Introducing telescopic chute to control dust emission in bagasse stacking

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Abstract –Bagasse is the raw material for paper used in industries. In industry bagasse yard, boom stackers are used to unload the bagasse from Lorries to storage yard. The unloaded bagasse is stored in pile form by using boom stackers in open space for nearly 40 days by adding water. In this boom stacker bagasse is transferred through belt conveyors and discharged through the circular chutes available in both sides of the stacker at the height of 20 meters. When the bagasse is discharged from that height to floor level, lot of pith and dust will fly off from the chute and result in severe air pollution to the environment. To eliminate this problem, a telescopic chute is introduced and attached in the boom stacker. By using this telescopic chute, we can store the bagasse in different height levels without any dust emission to the atmosphere. So it is used to make clean working environment as well as avoid air pollution.

Keywords— bagasse, stacker, telescopic chute

1. INTRODUCTION

Paper industries are producing papers in reel form. Bagasse is the raw material in order to conserve forest resources for ecological balance in the country. Bagasse received in Lorries is unloaded in hydraulically operated tipping system and passed through Depithers to separate Pith and Fibre. The pith is sent to the Boilers to be used as fuel and Depithed bagasse is stored in the yard through Boom Stackers. In the Boom-stacker, water is mixed with bagasse. In bagasse yard some lakh tones of bagasse is stored. Success of each industry depends not only on the initial investment of the plant equipment, but also depends on the environmental conditions. One such problem industry faces is severe air pollution during the process of feeding the bagasse in the boom stacker. Currently the air pollution by the bagasse is controlled to some extent by feeding water over the bagasse pile. Even the problem is not fully rectified. The problem in this method is pith from the bagasse is spreading through the environment which could cause asthma and breathing problems.

The objective of our project is to reduce the air pollution by enhancing the operation of the stacker by providing telescopic chute within it and controlling dust emission by using non-contact radar level meter sensor. Our project deals with feasibility study of the stacker, selection of the sensor which should be more suitable for sensing bagasse pile height and retract the telescopic chute accordingly.

2. TELESCOPIC CHUTE

A. Objective

The main objective of telescopic chute is to control the air pollution; it is proposed to provide retractable telescopic chute for these boom stackers. To study the feasibility of providing telescopic chute for this application one number of telescopic chute is installed in new stacker.

B. Description

- The Telescopic chute consists of bucket assembly, rope conveyor assembly, drum assembly, geared motor assembly and electrical panel for operation.

- The buckets are made up of stainless steel material in order to eliminate rusting of the components due to the corrosive atmosphere as these are kept in the open atmosphere and stock is acidic in nature.

- The sensor is fitted to the bottom most bucket to sense the height of the stock pile. The sensor can be positioned at any suitable location based on the requirement. As the stock piles the buckets one retract in stages.

C. Chute Bucket Assembly

Bucket is the main part of chute. It is used to reduce the split of the bagasse while it unloaded and is made up of Stainless Steel. Number of buckets are attached telescopically by means of rope as per height requirement. This project has 10 buckets and the top bucket is fixed in boom stacker. The major diameter of the bucket is 150 cm and the minor diameter is 100 cm. The other dimensions are as follows

| Height/depth | 1 m |
| Thickness    | 2 mm |
| Weight       | 35 kg |
| Wire rope diameter | 20 m |

D. Operation

During the operation of buckets are in extended condition (as shown in below figure) allowing bagasse to drop down from the lowest position. As the material gets filled up, when the level reaches about 1 m (height can be set) from the lower most bucket, the sensor mounted on the lower most bucket will give a signal to the motor through relay logic system to rotate the drum so that the rope pulls the bucket up by about 1 m.

Now the gap is about 2 m and piling of bagasse will continue. This operation repeats once the gap between the bagasse level and the bucket level raised condition reaches 1 m level (or the level set). This process continues till all the buckets reach to the top of conveying system. Once this position is reached, conveying system along with the chute assembly moves to next location.
FIG-2.1: The expanding position of chute

The same procedure will repeat at this position. Thus the falling height for the bagasse is reduced avoiding pollution caused by the fine bagasse being taken away by the wind at higher elevation.

