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**SYSTEMS AND EQUIPMENTS FOR BAGASSE AND PITH
HANDLING**

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Abstract

The development and progress of Pulp and Paper Industries in developing countries is dependent on the efficient use of raw materials & various other inputs, sales promotion, more dependence on indigenous technology, etc. Among these, adoption of efficient handling methods for raw materials is one of the important factors. This means, per ton of Pulp/Paper produced must -

- (a) consume less handling area,
- (b) have less movement of raw material,
- (c) consume less power by the handling method,
- (d) be less expensive etc.

These factors can be achieved by developing countries by adopting

- (a) indigenous technology,
- (b) handling methods which can be controlled by available man power and indigenous machines,
- (c) indigenous systems and equipments etc.

For the purpose of developing a simple, adoptable, indigenous, technology for handling of any raw material, the basic requirement is to know the behaviour of raw material under various conditions, types and forms.

Bagasse being the future promising raw material for the developing countries, the knowledge of its characteristics and behaviour, (with respect to handling systems) helps in designing efficient, simple and indigenous handling systems and equipments.

This paper discusses the various types of handling methods for Bagasse and Pith (in different forms) which are required to convey in a bagasse based Pulp and Paper Industry. The paper, also discusses some of the improvements made in our mill to solve the problems faced in Bagasse.pith Handling.

1. Introduction

Bagasse is a future promising raw material for the Pulp and Paper Mills for developing countries. By proper planning, efficient Handling, Storage and Cooking of Bagasse the developing countries can be self sufficient in their raw material requirement for Pulp and Paper.

The major hurdle in the up coming of Bagasse based Pulp and Paper Mills is-

Lack of information about Bagasse as raw material for Pulp and Paper making, because of which the indigenous system and equipment suppliers are unable to meet the requirements of the Pulp & Paper manufacturers. The information on Bagasse helps in developing indigenous system & equipments for efficient Bagasse and Pith Handling.

In our industry, the solutions found for the problems we have faced in Bagasse & Pith handling are simple, indigenous and adoptable to our conditions with low cost of investment which are explained in subsequent paragraphs.

In general, the handling system to be adopted must-be efficient, be less expensive, be within the reach of developing countries, be adoptable to the local condition, be simple to operate and maintain by the available manpower in the developing countries, be able to utilise the indigenous equipments, consume less power and area per tonne of Pulp/Paper manufacturing etc.

The application of characters and behaviour of Bagasse while designing the Bagasse & Pith handling system and equipments, results in simple, cheap, efficient, adoptable systems & equipments.

2. Handling of Bagasse & Pith :

The various forms of Bagasse and Pith to be handled in a Bagasse based Pulp & Paper Mills will be in dry, moist, wet and slurry condition. The handling of these can be achieved by :-

- (a) Pneumatic Conveying.
- (b) Belt Conveyors.

- (c) Flight/Slat Conveyors.
- (d) Screw Conveyors.
- (e) Slurry Conveying.
- (f) Bulldozers.
- (g) Front End Loaders.

These methods are having its own pros and cons. The equipments required for these can be efficiently designed & fabricated indigenously by developing countries.

2.1 Handling of Bagasse :

In a Bagasse based Pulp and Paper industry the Bagasse to be handled from the location of Sugar Mill to the Bagasse Cooking Digester, will be in different forms and needs suitable types of conveying system. For example - the fresh bagasse coming out from Sugar Mill will be at 50% moisture, where as the bagasse feeding to the Bagasse Cooking Digester will have 78% to 80% moisture. So, these various forms of Bagasse at Various stages calls for appropriate type of conveying system.

Tables 1, 3 and 4 respectively show the (a) Main features of Various conveying systems, (b) Factors to be considered while designing a handling method and (c) Type of handling methods preferred depending on conditions of Bagasse and Pith.

2.2 Handling of Pith

The Pith is also required to be handled in different forms in a Pulp and Paper Industry. For example Pith coming out from Moist Depithers will have moisture content of 50% or less where as the Pith coming out from Bagasse Washer or Wet Depither will be in the Slurry form. These two needs different types of conveying systems. In Tables 2, 3 and 4 details are given as recommended for Bagasse.

3. Problems Encountered and Remedial Action Taken in our Mill :

Some of the problems faced by us in Bagasse Handling has been rectified leading to better handling efficient operation & maintenance etc. These are :

3.1) To reclaim dry Bagasse from Sugar Mill we decided to use existing Belt Conveyor. But this could not be done as the inclination of Belt Conveyor was more with respect to dry bagasse. But after making arrangement for water spray over the Bagasse at feeding point of Belt Conveyor, it was possible to use existing Belt Conveyor. The cost involved for arranging this water spray was very much less.

