FORTY-FIFTH ANNUAL SUMMARY OF LABORATORY REPORTS OF SUGAR FACTORIES IN SOUTHERN AFRICA COVERING THE 1969 — 1970 SEASON

by CHARLES G. M. PERK

Sugar Milling Research Institute

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

INTRODUCTION

The final manufacturing results of the sugar factories reporting regularly to the Sugar Milling Research Institute have been compiled again in a number of tables which are to be found at the back of this summary. These tables contain the following data:

Table A: Final Production of the S.A. Factories specified according to the grades of sugar made by each mill.

Table B: Tons of sugar made and tons of cane crushed, composition and varieties of cane crushed, rainfall, throughputs and time account; performances.

Table C: Sucrose balance, analysis of juices, syrup, filter cake and of final molasses.

Table D: Data regarding masses cuites and their exhaustions; consumption of clarifying agents and of additional fuels.

Table E: Comparative manufacturing results of recent years (S.A. Factories).

Table F: Average manufacturing results of S.A. factories by monthly periods for the 1969–1970 season.

Table G: Comparative data of S.A. factories from 1925 to 1969.

Note: We take this opportunity to draw special attention to the last two tables which give a comprehensive review of the last season and of the results from 1925 onwards.

In addition to these seven main tables, there are many smaller tables in the text to illustrate the discussions of the different subjects.

METRICATION

At the request of the Metrication Committee, the present summary is still based on British Units. However, where Metric Units would have led to different figures, the latter are also shown.

To transfer the different weights, volumes and terms from British Units into Metric Units the following conversion factors were used:

MULTIPLY	BY	TO OBTAIN
Tons of 2,000 lbs	0.907185	Metric Tons
Cubic feet	0.02832	m^3
Cu ft per short ton	0.031217	m^3 per metric ton
Lbs per cu ft	16.018	kg m^{-3}
Btu per lb	2.3261	kJ kg^{-1}
Lbs/hr/cu ft T.R.V.	16.018	kgh^{-1} m^{-3} T.R.V.
Lbs/hr/sq ft E.D.A.	4.8824	kgh^{-1} m^{-2} E.D.A.

Note: T.R.V. stands for Total Roller Volume of the milling tandem(s). E.D.A. stands for Effective Drainage Area of the diffuser.

The Lower Calorific Value (or L.C.V.) of Bagasse:

British Units: 7 650—18S—86.4W Btu/lb bagasse

Metric (SI) Units: 17 795—42S—201S $kJkg^{-1}$ bagasse

"S" stands for sucrose % bagasse

"W" stands for moisture % bagasse

SUGAR AND CANE PRODUCTIONS OF THE SOUTH AFRICAN SUGAR INDUSTRY IN RECENT YEARS

In the following two tables the official production figures of sugars and the tonnages of cane crushed in the last five seasons are compared.

TABLE 1 (British Units)
Tons of 2,000 Lbs.

Season	Official Sugar Tonnages	Tons Cane Crushed	Cane to 96° Sugar Ratio
1965/66 . .	1 001 784	9 266 324	8.97
1966/67 . .	1 794 100	15 545 625	8.43
1967/68 . .	2 008 704	18 643 889	9.03
1968/69 . .	1 659 399	15 123 331	8.91
1969/70 . .	1 788 499	16 300 826	8.87

TABLE 2 (Metric Units)
Tons of 1 000 kg

Season	Official Sugar Tonnages	Tons Cane Crushed	Cane to 96° Sugar Ratio
1965/66 . .	908 803	8 406 269	8.97
1966/67 . .	1 627 581	14 102 756	8.43
1967/68 . .	1 822 266	16 913 471	9.03
1968/69 . .	1 505 381	13 719 657	8.91
1969/70 . .	1 622 499	14 787 865	8.87

Note: As Sezela, Gledhow and Pongola **do not publish the actual bagged tonnages of the sugars,** but record only figures representing the sugars passing from the rawhouse to the refinery department of their factories, the official tonnages of sugars differ materially from the figures recorded in tables derived from the final laboratory reports. In the previous summary the latter figure was 5 500 tons or 3.3% more for the whole crop than the official tonnages of sugars made in the 1968/69 season. This year the total according to the laboratory reports is 5 224 tons or 2.9% more than the official sugar tonnage as recorded in tables 1, 2 and A. **These discrepancies explain why the same cane to sugar ratios cannot be shown in all tables.**

THE CANE CROPS OF THE 1969 SEASON

We will start with a comparison of the past season of the South African Sugar Industry with the 41 year average of previous seasons by monthly periods:

TABLE 3

Month	Sucrose % Cane		Mixed Juice Purity	
	1969/70	41 year averages	1969/70	41 year averages
May . . .	11.79	12.43	84.16	84.04
June . . .	12.15	12.95	84.15	84.94
July . . .	12.84	13.54	84.44	85.52
August . .	13.55	14.01	84.68	85.74
September .	**13.94**	**14.29**	**84.92**	86.07
October . .	13.42	14.09	84.71	**86.08**
November .	12.84	13.57	84.47	85.71
December .	12.29	12.90	84.16	84.81
January . .	12.25	12.47	83.83	83.90

The comparison shows that the sucrose content of the cane stayed well below the 41 year average.

From a processing point of view the so much lower juice purities of the past season are a greater drawback than the lower sucrose content as the lower purities cause higher sucrose losses, higher heat consumption and reduction of boiling house capacity.

Another and better method of evaluating the quality of a cane crop is the comparison of the results of the Optimum Periods of the different cane crops, as seen in table 4.

TABLE 4

COMPARISON OF THE CANE HARVESTED DURING THE OPTIMUM PERIODS OVER THE LAST TWENTY SEASONS

Season	Percent Cane		Purity of Mixed Juice	Tons Cane/ Ton 96° Sugar
	Sucrose	Fibre		
1950	**14.79**	15.99	86.69	**7.70**
1951	13.47	16.36	84.94	8.62
1952	14.39	15.98	**86.71**	7.94
1953	14.32	16.31	86.07	8.04
1954	13.97	15.96	86.42	8.31
1955	14.45	15.60	86.39	7.91
1956	13.84	15.70	86.19	8.27
1957	13.73	15.24	85.86	8.32
1958	13.77	15.73	85.10	8.32
1959	13.99	15.76	86.06	8.21
Mean	14.07	15.86	86.04	8.16
1960	14.11	15.16	86.10	8.16
1961	14.11	14.46	86.69	7.99
1962	13.77	15.32	83.51	8.33
1963	13.91	15.38	86.09	8.15
1964	14.41	15.20	86.01	7.85
1965	13.10	15.44	84.53	8.82
1966	14.14	14.76	86.65	8.11
1967	13.51	14.78	83.74	8.59
1968	13.26	15.28	83.63	8.70
1969	13.30	14.90	84.63	8.51
Mean	13.76	15.07	85.16	8.32

Table 4 also shows how sucrose content of the cane and purity of the juice are so much lower in recent years than they were a decade before. As in the previous summary we raise the question again as to how far mechanical loading of cane has caused this decline in cane quality because of an increased delay between cutting and crushing of the cane.

Finally, in the following table the quality of the cane harvested in the Optimum Periods is compared with the cane crushed before July and after November, for the last five years.

TABLE 5
CANE HARVESTED DURING THE OPTIMUM PERIODS COMPARED WITH CANE CRUSHED BEFORE JULY AND AFTER NOVEMBER OF THE LAST FIVE SEASONS

	% of Crop	Percent Cane		Purity Mixed Juice	Cane to 96° Sugar Ratio
		Sucrose	Fibre		
Season 1965/66					
Optimum Period	67	13.10	15.44	84.53	8.83
Balance of Crop	33	12.76	15.83	83.50	9.26
TOTAL CROP	100	12.99	15.57	84.22	8.97
Season 1966/67					
Optimum Period	55	14.14	14.76	85.65	8.11
Balance of Crop	45	13.20	15.50	84.29	8.78
TOTAL CROP	100	13.72	15.09	85.06	8.40
Season 1967/68					
Optimum Period	58	13.51	14.78	83.74	8.59
Balance of Crop	42	12.21	15.29	82.92	9.57
TOTAL CROP	100	12.92	15.01	83.41	9.03
Season 1968/69					
Optimum Period	65	13.26	15.28	83.63	8.70
Balance of Crop	35	12.81	15.40	83.41	9.33
TOTAL CROP	100	13.11	15.32	83.60	8.91
Season 1969/70					
Optimum Period	62	13.30	14.90	84.63	8.51
Balance of Crop	38	12.19	15.25	83.53	9.49
TOTAL CROP	100	12.88	15.03	84.25	8.86

In the following four tables the monthly figures of Mhlume, Ubombo Ranches, Luabo and Marromeu, for "Sucrose % Cane" and "Mixed Juice Purity" are compared with the five year averages of previous seasons:—

TABLE 6
MHLUME

Month	Sucrose % Cane		Mixed Juice Purity	
	1969	Mean	1969	Mean
May	11.06	12.55	82.68	83.06
June	11.93	13.23	83.79	84.04
July	12.72	13.86	83.68	84.86
August	13.39	14.32	84.77	85.92
September	**14.76**	14.49	86.89	85.71
October	14.69	**14.73**	86.81	**86.20**
November	13.93	13.84	**87.16**	85.47
December	13.32	12.73	86.61	84.64

TABLE 7
UBOMBO RANCHES

Month	Sucrose % Cane		Mixed Juice Purity	
	1969	Mean	1969	Mean
May	10.00	12.02	77.04	81.35
June	11.23	12.28	80.39	81.79
July	12.13	12.78	80.33	82.35
August	13.39	13.66	84.03	83.24
September	**14.59**	**14.14**	**85.68**	**84.52**
October	13.61	14.00	85.49	84.18
November	13.03	13.36	85.53	83.99
December	12.43	12.93	84.22	83.37

TABLE 8
LUABO

Month	Sucrose % Cane		Mixed Juice Purity	
	1969	Mean	1969	Mean
June	12.43	12.61	85.01	84.40
July	13.07	13.30	87.30	85.99
August	13.45	14.17	87.66	87.36
September	**13.77**	14.60	**88.88**	87.49
October	13.60	(14.55)	86.55	(86.81)

TABLE 9
MARROMEU

Month	Sucrose % Cane		Mixed Juice Purity	
	1969	Mean	1969	Mean
June	13.16	12.20	82.10	82.30
July	13.94	13.24	82.80	83.23
August	13.38	14.30	82.61	85.36
September	14.71	15.33	85.12	86.64
October	**15.57**	15.98	**86.07**	86.27
November	13.91	15.62	83.62	85.67

Perusing these four tables, we see some really good figures such as 15.57% sucrose in cane (October—Marromeu); 88.88° purity mixed juice (September—Luabo); 87.16° mixed juice purity (November—Mhlume); 14.76% sucrose in cane (September—Mhlume), etc.

THE CANE VARIETIES

In the following table, i.e. table 10, the percentages of the main cane varieties of Mhlume, Ubombo Ranches, Luabo, Marromeu and Nchalo are shown:

TABLE 10

Factory	Mhlume	Ubombo Ranches	Luabo	Marromeu	Nchalo
N:Co.310	24.12	19.67	28.50	28.57	69.20
N:Co.376	63.24	67.62	58.50	61.30	29.88

With the exception of Nchalo, the main variety seems to be N:Co.376, as in South Africa.

In table 11, the change in the varietal scene of the South African cane belt is shown.

