

BELT INTERCARRIER

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Abstract

A standard drag type slat carrier was replaced by a smooth belt carrier for use between mills fitted with Donnelly chutes and an inclination of 27° was found to be possible. A kicker accelerates the bagasse coming from Meinecke type discharge chute onto the belt. Cost of construction and maintenance is considerably lower than that of a drag type carrier. Maceration on top of the Donnelly chute appears successful, provided chute level is maintained.

Introduction

Now that wide rubber belts are available, machinery manufacturers have designed rubber belt intercarriers for sugar mills. A large number of installations all over the world are working more or less successfully.

However, with the introduction of feed chutes, underslung feedrollers and Donnelly chutes the problem of elevation has arisen and at those mills where centre distances between mills are relatively small the use of belt intercarriers presented difficulties. Rough top, ribbed belts with different type attachments to the belts have been tried but most have been abandoned, due to damage and poor operation. At present in the South African sugar industry the drag type slat conveyor is mainly used and works successfully but has high wear characteristics, resulting in high maintenance cost and lost time.

A belt type intercarrier was installed at Melville in April 1975 to replace an existing drag type unit and its merits are now being assessed.

Initial consideration

After many years service and innumerable alterations, two intercarrier bodies had to be completely renewed. Slight alterations in design were planned. Quotations had been obtained for the manufacture of two bodies, with all drive-work, chain, slats and guides to be supplied by MSE. The wearing areas were all to be made in 430 SS material (Fig. 1). The total cost of one complete unit, including MSE supplies, but excluding gearbox and motor and headshaft, was $\pm R6\ 000$.

At about the time of ordering the two units, information was obtained on the "Riviere" type belt intercarrier used in Reunion. Considering the simple construction it was then decided to build one unit and compare its performance with the conventional intercarrier. The unit appeared very attractive in design and cost.

Construction (see Fig. 2)

The existing units at Reunion worked effectively with 30° incline so it was decided that 27° should be the target with small variations if necessary. Chute level was therefore dropped from 3,4 m to 2,4 m above the feedroller, with a centre distance of 7,28 m between the mills. Total belt length required for the installation was only 14 m (12,2 m circumference) and a width of 1 910 mm (for 1 675 mm wide mill). A Meinecke type discharge chute on No. 2 mill delivers the bagasse to the belt under an incline of $\pm 35^\circ$ from the discharge opening. A medium speed kicker, breaking up all lumps of bagasse, accelerates the bagasse from the Meinecke chute to the medium

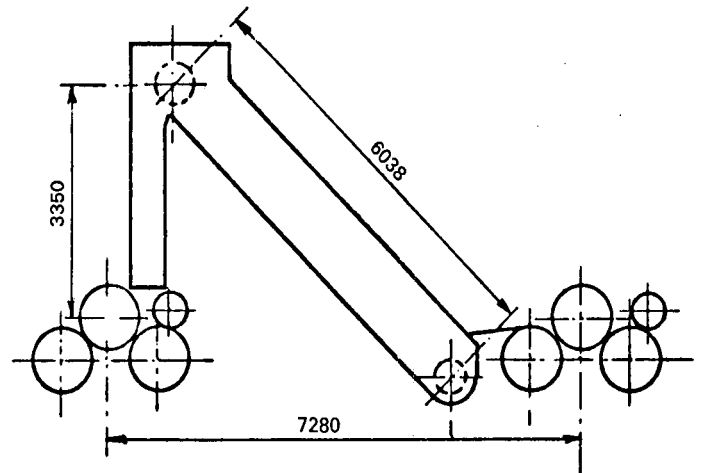


FIGURE 1 Basic Design Dimensions No. 3 IntercARRIER.

speed belt. As a result of the velocity all bagasse is flung from the belt into the chute, and a light rubber scraper ensures a clean return section of the belt.

