Alterations to Rota 900 to make it available for operation

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Introduction

- The Frome Sugar factory in the repairs season of 2007 was faced with a shortage of B-Grade centrifugals.
- At a crushing rate of 150 tc/h the factory requires three (3) High Grade B Centrifugals.
- The factory however had one Batch type centrifugal and a defective continuous type centrifugal.

Introduction

- The foreseen backlog of B massecuite would cause;

1. Elevated sugar losses in the process house.
2. Intermittent factory stoppages due to high process house stocks.
3. Significant reduction in through-put.
4. High chemical losses in the Cane Yard due to the high Cane Yard stocks.

Introduction

- The defective machine was a Rota 900/30° continuous centrifugal manufactured by Fletcher Smith Ltd.
- The working screen of the Rota 900 had shattered during operation.
- The factory did not have a spare screen and none was available locally.

Design Considerations

- Substituted screen should have no significant mass difference – prevent an imbalance of the basket.
- Size of drainage holes should be such that it can handle the high capacity of massecuite required

Design Considerations

- The angle of inclination of the screen should be the same as that in the basket.
- The screen to be installed must be easily removed.

Design Considerations

- After in-depth analysis of the above factors it was found that the working screen from a Western State Low Grade centrifugal best fit the design criteria.

Comparison of major specifications of both screen types

Specification	Rota 900/30°	Western State
Angle of inclination	30°	30°
Number of Segments	2	3
Dimension	30”×30”	37”×30”

Methodology

- The maintenance crew at Frome cut the dimensions of the Rota 900 working screen from that of the Western State screen which amounted to four segments.

Installation Method

Step 1

- The positioning ring was placed in the bottom of the basket.

Step 2

- The four segments were laid on the backing screen with each resting on the positioning ring.

Installation Method

Step 3

- Holding down rings were inserted into the basket and it was ensured that they were level.

Step 4

- The positioning rings were removed and screen retaining rings fitted, thereby clamping the working screen to the bottom.

