and prohibitive materials which need to be segregated before feeding into the conveyor for pulping. The mill has installed modern sorting stations to remove out throws and prohibitive material from the wastepaper to improve process efficiency, Less Chemical consumption, and the final quality of the pulp.

In M/s. KPML we are continuously improving the DIP yield by selecting the right quality of raw material and improving the plant efficiency by optimizing the rejects with the help of modern technologies. The modern technologies are adopted by the mill by installing efficient screening, cleaning, and flotation systems for less reject generation and to improve the quality of the pulp by removing ink and dirt.

Keywords: Distributed Control System (DCS), Operational efficiency, Automation Sorting station, Material recovery, Sustainable production, Innovations, Efficiency, Significance, Deinking process, Ink removal, Secondary flotation cells, Efficiency, Quality, Stickies removal, Environmental impact, Technological innovation, Reliable solution.

1.0 Introduction

At Khanna Paper Mill, we have established a robust system for managing both domestic and imported bales of wastepaper. This material undergoes thorough sorting at our dedicated sorting station. The core elements of this process feature specialized bale breaker drums strategically positioned within the yard. These drums seamlessly integrate with feeding conveyors, the sorting station, and efficient outfeed conveyors.

In the ever-evolving paper industry landscape, continuous innovations are sought to enhance efficiency, sustainability, and overall product quality. One innovation that has left a profound impact on the industry is the drum pulper. This article delves into the world of drum pulpers, exploring their significance, operation, and the advantages they bring to the paper manufacturing process.

Recycling has become a cornerstone of modern industry, and the paper sector is no exception. The deinking process, crucial for producing high-quality pulp, involves removing ink and contaminants from recycled paper. Secondary flotation cells, a critical component of this process, play a pivotal role in enhancing the efficiency and quality of recycled paper production. This article

explores the importance and operation of secondary flotation cells in the paper industry's deinking process, emphasizing their role in achieving superior results in recycled paper production.

In the relentless pursuit of cleaner and more sustainable paper production, the deinking process plays a pivotal role. A significant challenge in deinking is the removal of "stickies," including unwanted adhesives, coatings, and contaminants. The innovative Fibre Wall Fine Screening System has emerged as a game-changer in this regard, significantly improving deinking efficiency while reducing environmental impact. This article delves into the world of this cutting-edge technology and its transformative impact on the paper industry.

In the current process, we optimize chemical consumption in the Deinked Pulp (DIP) production line by manually controlling chemical flow rates into the Distributed Control System (DCS). This manual control is closely tied to monitoring the brightness levels in the dump tower and overseeing the performance of the first and second bleaching stages. Post-implementation, we anticipate a significant improvement in operational efficiency, especially regarding pulp quality. Manual intervention in operations will be drastically reduced, simplifying the entire process. Automation will take a central role in achieving superior quality and operational control, providing operators with a smoother management experience. Moreover, it will enable comprehensive monitoring of all operations, enhancing oversight and overall efficiency.

2.0 "Revolutionizing Recovered Paper Sorting": An Innovative Approach by KPML

At Khanna Paper Mill, a robust system is in place to manage the intake of both domestic and imported bales of wastepaper. This material undergoes meticulous sorting at our dedicated sorting station.

Key components of this process include specialized bale breaker drums, each strategically positioned within the yard. These drums are linked seamlessly to feeding conveyors, the sorting station, and efficient outfeed conveyors.

The distinguishing feature of our setup is the variety of bale breaker drums we have installed. Each drum is tailored to handle specific types of wastepaper, ensuring an optimized sorting process that maximizes the recovery of valuable materials while minimizing waste.

This approach allows Khanna Paper to efficiently manage the diverse streams of wastepaper, contributing to our commitment to sustainable and eco-friendly paper production.

Bale Reception: The mill receives bales of wastepaper, which can come from domestic sources (collected within the country) and imported sources (paper waste brought in from other countries). These bales can contain various types of paper waste.

Sorting Station: There is a sorting station within the mill where the bales are processed. This is likely a designated area with equipment and workers responsible for segregating different types of paper waste.