Maceration cannot be applied onto the belt, as this would cause lumps or slipping. The maceration distribution is therefore applied at the top of the chute of No. 3 mill, the flow of the juice crossing the path of the bagasse coming from the head pulley. The existing intercarriers required between 6–8 kW per unit. The designer at Reunion advised a 2 kW drive for the belt and a 8 kW for the kicker, so 3,5 kW and 12 kW were fitted at Melville. Total construction cost, including gearboxes and motors and belt was R5 200.

Operation

The designer had warned that some experimenting would be necessary as local fibre quality differs considerably from that of Reunion. He warned as well that if trouble is experienced it is usually much more serious than a broken slat or a jumped chain. This is indeed true.

Melville milling train consists of No. 1 mill, 1 828 mm wide, turbine drive; Nos. 2 and 3 mills, 1 675 mm wide each, tandem driven from one 410 kW steam engine; No. 4 mill, 1 828 mm wide and No. 5 mill, 1 980 mm wide, in tandem with 410 kW steam engine. DSM screen returns in No. 2 intercarrier before No. 2 mill.

On the first trial chokes were experienced in the Meinecke, as a result of overload on the kicker. Modifications to kicker and its anvil plate overcame this problem but digging out the compressed material from the chute, of course, took a considerable effort. Bagasse from the full Donnelly chute was kept feeding into the choked area until the steam engine stopped dead!

The kicker as such and the belt were, however, working perfectly. Slip of bagasse does not occur except momentarily at the side skirts. The layer of bagasse is ± 30 mm thick. There is no dust nor are there droppings of bagasse on the return side. Crushing at the speed of ± 80 tch, i.e. ± 13 tons fibre/hour, power requirements appeared to be 2–2,5 kW for the belt and ± 6 kW for the kicker.

