FORTY-SIXTH ANNUAL SUMMARY OF LABORATORY REPORTS OF SUGAR FACTORIES IN SOUTHERN AFRICA COVERING THE 1970 — 1971 SEASON

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Note: Except when otherwise stated, all data in this summary are as reported by the factories in their final laboratory reports.

Introduction

In the past nineteen years the form of presentation of these summaries has been gradually improved by Mr. Perk and this forty-sixth summary follows the same general pattern as last year's. The main tables are similar to those in the previous summaries but all weights and volumes are now expressed in metric units.

The principal tables are:

Table A: Final Production of different grades of sugar manufactured by South African factories.

Table B: Cane crushed and sugar made, cane varieties, cane analysis, rainfall, throughputs, time account and performances.

Table C: Sucrose balance, analytical data on: juices, syrup, filter cake, final molasses.

Table D: Massecuites and their exhaustion, consumption of clarifying agents and additional fuels.

Table E: Comparative manufacturing results of recent years for South African factories.

Table F: Average manufacturing results of South African factories by monthly periods for the 1970–1971 season.

Table G: Comparative data of South African factories from 1925 to 1970.

The 1970/71 season

The season started on the 24th April, 1970, and ended on the 23rd January, 1971 with most of the factories starting in early May and finishing during the first half of December. The drought seriously affected the production of certain mills, the worst hit being UK, which processed 39% less cane than in the previous season. On the other hand JB, UC and IL had larger crops than last year. The cane production was 12 143 896 tons which yielded an equivalent of 1 405 803 tons of raw sugar. We have to go back to the 1965/66 season to find a lower production of both cane and sugar.

Time account

The average number of crop days (based on available time which includes week-end stops) was 218. Overall time efficiency (76,60) was the same as last season and the percentage of hours stopped for week-ends, lack of cane and other reasons are almost exactly the same. The highest time efficiency is reported by UF (91,71%) but this is not strictly comparable with other factories since UF has two mill tandems which are stopped alternatively for maintenance during week ends while the factory keeps running.

The two Swaziland factories show high time efficiencies, particularly MH with 88,97. This is partly due to week-end stops, which are half the average for South African factories, but is also due to less stops for other reasons.

Although there is no doubt about the advantage of reducing or eliminating week-end stops from a factory operation point of view, these advantages should be weighed against the loss in sugar through deterioration of the cane which has to be stockpiled in the fields or factory yard to feed the factory during week-ends. With the advent of a new system of cane payment putting a premium on cane quality, it may be worth investigating the economics of storing syrup as is done by certain factories overseas. Surplus syrup is stored during the week to keep the boiling house and refinery going during the week-end when the front part of the factory is stopped.

Sugar

Most of the factories produced very high pol (V.H.P.) sugar during the past season. Specifications for this sugar call for a pol of between 99,3 and 99,7 and a safety factor of not more than 0,20. The sugar is coated with high test molasses at the terminal to bring the polarisation down to the buyer's specifications.

Production of this sugar has given rise to sugar dust problems in certain factories and at the terminal but these have been solved in almost all cases by a slight increase in moisture content and the safety factor limit being brought up to 0,25.

The higher pol of sugar this season has of course reduced the weight of sugar produced. Additional sugar production for the season would have been about 9 970 tons if all sugars had been produced at the average polarisation for the 1969/70 season (98,68).

The percentage of white sugar is still about the same (20%). Refined sugar was produced by refineries attached to ML, PG, GH and SZ and mill white by EN. (The production of HULSAR refinery is not included in these statistics.)

Cane quality

Average sucrose per cent cane was higher than during the past three years and compares favourably with the averages for the past forty-five years which are given in Table G. Mixed juice purity was however lower than average although higher than during the last three seasons. This, coupled with a lower than average fibre content and a better overall recovery, has enabled the cane to sugar ratio (based on 96° sugar) to be reduced to 8,34. Only three times have lower cane to sugar ratios been achieved during the past sixteen years. PG and EN report the best ratios with 7,71 and 7,73 respectively. Geographical considerations do not appear to have an overriding influence since in all regions, except the Midlands, some of the factories are lower and other higher than the industrial average. The two Midlands factories reported lower ratios than the average and Malelane equalled the average.

The monthly variation of cane to 96° sugar for this and the preceding season is plotted in Fig. 1. The month of December has not been included because most of the mills closed early in the month. The effect of the September rains appears clearly as do the favourable conditions for cane maturity created by the drought at the beginning of 1970.

Cane preparation and juice extraction

The improvement in milling performance which has been noted during the past years has continued. Industrial average values for lost absolute juice per cent fibre and pol per cent bagasse for the past five years are plotted in Fig. 2. A closer look at the figures for the past three seasons will show that the improvement in performance was achieved with almost the same throughput of cane

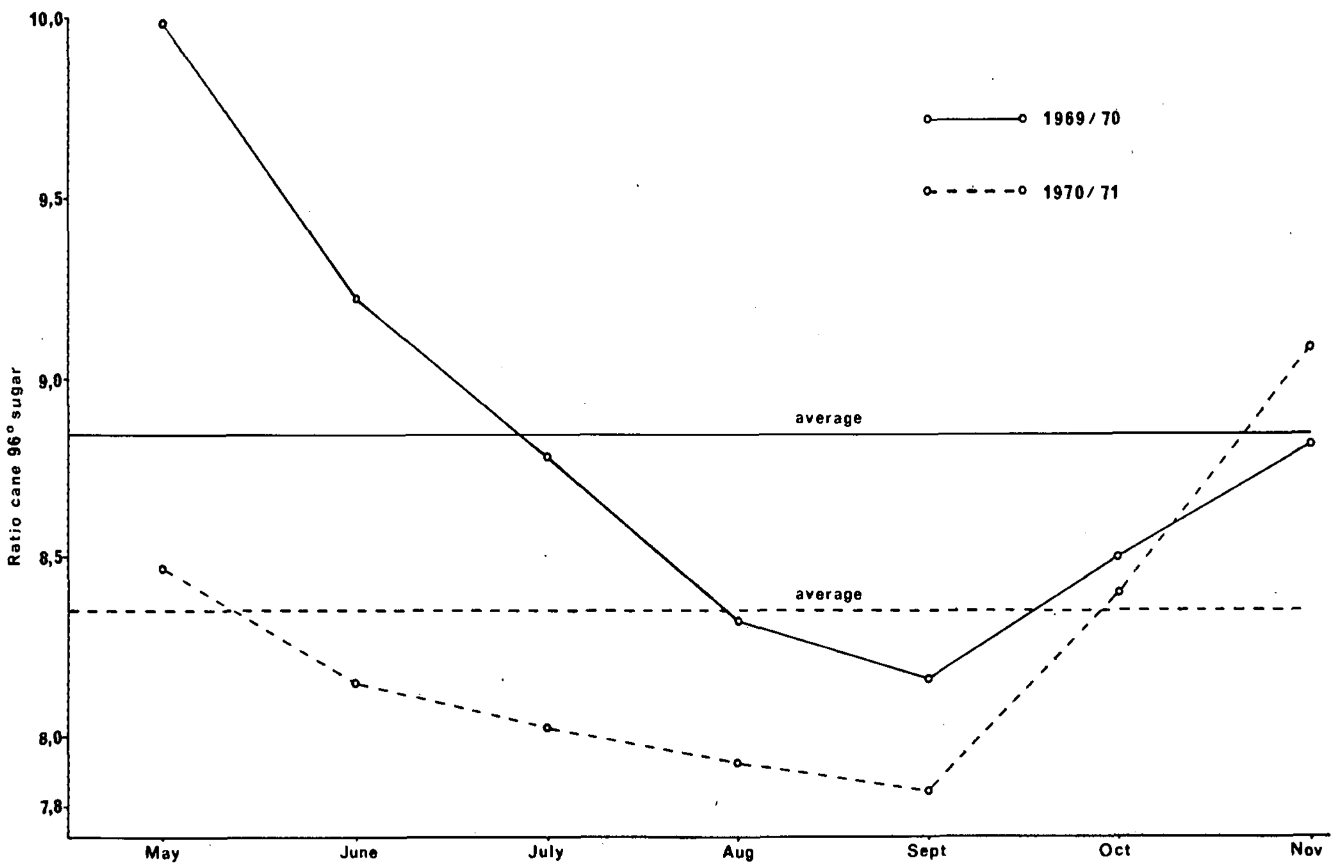

FIGURE 1

1969/70 and 1970/71 seasons monthly variation of ratio of tons cane to tons 96° sugar.

and fibre and with no major change in extraction equipment at any of the mills.

Unfortunately, the moisture per cent bagasse still remains at a high level (average 53,07) when compared with figures reported from overseas and there has been no improvement during the past season. A further increase in mill extraction of about 0,60 can be expected if the moisture content of bagasse can be reduced to 50. This has been achieved only at UC which reports an average moisture per cent bagasse of 49,68. This diffusion factory again reports the best extraction in spite of poor first mill performance and a comparatively low imbibition rate (240% fibre as against an industrial average of 285%). Of the straight milling factories, ME shows the best results with a Lost Absolute Juice % Fibre of 23,93 which however was obtained at the very high imbibition rate of 340% on fibre.

Table 1 has been prepared to give a better appreciation of the work done in relation to equipment available.

TABLE I

EQUIPMENT AND PERFORMANCE OF EXTRACTION PLANT

MILLING

Mill	Knives	Shredder	Specific Feed Rate	Imb. % F	L.A.J. % F
PG	2	–	576	301	31
UF	2	1	541	293	36
FX	2	1	618	254	29
AK	3	1	836	285	29
DK	2	1	834	237	41
GD	2	1	871	283	43
DL	2	1	749	386	29
GH	2	1	749	247	34
MV	2	1	688	309	34
JB	2	1	621	322	27
TS	2	1	868	216	33
ME	2	1	748	340	24
IL	2	1	627	270	31
RN	2	1	823	233	43
SZ	2	1	1 207	323	31
UK	2	1	975	246	35
LB	2	–	1 149	202	53
MR	2	–	1 258	161	57
MH	2	1	1 087	210	39
UR	2	1	1 045	194	40

DIFFUSION

Factory	Knives	Shredder	Mills	Kg. Fibre/ m^2 E.S.A. hr.	Imb. % F	L.A.J. % F
ML	3	–	2	176	293	34
EN	2	1	3	103	320	25
EM	2	–	4	180	299	25
UC	2	–	3	157	240	18

