

# PRELIMINARY RESULTS OF A MODIFIED BOILING SYSTEM AT ILLOVO FACTORY

By J. P. M. DE ROBILLARD and A. VAN HENGEL

*C. G. Smith Sugar Limited*

## Abstract

As a result of deterioration in the colour and polarisation of the VHP sugar caused by abnormal cane quality during October of the 1983/84 crushing season, it was decided to test a modified boiling system at Illovo as proposed by van Hengel at the SASTA Congress of 1983. The results achieved for the period before, during and after the trial are presented and compared. It was found that the quality of the VHP sugar improved significantly.

## Introduction

The new boiling system as proposed by van Hengel<sup>1</sup> was tested over a four week period during October/November 1983, at a time when, in spite of extensive use of sodium hydrosulphite in the A-massecuite, both colour and polarisation of the VHP sugar was outside the limits set by the industry. This resulted in high penalties being levied on the sugar delivered to the Terminal and Tongaat-Hulett Refinery. The change in boiling practice involved the graining of A- and C-massecuities. A magma of C-sugar and A-molasses was adopted for boiling the B-massecuite and the entire crop of B-sugar was remelted. Despite the fact that during the test period the cane quality deteriorated further, resulting in an increase in syrup colour, the colour and polarisation of the VHP sugar improved significantly, while the back-end of the factory operated more comfortably.

It is realised that the analytical work does not cover all the factors which may be influenced by the modified system. However, the authors feel it is appropriate to sharing their expenses at this early stage in view of the continuing efforts to improve sugar quality in our industry.

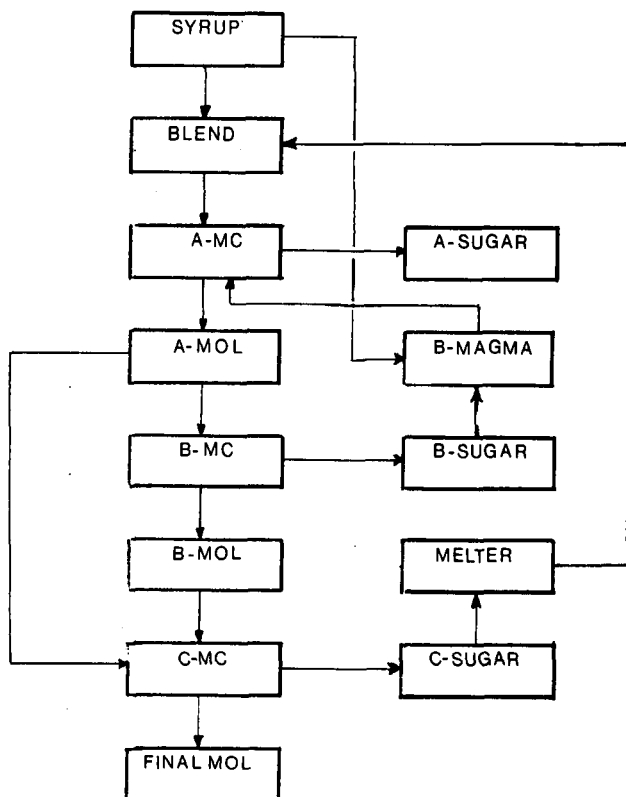
## Description of the Process and Equipment

Details of the conventional and the modified boiling schemes are given in Appendixes 1 and 2 respectively.

The details in Figure 1 illustrate the C-centrifugal station and the adaptation of the entire C-magma system for boiling B-massecuite. The modified process involves making a magma of all the C-sugar of 79/80 purity with warm A-molasses in a screw conveyor, to an acceptable consistency ( $\pm 80^\circ$  Brix) and then pumping it to seed receivers on the pan floor.

