**Performance of**

**In-Chute Magnet at**

**1st Mill of**

**Ranipur Sugar Mills**

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1. **Abstract:**

In off season 2014 the In-chute Magnet was installed at 1st mill of Ranipur Sugar Mills. The purpose was to stop the accidental or malicious delivery of Iron or ferric material to mills. This generic cost effective approach proved successful by delivering mill efficiency without mill chute choking and extending the life of the mill rolls. In-chute Magnet is a simple, drive less and easy to install and adjust electromagnetic equipment. After Installation of In-chute Magnet, the average Mill Extraction (Mittal) for two crushing season2015-16 &2014-15 was increased by 0.125% as compared with previous Magnet non installed crushing season 2013-14 & 2012-13. Life extension of mill rolls by less damaging of teeth and saving in money and time to re-build and machine these teeth was an additive advantage. The paper is focused on 1st mill chute designing to fit in the Magnet and replacing the damp feeding of prepared cane with slip feeding to mill chute to insure continuous spreaded flow of mill feed over the magnet face to increase the magnet performance.

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1. **Introduction:**

Application of electromagnet in Sugar Industry may be as old as 19th century. The function is to entrap the delivery of accidental or malicious Iron or Ferric material with inflow of cane or process stream to save the machinery from the ill effect of these materials. There as many evidences of broken of hammers of preparatory cane devices and even mill cheeks with the introduction of formers tools, strings or parts of operating in line machinery starting from cane delivery in cane carrier to prepared cane to Mill. The shape, make and placing location of magnets are different but aim is same to save machinery loss and improve Mill efficiency.

Ranipur Sugar Mills extended its mill tandem from four to five mills in its BMR program held in 1988 with introduction of FCB made three roll mills of 36 x 72 inch with chain driven feeder as 1st mill. The cutters and Unigrator were shifted behind to create the mill space. This exercise made it difficult to re-create new space to install any kind of electromagnet at suitable position out re-shifting the machines or increasing degree of cane or drag carriers. Increasing the degree of carriers normally make these shorten in length and increased wear tear of chains and operating loads of gears and drives.

After year’s brainstorming, idea provoked to install fixed face drive less electromagnet before the feeding of prepared cane to 1st mill. Merits and demerits of different locations were studied technically before finalizing the present position of the In-chute Magnet.

1. **Material and Methods:**

A study was conducted for measurement of degree of drag elevator for prepared cane, center distance of head shaft of drag elevator and mills chute, Mill chute height, its feeding and delivery sizes and locating position w.r.t to the center of feed and top roller etc. All study dimensions are shown in drawing # 1-A. After reviewing all these dimensions and Magnet sizes, the chute was designed, fabricated and installed in focal with the underneath points:

1. In new design of Mill #1 chute, feed side chute width changed from 620mm to 750mm
2. Drag carrier base plate feeding radius length to chute was increased from 250 mm to 350 mm to provide more feed slip to chute.
3. Mill chute was S.S lined to cut off false signal to Magnet from surrounding to improve its working strength, as shown in pic# 1-A
4. Magnet was fit in the back plate of the mill chute at a degree of 9 w.r.t to vertical axis in a position that most part of prepared cane must fall and slide over it, as shown in drawing # 1-B, section “A”
5. Two pocket windows were made at both sides of chute along with working plate form of mills to collect the entrapped Iron or Ferric material from drag box of the Magnet.

**Drawing No. 1-A**

**Side view of Drag Elevator & 1st Mill Chute before In-chute Magnet**

**Drawing No.1-B**

**Side view of Drag Elevator & 1st Mill Chute after installation of In-chute Magnet**

**Pic# 1-A Pic# 1-B**

**Pic # 1-A Pic # 1-B**

**Front view of In-chute Magnet Side view of In-chute Magnet**

1. **Function, Trial and Operation of Magnet:**
2. The front face of magnet is made like a baby slider to maintain magnet grip with entrapped material to bear the rubbing force of prepared cane while passing over it. The entrapped material was dragged down slowly with prepared cane feed towards the down end of Magnet where it rolled back to dag box under the Magnet as shown in drawing # 1-B, section “A” and Pic# 1-A
3. Magnet was energized at ground floor to check and adjust its flux strength for its working insurance at installed position then installed as describe in material and method.
4. Magnet was energized and conducted its trial run with drag elevator operation to deliver the light and heavy Iron pieces to 1st Mill chute.
5. The front face of Magnet was adjusted at 90 to insure the conduct of falling material with Magnet face.
6. The Magnet was set in operation under supervision with the start of crushing season 2014-15.
7. During any mill stoppage within 24 hrs, side pockets were opened and entrapped

material was removed out from the drag box of the Magnet .

1. **Results and Discussion:**
2. Mill performance is difficult to judge with little improvement due to Laboratory test procedures, however the average Mill Extraction(Mittal) for the season 2014 – 15 & 2015-16 (after in-chute Magnet) Is 0.125% higher than the Season 2013 -14 & 2014-15 (before In-chute Magnet) as shown in Exhibit -A
3. Ranipur availed the benefit of the spare Magnet lying with it. The space limitation at both ends of unigrator helped to install the Magnet at best position. The scope of paper is limited as described above. It did not include the comparison of different types of electromagnets available in market for same purpose.
4. In-chute Magnet is drive less equipment and maintenance & trouble free equipment.
5. In-chute Magnet did not possess hindrance to prepared cane feed flow to mill.
6. With the installation and working of subjected Magnet at the start of season 2014-15;
7. The technical results of two crushing seasons 2014-15 & 2015-16 observed

Somewhat uniform throughout the season.

1. Roller’s teeth damaging observed minimum.
2. Mill Stoppages due to the presence of foreign material delivery to mills got minimized
3. Mill Roller’s life increased and broken teeth re-building and machining cost decreased.
4. **Recommendation:**

Installation of Electromagnet is highly recommended before the Cane Preparatory Device or 1st mill chute. It must be treated as essential part of the cane preparation line of machinery. It provides insurance against heavy accidental damages to mill machinery and improves mill efficiency.

1. **Acknowledgement:**

1st to Al-mighty ALLAH SUBHANA HU who braced the mankind with knowledge and taught him the ways of its application. 2nd to my team members, especially the Late Ghulam Muhammad, former Technical Manager, Syed Jawed Akhtar, General Manager(E) and Sofi Mukhtar Ahmed, Chief Engineer(M) for their technical assistance for completion and operation of the In-chute Magnet.

**Exhibit -A**

**Mill Extraction (Mittal) Comparison before and after the Installation of In-chute Magnet at 1st Mill**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sr. No. | **Before In-Chute Magnet** | | **After In-Chute Magnet** | |
|  | **Crushing Season** | **Mill Extraction(M)** | **Crushing Season** | **Mill Extraction(M)** |
| 1 | 2012 - 2013 | 94.893 | 2014-2015 | 94.873 |
| 2 | 2013 – 2014 | 95.074 | 2015 - 2016 | 95.344 |
| 3 | Average M.E ( E ) | 94.983 | Average M.E ( E ) | 95.108 |