Bale Breaker Drum: The key bale of equipment for this sorting process is the bale breaker drum. A bale breaker drum is a large rotating drum with various mechanisms designed to break apart the compacted bales of paper waste. It helps to loosen and separate the paper sheets and materials within the bales.

Feeding Conveyor: The bale breaker drum is connected to a feeding conveyor. This conveyor system transports the bales to the bale breaker drum for processing. It may involve an automated or manual loading process.

Sorting: As the bales go through the bale breaker drum, it effectively opens them up, allowing the paper waste materials to be separated. This is where the sorting process takes place, with workers or machinery identifying and segregating several types of paper waste.

Outfeed Conveyor: After the sorting process, there is an outfeed conveyor that transports the sorted paper waste materials to the next stage of the recycling process. This could involve further processing, cleaning, or baling of the 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.

The heart of our wastepaper sorting system is the bale breaker drum, a marvel of engineering that relies on the gentle power of centrifugal force, operating at a low, deliberate RPM range of 12 to 13. This ingenious machine serves a dual purpose:

1. Contamination Removal: The bale breaker drum's primary task is to delicately remove contamination and meticulously loosen the tightly compressed wastepaper bales. With precision, it effectively dislodges foreign materials from the paper, ensuring that what emerges is cleaner and more amenable to the recycling process.
2. Integration with the Outfeed Conveyor: A vital element in our process, the bale breaker drum is seamlessly connected to an outfeed conveyor. This conveyor plays a crucial role in carrying the now loosened wastepaper material, facilitating further sorting and processing.

As the sorted material progresses to the sorting station, our skilled workers play a pivotal role in ensuring that any out throws and non-fibrous materials are manually separated from the mix. The right quality of wastepaper material is carefully directed to the drum pulper feeding station.

By meticulously removing out throws and non-fibrous materials from the initial bales, we safeguard the quality of our wastepaper, a pivotal factor in maintaining the integrity of our pulp during the pulping process. This meticulous attention to detail not only helps us maintain pulp quality but also minimizes plant losses, contributing to our commitment to efficiency and sustainability.

"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."

Picture of Mechanized Bale Breaker:

Table 1. Location Wise KPML Bale Breaking & Sorting Capacity

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

3.0 Drum Pulper: A Pioneering Solution in the Paper Industry

The Drum Pulper: Unveiling the Technology:

At the heart of paper recycling and manufacturing facilities, we have installed drum pulper in the newsprint line. These robust machines have revolutionized the way papermakers handle recovered paper, contributing significantly to sustainability goals. A brief description of the drum pulper is explained below;

1. The Mechanical Marvel: Drum pulpers are essentially large rotating drums equipped with blades or teeth that effectively break down baled or compacted paper. They operate with the precision of a surgeon, achieving a delicate balance between efficiency and paper fibre preservation.

2. The Soaking Stage: The drum pulper's primary role is to submerge the recovered paper in water. This soaking process helps to soften and disintegrate the paper, separating the fibres while simultaneously removing contaminants.

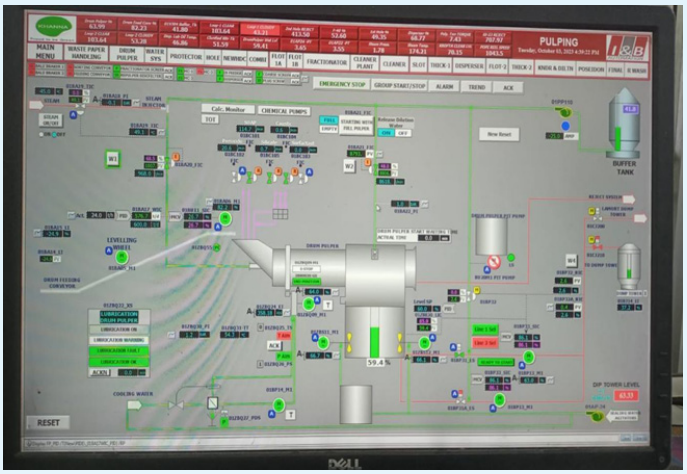
3. Preservation of Fibbers: Drum pulpers apart is their gentleness on paper fibres. Unlike more aggressive methods, drum pulpers minimize fibre damage, ensuring that a significant portion of the original fibre length is retained, thereby contributing to high-quality paper production.