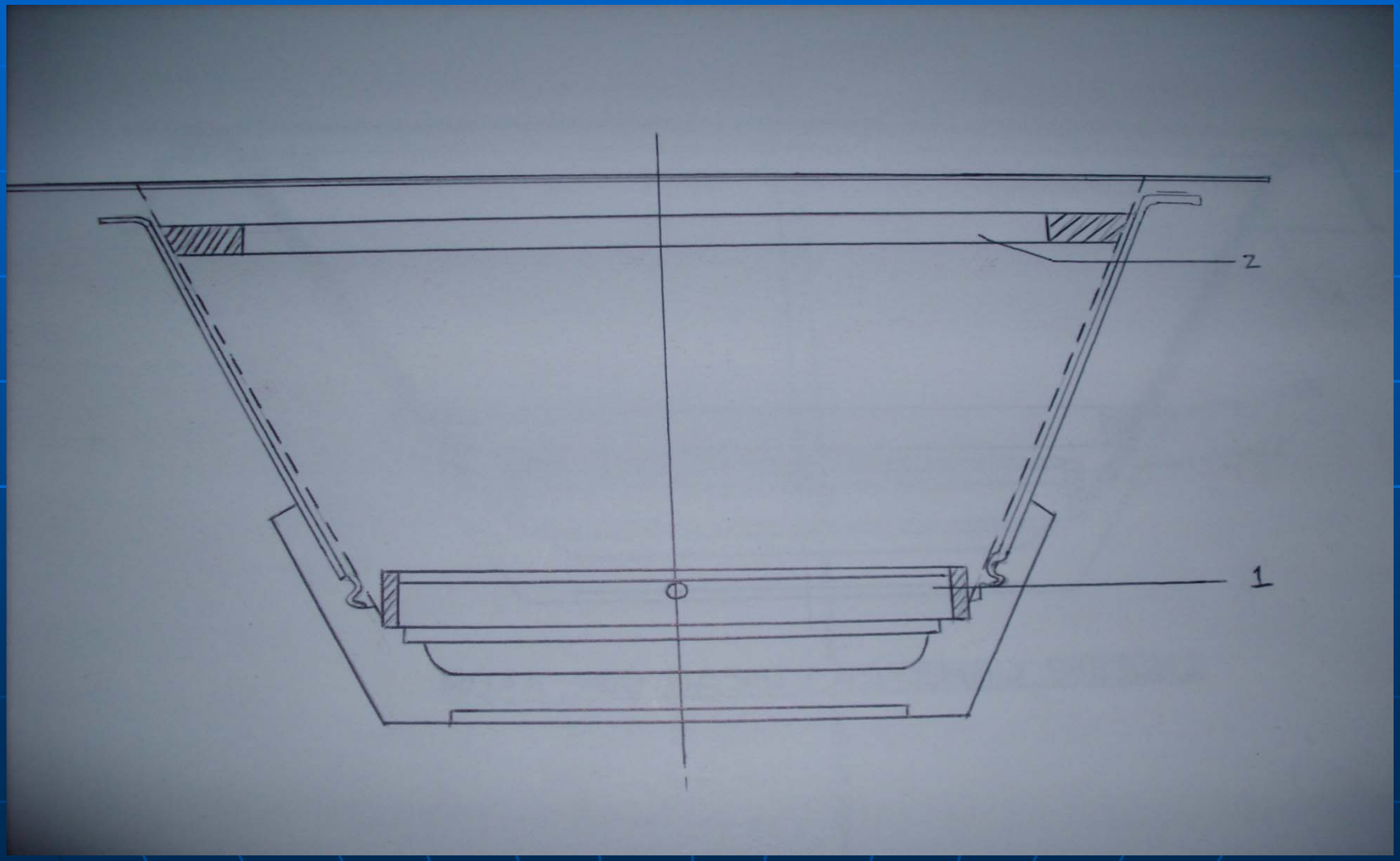
Installation Method

Step 5

- Screen clamps were fitted at the top of the basket at the joints of the screens.

- Rota 900 subsequently put in service.

Rota 900 Assembly Sketch



Results/Calculations

TABLE 1: The quantity of different massecuite types produced from 95302 tonnes of cane at a grinding rate of 138.34tc/h for the period ending 27.01.08

Massecuite Type	Volume produced to date / ft^3	Average Brix	Density lb / ft^3	Tonnes Massecuite Produced to date	Tonnes Produced / hr
A	230870	91.81	92.833	9721.65	14.11
B	202250	92.20	92.921	8524.57	12.37
C	141470	94.82	94.162	6042.41	8.77

Therefore at current grinding rate 12.37 tonnes of B Massecuite produced/h.

Analysis of B Basket Performance

- Recall: Two baskets are responsible for total B massecuite curing – Asea Batch centrifugal and the Rota 900.

Determination of removal capacity of the Asea Batch Centrifugal

- The cycle of the machine was determined using a stop watch and found to be 4 min and 30 sec.
- Cycles/h= 60min/4.5min=13 cycles
- The 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 92.921lb/ft^3

Determination of removal capacity of the Asea Batch Centrifugal cont

- The density of massecuite at an average brix of 92.20 is 92.921lb/ft^3
- Capacity in lbs
  $=15.89ft^3 \times 92.921lb/ft^3$
  $= 1476.34lbs$ / 0.66 tonnes per cycle

