FORTY-FOURTH ANNUAL SUMMARY OF LABORATORY REPORTS OF SUGAR FACTORIES IN SOUTHERN AFRICA COVERING THE 1968 – 1969 SEASON

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N.B.: 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 which report regularly to the Sugar Milling Research Institute have again been compiled in a number of tables which are to be found at the back of the Summary. These tables contain the following data:

Table A: Final Production of the S.A. Sugar Factories specified according to grades.

Table B: Cane crushed and sugar made; cane composition and varieties; throughputs and time accounts; factory performances.

Table C: Analyses of bagasse, juice, syrup and final molasses.

Table D: Data regarding masses cuites, clarifying agents and additional fuels.

Table E: Comparative manufacturing results of recent years of S.A. Mills.

Table F: Average manufacturing results by monthly periods for the 1968/69 season (S.A. Mills).

Table G: Comparative Data of S.A. Mills from 1925 to 1968.

We take this opportunity to draw special attention to the last table which gives a comprehensive review of the results from 1925 onwards.

The discussion of the season under review (preceding the above-mentioned tables) starts with a report of the weather in relation to the 1968/69 cane crop of the S.A. Mills.

A. S.A. CANE CROP, 1968/69 SEASON

(i) The Weather

We quote from the weather reports:

"Very satisfactory continuous rains which started in the second half of October (1967) built up to a climax on the 27th of the month when some areas received more than 2.5 inches in penetrating showers within a twenty-four hour period. The mean rainfall for October 1967 was slightly above the past average for the month."

"The delayed spring growth started in earnest following the initial rains. A heavy fall of 5.24 inches was recorded during November (1967). Distribution was fairly good and the cane crop responded immediately. Rainfall for December (1967) was 1.90 inches, which is less than half the forty-four year average, and represented the lowest precipitation for the month since 1936."

"The calendar year 1968 started with a rainfall of 5.59 inches in January, and peak growth of cane was resumed."

"*March 1968 rainfall* at 4.25 inches was reasonably good, although less than the average previously recorded for this month. Most of the rain occurred early in the month however, and by the beginning of April dry conditions were affecting growth. During *April* only 1.34 inches of rain fell in the cane belt. By the end of that month drought was being experienced in many areas."

"The drought continued into *May* when 0.53

inches of rain were recorded for the entire month. This is barely one-quarter of the average rainfall for this month recorded during the past forty-four years."

"*June 1968* has been a cold, dry, windy month in the S.A. cane belt. Main rainfall throughout the region was 0.90 inches for the month, which is well below the average recorded during the past forty-five years. All areas covered by this report are being seriously affected by the drought caused by three months of deficient rainfall."

"No relief from the prevailing conditions was experienced in *July* when the rainfall for the sugar-belt averaged only 0.24 inches compared with the forty-five year July average of 1.16 inches."

"*August 1968.* Good soaking rains fell over almost the entire S.A. cane belt, breaking at last the severe five-month old drought. The average rainfall recorded was 3.75 inches, which is 2.30 inches above the forty-five year average of 1.45 inches."

In order to illustrate the effect of the drought period on the sucrose content of the cane and on the mixed juice purity by month as recorded during the reporting season these are compared with forty year averages in Table 1:

TABLE 1

Month	Sucrose % Cane		Mixed Juice Purity	
	1968/69	40 year average	1968/69	40 year average
May	12.90	12.45	83.08	84.04
June	13.61	12.94	**84.60**	84.95
July	**13.64**	13.54	83.86	85.56
August	13.60	14.02	83.37	86.12
September	13.27	**14.32**	83.94	86.12
October	13.03	14.12	83.55	**86.14**
November	12.72	13.60	82.86	85.78
December	12.30	12.92	82.70	84.86
January	12.10	12.48	82.12	83.94

The desiccation caused by the drought period resulted in an earlier ripening of the cane followed by an early drop in sucrose content of the cane and in mixed juice purity. The sucrose content of the cane would have dropped even faster if it had not been counteracted by the simultaneous increase of the sucrose in the cane harvested from the irrigated lands of Malelane and Pongola as Table 2 shows:

TABLE 2
SUCROSE CONTENT OF THE CANE BY MONTH OF CANE CRUSHED AT MALELANE AND PONGOLA MILLS

Month	Malelane	Pongola	Month	Malelane	Pongola
May	12.81	—	October	**15.05**	**15.30**
June	12.87	14.31	Nov.	14.50	14.91
July	13.53	14.22	Dec.	13.67	14.39
Aug.	14.17	14.52	Jan.	12.94	—
Sept.	14.48	14.89			

The Crops of other Southern African Factories

For sake of comparison we show below the sucrose content of the cane by month of those affiliated mills which regularly send us monthly data:

TABLE 2
Sucrose % Cane by monthly periods

1968	Mhlume	Ubombo Ranches	Luabo	Marromeu	Nchalo
May.	12.98	12.25	11.40	11.74	13.08
June.	13.73	12.24	12.05	12.81	13.19
July.	13.55	12.88	13.18	13.49	12.84
Aug.	13.39	13.39	14.36	14.74	?
Sept.	13.77	**14.40**	14.94	**16.29**	13.01
Oct.	**14.34**	13.91	**15.25**	16.06	13.05
Nov.	13.62	12.90	14.40	15.45	**13.24**
Dec.	12.46	12.33	—	—	—

We draw attention especially to the high sucrose contents of the canes of the Sena Sugar Estates' factories; i.e. Marromeu, more than 16% in the months of September and October; and Luabo, 15.25% in October 1968.

(ii) Comparison of the Cane Harvested during the optimum periods over the last twenty years

Table No. 1 illustrated the effect of the drought on the sucrose content of the cane and on the purity of its juice; the following Table 3 shows us the average quality of the cane in the optimum period of 1968 compared with that in the previous seasons:

TABLE 3

Year	Sucrose % Cane	Fibre % Cane	Mixed Juice Purity	Tons Cane/ Ton Sugar
1949.	13.86	16.20	86.49	8.50
1950.	**14.79**	15.99	**86.69**	**7.92**
1951.	13.47	16.36	84.94	8.88
1952.	14.39	15.98	86.71	8.16
1953.	14.32	16.31	86.07	8.26
1954.	13.97	15.96	86.42	8.53
1955.	14.45	15.60	86.39	8.13
1956.	13.84	15.70	86.19	8.51
1957.	13.73	15.24	85.86	8.57
1958.	13.77	15.73	85.10	8.57
Mean	14.05	15.90	86.09	8.41
1959.	13.99	15.76	86.06	8.47
1960.	14.11	15.16	86.10	8.38
1961.	14.11	14.46	**86.69**	8.23
1962.	13.77	15.32	83.51	8.58
1963.	13.91	15.38	86.09	8.36
1964.	14.41	15.20	86.01	8.06
1965.	13.10	15.44	84.53	9.06
1966.	14.14	14.76	86.65	8.33
1967.	13.51	14.78	83.74	8.80
1968.	13.26	15.28	83.58	9.09
Mean	13.83	15.15	85.50	8.54

Calamitous droughts struck the sugar cane belt five times in these twenty years affecting the crops harvested in the 1951/52, 1962/63, 1964/65, 1965/66 and 1968/69 seasons. In addition, the aftermath of the restrictions in sugar production, commencing in 1960 and lasting three seasons, had a material effect on the cane quality.

Finally, in Table 4 the results recorded for cane harvested in the optimum periods are compared with those obtained from the cane harvested before July and after November of each season.

N.B.: For a comparison of results recorded before the season 1964/65 we refer to the *Forty-second Summary* (Congress 1967) and for records before 1961/62 to the *Thirty-sixth Summary* (Proc. Congress 1961).

TABLE 4
RESULTS OF CANE HARVESTED DURING THE OPTIMUM PERIOD COMPARED WITH THOSE OBTAINED WITH CANE CRUSHED BEFORE JULY AND AFTER NOVEMBER OF THE SAME SEASON

	% of Crop	Percent Cane		Purity Mixed Juice	Cane to Sugar Ratio
		Sucrose	Fibre		
Season 1964/65					
Optimum Period	60	14.41	15.20	86.01	8.06
Balance of Crop	40	13.17	15.62	84.74	9.01
TOTAL CROP	100	13.90	15.38	85.52	8.38
Season 1965/66					
Optimum Period	67	13.10	15.44	84.53	9.06
Balance of Crop	33	12.76	15.83	83.50	9.50
TOTAL CROP	100	12.99	15.57	84.22	9.20
Season 1966/67					
Optimum Period	55	14.14	14.76	85.65	8.33
Balance of Crop	45	13.20	15.50	84.29	9.02
TOTAL CROP	100	13.72	15.09	85.06	8.63
Season 1967/68					
Optimum Period	58	13.51	14.78	83.74	8.80
Balance of Crop	42	12.21	15.29	82.92	9.80
TOTAL CROP	100	12.92	15.01	83.41	9.25
Season 1968/69					
Optimum Period	65	13.26	15.28	83.63	8.80
Balance of Crop	35	12.81	15.40	83.41	9.52
TOTAL CROP	100	13.11	15.32	83.60	9.09

N.B.: To arrive at the sugar weights (required for the calculations of cane to sugar ratios) the equivalent tons of sugar made by Mount Edgecombe during the last two seasons have been calculated with the aid of the formula for E.R.S.Y. = S – 0.485 (B – S) – 0.0647 F. For the sugar weights of the other Mills the weights recorded on the Laboratory Reports have been taken (i.e. not the official weights of the actual manufactured sugars).