TABLE 11
PERCENTAGES OF THE MAIN CANE VARIETIES CRUSHED IN RECENT SEASONS

Season	1965/66	1966/67	1967/68	1968/69	1969/70
Co.331	2.70	1.83	1.41	1.30	0.60
N:Co.310	40.15	33.63	24.77	19.21	13.47
N:Co.293	4.51	5.98	6.21	7.03	4.40
N:Co.376	32.19	36.45	41.46	44.52	52.60
N:Co.382	3.35	4.89	6.42	6.43	3.95
N:50/211	3.52	3.56	3.80	3.08	3.64

The replacement of N:Co.310 by N:Co.376 is slowing down, as a number of North Zululand growers do not join in this replacement.

As the Midland (Natal) factories plant from 3 to 7% of the old-fashioned variety Co.331 we continue showing

this variety in our tables, notwithstanding the fact that the average percentage of Co.331 is less than 1%.

The distribution N:Co.293 seems to have reached its saturation point during the 1968/69 season and the same can be said about N:Co.382. The extension of N:50/211 seems to be stationary.

TIME ACCOUNT AND LENGTH OF THE S.A. CRUSHING SEASON

In 1969 the seven day week was introduced as a basis of the time account, replacing the six-day week as a basis. This was done to emphasise the time lost by weekend stops. Reducing the time wastefully spent for weekend stops will shorten the season, or when maintaining the length of the season it will make it possible to crush more cane with the same plant. In the following table, i.e. table 12, the hours available time and the length of the season in weeks as far as the two previous seasons are concerned, are more or less estimated as these figures were not recorded. From 1969/70 the hours available time, i.e. the calendar days of 24 hours which elapsed from the start of the season until the close have been recorded on the laboratory reports. Also recorded were the hours spent for weekend stops, the hours available time minus the hours of weekend stops giving the hours mill open. Table B at the back of the summary shows that the percentage of hours of weekend stops differs from factory to factory. Some factories stop 24 hours each week (with both tandems) because of weekends, while another factory stops alternative weekends with one of the two milling trains for a period of 8 hours only. Returning to table 12, we repeat the warning that as available time and hours of weekend stops are roughly estimated as far as the previous seasons are concerned, this season's time account cannot be compared too closely with the accounts of the two previous seasons.

TABLE 12

Season	1967/68	1968/69	1969/70
Tons cane crushed (BU)	18 643 889	15 123 331	16 300 826
Tons cane crushed (M)	16 913 363	13 719 657	14 787 864
Hours available time	135 479	114 244	120 577
Hours mills open	120 963	102 003	105 438
Hours actual crushing	105 436	87 905	92 572
Tons cane per hour (BU)	177	172	176
Tons cane per hour (M)	160	156	160
No. of mills crushing	20	20	20
Average lengths of season:			
In weeks	40	34	36
In hours (available)	6 774	5 712	6 029
In hours mill open	6 048	5 100	5 272
In hours crushing	5 272	4 395	4 629
Industrial averages of:			
Total hours of stoppages	22.18%	23.06%	23.23%
Weekend stops	10.71%	10.71%	12.55%
Stops for lack of cane	4.02%	5.36%	5.16%
Other hours of stoppages	7.45%	6.99%	5.52%

REFRACTOMETRIC AND HYDROMETRIC DETERMINATION OF BRIX

When a number of years ago the refractometer started to replace the hydrometer for determining the apparent dry matter of sugar solutions, it came quickly to the fore that the refracto brix could not entirely replace the spindle brix. We refer here to those cases where the specific gravity of the solution is involved, e.g. where volumes have to be converted into weights with the aid of the specific gravity of the solutions.

Three examples of this are:

(*a*) when using the Schmitz table, because the function of the brix here is to indicate the specific weight of the sugar solution;

(*b*) when converting cu ft or m^3 of masses cuites into tons of masses cuites and

(*c*) when converting the weight of final molasses of a certain brix into tons of molasses of 85° brix.

Attention is drawn to the fact that in the event of the Schmitz table, the uncorrected brix should be used and in the case of conversion of volumes of masses cuite into weights, the brix should be corrected to the same temperature at which the volume of the masses cuite is determined, i.e. approximately 65°C.

THE TERM "W" (Brixfree Water % Fibre in Final Bagasse)

In table 13 the check figures called "W" are shown, but they do not give much cause for rejoicing. However, finding the reason for an abnormal figure for "W" can be tedious.

TABLE 13

COMPARISONS OF THE VALUE OF "W" OF THE DIFFERENT FACTORIES FOR RECENT YEARS

Season	1969	1968	1967	1966	1965
ML	(18)	(neg.)	(9)	—	—
PG	26	30	32	32	29
UF	23	39	30	23	25
EM	(11)	(12)	(13)	25	27
FX	30	24	23	21	20
EN	(45)	(43)	(45)	(31)	46
AK	20	23	18	16	8/24
DK	36	33	30	26	29
GD	26	26	21	21	26
DL	23	19	14	17	21
GH	24	17	15	15	21
MV	29	24	24	23	22
JB	28	25	25	27	—
UC	(30)	(29)	(25)	(33)	—
TS	34	33	28	27	28
ME	24	26	25	16	18
IL	27	24	27	25	20
RN	27	41	25	21	16
SZ	24	30	25	24	21
UK	27	39	30	18	25
MH	20	40	17	25	36
UR	30	28	29	27	20
LB	Cane laundry			35	29
MR	Cane laundry			—	5
NH	(32)	(18)	—	—	—

Note: The figures in brackets refer to factories where milling-cum-diffusion is applied.

A SET OF NEW PERFORMANCE INDICATORS

During the past season a set of new figures have been introduced which can be used to evaluate the performance of the factories. They are:

(i) Corrected Milling Loss, according to R. R. Follet-Smith (published in the May and August, 1969, issues of the International Sugar Journal).

(ii) Whole Reduced Extraction, according to Mittal (Proc. 11th Congress ISSCT, 1962, pp. 1046–1151).

(iii) Reduced Boiling House Recovery, E.S.G. (See "System of Cane Sugar Factory Control" 2nd Ed., p. 35.)

(iv) Reduced Overall Recovery, E.S.G. (*Loc. cit.* p. 36).

The whole reduced extraction is found by subtracting "corrected milling loss" from 100.00%; the result being the extraction which would have been obtained if the sucrose and the fibre content of the cane both had been 13½%.

The reduced boiling house recovery, E.S.G. estimates the boiling house recovery which would have been obtained if the purity of the mixed juice had been equal to 85° and the result expressed in the form of E.S.G. (Equivalent Standard Granulated is simply the crystal in the sugar calculated with the aid of the Winter Formula "S-0.4 (B.S.)").

Multiplying "Whole Reduced Extraction" with "Reduced Boiling House Recovery, E.S.G." gives us "Reduced Overall Reduced Recovery, E.S.G." being the Overall Recovery in Crystal, when the sucrose content of the cane is 13½%, the fibre content of the cane 13½% and the purity of the mixed juice 85°.

By using this method to obtain more or less comparable figures for:

(*a*) extraction

(*b*) boiling house performance and

(*c*) the performance of the complete factory

table 14 reveals that the *highest whole reduced extraction* was obtained by Dalton UC, a factory equipped with a B.M.A. diffuser. Dalton UC is followed by Mount Edgecombe with its 21-roller tandem and Illovo with its 18-roller mill.

The *highest reduced boiling house recovery E.S.G.* was obtained by the modern plant of Amatikulu, closely followed by Felixton and Tongaat.

Thanks to the high extraction, Dalton UC is also first with respect to the performance of the whole factory as indicated by the *whole reduced overall recovery E.S.G.*, closely followed by Tongaat and Amatikulu.

TABLE 14

WHOLE REDUCED EXTRACTION AND WHOLE REDUCED OVERALL RECOVERY, E.S.G.

Symbol of Factory	Corrected Milling Loss	Whole Reduced Extraction	Reduced Boiling House Recovery, E.S.G.	Whole Reduced Overall Recovery, E.S.G.
ML	5.01	94.99	85.04	80.78
PG	4.41	95.66	89.88	85.98
UF	4.83	95.17	89.71	85.38
EM	4.19	95.81	88.06	84.37
FX	4.62	95.38	90.15	85.99
EN	3.99	96.01	85.81	82.39
AK	4.52	95.48	90.35	86.27
DK	5.36	94.64	88.54	83.79
GD	5.82	94.05	89.38	84.07
DL	3.93	96.07	89.22	85.72
GH	4.63	95.37	89.28	85.15
MV	5.48	94.52	89.30	84.40
JB	4.13	95.87	87.33	83.72
UC	1.80	98.20	88.16	86.57
TS	4.09	95.90	90.25	86.55
ME	2.94	97.06	—	—
IL	2.96	97.04	87.58	84.99
RN	4.06	95.74	87.96	84.22
SZ	4.60	95.40	87.92	83.88
UK	4.27	95.73	88.08	84.32
MH	5.07	94.93	88.93	84.42
UR	4.94	95.06	88.69	84.30
LB	8.48	91.52	87.87	80.42
MR	9.42	90.58	87.79	79.52
NH	4.69	95.31	84.70	80.73
Average	4.08	95.92	85.99	85.35

Comparing the figures of two neighbouring factories, i.e. Jaagbaan and Dalton UC, we see that Dalton UC obtained, owing to its diffusion plant, 2.33% more whole reduced extraction and as its reduced boiling house recovery, E.S.G., is also higher, i.e. 0.83% more, the reduced overall recovery E.S.G. is 2.85% higher than that of Jaagbaan.

The Swaziland factories Mhlume and Big Bend obtained similar figures for reduced overall recovery, E.S.G. because where one is lower in whole reduced extraction the other made up by its higher reduced boiling house recovery E.S.G.

We think that table 14 is a very interesting table which is worthwhile perusing.

THE RATIO BETWEEN THE WEIGHT OF NONSUCROSE IN TOTAL FINAL MOLASSES AND THE WEIGHT OF NONSUCROSE IN MIXED JUICES

Note I: The weight of nonsucrose is found by subtracting the weight of the sucrose from the weight of the brix in the material in question.

Note II: Total Final Molasses is the weighed final molasses plus the film of final molasses around the crystals of the weighed sugars.

Note III: The brix of the material in question can be determined with the aid of the specific gravity (spindle or hydrometer brix), with the aid of the refractometric index (refracto brix) or by drying at 105°C (dry matter), as is the case with sugars.

To add to the confusion we have the problem that the mixed juice of pure milling factories cannot truly be compared with the mixed juice of a milling-cum-diffusion factory. In the latter case approximately 40% of the mixed juice has passed some kind of juice clarification inside the diffuser. We have only to point to the fact that the percentage of filter cake discharged from a milling-cum-diffusion factory is only 3/5th of that of a pure milling factory.

It would therefore be a good idea to compare nonsucrose in total final molasses with nonsucrose in clarified juice. However, here again we have the difficulty that some factories use the refracto brix for the boiling house products, while most of the mills use the spindle brix throughout. If we want to compare the effect of diffusion on the nonsucrose ratio we should divide the factories into four groups:

(*a*) pure milling and spindle brix

(*b*) pure milling and refracto brix

(*c*) diffusion and spindle brix

(*d*) diffusion and refracto brix

TABLE 15

NONSUCROSE RATIOS BASED ON CLARIFIED JUICE

(a)	(b)	(c)	(d)
PG 0.926	FX 0.839	UC 0.940	ML 0.836
UF 0.924	AK 0.823	EN 0.946	EM 0.887
DK 0.954	DL 0.833	—	NH 1.031
GD 0.901	ME H.T.M.	—	—
GH 0.970	MH 0.826	—	—
MV 0.996	TS 0.829	—	—
JB 0.993	—	—	—
IL 0.982	—	—	—
RN 0.950	—	—	—
SZ 0.992	—	—	—
UK 0.996	—	—	—
UR 0.918	—	—	—
LB 0.829	—	—	—
MR 0.825	—	—	—

Table 15 gives us quite a different picture to that of the following table, i.e. table 16, where we tried to make the different factories comparable by converting the outgoing nonsucrose of all factories to "spindle brix nonsucrose", like the nonsucrose in mixed juice of all factories.