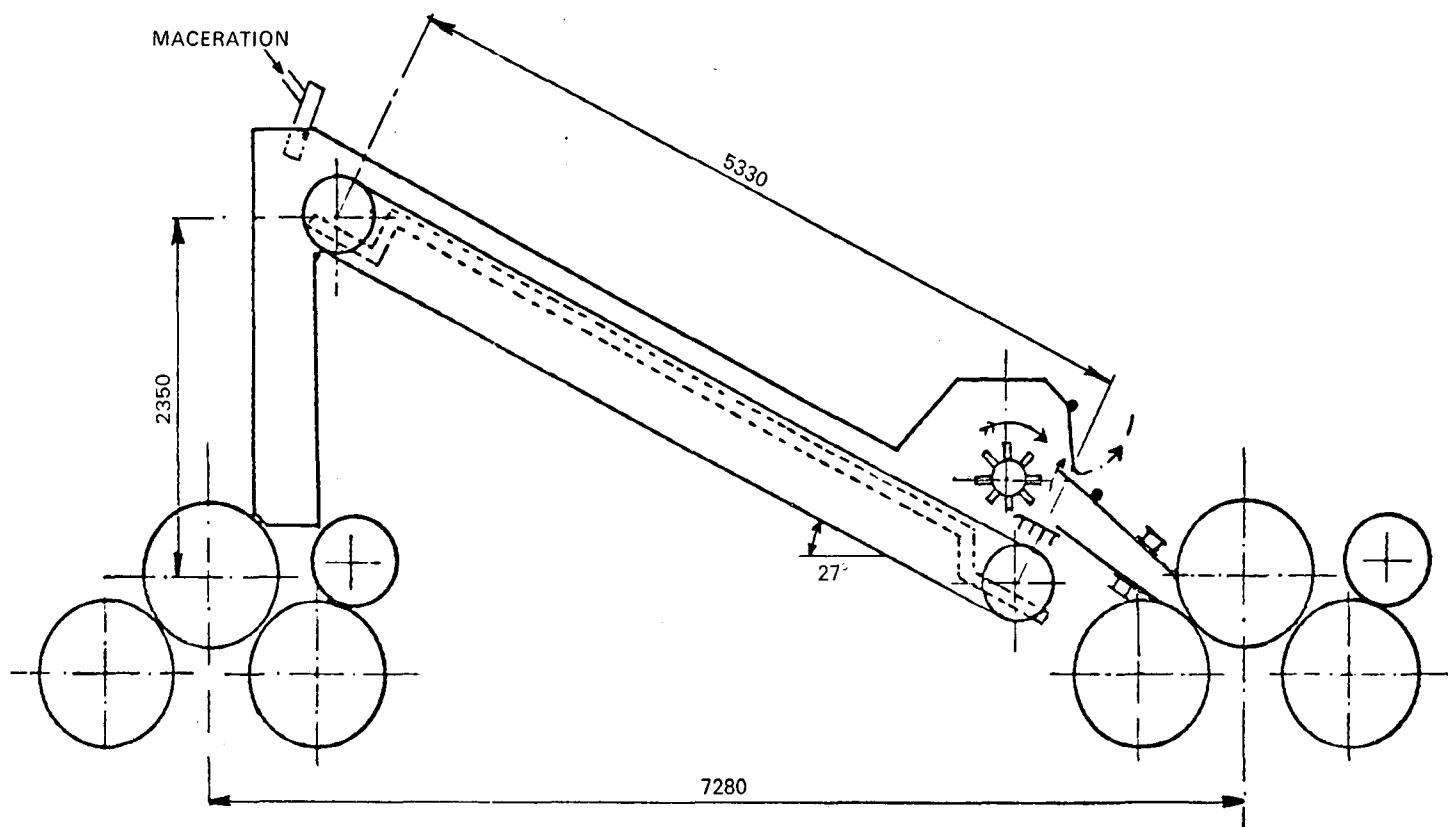


FIGURE 2 "Riviere" Intercarrier at Melville Sugar Estates.

Several serious breakdowns took place and all the damage occurred to the top scraper of the Meinecke, including complete distortion of the heavy construction scraper bar and cast steel scraper itself. These chokes, first mysteriously occurring during perfectly smooth running, eventually were traced to a cable fault in the kicker drive, where an existing cable was extended to suit the new kicker drive. After replacement of the cable (September 4) no breakdowns were experienced at all.

During this off crop the only maintenance required was regreasing of the bearings, hardfacing of the kicker arms and fitting new scrapers to suit remachined rollers. The belt is in perfect condition.

Maceration

Is this type intercarrier a success as far as individual mill extraction is concerned as a result of the maceration on top of the chute? The feeding of No. 2 mill is problematical at Melville due to the reduction in size from No. 1 to 2 mill, and the addition of the wet crush-crush from the DSM screens. The chute is kept between $\frac{2}{3}$ to $\frac{3}{4}$ full by varying the speed of No. 1 mill.

A further problem was the varying quality of cane, from the burnt clean cane of the small farmers to 23% (average) trash plus tops of the larger suppliers, and in addition the chute level in No. 3 (coupled to No. 2 mill) varies considerably.

As long as the level of bagasse in the chute is maintained at $\frac{1}{3}$ or more an individual extraction of 38% - 40% is well possible, as proved in the milling test. In many an instance bagasse was only just filling the feeder drum - top roller opening, and much of the maceration juice was simply by-passing, overflowing the feeder drum without absorption, resulting in just 20% individual extraction. Undoubtedly

individually driven mills have not got this problem (e.g. Quartier Francais in Reunion).

Tests on the last mill with imbibition at the top of the chute, maintaining a constant $\frac{3}{4}$ to full level, had no adverse effect at all on extraction; on the contrary it improved the feeding characteristics.

Feed effects

It was noticed that the feeding of No. 3 mill had definitely improved, the maceration juice forcing the bagasse into the feed opening; reducing the mill setting because of the improved feeding gave best results with a ratio of 1,75.

Conclusion

From an engineering point of view this type of intercarrier has definite merit and should seriously be considered. Its simplicity, low initial and low maintenance cost is a great advantage. Power consumption is not more than that of a drag type intercarrier. Weekly inspection and replacement of slats are not required. The effect on maceration is to be further investigated, however, but with individual mill drives this should not be a problem. It is essential that a spare top scraper and support bar be available in case of an unfortunate heavy choke resulting in distortions.

Acknowledgement

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