(iii) Cane and Sugar Production in recent years

TABLE 5
Short tons (of 2000 lb)

Season	Tons Sugar*	Tons Cane	Cane/Sugar Ratio
1964/65	1,395,446	11,752,031	8.42
1965/66	1,001,784	9,266,324	9.21
1966/67	1,794,423	15,545,625	8.75
1967/68	2,008,683	18,643,889	9.28
1968/69	1,659,399	15,123,331	9.11

*Official Tonnages of Sugar.

Actually less sugar has been manufactured in the last two seasons than indicated by the above table (and by the following table). The fact is that Mount Edgecombe Mill produced high test molasses instead of sugar during the seasons 1967/68 and 1968/69. However, to make the data comparable with those of other seasons, the tons of sugar which Mount Edgecombe Mill would have produced have been estimated based on the tons cane crushed and the analysis of juice and bagasse.

TABLE 6
Metric tons (of 1000 kg)

Season	Tons Sugar*	Tons Cane	Cane/Sugar Ratio
1964/65	1,265,921	10,661,207	8.42
1965/66	908,803	8,406,269	9.21
1966/67	1,627,869	14,102,756	8.66
1967/68	1,822,249	16,913,471	9.28
1968/69	1,505,381	13,719,657	9.11

*Official Tonnages of Sugar.

Before the season started a production restriction was imposed in connection with the international sugar stock position. However, when the effect of the drought on production could be assessed, it appeared that the set production level of 1,800,000 million tons of sugar would not be exceeded and the imposed production cut was cancelled.

N.B.: Only in Table A and Tables 5 and 6 are the official figures, as released by the S.A. Sugar Association, recorded. The figures in the other tables are all based on the sugar tonnages as recorded in the mills' laboratory reports. This implies that figures for undetermined losses and recoveries of the factories-cum-refineries Pongola, Gledhow and Sezela refer only to the performance of the rawhouse, and the sugar tonnages represent the sugars which passed from the rawhouse to the refinery department. The other factories-cum-refineries Malelane, Marromeu, Ubombo Ranches and Nchalo and the factories Mhlume and Entumeni (which produce also white sugars by re-melting of raw sugars) record however, the performances of the whole factories, i.e. from cane to the actual bagged sugars.

(iv) The Varietal Scene

The following table shows the changes in percentages of the main varieties in recent years for the whole S.A. Industry. It shows how the drop in percentage N:Co.310 is gradually levelling off at about 20%. This is because N:Co.310 is still the mainstay of Northern Zululand, and will remain so until a more suitable variety becomes available to growers.

The initial sharp rise in percentage N:Co.376 is gradually levelling off. This is not only because the point of saturation is approaching, but because other varieties are also starting to increase their percentages.

The extension of N:Co.293 in the higher altitude areas (Entumeni, Doornkop, but especially in the Midlands) caused the increase in percentages N:Co.293 crushed. Extension in the Midlands, Umfolozi, Felixton, Illovo and Renishaw increased the percentage of N:Co.382. The increase in N.20/211 originates from extensions at Tongaat, Melville, Entumeni and Mount Edgecombe.

TABLE 7
Percentages of Varieties crushed in Recent Years

Season	1964/65	1965/66	1966/67	1967/68	1968/69
Co.331	4.41	2.70	1.83	1.41	1.30
N:Co.310	46.91	40.15	33.63	24.77	19.21
N:Co.293	3.72	4.51	5.98	6.21	7.03
N:Co.376	23.36	32.19	36.45	41.46	44.52
N:Co.382	2.87	3.35	4.89	6.42	6.43
N:20/211	2.84	3.52	3.56	3.80	3.08

(v) Time Account and length of Season

TABLE 8

Season	1968/69	1967/68	1966/67
Tons cane crushed	15,213,331	18,643,889	15,545,625
Hours mills open	102,003	120,963	109,216
Hours actual crushing	87,905	105,436	95,229
No. of mills crushing	20	20	19
Average crushing rate	172	177	163
Av. length of season	34 weeks	39 weeks	40 weeks
Av. days of crushing	183 days	220 days	209 days
Overall time efficiency	86 %	87¼ %	87 %
Hours of stoppages owing to cane in short supply	14 % 6 %	12¾ % 4¼ %	13 % 5 %

This season there were again twenty factories crushing, which crushed on an average for 183 days only owing to disappointing average cane yield. Though there were two mills which were still crushing in the first weeks of March, the average length of the season was only thirty-four weeks, as there were also factories which completed their seasons rather early.

Table 9 reviews the increase in yearly tonnages of cane crushed, the combined crushing rate available and the average length of the crushing season, from 1950/51 onward. To facilitate the comparison the results of the 1950/51 season are assumed to be 100 %. In this season 5.7 million tons of cane were crushed, the combined crushing rate of all mills was 1300 tch and the length of the crushing season was thirty-one weeks. The review shows that the combined crushing rate always lags a number of years behind the increase in cane tonnage. It shows too that except in the event of very good crop results the average duration of the season is always less than thirty-nine weeks.

TABLE 9

Season	Total Tons Cane Crushed	Combined Crushing Rate	Average Duration of Season
1950/51	100.0	100.0	31 weeks
1951/52	84.2	99.6	27 „
1952/53	100.1	102.9	29 „
1953/54	108.8	104.9	30 „
1954/55	128.8	117.6	36½ „
1955/56	139.6	128.1	35 „
1956/57	131.8	130.2	32 „
1957/58	150.0	135.8	37 „
1958/59	179.6	143.7	39 „
1959/60	159.8	144.8	36 „
1960/61	151.5	150.9	32 „
1961/62	164.4	156.4	33 „
1962/63	187.9	149.6	40 „
1963/64	192.1	165.1	37½ „
1964/65	205.8	171.4	38 „
1965/66	162.3	185.7	31 „
1966/67	272.3	227.2	39 „
1967/68	325.7	263.6	40 „
1968/69	266.4	261.5	34 „

B. FACTORY CONTROL

(i) Two Check Figures

We open the chapter on "Factory Control" by discussing two check figures, i.e. "The Factor 'W'" (or so-called brix-free water in final bagasse % fibre) and "Imbibition Efficiency"

The Factor 'W'

Firstly, we should explain that the check figure 'W' and the way it is determined should not be confused with "Colloid Water", "Absorption Water" or "Water of Hydration". The first is discussed in Communication No. 18 (1953) of the S.M.R.I. and the determination of the quantity of water bound to cellulose fibres in Quarterly Bulletin No. 25 (Oct. 1963) of the S.M.R.I.

The value of 'W' is affected by the accuracy of "Tons Cane", "Tons Imbibition Water", "Tons Mixed Juice", "Brix First Expressed Juice", "Brix Mixed Juice", "Moisture % Bagasse", "Sucrose % Bagasse" and "Purity Last Expressed Juice". Therefore we can use 'W' as a check on the correctness of the aforementioned items. In general the values of 'W' range between 18 % and 26 % in the event of straight milling, using "cold" imbibition water and determining the bagasse weight by inference. We know, however, that the bagasse weight determined with the aid of the formula: Tons Bagasse = Tons Cane + Tons Imb. Water – Tons Mixed Juice, is too high. Under the conditions that prevailed at Entumeni before diffusion was introduced, it appeared that the bagasse weight determined by inference was 7 % too high. This difference is due to errors in the mass balance, which for the greater part are due to loss of water by evaporation, commencing when the weighed cane stands in the mill yard and continuing during the milling process. The use of hot water for imbibition will increase the loss due to evaporation. In Queensland it was found that the bagasse weight determined by inference was 18 % too high in the case of hot maceration. Such high losses will also occur in the event of milling-cum-diffusion. Because of this Servo balances to weigh the bagasse were installed at Entumeni and Dalton U.C. At Malelane Mill a belt weigher came into operation at the end of the 1968/69 season, while Empangeni is considering the installation of a belt weigher for the next season.

As cane at Luabo and Marromeu is mechanically loaded it has to be cleaned in so-called "cane laundries". The cane leaving the laundries is dripping wet and dilutes the samples for first expressed juice analysis. As a result of this 'W' cannot be calculated for these factories ('W' would become negative) and the Java Ratio cannot be used for sucrose distribution.

In Table 10 the values of 'W' for the last five seasons are compiled; the figures referring to factories applying milling-cum-diffusion are in parentheses.