TABLE 16

NONSUCROSE RATIOS OF MILLING FACTORIES COMPARED WITH THOSE OF MILLING-CUM-DIFFUSION ONES ("BRIX" IN MIXED JUICE AND IN WEIGHED FINAL MOLASSES DETERMINED WITH THE AID OF THE HYDROMETER)

Pure Milling Factories		Diffusion Factories	
Mill	Ratio	Mill	Ratio
PG	0.82	ML	0.94
UF	0.85	EM	0.88
FX	0.79	EN	0.95
AK	0.82	UC	0.88
DK	0.90		
GD	0.86	Average	0.91
DL	0.84		
GH	0.84	NH	1.06
MV	0.89		
JB	0.87		
TS	0.85		
IL	0.87		
RN	0.82		
SZ	0.92		
UK	0.88		
MH	0.85		
UR	0.85		
LB	0.92		
MR	0.74		
Average	0.85		

Note: The N.S. Ratio of Nchalo was not included into the average for diffusion factories because of doubt regarding its final molasses weight.

Table 16 gives us the impression that the diffusion factories produce more final molasses than commensurate with the purity of the mixed juice, but table 15 does not confirm this.

Although using clarified juice as a starting point makes the different factories better comparable, it still does not take into account something that might happen in the diffuser. In this respect using clarified juice as base is not any better than using mixed juice.

Of course we could also try to compare the differences in purities between first expressed juice and clarified juice in order to make out if diffusion leads to a greater portion of nonsucrose in the juice than in the event of pure milling. However here we will meet the difficulty that the drop in purity between first and last expressed juices depends on many factors, for example in the case of pure milling on the degree of cleanliness of the tandem. Further there is the effect of the degree of extraction on this drop. In addition the curve described by the drop in purity by increased pressure and extraction is not the same for every cane.

The staff of Dalton UC is convinced that the treatment of the press water, i.e. the method of clarification applied to the juice squeezed out by the dewatering mill(s), has a great effect. During the period that the press water was returned directly to the diffuser (by-passing the press water clarifier) the nonsucrose ratio

dropped materially. As a result of this test Dalton UC as well as Malelane will only screen their press waters in the 1970/71 season.

THE REDUCING SUGARS BALANCE

TABLE 17
REDUCING SUGARS BALANCE

Mill	Per 100 R.S. in mixed juice there is present in:		
	Clear Juice	Syrup	Total Final Molasses
ML	104%	105%	148%
PG	99%	74%	—
UF	103%	106%	114%
EM	92%	81%	107%
FX	90%	86%	94%
EN	87%	79%	108%
AK	94%	87%	116%
DK	88%	106%	116%
GD	114%	81%	79%
DL	96%	93%	106%
GH	63%	61%	62%
MV	104%	111%	115%
JB	98%	100%	105%
UC	87%	87%	80%
TS	88%	83%	81%
ME	93%	98%	H.T.M.
IL	97%	67%	98%
RN	81%	64%	—
SZ	88%	75%	91%
UK	97%	96%	84%
MH	87%	55%	—
UR	95%	83%	95%
LB	100%	87%	88%
MR	100%	90%	142%
NH	90%	80%	93%

It is usually understood that the percentage of R.S. in clarified juice should be slightly less than that in mixed juice as a result of the high pH directly after liming. The high temperature in the first effect causes the neutral pH point to move to a smaller pH which causes the H-ion concentration as well as the OH-ion concentration to increase, which means that, depending on the magnitude of the pH at 20°C, formation of R.S. by inversion as well as destruction of R.S. by OH-ion takes place. If the retention in the first effect is short and the pH at 20°C well above 7.00 the R.S. percentage in syrup should not differ much from the R.S. percentage in clear juice. Usually the percentage of R.S. in Total Final Molasses is again around 100%.

Some factories show percentages which vary materially from the standard values. This does not always mean that abnormal destruction of R.S. has taken place or that more than normal R.S. has been formed owing to inversion; it can be that the analysis has not been carried out exactly as it should be, i.e. the sample has not been correctly diluted.

Note: With regard to the change in H-ion and OH-ion concentrations by higher temperatures see "Reduction of Retention Time of Juice at High Temperature" by C. G. M. Perk; Int. Sug. Jnl. 1966, **68**, 361–363.

SUCROSE, BRIX, NONSUCROSE BALANCES, ETC.

TABLE 18
PARTS OF UNDETERMINED LOST SUCROSE, BRIX AND NONSUCROSE PER 100 PARTS PRESENT IN CLARIFIED JUICE

Mill	Sucrose	Brix	Non-Sucrose	Ratio
ML*	4.08%	6.27%	16.27%	53.37°
EM*	2.70%	4.09%	11.25%	55.17°
FX*	1.52%	3.68%	16.14%	35.16°
AK*	1.23%	3.50%	17.04%	30.17°
DL*	1.60%	3.79%	16.67%	35.98°
TS*	0.40%	2.83%	17.08%	12.13°
MH*	1.52%	3.58%	17.60%	37.14°
NH*	2.10%	−5.07%	−16.06%	Negative
PG	0.02%	1.03%	7.49%	1.74°
UF	0.74%	1.87%	7.75%	33.43°
EN	1.61%	2.29%	6.45%	60.87°
DK	1.64%	2.03%	4.61%	69.92°
GD	1.24%	2.86%	12.61%	37.12°
GH	0.44%	0.70%	2.98%	53.60°
MV	0.93%	0.83%	0.35%	94.54°
JB	2.97%	2.62%	0.70%	95.85°
UC	2.09%	2.70%	5.98%	65.10°
IL	2.58%	2.55%	2.36%	86.56°
RN	2.67%	3.00%	4.95%	76.74°
SZ	0.11%	0.20%	−0.78%	47.13°
UK	1.08%	1.00%	0.39%	95.35°
UR	1.87%	2.89%	8.24%	54.39°
LB	1.02%	2.59%	12.26%	34.01°
MR	2.49%	4.78%	17.49%	44.07°

* indicates that brix of the boiling house products is determined with the aid of the refractometer.

The undetermined sucrose, brix and nonsucrose losses together with the ratio between the tons undetermined sucrose and brix losses are shown in table 18. We draw attention to the fact that as these balances are based on "clarified juice" the undetermined sucrose loss will differ from that shown in Table C as the latter is based on 100 sucrose in cane and the former on 100 sucrose in clarified juice.

Generally the undetermined sucrose loss should be approximately 1% of the sucrose originally present in clarified juice and the ratio between tons undetermined lost sucrose and tons undetermined lost brix approximately 80%.

THE QUANTITY (VOLUME) OF C-MASSECUITES

The quantity of C-m.c. to be boiled is related to the following items:

(1) the quantity of nonsucrose entering the factory with the mixed juice.
(2) the nonsucrose ratio
(3) the purity of the C-m.c. and
(4) the circulation ratio

With regard to the nonsucrose ratio this figure indicates nothing else than the ratio between the tonnage of nonsucrose in mixed juice to the tonnage of nonsucrose in final molasses and sugars. We are not allowed to speak of "recovered" nonsucrose in total final molasses for two reasons:

Firstly, because the nonsucrose in mixed juice cannot be taken as "Input" as other nonsucrose substances (clarifying agents) are added, and moreover nonsucrose is formed during processing.

Secondly, the nonsucrose originally present in mixed juice is of a completely different composition to the nonsucrose present at the end of the manufacturing process.

In the following table (table 19) the cubic feet of C-m.c. per ton of nonsucrose in mixed juice of all factories are shown, together with the related factors (Nonsucrose Ratio, Circulation Ratio and Purity of the C-m.c.) in order to investigate a possible connection between the abovementioned four items.

TABLE 19

Mill	Cu ft of C-m.c. per ton Non-Sucrose in Mixed Juice	Non-Sucrose Ratio (Spindle)	Circulation Ratio (Excess)	Purity of C-m.c.
ML	60.19 cu ft/ton	0.864	30%	R 57.99
PG	56.31 cu ft/ton	0.818	25%	S 60.79
UF	51.91 cu ft/ton	0.849	21%	S 57.09
EM	64.28 cu ft/ton	0.884	22%	R 59.50
FX	48.49 cu ft/ton	0.794	12%	R 60.04
EN	63.06 cu ft/ton	0.948	26%	S 58.77
AK	50.52 cu ft/ton	0.819	27%	R 59.87
DK	64.75 cu ft/ton	0.899	32%	S 60.06
GD	50.24 cu ft/ton	0.834	29%	S 54.26
DL	52.62 cu ft/ton	0.839	23%	R 59.49
GH	61.74 cu ft/ton	0.838	31%	S 60.60
MV	53.74 cu ft/ton	0.891	21%	S 56.00
JB	62.27 cu ft/ton	0.870	30%	S 60.70
UC	55.37 cu ft/ton	0.880	21%	S 57.78
TS	55.56 cu ft/ton	0.851	21%	R 58.29
IL	60.80 cu ft/ton	0.971	24%	S 61.38
RN	52.32 cu ft/ton	0.823	17%	S 59.88
SZ	67.59 cu ft/ton	0.923	15%	S 59.66
UK	55.61 cu ft/ton	0.884	17%	S 59.78
UR	63.53 cu ft/ton	0.847	32%	S 61.60
MH	67.00 cu ft/ton	0.853	32%	R 62.84
LB	79.35 cu ft/ton	0.916	63%	S 59.50
MR	63.76 cu ft/ton	0.740	65%	S 60.50
NH		1.060		

Perusing Table 19 we see a number of factories showing a high cubic footage of C-m.c. per ton of NS in mixed juice, which large volumes cannot always be explained by the other items.

In connection with the relation between the nonsucrose circulation and the purity of the pre-cured C-sugar we reprint here the table which accompanied the Monthly Summary No. 4 of the 1969/70 season.

TABLE 20

PURITY OF THE SINGLE-CURED C-SUGAR ADJUSTED TO THE RECIRCULATION RATIO

Purity of C-m.c. . . . / Final Molasses Purity .	55° / 35°	57½° / 37½°	60° / 40°
Recirculation Ratio (Minus 100)	Purity of C-sugar		
10%	89	90	90¾
20%	82	84	85
30%	77¾	79½	81
40%	74½	76¼	78
50%	72	74	76
60%	70¼	72¼	74¼
70%	68¾	71	73

CONSUMPTION OF CLARIFYING AGENTS AND OF ADDITIONAL FUELS

Particulars about these two subjects can be found in the lower part of Table D at the end of the Summary.