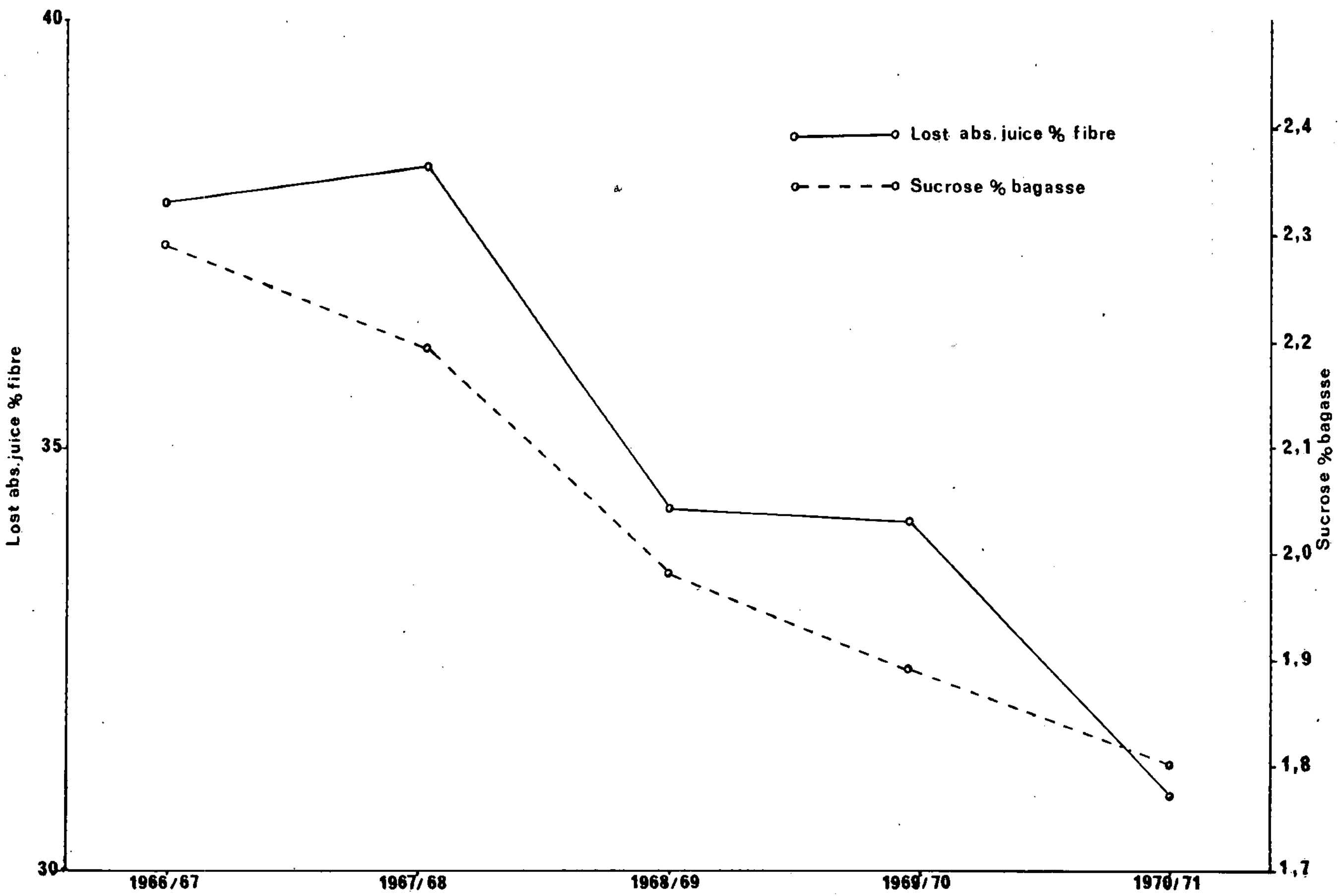

FIGURE 2

Average milling performance South African Mills.

The improved milling performance is probably the result of a better awareness of the importance of good preparation. Engineers are showing increased interest in measuring the degree of preparation of the feed to the mills and this has been adopted as routine control in at least one mill. Measurements made at several factories have shown that the percentage of broken cells in shredded cane ranged from 70% to 88%. The best results were reported by JB with a weekly average of 89%.

A new proto-type diffuser patented by Hulett's was installed at EM. The unit, which processes bagasse from the BMA diffuser, is of industrial width but consists of a single cell only, for test purposes. Both UC and EM return the press water to their diffusers without any treatment. At EM special vertical screws churn up the bagasse bed to allow the press water to percolate through. No adverse effect has been reported.

Clarification and filtration

No particular clarification problems have been reported during the season. Efforts have been made by several factories to reduce or eliminate the use of flocculents because of their cost. In many cases the efficiency of the flocculent could have been improved by preparing a homogeneous suspension in water and controlling more accurately the rate of addition. The highest flocculent users are the Midlands mills with 7,07 (JB) and 10,39 (UC) ppm on mixed juice. Eight factories do not use any flocculent.

A new type of clarifier has been introduced in the South African sugar industry. It is the RapiDorr 444 which was installed at EM and UK. Its performance was satisfactory at EM but problems with the removal of mud from some of the trays caused foaming at UK. At the latter factory, the outdoor installation of the clarifier is a noteable break from the long established tradition of having all sugar machinery under roofs.

An interesting modification to a RapiDorr clarifier was carried out at JB where the large clarifier capacity per ton of cane resulted in a long retention time for clarified juice. One of the two clarifiers was modified to operate with only the two bottom trays and this proved to be very satisfactory.

The performance of filters has been summarised in Table II. The results obtained by EM and UR are exceptionally good. At this last factory, excellent results are obtained in spite of having the lowest filtering surface per ton of cane per hour of all the reporting mills in Southern Africa.

We are not able to pinpoint the reasons for the good work done by EM and UR. It is certainly not due to excessive washing since the Brix drop between Mixed Juice and Clarified Juice is:

EM	0,23
UR	0,37
Industrial Average	0,63

In the last column of Table II, sugar lost in filter cake is expressed as a percentage of the sugar input to the clarifier. Inspection of the figures listed shows that the best overall results are obtained with a low pol per cent cake rather than from having a low percentage of filter cake on cane. The performance of filters during the past five seasons is plotted in Fig. 3.

Although the losses in filter cake are usually the least important in a factory, they are still high enough to warrant a better control of the filter station. In many factories the cake sampling procedure is unsatisfactory and the weight of filter cake reported is fictitious and based on an assumed ratio of filter cake to cane. When conditions are such that an installation for weighing filter cake would not be economical, production should be weighed for a few hours at approximately weekly intervals to arrive at a more accurate value of filter cake per cent cane.

TABLE II

CAPACITY AND PERFORMANCE OF FILTERS

Mill	m^2 Screen area	m^2 per T.C.H.	Filter Cake % cane	Pol % Filter Cake	Pol in F.C. % Sucrose in Mixed Juice
ML	74,3	0,38	3,59	1,72	0,46
PG	74,3	0,51	5,76	2,39	1,01
UF	139,3	0,65	5,00	1,56	0,61
EM	148,6	0,82	3,44	0,65	0,17
FX	—	—	6,00	0,94	0,45
EN	46,5	0,96	5,01	1,85	0,65
AK	148,6	6,59	4,90	1,39	0,52
DK	60,4	0,86	5,00	1,64	0,61
GD	27,9	0,68	3,00	1,42	0,33
DL	111,5	0,65	5,23	1,02	0,41
GH	148,6	0,66	4,52	1,94	0,70
MV	55,7	0,81	4,15	1,16	0,37
JB	102,2	0,59	4,07	1,27	0,38
UC	37,2	0,72	4,91	1,00	0,37
TS	167,2	0,59	4,08	1,86	0,62
ME	148,6	0,89	6,47	0,94	0,47
IL	74,3	0,75	3,95	1,74	0,51
RN	53,4	0,70	5,47	2,12	0,91
SZ	148,6	0,67	6,43	1,18	0,58
UK	83,6	0,57	4,00	1,90	0,58
LB	—	—	4,74	0,90	0,34
MR	83,6	0,56	4,16	2,48	0,79
MH	92,9	0,65	2,59	2,44	0,48
UR	55,7	0,38	4,06	0,56	0,17

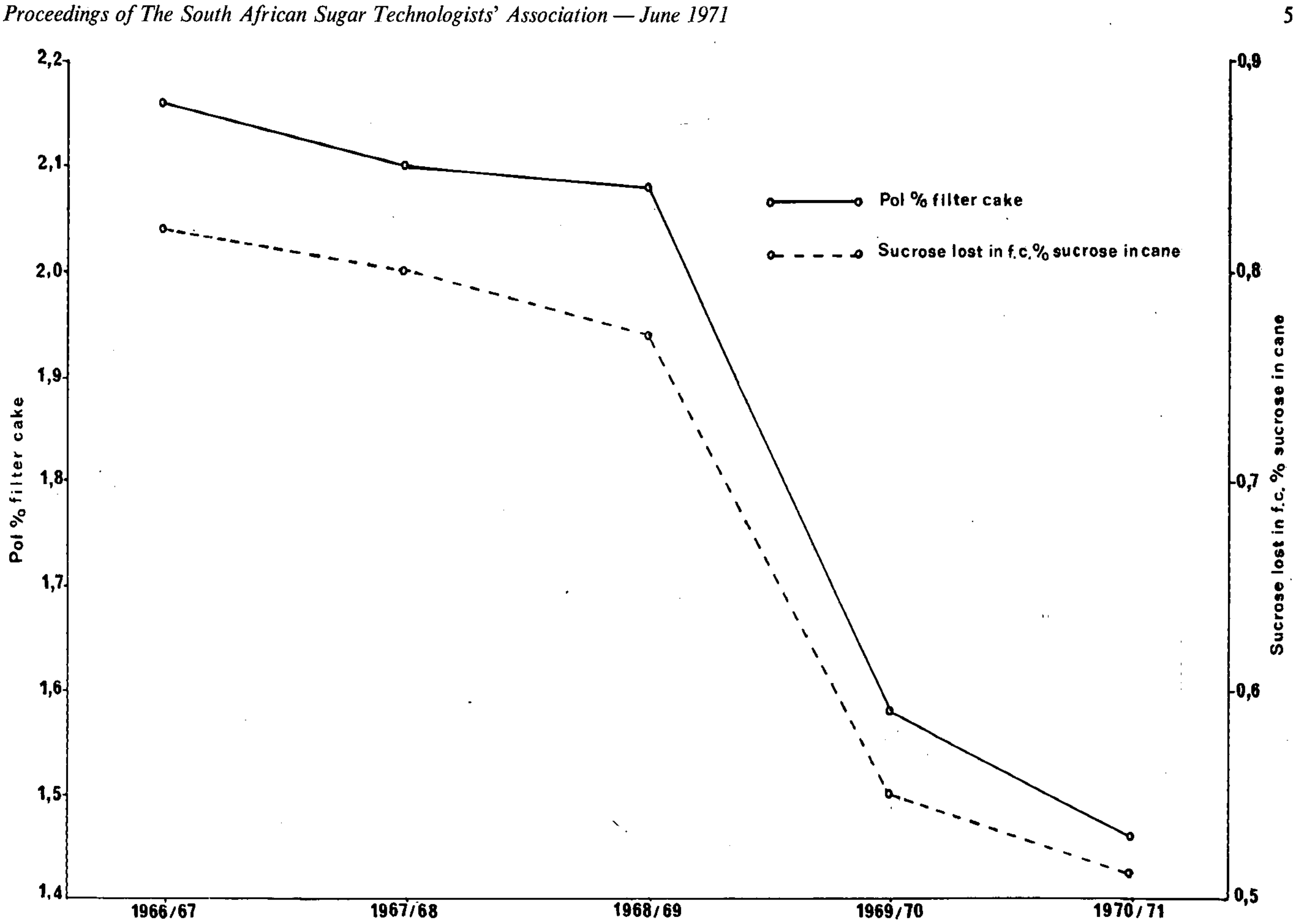

FIGURE 3 — Performance of filters

Evaporation, boiling and curing

The higher juice purities of the 1970 season do not seem to have had an effect on the performance of the boiling house especially when compared with the 1969 season. The results look better when compared with those of the past five years. The most important data are plotted in Fig. 4. One should be careful in drawing conclusions based on final molasses purity or Brix since unfortunately some factories have reported figures based on refractometer Brix and others on spindle Brix. This is an unfortunate state of affair which makes average figures almost valueless.

An explanation has been sought for the higher molasses production of this season when compared to 1969, and it seems to be due to the higher Brix of cane which has caused a greater weight of impurities to be introduced into the factory per ton of cane in spite of better juice purity. Values of tons of molasses per ton of Brix in mixed juice for the past five years are set out in Table III. The cubic metres of C massecuite per ton of Brix in mixed juice are also very nearly the same as for last season in spite of the greater quantity of molasses produced.

The volume of A massecuite has increased from 0,94 to 1,00 m^3 per ton Brix in mixed juice between the two last seasons while the volume of B and C massecuite is almost unchanged. This is probably a consequence of the syrup purity which was almost one point higher than last season.

Very high viscosities were reported by several mills during the season and an attempt was made to record C massecuite viscosities measured on spot samples taken from several mills. The results are listed in Table IV. No relationship has so far been established between boiling process and viscosity but it seems that routine viscosity measurements on C massecuites could be used to determine to what temperature a massecuite should be cured for maximum exhaustion.

A new centrifugal station for curing B and C massecuite was commissioned at DL during the season. A total of 18 continuous machines are used and, unlike the procedure followed at ML, the B sugar is not remelted but is used as a magma for boiling the A strike. Electrical resistance heating of C massecuite before feeding to continuous centrifugals was introduced at EN and the results are reported to be satisfactory.