TABLE 10
The Factor 'W' (or "Brix-free Water % Fibre")

Season	1968	1967	1966	1965	1964
ML . . .	(neg)	(9)	—	—	—
PG. . . .	30	32	32	29	24
UF. . . .	39	30	23	25	21
EM . . .	(12)	(13)	25	27	24
FX. . . .	24	23	21	20	25
EN. . . .	(43)	(45)	(31)	46	41
AK. . . .	23	18	16	8/24	23
DK . . .	33	30	26	29	31
GD . . .	26	21	21	26	38
DL. . . .	19	14	17	21	21
GH . . .	17	15	15	21	18
MV . . .	24	24	23	22	30
JB	25	25	27	—	—
UC. . . .	(29)	(25)	(33)	—	—
TS	33	28	27	28	33
ME . . .	26	25	16	18	21
IL	24	27	25	20	18
RN . . .	41	25	21	16	23
SZ	30	25	24	21	13
UK . . .	39	30	18	25	30
MH . . .	40	17	25	36	30
UR. . . .	28	29	27	20	21
LB	Cane Laundry		35	29	36
MR . . .	Cane Laundry			5	2
NH . . .	(18)	—	—	—	—

TABLE 11
Imbibition Efficiency

Season	1968	1967	1966	1965	1964
ML . . .	(60)	(76)	—	—	—
PG. . . .	45	45	45	48	50
UF. . . .	40	43	41	44	50
EM . . .	(82)	(79)	52	48	49
FX. . . .	48	48	42	42	47
EN. . . .	(78)	(41)	(43)	30	26
AK. . . .	(42)	50	44	46/42	47
DK . . .	57	59	58	46	57
GD . . .	47	48	42	41	51
DL. . . .	41	32	34	34	35
GH . . .	45	42	40	52	58
MV . . .	37	35	35	42	44
JB	44	41	45	—	—
UC. . . .	(81)	(90)	(73)	—	—
TS	57	55	55	52	53
ME . . .	48	43	47	41	45
IL	46	47	43	47	58
RN . . .	60	61	48	49	48
SZ	48	45	52	68	46
UK . . .	44	70	46	52	48
MH . . .	71	76	75	65	55
UR. . . .	48	57	53	42	50
LB	40	56	41	39	50
MR . . .	68	61	70	72	69
NH . . .	(112)	—	—	—	—

Imbibition Efficiency

Table 11 shows the values obtained in recent years for "Imbibition Efficiency". This figure, which under the name "Vermengingsfactor" is as old as "Winter Rendement", has a dual purpose. Firstly it indicates to what extent the water applied before the last mill mixes with the residual juice in the bagasse of the penultimate mill. Secondly it is a check on the correctness of the determination of Pol % bagasse. As in milling-cum-diffusion, the imbibition water has a better opportunity to mix with the residual juice, the figures for m-c-d plants should always be higher than those obtained with straight milling. In addition the imbition rate has an effect on the result; lower imbition ratios leading to higher figures for Imbibition Efficiency than higher imbibition rates.

Abnormally high values, which cannot be explained by the application of diffusion or of a low imbibition ratio, point to a too low determined pol % bagasse.

N.B.: In order to indicate whether m-c-d is applied, the figures obtained by these plants are in parentheses.

As the foregoing paragraphs dealt with a check on the accuracy of certain analyses and weight determinations this would seem to be a suitable place to refer to an article published in the Quarterly Bulletin No. 26 of the S.M.R.I. and in the S.A. Sugar Journal, April *1964*, under the title "*Determination of the Percentage of Sediment in Mixed Juice*". The effect of suspended matter in juices does not only affect the sucrose determination in mixed juice, but it affects also all brix determinations. For example, we know that the purity rise from mixed to clarified juice is only "apparent" and is caused by the effect of the suspended matter in the mixed juice on the brix determination. (Clayton: Twenty-sixth Conference of the Q.S.S.C.T. *1959*).

The effect of suspended matter on sucrose and brix determination in juices is proportional to the percentage of suspended matter. Mechanical loading of the cane has brought to the fore the influence of dirt adhering to the cane on the correctness of sucrose and brix determination in juices.

In the following table, i.e. Table 12, a review is given of figures relating to the performance of the milling tandems and milling-cum-diffusion plants. These figures are:

(ii) Milling Control

(*a*) Lost Absolute Juice in Final Bagasse % Fibre.
(*b*) Imbibition % Fibre.
(*c*) Tons of Fibre milled per hour.
(*d*) Total Roller Volume in cu. ft.
(*e*) Total Effective Diffuser Area in sq. ft.
(*f*) Specific Feed Rate or Unit Load (lb/hr/cu. ft. T.R.V) of Mills.
(*g*) Specific Feed Rate or Unit Load (lb/hr/sq. ft. E.D.A) of Diffuser.
(*h*) Number of Imbibition Steps.

The performance of Dalton U.C. could have been even better if the pre-diffusion mill had operated more satisfactorily. For the next season a feeder-roller will be fitted to improve the feed to this mill. Second in the list is the Mount Edgecombe tandem, a mill that has many times in previous years taken top place. Third is Nchalo's milling-cum-diffusion plant, the diffuser being preceded and followed by one (ordinary) mill only. Fourth Empangeni m-c-d plant is preceded and followed by two (ordinary) mills. As the fibre throughput is high and the journal

TABLE 12

Name of Mill	a	b	c	d	e	f	g	h
UC . .	22.80%	244%	8.06	285	518	57	31	12
ME . .	25.40	302	31.32	1203	—	52	—	6
NH . .	27.43	211	6.91	147	636	94	22	13
EM . .	28.45	272	37.79	907	1990	83	38	13
MH . .	28.63	188	21.99	700	—	63	—	5
FX . .	30.44	262	28.00	1408	—	40	—	6/5
DL . .	31.00	369	32.27	1212	—	53	—	5
TS . .	31.48	233	45.45	1850	—	49	—	6/5
IL . .	31.70	309	17.02	813	—	42	—	5
PG . .	32.01	266	20.54	1213	—	34	—	5/4
RN . .	32.26	220	13.80	507	—	54	—	4
AK . .	32.75	252	43.50	1624	—	54	—	6
EN . .	33.00	319	7.01	155	686	90	20	13
UF . .	38.08	287	34.79	2011	—	35	—	6/6
DK . .	39.30	260	11.56	435	—	53	—	5
ML . .	39.31	299	33.76	404	1725	167	39	12
UK . .	40.04	343	23.80	763	—	62	—	5
SZ . .	40.21	255	44.20	1530	—	58	—	4/4
UR . .	40.61	208	19.84	703	—	56	—	5
GH . .	41.72	245	38.36	1281	—	60	—	5
MV . .	41.91	296	12.23	550	—	44	—	4
GD . .	42.64	260	7.05	246	—	57	—	4
JB . .	42.69	245	29.52	1439	—	41	—	5
MR . .	57.01	167	24.13	636	—	76	—	4
LB . .	59.85	179	28.38	763	—	74	—	5

area of the mills restricts the loading, two mills in front and two at the rear were required. During the season the system of "wet feeding" of the bagasse into the diffuser was changed to "dry feeding" viz. the method applied in Egypt even for diffusers of more than 200 tch, which is also the method with the B.M.A. diffuser as supplied to Dalton U.C.

The effort of Mhlume resulting in a loss of less than 30% juice on fibre, notwithstanding a rather high unit load, a minimum of imbibition applied and only five imbibition steps available, deserves special mention.

Malelane's milling-cum-diffusion plant has been beset with difficulties from the first year it came into operation. Most of the trouble with poor percolation disappeared when here too "wet feeding" was changed into "dry feeding" of the bagasse into the diffuser. However, many hours of stoppages are still caused by lack of cane owing to rain, broken knives as a result of "rocks" being embedded in the cane by the mechanical loading of the trucks, etc. Introduction of cane washing would not only provide a more constant feed to the crusher, but would also dispose of the clay clinging to the cane after a rain shower. In addition it would make it possible to precede the crusher with a shredder, which cannot be done at present owing to the stones which are brought in with the cane.

The list is closed by mention of two mill tandems which are heavily handicapped, i.e. more than 70 lb fibre unit load and which apply the lowest imbibition ratio of all factories. In addition Marromeu has only four and Luabo only five imbibition steps. A fifth mill added to the Marromeu tandem would reduce the Specific Feed Rate to 63 lb and the number of imbibition steps would be increased to five, which would improve the lost juice percentage materially.

(iii) Boiling House Control

Discontinuation of "Boiling House Performance"

The Chemical Control Committee of the S.A. Sugar Technologists' Association has recommended that the use of "Boiling House Performance" should be discontinued and that an investigation should be carried out to find a better yardstick or a combination of formulae to evaluate the work done by the boiling house.

The reason for this decision was twofold. The formula for B.H.P. is based on the quantity of non-sugars in mixed juice and differences in the composition of the non-sugars is not taken into account. Therefore two juices with the same purity treated in the same plant by the same staff may result in different figures for B.H.P., because (notwithstanding the same quantity of non-sugars) the physical and chemical behaviour of the non-sugars during processing operations differ.

Up till 1957 the B.H.P. figures had been steadily improving and the S.A. Sugar Technologists were satisfied with the figure. At that time reduction of the factor "F" was even considered because on a number of occasions the 100% mark was exceeded. Then came the change in juice quality and between 1957 and 1965 the industrial average for B.H.P. dropped two units.

This drop brought to the fore that B.H.P. is not only affected by the skill of the mill staff and the capacity of the boiling house plant, but even more by the physical and chemical behaviour of the non-sugars during processing operations. Is a high B.H.P. caused by the skill of the staff, the capacity of the plant, or by a favourable composition of the non-sugars? Or, is it the result of a combination of two or three alternatives? How can we decide how great the part is that each participant has in the total result?

As long as the B.H.P. was improving we were satisfied and attributed the improvement to improvement of the plant and improved processing techniques. Now the B.H.P. has dropped we cannot accept that our technologists and our processing techniques have deteriorated. Therefore the quality of the non-sugars must be responsible. As we cannot separate the effect that the quality of the non-sugars has on the B.H.P. figure, it has been decided that this confusing figure must go.

MAIN AND ANCILLARY FIGURES WITH RESPECT TO "BOILING HOUSE CONTROL"

We saw in the case of "Milling Control" that it was not enough to indicate the result with one figure only, i.e. "Lost Absolute Juice % Fibre". More information was needed such as imbibition rate, load, etc. This holds good also for "Boiling House Control", it being not enough to mention merely one figure, i.e. "Boiling House Performance". We want a group of ancillary figures in order to interpret the main figure properly.

These ancillary figures also serve another purpose. For example, a factory records a high B.H.P. but shows at the same thime a high undetermined sucrose loss. Is this possible? Are the figures correct? Which one is doubtful? To answer such questions we have to study the ancillary data, therefore we supply each year a great number of ancillary figures grouped in tables such as sucrose and brix balances, reducing sugars balance, non-sucrose re-circulation, etc. We do not draw conclusions ourselves based on these ancillary figures, we leave this to the Process Managers concerned, as they know best how much value can be attached to each figure. For example, in a case where one or more figures point to a too high molasses weight, then the Process Manager knows if the molasses weight has been checked with the tanker weights, etc. We do not know this.