TABLE A

SOUTH AFRICAN SUGAR ASSOCIATION FINAL PRODUCTION 1969/70 SEASON

SHORT TONS

MILL	LOCAL MARKET			EXPORT MARKET					TOTAL
						Very High Pol Adjusted to		H.T.M. (Sugar) Equivalent)	
	White	Refinery Raws	Brown	High Pol	Low Pol	High Pol	Low Pol		
Malelane	107,827	—	8,626	—	—	—	—	—	116,453
Pongola	44,255	—	38,953	—	—	—	—	—	83,208
Umfolozi	—	42,209	8,290	8,785	47,303	4,483	9,962	—	121,032
Empangeni	—	109,324	240	—	—	—	—	—	109,564
Felixton	—	69,427	1,198	32,344	—	267	593	—	103,829
Entumeni	11,318	—	3,659	8,800	—	271	601	—	24,649
Amatikulu	—	17,174	17,832	41,172	91,568	4,433	9,852	—	182,031
Doornkop	—	105	95	6,921	35,412	—	—	—	42,533
Glendale	—	23,305	76	—	—	—	—	—	23,381
Darnall	—	21,056	312	25,140	75,619	2,755	6,121	—	131,003
Gledhow	116,018	248	83	29,824	—	1,588	3,528	—	151,289
Melville	—	18,634	2,740	—	17,141	324	721	—	39,560
Jaagbaan	—	8,519	—	57,413	—	—	—	—	65,932
Union Co-op.	—	254	71	112	21,123	658	1,461	—	23,679
Tongaat	—	100,038	548	62,969	—	7,790	17,310	—	188,655
Mount Edgecombe	—	20,701	2,498	—	—	—	—	63,544	86,743
Illovo	—	83	7,410	4,994 (Syrup) 177	35,397	—	—	—	48,061
Sezela	81,037	42	50	38,197	—	933	2,073	—	122,332
Renishaw	68	—	33,926	—	—	—	—	—	33,994
Umzimkulu	—	10,159	80	78,083	—	698	1,551	—	90,571
TOTALS	360,523	441,278	126,687	394,931	323,563	24,200	53,773	63,544	1,788,499

TABLE B

SUGAR MADE AND CANE CRUSHED, CANE COMPOSITION AND VARIETIES, (Season 1969 - 1970)

SYMBOLS indicating factories:	ML	PG*	UF	EM	FX	EN	AK	DK	GD	DL	GH*
Short Tons of Sugar Made	**114 127**	**(84,138)**	**120,673**	**109,716**	**103,825**	**24,625**	**181,800**	**42,533**	**23,424**	**130,867**	**(154,443)**
Metric Tons of Sugar Made	**103 534**	**(76 329)**	**109 474**	**99 533**	**94 188**	**22 339**	**164 926**	**38 585**	**21 250**	**118 721**	**(140 108)**
Percentage of White Sugars made	92.42%	53.18%	Nil	Nil	Nil	45.96%	Nil	Nil	Nil	Nil	76.74%
Average °Pol of All Sugars made	99.73°	98.77°	98.23°	98.78°	98.66°	99.26°	98.09°	97.85°	98.46°	98.08°	99.65°
Short Tons of Cane Crushed	**1,104,305**	**696,958**	**1,098,387**	**1,033,966**	**962,812**	**223,308**	**1,590,788**	**378,198**	**211,764**	**1,138,712**	**1,423,653**
Metric Tons of Cane Crushed	**1 001 809**	**632 270**	**996 440**	**937 998**	**873 448**	**202 582**	**1 443 139**	**343 094**	**192 109**	**1 033 022**	**1 291 517**
Season started on	30.4.69	21.5.69	23.6.69	1.6.69	17.5.69	2.6.69	8.5.69	29.5.69	6.6.69	15.5.69	9.6.69
Season completed at	4.3.70	10.1.70	8.1.70	15.2.70	11.2.70	4.1.70	12.2.70	7.2.70	18.2.70	14.2.70	21.3.70
Per hour actual crushing:											
Short tons of cane crushed	215.01	157.33	260.76	208.61	188.34	54.79	292.72	79.50	48.06	208.56	253.79
Metric tons of cane crushed	195.05	142.73	236.56	189.25	170.86	49.70	265.55	72.12	43.60	189.20	230.23
Short tons of fibre milled	29.53	21.06	35.78	37.63	29.48	7.21	43.68	12.54	7.11	30.22	40.14
Metric tons of fibre milled	26.79	19.12	32.46	34.14	26.74	6.54	39.63	11.38	6.45	27.42	36.41
Short tons of brix processed	32.38	24.45	38.36	30.72	26.98	7.96	43.20	11.28	6.83	31.12	36.03
Metric tons of brix processed	29.38	22.21	34.80	27.87	24.47	7.22	38.10	10.23	6.20	28.23	32.68
Short tons of sugar bagged	22.22	(18.99)	28.65	22.13	20.31	4.85	33.45	8.94	5.32	23.97	27.42
Metric tons of sugar bagged	20.16	(17.23)	25.99	20 08	18.42	4.40	30.35	8 11	4.82	21.74	24.96
Time Account:											
Hours crushing % available hours	69.33	79.87	88.88	79.69	78.77	78.67	81.38	78.55	71.77	82.68	82.22
Hours weekend stops % available hour	7.05	15.47	2.36	10.26	9.72	13.61	12.95	15.47	15.44	10.74	10.42
Hours lack of cane % available hours	9.29	1.02	2.77	2.53	4.96	2.84	1.68	3.70	9.84	4.66	1.67
Other hours of stoppages % avail. hours	14.34	3.64	6.00	7.52	6.55	4.88	3.99	2.27	2.94	1.92	5.69
Composition of Cane Crushed:											
Sucrose per cent cane	**13.11**	**13.81**	**12.84**	**12.93**	**12.63**	**13.04**	**13.09**	**12.99**	**12.97**	**13.17**	**12.86**
Fibre per cent cane	**13.64**	**13.39**	**13.72**	**18.04**	**15.64**	**13.16**	**14.92**	**14.80**	**14.80**	**14.49**	**15.88**
Tons cane per ton of sugar	9.68	(8.28)	9.10	9.42	9.27	9.07	8.75	8.89	9.04	8.70	(9.22)
Tons cane per ton of 96° sugar	9.31	(7.95)	8.90	9.16	9.02	8.77	8.56	8.72	8.81	8.52	(8.93)
Java Ratio	91.16	80.78	78.85	77.15	77.12	78.35	79.06	77.14	79.69	79.60	78.08
Cane Varieties Crushed:											
Co.331	Nil	Nil	Nil	Nil	0.06	0.22	0 04	0.41	4.33	0.63	0.18
N:Co.310	32.80	81.41	77.84	31.87	35.64	1.24	2.67	2.92	11.40	3.59	2.74
N:Co.293	0.20	0.32	Nil	0 11	0 01	25.54	0.82	7.54	2.50	0.17	0.57
N:Co.376	56.29	16.42	8.71	33.09	43.94	61.01	19.61	73.52	58.70	80.11	69.12
N:Co.382	1.32	0.13	10.87	1.80	7.71	4.72	0.63	9.60	1.72	0.27	3.04
N.50/211	Nil	0.12	1.47	1.68	1.95	5.38	1.42	2.24	2.45	3.75	5.57
Not specified	9.39	1.60	1.11	31.45	10.69	18.91	74.81	3.77	18,90	11.48	18.78
Total Rainfall during 1969:											
Inches	?	29.86	32 88	47.85	55 40	45 60	36 83	39 84	33 22	42 27	37 27
Millimetres	?	758	835	1216	1407	1158	935	1194	844	1074	947
Performances:											
Specific feed rate (lb./h/c. ft)	—	34.73	35.58	—	41.86	—	45 08	57 61	57 68	49 86	53.06
Specific feed rate (kg/h/m³ t.r.v.)	—	556	570	—	671	—	722	923	924	799	850
Specific feed rate (lb./h/sq. ft)	34 24	—	—	37 81	—	21 00	—	—	—	—	—
Specific feed rate (kg/h/m² e.d.a.)	167	—	—	185	—	103	—	—	—	—	—
Imbibition % cane	39.28	37.17	39.63	51.38	36.51	39.47	43 99	32.95	38.32	53.34	37.92
Imbibition % fibre	288	278	289	285	233	300	295	223	259	368	239
Lost absolute juice % fibre	**40.82**	**35.18**	**37.13**	**30.81**	**34.02**	**32.51**	**32.14**	**42.65**	**43.97**	**30.86**	**40.65**
Extraction	94.86	95.76	94.97	94.28	94.47	96.04	94.93	94.07	93.26	95.74	93.82
Boiling house recovery	82.89	90.16	88.47	85.96	89.17	87.38	90.24	90.08	89.93	89.37	89.08
Overall recovery	78.63	86.34	84.02	81.05	84.24	83.92	85.67	84.69	83.96	85.56	83.58

* The sugar tonnages of these three factories do not reflect the actually produced quantities of sugar. Like the other boiling house data they refer solely to the processing in the rawhouse department and not to the whole factory.

THROUGHPUTS AND TIME ACCOUNTS, PERFORMANCES

MV	JB	UC	TS	ME	IL	RN	SZ*	UK	Totals and Means	MH	UR	LB	MR	NH
39,546	**65,895**	**23,734**	**188,806**	**(86,744)**	**48,059**	**33,994**	**(124,551)**	**90,577**	**(1,792,077)**	**87,829**	**84,808**	**78,181**	**74,587**	**29,640**
35 875	**59 779**	**21 531**	**171 282**	**(78 693)**	**43 598**	**30 839**	**(112 991)**	**82 170**	**(1,625,745)**	**79 677**	**76 937**	**70 925**	**67 664**	**26 889**
Nil	Nil	Nil	Nil	Nil	Nil	Nil	66%	Nil	20%	2.17%	21.40%	55.40%	64.48%	37.14%
98.06°	98.56°	97.88°	98.42°	H.T.M.	97.85°	98.63°	99.64°	98.73°	98.68°	98.56°	98.72°	98.93°	99.17°	97.58°
355,048	**631,073**	**220,852**	**1,748,628**	**807,958**	**443,048**	**327,818**	**(1,116,090)**	**787,459**	**16,300,826**	**761,694**	**803,176**	**725,693**	**691,600**	**266,106**
322 094	**572 500**	**200 354**	**1 586 329**	**732 967**	**401 926**	**297 392**	**(1 012 500)**	**714 371**	**14 787 865**	**690 997**	**728 629**	**658 344**	**627 410**	**241 407**
14.5.69	17.5.69	19.5.69	6.6.69	28.5.69	8.5.69	19.6.69	16.6.69	14.6.69	30.4.69	19.5.69	2.5.69	5.5.69	5.5.69	24.4.69
29.1.70	6.12.69	20.12.69	23.2.70	14.1.70	11.1.70	26.2.70	28.2.70	11.2.70	21.3.70	19.1.70	1.1.70	4.11.69	21.12.69	24.11.69
79.48	192.39	57.69	315.87	185.47	103.19	78.65	251.53	171.46	176.05	164.16	161.31	204.93	151.12	70.40
72.11	174.53	52.34	286.55	168.27	93.61	71.35	228.18	155.55	159.70	148.92	146.24	185.91	137.09	63.87
12.00	27.85	8.66	49.60	28.30	15.17	12.26	37.92	24.54	26.46	23.44	21.33	28.16	22.33	9.85
10.89	25.26	7.85	45.00	25.68	13.76	11.12	34.40	22.26	24 00	21.26	19.35	25.55	20.26	8.94
11.27	27.98	8.34	43.77	26.46	14.96	10.91	36.55	24.82	25.57	24.28	23.19	28.11	22.42	10.65
10.22	25.39	7.57	39.71	24.01	13.57	9.90	33.15	22.51	23.20	22.03	21.04	25.50	20.34	9.66
8.85	20.09	6.20	34.10	H.T.M.	11.19	8.16	28 07	19.72	19.35	18.93	17.02	22.08	16.30	7.84
8.03	18.22	5.62	30.94	H.T.M.	10.15	7.40	25.46	17.89	17.56	17.17	15.44	20.03	14.78	7.11
71.68	68.09	73.82	79.17	78.32	72.68	68.89	72.79	78.84	76.77	78.89	85.01	80.67	82.94	74.26
16.09	13.18	14.95	9.76	15.64	17.25	15.62	12.20	14.19	12.55	6.67	7.55	9.11	9.25	12.53
6.12	9.42	4.19	4.39	4.59	8.34	8.96	7.43	4.39	5.16	10.53	4.90	5.55	3.11	0.95
6.11	9.31	7.04	6.68	1.45	1.72	6.53	7.58	2.56	5.52	3.91	2.54	4.68	4.64	12.26
12.92	**12.62**	**12.31**	**12.36**	**12.35**	**12.72**	**12.31**	**13.14**	**13.19**	**12.88**	**13.37**	**12.55**	**13.03**	**13.78**	**13.46**
15.10	**14.48**	**15.01**	**15.70**	**15.26**	**14.70**	**15.59**	**15 08**	**14 31**	**15.03**	**14.28**	**13.22**	**13.74**	**14.78**	**14.00**
8.98	9.58	9.31	9.26	H.T.M.	9.22	9.64	(8.96)	8.69	(9.10)	8.67	9.48	9.28	9.17	8.98
8.79	9.33	9.13	9.03	H.T.M.	9.04	9.39	(8 69)	8.45	(8.86)	8.45	9.16	9.01	8.87	8.83
78.26	80.59	78.55	77.16	78.60	78.49	78.15	78.52	79.64	78.78	81.17	80.65	Cane Laundries		80.50
0.65	6.95	3.07	0.23	1.02	1.20	Nil	0.13	0.31	0.60	Nil	Nil	Nil	Nil	Nil
3.37	2.28	0.47	5.01	3.44	3.53	3.53	2.10	5.63	13.47	34.12	19.67	28.50	28.57	69.20
0.01	51.01	63.39	1.05	6.15	Nil	Nil	0.07	2.14	4.40	Nil	Nil	Nil	0.21	Nil
47.78	15.97	7.09	53.13	44.07	78.26	78.26	81.15	90.25	52.60	63.24	67.62	58.50	61.30	29.88
1.37	22.07	24.56	5.56	1.95	10 68	10.80	3.14	0.28	3.95	0.14	Nil	9.70	8.99	Nil
3.45	0.40	1.08	12.21	7.90	2.13	6.78	0.95	0.51	3.64	Nil	3.54	Nil	Nil	Nil
43.37	1.32	0.34	22.81	35.47	4.20	0.63	12.46	0.88	21.34	2.50	9.17	3.30	0.93	0.92
48.29	30.21	37.15	44.88	51.02	46 40	46.85	47 85	45.75	41.54	33.36	23.73	47.46	41.13	?
1227	767	944	1140	1296	1179	1190	1215	1162	1055	847	603	1205	1044	?
43.63	38.71	—	53.61	47.05	37.32	48.35	75.10	64.32	—	66.96	65.97	73.81	70.22	—
699	620	—	859	754	598	774	1203	1030	—	1073	972	1182	1125	—
—	—	33.40	—	—	—	—	—	—	—	—	—	—	—	30.98
—	—	141	—	—	—	—	—	—	—	—	—	—	—	151
45.68	38.28	35.31	34.32	50.54	39.10	35.59	44.85	36.48	41.22	27.92	28.04	27.52	28.48	42.03
302	264	235	219	331	266	228	297	255	274	196	212	200	193	300
41.15	**34.31**	**15.83**	**30.76**	**25.40**	**33.25**	**34.56**	**35.52**	**35.08**	**34.15**	**36 44**	**37.18**	**61.76**	**63.39**	**32.46**
93.74	95.42	97.91	95.02	96.53	95.66	94.86	94.79	95 42	94.98	94.62	94.98	91.21	89.79	95.14
90.19	84.45	87.25	90.50	—	87.21	87.57	88.88	90.21	88.58	89.81	87.38	89.71	86.64	84.85
84.54	81.54	85.43	85.99	—	83.43	83.07	84.25	86.08	84.13	84.98	82.99	81.83	77.98	80.73