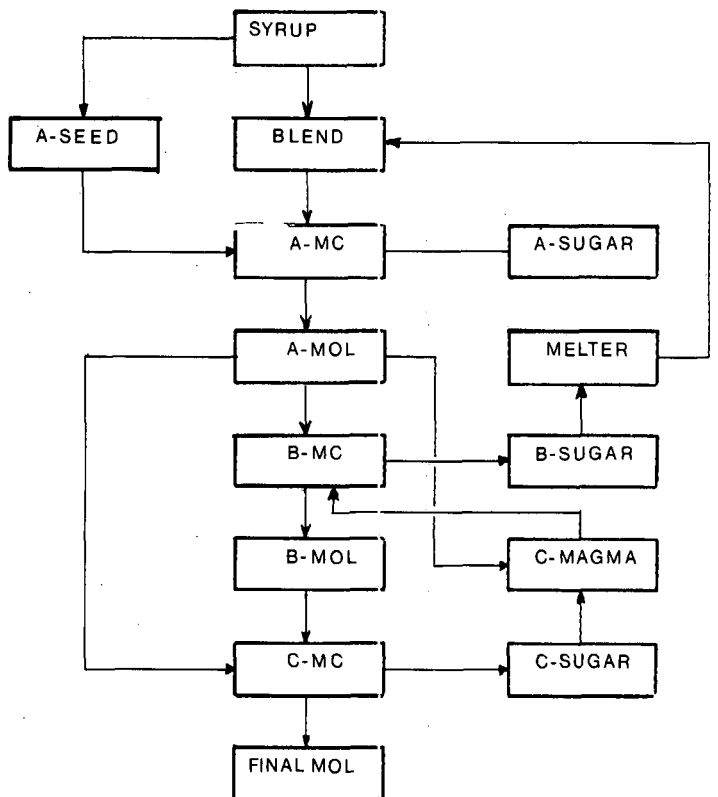
At Illovo, all the B-massecuities are boiled in a continuous pan, but because of the problems associated with broken crystals from the continuous C-centrifugals, all the C-magma is conditioned in a seed pan, prior to being pumped at a pre-determined rate to the continuous pan. The purity of the B-massecuite is now partially dependent on the C-sugar purity. The B-sugar, at a purity in excess of 92, is then totally remelted and returned to the syrup.

The A-massecuite is grained on "virgin syrup" and thereafter boiled on a blend of syrup/remelt.



