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Process improvement in Agro pulping for enhanced productivity - Case studies

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Abstract: ***Bagasse is the by-product of the sugar industry and is also one kind of papermaking fiber material. Earlier it was considered that bagasse is low-cost and inexhaustible to make paper pulp. Now the scenario has changed due to usage of bagasse for other purpose. Now the bagasse cost is high and availability is very poor. So the mills using bagasse has to think seriously to reduce the consumption of bagasse with the proper manufacturing process and optimization of parameters. In this paper we have shared our experience and action taken in the plant.***

Keywords : ***Baggase- Fiberous material from sugar cane***
Pith - Parenchyma cells in bagasse fibre
Fermentation- Biological process in bagasse during storage

Introduction

Bagasse fibre preparation can be divided into three steps. First is dry depithing just after receiving from Sugar Mill. Second Storage of bagasse at mill yard. Third wet depithing before feeding to digester. Proper precautions are required to avoid deterioration and damage of fibre during all three stages. Further four stages ie Cooking, Pulp Washing, Screening and Bleaching are there to convert bagasse into pulp. Improper conditions during these stages may result in poor strength and optical properties of bagasse pulp. These conditions cannot be same for all. Each mill has to find suitable conditions based on their mills' condition.

Action Taken for Optimization

Following quality control points are to being taken care for Bagasse Receipt, storage & pulp production:-

1. Bagasse Receipt and Preparation –

Longer storage period of bagasse leads it to biological action that can rapidly lead the material to severe color degradation, yield loss and degradation of fiber properties. The material received at site should be properly checked. Some methods are mentioned below.

- Visual inspection – Colour of bagasse - Red, Black & Normal.
- Lab testing – Moisture, sand/ pith and pH.
- Normal Bagasse pH- 6.0 - 7.0
- Red Bagasse pH- 3.0 - 4.0
- Black Bagasse pH- 4.0 - 5.0

2. Depithing of bagasse:-

The length of bagasse fiber is similar to the hardwood fiber ie 1.0 - 2.3 mm. Bagasse pith is a parenchyma cell, it reduces the opacity and strength of paper and increase the chemicals consumption in Pulping process. So the depithing is important for bagasse pulping.

- Maximum removal of pith.
- Less damage of fiber.
- Less loss of fiber with pith.
- Condition of depither – Basket of depither, hammers of depither.
- Preventive maintenance of depither.

3. Storage the bagasse:-

Wet storage can keep the bagasse wet, the water content is 70-80%. This helps in controlling bagasse fermentation and keep high stock per unit area. After wet storage and pulp washing, the bagasse has features of good fiber quality and quick penetration of cooking liquor, which decide the quality of bagasse paper

- pith separation is very important in bagasse raw material . Bagasse Pith is play major role in pulp quality & Paper Machine run-ability due to more fines.
- Proper bagasse depithing and continuous spray of water to wet storage bagasse.
- Storage the bagasse after depithing.
- Preservation during storage – Wet storage with proper spray of water to reduce the fermentation and maintain the pH.
- Quality of storage bagasse depends on quality of water used for wet preservation.

4. Wet Washing

- Wet washing bagasse is also very impotent due to remove the sand, pith
- Wet washing system water consumption approx.15M3/t of BD raw material following practices was adopted to reuse the back water with minimum chloride going to system.

	Case-1st	Chloride	Case- 2nd	Chloride
	M^3/t	Kg/mt.	M^3/t	Kg/mt.
➢ Recovery Condensate water	4.0	0.00	0.00	0.00
➢ ETP Treated water	11.0	11.00	15.00	15.00
➢ Chloride entering the system	--	11.50	--	15.00

Case Study-1

Automation in Wet Washing long feed conveyor for constant feeding of raw material in digester- Speed of long conveyor interlock with pin feeder load.

Earlier

- Jamming of long conveyor during raw material feeding.
- Chances of blow back of cylinder due to uneven feeding of raw material.
- High variation in unbleached Kappa No. due to uneven feeding of raw material.
- Due to uneven feed of raw material so uneven cooking resulting high screen reject and yield loss.
- High variation in Optical and strength properties in pulp.

After

- Proper feeding of raw material and no jamming of raw material on conveyor.
- Proper feeding of raw material there is no chances of blow back of cylinder, productivity loss and accident.
- Less variation in unbleached pulp Kappa number due to proper feeding of raw material. Previous Kappa No. variation was 14-18 and now - 15 to 17.
- Due to content feeding of raw material less reject pulp generate so pressure screen basket life increase & also increase the pulp yield. Screen life increase 12 Months to 18 Months.
- Less variation in Optical and strength properties of pulp due to proper feeding of raw material. Previous brightness. Previous bleached pulp brightness variation was 84 - 87 ISO and now brightness 86 - 87 ISO.