The Advantages of Drum Pulpers:

1. Enhanced Sustainability: Drum pulpers play a vital role in paper recycling by efficiently breaking down recovered paper into usable pulp. This promotes a circular economy and minimizes the need for virgin fibre, reducing the industry's ecological footprint.
2. Improved Quality: The gentle yet thorough action of drum pulpers preserves fibre quality, resulting in higher-quality paper products. This is particularly essential for industries requiring precise paper characteristics, such as printing and packaging.
3. 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.
4. 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.

Table 2. Pulper Types and their specific power consumption

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



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

The Deinking Process: A Brief Overview:

Deinking is the art of transforming used paper into clean pulp suitable for producing high-grade paper products. It involves the removal of ink, adhesives, and other contaminants from recycled paper. Primary flotation cells are the initial workhorses in this process, but secondary flotation cells step in to optimize pulp quality.

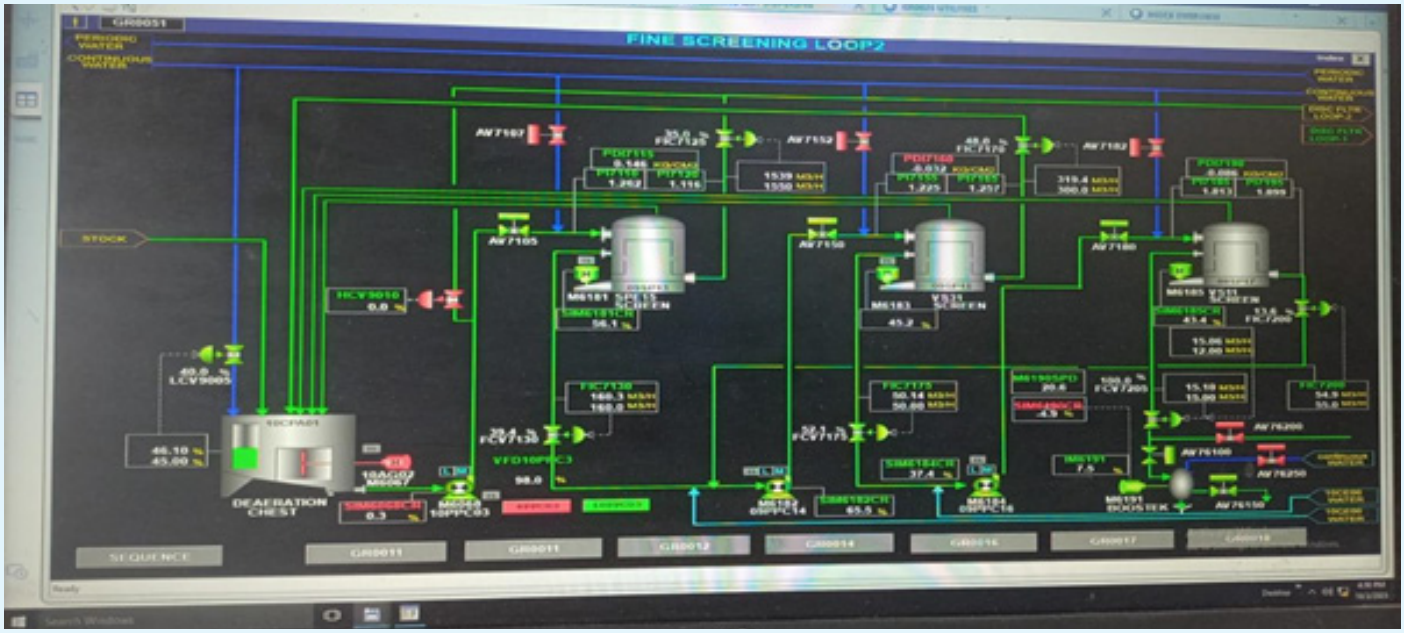
Secondary Flotation Cells modification: A Closer Look:

In Loop 2, a significant improvement in acceptable fibre recovery is expected through the implementation of a Secondary Cell, following a similar process as in the Voith-Andritz line. The reject material, which is currently discharged, will undergo treatment by a Secondary Cell, mirroring the Voith/Andritz systems. This strategic addition is projected to boost production in Loop 2 by approximately 5%.