Before commencing the tables of ancillary figures reference must be made to the following:

Spindle and Refractometric Brixes

In the previous Summaries we have converted all refracto-brixes and purities into figures based on spindle-brixes. We now wish to change this and where figures differ (because they are based on different brix determinations) we will either treat them separately or indicate them with an asterisk (*).

Non-sucrose Ratio (Mixed Juice to Total Final Molasses)

TABLE 13

Parts of Non-sucrose in Total Final Molasses per 100 parts originally present in mixed juice					
	Spindle-brix Factories			Refracto-brix Mills	
Mill	Ratio	Mill	Ratio	Mill	Ratio
PG	0.85	UC	0.91	ML	0.89
UF	0.81	TS	0.82	EM	0.76
EN	0.92	IL	0.84	FX	0.71
DK	0.88	RN	0.80	AK	0.74
GD	0.88	SZ	0.89	DL	0.71
GH	0.86	UK	0.92	ME	—
MV	0.93	UR	0.75	MH	0.75
JB	0.86	LB	0.94	NH	0.95
		MR	0.76		

Actually we should separate the "Refracto-brix Mills" into two groups, i.e. those which use the refractometer from cane to molasses and those which use this instrument only for the boiling house products. In the latter case the brix of the mixed juice is determined with the spindle, while the first group of factories use also the refractometer on mixed juice. This seems to be the explanation why Empangeni, Felixton, Amatikulu, Darnall and Mhlume show such low ratios. It is thought that these low ratios will disappear if the non-sucrose in mixed juice is calculated with the aid of refracto-brixes.

There are a number of factories which show very high ratios. Are they real, or are they the result of too high weights of final molasses? perhaps the following ancillary figures will clarify this point.

Non-Sucrose or Final Molasses Re-circulation

As the quantity of C-massecuite is recorded in volume, this data has to be converted into weight. In the event of the brix being given as refracto-brix the refracto-brix has to be converted into spindle-brix, as the latter is directly proportional to specific gravity and the former is not directly related to the density. However, the spindle-brix refers to conditions at 20°C., while the volume of the massecuite has been measured at 65–70°C. Therefore the spindle-brix has to be "corrected" to the latter temperatures. Finally, we look up the density (lb per cu ft) corresponding with the "corrected" brix in the appropriate table.

The next operation is to calculate the tons non-sucrose in the given cu ft of C-massecuite and to compare this with the non-sucrose in "weighed" final molasses, i.e. comparing the non-sucrose *entering* the pre-curers for C-m.c. with the non-sucrose *leaving* these machines. There is here, however, the snag that at those mills which turn out sugar coated with final molasses not all the molasses discharged from the pre-curers is weighed. It would, of course, be possible to estimate how much molasses is not weighed and to add this to the weighed final molasses. As with the white sugars and the high pol sugars only a fraction of the final molasses is weighed with the sugars (and not with the final molasses) we use in our comparison "Total Final Molasses" instead of "Weighed Final Molasses". The re-circulation can therefore be indicated by the following formula:

$$100 \frac{\text{Tons Non-sucrose in C-massecuite}}{\text{Tons Non-sucrose in Total Final Molasses}} - 100$$

In Table 14 the results of this formula are shown, differentiating again between "mills using the hydrometer" and "factories using the refractometer".

TABLE 14
Non-sucrose or Final Molasses Re-circulation

	Spindle-Brix Factories			Refracto-Brix Mills	
Mill	Excess	Mill	Excess	Mill	Excess
PG	12%	UC	28%	ML	20%
UF	19%	TS	31%	EM	34%
EN	32%	IL	38%	FX	19%
DK	23%	RN	29%	AK	20%
GD	37%	SZ	31%	DL	38%
GH	26%	UK	11%	ME	—
MV	20%	UR	38%	MH	35%
JB	23%	LB	106%	NH	18%
		MR	61%		

A re-circulation rate of 106% is excessive and points to a far too high recorded C-m.c. volume. The latter assumption is confirmed by perusing Table C at the end of the Summary. Here we will see that the same factory has the highest cu ft of C-m.c. per ton of brix, although this mill has the highest mixed juice of all twenty-five mills.

The next parameter to be discussed is:

The Reducing Sugars Balance

In Table 15 the amount of reducing sugars originally present, i.e. in mixed juice, is taken as 100%, and the quantities of R.S. present in clarified juice, syrup and total final molasses are indicated as percentages of the original amount, no differentiation being made between mills using spindle or refractobrixes.

TABLE 15
Reducing Sugars Balance

Mill	Percentages of R.S. present in:		
	Clear Juice	Syrup	Total Final Molasses
ML	89	80	91
PG	97	85	?
UF	96	100	105
EM	96	79	86
FX	84	80	85
EN	93	81	104
AK	90	81	108
DK	111	117	124
GD	109	86	62
DL	95	93	98
GH	66	63	66
MV	106	115	140
JB	96	94	90
UC	96	92	99
TS	92	93	96
ME	101	104	—
IL	96	64	106
RN	81	57	?
SZ	97	71	127
UK	109	107	100
MH	89	64	?
UR	95	88	?
LB	107	88	91
MR	101	91	139
NH	89	95	78

The percentages of R.S. present in clarified juice range from 81% to 111%, those present in syrup from 57% to 117% and the percentages present in total final molasses range from 62% to 140%. Normal percentages are: ±95% in clarified juice, ±90% in syrup and approximately 95% in total final molasses.

Perusing the percentages recorded it appears that the standard of accuracy is variable.

Sucrose, Brix and Non-sucrose Balances

These data have again to be divided into those based on spindle-brix and data derived from refractobrix.

"Ratio" indicates the percentage ratio between "tons undertermined sucrose losses" and "tons undetermined brix losses". When we introduced this parameter in the nineteen-twenties we called it "purity of the undetermined losses", recently we changed the name to "Ratio" to indicate that the actual average purity of the undetermined losses can differ a great deal from the value recorded as "Ratio". For example, when the clarified juice purity is recorded to only one decimal place, for example 84.4, it may actually have been 84.35° or 84.45°, making a difference of about 10% in the determination of the undetermined brix losses and a commensurate difference in "ratio". Moreover we are of the opinion that not the same care and attention is given to the sampling and preservation of the clarified juice as is given, for example, to the mixed juice. In this respect we draw attention to the fact that 28% of the figures recorded for brix° of clarified juice are equal or higher than brix° of mixed juice. Therefore when using the parameter "ratio" to detect how sucrose was lost, we must not forget the limited accuracy of this figure.

TABLE 16

Undetermined losses of sucrose, brix and non-sucrose in percentages of material present in clarified juice				
Mill	Sucrose	Brix	Non-Sucrose	Ratio
ML*	4.49%	5.67%	11.01%	65°
EM*	2.56%	4.20%	12.95%	51°
FX*	1.70%	4.51%	20.24%	32°
AK*	1.16%	3.93%	19.48%	25°
DL*	1.95%	4.03%	16.27%	41°
EM*	—	—	—	—
MH*	1.12%	2.12%	9.22%	47°
NH*	2.11%	1.61%	-1.05%	110°
PG	1.23%	1.36%	2.54%	78½°
UF	0.65%	2.59%	12.59%	21°
EN	2.01%	3.42%	10.70%	49°
DK	1.71%	2.40%	6.93%	62°
GD	1.28%	2.06%	6.62%	53°
GH	0.70%	1.34%	5.02%	44°
MV	1.26%	1.35%	1.87%	80°
JB	1.79%	1.02%	3.25%	74°
UC	1.56%	2.39%	6.25%	54°
TS	1.22%	2.29%	8.29%	45°
IL	2.57%	2.81%	4.28%	78°
RN	0.35%	2.51%	14.28%	12°
SZ	0.36%	0.95%	4.33%	32°
UK	1.16%	1.90%	6.48%	53°
UR	1.43%	2.69%	9.46%	45°
LB	0.99%	2.21%	10.36%	39°
MR	1.95%	3.70%	15.11%	46°

Further, we want to draw attention to the difference in figures shown under "factories using the refractometer" with those recorded by the mills using the hydrometer or spindle. For example, Melville shows the following sequence: 1.26% und. sucrose loss, 1.35% und. brix loss, 1.87% und. non-sucrose loss and 80° ratio, while Amatikulu shows: 1.16% und. sucrose loss, 3.93% und. brix loss, 19.48% und. non-sucrose loss and 25° ratio.

Finally, the main figure indicating the result of the boiling house will be reviewed, i.e.

Boiling House Performance

In the following table, i.e. Table 17, the boiling house performance figures recorded during the 1968/69 season are tabulated, together with gravity purities of the final molasses and the undetermined sucrose losses (based on sucrose in cane). The final molasses purities of those factories which use the refractometer are indicated by an asterisk (*) and the factories which record only the result of the rawhouse department are shown in parentheses.