- Capacity/ h $= 13 \times 0.66 = 8.58$tons/h

Determination of removal capacity of the Asea Batch Centrifugal cont

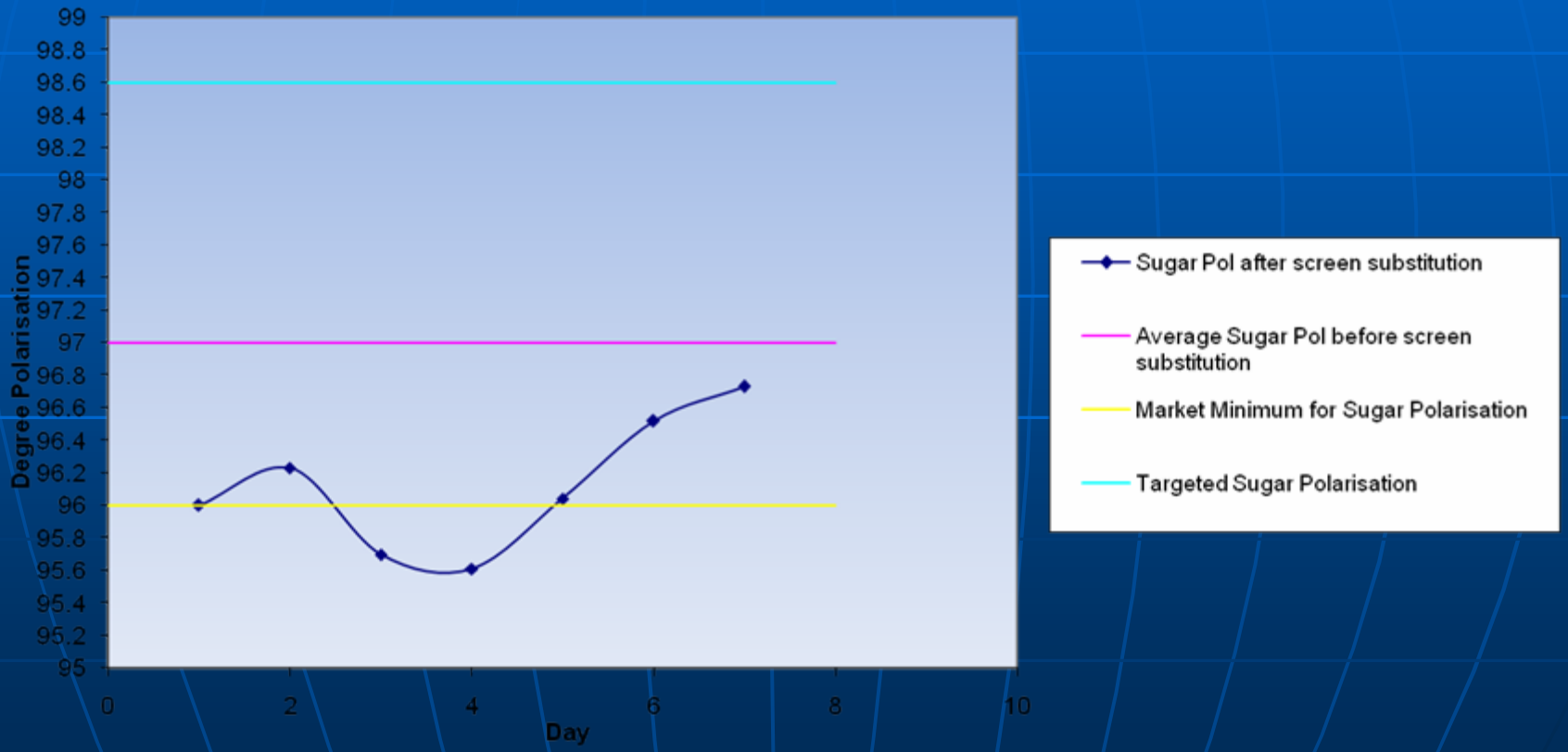
- Capacity/ h = 13×0.66=8.58tons/h
- The operating capacity however is 60% of this value so as to obtain the targeted sugar Pol of 98.60° or higher.

- Reduced capacity=8.58t/h×60%
  = 5.15t/h

Analysis of Rota performance

- At current grinding rate 12.37tonnes of B massecuite is produced/h
- The Asea Batch centrifugal removes 5.15 tonnes/h
- The Rota 900 therefore removes 12.37t/h – 5.15t/h=7.22t/h
- This sees the Rota removing about 58.37% of total B massecuite produced

Graph 1:Average Polarisation of sugar obtained from Rota 900 after screen substitution over a 7 day period



Discussion

- As a result the overall polarization obtained from the machine fell below the standard for the previous year (Graph 1) as the higher required throughput (7.22 t/h) does not allow the massecuite to be purged at its best potential.

Discussion

- Average Pol from Rota 900 ~ 96.28°
- While this might be low compared to today's standard it should be noted that the machine was designed to produce sugar of 96° pol on average
- In fact, commissioning data reveals that the average pol when curing High Grade massecuite is 95.95° at a 2 t/h flow rate

