Alteration of centrifugal basket's working screen for installation in a dissimilar basket

By

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ABSTRACT

At a crushing rate of 150tc/h the Frome division produces approximately 12 tonnes B Grade massecuite/h. This quantity of high grade massecuite was greater than could be handled by the working centrifugal separators. Management decided to adjust a low grade working screen taken from a Western State centrifugal separator to replace a damaged working screen of a high grade Rota 900/30^{o} separator. The perimeter of the working screen was altered by cutting away the difference from the Western State working screen thus making it compatible for the Rota 900/30^{o} separator.

This allowed the Division to remove 13.425 tonnes massecuite/h as opposed to 5.15 tonnes massecuite/h in its absence. Thereby improving massecuite clearance by 140% while maintaining adequate sugar quality (Pol %- 98.62° and moisture content – 0.36%)

It was ascertained that the Pol of the sugar produced by the machine with the original high grade screen was 97° at much reduced massecuite flow rate. At the prevailing rate the sugar produced had a Polarisation of 96.58 and moisture of 0.36. It was also deduced that at lower massecuite flow rates of about 5-6 tonnes/h a Polarisation of 97° and above has been obtained.

Key words*:* Centrifugal Separator, Working Screen, B Grade Massecuite

INTRODUCTION

The Frome Sugar Factory is located in the western parish of Westmoreland and is a part of the Sugar Company of Jamaica Limited, a company comprised of three sugar factories, the others being Monymusk in Clarendon and Bernard Lodge in St. Catherine and are owned by the Government of Jamaica.

The Frome factory consists of two tandems each with a crushing capacity of150 tc/h.

Frome Sugar factory requires three High Grade B Centrifugals to adequately relieve the B massecuite load when crushing cane at a rate of 150 tc/h. The factory had one working Batch type centrifugal and a defective continuous type centrifugal.

The working screen of the continuous type centrifugal had shattered during operation. The factory did not have a spare working screen and none was available locally. A backlog of Grade B massecuite in the Process House would have increased significantly, thereby causing intermittent stoppages or significant reduction in through-put during the exhaustion process.

The purpose of this paper is to describe the method employed by management and maintenance personnel to solve the foreseen problem. Analytical information of the equipment during its operation before and after repairs is included.

METHOD

A used low grade working screen was removed from a Western State centrifugal basket. The installed screen of the Western state basket is divided into three segments; each segment represents 1/3 of the basket's working screen. The angle of inclination for the working screen is 30^0 and the dimensions of the basket are 34" x 34."

The damaged centrifugal is a Rota $900/30^0$ continuous type separator. The original working screen of this centrifugal basket is supplied and installed in two halves. The dimension of the basket is 30" x 25."

The maintenance crew at Frome took the dimensions of the Rota 900 basket and subtracted it from the dimensions of the Western State screen. The difference was cut from the Western State screen, which amounts to four segments.