TABLE C

SUCROSE BALANCE, ANALYSIS OF BAGASSE, JUICES,

(Season 1969 - 1970)

FACTORY SYMBOL:	ML	PG	UF	EM	FX	EN	AK	DK	GD	DL	GH*
Sucrose Balance:											
Lost in Bagasse (*a*)	5.14	4.26	5.03	5.72	5.53	3.96	5.06	5.99	6.64	4.26	6.18
Lost in Filter Cake (*b*)	0.44	1.06	0.76	0.19	0.76	0.80	0.57	0.62	0.27	0.49	0.56
Lost in Final Molasses (*c*)	11.93	8.33	9.49	10.69	8.04	9.78	7.53	6.97	8.24	8.16	9.28
Undetermined Sucrose Losses (*d*)	**3.86**	**0.03**	**0.70**	**2.35**	**1.43**	**1.54**	**1.17**	**1.73**	**1.06**	**1.53**	**0.41**
Boiling House Losses (*b*)+(*c*)+(*d*)	16.23	9.41	10.95	13.23	10.23	12.12	9.27	9.32	9.30	10.18	15.74
Sum of All Losses (*a*)+(*b*)+(*c*)+(*d*)	21.37	13.67	15.98	18.95	15.76	16.08	14.33	15.31	16.04	14.44	21.92
Final Bagasse:											
Sucrose % Bagasse	**2.09**	**2.01**	**1.99**	**1.77**	**1.99**	**1.60**	**1.94**	**2.27**	**2.58**	**1.75**	**2.16**
Moisture % Bagasse	**54.56**	**51.28**	**54.84**	**54.32**	**52.70**	**56.75**	**53.69**	**53.51**	**52.03**	**52.33**	**53.50**
Fibre % Bagasse	42.23	45.80	42.31	43.12	44.55	40.91	43.73	43.18	44.44	45.11	43.27
Bagasse % Cane	32.29	29.23	32.43	41.85	35.10	32.16	34.13	34.27	33.30	32.12	36.70
L.C.V. in btu per lb. Bagasse	**2898**	**3183**	**2876**	**2925**	**3061**	**2718**	**2926**	**2986**	**3108**	**3097**	**2988**
L.C.V. in kJ per kg Bagasse	**6741**	**7404**	**6690**	**6803**	**7120**	**6322**	**6807**	**6945**	**7230**	**7204**	**6951**
Brixfree Water % Fibre	**18**	**26**	**33**	**11**	**30**	**45**	**20**	**36**	**26**	**23**	**24**
First Expressed Juice:											
Degrees Brix	19.20	19.74	19.12	19.77	19.21	18 87	19.05	19.20	18.91	19.15	19.22
Degrees (Apparent) Purity	84.12	86.63	85.16	84.77	85.22	88.23	86.87	87.73	86.69	86.44	85.80
Last Expressed Juice:											
Degrees Brix	3.08	2.55	1.95	3.58	2.42	1.28	1 81	3.39	3.04	1.82	2.80
Degrees (Apparent) Purity	65.10	69.41	70.25	69.09	72 41	69.55	75.38	69.92	73.02	68.40	67.40
Purity Drop	**19.02**	**17.22**	**14.91**	**15.68**	**12.81**	**18.68**	**11.49**	**18.81**	**13.67**	**18.04**	**18.40**
Mixed Juice:											
Degrees Brix	14.08	14.42	13.72	13.45	14.13	13.53	12.77	14.38	13.54	12.31	14.08
Degrees (Apparent) Purity	—	85.02	82.92	—	—	—	—	86.03	85.18	—	—
Purity Drop	**1.56**	**1.61**	**2.24**	**1.97**	**1.93**	**1.97**	**2.70**	**1.70**	**1.51**	**1.92**	**1.20**
Degrees Gravity Purity	82.56	84.95	—	82.80	83.29	86.26	84 17	86.10	—	84.52	84.60
Reducing Sugars/Sucrose Ratio	6.10	3.18	3.59	4.11	4.49	2.51	3.59	2.99	4.61	3.63	5.20
Clarified Juice:											
Degrees Brix	13.09	14.09	13.22	13.20	12.71	13.02	12.52	13.87	13.48	11.63	13.45
Degrees (Apparent) Purity	82.03	86.37	83.97	83 69	85.22	86.14	85.66	86.72	85.72	85.45	86.40
Reducing Sugars/Sucrose Ratio	6.39	3.18	3.73	3 80	4.06	2.20	3.38	2.26	4.87	3.49	3.29
Average pH	7.25	**7.18**	7.07	**7.30**	**7.30**	**7.47**	**7.46**	**7.40**	**7.08**	**7.40**	7.39
Filter Cake:											
Sucrose % Filter Cake	1.76	2.47	1.96	0.79	1.60	2 09	1.50	1.61	1.16	1.31	1.54
Filter Cake % Cane	3.30	5.92	5.00	3.17	6 00	5.00	5 03	5.00	3.00	4.95	4.64
Syrup:											
Degrees Brix	60.97	64.19	62.59	61.80	61.56	61.83	59.76	58.81	61.33	62.51	60.65
Degrees (Apparent) Purity	82.40	85.73	83.95	84.65	85.90	85.96	86.52	86.60	86.11	85.70	86.10
Reducing Sugars/Sucrose Ratio	6.43	2.39	3.83	3.32	3.87	2.00	3.16	3.20	4.07	3.37	3.20
Average pH	6.26	**6.59**	**6.39**	**6.50**	**6.30**	**7.01**	**6.66**	**6.50**	**6.62**	**6.60**	—
Final Molasses:											
Spindle Brix (undiluted)	—	93.22	94.06	—	—	91.08	—	92.40	94.18	—	87.87
Refracto Brix (undiluted)	84.91	—	—	89.32	89.17	—	89.04	—	—	85.72	—
Pol/Spindle Brix Purity	—	38.98	38.95	—	—	42.11	—	36.81	36.91	—	—
Sucrose/Spindle Brix Purity	—	—	38.04	—	—	40.36	—	39.04	38.91	—	39.70
Pol/Refracto Brix Purity	37.47	—	—	40.81	—	—	36.71	—	—	—	—
Sucrose Refracto Brix Purity	41.02	—	—	40.65	38.68	—	38.81	—	—	40.14	—
Percentage Reducing Sugars	18.45	—	10.25	13.59	15.80	—	16.27	13.15	15.18	13.67	10.97
Percentage Sulphated Ash	11.38	—	15.25	13.21	16.14	13.01	13.79	—	15.70	14.98	—
Reducing Sugars/Ash Quotient	1.62	—	0.67	1.03	0.98	—	1.18	—	0.97	0.92	—
Molasses of 85° Spindle Brix % Cane	4.72	3.47	3.77	4.00	3.29	3.63	3.22	2.98	3.24	3.34	3.53

L.C.V. (Bagasse: British Units) = 7650 − 18S − 86.4M btu per lb. Bagasse.
Lower Calorific Value (metric units) 17 795 − 42S − 201M kJ per kg.
S stands for Pol % Bagasse; M indicates moisture % Bagasse.