TABLE - 1

MAIN FEATURES OF VARIOUS TYPES OF HANDLING METHODS OF BAGASSE

Type of Bagasse	Handling Distance	CONVENTIONAL TYPES					OTHER TYPES				
		Belt conveyor	Flight Conveyor	Screw Conveyor	Pneum. conveying	Truck	Manual	Gravity	SLURRY Pumping dozer	Front End Loader	
DRY	Long	A2, E2, H1, J1, K2	A1, E1, G1, J1, K2	NA	NA	RE	NA	A3, B2, D1, F2, H2, K1	A1, D1, F1, H2, J1, K1	B1, E1, G1, P, R, C1	P, R, C1
	Short	-DO-	A3, B3, E3, G2, H2, J1, K2, J1	A3, B3, E3, G2, H2, J1, K2, J1	B3, F1, H2, K2	RE	RE	A2, D1, F2, H2, K1	A1, D1, F1, H2, J1, K1	B1, E1, G1, P, R, C2	P, R, C2
MOIST	Long	-DO-	NA	NA	-DO-	RE	NA	A3, D1, F2, H2, K1	B2, E2, G2, -Do-	P, R, C1	P, R, C1
	Short	-DO-	J1, K2, J1	A3, B3, E3, H2, K2, J1	F1, F1, H2, K2	RE	RE	A2, D1, F2, H2, K1	B2, E2, G2, -Do-	P, R, C2	P, R, C2

Remarks : Refer legend for Abbreviations

Long	A2, B2, E2, G2, J1, K3	NA	NA	NA	RE	Nf	A3,B2,D1 E2,F2,G2 H2,J2, K1, -Do-	P, R C1	P, R C1
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WET

Short	-DO-	A3, B3, E3, G1, J2,	A3, B3, F1, H2, K1,	A3, B3, F1, H2, K1, K3,	RE	RE	A2, B2, D1,E2, F2, G2,-Do- H2,J1,K1	P, R C2	P, R C2
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Long	NA	NA	NA	A1, B1, D1, F1, H2, K1	NA	NA	A2,B2,D2 D2, E2,D2, F2, G2,F1, H2,J2,K1 H2,J2,K1	B1, E1,P, R G1,C1 C1	P, R C1
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SLURRY

Short	RE	NA	A3, E3, G2, J1,	A3, B3, F1, H2, J1, K3	NA	NA	-DO-	A2,B2,D2, E2,F2,G2, H2, J1, K1, -Do-	P, R C1	P, R C1
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TABLE - II

MAIN FEATURES OF VARIOUS TYPES OF HANDLING METHODS OF PITH

Type of Pith	Handling Dis-tance	CONVENTIONAL TYPES					OTHER TYPES				
		Belt conveyor	Flight Conveyor	Screw Conveyor	Pneum. conveying	Truck	Manual	Gravity	Slurry Pumping	Bull dozer	Front Loader
Long	A2, B2, E2, F2, G2, H1, J1, K2	NA	A3, B1, E1, F1, G1, H2, J1, K2	NA	NA	A2, B2, D1, E1, F1, G1, H2, J1, K3, C1					
	Short	-DO-	A2, E3, G2, J1	B2, F1, E3, H1, G2, K2, J1	F1, -DO-	RE	-Do-	-Do-	P, R, C2	P, R, C2	
	Long	A2, E2, G2, J1	B2, F2, H1NA, K3	NA	-DO-	RE	NA	-Do-	P, R, C1	P, R, C1	
MOIST	Short	-DO-	A2, E3, G2, J1	B2, F1, E3, H1, G2, K2, J1	F1, -DO-	RE	-Do-	-Do-	P, R, C2	P, R, C2	

Remarks : Refer legend for Abridgments

LEGEND FOR TABLE 1 & 2

- A1. - High investment
- A2. - Low investment
- A3. - Considerable investment
- B1. - High power consumption
- B2. - Low power consumption
- B3. - Considerable power consumption
- C1. - High fuel consumption
- C2. - Low fuel consumption
- D1. - High water consumption
- D2. - Low water consumption
- E1. - High operation & maintenance (O&M) cost
- E2. - Low O & M cost
- E3. - Considerable O & M cost
- F1. - O & M needs skilled manpower
- F2. - O & M needs unskilled manpower
- G1. - Cannot handle over capacity
- G2. - Can handle over capacity
- H1. - Creates, Spillage, Dusty, Hazardous atmosphere
- H2. - Does not create Spillage, Dusty, Hazardous atmosphere
- J1. - Material flows freely
- J2. - Material do not flow freely
- K1. - Material sticks to the conveying and its surrounding surface creating problem for free flow
- K2. - Material does not sticks to the conveying and its surrounding surface creating free flow of material
- K3. - Material sticks to the conveying and its surrounding surface but does not create problem for free flow of material
- P. - For Piling only
- R. - For Reclaiming only
- NA. - Not Advisable
- RE. - Recommend in Extreme condition
- do. - As Above

TABLE - III
FACTORS TO BE CONSIDERED WHILE DESIGNING THE
HANDLING METHODS FOR BAGASSE/PITH.