Discussion

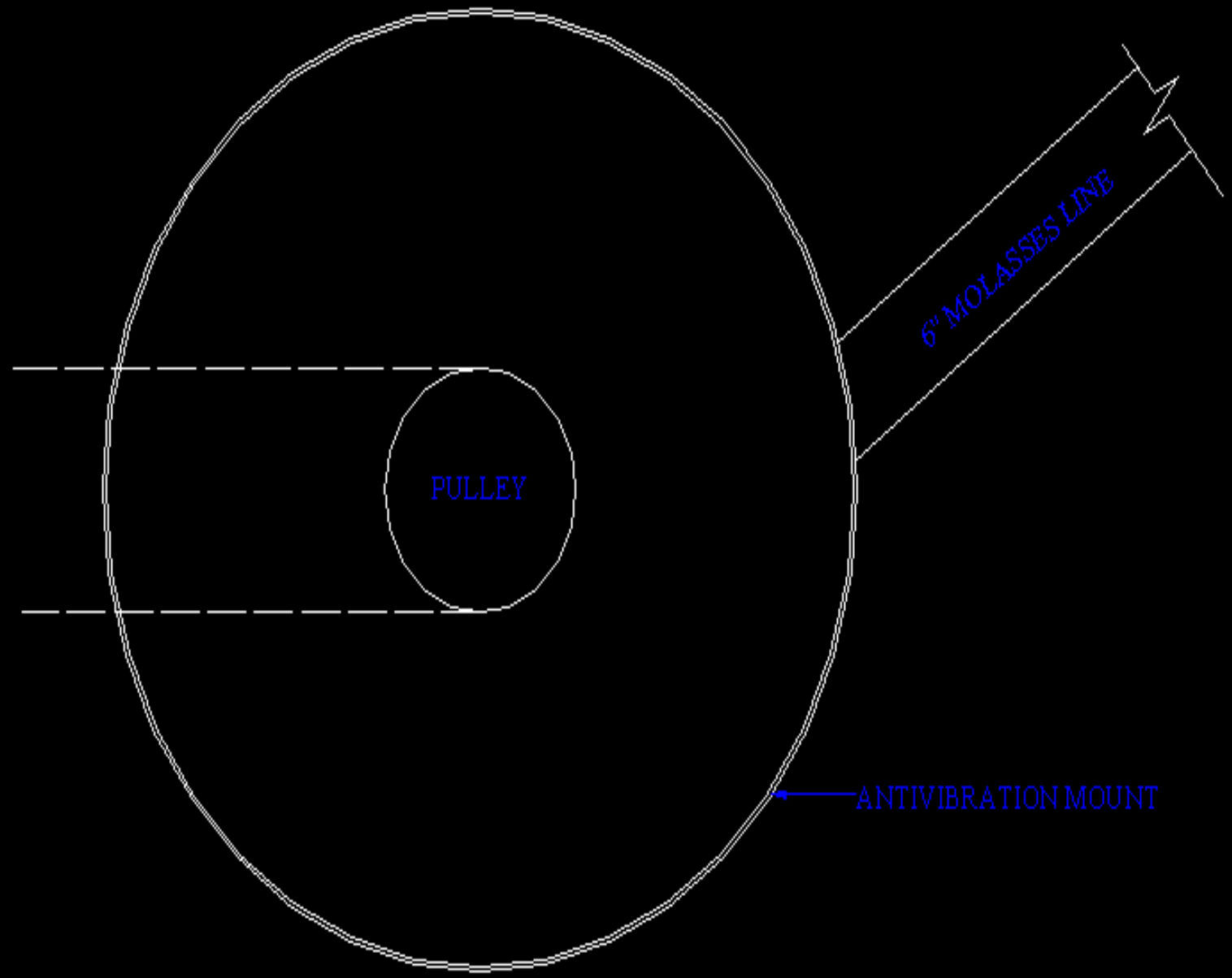
- Although a reduction in Pol occurs at the increased massecuite flow rate used, the average Pol in the total sugar produced by all centrifugals is still above the market minimum of 96° Polarization and stands at 98.66°.