Case Study:- 2

Removal of refiner at unbleached pulping stage:-

Earlier

- Unbleached pulp through put reduces due to washer efficiency affected.
- Poor cleanliness of pulp due to Shives.
- High power consumption due to refiner (160KW/Hrs)

After

- Increase the Unbleached pulp through put due to improve the washing efficiency at washer.
- Improve in pulp cleanliness.
- Saving of Power Consumption and maintenance cost.

Case Study: - 3

Installation of centicleaner bottle after Janson screen in unbleached pulp screening system.

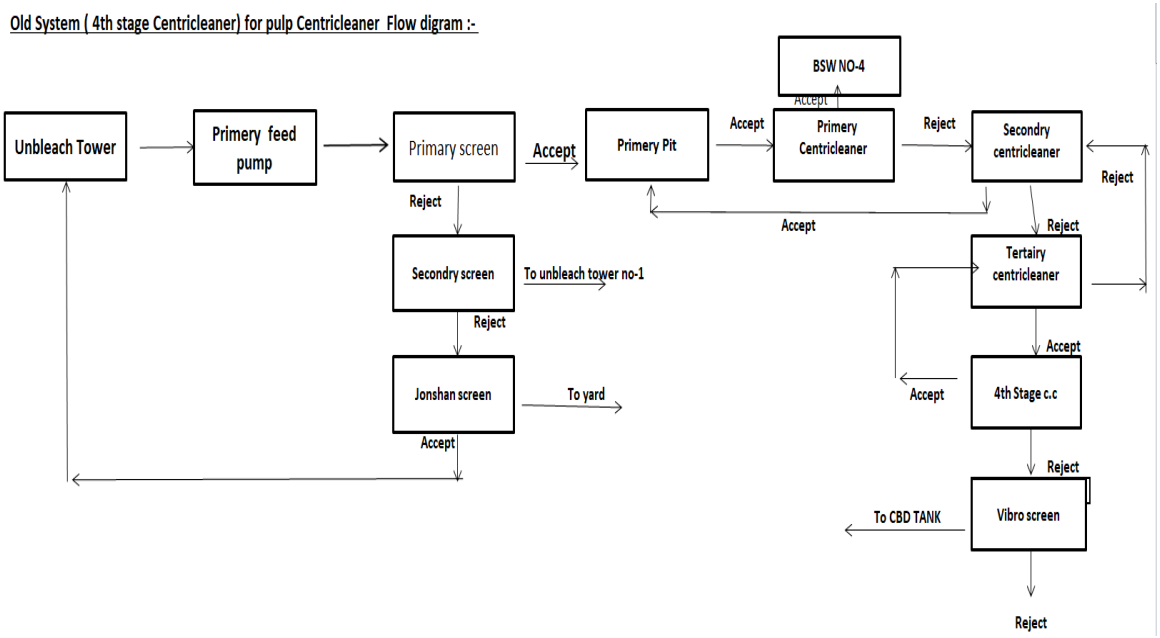
Earlier

- Pulp cleanliness was poor.
- Pump life was low.
- Primary and secondary screen basket life also was low due to sand circulation in system.