ANNEXURE I

PRESENT BOILING SYSTEM



ANNEXURE II

MODIFIED BOILING SYSTEM

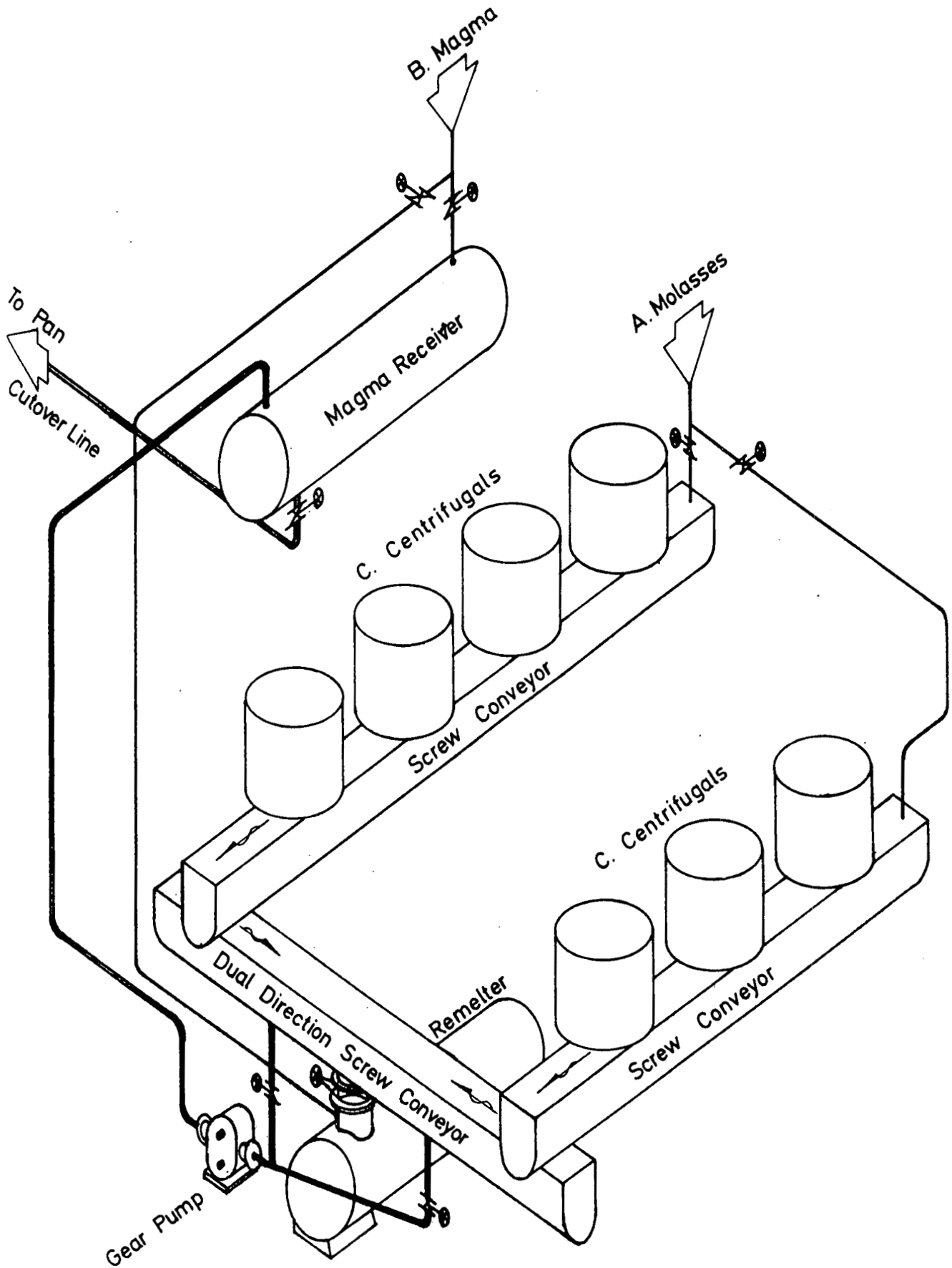


FIGURE 1 Sketch of the Illovo C Station showing alterations for the modified boiling system