TABLE III
TONS 85° SPINDLE BRIX MOL/TON BRIX M.J.

1966–67	0,23
1967–68	0,25
1968–69	0,26
1969–70	0,24
1970–71	0,24

TABLE IV
VISCOSITY OF C MASSECUITE AT 50°C
(SPOT SAMPLES)

EM	1 450 000 cp
FX	1 350 000 cp
EN	90 000 cp
TS	325 000 cp
JB	730 000 cp
UC	225 000 cp
IL	97 000 cp

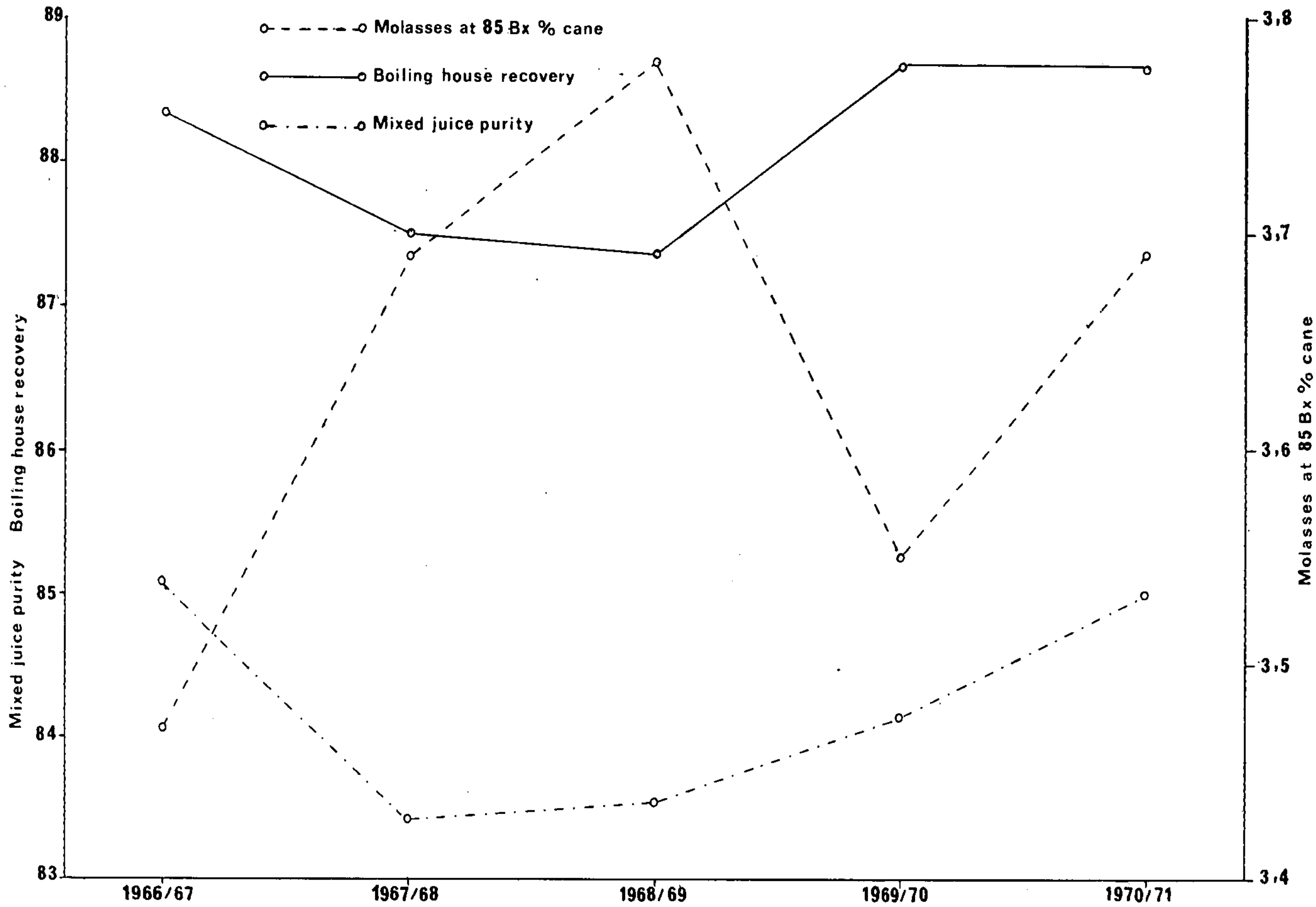

FIGURE 4 — Boiling house figures.

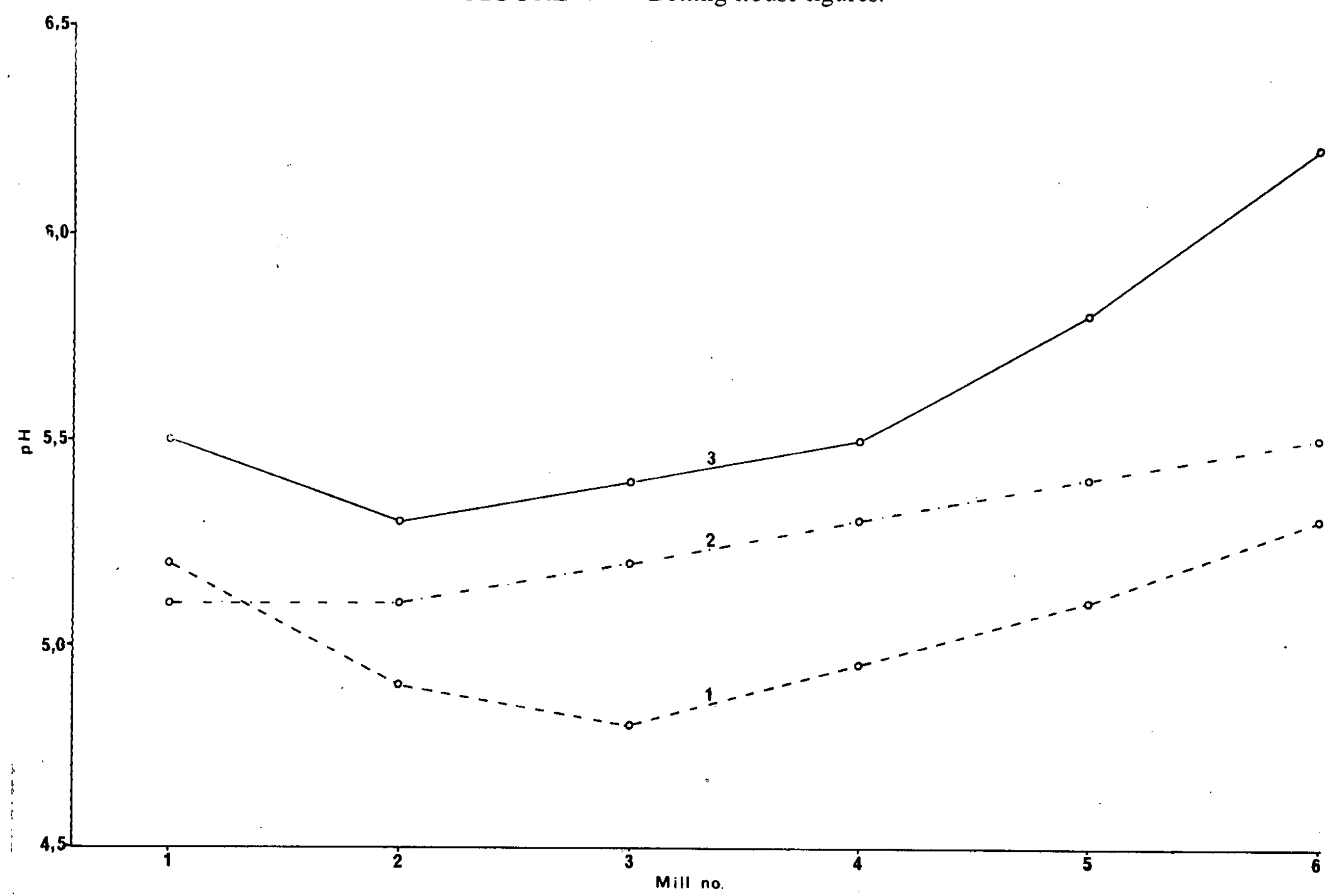

FIGURE 5 — pH of juice from mills.

Chemical control notes

Direct weighing of bagasse

ML started using a belt weigher to obtain directly the weight of final bagasse during the season. Imbibition water weight is no longer used in the mass balance of the extraction plant. A check carried out during one week showed that the weight of bagasse determined directly was about 0,7% higher than when calculated by the inferential method.

pH of mill and diffuser juices

Some pH curves for mill juices are drawn in Fig. 5. Curves Nos. 1 and 3 show disturbing drops in pH at the first three intermediate mills. The drops are probably due to microbiological activity. The drawing of a pH curve for the mills in a simple control which should be carried out as a routine measure once a shift. It is even more important with diffusers.

Comparison of boiling house work

Three different factors for assessing boiling house work are discussed below and they are compared in Table V with the more conventional factors: "Boiling house losses" and "sucrose lost in molasses percent sucrose in cane".

It may not be out of place to sound a note of warning on the use of new factors. It is quite evident that expressing the losses in a different form will not reduce them, but it is sometimes less apparent that a factor is only as good as the different terms that are used in calculating it. If for example, there are doubts on the comparative values of molasses Brix between different factories, any factor involving Brix which is used to compare the work of the factories will suffer from the same weakness although the effect of the error may be reduced or increased depending on the formula.

TABLE V

BOILING HOUSE LOSSES AND LOSSES IN MOLASSES

Factory	Molasses Factor	Sucrose lost in molasses % sucrose in cane	Loss Factor	B.H. Losses
ML	58,97	10,42	76,74	13,56
PG	44,05	7,41	51,81	8,72
UF	56,02	10,24	59,74	10,92
EM	57,21	10,52	68,34	12,57
FX	44,86	8,70	56,65	10,98
EN	63,87	8,89	84,75	11,79
AK	48,71	8,37	62,87	10,80
DK	60,29	8,04	73,29	9,78
GD	52,31	8,33	63,22	10,06
DL	46,52	8,57	59,13	10,89
GH	46,81	9,69	62,94	10,98
MV	56,56	8,79	62,22	9,67
JB	56,97	9,58	72,02	12,16
UC	52,61	8,88	63,45	10,71
TS	50,71	8,08	61,68	9,82
IL	56,30	8,88	74,64	11,78
RN	54,02	8,49	75,85	11,93
SZ	62,43	9,47	69,00	10,46
UK	64,86	9,28	91,05	13,03