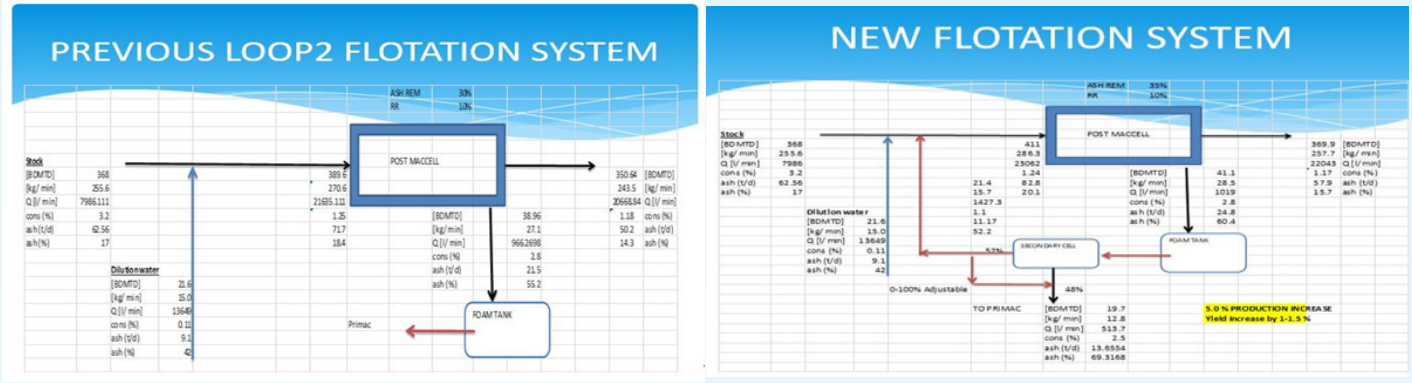
Moreover, the enhancements extend to Loop 1 as well. The quality of Loop 1 is anticipated to increase due to the elimination of untreated reject material recirculation into the Prime MAC, thereby enhancing overall plant process stability. This, in turn, will benefit Loop 2 by ensuring a higher initial quality as it enters the process.

The installation of the Secondary Cell brings another notable advantage over the existing Single MAC cell. In cases of fluctuations in stock quality stemming from variations in furnish quality, we gain the flexibility to increase the reject overflow without the concern of excessive fibre loss. This flexibility significantly enhances our operational adaptability.

Furthermore, an accept line branch will be established from the Secondary Cell's accept output, leading back to the inlet of the Prime MAC. This measure provides absolute assurance that we can maintain quality control even in scenarios involving process issues or temporary disruptions due to subpar furnish quality. We will have the capability to operate with partial flow ratios or redirect the entire accept stream back to Loop 1. Importantly, the quality of the accepted material from the Secondary Cell in Loop 2 will meet the necessary standards, ensuring that it has no adverse impact on the overall quality of the output.



Mass Balance of flotation cell:



5.0 Revolutionizing Deinking: The Fibre Wall Fine Screening System for Stickie's Removal in the Paper Industry

In the relentless pursuit of cleaner and more sustainable paper production, the deinking process plays a pivotal role. A critical challenge in deinking is the removal of "stickies" - unwanted adhesives, coatings, and contaminants. The innovative Fibre 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.

The Beginning of Fibre Wall Fine Screening:

The Fibre Wall Fine Screening System, a technological marvel, was born out of the industry's need for a more efficient and reliable stickies removal solution.

The working principle of fibre wall screen:

Precision Screening: The system utilizes a specially designed screen with microscopic openings, allowing only minute particles to pass through. This precision screening ensures that stickies, which are typically larger, are trapped and separated from the pulp.