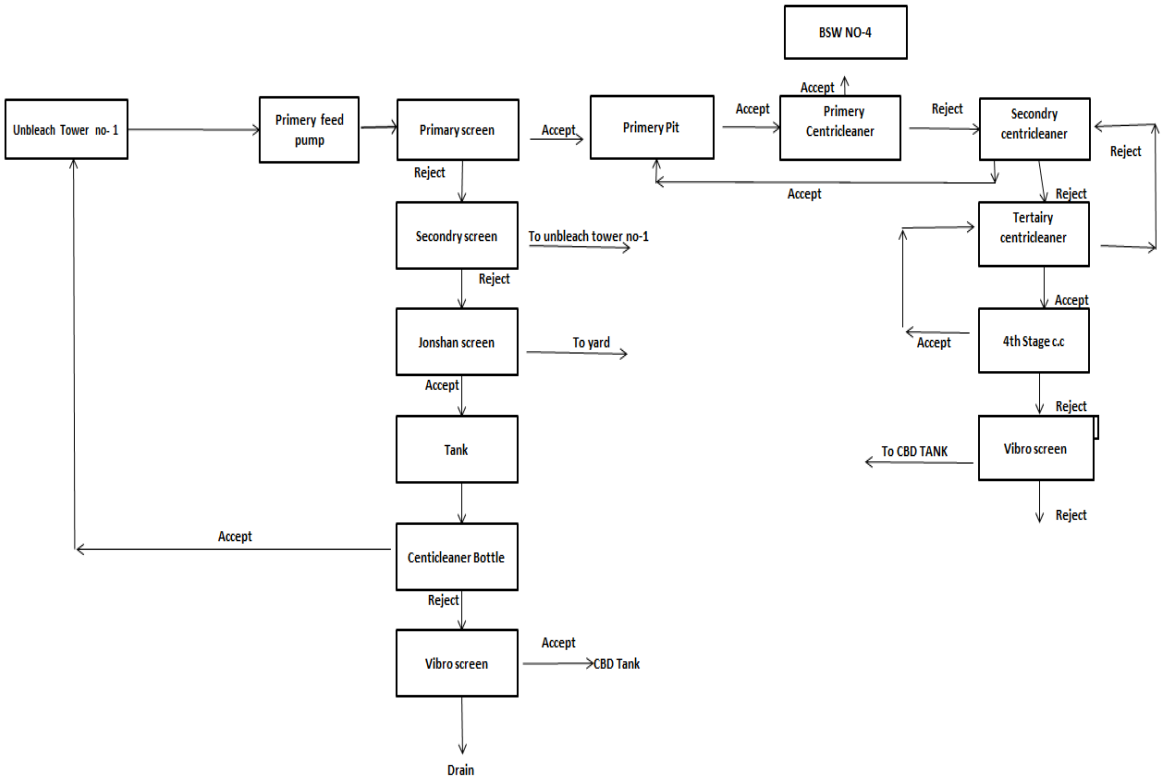
After

- Improve the Pulp cleanliness.
- Increase the life of Pumps due less sand circulation in the system.
- Primary and secondary screen basket life increase from 1 to 1.5 years.

Flow Diagram previous and after modification in Centicleaner system is given below:-



New System after installation of centicleaner bottle after jonson screen in unbleached pulp screening system :-



Case Study:- 4

The case studies in different raw material like bagasse and wheat straw on recovery (Fluidized Bed Rector - FBR)

The Chloride play major role in operation of fluidized bed rector (FBR). The standard norms to maintained chloride in black liquor are 0.4 to 0.5% for optimum running of FBR. In case of wheat straw black liquor chloride observed very high so very difficult to maintained the chloride in black liquor with in norms (0.4% to 0.5%). In case of bagasse raw material black liquor chloride observed very less so other chloride additives addition in black liquor to maintain the chloride in black liquor within desire standard norms 0.4 to 0.5, Both black liquor case studies are given below:-

Wheat Straw:-

In wheat straw raw material chloride observed very high, depend on the areas wise. Presences of high chloride leads to de-fluidization of FBR so following steps were taken to reduce the chloride in raw material.

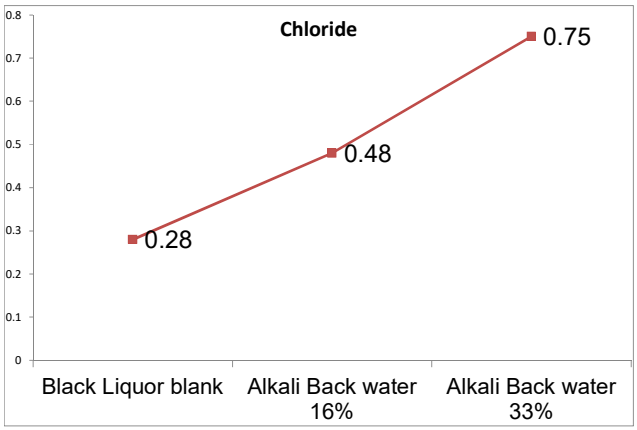
- De-dusting of wheat straw to remove the dust and dirt particles.
- Double wet washing system for raw material washing for reducing the chloride.
- Wet washing water frequently purging to maintain the chloride in black liquor.

Bagasse:-

In Bagasse raw material chloride observed very low. Chlorides in bagasse depend on the fertilizer and water. Due to low chloride in bagasse black liquor so high fines generation and low soda ash production in FBR operation so following steps were taken to increase the chloride.

- Wet washing the raw material with ETP secondary treated effluent water due to presence of chloride in secondary water.
- If chloride not maintained within standards norms than addition of NaCl in black liquor (previous practices).
- Different lab studies were done to increase the chloride in black liquor without NaCl addition. Use of Eop back water in brown stock washing in place of salt.

Lab Study after use of alkali back water in brown stock washing :-



Conclusion

There is no firm parameter which can be adopted all mills to get same result. Mills, based on their experience, have to develop their own parameters, with a reference to standard parameters, to achieve best results. Mills should fix bench marking with their own best achieved parameters.

Acknowledgement

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