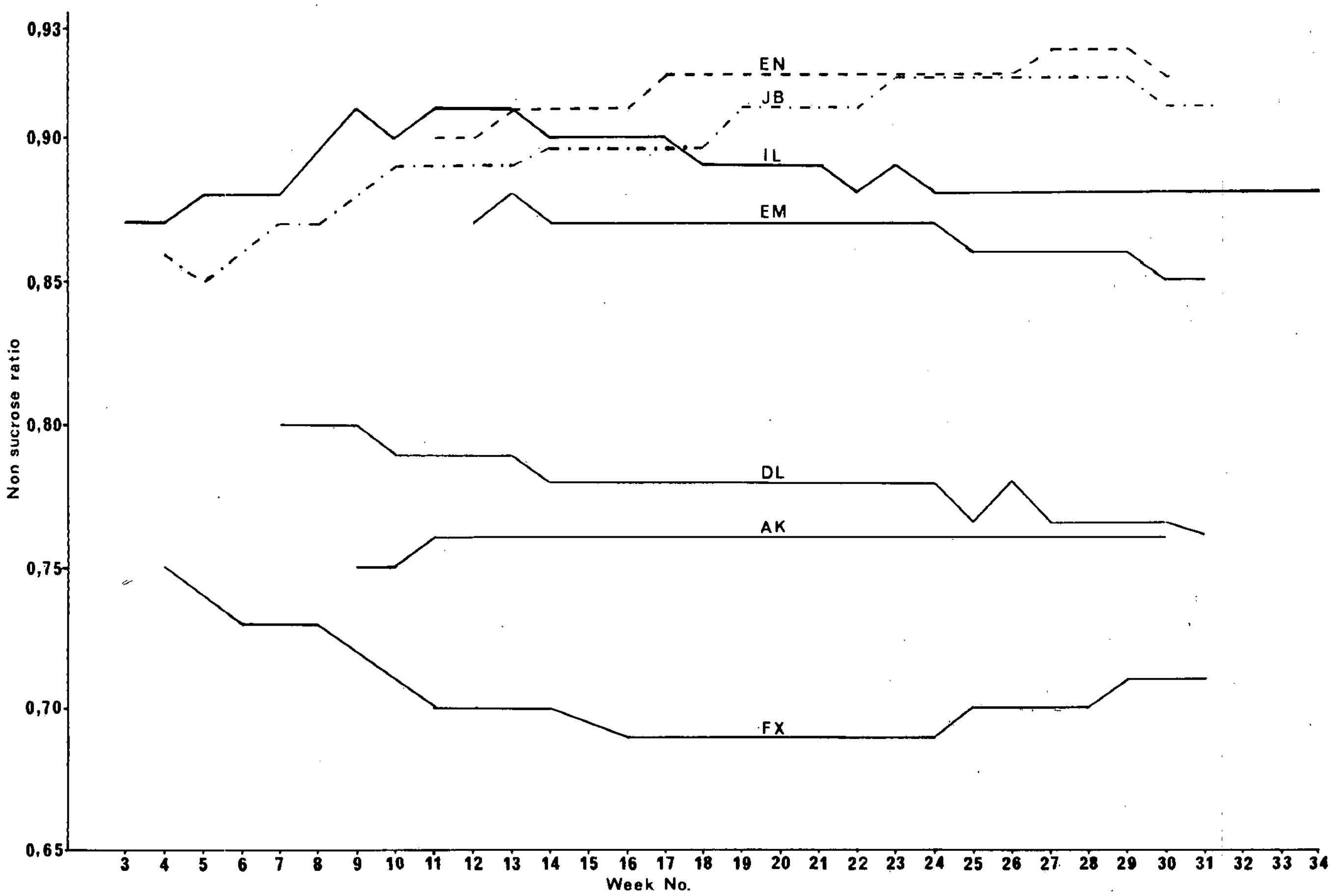

FIGURE 6

Weekly to-date values of non-sucrose ratio.

Non-sucrose ratio

This ratio has been defined and discussed at length in previous summaries. A survey of to-date weekly non-sucrose ratios (based on mixed juice) has been carried out during the season and the results are plotted in Fig. 6. To prevent confusion only a few typical curves have been drawn. The curves show clearly the overwhelming influence of the procedure used for Brix determination in molasses on the ratio. EN, IL, JB use spindle Brix while EM, DL, AK and FX use refractometer Brix. The only exception is EM which uses refractometer Brix but obtains values of non-sucrose ratio in the spindle Brix range. This could be surmised to be due to the effect of diffusion but EN which has a diffuser and spindle Brix control shows a curve which fits in with that of milling factories.

Molasses factor

This factor is defined as Sucrose in Molasses % non-Sucrose in mixed juice. It has the advantage of being independent of Brix in molasses and is an expression of total losses in molasses as a function of the quality of mixed juice. It suffers of course from some of the main objections advanced against non-sucrose ratio, i.e. that the type of non-sucrose present in mixed juice or a change in the nature of non-sucrose during processing are not taken into account although they will influence the losses in molasses. Values of the molasses factor and sucrose lost in molasses % sucrose in cane are listed in Table V. PG has the lowest molasses factor and also the lowest sucrose losses in molasses but FX with sucrose losses in molasses of 8,70 appears to be doing better work than DK with losses of 8,04. Factories with high losses in molasses like ML, UF and EM show a much better performance when compared on the basis of the molasses factor.

Loss factor

This factor has been proposed by Jennings[1] to express losses not only in molasses but also in filter cake and undetermined as a ratio of the impurities entering the factory with mixed juice. By definition:

$$\text{Loss factor} = \frac{\text{Tons sucrose in mixed juice} - \text{tons sucrose in crystal}}{\text{Tons non-sucrose in mixed juice}}$$

The term sucrose in crystal is used instead of sucrose in sugar to overcome the apparent benefits of producing a lower pol sugar when some molasses is sent out with the sugar. Unfortunately calculation of the crystal content of sugar involves the use of molasses purity which will depend on the type of instrument used for Brix determination. Under these conditions, and in view of the slight differences in sugar pol between the majority of mills the loss factor has been calculated substituting tons sucrose in sugar for tons sucrose in crystal. The results obtained are listed in Table IV and should be compared with the Boiling House losses. This factor will inflate the effect of losses in filter cake and undetermined losses. In the case of filter cake, sucrose losses will depend on non-sucrose elimination but it may be questioned if there are grounds for inflating the value of undetermined losses (by a factor of about 6) when there may not be a correlation between undetermined losses and non-sucrose content of mixed juice.

Acknowledgements

The help received from Messrs. S. Koenig and J. Buijs in the preparation of this paper and the compilation of tables is gratefully acknowledged.

(1) Jennings, R. P. (1970) — Factory Balance and Loss. S. Afr. Sug. J. 54, 7, 479-485.

Battery of cold digesters at Melville

TABLE A

SOUTH AFRICAN SUGAR ASSOCIATION FINAL PRODUCTION 1970/71 SEASON
METRIC TONS

MILL	LOCAL MARKET			EXPORT MARKET		TOTAL
	White	Refinery Raws	Brown	Very High Pol	H.T. Molasses (Sugar Equivalent)	
Malelane	79 916,124 0	—	453,728 0	—	—	80 369,852 0
Pongola	48 601,150 0	—	24 454,687 5	—	—	73 055,837 5
Umfolozi	—	50 367,000 0	15 032,014 0	31 084,211 4	—	96 483,255 4
Empangeni	—	80 001,552 6	247,500 0	—	—	80 249,052 6
Felixton	—	71 016,963 4	1 275,000 0	3 155,791 0	—	75 447,754 4
Entumeni	10 978,375 0	31,660 7	3 342,847 8	7 178,913 0	—	21 531,796 5
Amatikulu	—	24 519,021 8	15 792,643 0	78 351,155 8	—	118 662,820 6
Doornkop	—	—	88,452 0	35 174,157 0	—	35 262,609 0
Glendale	—	16 560,789 2	32,999 0	—	—	16 593 788 2
Darnall	—	7 665,006 7	247,495 0	77 544,159 0	—	85 456,660 7
Gledhow	107 146,500 0	944,379 4	70,000 0	—	—	108 160,879 4
Melville	—	13 417,988 4	2 100,300 0	11 074,151 0	—	26 592,439 4
Jaagbaan	—	57 127,610 3	35,662 0	29 746,366 0	—	86 909,608 3
Union Co-op	—	500,176 1	73,185 0	27 252,655 0	—	27 826,016 1
Tongaat	—	75 503,546 0	376,000 0	65 692,007 0	—	141 571,553 0
Mount Edgecombe	—	—	2 403,575 0	—	82 773,493 0	85 177,068 0
Illovo	—	1 927,563 0	18 351,423 0	37 619,568 0 Syrup 91,226 0	—	57 989,780 0
Sezela	71 461,000 0	266,621 6	130,000 0	30 469,958 0	—	102 327,579 6
Renishaw	53,750 0	—	29 980,100 0	—	—	30 033,850 0
Umzimkulu	—	78,221 8	70,000 0	49 021,055 0	—	49 169,276 8
TOTAL	318 156,899 0	399 928,101 0	114 557,611 3	483 455,343 2	82 773,493 0	1 398 871,447 5

TABLE B

CANE CRUSHED AND SUGAR MADE, CANE COMPOSITION AND VARIETIES,
(Season 1970 - 1971)

SYMBOLS OF FACTORIES	ML	PG*	UF	EM	FX	EN	AK	DK	GD	DL	GH*
Tons of Sugar made	**80 370**	**74 060**	**96 483**	**80 432**	**75 344**	**21 537**	**118 826**	**35 262**	**16 587**	**85 611**	**111 275**
Percentage of White Sugars Made	99	67	Nil	Nil	Nil	51	Nil	Nil	Nil	Nil	100
Average °Pol of All Sugars made	99,90	99,28	99,18	99,37	99,45	99,59	99,38	99,62	98,68	99,54	99,94
Tons of Cane Crushed	**697 505**	**590 515**	**840 948**	**705 725**	**677 192**	**172 769**	**1 020 084**	**292 048**	**140 568**	**735 350**	**994 199**
Season started on	29.5.70	14.5.70	22.6.70	2.5.70	1.5.70	18.5.70	1.5.70	13.5.70	18.5.70	1.5.70	25.5.70
Season completed on	9.1.71	21.12.70	17.12.70	2.12.70	14.12.70	26.11.70	8.12.70	16.12.70	23.12.70	6.12.70	21.1.71
Time Account:											
Hours crushing % available hours	66,27	77,98	91,71	76,46	80,23	77,33	76,97	80,24	71,10	82,31	76,74
Hours weekend stops % available hours	8,87	13,98	—	9,37	10,61	13,94	13,67	15,05	14,61	9,45	14,19
Hours lack of cane % available hours	7,88	3,87	2,12	8,59	3,03	2,96	4,05	3,38	9,11	6,46	2,04
Other hours of stoppages % avail. hours	16,98	4,17	6,17	5,58	6,13	5,77	5,32	1,33	5,18	1,78	7,03
Throughputs per Hour Actual Crushing:											
Tons of cane crushed	196,61	144,84	214,56	180,31	156,06	48,35	250,21	70,06	40,87	170,47	222,34
Tons of fibre milled	28,02	19,77	30,83	33,27	24,60	6,59	38,47	10,27	6,08	25,71	36,32
Tons of Brix processed	31,24	23,29	32,88	28,07	23,49	7,81	38,56	10,74	6,24	26,58	33,06
Tons of sugar bagged	22,65	18,17	24,62	20,55	17,36	6,03	29,15	8,46	4,82	19,85	24,88
Composition of Cane Crushed:											
Sucrose % cane	**14,02**	**14,22**	**13,51**	**13,70**	**13,12**	**14,56**	**13,70**	**14,26**	**13,97**	**13,67**	**13,24**
Fibre % cane	**14,25**	**13,65**	**14,37**	**18,45**	**15,76**	**13,63**	**15,37**	**14,66**	**14,88**	**15,08**	**16,34**
Java Ratio	78,58	80,33	78,51	76,44	76,99	79,27	78,89	77,55	79,38	79,77	77,82
Tons cane per ton of sugar	8,68	7,97	8,72	8,77	8,99	8,02	8,58	8,28	8,47	8,59	8,93
Tons cane per ton of 96° sugar	8,34	7,71	8,44	8,48	8,68	7,73	8,29	7,98	8,24	8,28	8,65
Cane Varieties Crushed:											
Co. 331	Nil	Nil	0,06	0,01	0,12	0,01	0,05	0,72	4,44	0,30	0,22
N:Co. 310	32,52	73,06	74,84	24,06	38,89	1,31	1,76	1,88	8,11	2,72	1,97
N:Co. 293	0,06	Nil	Nil	0,09	0,02	17,58	0,30	8,52	4,43	0,15	1,26
N:Co. 376	56,22	23,81	9,53	21,58	40,10	70,57	37,81	76,15	62,06	82,92	68,22
N:Co. 382	0,98	Nil	10,34	0,87	8,76	3,78	0,47	5,03	2,47	0,44	2,98
N.50/211	0,01	Nil	4,16	0,88	1,31	2,25	0,83	1,02	1,26	2,16	3,33
Not specified	10,21	3,13	1,07	52,51	10,80	4,50	58,78	6,68	17,23	11,31	22,02
Total Rainfall during 1970 (mm)	—	442	579	850	1 042	1 076	811	810	599	747	678
Performances:											
Specific feed rate (kg/h/m³ t.r.v.)	Diff.	576	541	Diff.	618	Diff.	836	834	871	749	848
Specific feed rate (kg/h/m² e.d.a.)	176	—	—	180	—	103	—	—	—	—	—
Imbibition % cane	41,68	41,09	42,22	55,18	40,10	43,69	43,74	34,75	42,10	58,25	40,42
Imbibition % fibre	293	301	293	299	254	320	285	237	283	386	247
Lost absolute juice % fibre	**33,82**	**31,11**	**35,50**	**24,99**	**28,62**	**25,31**	**28,99**	**41,09**	**43,18**	**28,54**	**33,98**
Extraction	95,67	96,25	95,14	95,23	95,34	97,04	95,29	94,11	93,41	95,68	94,83
Boiling House Recovery	85,82	90,94	88,52	86,80	88,48	87,85	88,66	89,61	89,22	88,62	88,42
Overall Recovery	82,11	87,53	84,22	82,66	84,36	85,25	84,49	84,33	83,35	84,79	83,85
Sucrose Balance:											
Lost in bagasse (a)	4,33	3,75	4,86	4,77	4,66	2,96	4,71	5,89	6,59	4,32	5,17
Lost in filter cake (b)	0,44	0,97	0,58	0,16	0,43	0,64	0,50	0,57	0,31	0,39	0,66
Lost in final molasses (c)	10,42	7,41	10,24	10,52	8,70	8,89	8,37	8,04	8,33	8,57	9,69
Undetermined losses (d)	**2,70**	**0,34**	**0,10**	**1,89**	**1,85**	**2,26**	**1,93**	**1,17**	**1,42**	**1,93**	**0,63**
Boiling house losses (b)+(c)+(d)	13,56	8,72	10,92	12,57	10,98	11,79	10,80	9,78	10,06	10,89	10,98
Sum of all losses (a)+(b)+(c)+(d)	17,89	12,47	15,78	17,34	15,64	14,75	15,51	15,67	16,65	15,21	16,15