FILTER CAKE, SYRUP AND FINAL MOLASSES

MV	JB	UC	TS	ME	IL	RN	SZ*	UK	Averages	MH	UR	LB	MR	NH
6.26	4.58	2.10	4.98	3.47	4.34	5.14	5.21	4.58	5.02	5.38	5.02	8.79	10.21	4.86
0.70	0.64	0.32	0.46	0.43	0.41	0.56	0.55	0.47	0.55	0.30	0.23	0.40	0.97	0.84
7.63	10.48	10.12	8.18	—	9.28	8.70	9.89	7.84	9.01	7.90	9.99	8.06	8.98	11.54
0.87	**2.76**	**2.04**	**0.39**	—	**2.54**	**2.52**	**0.10**	**1.03**	**1.29**	**1.44**	**1.77**	**0.92**	**1.86**	**2.03**
9.20	13.88	12.48	9.03	—	12.23	11.79	10.54	9.34	10.85	9.64	11.99	9.38	11.81	14.41
15.46	18.46	14.58	14.01	—	17.02	16.93	15.75	13.92	15.87	15.02	17.01	18.17	22.02	19.27
2.38	**1.72**	**0.85**	**1.75**	**1.31**	**1.65**	**1.79**	**2.01**	**1.84**	**1.89**	**2.30**	**2.09**	**3.40**	**4.04**	**1.88**
52.34	**54.39**	**49.35**	**52.95**	**51.25**	**53.58**	**53.13**	**52.86**	**53.61**	**53.30**	**51.37**	**53.34**	**54.68**	**52.26**	**57.40**
44.37	42.95	49.27	44.66	46.67	43.87	44.19	44.27	43.64	43.97	45.55	43.80	40.86	42.46	40.18
34.03	33.70	30.46	35.16	32.70	33.50	35.06	34.06	32.79	34.18	30.68	30.19	33.63	34.81	34.83
3085	**2919**	**3371**	**3044**	**3198**	**2991**	**3027**	**3047**	**2985**	**3011**	**3170**	**3004**	**2864**	**3062**	**2658**
7176	**6790**	**7841**	**7080**	**7440**	**6957**	**7042**	**7087**	**6943**	**7005**	**7375**	**6987**	**6663**	**7123**	**6182**
29	**22**	**30**	**34**	**24**	**27**	**27**	**24**	**27**	**(27)**	**20**	**30**	**C.L.**	**C.L.**	**26**
19.00	18.77	18.48	18.62	18.43	18.86	18.46	19.06	18.78	19.00	19.01	18.40	C.L.	C.L.	19.40
86.90	83.40	84.82	86.00	85.23	85.95	85.31	87.78	88.22	86.06	86.68	84.59	87.15	85.10	86.19
2.19	1.88	3.82	2.42	1.44	2.12	2.91	2.19	1.90	2.42	2.67	1.98	3.96	7.20	3.18
72.30	63.80	62.47	73.07	62.96	64.62	70.44	69.90	67.44	68.78	75.31	73.16	76.49	76.20	77.67
14.60	**19.60**	**22.35**	**12.93**	**22.27**	**21.33**	**14.87**	**17.88**	**20.78**	**17.28**	**11.37**	**11.43**	**10.66**	**8.90**	**8.52**
12.70	13.91	13.79	13.98	12.11	13.72	13.83	13.11	13.96	13.57	15.31	14.69	14.61	15.84	14.11
—	—	83.39	—	—	83.53	84.16	85.74	86.82	—	85.56	82.60	85.47	—	84.12
1.48	**0.60**	**1.44**	**1.26**	**1.67**	**2.42**	**1.15**	**2.04**	**1.40**	**1.81**	**1.12**	**1.99**	**1.68**	**1.72**	**2.07**
85.42	82.80	83.44	84.74	83.56	84.00	—	—	86.97	84.25	—	82.94	86.64	83.38	84.67
3.30	5.83	5.06	5.22	5.06	4.76	3.27	3.78	3.36	4.17	3.41	5.60	4.66	3.64	4.18
11.87	12.93	14.05	13.87	11.36	13.21	15.15	12.51	13.22	13.12	15.17	14.30	15.10	15.50	14.15
86.67	84.50	84.24	85.44	84.72	85.47	85.94	86.50	88.20	85.45	87.22	84.00	86.09	84.70	85.37
3.46	5.75	4.41	4.60	4.75	4.65	2.67	3.36	3.26	3.91	2.99	5.34	4.69	3.67	3.79
7.20	**7.50**	**7.20**	**7.27**	**7.33**	**7.43**	**7.00**	**7.60**	**7.60**	7.32	?	**7.20**	**7.10**	**6.70**	**7.60**
1.80	1.76	1.05	1.70	0.90	1.46	1.63	1.33	1.59	1.58	1.62	0.71	1.36	2 85	2.64
5.00	4.54	3.79	3.36	5.92	3.54	4.27	5.42	4.00	4.49	2.45	4.02	3.83	4.51	4.27
59.99	62.50	60.90	64.30	56.70	62.64	55.81	61.93	59.64	61.03	64.21	62.30	63.80	62.20	56.07
86.14	83.70	84.04	85.48	85.17	84.88	85.22	86.84	87.58	85.45	87.07	83.90	85.60	84.60	85.20
3.68	5.68	4.40	4.36	4.98	3.21	2.10	2.87	3.23	3.68	3.24	4.68	4.07	3.33	3.37
6.80	**6.80**	**6.30**	**6.52**	**6.39**	**6.74**	**6.80**	**6.60**	**7.20**	—	?	**6.70**	**6.80**	**6.70**	**7.20**
92.50	90.76	92.62	—	—	91.38	92.68	90.86	85.41	91.37	—	90.76	90.09	91.50	—
—	—	—	84.30	86.67	—	—	—	—	—	89.75	—	—	—	81.27
36.86	—	39.06	—	—	36.97	38.74	40.83	38.09	—	—	37.59	38 33	39.48	—
37.03	38.93	39.33	—	—	39.10	—	41.43	39.80	38.43	—	38.87	39.86	41.46	—
—	—	—	39.10	40.84	—	—	—	—	—	40.91	—	—	—	41.43
—	—	—	39.97	42.67	—	—	—	—	—	—	—	—	—	43.01
14.75	17.61	13.95	15.94	14.24	15.17	—	12.25	10.99	14.18	—	16.52	15.91	19.36	10.28
—	13.32	11.34	14.14	14.73	11.50	—	13.74	—	13.79	—	14.13	13.07	15.24	—
—	1.32	1.23	1.13	0.97	1.32	—	0.89	—	1.05	—	1.17	1.22	1.27	—
3.13	3.98	3.75	3.15	—	3.55	3.25	3.60	3.06	3.55	3.24	3.80	3.10	3.51	4.53

TABLE D

DATA REGARDING: MASSECUITES, EXHAUSTIONS, CONSUMPTION OF

(Season 1969 - 70)

SYMBOLS OF FACTORIES	ML	PG	UF	EM	FX	EN	AK	DK	GD	DL	GH
Brix in Mixed Juice % Cane	**15.06**	**15 56**	**14.71**	**14.73**	**14.32**	**14.52**	**14.76**	**14.19**	**14.22**	**14.92**	**12.15**
A-Massecuite:											
Cu. ft. per short ton Brix*	41.29	27.88	†30.56	28 43	28.54	23.24	29.31	29.44	21.22	29.99	30.79
hl per metric ton Brix*	12.85	8.70	9.54	8 88	8.91	7.25	9.15	9.19	6.62	9.36	9.61
Brix of massecuite	92.24	90.70	93.50	93.20	92.84	92.47	93.73	94.44	92.90	94.55	93.01
Purity of massecuite	83.22	86.69	87.86	86.10	87.21	85.81	89.90	89.85	85.16	87.92	89.80
Purity of A-molasses	68.11	72.26	71.16	68.50	69.67	69.99	70.10	72.38	64.74	69.34	72.60
Purity Drop	15.11	14.43	16.70	17.60	17.54	15.82	19.80	17.47	19.42	18.58	17.20
Exhaustion	**56.93**	**60.00**	**65.90**	**64.89**	**66.31**	**61.43**	**73.66**	**70.40**	**65.44**	**60.60**	**69.90**
Purity A-m.c.—Purity Syrup	**0.79**	**0.96**	**3.91**	**1.45**	**1.31**	**−0.15**	**3.38**	**3.25**	**−1.95**	**2.22**	**3.30**
B-Massecuite											
Cu. ft. per short ton Brix*	13.82	12.41	10.25	9.85	8.27	14.21	9.16	10.08	13.93	7.57	12.16
hl per metric ton Brix*	4.30	3.87	3.20	3.07	2.58	4.44	2.86	3.15	4.35	2.36	3.80
Brix of massecuite	93.82	93.41	95.17	94.90	93.86	96.29	93.81	94.81	95.06	94.88	94.91
Purity of massecuite	70.73	76.53	71.14	70.40	71.55	71.01	72.34	74.17	73.00	70.91	74.20
Purity of B-molasses	47.28	58.17	51.33	49.70	49.53	51.77	48.47	52.22	50.52	48.22	52.40
Purity Drop	23.45	18.36	19.81	20.70	22.02	19.24	23.87	21.95	22.48	22.69	21.80
Exhaustion	**62.89**	**57.35**	**57.21**	**58.46**	**60.98**	**56.18**	**64.03**	**62.00**	**62.24**	**61.80**	**61.72**
C-Massecuite											
Cu. ft. per short ton Brix*	10.50	8.45	8.87	11.06	8.10	8.66	8.00	9.00	7.45	8.14	9.47
hl per metric ton Brix*	3.27	2.64	2.77	3.45	2.53	2.70	2.50	2.81	2.32	2.54	2.96
Brix of massecuite	95.67	97.94	98.01	97.10	96.24	98.87	95.90	97.49	98.79	96.66	97.00
Purity of massecuite	57.99	60.79	57.09	59.50	60.04	58.77	59.87	60.06	54.26	59.49	60.60
Purity of C-molasses	37.47	38.98	38.95	40.81	38.38	42.11	36.71	36.81	36.91	37.47	39.80
Purity Drop	20.52	21.81	18.14	18.69	21.66	16.66	23.16	23.25	17.35	22.02	20.80
Crystal % massecuite	**31.40**	**35.01**	**29.12**	**30.66**	**33.83**	**28.45**	**35.09**	**35.86**	**27.17**	**34.04**	**33.51**
Exhaustion	**56.59**	**58.80**	**52.05**	**53.07**	**58.54**	**48.97**	**61.12**	**61.26**	**50.68**	**59.19**	**57.01**
White Sugar Massecuites :											
Lb. sugar per cu. ft. m.c.'s	33.66	41.60	—	—	—	?	—	—	—	—	47.81
Kg. sugar per hl m.c.'s.	53.92	66.64	—	—	—	?	—	—	—	—	75.57
Total Volume of all m.c.'s:											
Cu. ft. per short ton Brix*	104.13	68.36	49.68	49.34	44.91	?	46.47	48.51	42.60	45.70	76.33
hl per metric ton Brix*	32.41	21.34	15.51	15.40	14.02	?	14.51	15.14	13.29	14.26	23.83
Clarifying Agents:											
Per 1000 *tons of Cane*											
Tons Limestone	?	5.165	—	—	—	—	—	—	—	—	4.38
Tons Coke	?	0.521	—	—	—	—	—	—	—	—	0.7
Tons Lime	?	0.604	0.512	0.635	0.580	1.881	0.494	0.512	0.529	0.506	0.632
Tons Sulphur	?	0.014	—	—	—	0.837	—	Nil	Nil	Nil	?
p.p.m. Mixed Juice											
Phosphoric	?	Nil	Nil	Nil	Nil	—	—	Nil	Nil	Nil	—
Flocculants	?	0.665	0.330	Nil	Nil	0.668	—	Nil	1.517	Nil	—
Additional Fuels:											
Per 1000 *Tons of Cane*											
Tons of Fuel Oil	?	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Tons of Coal	?	6.263	2.638	0.976	12.203	5.150	0.256	Nil	Nil	Nil	12.222
Tons of Wood	?	—	0.377	4.041	Nil	5.374	Nil	10.211	0.940	0.703	1.861
Converted into tons Bagasse	?	**25.05**	**11.00**	**8.75**	**48.81‡**	**27.05**	**1.03**	**12.253**	**1.13**	**0.84**	**51.12**

* Brix in Mixed Juice.

† Weighed Averages of A-1 and A-2 strikes.

‡ Inclusive paper factory

Exhaustion is: "recovered crystal **per 100 sucrose** in massecuite".

Crystal % Massecuite is: "recovered crystal **per 100 parts of massecuite**".