Fibre Wall Formation: The secret sauce of this system lies in its ability to create a "fibre wall." As the paper pulp passes through the fine screen, it forms a dense fibre mat on the screen's surface. Stickies, being less pliable than fibres, are captured on this mat while fibres continue through the screen.

Smart fibre Treatment: The Fibre Wall Fine Screening System is gentle on fibres, minimizing fibre loss and preserving the overall quality of the pulp.

1. Continuous Operation: This technology operates continuously, reducing downtime associated with traditional batch cleaning methods.

The advantages of the Fibre Wall Fine Screening System are profound:

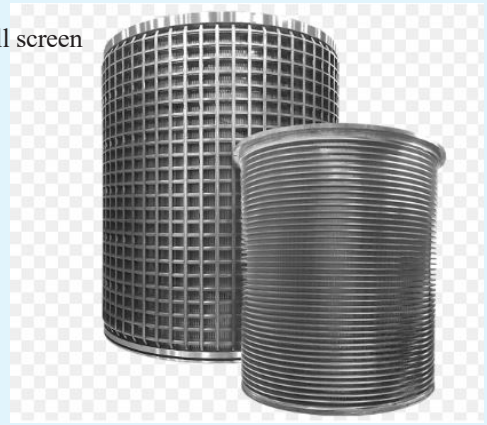
2. Enhanced Stickies Removal: Its precision screening and fibre wall formation result in exceptional stickies removal rates, ensuring cleaner pulp.

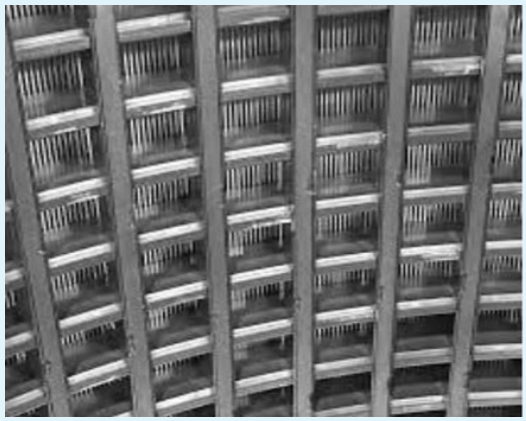
3. Improved Paper Quality: Cleaner pulp translates to higher paper quality with fewer defects and improved printability.

Reduced Environmental Impact: By efficiently removing stickies, this system reduces the need for costly and environmentally taxing chemical treatments.