* Sugar tonnages and boiling house data reported by these three factories are based on weight of sugar leaving rawhouse and not on actual sugar production of the factory cum refinery.

THROUGHPUTS AND TIME ACCOUNTS, PERFORMANCES AND LOSSES

MV	JB	UC	TS	ME	IL	RN	SZ*	UK	Totals and Means	MH	UR	LB	MR	NH
26 614	**86 924**	**27 969**	**141 572**	**H.T.M.**	**57 910**	**30 034**	**104 158**	**49 119**	**1 405 803†**	**79 423**	**81 800**	**73 559**	**71 811**	**36 115**
Nil	Nil	Nil	Nil	Nil	—	—	70	—	23	4	23	11	57	40
98,94	99,21	99,66	99,61	—	99,43	98,69	99,76	99,75	99,38	98,63	98,64	98,31	99,08	97,01
225 668	**730 750**	**238 010**	**1 283 642**	**713 246**	**486 797**	**265 165**	**897 912**	**435 803**	**12 143 896**	**656 918**	**682 697**	**632 751**	**626 211**	**115 974**
13.5.70	24.4.70	8.5.70	5.5.70	29.4.70	30.4.70	21.5.70	12.5.70	12.5.70	24.4.70	28.4.70	1.5.70	14.5.70	4.5.70	21.4.70
19.11.70	26.12.70	8.1.71	10.1.71	12.12.70	23.1.71	4.12.70	23.12.70	7.11.70	23.1.71	2.12.70	12.12.70	21.11.70	6.12.70	18.12.70
71,78	73,24	78,06	75,66	78,76	78,17	73,83	75,33	70,37	76,60	88,97	85,82	84,15	80,50	80,44
16,37	13,05	13,98	11,79	14,07	13,66	15,56	12,54	15,68	12,58	6,49	8,14	6,39	8,95	11,13
5,55	4,77	2,50	3,38	6,31	6,29	7,25	7,43	10,00	5,28	1,80	1,57	0,54	2,54	0,68
6,30	8,95	5,46	9,17	0,86	1,88	3,36	4,70	3,95	5,54	2,74	4,47	8,92	8,01	7,75
69,00	172,84	51,63	282,99	165,91	98,45	76,05	223,39	145,79	151,37	144,34	146,96	165,77	150,56	73,36
10,71	25,31	7,55	45,50	25,51	14,42	11,82	34,53	21,08	23,21	21,55	20,81	24,82	22,66	10,55
10,44	27,39	7,97	40,56	25,34	15,46	11,38	33,55	21,83	23,14	22,18	22,84	20,07	22,90	10,90
8,14	20,56	6,07	31,21	—	11,71	8,61	25,91	16,43	17,52	17,45	17,61	19,27	17,27	8,34
13,71	**13,99**	**13,48**	**12,99**	**13,41**	**14,07**	**13,68**	**13,58**	**13,66**	**13,61**	**14,07**	**14,12**	**13,72**	**14,34**	**13,48**
15,53	**14,64**	**14,63**	**16,08**	**15,37**	**14,65**	**15,55**	**15,46**	**14,46**	**15,34**	**14,93**	**14,16**	**14,97**	**15,05**	**14,52**
78,91	80,63	77,68	76,80	77,83	78,36	79,81	78,83	80,09	77,98	80,32	80,27	C.L.	C.L.	81,16
8,48	8,41	8,51	9,07	8,32	8,41	8,83	8,62	8,87	8,64	8,27	8,35	8,60	8,72	8,79
8,16	8,14	8,20	8,74	8,09	8,11	8,59	8,32	8,54	8,34	8,05	8,11	8,40	8,45	8,70
0,25	6,55	5,16	0,09	0,52	0,41	0,01	0,06	0,27	0,64	Nil	Nil	Nil	Nil	Nil
2,43	1,66	Nil	3,49	2,22	6,66	2,27	1,68	2,78	11,85	30,42	23,85	29,90	30,11	74,26
0,01	53,12	64,21	1,29	5,74	27,36	Nil	1,06	5,02	6,28	Nil	Nil	Nil	Nil	Nil
51,69	13,26	5,27	66,05	40,53	50,55	86,46	79,30	90,52	54,18	64,66	68,19	52.70	52,72	24,66
0,97	22,50	24,27	5,41	2,12	10,63	6,86	4,24	0,11	4,48	Nil	Nil	14,20	16,60	Nil
1,54	0,30	1,07	7,39	4,84	1,30	1,63	0,72	0,36	2,12	Nil	1,38	Nil	Nil	Nil
43,11	2,61	0,02	16,28	44,03	3,09	2,77	12,94	0,94	20,45	4,92	6,58	3,20	0,57	1,08
738	650	844	687	910	942	1 027	1 024	1 074	—	530	419	681	741	521
688	621	Diff.	868	748	627	823	1 207	975	—	1 087	1 045	1 149	1 258	—
—	—	157	—	—	—	—	—	—	—	—	—	—	—	182
48,04	47,13	35,16	34,68	52,20	39,59	36,15	49,99	35,56	43,17	31,33	27,40	30,26	31,39	36,51
309	322	240	216	340	270	233	323	246	285	210	193	202	209	251
33,71	**27,39**	**18,45**	**32,70**	**23,93**	**31,41**	**43,18**	**31,07**	**34,86**	**30,85**	**39,01**	**39,89**	**52,51**	**57,43**	**35,38**
94,75	96,49	97,57	94,38	96,84	95,83	93,63	95,40	95,34	95,41	93,73	94,23	91,76	90,82	94,48
89,80	87,40	89,03	89,59	—	87,71	87,26	89,03	86,34	88,57	90,44	89,02	90,77	87,22	86,58
85,08	84,33	86,86	84,56	—	84,05	81,70	84,94	82,32	84,51	84,77	83,88	83,29	79,21	81,81
5,25	3,51	2,43	5,62	3,16	4,17	6,37	4,60	4,66	4,59	6,27	5,77	8,24	9,18	5,52
0,35	0,37	0,36	0,58	0,45	0,49	0,85	0,56	0,56	0,51	0,45	0,16	0,31	0,72	0,69
8,79	9,58	8,88	8,08	—	8,88	8,49	9,47	9,28	8,96	7,62	8,62	6,62	7,91	9,20
0,53	**2,21**	**1,47**	**1,16**	—	**2,41**	**2,59**	**0,43**	**3,18**	**1,43**	**0,89**	**1,57**	**1,54**	**2,98**	**2,78**
9,67	12,16	10,71	9,82	—	11,78	11,93	10,46	13,03	11,05	8,96	10,35	8,47	11,61	12,67
14,92	15,67	13,14	15,44	—	15,95	18,30	15,06	17,69	15,64	15,23	16,12	16,71	20,79	18,19

† Total weight of sugar made includes the sugar equivalent of H.T.M. made by M.E.

TABLE C

ANALYSIS OF BAGASSE, JUICES, FILTER

(Season 1970 - 1971)

FACTORY SYMBOL	ML	PG	UF	EM	FX	EN	AK	DK	GD	DL	GH
Final Bagasse:											
Sucrose % bagasse	**1,84**	**1,81**	**1,90**	**1,53**	**1,78**	**1,32**	**1,88**	**2,45**	**2,77**	**1,77**	**1,86**
Moisture % bagasse	**54,06**	**50,78**	**55,49**	**54,67**	**51,74**	**56,04**	**52,74**	**53,79**	**51,51**	**52,24**	**52,65**
Fibre % bagasse	43,08	46,39	41,69	43,16	45,80	41,89	44,77	42,81	44,74	45,26	44,52
Bagasse % cane	33,08	29,43	34,47	42,75	34,41	32,55	34,34	34,24	33,27	33,33	36,69
L.C.V. in kJ per kg bagasse	6 852	7 512	6 562	6 742	7 321	6 476	7 115	6 880	7 325	7 221	7 134
Brix-free water % fibre	**37**	**25**	**35**	**12**	**30**	**31**	**18**	**38**	**25**	**19**	**17**
First Expressed Juice:											
Brix	20,90	20,41	20,20	20,81	20,00	20,50	19,87	20,67	20,28	20,02	19,65
Apparent purity	85,36	86,77	85,21	86,11	85,16	89,60	87,41	88,98	86,78	85,56	85,55
Last Expressed Juice:											
Brix	3,00	2,34	1,60	2,79	2,31	1,05	1,51	3,68	3,04	1,80	2,27
Apparent purity	64,67	65,29	67,60	70,50	71,88	64,24	75,34	72,43	73,77	70,86	65,61
Purity drop	**20,69**	**21,48**	**17,61**	**15,61**	**13,28**	**25,36**	**12,07**	**16,55**	**13,01**	**14,70**	**19,49**
Mixed Juice:											
Brix	14,63	14,40	14,22	13,85	14,24	14,54	14,09	15,25	14,03	12,48	14,33
Apparent purity	—	85,14	83,88	—	—	—	—	87,53	—	—	—
Purity drop	**0,94**	**1,63**	**1,33**	**2,36**	**2,06**	**2,14**	**2,69**	**1,46**	**1,34**	**1,71**	**1,04**
Gravity purity	84,42	85,14	—	83,75	83,10	87,46	84,72	87,59	85,44	83,85	84,51
Reducing Sugars/Sucrose Ratio	5,63	3,22	3,28	3,18	4,65	2,13	4,00	2,29	4,35	3,97	4,96
Clarified Juice:											
Brix	14,00	14,93	13,54	13,62	12,31	13,90	13,07	14,65	14,09	11,65	13,22
Apparent purity	86,14	86,40	84,78	85,11	85,13	87,46	85,85	87,30	85,92	84,88	85,69
Reducing Sugars/Sucrose Ratio	4,92	3,03	3,05	3,49	4,41	2,09	3,40	2,55	4,54	3,84	3,41
Average pH	7,28	**7,08**	**7,21**	**7,20**	**7,30**	**7,42**	**7,44**	**7,10**	**7,20**	**7,10**	**7,32**
Filter Cake:											
Pol % filter cake	1,72	2,39	1,56	0,65	0,94	1,85	1,39	1,64	1,42	1,02	1,94
Filter cake % cane	3,58	5,76	5,00	3,40	3,61	5,00	4,90	5,00	3,00	5,23	4,52
Syrup:											
Brix	61,09	65,14	61,62	62,03	62,16	62,13	61,91	60,64	66,98	64,70	61,08
Apparent purity	85,56	85,65	84,58	86,70	85,89	87,09	86,75	87,91	86,29	85,89	85,93
Reducing Sugars/Sucrose Ratio	5,38	2,44	3,40	2,88	4,36	1,82	3,17	2,32	3,76	3,84	3,31
Average pH	6,21	**6,77**	**6,60**	**6,60**	**6,40**	**7,01**	**6,59**	**6,60**	**6,00**	**6,30**	**6,74**
Final Molasses:											
Spindle Brix (undiluted)	—	93,55	94,41	—	—	88,03	—	92,90	92,33	—	88,37
Refracto Brix (undiluted)	85,94	—	—	90,34	89,33	—	89,27	—	—	85,57	—
Pol/spindle Brix purity	—	38,74	39,80	—	—	42,92	—	39,20	36,25	—	—
Sucrose/spindle Brix purity	—	38,26	38,31	—	—	41,58	—	40,46	38,86	—	39,78
Pol/refracto Brix purity	38,96	—	—	41,46	39,69	—	39,71	—	—	—	—
Sucrose/refracto Brix purity	42,91	—	—	41,01	39,46	—	—	—	—	38,36	—
Percentage reducing sugars	16,81	10,78	12,87	—	—	7,38	16,85	12,59	13,73	—	—
Percentage sulphated ash	13,04	—	16,52	—	—	14,47	13,37	—	—	—	10,69
Reducing sugars/ash ratio	1,29	—	0,79	—	—	0,51	1,26	—	—	—	—
Molasses of 85° spindle Brix % cane	4,01	3,20	4,25	4,15	3,61	3,66	3,52	3,34	3,52	3,84	—