CLARIFYING AGENTS AND OF ADDITIONAL FUELS

MV	JB	UC	TS	ME	IL	RN	SZ	UK	Averages	MH	UR	LB	MR	NH
14.18	**14.55**	**14.46**	**13.86**	**(13.03)**	**14.49**	**13.87**	**14.53**	**14.47**	**14.52**	**14.79**	**14.37**	**13.71**	**14.83**	**15.12**
35.00	30 08	30.60	30.10	(31.27)	37.07	21.03	33.71	30.68†	30.01	27.83	30.94	31.44	27.20	—
10.93	9.39	9.55	9.40	(9.76)	11.57	6.57	10.52	9.58	9.36	8.69	9.66	9.82	8.49	—
91.51	92.96	92.52	92.74	91.39	92.44	93.70	92.56	92.43	92.79	92.19	91.70	93.52	93.11	—
88.66	86.40	85.87	86.40	86.29	88.91	85.51	87.17	87.43	87.11	85.74	87.90	83.76	87.08	—
72.34	69.90	67.96	69.17	70.95	74.60	67.52	72.52	71.78	70.28	67.54	71.90	69.45	70.88	—
16.32	16.50	17.91	17.23	15.34	14 31	17.99	14.65	15.66	16.83	18.20	16.00	14.31	16.20	—
66.55	**63.44**	**65.10**	**64.68**	**61.19**	**63.36**	**64.77**	**61.16**	**63.44**	**65.01**	**65.39**	**64.78**	**55.92**	**63.88**	—
2.52	**2.70**	**1.83**	**0.92**	**0.81**	**4.03**	**0.29**	**0.33**	**−0.15**	**1.66**	**−1.33**	**4.00**	**−1.84**	**2.48**	—
11.45	11.40	12.62	8.29	(15.48)	11.87	11.42	16.62	8.88	11.49	13.66	12.69	16.56	16.91	—
3.58	3.56	3.94	2.59	(4.83)	3.70	3.57	5.19	2.77	3.59	4.26	3.96	5.17	5.28	—
93.93	94.96	94.68	93.58	93.44	93.31	95.61	95.33	95.27	94.55	93.41	94.10	94.18	95.76	—
72.46	75.20	70.58	69.06	71.48	75.75	74.06	72.44	73.55	72.53	73.06	75.30	72.93	73.93	—
46.31	53.10	47.59	50.94	53.38	53.94	49.51	48.91	51.00	50.76	54.52	52.00	52.77	52.52	—
26.15	22.10	22.99	18.11	18.10	21.81	24.55	23.53	22.55	21.77	18.44	23.30	20.16	21.41	—
67.22	**62.66**	**62.22**	**53.45**	**54.31**	**62.51**	**65.65**	**63.58**	**62.57**	**60.96**	**55.62**	**64.47**	**58.53**	**60.99**	—
7.84	10.71	9.19	8.48	(9.41)	9.74	8.28	9.66	7.25	8.91	9.68	10.84	10.71	10.59	—
2.44	3.34	2.87	2.65	(2.94)	3.04	2.58	3.12	2.26	2.78	3.02	3.38	3.34	3.31	—
96.66	97.84	97.16	94.77	95.92	97.60	97.33	99.19	97.94	97.20	95.57	97.90	98.27	101.19	—
56.00	60.70	57.78	58.69	59.81	61.38	59.88	59.66	59.78	59.11	62.84	61.60	59.50	60.50	—
36.86	38.93	39.06	39.10	41.34	36.97	38.74	40.77	38.69	38.74	40.91	37.59	38.33	39.48	—
19.14	21.77	18.72	19.59	18.47	24.41	21.14	18.89	21.09	20.37	21.93	24.01	21.17	21.02	—
29.30	**34.88**	**29.85**	**30.48**	**30.20**	**37.80**	**33.59**	**31.63**	**33.69**	**32.32**	**35.47**	**37.66**	**33.73**	**35.15**	—
54.13	**58.73**	**53.16**	**54.81**	**52.64**	**63.09**	**57.63**	**53.46**	**57.54**	**56.25**	**59.06**	**62.45**	**57.69**	**57.41**	—
—	—	—	—	—	—	—	36.94	—	—	47.16	31.38	—	54.95	
—	—	—	—	—	—	—	51.21	—	—	65.38	43.50	—	76.18	—
54.29	52.19	52.41	46.87	(56.16)	58.68	40.73	87.05	46.81	—	51.89	64.32	58.71	82.36	—
16.95	16.29	16.36	14.64	(17.53)	18.32	12.72	27.17	14.61	—	16.20	20.08	18.33	25.71	—
—	—	—	—	—	—	—	3.637	—	—	—	—	—	—	—
—	—	—	—	—	—	—	0.523	—	—	—	—	—	—	—
0.637	0.856	0.860	0.580	0.567	0.519	0.671	1.819	0.533	—	0.856	1.407	1.412	1.295	—
Nil	Nil	Nil	Nil	Nil	—	—	0.001	—	—	—	0.002	0.316	0.007	—
37.84	147.72	112.27	Nil	—	—	—	0.477	894	—	—	—	—	0.340	—
6.31	6.659	6.909	263.7	—	7.496	—	—	73	—	5.419	2.416	0.874	0.491	—
Nil	Nil	Nil	?	Nil	—	Nil	0.048	—	—	—	—	—	2.436	—
5.591	Nil	22.408	?	0.062	3.850	Nil	4.141	Nil	—	0.002	8.958	1.233	—	—
2.377	9.508	0.702	?	—	9.180	Nil	0.523	1.859	—	—	—	7.594	15.647	—
25.22	**11.41**	**90.47**	?	**0.248**	**26.416**	**Nil**	**17.480**	**2.23**	—	**0.008**	**35.833**	**14.045**	**33.392**	—

1 m³ fuel oil is equivalent to 6.1 short or 5.5 metric tons of bagasse.
1 short or 1 metric ton of fuel oil is equivalent to 6 short resp. 6 metric tons of bagasse.
1 short or 1 metric ton of coal is equivalent to 4 short resp. 4 metric tons of bagasse.
1 m³ fire wood is equivalent to 0.46 short or 0.42 metric tons of bagasse of 3 000 btu/lb. resp. 6 978 kJ/kg.

TABLE E

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

SEASON	1969/70	1968/69	1967/68	1966/67	1965/66
CANE					
Sucrose % Cane	12.88	13.11	12.92	13.72	12.99
Fibre % Cane	15.03	15.32	15.01	15.09	15.57
JUICES					
Brix° First Expressed Juice	19.00	19.54	19.16	19.84	19.27
Purity of First Expressed Juice	86.06	85.49	85.26	86.97	86.30
Purity of Last Expressed Juice	68.78	69.72	71.43	72.43	72.30
DROP in Purity	17.28	15.77	13.83	14.54	14.00
Purity of Mixed Juice	84.25	83.60	83.41	85.06	84.22
Reducing Sugars/Sucrose Ratio	4.17	4.23	3.81	3.62	3.73
MILLING					
Imbibition % Fibre	274	268	261	262	261
LOST ABSOLUTE JUICE % FIBRE	34.15	34.38	38.32	37.91	37.58
Imbibition % Cane	41.22	41.12	39.15	39.60	40.57
EXTRACTION	94.98	94.74	94.15	94.22	93.99
Sucrose % Bagasse	1.89	1.98	2.19	2.29	2.20
Moisture % Bagasse	53.30	53.52	53.47	53.52	52.98
Bagasse % Cane	34.18	34.93	34.53	34.56	35.42
Lower Calorific Value (btu/lb.)	**3,011**	**3,008**	**2,991**	**2,985**	**3,033**
Available btu per lb. Brix	**7,085**	**7,070**	**7,084**	**6,788**	**7,414**
RECOVERIES					
BOILING HOUSE PERFORMANCE	—	96.19	95.82	95.96	95.65
Boiling House Recovery	88.58	87.40	87.52	88.38	87.67
Overall Recovery	84.13	82.72	82.33	83.27	82.40
Tons Cane per Ton Sugar	9.10	9.06	9.28	8.63	9.20
FILTER CAKE					
Sucrose % Cane	1.58	2.08	2.10	2.16	1.57
Filter Cake % Cane	4.49	4.71	4.71	5.21	5.62
FINAL MOLASSES					
GRAVITY PURITY	38.43°	39.40	38.75	40.65	39.91
Degree Brix	91.37	91.81	92.03	93.45	91.72
Weight at 85° Brix % Cane	3.55	3.78	3.69	3.47	3.59
AVERAGE SUGAR POLARISATION	98.68°	98.42°	98.34°	98.58°	98.49°
SUCROSE BALANCE					
Lost in Filter Cake	0.55	0.77	0.80	0.82	0.68
Lost in Final Molasses	9.01	9.64	9.38	8.75	9.38
Undetermined Losses	1.29	1.51	1.57	1.38	1.53
LOST IN BOILING HOUSE	10.85	11.92	11.75	10.95	11.59
Lost in Bagasse	5.02	5.36	5.92	5.78	6.01
TOTAL OF ALL LOSSES	15.87	17.28	17.67	16.73	17.60
CU. FT. OF MASSECUITES PER TON BRIX					
A-massecuite	30.01	29.30	29.44	29.02	27.89
B-massecuite	11.49	11.67	11.74	10.30	11.78
C-massecuite	8.91	9.25	9.59	8.83	9.14
TOTAL	50.41	50.22	50.77	48.15	48.81
EXHAUSTION OF MASSECUITES					
A-massecuite	65.01	64.73	65.05	62.85	62.78
B-massecuite	60.96	60.35	61.31	58.36	59.53
C-massecuite	56.25	56.15	58.28	55.59	56.37
PURITY RISE					
A-massecuite purity	87.11	86.26	86.07	86.68	85.91
Syrup purity	85.45	84.92	84.59	86.03	85.06
RISE	+1.66	+1.34	+1.48	+0.65	+0.85
DENSITY (°BRIX) OF SYRUP	61.03°	61.23°	59.96°	60.35°	59.33°

TABLE F

AVERAGE MANUFACTURING RESULTS BY MONTHLY PERIODS FOR SOUTH AFRICAN MILLS

(Season 1969 - 1970)