TABLE 17

Mill	Boiling House Performance	Gravity Purity Final Molasses	Undetermined Sucrose Losses
ML	91.9	39.0*	4.18
PG	(96.3)	39.5	(1.16)
UF	96.7	40.6	0.61
EM	94.2	42.7*	2.42
FX	97.7	40.2*	1.59
EN	94.0	39.2	1.91
AK	98.4	39.9*	1.08
DK	96.4	40.4	1.60
GD	98.3	36.4	1.20
DL	96.4	43.1*	1.85
GH	(97.3)	39.0	(0.66)
MV	95.9	39.7	1.16
JB	95.2	39.7	1.67
UC	95.9	39.2	1.52
TS	96.6	40.5	1.14
ME	—	—	—
IL	93.6	41.0	2.46
RN	97.8	36.1	0.33
SZ	(95.4)	41.7	(0.33)
UK	96.8	39.9	1.10
MH	98.8	39.5*	1.08
UR	96.9	38.7	1.35
LB	95.7	41.0	0.89
MR	96.7	39.8	1.75
NH	90.9	45.0	2.01

Anomalies in the different parameters (for example, a low undetermined sucrose loss accompanied by a low B.H.P. figure) should be checked by studying the different ancillary figures in order to establish if the final molasses weight is correct.

Finally, we end this Summary by presenting two tables relating to the work of pans and centrifugals.

Exhaustion of the Masses Cuites

In Table 18 the exhaustions of the A-, B- and C-masses cuites are shown. In the case of Umfolozi and Umzimkulu, two factories which apply a four-boiling system, the figures under "A-m.c." indicate the averages of the first two strikes.

TABLE 18

Mill	Recovered Crystallised Sucrose per 100 parts of sucrose in masse cuite			lb. of Crystals per 100 lb. of C-m.c.
	A-m.c.	B-m.c.	C-m.c.	
ML*	57.6%	57.1%	53.1%	29.0
EM*	64.3	55.3	55.0	31.5
FX*	67.4	61.8	60.2	34.7
AK*	69.8	62.7	59.9	34.7
DL*	67.2	55.2	54.0	31.2
EM*	—	—	—	—
MH*	65.1	57.9	59.8	35.1
NH*	53.6	55.7	54.9	32.7
PG	59.1	60.6	61.2	37.6
UF	68.4	57.0	53.9	31.9
EN	60.1	54.9	49.7	28.7
DK	69.8	60.0	59.6	35.7
GD	63.0	66.6	56.6	30.7
GH	67.9	60.5	59.0	34.7
MV	65.0	66.6	52.4	29.2
JB	64.3	60.4	57.4	33.8
UC	64.9	63.4	52.9	28.7
TS	67.8	58.9	56.5	32.6
IL	60.9	63.1	62.7	37.2
RN	66.1	61.9	56.7	32.8
SZ	62.6	59.0	56.1	34.1
UK	62.8	60.6	58.8	34.6
UR	63.6	65.3	63.2	38.0
LB	56.6	56.4	57.3	34.0
MR	64.3	66.1	60.2	35.4

There are only four factories showing a series of three exhaustions, each greater than 60%. It is especially the exhaustion (or the crystal content) of the C-strikes which interest us because it can lead to low final molasses purities, *provided* the purity of the C-strikes is well below 60° (spindle-brix purity). Therefore the next table (Table 19) will show C-m.c. purity, crystal content of the C-m.c., and the Purity of the Final Molasses.

TABLE 19

Mill	C-m.c. Purity	Crystal % C-m.c.	Purity Final Molasses
ML*	57.2°	29.0%	38.5°
EM*	60.4	31.5	42.2
FX*	60.4	34.7	37.8
AK*	60.9	34.7	38.5
DL*	59.6	31.2	40.4
EM*	—	—	—
MH*	61.9	35.1	39.5
NH*	62.4	32.7	42.8
PG	62.7	37.6	39.5
UF	59.8	31.9	40.7
EN	58.2	28.7	41.2
DK	61.2	35.7	38.9
GD	**54.9**	30.7	**34.5**
GH	60.8	34.7	38.9
MV	58.0	29.2	39.7
JB	60.7	33.8	39.7
UC	56.7	28.7	38.2
TS	59.3	32.6	38.8
IL	61.9	37.2	37.7
RN	59.7	32.8	39.1
SZ	61.8	34.1	41.5
UK	60.5	34.6	38.7
UR	61.3	38.0	39.5
LB	60.0	34.0	36.8
MR	58.2	35.4	35.6

N.B.: The final molasses purities are those which are recorded in conjunction with the C-strikes. Therefore they are in many cases apparent purities, either spindle- or refracto-purities. They will not tally in most cases with the purities determined in the weighed final molasses samples which are recorded in Table C.

When perusing the table we see that Felixton* has the lowest refracto-purity of final molasses, combined with one of the lowest C-strike purities and one of the highest C-m.c. crystal contents.

In the second part of the table our attention is drawn to Glendale which recorded the lowest C-m.c. purity and the lowest final molasses purity. (Because the C-m.c. purity was so low the crystal content could not be high). Union Co-Op. has also a good low purity of the C-m.c., but not sufficient crystal surface to obtain a really low final molasses purity.

Next in C-m.c. purity is Melville; however, owing to insufficient cooling capacity it was not possible to achieve a low final molasses purity.

Marromeu has a low C-m.c. purity combined with a high crystal content resulting in a low final molasses purity.

Entumeni with a C-m.c. purity of 58.2° has not sufficient crystal surface to achieve a low final molasses purity; the C-m.c. pan lacking capacity and circulation being the main cause.

DISCUSSION

Mr. Perk: As the summary is so long and detailed I wish to draw attention to certain points.

Table G, the last table, shows how juice purity is decreasing. For instance, the averages for 1935/44, 1945/54 and 1955/64 were 86.01°, 85.95° and 85.21° respectively, whereas for the last four seasons it is down to 84.01°.

This purity drop of two units means that 19.033 parts of non-sucrose, instead of 16.265, accompany every 100 parts of sucrose in mixed juice, thus increasing the padding of the sucrose by 17 per cent.

The increases in non-sucrose last season and the season before over the ten year period 1935/44 are 21% and 22% respectively. This not only means a decrease in plant capacity but also an increase in steam consumption and, more important, in sucrose losses.

The decrease in purity has been accompanied by an adverse change in non-sucrose composition.

Is the main reason for these phenomena a longer delay between cutting and crushing of cane?

Referring to the time account, Table 8, it is to be noted that in the last decade total hours of stoppages increased from 8% to 14%, percentages due to lack of cane increasing from 3% to 6%.

The check figure "W" becomes very low and even negative in cases where a cane laundry is used or where diffusion is practised. Such cases make it particularly apparent that instead of the imbibition water, the bagasse should be weighed.

The Chemical Control Synopsis for S.A.S.T.A. for the years 1927 to 1932 states "the necessity for a bagasse scale becomes more clamant with every succeeding year, especially where cane is paid on a sucrose basis, as in South Africa". The synopsis also states that "hot imbibition water causes errors in weight of bagasse owing to excessive evaporation".

With regard to Absolute Juice Lost in Final Bagasse % Fibre I refer you to Communication No. 7 (1951) of the S.M.R.I. where terms to evaluate milling performance are discussed and the reason given why the S.M.R.I. selected Lost Absolute Juice % Fibre as the yardstick for milling performance, namely, that mills squeeze out a certain volume of juice, and not sugar as such.

Turning to Table 12, it should be pointed out that Dalton U.C. is still a relatively new factory and therefore even better figures may be expected in the coming season.

The summary mentions that Natal-Estates is as usual among the top places but credit must be given for the enormous effort required to attain and retain these positions. It has modern first and last mills driven by powerful turbines but the five older mills are of much lighter construction and have electric motors of limited capacity.

Empangeni and Nchalo are also well placed, their high extractions being what is expected of diffusion plants.

It is not possible to comment on all the mills, but a special word for Mhlume for its low Lost Juice figure, notwithstanding a fairly high specific feed rate and a low imbibition rate.

It is mentioned in the summary that the S.A.S.T.A. Chemical Control Committee has recommended the abolition of the use of Boiling House Performance and this will leave us without a means of evaluating this factor. Replacement by other yardsticks such as Boiling House Recovery E.S.G. will not help as these also correct for quantity of non-sucrose but not its quality.

I suggest a parameter other than purity be used to indicate juice quality. Purity is a percentage ratio between sucrose quantity and specific weight of juice, or, when a refractometer is used to measure brix, the ratio between two optical properties and this is even less suitable for determining the physical and chemical properties of the non-sucrose.

Both Tables 13 and 14 show the anomalies caused when factories use either the spindle brix or the refractometer and it is clearly highlighted that refractometer brix may not be used for conversion of volumes into weights. This also poses the problem of the use of refractometer brix with the Schmidt table.

Information regarding performance of vacuum pans, crystallisers and pre-curing centrifugals is given in Tables 18 and 19. Exhaustion is the ratio of crystallised sucrose or crystal per hundred sucrose in massecuite. For good performance this ratio should always be more than 60% although this requires a greater effort for 'C' massecuite than for 'A' massecuite. The only factories to obtain 60% exhaustion for all three masses cuite were Felixton, Illovo, Big Bend and Marromeu.

The conditions required for well exhausted final molasses are threefold, namely, a 'C' massecuite purity below 60°, sufficient crystal surface, i.e. 30% or more crystal percent massecuite, and proper cooling and curing.

Table 19 reveals that Glendale has the lowest 'C' massecuite purity and the lowest gravity purity of final molasses, the crystal content of the 'C' massecuite being 30%. Felixton has a low 'C' massecuite and the lowest molasses purity for refractometer brix factories, the crystal content being 31%.

The pH's of clarified juice are shown in Table C to range between 6.60 and 7.50. It is to be hoped that figures below 7.00 are the results of errors in determination and that the true figures are higher. In the International Sugar Journal, 1966, pages 361 to 363 reference is made to increased H-ion and OH-ion concentrations by increase in temperature in an article entitled 'Reduction in retention time of juices at high temperatures'.