CAKE, SYRUP AND FINAL MOLASSES

MV	JB	UC	TS	ME	IL	RN	SZ	UK	Totals and Averages	MH	UR	LB	MR	NH
2,08	**1,48**	**1,09**	**2,01**	**1,27**	1,76	2,44	1,81	1,90	1,80	2,65	2,52	3,17	3,84	**2,06**
52,30	**53,43**	**49,68**	**53,18**	**51,94**	53,57	53,01	52,51	54,00	53,07	51,69	52,79	53,90	51,09	**57,08**
44,82	44,21	48,65	44,19	45,99	43,75	43,42	44,86	43,20	44,32	44,91	43,83	41,99	43,88	40,28
34,65	33,12	30,07	36,39	33,43	33,48	35,80	34,46	33,47	34,61	33,25	32,31	35,66	34,30	36,05
7 195	**6 993**	**7 971**	**7 021**	**7 302**	**6 954**	**7 038**	**7 165**	**6 861**	**7 052**	**7 294**	**7 079**	**6 828**	**7 365**	**6 235**
23	**22**	**39**	**34**	**27**	**28**	**15**	**23**	**22**	**(26)**	**24**	**18**	—	—	**17**
19,94	20,26	20,00	19,49	19,85	20,45	19,79	19,66	19,32	20,10	20,23	20,32	C.L.19,11	C.L.18,85	19,05
87,15	85,69	86,77	86,81	86,79	87,82	86,61	88,30	88,25	86,83	86,56	86,58	88,23	86,56	87 28
2,08	1,47	3,03	2,60	1,39	2,27	2,80	2,21	2,31	2,28	3,16	2,97	3,76	4,21	3,16
72,74	62,58	65,30	76,19	61,12	65,20	67,50	68,78	67,97	68,48	78,14	74,67	77,07	76,20	78,48
14,41	**23,11**	**13,28**	**10,62**	**25,67**	**22,62**	**19,11**	**19,52**	**20,28**	**18,35**	**8,42**	**11,91**	**11,16**	**10,36**	**8,80**
13,34	13,90	14,68	14,58	12,86	14,80	14,91	13,00	14,67	14,14	15,66	16,34	15,21	15,67	14,79
—	—	85,25	—	—	85,54	—	86,08	86,43	—	85,82	85,47	—	—	85,09
1,25	**0,50**	**1,52**	**1,25**	**1,77**	**2,28**	**0,99**	**2,22**	**1,82**	**1,02**	**0,74**	—	—	—	**2,19**
85,90	85,19	85,28	85,56	85,02	85,87	85,62	86,31	86,91	84,99	—	85,62	87,50	85,60	85,75
3,14	5,12	3,47	4,27	4,27	4,28	2,95	3,29	3,59	3,80	3,10	4,36	4,21	3,57	3,86
12,31	12,99	14,97	14,05	11,86	13,92	15,52	12,09	13,62	13,51	15,63	15,97	15,95	15,58	15,08
87,07	86,53	85,85	87,18	85,95	86,85	86,73	86,68	87,59	86,25	87,31	86,45	86,77	85,91	87,00
3,03	4,58	3,76	3,71	4,04	4,33	2,54	2,90	3,62	3,56	2,75	4,42	3,97	3,74	2,66
7,20	**7,40**	**6,90**	**7,29**	**7,40**	**7,45**	**7,10**	**7,57**	**7,36**	**7,27**	**7,10**	**7,10**	**7,00**	**7,20**	**7,70**
1,16	1,27	1,00	1,86	0,94	1,74	2,12	1,18	1,90	1,46	2,44	0,56	0,90	2,48	1,82
4,15	4,07	4,91	4,08	6,47	3,95	5,47	6,43	4,00	4,82	2,59	4,06	4,74	4,16	5,13
62,55	63,72	60,07	66,00	55,04	63,70	59,41	60,90	61,52	62,12	63,88	63,06	65,69	61,05	53,09
86,36	86,06	85,79	87,35	86,65	86,20	87,06	87,16	86,52	86,37	86,45	86,16	86,77	85,86	86,66
3,27	4,51	3,66	3,66	4,24	3,01	2,96	2,75	3,92	3,43	1,82	4,08	3,75	3,25	3,23
6,50	**6,70**	**6,10**	**6,49**	**6,50**	**6,81**	**7,00**	**6,73**	**6,81**	**6,57**	**6,50**	**6,50**	**6,80**	**7,10**	**7,00**
—	90,87	93,10	—	H.T.M.	92,42	93,87	90,84	84,39	91,82	—	92,61	95,00	91,30	—
—	—	—	84,92	—	—	—	—	—	—	90,28	—	—	—	87,34
39,56	35,59	36,78	—	—	38,08	40,80	41,67	39,89	—	—	37,25	39,05	40,16	—
39,70	39,36	37,52	—	—	40,03	—	41,90	41,18	38,94	—	39,75	40,45	41,81	—
—	—	—	40,41	—	—	—	—	—	—	41,23	—	—	—	40,01
—	—	—	41,11	—	—	—	—	—	—	—	—	—	—	41,98
12,86	15,73	13,91	—	—	14,80	—	12,29	11,65	13,25	—	—	—	19,06	11,27
—	12,99	11,54	15,00	—	12,18	—	13,74	—	13,35	—	—	—	15,30	—
—	1,21	1,21	—	—	1,22	—	0,89	—	1,05	—	—	—	1,25	—
3,57	4,01	—	3,18	—	3,67	3,35	3,61	4,29	3,69	3,26	3,60	2,64	3,19	3,61

TABLE D

MASSECUITES, EXHAUSTIONS, CLARIFYING

(Season 1970 - 1971)

SYMBOLS OF FACTORIES	ML	PG	UF	EM	FX	EN	AK	DK	GD	DL	GH
Brix in Mixed Juice % Cane	**15,89**	**16,08**	**15,33**	**15,57**	**15,05**	**16,16**	**15,41**	**15,32**	**15,27**	**15,59**	**14,87**
A-Massecuite:											
m³ per ton Brix in mixed juice	1,20	1,19	0,93	0,91	0,90	0,90	0,93	0,93	0,66	0,94	0,99
Brix of massecuite	91,36	90,91	93,71	92,89	93,06	92,00	94,22	94,22	93,22	93,90	93,09
Purity of massecuite	84,83	86,62	86,27	88,23	87,47	85,87	91,02	90,14	84,38	89,07	89,28
Purity A molasses	70,73	70,52	68,25	70,94	71,46	71,04	70,91	73,64	63,38	71,90	72,71
Purity drop	14,10	16,10	18,02	17,29	16,01	14,83	20,11	16,50	21,00	17,17	16,57
Exhaustion	**56,79**	**63,05**	**65,95**	**67,43**	**64,13**	**59,63**	**75,95**	**69,44**	**67,96**	**68,60**	**68,01**
Purity A mc—Purity Syrup	**—0,73**	**0,97**	**1,69**	**1,53**	**1,58**	**—1,22**	**4,27**	**2,23**	**—1,91**	**3,18**	**3,35**
B-Massecuite:											
m³ per ton Brix in mixed juice	0,41	0,40	0,33	0,32	0,30	0,44	0,29	0,29	0,55	0,28	0,37
Brix of massecuite	94,08	94,15	95,50	95,12	93,77	96,76	94,15	94,54	94,81	93,95	95,14
Purity of massecuite	70,70	74,84	70,71	72,28	72,32	71,72	73,19	74,65	72,54	72,71	73,65
Purity of B molasses	47,30	55,48	51,82	51,73	50,56	50,75	49,31	54,19	50,91	48,24	52,85
Purity drop	23,40	19,36	18,89	20,55	21,76	20,97	23,88	20,46	21,63	24,47	20,80
Exhaustion	62,80	58,11	55,45	58,90	60,86	59,37	64,37	59,83	60,74	65,02	59,90
C-Massecuite											
m³ per ton Brix in mixed juice	0,28	0,30	0,27	0,35	0,26	0,25	0,26	0,27	0,24	0,25	0,29
Brix of massecuite	95,74	98,20	99,29	96,91	96,05	97,54	96,04	97,22	98,15	95,80	97,32
Purity of massecuite	57,77	59,99	57,85	61,12	60,21	60,00	60,45	60,71	54,75	58,79	59,91
Purity of C molasses	38,06	38,74	38,81	41,01	39,69	41,58	39,71	39,20	38,86	36,91	39,94
Purity drop	19,71	21,25	19,04	20,11	20,52	18,42	20,74	21,51	15,89	21,88	19,97
Crystal % massecuite	**30,47**	**34,06**	**30,89**	**33,04**	**32,68**	**30,75**	**33,04**	**34,39**	**25,51**	**33,22**	**32,36**
Exhaustion	**55,08**	**57,82**	**53,91**	**55,78**	**56,51**	**52,55**	**56,91**	**58,27**	**47,47**	**58,99**	**55,50**
White Sugar Massecuites:											
Kgs sugar per m³	—	559	—	—	—	—	—	—	—	—	—
Total volume of all massecuites											
m³ per ton Brix in mixed juice	—	2,80	1,53	1,58	1,46	1,59	1,48	1,49	1,45	1,47	2,59
Clarifying Agents:											
Tons limestone per 1 000 T.C.	—	5,11	—	—	—	—	—	—	—	—	5,04
Tons coke per 1 000 T.C.	—	0,52	—	—	—	—	—	—	—	—	0,55
Tons lime per 1 000 T.C.	—	—	0,58	0,67	0,59	2,33	0,49	0,46	0,57	0,51	0,62
Tons sulphur per 1 000 T.C.	—	0,02	—	—	—	0,78	—	—	—	—	—
Phosphoric acid ppm mixed juice	—	—	—	—	—	—	—	—	—	—	—
Flocculents ppm mixed juice	—	1,03	2,88	—	—	4,17	—	—	1,48	—	—
Additional Fuels:											
Per 1 000 Tons of Cane											
Tons of fuel oil	—	—	—	—	—	—	—	—	—	—	—
Tons of coal	33,91	8,26	1,97	0,69	24,38	5,07	0,55	—	—	—	11,47
Tons of wood	—	—	0,05	2,31	—	—	—	13,21	5,78	1,34	2,93
Converted into tons bagasse	**135,64**	**33,04**	**7,94**	**5,53**	**97,52**	**20,28**	**2,20**	**15,85**	**6,92**	**1,61**	**49,40**

$$\text{Exhaustion} = \frac{100\ (\text{Pty. Massecuite} - \text{Pty. run off})}{\text{Pty. Massecuite}\ (100 - \text{Pty. run off})}$$

$$\text{Crystal Content} = \frac{100\ (\text{Pty. Massecuite} - \text{Pty. run off})}{100 - \text{Pty. run off}}$$