Installation method

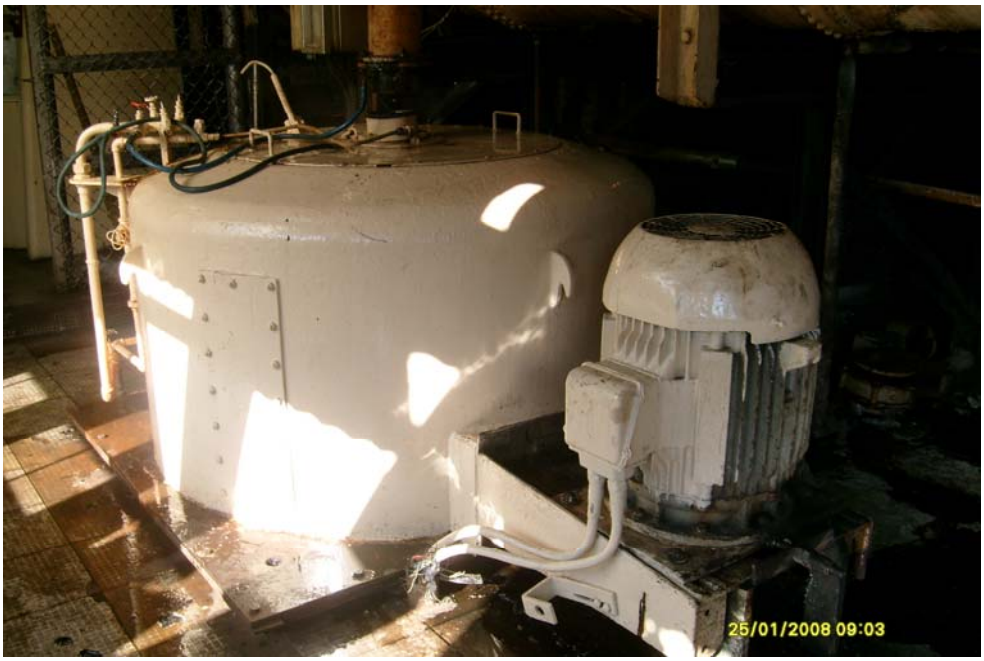

Fig. 1. Rota 900 High Grade continuous Centrifugal installed at Frome

The screen was installed by placing the positioning ring into the bottom of the basket. The four segments were laid on the backing screen with each resting on the positioning ring. It was ensured that the screens overlap each other. Holding down rings were inserted into the basket and it was ensured that they were level. The positioning rings were removed and the screen retaining rings were fitted thereby clamping the working screen to the bottom. Screen clamps were fitted at the top of the basket at the joints of the screens.

Subsequent to the installation of the screen, the Rota 900 centrifugal separator was put in service.

RESULTS/CALCULATIONS

Determination of the capacity of Batch Centrifugals

The cycle of B machines was determined using a stop watch and found to be 4 min 30 sec.
∴ Cycles/h = 60 min/4.5 min = 13 cycles
Each Batch Basket has a capacity of 450 L at full load = 15.89 ft^3[1]
The density of massecuite at an average brix of 92.20 is 92.921 lb/ft^3
Capacity in lbs = 15.89 $ft^3 \times$ 92.921 lb/ft^3
= 1476.34 lbs /0.66 tonnes per cycle

Capacity/h= 13 × 0.66 = 8.58 tonnes /h

The operating capacity however is 60% of this value so as to obtain the targeted sugar pol of 98.60° or higher.

∴ Reduced capacity = 8.58 tonnes/h × 60% = 5.15 tonnes/h

∴At a massecuite production rate of 12.37 tonnes/h (**Table 1**) at least two baskets of this capacity are required.

Table 1: The quantity of different massecuite types produced from 95,302 tonnes of cane at a grinding rate of 138.34 tc/h for the period ending 27.01.08

Massecuite Type	**Volume Produced to date/ft^3**	**Average Brix**	**Density/ lb/ft^3**	**Massecuite Produced (t) to date**	**Massecuite produced (t/h)**	**Massecuite % cane**
A	230870	91.81	92.833	9721.65	14.11	10.20
B	202250	92.20	92.921	8524.57	12.37	8.94
C	141470	94.82	94.162	6042.41	8.77	6.34

At current grinding rate 12.37 tonnes of B massecuite are produced per hour.

The Batch removes 5.15 tonnes massecuite/h.

∴ Rota removes 12.37 tonnes/h – 5.15 tonnes/h = 7.22 tonnes massecuite/h

The result is that there is a 140% increase in B massecuite removal - removal of 58.37% of total B Grade massecuite produced.

DISCUSSION

The Rota 900 machine was used at a rate determined more by expediency than by quality of output as to have opted for the latter would have resulted in
process stocks and significant sugar loss in the process house and chemical losses in the Cane Yard as a result of high Cane Yard stocks.

The Rota 900 has been used in the past year to take the place of one centrifugal. This allowed polarisation percentages of above 97º. The prevailing conditions up to week-ending January 27, 2008 did not allow for a massecuite removal of 5.15 tonnes, which is the removal capacity of one batch centrifugal, but an average removal capacity of 8.26 tonnes. It must be pointed out that as the quality of cane reduces the quantity of B massecuite increases. There are times when more than twice as much massecuite as the Batch centrifugal will be needed to be processed. This higher required throughput does not allow the massecuite to be purged at its best potential and this was observed in the polarisation obtained from this machine during this period as shown in Graph 1. Although a reduction in polarisation occurs at the increased massecuite flow rate used, the average polarisation in the total sugar produced by all centrifugals is still above the market minimum of 96° polarisation and stands at 98.66º pol.

In essence, the screen substitution allowed the Frome Sugar Factory to significantly increase its B massecuite handling capacity while maintaining budgeted sugar quality.

ACKNOWLEDGEMENT

The successful completion of this project would not have materialised without the relentless effort of a number of persons. Firstly, thanks to Mr. Keith Espuet for providing a history of the Rota 900/30^{O} Centrifugal Basket and for coordinating the repair programme. To the Frome Quality Control Analysts who provided data on the quality of the sugar separated by the Rota, and to the Maintenance Personnel who repaired the Rota accept heart felt gratitude. Special thanks to the Sugar Company of Jamaica Limited and Messrs. Aston Smith -Vice President Operations and Robert McIntyre- Factory Manager, in particular, for permission to publish this paper. Most importantly, thanks to the Almighty God who has given the strength and direction required to undertake this mammoth task.

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