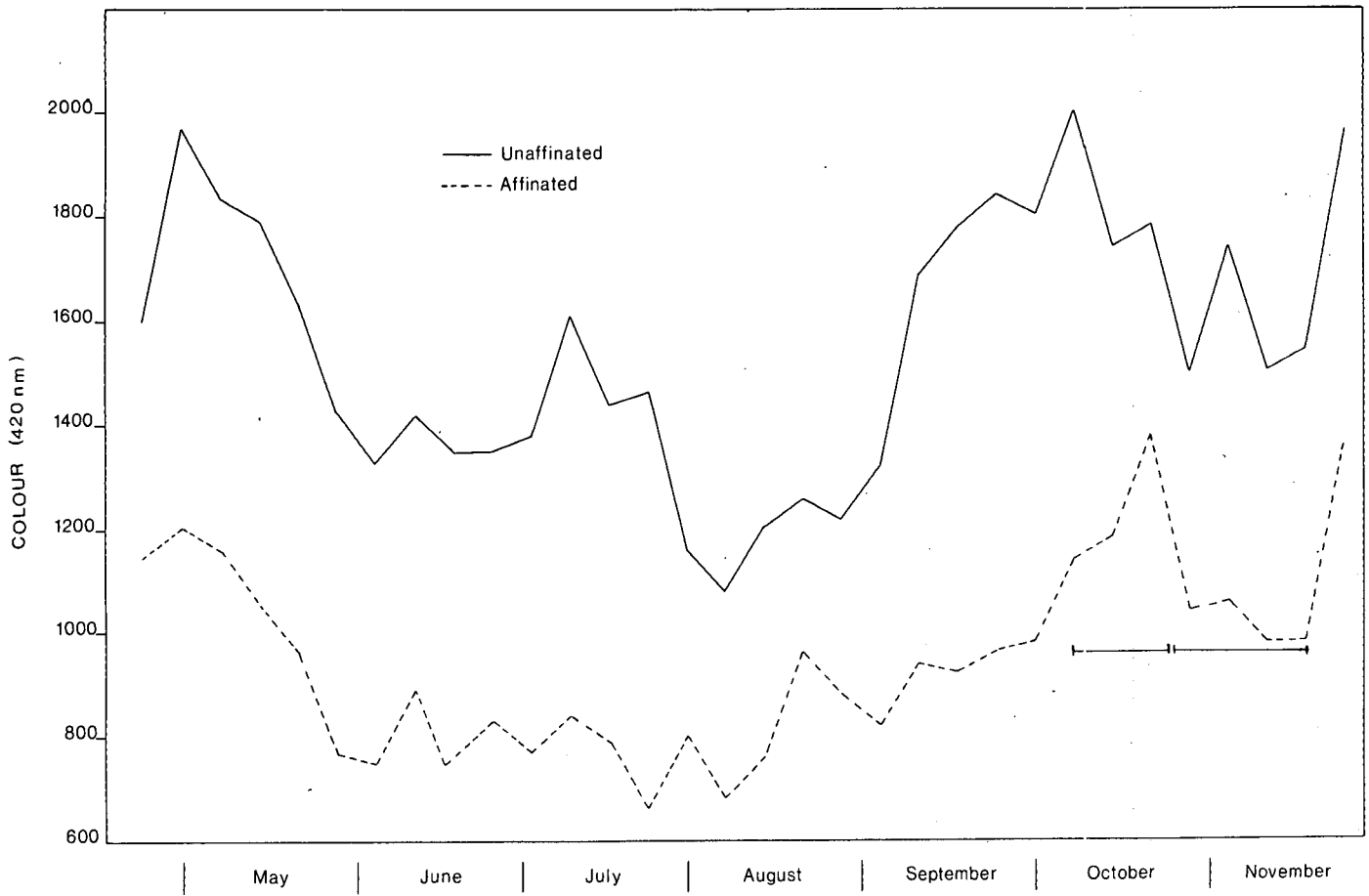


FIGURE 2 Comparison of raw and affinated sugar colours at Illovo during 1983/84 season