Type Material	Dry	Moist	Wet	Slurry	Refer Legend for Abbreviations
Bagasse	a,e,f,j, m,n,r.	b,e,g,j, l,o,r.	c,d,h,i, k,p,r.	d,i,k,p, q.	For Table-3
Pith	a,e,f,j, m,n,r.	b,e,g,j, l,o,r.	c,d,h,i, k,p,r.	d,i,k,p, q.	For Table-4

TABLE - 4

TYPES OF HANDLING METHODS WHICH CAN BE INSTALLED FOR
VARIOUS CONDITIONS OF BGASSE/PITH.

METHOD OF CONVEYING BAGASSE/PITH IN THE DIFFERENT CONDITIONS.	Belt Con- veyor	Flight veyor	Screw Con- veyor.	Pneum. Con- veying	Slurry Gravity or pump	Truck	Manual	Bull- dozer	Front End Loader
Bagasse from Sugar mill to Depithers/Storage Yard	✓	✗	✗	✓	✓	✓	✗	✗	✗
Controlled feed (Bagasse/Pith) to succeeding equipments (like Depithers, Blowers, Washers etc.)	✗	✓	✓	✗	✗	✗	✗	✗	✗
Piling and Reclaiming of Bagasse/Pith at Storage Yard	✗	✗	✗	✗	✗	✗	✓	✓	✓
Bagasse/Pith from Depithers to Storage Yard	✓	✗	✗	✗	✓	✓	✗	✗	✗
Water containing Pith/ Bagasse (i.e. after Bagasse Washing/Wet Depithing etc.)	✗	✗	✓	✗	✓	✗	✗	✗	✗
Wet Bagasse/Pith to Digester House/Yard etc.	✓	✗	✓	✗	✗	✓	✓	✓	✓

LEGEND FOR TABLE 3 & 4

For Table-3 :

- a - Very light, tends to fly creating spillage
- b - Moderately light, does not fly as much as dry Bagasse/Pith spillage is considerable
- c - Does not fly
- d - Sticks to the conveying surfaces like belt, screws etc
- e - Does not sticks to conveying surfaces like belt, screws etc
- f - Permissible inclination of belt conveyor is less
- g - permissible inclination of belt conveyor is considerable
- h - permissible inclination of belt conveyor is more
- i - Obstruction to free flow of Bagasse/Pith creates more jamming
- j - Obstruction to free flow of Bagasse/Pith creates considerable jamming
- k - High bulk density
- l - Considerable bulk density
- m - Low bulk density
- n - Conveying system must have dust proof arrangement
- o - Conveying system with dust proof arrangement is preferred
- p - Conveying system may or may not need dust proof arrangement
- q - Can be conveyed from higher elevation to lower elevation by make use of gravity flow without external power consumption
- r - Can be conveyed in the form of slurry either by gravity or by pumping

For Table-4 :

- x - Not advisable
- ✓ - Can be adopted after justifying the method (i.e. it's necessity, investment, feasibility etc.)

3.2) Originally, we had installed Flight Conveyor to convey wet bagasse from dewatering screw outlet to Digester House Belt Conveyor. But we faced the problems of frequent failures of Conveyor Chain, Bearings etc. After studying the problem, it was decided to replace the Flight Conveyor by an equivalent width of Belt Conveyor. This replaced Belt Conveyor served the purpose and operating very efficiently at lesser cost.

3.3) Originally the reclaiming of Bagasse from the yard was from Front End Loader to the main reclaiming belt conveyor via portable belt conveyors. As this system created the problems of frequent jamming of subsequent Belt Conveyors, Spillage, Uneven Loading etc., it was decided to control the feed at reclaiming point itself. So, a Pin Feeder has been installed above the Main Reclaiming Belt Conveyor. The new system made it possible for Front End Loader to feed the Main Reclaiming Belt Conveyor Via Pin Feeder, eliminating the Portable Belt Conveyors. The advantages we achieved in new system over the old are - less number of cycles of operation and less fuel consumption by Front End loader per tonne of Bagasse Pulp produced, deployment of only one number of Front End Loader instead of Two for reclaiming, (which saved man and machine hour cost), elimination of uneven loading f Belt Conveyors, jamming and spillage, etc.

4. Conclusion

From above it is clear that the knowledge of characteristics and behaviour of various forms of Bagasse & Pith, makes the handling system and equipment designer to design an indigenous, adoptable, efficient, cheaper, justifiable, handling systems which is very much vital for a developing country.

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