TABLE A

SOUTH AFRICAN SUGAR ASSOCIATION FINAL PRODUCTION 1968/69 SEASON BASED ON REFINERY AND TERMINAL RECEIVED WEIGHTS

MILL	LOCAL MARKET			EXPORT MARKET			TOTAL (Short tons)
	White	Refining	Brown	High Pol.	Low Pol.	H.T.M.	
Malelane	100,924	—	7,091	—	—	—	108,014
Pongola.	37,083	—	33,317	—	—	—	70,400
Umfolozi	—	14,670	12,640	—	98,428	—	125,738
Empangeni	—	99,221	275	—	—	—	99,496
Felixton	—	91,976	1,130	—	—	—	93,106
Entumeni	7,582	—	2,073	8,426	—	—	18,081
Amatikulu	—	11,974	4,728	—	132,701	—	149,404
Doornkop	—	40	102	—	43,576	—	43,718
Glendale	—	20,130	50	38	—	—	20,218
Darnall	—	9,780	325	—	114,406	—	124,511
Gledhow	104,314	1,067	113	8,197	—	—	113,691
Melville.	—	636	2,026	—	27,509	—	30,171
Jaagbaan	—	20,950	—	81,224	—	—	102,174
Union Co-Op. . . .	—	1,471	84	—	29,150	—	30,705
Tongaat	—	112,239	403	29,811	9,732	—	152,184
Mount Edgecombe .	—	1,424	2,099	—	—	101,632	105,155
Illovo	—	7,218	13,822	Syrup 28 15,901	30,622	—	67,592
Renishaw	79	—	34,607	—	—	—	34,686
Sezela	64,124	—	220	33,011	—	—	97,355
Umzimkulu . . .	—	17,974	117	54,909	—	—	73,000
TOTALS	314,106	410,770	115,222	231,544	486,124	101,632	1,659,399

TABLE B

CANE CRUSHED AND SUGAR MADE, CANE COMPOSITION AND VARIETIES,

(Season 1968/69)

SYMBOLS indicating factories:	ML	PG*	UF	EM	FX	EN	AK	DK	GD	DL	GH*
Tons Sugar Made	**111,926**	**(71,344)**	**125,735**	**99,571**	**93,115**	**18,081**	**149,671**	**43,719**	**20,243**	**124,552**	**(116,315)**
Percentage White Sugar made	93	53	Nil	Nil	Nil	42	Nil	Nil	Nil	Nil	92
Average °Pol of All Sugars made	99.80°	(98.79°)	97.66°	98.75°	98.62°	99.03°	97.64°	97.68°	98.59°	97.61°	(99.12°
Tons Cane Crushed	**1,073,672**	**564,804**	**1,111,066**	**930.555**	**845,366**	**168,330**	**1,316,399**	**377,390**	**178,911**	**1,099,987**	**1,082,410**
Season started on:	1.4.68	29.5.68	21.5.68	15.5.68	9.5.68	27.5.68	9.5.68	8.5.68	6.6.68	9.5.68	29.5.68
Season ended at:	9.3.69	21.12.68	4.12.68	9.1.69	13.1.69	10.11.68	18.1.69	25.1.69	25.1.69	19.1.69	25.1.69
Time Account:											
Hours Crushed % Hours Mill Open	71.52	92.68	90.14	87.81	85.74	93.43	87.81	93.74	80.27	91.78	92.98
Hours Cane Shortages % H.M.O.	8.95	1.98	2.42	4.82	8.59	1.76	4.00	4.64	13.83	5.10	3.22
Other Hours of Stoppages % H.M.O.	19.53	5.32	7.44	7.37	5.67	4.80	8.19	1.62	5.90	3.12	3.80
Throughputs per hour actual crushing:											
Tons Cane crushed	207.01	148.44	260.84	207.53	180.00	52.05	287.66	76.09	47.76	217.00	235.28
Tons Fibre milled	33.76	20.54	34.79	37.79	28.00	7.01	43.50	11.56	7.05	32.27	38.36
Tons Brix processed	31.77	24.35	39.67	31.08	26.41	7.67	42.41	11.13	7.00	32.70	33.91
Tons Sugar bagged	21.58	18.75	29.52	22.20	19.83	5.59	32.70	8.81	5.40	24.57	(25.28)
Composition of Cane crushed:											
Sucrose % Cane	**13.44**	**14.70**	**13.28**	**13.07**	**12.88**	**12.99**	**13.05**	**13.39**	**13.26**	**13.18**	**12.96**
Fibre % Cane	**16.31**	**13.83**	**13.34**	**18.21**	**15.53**	**13.46**	**15.12**	**14.70**	**14.77**	**14.87**	**16.30**
Java Ratio	80.57	79.98	78.66	76.82	78.21	78.00	78.42	78.18•	78.93	79.37	78.23
Tons Cane per Ton Sugar	9.59	(7.92)	8.84	9.35	9.08	9.31	8.80	8.63	8.83	8.83	(9.31)
Tons Cane per Ton 96° Sugar	9.21	(7.69)	8.69	9.09	8.84	9.09	8.65	8.48	8.61	8.68	(9.01)
Cane Varieties Crushed:											
Co.331	0.01	Nil	0.08	0.08	0.21	0.18	0.15	0.74	7.11	1.12	0.46
N:Co.310	31.20	86.81	77.24	41.93	41.63	2.11	2.90	5.01	5.67	7.90	4.14
N:Co.293	0.33	0.37	0.02	0.12	0.01	26.13	2.07	11.75	4.08	0.91	0.73
N:Co.376	59.12	11.66	8.08	29.34	35.15	61.09	19.87	71.01	37.21	72.56	68.30
N:Co.382	1.26	0.10	12.15	4.46	10.27	3.16	0.66	6.58	0.92	1.04	4.15
N.50/211	Nil	0.18	0.56	3.71	2.06	6.46	1.24	2.36	2.20	2.81	5.02
Unspecified	8.08	0.88	1.87	20.34	10.67	0.87	73.11	2.55	42.81	13.66	17.72
Total Rainfall during 1968 (inches)	?	13.41	25.15	37.57	48.56	36.76	33.66	33.94	27.36	39.77	34.61
Lost Absolute Juice % Fibre	**39.31**	**32.01**	**38.08**	**28.45**	**30.44**	**33.00**	**32.75**	**39.30**	**42.64**	**31.00**	**41.72**
Imbibition % Fibre	298.68	266.43	287.26	271.75	262.11	319.28	252.13	241.84	260.47	369.11	245.37
Specific Feed Rate**	Diffuser	33.87	34.60	Diffuser	39.76	Diffuser	53.59	53.10	57.20	53.25	59.88
Sucrose Extraction	93.60	95.68	94.95	94.53	95.15	95.59	94.70	94.28	93.58	95.46	93.32
Brix Extraction or Juice Extraction	92.34	94.86	94.14	93.22	94.41	94.87	94.16	93.23	92.61	94.59	91.87
Imbibition % Cane	48.71	36.86	38.31	49.48	40.71	42.99	38.13	35.55	38.46	54.88	40.00
Boiling House Performance	**91.92**	**(96.28)**	**96.66**	**94.23**	**97.71**	**94.03**	**98.40**	**96.35**	**98.27**	**96.37**	**(97.31)**
Boiling House Recovery	82.67	(88.75)	87.64	85.54	88.63	85.68	89.86	89.63	89.93	87.87	(88.09)
Sucrose Balance (on sucrose in cane):											
In Bagasse (*a*)	6.40	4.32	5.05	5.47	4.85	4.41	5.30	5.72	6.42	4.54	6.68
In Filter Cake (*b*)	0.43	1.19	1.32	0.49	0.79	0.67	0.55	0.63	0.22	0.81	0.74
In Final Molasses (*c*)	11.61	8.42	9.81	10.76	8.43	11.10	7.97	7.55	8.01	8.92	9.72
Undetermined Sucrose Losses (*d*)	4.18	(1.16)	0.61	2.42	1.59	1.91	1.08	1.60	1.20	1.85	(0.66)
Boiling House Losses (*b*) + (*c*) + (*d*)	16.22	10.77	11.74	13.67	10.81	13.68	9.60	9.78	9.43	11.58	11.12
Sum of All Losses (*a*) + (*b*) + (*c*) + (*d*)	22.62	15.09	16.79	19.14	15.66	18.09	14.90	15.50	15.85	16.12	17.80
Overall Recovery	**77.38**	**(84.91)**	**83.21**	**80.86**	**84.34**	**81.91**	**85.10**	**84.50**	**84.15**	**83.88**	**(82.20)**

*The data of this factory-cum-refinery refer ONLY to the rawhouse.

**Specific Feed Rate or Unit Load is the number of lbs. of fibre milled per hour divided by the TOTAL ROLLER VOLUME in cu. ft.