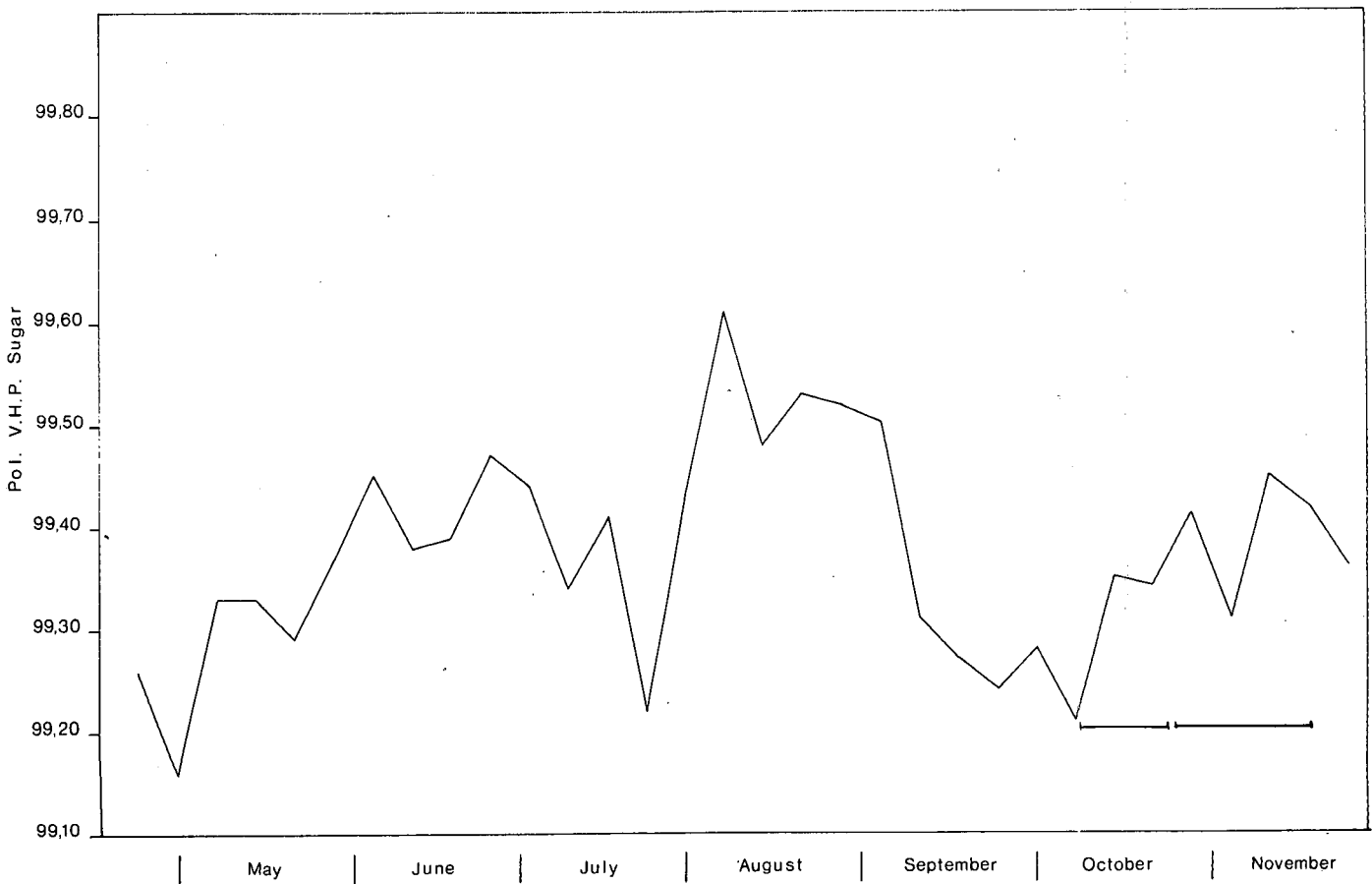


FIGURE 3 Polarisation of VHP sugar at Illovo during 1983/84 season

In general, the system as illustrated in Figure 1 and Appendix 2, is very simple and flexible to operate as it can be changed from the modified to the conventional system by simply opening and closing valves and switching off the gear pump.

## Results

TABLE 1

Comparative data between standard and modified boiling system

Product		Mean Value		Significance at 5%
		Standard	Modified	
Raw - Sugar	Colour	1871	1575	Yes
	Purity	99,45	99,54	Yes
	Pol	99,29	99,40	Yes
Affinated Sugar	Colour	1233	1015	Yes
Syrup	Colour	26373	29080	No
Remelt	Colour	38012	31634	Yes
B - Sugar	Purity	91,55	92,06	Yes

Units for colour: (ICUMSA 420 nm)

The positive influence of the changeover on the quality of the VHP sugar is shown in Table 1. In spite of a deterioration in the syrup colour, the remelt and B-sugar quality are also significantly improved. However, these results should be viewed with caution since the comparison was carried out during the end of season "boiling off" when there was a notable deterioration in cane quality.

To ensure that the results are as unbiased as possible, all the data used in the calculations and graphs related to sugar are as analysed by the Tongaat-Hulett Refinery.<sup>2</sup>

## Observations and Discussion

The general observations relevant to the modified system are summarised as follows:—

### A-Massecuite

- It was found that graining and establishing the A-footing on "virgin syrup" alone as compared with a blend of syrup and remelt was preferred by the pan-boilers as it was both easier and quicker to develop a more regular crystal.
- The A-sugar crystals were observed to be more regular and slightly larger, although no special attempt was made to increase the size.
- The greatest and most tangible improvements in operation were observed at the centrifugal station. As a result, the wash water spraying time per centrifugal was progressively reduced from thirty-seven seconds to just below twelve seconds, which nevertheless still resulted in a significant improvement in both colour and purity of the VHP sugar as is illustrated in Table 1.

- Because of the noticeable improvement in the boiling and centrifuging of the A-massecuite, the dosage of sodium hydrosulphite was drastically reduced, i.e. from a level of 150 kg per day to 40 kg and less. This represented a saving of approximately R0,50/ton sugar during the test period. When the modified system was stopped on 19 November and changed to the standard boiling scheme, all those parameters discussed above had to be re-adjusted and again the VHP sugar quality deteriorated for both colour and pol (Figures 2 and 3).

### B-Massecuite

- As a result of the large amount of broken crystals from the C-curing, the final B-massecuite was of poor quality and resulted in an abnormally high purity rise across the B-centrifugals. However, this effect could have perhaps been reduced by changing to the screens with a smaller aperture.
- The amount of crystal in the B-molasses increased to the point where the "blow-up" station was overloaded, thus causing some problems with the C-massecuite.
- Apart from the wider distribution of crystal size, the boiling was no different in the continuous pan.

### C-Massecuite

- Due to the higher purity of the B-molasses, the final purity of C-massecuite had to be carefully controlled.
- As the liquidation of the back-end stock was in progress and because of other physical problems associated with the C-crystallizers, no apparent gain was registered in the final molasses purity. However, as a result of findings by Jullienne<sup>3</sup> the authors are of the opinion that, by centrifuging C-sugar to a purity of 79/80, a slight improvement in final molasses should be expected and this remains to be tested in the 1984/85 crushing season.

## Conclusion

As a result of the changeover to the modified boiling system at Illovo, the VHP sugar quality improved significantly without undue operational or other problems being encountered.

As a result, this installation is to be adopted for the coming season and its effect will be appraised in more detail with the Sugar Milling Research Institute. The equipment required for this project amounted to one pump, two 150 mm Ø valves, approximately 15 metres of 150 mm Ø pipe and twenty hours of boilermaker work.

## Acknowledgements

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## REFERENCES

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