AGENTS AND ADDITIONAL FUELS

MV	JB	UC	TS	ME	IL	RN	SZ	UK	Totals and Averages	MH	UR	LB	MR	NH
15,13	**15,74**	**15,93**	**14,33**	**15,27**	**15,71**	**14,96**	**15,02**	**14,97**	**15,28**	**15,36**	**15,54**	**14,39**	**15,21**	**14,85**
1,12	1,02	1,22	1,02	—	1,26	0,66	1,10	0,94	1,00	0,92	1,01	0,77	0,73	0,71
91,63	92,30	93,13	92,45	—	93,62	94,04	91,59	92,48	92,83	92,00	91,43	93,58	93,21	89,81
88,80	87,89	87,06	87,84	—	88,60	86,20	88,70	87,30	87,66	87,56	88,51	82,59	86,11	87,45
74,30	72,76	71,00	73,14	—	74,88	69,40	75,21	71,63	71,46	71,17	73,23	66,54	69,93	73,37
14,50	15,13	16,06	14,70	—	13,72	16,80	13,49	15,67	16,20	16,39	15,28	16,05	16,18	14,08
63,54	**63,20**	**63,61**	**62,30**	—	61,63	61,34	61,35	63,27	64,75	64,93	64,51	58,08	62,49	**60,46**
2,46	**1,83**	**1,27**	**0,49**	—	**2,40**	**—0,82**	**1,54**	**0,78**	**1,29**	**1,11**	**2,35**	**4,18**	**0,21**	**0,79**
0,38	0,39	0,53	0,37	—	0,36	0,35	0,46	0,30	0,36	0,44	0,37	0,49	0,47	0,42
94,07	94,80	94,64	93,13	—	93,73	95,62	94,25	95,29	94,61	93,57	94,06	94,65	95,62	92,47
74,20	75,89	70,82	73,64	—	76,08	74,00	74,49	72,93	73,23	75,42	75,79	70,84	73,63	76,32
48,70	53,91	48,64	53,38	—	53,88	51,70	54,53	52,22	51,58	56,76	52,10	51,80	52,43	54,50
25,50	21,98	22,18	20,26	—	22,20	22,30	19,96	20,71	21,65	18,66	23,69	19,04	21,20	21,82
66,99	62,84	60,98	59,01	—	63,26	62,39	58,93	59,43	61,06	57,22	65,25	55,76	60,53	62,84
0,23	0,29	0,30	0,23	—	0,26	0,24	0,31	0,25	0,27	0,29	0,31	0,35	0,25	0,24
96,70	97,54	96,28	94,52	—	98,05	97,23	98,19	97,70	97,08	95,53	97,90	98,52	100,67	95,83
57,00	60,43	57,61	58,75	—	60,95	60,40	61,04	60,47	59,38	64,11	62,20	58,73	59,70	58,63
39,56	39,36	36,78	40,25	—	40,03	41,50	41,58	40,29	39,57	41,23	37,25	38,93	36,24	40,01
17,40	21,07	20,83	18,50	—	20,92	18,90	19,46	20,18	19,81	22,88	24,95	19,80	23,46	18,62
27,84	**33,89**	**31,72**	**29,27**	—	**34,20**	**31,41**	**32,71**	**33,02**	**31,82**	**37,19**	**38,93**	**31,94**	**37,04**	**29,74**
50,51	**57,50**	**57,19**	**52,70**	—	**57,23**	**53,49**	**54,57**	**55,89**	**55,21**	**60,73**	**63,92**	**55,20**	**61,63**	**52,94**
—	—	—	—	—	—	—	—	—	—	—	576	—	—	773
1,73	1,70	2,05	1,62	—	1,88	1,25	1,87	1,49	—	1,65	2,00	1,61	1,45	1,77
—	—	—	—	—	—	—	3,35	—	—	—	—	—	—	—
—	—	—	—	—	—	—	0,33	—	—	—	—	—	—	—
0,56	0,84	0,82	0,42	0,60	0,41	0,69	1,88	0,58	—	0,75	1,17	1,59	1,40	—
—	—	—	—	—	—	—	0,08	—	—	—	0,02	0,15	0,33	—
—	214,86	439,77	—	—	—	—	—	22,88	—	—	—	—	2,13	—
4,80	7,07	10,39	1,01	—	4,55	—	2,89	2,54	—	1,78	3,02	4,51	4,48	—
—	—	—	—	—	—	—	0,03	—	—	—	—	6,19	5,48	—
7,77	—	20,74	—	0,09	4,57	—	6,75	—	—	—	9,13	1,07	0,96	—
4,45	7,81	0,82	—	—	6,83	—	0,30	3,50	—	—	—	0,63	0,56	—
36,42	**9,37**	**85,94**	—	**0,36**	**26,48**	—	**27,36**	**4,20**	—	—	**36,52**	**48,11**	**42,63**	—

1 m³ fuel oil is equivalent to 5,5 metric tons of bagasse.

1 metric ton of fuel oil is equivalent to 6 metric tons of bagasse.

1 metric ton of coal is equivalent to 4 metric tons of bagasse.

1 m³ fire wood is equivalent to 0,42 metric tons of bagasse.

TABLE E

COMPARATIVE MANUFACTURING DATA OF RECENT YEARS (S.A. MILLS)

SEASON	1970/71	1969/70	1968/69	1967/68	1966/67
CANE					
Sucrose % cane	13,61	12,88	13,11	12,92	13,72
Fibre % cane	15,34	15,03	15,32	15,01	15,09
JUICES					
Brix % first expressed juice	20,10	19,00	19,54	19,16	19,84
Purity of first expressed juice	86,83	86,06	85,49	85,26	86,97
Purity of last expressed juice	68,48	68,78	69,72	71,43	72,43
Drop in purity	18,35	17,28	15,77	13,83	14,54
Purity of mixed juice	84,99	84,25	83,60	83,41	85,06
Reducing sugar/sucrose ratio	3,80	4,17	4,23	3,81	3,63
MILLING					
Imbibition % fibre	285	274	268	261	262
LOST ABSOLUTE JUICE % FIBRE	30,85	34,15	34,38	38,32	37,91
Imbibition % cane	43,17	41,22	41,12	39,15	39,60
EXTRACTION	95,41	94,98	94,74	94,15	94,22
Sucrose % bagasse	1,80	1,89	1,98	2,19	2,29
Moisture % bagasse	53,07	53,30	53,52	53,47	53,52
Bagasse % cane	34,61	34,18	34,93	34,53	34,56
Lower calorific value kJ/kg	**7 052**	**7 005**	**6 997**	**6 957**	**6 943**
Available kJ per kg Brix	**15 967**	**16 479**	**16 444**	**16 477**	**15 788**
RECOVERIES					
BOILING HOUSE PERFORMANCE	—	—	96,19	95,82	95,96
Boiling house recovery	88,57	88,58	87,40	87,52	88,38
Overall recovery	84,51	84,13	82,72	82,33	83,27
Tons cane per ton sugar	8,64	9,10	9,06	9,28	8,63
FILTER CAKE					
Sucrose % filter cake	1,46	1,58	2,08	2,10	2,16
Filter cake % cane	4,82	4,49	4,71	4,71	5,21
FINAL MOLASSES					
GRAVITY PURITY	38,94	38,43	39,40	38,75	40,56
Degree Brix	91,82	91,37	91,81	92,03	93,45
Weight at 85° Brix % cane	3,69	3,55	3,78	3,69	3,47
AVERAGE SUGAR POLARISATION	99,38	98,68	98,42	98,34	98,58
SUCROSE BALANCE					
Lost in filter cake	0,51	0,55	0,77	0,80	0,82
Lost in final molasses	8,96	9,01	9,64	9,38	8,75
Undetermined losses	1,43	1,29	1,51	1,57	1,38
LOST IN BOILING HOUSE	11,05	10,85	11,92	11,75	10,95
Lost in bagasse	4,59	5,02	5,36	5,92	5,78
TOTAL OF ALL LOSSES	15,64	15,87	17,28	17,67	16,73
m^3 OF MASSECUITES PER TON BRIX					
A-Massecuite	1,00	0,94	0,91	0,92	0,91
B-Massecuite	0,36	0,36	0,36	0,37	0,32
C-Massecuite	0,27	0,28	0,29	0,30	0,27
TOTAL	1,63	1,58	1,56	1,58	1,50
EXHAUSTION OF MASSECUITES					
A-Massecuite	64,75	65,01	64,73	65,05	62,85
B-Massecuite	61,06	60,96	60,35	61,31	58,36
C-Massecuite	55,21	56,25	56,15	58,28	55,59
PURITY RISE					
A-Massecuite purity	87,66	87,11	86,26	86,07	86,68
Syrup purity	86,37	85,45	84,92	84,59	86,03
RISE	+1,29	+1,66	+1,34	+1,48	+0,65
°BRIX OF SYRUP	62,12	61,03	61,23	59,96	60,35

TABLE F

AVERAGE MANUFACTURING RESULTS BY MONTHLY PERIODS FOR SOUTH AFRICAN MILLS
(Season 1970 - 1971)

END OF MONTHLY PERIOD:		May 30 1970	June 27 1970	August 2 1970	August 29 1970	September 27 1970	October 31 1970	November 29 1970	January 2 1971
TONS SUGAR MADE AND ESTIMATED	Month	(124 865)	(181 601)	(248 278)	(200 066)	(198 043)	(204 920)	(150 206)	(81 561)
	To Date	(127 246)	(308 847)	(557 125)	(757 191)	(955 231)	(1 160 151)	(1 310 357)	(1 391 918)
TONS CANE CRUSHED	Month	1 092 914	1 538 371	2 063 653	1 643 867	1 607 485	1 781 748	1 407 235	830 776
	To Date	1 114 612	2 652 983	4 716 636	6 360 505	7 967 992	9 749 740	11 156 975	11 987 751
TONS CANE CRUSHED PER HOUR ACTUAL CRUSHING	Month	151	148	152	154	150	150	158	158
	To Date	151	150	151	152	152	151	155	149
SUCROSE % CANE.	Month	13,46	13,77	13,97	14,19	14,41	13,64	12,65	11,99
	To Date	13,46	13,64	13,80	13,90	14,00	13,93	13,86	13,72
FIBRE % CANE.	Month	15,19	15,07	14,99	15,07	15,55	15,57	15,69	16,02
	To Date	15,17	15,11	15,04	15,05	15,15	15,22	15,28	15,25
TONS CANE PER TON 96° SUGAR	Month	8,47	8,16	8,03	7,93	7,84	8,40	9,09	9,84
	To Date	8,48	8,30	8,18	8,12	8,06	8,12	8,22	8,28
LOST ABSOLUTE JUICE % FIBRE	Month	35	28	30	31	30	29	31	33
	To Date	35	31	31	31	30	30	30	31
IMBIBITION % FIBRE	Month	274	286	288	287	289	287	290	285
	To Date	275	281	284	285	286	286	288	295
SUCROSE EXTRACTION	Month	95,35	95,44	95,64	95,59	95,50	95,37	95,29	94,99
	To Date	95,37	95,41	95,52	95,54	95,53	95,49	95,51	95,49
SUCROSE % BAGASSE	Month	1,81	1,86	1,80	1,85	1,86	1,81	1,69	1,66
	To Date	1,81	1,84	1,82	1,83	1,84	1,83	1,80	1,79
MOISTURE % BAGASSE . . .	Month	52,94	52,89	53,01	52,87	52,81	53,12	52,23	53,49
	To Date	53,07	52,97	53,00	52,97	52,94	52,97	53,01	53,11
BOILING HOUSE RECOVERY . .	Month	88,30	89,41	89,33	89,25	89,01	87,88	87,62	85,65
	To Date	88,21	88,92	89,04	89,09	89,06	88,85	88,76	88,44
OVERALL RECOVERY	Month	84,18	85,33	85,44	85,31	85,01	83,78	83,49	81,35
	To Date	84,12	84,83	85,05	85,12	85,08	84,85	84,78	84,46
MIXED JUICE PURITY	Month	85,00	85,82	85,88	85,95	85,59	84,61	83,65	82,46
	To Date	84,98	85,45	85,62	85,82	85,78	85,39	85,18	84,95
R.S./SUCROSE RATIO	Month	3,90	3,58	3,43	3,57	3,63	3,81	4,26	5,27
	To Date	3,94	3,70	3,62	3,61	3,62	3,65	3,75	3,78
SUCROSE/SPINDLE BRIX PURITY OF FINAL MOLASSES	Month	38,63	38,59	39,15	39,02	38,69	41,26	39,76	40,33
	To Date	38,73	38,65	38,96	39,12	38,73	39,19	39,43	39,31
SUCROSE LOST IN FINAL MOLASSES % SUCROSE IN CANE	Month	8,62	8,50	8,35	8,50	8,85	9,19	9,83	11,48
	To Date	8,68	8,57	8,40	8,44	8,52	8,64	8,78	9,03
UNDETERMINED LOST SUCROSE % SUCROSE IN CANE	Month	2,09	1,13	1,36	1,28	1,15	1,85	1,33	1,56
	To Date	2,11	1,54	1,52	1,50	1,44	1,50	1,45	1,49