FIG-2.2: During the operation

### TABLE.1

<table>
<thead>
<tr>
<th>S.NO</th>
<th>DESCRIPTION</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flat Belt</td>
<td>Nylon</td>
</tr>
<tr>
<td>2</td>
<td>Bush Assembly</td>
<td>Nylon</td>
</tr>
<tr>
<td>3</td>
<td>Roller</td>
<td>Nylon</td>
</tr>
<tr>
<td>4</td>
<td>Chute Bucket Assembly</td>
<td>SS 316 L</td>
</tr>
<tr>
<td>5</td>
<td>Rib</td>
<td>SS 304</td>
</tr>
<tr>
<td>6</td>
<td>Guide Assembly</td>
<td>Assay</td>
</tr>
<tr>
<td>7</td>
<td>Connecting Drum</td>
<td>SS 316 L</td>
</tr>
<tr>
<td>8</td>
<td>Rope Locking Assembly</td>
<td>SS 304</td>
</tr>
<tr>
<td>9</td>
<td>Sensor Locking Assembly</td>
<td>SS 304</td>
</tr>
<tr>
<td>10</td>
<td>Winch Assembly</td>
<td>Assembly</td>
</tr>
<tr>
<td>11</td>
<td>Roller Assembly</td>
<td>Assembly</td>
</tr>
<tr>
<td>12</td>
<td>Gear Motor</td>
<td>SEW</td>
</tr>
</tbody>
</table>

### 3. DRIVE MOTOR

#### A. Description

3 phase AC squirrel cage motor or single phase AC special motor is used to drive the actuators. Motor which was especially developed for this application is in a completely enclosed housing. It is used to retract and expand the buckets by means of wire rope.

#### B. Motor Specification

- Rated motor speed: 1400rpm
- Output speed: 29rpm
- Overall gear ratio: 47.58
- Output torque: 715N-m
- Service factor SEW-FB: 2.20
- Terminal box position: 0 degree
- Output shaft: 50 X 100
- Permitted output load: 2000 Nm
- Motor power: 2.2 KW
- Duration factor: S1 – 100%
- Motor voltage: 230/400 V
- Frequency: 50Hz
- Rated current: 8.4/4.85 A
- Net weight: 85 Kg
- Braking torque: 40 N-m
- Brake voltage: 400 V

**Application**

- The part – turn actuators are designed for the remote operation of valves, ball valves and etc.
- The nominal torque is available over the whole travel, which can be set between 80 degree and 120 degree.
- Operating time from 4 to 180 seconds (ratio 1.4) for 90 degree travel makes those actuators most suitable for any application.
- The part – turn actuators in standard version can be used at ambient temperature between -20 degree Celsius and +80 degree Celsius special versions for lower or higher ambient temperatures are available.

### 4. FEATURES OF TELESCOPIC CHUTE

- Compact, robust and fits most conveyors.
- Metal plates seal the area between the upper frame and the top bucket.
- The user friendly design gives flexible interface and saves time during installation.
- The telescopic chute can be operated from the control cabinet, with automatic level sensor.
The chute senses its height above the material stockpile and automatically adjusts its position.

The automatic level sensor minimizes the need for manual monitoring, and eliminates the risk of the lowest conical chute segment coming into contact with the material stockpile.

In addition, the electrical rope drive hoist is equipped with limit switches and over load protection to limit movement and prevent damage to the chute.

The chute senses its height above material stockpile and automatically adjusts its position.

The belts are fixed to a rigid split collar, which safety holds the replaceable conical chute segment in position.

The carrying collar can be easily separated allowing the conical chute segment to be removed/ replaced easily.

The construction of the chute segment is optimized for stiffness, long life and smooth material flow.

The telescopic chutes prevented emission of dust and loss of material.

5. CONCLUSION

In bagasse stacking operation, we have installed one telescopic chute in the stacker and the same is allowed in continuous operation. The performance of the telescopic chute installed was observed and it controls the dust emission in atmosphere.

REFERENCE