4. Energy Savings: The continuous operation and reduced downtime contribute to energy efficiency and cost savings.

Fibre wall screen





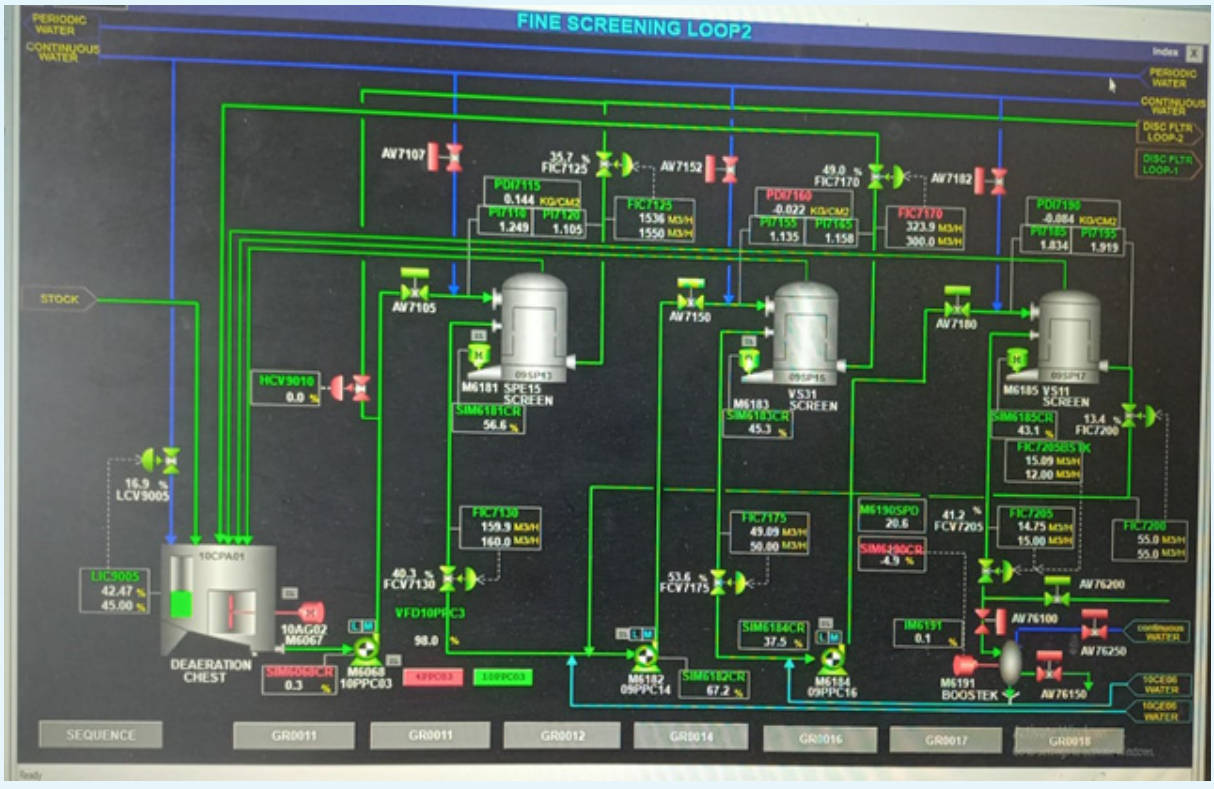


Table 3. Comparison of before and after fibre wall screen:

LAMORT DIP STAGE WISE STICKIES ANALYSIS BEFORE FIBER WALL								
S No	Particula	Consistency (%)	Dirt Count (mm2/m2)	0.12	0.30	0.60	Sticky Area	Sticky Count (mm²/kg)
1	Dump To	5.3	3509	200	80	55	81.0	8100.0
2	Polcon T	5.3	247	130	4	0	16.8	1680.0
3	Final Tov	4.9	72	80	0		9.6	960.0
Furnish	SOP-50.0% + SHB-50.0%							

LAMORT DIP STAGE WISE STICKIES ANALYSIS AFTER FIBER WALL								
S No	Particula	Consistency (%)	Dirt Count (mm2/m2)	0.12	0.30	0.60	Sticky Area	Sticky Count (mm²/kg)
1	Dump To	4.8	3630	220	82	56	84.6	8460
2	Polcon T	4.5	289	135	10	0	19.2	1920
3	Final Tov	5.5	52	65	0		7.8	780
Furnish	SOP-50.0% + SHB-50.0%							

Conclusion:

In the ever-evolving paper industry, innovation is the cornerstone of progress, addressing sustainability, quality, and efficiency challenges. Drum pulpers exemplify this innovation, earning their place as a testament to ingenuity in meeting evolving industry needs. The installation of a secondary cell in the Loop-2 flotation system serves vital purposes. It significantly enhances overall yield and harmonizes foam management between primary and secondary cells, optimizing system performance. Beyond these benefits, it brings substantial environmental advantages, reducing water consumption by 20 cubic meters per hour, aligning with sustainability goals. Furthermore, it results in a remarkable 25 cubic meters per hour reduction in reject foam discharge, lightening the load on the Effluent Treatment Plant (ETP) and promoting environmentally responsible and cost-effective operations. In this dynamic paper manufacturing landscape, innovations like the Fibre Wall Fine Screening System are shaping the future. This system confronts the stickies challenge head-on, preserving fibre quality, and reducing environmental impact, showcasing its significance in sustainable, high-quality paper production. As the paper industry prioritizes efficiency, sustainability, and product excellence, technologies like the Fibre Wall Fine Screening System exemplify progress. They empower the industry to embrace a future of cleaner, greener, and more efficient paper production processes.

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