Figures between brackets include the sugar equivalent of H.T.M. manufactured

TABLE G

COMPARATIVE DATA OF REPORTING S.A. MILLS FROM 1925 ONWARDS

PERIOD (Season)	Per Cent Cane		Cane/Sugar Ratio		Extraction	Lost Absol. Juice % Fibre	Per Cent Bagasse		Imbibition per cent		Mixed Juice		Final Molasses Purity	Boiling House Performance	Boiling House Recovery	Overall Recovery
	Sucrose	Fibre	Tel. Quel	96° Sugar			Sucrose	Moisture	Cane	Fibre	Purity	Reducing Sugar Ratio				
Average 1925–1934	13,19	15,78	9,86	9,64	89,83	58,4	3,88	50,57	27,6	175	85,09	3,65	45,3	90,6	83,67	75,12
Average 1935–1944	13,53	15,30	8,96	8,73	92,05	48,9	3,11	51,60	32,6	213	86,01	3,22	43,3	95,4	88,36	81,34
1945	**14,28**	15,99	**8,29**	**8,08**	93,28	39,3	2,77	**50,19**	35,0	219	86,23	3,38	42,0	96,4	89,29	83,30
1946	14,21	16,21	8,36	8,14	93,07	40,5	2,79	50,32	35,2	217	85,86	3,30	41,8	96,7	89,12	82,94
1947	13,32	15,80	8,84	8,60	93,94	39,8	2,54	50,46	34,4	218	86,24	2,95	41,1	96,8	89,61	83,73
1948	13,89	15,90	8,55	8,31	93,32	39,8	2,67	50,53	34,1	214	85,92	3,67	41,5	96,5	89,14	83,19
1949	13,52	16,19	8,76	8,52	92,94	41,0	2,66	50,84	33,7	208	86,22	3,11	41,4	96,9	89,68	83,35
1950	14,19	15,80	8,32	8,09	93,33	39,3	2,72	51,22	32,8	206	**86,40**	3,12	40,5	96,9	89,63	83,65
1951	13,33	16,29	8,98	8,73	92,98	40,2	2,57	51,71	35,0	215	84,92	3,52	40,3	96,7	88,72	82,50
1952	13,87	16,10	8,50	8,27	93,00	40,8	2,65	52,53	34,9	217	86,25	**2,92**	39,3	97,2	89,96	83,66
1953	13,93	16,31	8,55	8,32	92,67	41,7	2,75	52,47	32,7	200	85,61	3,66	39,5	96,9	89,36	82,81
1954	13,34	16,03	8,87	8,65	92,40	44,1	2,75	52,92	30,7	191	85,86	3,28	39,3	97,4	90,04	83,20
Average 1945–1954	13,79	16,06	8,60	8,36	93,04	40,6	2,69	51,32	33,8	210	85,95	3,29	40,7	96,8	89,46	83,23
1955	13,87	15,74	8,51	8,28	92,32	45,5	2,91	53,18	32,1	204	85,96	3,40	39,6	97,9	**90,51**	83,56
1956	13,35	15,81	8,87	8,62	92,93	42,1	2,60	53,12	35,2	222	85,49	3,32	39,9	97,4	89,79	83,44
1957	13,11	15,38	8,93	8,67	93,36	40,9	2,47	53,06	34,5	224	85,10	3,69	38,5	**98,5**	90,43	84,42
1958	13,12	15,92	9,09	8,82	92,87	42,3	2,55	52,38	32,9	207	84,46	4,30	39,1	97,8	89,49	83,11
1959	13,66	15,92	8,74	8,44	92,86	43,0	2,66	53,26	34,6	218	85,52	3,51	40,3	97,1	89,42	83,04
1960	13,69	15,22	8,70	8,41	93,35	42,0	2,60	53,01	36,2	238	85,63	3,31	40,3	96,8	89,40	83,45
1961	13,75	**14,52**	8,51	8,26	94,21	39,0	2,43	52,54	36,7	253	86,04	3,31	39,5	97,1	89,72	**84,53**
1962	13,29	15,49	8,97	8,73	94,15	37,4	2,24	52,17	41,2	266	83,36	5,11	39,6	96,2	87,81	82,67
1963	13,55	15,50	8,66	8,42	94,08	37,5	2,29	52,46	39,8	258	85,30	3,44	39,4	97,2	89,60	84,30
1964	13,90	15,38	8,42	8,20	94,16	37,0	2,34	52,64	39,4	256	85,52	3,32	39,9	97,1	89,65	84,42
Average 1955–1964	13,53	15,49	8,75	8,49	93,43	40,7	2,51	52,78	36,3	235	85,24	3,67	39,6	97,3	89,58	83,69
1965	12,99	15,57	9,20	8,97	93,99	37,6	2,20	52,98	40,6	261	84,22	3,73	39,9	95,6	87,67	82,40
1966	13,72	15,09	8,63	8,40	94,22	37,9	2,29	53,52	39,6	262	85,06	3,63	40,6	96,0	88,38	83,27
1967	12,92	15,01	9,28	9,06	94,15	38,3	2,19	53,47	39,2	261	83,41	3,81	38,8	95,8	87,52	82,33
1968	13,11	15,32	9,06	8,83	94,74	34,4	1,98	53,32	41,1	268	83,60	4,23	39,4	96,2	87,40	82,72
1969	12,88	15.03	9,10	8,86	94,98	34,2	**1,89**	53,30	41,2	274	84,25	4,17	**38,4**	—	88,58	84,13
1970	13,61	15,34	8,64	8,34	**95,41**	**30,9**	**1,80**	53,07	**43,2**	**285**	84,99	3,80	38,9	—	88,57	84,51

DISCUSSION

Mr Perk: Swaziland factories have the highest time efficiencies and the lowest hours for weekend stoppage. By reducing weekend hours of stoppage efficiency is increased.

Mr Van Hengel: If we stop the mill but let the boiling house carry on over the weekend then our most capital intensive equipment is idle and also the mills must have an overproduction in respect of the pans.

I wish to comment on evaporation, boiling and cooling. Mr Lamusse draws all his comparisons on the basis of brix, especially in connection with molasses and C massecuites. I think a better relationship can be found by using non-sucrose in mixed juice.

What is not in the paper, because the information was not available, was that between refractometer and brix spindles, the average molasses purity difference between this year and last year is only 0,5. The Huletts average is 0,9 difference. The season was short and the crushing rate low because of cane shortages so there was plenty of time and opportunity to obtain a lower purity instead of a higher one. There is obviously plenty of work still to be done in connection with exhaustion of molasses.

Mr Lamusse: Regarding the relative value of the front and back end of a factory, in Australia and Hawaii the whole factory is closed at weekends but it is better to keep at least the back end open. Account must be taken of the cost of extraneous fuel and possible cane deterioration. Usually where this is done the factory is refining its raw sugar so there is heavy capital investment in the back end.

To report molasses and C massecuites on the basis of non-sucrose instead of brix brings in the error caused by spindle and refractometer brix. Non-sucrose is brix minus sucrose so we would be using the same figure in the calculations, although from a purely academic point of view it would be better to use non-sucrose.

I think that to improve molasses exhaustion we must first solve our viscosity problems.

Mr Du Toit: On page 10 varieties crushed are listed and the amount not specified is twenty per cent, which is the second highest total listed. Obviously the table should be up-dated to include varieties such as N.53/216.

On page 8, a molasses factor and a loss factor are mentioned. The loss factor appears to express the losses in boiling house, i.e. the molasses, the undetermined and the filter cake as a function of non-sugars. The cane payment committee have briefly discussed this and it is a possible suggestion but it is also thought that losses in filter cake and undetermined losses are not related to non-sugars but are related to the percentage sucrose coming into the factory.

Mr Jennings: The term "loss factor" was proposed as an expression of factory performance similar to "lost absolute juice % fibre" for mill performance. If the basis for mill calculations was changed, l.a.j. % fibre would be determined from absolute juice in cane minus absolute juice in mixed juice. In this event it would be by no means certain that all of the non-recovered juice was lost because of the fibre in the cane. A similar situation exists with "loss factor". I agree that not all factory losses may be directly attributed to non-sucrose entering in mixed juice but the major losses, in molasses, definitely are attributable and a case can be made for the dependence on non-sucrose in mixed juice of some of the undetermined sucrose losses, for example those caused by the over-estimation of sucrose in mixed juice because of suspended solids or optically active non-sucrose constituents. In addition, if there is loss by inversion, the non-sucrose is affected and more is available to remove sucrose in final molasses than was present in mixed juice. This undetermined sucrose loss also has a relationship to the amount of non-sucrose handled by the boiling house.

I must say that I am not in favour of a single term for expressing factory losses but such a term is apparently required by the accountants. I think that "loss factor" is as defensible as any of the other terms available.

Mr Lamusse: I agree with Mr Jennings that there is an unfortunate tendency to base everything on a single factor even though no single factor can describe factory efficiency.

I think undetermined losses are simply undetermined and are not related to non-sucrose.

Unless there is entrainment or fermentation in a factory lost time is probably the factor having the greatest influence on undetermined losses.

Mr Du Toit: Are undetermined losses and filter-cake losses more associated with non-sucrose or with incoming sugars?

Mr Perk: They can be associated with both.

Mr Buchanan: Is it not simply that 1969 was a particularly good year for molasses rather than 1970 being a particularly bad year? The higher molasses purity could relate to better milling performance and higher purities of first and last expressed juice and further extraction of undesirable impurities.

Mr Lamusse: Although 1969 was a particularly good year we should have been able to maintain progress in 1970.

I do not think that the extraction ranges in which we are working at present would have an effect on molasses purity.

Dalton had exceptionally high extraction but below-average molasses losses.

Mr Smith: Does not the temperature at which a C massecuite should be cured depend on the saturation temperature of the massecuite?

Mr Lamusse: In theory it does but until we have an effective apparatus to measure saturation we cannot control it, so we must stick to what we can measure.

If we take the viscosity of the massecuite when it is cold, from a previously prepared viscosity temperature curve we can predict to what temperature it must be reheated in order for it to be at 400 000 centipoises when it reaches the centrifuge.

Mr Smith: If the temperature is considerably higher than that normally accepted as saturation temperature must you heat to that temperature?

Mr Lamusse: If you do not, your centrifugals will not spin it. You must heat it or dilute it.