END OF MONTHLY PERIOD:		May 31 1969	June 28 1969	Aug. 2 1969	Aug. 30 1969	Sept. 27 1969	Nov. 1 1969	Nov. 29 1969	Dec. 27 1969	Feb. 1 1970	Feb. 28 1970	Mar. 21 1970
TONS SUGAR MADE & ESTIMATED	Month	(54,927)	(159,730)	(265,230)	(227,472)	(226,404)	(249,535)	(195,176)	(158,541)	(172,981)	(70,938)	—
	To Date	(54,927)	(214,657)	(479,887)	(707,359)	(933,763)	(1,183,398)	(1,378,474)	(1,537,015)	(1,709,996)	(1,780,934)	(1,792,077)
TONS CANE CRUSHED	Month	563,893	1,510,277	2,390,063	1,943,007	1,895,431	2,165,300	1,779,446	1,524,722	1,683,579	735,978	—
	To Date	563,893	2,074,170	4,464,232	6,407,239	8,302,670	10,467,970	12,247,416	13,772,138	15,455,719	16,191,695	16,300,826
TONS CANE CRUSHED PER HOUR ACTUAL CRUSHING		184	165	176	176	178	173	171	176	179	199	—
	To Date	184	170	173	174	175	174	174	174	175	176	176
SUCROSE % CANE	Month	11.79	12.35	12.84	13.55	13.93	13.42	12.84	12.29	12.25	11.75	—
	To Date	11.79	12.20	12.54	12.85	13.10	13.16	13.09	13.03	12.94	12.89	12.88
FIBRE % CANE	Month	14 30	14 60	14.50	14.60	14.94	14 92	15 62	15.51	15.66	15.80	—
	To Date	14 30	14 52	14 53	14.55	14.64	14.70	14 83	14 91	14.99	15.03	15.03
TONS CANE PER TON OF 96° SUGAR	Month	(9.98)	(9.22)	(8 79)	(8 32)	(8 15)	(8 50)	(8.81)	(9.34)	(9.48)	(10.11)	—
	To Date	(9.98)	(9.42)	(9.07)	(8.83)	(8.66)	(8.63)	(8.65)	(8.72)	(8.80)	(8.85)	(8.86)
LOST ABSOLUTE JUICE % FIBRE	Month	35	36	34	34	32	31	32	32	35	—	—
	To Date	35	35	34	34	34	34	33	33	33	34	34
IMBIBITION % FIBRE	Month	269	268	272	278	277	278	273	276	260	310	—
	To Date	269	268	270	272	273	274	274	274	273	275	274
SUCROSE EXTRACTION	Month	95 06	94.95	95.14	95.14	95.32	95.29	95.02	94.82	94.50	93.80	—
	To Date	95.06	94.98	95.07	95.02	95.15	95.18	95.15	95.12	95.05	95.00	94.98
SUCROSE % BAGASSE	Month	1.76	1.85	1 88	1.99	1.93	1.86	1.84	1.81	1.90	1.98	—
	To Date	1.76	1.83	1.86	1.90	1.90	1.89	1.89	1.88	1.88	1.89	1.89
MOISTURE % BAGASSE	Month	54 85	53 86	53.55	53.13	52.26	53.60	53.03	53.05	53.08	54.13	—
	To Date	54 85	54.07	53.79	53.59	53.28	53.34	53.30	53.27	53.25	53.30	53.30
BOILING HOUSE RECOVERY . .	Month	(85 81)	(88 55)	(89.34)	(89.59)	(88.76)	(88.34)	(89.37)	(88.21)	(87.48)	—	—
	To Date	(85.81)	(87.78)	(88.64)	(88.94)	(88.92)	(88.80)	(88.88)	(88.81)	(88.68)	(88.57)	(88.58)
OVERALL RECOVERY.	Month	(81.57)	(83.97)	(84.93)	(85.15)	(84.62)	(84.17)	(84.92)	(83.64)	(82.65)	—	—
	To Date	(81.57)	(83.30)	(84.19)	(84.50)	(84.61)	(84.51)	(84.57)	(84.47)	(84.29)	(84.14)	(84.13)
MIXED JUICE PURITY	Month	82.95	84.15	84 44	84.68	84.92	84.71	84.47	84.47	83.83	81.00	—
	To Date	82.95	83.83	84.16	84.33	84.47	84.52	84.51	84.51	84.41	84.25	84.25
R.S./SUCROSE RATIO	Month	4.92	4.03	4.02	3.97	3.87	3.80	3.98	4.38	4.63	—	—
	To Date	4.92	4.11	4.50	4 03	3.98	3.95	3.96	4.06	4.12	4.10	4.17
SUCROSE/SPINDLE BRIX PURITY OF FINAL MOLASSES	Month	38.01	38.21	39.10	39.08	38.50	39.02	38.45	38.50	37.84	37.62	—
	To Date	38.01	38.10	38.57	38.74	38.52	38.23	38.27	38.30	38.42	38.37	38.43
SUCROSE LOST IN FINAL MOLASSES % SUCROSE IN CANE	Month	9.06	9.04	8.29	8.79	8.26	9.03	8.30	9.14	10 12	—	—
	To Date	9.06	9.03	8.62	8.68	8.57	8.67	8.61	8.67	8.82	9.00	9.01
UNDETERMINED LOST SUCROSE % SUCROSE IN CANE	Month	(3.77)	(1.28)	(1.31)	(1.50)	(1.60)	(1.51)	(1.20)	(1.45)	(1.20)	—	—
	To Date	(3.77)	(1.99)	(1.63)	(1.54)	(1.56)	(1.45)	(1.42)	(1.43)	(1.39)	(1.30)	(1.29)
MONTHLY RAINFALL (INCHES) .	Month	3.98	0.64	0 73	0.54	2.98	6.14	3.98	3.66	3 07	2.09	—
RAINFALL FROM 1st JANUARY .	To Date	22.86	23.17	23.85	24.28	27.19	33.94	37.80	41.54	3.07	5.16	—

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	96s 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 1935–44. . .	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	93.44	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	93.53	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	82.30
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	8.24	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	62.92	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	84.49	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**	8.54	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	15.50	9.01	8.91	94.15	37.4	2.24	52.17	**41.2**	266	83.36	**5.11**	39.6	96.6	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	8.46	93.43	40.7	2.51	52.78	36.3	235	85.24	3.67	39.6	97.4	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	3.62	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

DISCUSSION

Mr. Perk: I try and introduce at least one new item into my report each year.

For example, the nonsucrose ratio was introduced to have a check figure at hand to assess the accuracy of the recorded final molasses weights. Members should remember that in 1952 only ten factories published their final molasses weights and it took seventeen years before all mills had final molasses scales. There were factories which took the total 'tanker weights' as the weight of the produced molasses over the season; the molasses weight being therefore available only once a season. There was another mill which measured the volume of the produced molasses. It was this mill that showed the biggest deviations from the normal nonsucrose ratio. It is not only the nonsucrose ratio which I use as a check on the accuracy of the final molasses weight; the reducing sugars balance, the circulation ratio of final molasses inside the system "C-m.c. pans and centrifugals" also throw a light on the accuracy of the final molasses weights.

Quotations of the Monthly Weather Report were this year omitted as other papers deal with this subject more thoroughly. The results of the weather on the ripening of the cane is shown in a number of tables where "sucrose content of the cane by months" and "purity of the mixed juice by months" are compared with average values for these properties.

As far as the South African cane belt is concerned, the 1969/70 season started with a very low sucrose content of the cane and during the whole season the sucrose content stayed below the forty-one year averages. The mixed juice purity started at a normal value but did not improve during the course of the season.

Table 4 shows how much lower the average juice purity and the average sucrose content of the cane harvested during the last ten optimum periods were than the corresponding values of the previous decade. It is particularly the lower juice purities which affect the boiling house most, by reducing recovery, increasing sugar losses and steam consumption, and overloading the backend of the factory.

Marromeu's mixed juice showed a purity of 88.88° in September 1969. Luabo's maximum sucrose content of 15.57%, though high according to South African standards, is still below the mean value of 15.98% for the October month.

The mixed juice purities and the sucrose contents of the cane harvested by Mhlume and Big Bend do not differ much from the values obtained in other years.

With regard to the time account and length of seasons, the introduction of the seven-day week or the week of 168 hours available time brings to the fore how much time could be won if the weekend stop could be reduced in length. In the last season the average time lost by weekend stops was twenty-one hours per week; the highest loss being twenty-nine hours, the smallest loss four hours per week, i.e. eight hours per milling tandem in alternative weeks.

In a chapter on refractometric and hydrometric brix determination it is pointed out that the refractometric brix, although it gives a closer approach to the actual dry matter content of the product, cannot replace the spindle brix in all cases as the refracto brix is not directly related to the specific gravity of the product.

A new factory performance indicator has been introduced. The part which is really new is the use of the "corrected milling loss according to Follet-Smith" as a yardstick for the performance of the extraction plant, the plant being either a diffuser or a milling train.

Subtracting the corrected milling loss from 100% gives us the whole reduced extraction according to Mittal i.e. the extraction which might have been expected had cane of 13½% fibre and 13½% sucrose been milled.

Multiplying the whole reduced extraction with reduced boiling house recovery, E.S.G. leads to an overall recovery which would have been achieved had the purity of the mixed juice been 85°, in addition to 13½% fibre and 13½% sucrose in the cane; the result being indicated as "crystal".

N.B.: For the calculation of the crystal content of the sugar the Winter Formula with a factor of 0.4 is used. Java used for the calculation of the crystal content of a sugar the Winter Formula with a factor 0.5 after converting the pol of the sugar into sucrose content. (Addition of 0.3° for the difference in temperature during polarisation). South Africa is going to use a factor of 0.661 in the formula: S – y – times (B – S) = crystal percentage.

The nonsucrose ratio based on mixed juice appeared to indicate that diffusion factories produced more molasses from their nonsucrose introduced with the mixed juice than did the pure milling factories. However, as about 40% of the mixed juice of a diffusion factory has passed a purification process inside the diffuser, mixed juice of a pure milling factory cannot be compared with that of a diffusion factory. This is apparent when we compare the quantities of filter cake produced by the one and by the other.

For a better basis of comparision, we introduced in 1969 "the nonsucrose ratio based on clarified juice analysis". This change-over eliminated the indication that diffusion factories made more final molasses from their nonsucrose introduced with the juice than did pure milling factories.

However, it still leaves the question unresolved as to whether the diffuser (under similar conditions) extracts more impurities than the milling tandem.

The abnormal figures encountered in the Reducing Sugars Balance are attributed more to mistakes made when analysing the products for reducing sugars content than to abnormal inversion or abnormal destruction of reducing sugars.

I refer now to the Sucrose, Brix and Nonsucrose balances and the Ratio or Purity of the Undetermined Losses.

As all these balances are based on the clarified juice analysis no discrimination has been made between diffusion and milling factories. However, as some factories apply the refractometer when analysing the boiling house products and others the hydrometer, the results had to be divided into two groups i.e. factories using the refractometer and those determining their brix with the spindle.

Attention is drawn to the three factories which publish the results only of their rawhouse departments and not of the complete combination of refinery and rawhouse departments. They all show very low undetermined sucrose and brix losses. In such cases small inaccuracies in both losses will lead to abnormal figures for the nonsucroses losses and for the ratio (or purity) of the undetermined losses. For example, Sezela shows a negative nonsucrose loss and Pongola a too low purity of the losses.

A note under Table 16 tells us that the average of the diffusion factories does not include Nchalo because there is doubt about the correctness of the final molasses weight. This remark was based on the results shown in Table 18 i.e. a negative brix loss, a negative nonsucrose loss and a negative figure for the purity of the undetermined losses. This is an example how other properties in addition to the nonsucrose ratio can pinpoint an incorrect final molasses weight.

As regards the quantity (volume) of C-Massecuite, Table 19 deals with the cu ft of C-m.c. as recorded per ton of nonsucrose in mixed juice. As this table deals with diffusion and pure milling factories it would have been better if the volume of massecuite had been based on the quantity of nonsucrose in clarified juice.

Mr. Jennings: The cane/sugar ratios in South Africa over the years compare unfavourably with the figures achieved in Australia. In Australia the figure has been below 7.0 whereas we are fortunate if we record a figure of 8.5.

Mr. Perk mentions one avenue of investigation we should pursue to reduce the cane/sugar ratio, namely, deterioration of cane after harvesting.

An aspect which has not been covered is planned harvesting of cane — programmed ripening trials.

Mr. Perk: The emphasis in South Africa has always been on tons cane per acre, and not on tons of available sugar per acre which is of course the really important figure.

As regards metrication, I note that rainfall is being reported in millimetres to two decimal places, an accuracy which I do not think can be achieved.

Mr. Jennings: Mr. Perk has refered to accuracy of reporting. Dr. Parker of Tate & Lyle recently mentioned that the most accurate buffer solution obtainable has a standard error of 0.045 pH and yet we find people who insist on reporting pH to two places of decimals.

Mr. Allan: The Time Account of factories makes interesting reading. The figures for UF are 88.88% for crushing hours per cent available hours. Another factory goes as low as 68.09%.

Half the factories keep to the average of 76% but those below this should look into the reasons for the time lost.

Mr. van Hengel: We have a factory with two tandems and when we stop a tandem for maintenance we record this as hours of stoppage.

Does UF do the same?

Mr. Perk: UF shuts down each tandem on alternative week-ends but does not record this period in hours of stoppage.

I merely produce the figures declared by the factories — I cannot vouch for their accuracy.

Mr. van Hengel: In that case the figures can be highly misleading.

Mr. Alexander: (in the chair) I wish to thank Mr. Perk for this his last paper on the summary of laboratory reports.

We shall sorely miss his reports at future meetings.

HAYNE & GIBSON (DBN) — 28617