THROUGHPUTS AND TIME ACCOUNTS, PERFORMANCES AND LOSSES

MV	JB	UC	TS	ME	IL	RN	SZ*	UK	Totals and Means	MH	UR	LB	MR	NH
30,167	102,191	30,793	152,189	H.T.M.	67,565	34,686	(99,286)	73,000	(1,564,149)	91,263	78,033	83,811	79,576	21,906
Nil	Nil	Nil	Nil	Nil	Nil	Nil	65	Nil	21	4	18	48	61	36
97.66°	98.54°	97.83°	98.46°	—	98.06°	98.28°	(99.07°)	98.58°	(98.42°)	98.49°	98.56°	98.99°	99.10°	97.94°
270,750	978,959	295,414	1,423,235	958,339	598,998	318,988	889,643	640,120	15,123,331	757,413	703,937	732,674	674,647	204,828
21.5.68	9.5.68	22.4.68	3.5.68	15.5.68	16.5.68	30.5.68	21.5.68	27/5–3/12	1.4.68	1.5.68	1.5.68	13.5.68	6.5.68	16.4.68
3.12.68	1.3.69	1.2.69	12.1.69	29.1.69	1.3.69	18.1.69	2.12.68	18/2–18/3	18.3.69	22.12.68	11.12.68	16.11.68	22.12.68	22.11.68
87.50	79.89	89.29	89.71	93.67	86.38	86.70	72.20	89.06	86.18	90.74	95.04	94.17	96.03	86.82
7.66	7.20	3.82	3.56	3.82	8.39	6.85	18.41	6.16	6.26	5.07	2.12	Nil	1.11	1.49
4.84	12.91	6.89	6.73	3.77	5.23	6.45	9.39	4.78	7.56	4.19	2.84	5.83	2.86	11.69
77.61	207.89	58.59	284.02	193.91	115.18	78.23	299.00	164.89	172.04	164.39	151.11	195.33	161.70	50.58
12.23	29.52	8.06	45.45	31.32	17.02	13.80	44.20	23.80	26.36	21.99	19.84	28.38	24.13	6.91
11.23	30.16	8.44	40.81	28.67	17.58	11.19	45.55	24.41	25.57	25.01	22.44	28.25	24.83	7.68
8.65	21.70	6.11	30.37	—	12.99	8.51	33.12	18.80	17.79	19.81	16.75	22.36	19.07	5.41
13.19	12.69	12.17	12.67	12.66	13.42	12.72	13.49	13.34	13.11	13.55	13.09	13.92	14.47	13.18
15.76	14.20	13.75	16.00	16.10	14.78	17.64	14.61	14.43	15.32	13.38	13.13	14.54	14.92	13.66
78.48	80.10	79.87	76.68	77.27	78.22	76.12	78.25	79.70	78.48	79.61	80.79	cane laundries		82.43
8.97	9.58	9.59	9.35	—	8.86	9.20	(8.96)	8.77	(9.06)	8.30	9.02	8.74	8.48	9.35
8.61	9.33	9.42	9.14	—	8.68	8.98	(8.60)	8.54	(8.83)	8.09	8.79	8.47	8.21	9.16
1.76	9.95	8.76	0.33	2.18	0.88	0.01	0.19	0.73	1.30	—	Nil	Nil	Nil	Nil
3.97	1.05	0.14	4.76	4.66	10.63	3.32	3.44	7.04	19.21	51.49	24.76	38.00	43.99	49.12
0.57	46.56	55.78	1.58	7.08	27.12	0.28	0.08	6.03	7.03	—	Nil	Nil	0.48	Nil
43.67	16.95	9.56	48.38	48.83	45.46	81.15	82.97	84.14	44.52	46.22	52.55	49.10	46.02	39.16
2.82	23.85	24.38	6.29	4.69	12.52	10.92	4.07	0.57	6.43	—	0.75	7.90	6.59	Nil
10.30	0.26	1.38	11.11	6.39	1.48	1.51	1.22	0.61	3.08	—	5.50	Nil	Nil	Nil
36.91	1.38	Nil	27.55	26.17	1.91	2.81	8.03	0.88	18.43	2.29	16.44	5.00	2.92	11.72
32.61	34.52	34.92	31.40	37.16	40.02	34.57	29.27	29.84	32.45	25.07	14.70	—	—	18.98
41.91	42.69	22.80	31.48	25.40	31.70	32.26	40.21	40.04	34.38	28.63	40.61	59.85	57.01	27.43
296.45	244.69	243.53	233.06	302.12	308.53	220.23	255.41	342.78	268.34	187.65	208.01	178.94	167.42	211.20
44.47	41.03	Diffuser	49.13	52.07	41.88	54.42	57.77	62.38	—	62.83	56.44	74.38	75.88	Diffuser
93.23	94.51	97.08	94.69	96.14	95.71	94.24	94.23	94.72	94.74	96.08	94.50	91.08	90.80	96.14
92.16	92.94	96.35	94.00	95.13	94.50	93.09	93.12	93.26	93.76	95.58	93.86	89.82	90.00	95.66
46.72	34.76	33.50	37.30	48.64	45.59	38.85	37.32	34.28	41.12	25.10	27.31	26.01	24.98	28.84
95.93	95.15	95.94	96.60	—	93.61	97.85	(95.37)	96.77	96.19	98.82	96.87	95.72	96.74	90.87
88.47	85.77	86.27	87.71	—	86.09	89.14	(87.00)	89.00	87.40	91.15	88.31	89.39	88.98	82.69
6.77	5.49	2.92	5.31	3.86	4.29	5.76	5.77	5.28	5.36	3.92	5.50	8.92	9.20	3.86
0.52	1.12	0.20	0.72	0.43	0.54	1.26	1.16	0.47	0.77	0.18	0.26	0.84	0.93	0.92
9.05	10.66	11.60	9.77	—	10.32	8.64	10.76	8.85	9.64	7.24	9.45	7.93	7.33	13.76
1.18	1.67	1.52	1.14	—	2.46	0.33	(0.33)	1.10	1.51	1.08	1.35	0.89	1.75	2.01
10.75	13.45	13.32	11.63	—	13.32	10.23	12.25	10.42	11.92	8.50	11.05	9.66	10.01	16.69
17.52	18.94	16.24	16.94	—	17.61	15.99	18.02	15.70	17.28	12.42	16.55	18.58	19.21	20.55
82.48	81.06	83.76	83.06	—	82.39	84.01	(81.98)	84.30	82.72	87.58	83.45	81.42	80.79	79.45

TABLE C

ANALYSIS OF BAGASSE, JUICES,

(Season 1968/69)

SYMBOL INDICATING FACTORY:	ML	PG	UF	EM	FX	EN	AK	DK	GD	DL	GH
Final Bagasse:											
Sucrose % Bagasse	2.28	2.09	2.10	1.68	1.84	1.71	2.02	2.27	2.57	1.80	2.33
Moisture % Bagasse	53.43	51.58	55.17	54.94	51.64	57.41	53.15	53.38	51.87	52.61	52.71
Fibre % Bagasse	43.20	45.50	41.86	42.68	45.80	40.21	44.18	43.47	44.60	44.80	43.86
Bagasse % Cane	37.75	30.40	31.86	42.66	33.91	33.49	34.23	33.81	33.11	33.19	37.17
Lower Calorific Value (btu/lb.)	**2,993**	**3,156**	**2,845**	**2,873**	**3,155**	**2,659**	**3,021**	**2,997**	**3,122**	**3,072**	**3,054**
Brixfree Water % Fibre ('W')	negative	29.57	39.09	11.97	24.15	42.90	22.73	33.27	26.01	18.60	16.65
Imbibition Efficiency	59.65	45.45	39.69	81.55	47.83	77.78	41.58	57.27	46.69	40.50	45.49
Dilution Ratio	73.95	79.84	77.17	87.76	81.03	88.36	81.16	76.16	69.37	81.78	71.54
First Expressed Juice:											
Degrees Brix	19.74	21.07	19.83	20.09	19.25	19.23	19.23	19.52	19.44	19.34	19.37
Degrees (app.) Purity	84.55	87.23	85.13	84.62	85.55	86.60	86.53	87.75	86.40	85.87	85.40
Last Expressed Juice:											
Degrees Brix	3.55	2.42	2.03	3.40	2.26	3.10	1.99	3.18	2.97	1.90	2.76
Degrees (app.) Purity	67.50	71.90	71.02	70.39	71.82	71.76	75.42	72.27	72.86	69.47	68.10
Purity Drop	17.05	15.33	14.11	14.23	13.73	14.84	11.11	15.48	13.54	16.40	17.30
Mixed Juice:											
Degrees Brix	14.47	15.41	14.28	14.02	13.74	13.45	14.19	14.38	13.92	12.38	14.01
Degrees (app.) Purity	—	85.66	82.93	—	—	—	—	86.16	84.64	—	—
Purity Drop	2.32	1.57	2.20	2.16	2.00	2.35	2.73	1.59	1.76	2.40	1.50
Degrees gravity Purity	82.23	85.72	—	82.46	83.55	84.25	83.80	86.27	—	83.47	83.91
Reducing Sugars/Sucrose Ratio	6.47	2.76	3.30	4.03	4.65	3.31	3.59	2.71	4.40	3.85	4.98
Clarified Juice:											
Degrees Brix	13.54	15.88	14.48	13.58	12.74	13.07	13.11	14.31	13.91	11.48	13.21
Degrees (app.) Purity	81.89	87.09	83.79	84.22	84.90	83.80	84.84	86.80	85.40	85.48	85.10
Reducing Sugars/Sucrose Ratio	5.85	2.71	3.21	3.90	3.93	3.11	3.28	3.04	4.82	3.69	3.30
Average pH	**7.21**	**7.25**	**7.23**	**7.30**	**7.20**	**7.05**	**7.48**	**7.40**	**7.20**	**7.40**	**7.34**
Filter Cake:											
Sucrose % Cake	1.75	3.00	3.50	1.59	1.69	2.28	1.42	1.68	0.99	2.03	2.06
Cake % Cane	3.26	5.81	5.00	4.03	6.00	3.84	5.02	5.00	3.00	5.24	4.68
Syrup:											
Degrees Brix	62.02	65.06	62.22	62.09	62.41	61.48	61.21	59.11	64.88	59.65	60.66
Degrees (app.) Purity	83.07	86.06	84.42	85.04	86.11	83.80	85.54	86.54	85.80	86.35	85.20
Reducing Sugars/Sucrose Ratio	5.22	2.37	3.38	3.22	3.74	2.69	2.93	3.20	3.80	3.62	3.15
Average pH	**6.35**	**6.62**	**6.41**	**6.60**	**6.40**	**6.74**	**6.61**	**6.90**	**6.80**	**6.70**	**6.98**
Final Molasses:											
Spindle Brix° (undiluted)	—	93.54	95.27	—	—	93.35	—	91.98	94.57	—	90.40
Refracto Brix° (undiluted)	84.87	—	—	88.74	89.12	—	88.97	—	—	85.40	—
Pol/spindle Brix Purity	—	39.46	40.66	—	—	41.23	—	38.94	34.54	—	?
Sucrose/spindle Brix Purity	—	—	40.58	—	—	39.23	—	40.40	36.36	—	38.97
Sucrose/refracto Brix Purity	38.99	—	—	42.66	40.25	—	39.88	—	—	43.13	—
Percentage Sulphated Ash	11.32	?	16.75	14.08	16.60	12.35	15.48	?	11.90	14.80	?
Percentage Reducing Sugars	15.54	?	11.32	10.92	14.90	11.38	14.50	12.83	8.90	12.96	10.99
Reducing Sugars/Ash Ratio	1.37	?	0.68	0.78	0.90	0.92	0.94	?	0.75	0.88	?
Molasses (85° spindle Brix) % Cane	5.04	3.70	3.78	4.12	3.37	4.11	3.30	3.27	3.43	3.42	3.80