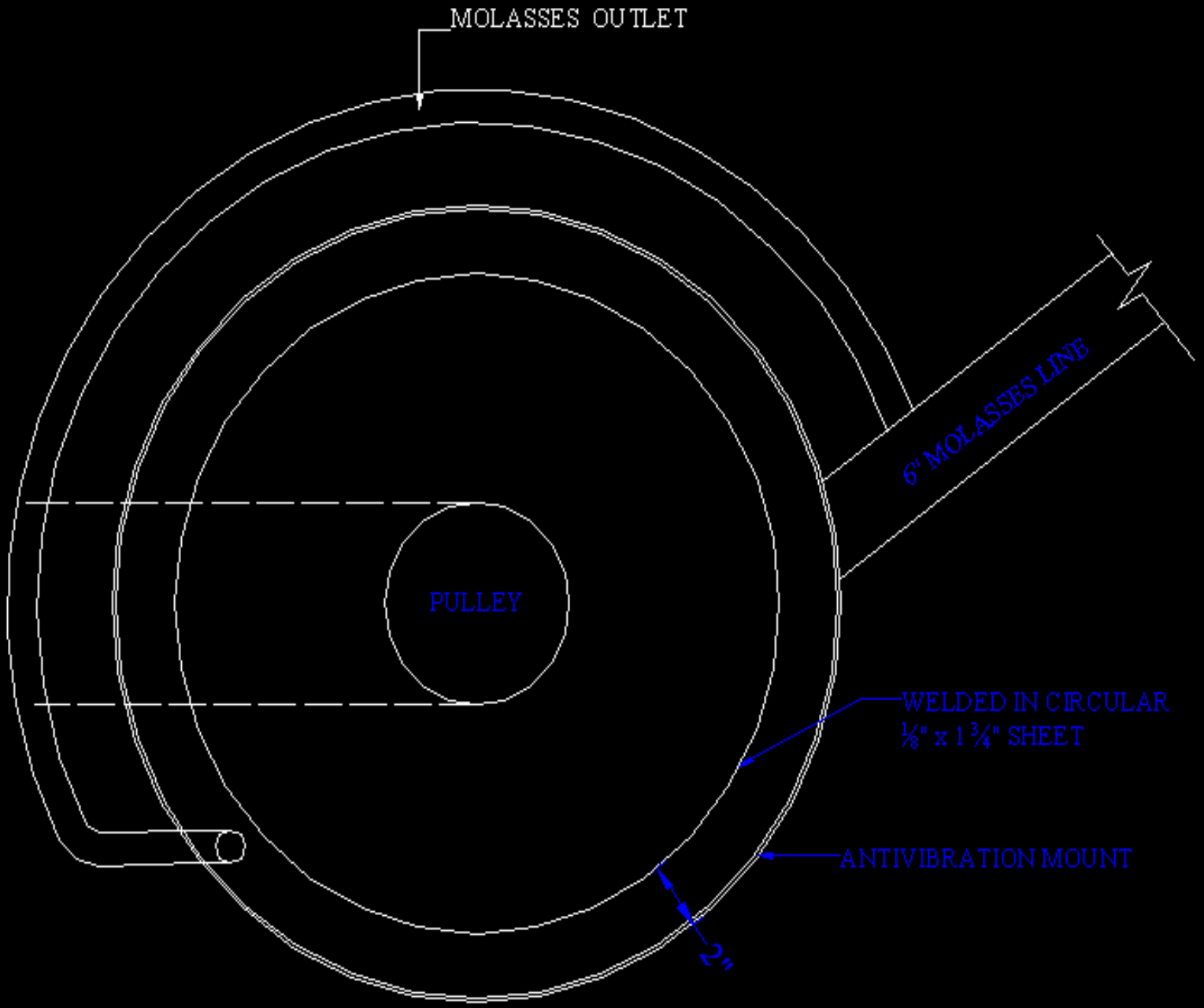
Other Alterations

- Shortly after screen substitution machine had to be taken off line frequently due to a damaged pulley belt.
- Again parts sourcing proved difficult – decided to change the pulley to suit the belts we could source but this did not help.
- Belts were changed from Poly-V to Four V belts.

Other Alterations

- Investigations revealed that the damaged belt was due to molasses leakage from the Rota 900 unto the pulley system.
- Further checks revealed that the molasses leakage was through several cracks in the antivibration mount.


6" MOLASSES LINE
PULLEY
ANTIVIBRATION MOUNT


MOLASSES OUTLET
6" MOLASSES LINE
PULLEY
WELDED IN CIRCULAR
⅛" x 1 ¾" SHEET
ANTIVIBRATION MOUNT
2"

Other Alterations

Pulley + V Belt change resulted in economic savings of at least $30,000 per belt change and a reduction in down time.

Buffer Ring insertion:

- Prevented Molasses Wastage
- Protected the pulley system from damage.

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 coordinating the repair programme.

Acknowledgement

- To the Frome Quality Control Analysts who provided data on the quality of the sugar separated by the Rota, the Maintenance Personnel who repaired the Rota 900 please accept our 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.

Acknowledgement

- Most importantly, thanks to the Almighty God who has given the strength and direction required to undertake this mammoth task.