

## FACTORY BALANCE SYMPOSIUM

## SYRUP WEIGHING AT EMPANGENI

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*Hulett's S.A. Sugar Mills & Estates, Ltd., Empangeni***Abstract**

In an attempt to locate untraced sucrose losses, a Servo Balans was installed at Empangeni factory to weigh syrup. Over a twelve-week period the untraced sucrose loss between mixed juice and syrup amounted to 181 tons, and the loss after syrup to 836 tons.

**Introduction**

If an accurate weight and analysis of syrup is known, the factory can be broken into two sections, and sucrose losses divided between 'clarification/evaporation' and 'crystallisation'.

Empangeni factory experienced persistently high untraced losses during both the 1968/69 and 1969/70 seasons. Attempts were made to discover the cause of these losses, using both conventional and unconventional techniques. All efforts were unsuccessful; the untraced loss remained untraced.

The decision was taken during the first week of October, 1969, to install a scale in the factory for weighing syrup. A suitably sized Servo Balans was located at Triangle. The dismantling, transport, servicing, and installation of the scale was achieved almost without a hitch, and the system was operational by 10th November, 1969.

**Equipment, Sampling and Analysis**

Syrup was weighed by means of a fully automatic, 100 ton per hour, Servo Balans.

The sample was taken from the scale discharge, using a perforated  $\frac{3}{4}$ " OD brass tube canted at an angle, and placed in such a way that the holes covered the entire width of the scale discharge. The device was virtually identical to that recommended for sampling mixed juice<sup>1</sup>.

The hot syrup was cooled by means of an Alfa Laval type P20 plate heat exchanger, which has a designed capacity equivalent to 20 gallons of syrup per hour. The cooled sample was collected in covered stainless steel buckets.

The samples were analysed for refractometer brix and pol. A series of comparisons was made between pol and true sucrose analyses, but the differences found were insignificant.

Although the scale had not been assized after transportation and erection, it was checked by pumping water in series through the syrup and imbibition scales. The total difference over a series of 100 tips was only 500 lbs, representing an error of 0.2%. This is within the 0.25% tolerance of the scale.

**Results**

In Table 1 the actual tons of sucrose in weighed syrup from week to week are compared with the tons of sucrose in syrup calculated from figures for mixed juice and filter cake. The Table also shows the untraced sucrose loss for the whole factory, expressed as a percentage of sucrose in mixed juice.

TABLE 1

Tons of sucrose in syrup

Factory week No.	Tons sucrose in syrup weighed	Tons sucrose in syrup calculated	Difference % (on Calculated)	Factory Undetected loss %
26	3523.1	3409.5	+ 3.33	2.22
27	3282.7	3276.0	+ 0.20	1.44
28	3074.2	3013.5	+ 2.01	3.83
29	3333.9	3340.4	- 0.19	0
30	2552.6	2584.5	- 1.23	1.87
31	3359.4	3369.0	- 0.28	1.40
32	3563.1	3557.1	+ 0.17	0.77*
33	3024.5	3150.4	- 4.00	4.27
34	3056.8	3065.9	- 0.30	5.21
35	2931.7	2920.4	+ 0.39	1.29
36	2711.5	2739.8	- 1.03	6.48
37	2203.0	2371.4	- 7.10	5.75
Total/Average:	36616.5	36797.9	- 0.49	2.75

\* undetected gain.

Calculated tons sucrose in syrup = tons sucrose in mixed juice - tons sucrose in filter cake + tons sucrose in previous clear juice stock - tons sucrose in present clear juice stock - tons sucrose in clear juice used for B sugar magma.

### Discussion

Over a twelve-week period, the tonnage of sucrose in mixed juice was 36,970 tons. Of this amount 1,017 tons was lost 'untraced'.

Over the same period the difference between the weighed and calculated tonnage of sucrose in syrup was 181 tons.

It would appear that, although there is some loss of sucrose prior to the syrup scale, a more substantial loss occurs during the crystallisation process. Over the period in question the untraced loss of sucrose after the syrup scale amounted to 836 tons, an average of 70 tons per week.

Routine laboratory measurements showed that mixed juice entering the factory during the period from week 26 to week 37 contained 1,431 tons of suspended matter. This inflated the tons of sucrose in mixed juice by 160 tons. Because of an inefficient sampling method this figure is certainly an underestimate, but even so, suspended matter accounts for

over 88% of the 'untraced sucrose loss' before the syrup scale. Chemical losses of sucrose in the clarifiers must also be considered.

Losses during crystallisation are less easy to explain. The answer may well lie in the destruction of sucrose in the crystallisers themselves, and to a lesser extent in the pans. The danger of losses of this type was stressed by Mr. Frank Chapman at a recent meeting of this Association.

The week-to-week fluctuations in the differences between weighed and calculated sucrose in syrup are a cause for concern. This matter will be investigated during the 1970/71 season, both at Empangeni and at Amatikulu, where it is hoped to install Hulett's second syrup scale.

### Reference

1. Laboratory Manual for South African Sugar Factories, published (1962) by S. Afr. Sug. Technol. Ass. pp. 33-34.

For discussion on this Paper, see page 50.