L.C.V. of Bagasse = 7,650 – 18 (pol % bag.) – 86.4 (Moisture % bag.) btu. per lb. of bagasse.

FILTER CAKE, SYRUP AND FINAL MOLASSES

MV	JB	UC	TS	ME	IL	RN	SZ	UK	Averages	MH	UR	LB	MR	NH
2.49	2.06	1.22	1.91	1.40	1.68	1.84	2.25	2.08	1.98	1.82	2.39	3.61	3.89	1.62
52.71	54.78	50.74	51.98	51.71	54.38	53.08	54.47	54.28	53.32	51.57	53.13	52.88	51.83	54.22
43.86	41.96	47.38	45.42	46.12	43.03	44.26	42.31	42.56	43.86	46.01	43.64	42.35	43.60	43.58
35.93	33.85	29.03	35.24	34.90	34.34	39.86	34.54	33.91	34.93	29.08	30.08	34.33	34.23	31.34
3,051	**2,880**	**3,244**	**3,125**	**3,157**	**2,921**	**3,049**	**2,903**	**2,923**	**3,008**	**3,170**	**3,017**	**3,016**	**3,138**	**2,936**
24.40	25.29	28.51	32.76	26.16	24.44	40.93	30.49	38.59	23.25	40.20	28.36	Cane laundries		27.97
36.90	43.69	81.15	57.07	47.86	45.89	59.78	48.00	43.63	51.25	71.43	48.20	40.33	68.12	112.30
71.85	75.00	87.78	81.15	86.76	84.34	81.90	77.37	76.60	80.03	83.44	73.74	56.32	52.23	87.65
19.48	18.90	18.17	19.41	19.49	19.79	19.23	19.98	19.33	19.54	19.59	19.03	Cane laundries		18.92
86.30	83.80	83.90	85.18	84.07	86.71	85.10	86.27	86.55	85.49	86.69	85.14	88.44	86.80	84.51
2.25	2.48	2.93	2.73	1.92	2.08	2.71	2.68	2.38	2.59	3.20	2.76	3.35	6.03	4.38
72.60	63.20	64.56	73.36	64.68	64.90	73.10	69.78	65.79	69.72	75.58	74.05	75.36	77.99	73.74
13.70	20.60	19.34	11.82	19.39	21.81	12.00	16.49	20.76	15.77	11.11	11.09	13.08	8.81	10.77
13.06	14.37	13.79	14.08	13.00	13.72	14.45	14.65	14.75	14.00	15.84	15.28	15.78	16.91	15.57
—	—	82.01	—	—	83.60	83.81	84.37	85.22	—	85.58	83.00	86.96	85.55	82.98
1.30	1.12	1.89	1.66	1.73	3.11	1.29	1.90	1.33	1.89	1.31	2.14	1.48	1.25	1.53
85.01	82.68	82.14	83.54	82.34	84.17	—	—	85.32	83.60	—	83.31	87.62	—	83.47
3.22	5.95	5.75	4.83	5.23	4.75	3.23	3.98	3.87	4.23	3.27	5.10	3.61	3.14	4.54
12.28	13.68	14.06	13.60	12.04	13.46	15.95	14.22	13.53	13.62	15.76	15.10	16.39	16.60	15.34
85.60	84.10	82.41	84.90	84.25	85.74	84.50	85.00	86.10	84.75	87.75	84.30	87.00	86.70	83.96
3.44	5.77	5.56	4.49	5.32	4.58	2.66	3.90	4.25	4.05	2.90	4.85	3.92	3.20	4.10
7.20	**7.50**	**7.20**	**7.31**	**7.36**	**7.49**	**7.20**	**7.52**	**7.50**	**7.30**	?	**7.10**	**6.60**	**6.80**	**7.30**
1.38	2.70	1.10	2.16	0.87	1.96	3.61	3.23	1.57	2.08	0.95	0.84	2.35	3.24	3.43
5.00	5.20	2.18	4.20	6.16	3.72	4.45	4.87	4.00	4.71	2.57	4.11	4.96	4.14	3.54
62.64	63.51	60.37	63.00	54.93	63.18	57.31	58.50	61.33	61.23	62.23	53.90	60.99	62.20	50.23
85.20	83.00	81.99	85.00	84.67	85.14	84.60	85.13	85.86	84.92	87.70	84.20	86.47	86.60	83.54
3.73	5.68	5.31	4.53	5.48	3.08	1.85	2.88	4.16	3.70	2.09	4.52	3.19	2.88	4.36
6.80	**6.60**	**6.60**	**6.43**	**6.69**	**6.75**	**6.90**	**6.93**	**7.10**	**6.68**	?	**6.70**	**6.40**	**6.90**	**6.40**
91.67	89.50	91.58	90.68	—	93.00	92.31	89.98	87.46	91.81	—	91.41	92.12	92.90	—
—	—	—	—	—	—	—	—	—						
?	?	38.15	38.80	—	37.95	39.10	41.44	38.66		89.42	—	—	—	88.56
39.68	39.71	39.20	40.54	—	41.05	—	41.73	39.89	39.40	—	38.68	40.99	39.80	—
—	—	—	—	—	—	—	—	—		39.48	—	—	—	45.04
14.30	12.68	10.84	14.22	—	10.36	?	11.94	14.11	13.45	14.49	?	15.03	17.09	?
14.15	16.20	14.55	15.63	—	16.29	?	16.27	13.39	13.79	?	?	13.57	19.53	8.84
0.99	1.28	1.34	1.10	—	1.57	?	1.36	0.95	1.03	—	—	0.90	1.14	—
3.54	4.01	4.36	3.59	—	3.97	3.31	4.09	3.48	3.78	3.12	3.76	3.17	3.14	5.02

TABLE D

DATA REGARDING: MASSES CUITES, EXHAUSTIONS, CONSUMPTION OF

(Season 1968/69)

SYMBOL INDICATING FACTORY:	ML	PG	UF	EM	FX	EN	AK	DK	GD	DL	GH
Brix in Mixed Juice % Cane	15.35	16.12	15.21	14.98	14.67	14.73	14.74	14.63	14.65	15.07	14.41
A-Massecuite:											
Cu. ft. per ton Brix*	44.46	28.06	29.39†	25.93	27.64	30.68	28.76	29.38	21.14	27.09	24.23
Brix of massecuite	91.75	90.94	93.28†	92.25	92.23	92.78	93.17	94.53	93.37	93.80	92.62
Purity of massecuite	83.66	86.81	87.57†	85.07	87.63	83.50	88.35	90.27	84.34	87.20	87.60
Purity of A-molasses	68.48	72.92	68.98†	67.05	69.80	66.90	69.59	73.67	63.06	69.10	69.40
Drop in purity	15.18	13.89	18.59†	18.02	17.83	16.60	18.76	16.60	23.28	18.10	18.20
Exhaustion**	**57.56**	**59.09**	**68.44†**	**64.29**	**67.37**	**60.06**	**69.82**	**69.84**	**63.02**	**67.17**	**67.90**
Purity A-m.c. – Purity Syrup	+0.59	+0.75	+3.15†	+0.03	+1.52	–0.03	+2.81	+3.73	–1.46	+0.85	+2.40
B-Massecuite:											
Cu. ft. per ton Brix*	13.59	11.39	10.63	11.88	8.18	15.37	10.16	9.94	13.75	7.55	12.39
Brix of massecuite	93.77	93.59	95.50	93.32	93.11	97.33	93.88	94.78	95.80	94.20	94.42
Purity of massecuite	69.82	77.66	71.41	71.78	72.09	69.10	72.58	74.72	73.82	71.40	73.50
Purity of B-molasses	49.81	57.78	51.81	53.21	49.63	50.20	49.68	54.17	48.50	52.80	52.30
Drop in purity	20.01	19.88	19.60	18.57	22.46	18.90	22.90	20.55	25.32	18.60	21.20
Exhaustion**	**57.10**	**60.63**	**56.98**	**55.29**	**61.85**	**54.92**	**62.70**	**60.01**	**66.60**	**55.19**	**60.47**
C-Massecuite:											
Cu. ft. per ton Brix*	9.78	7.93	8.70	10.24	8.06	9.49	8.33	8.43	8.73	8.85	9.80
Brix of massecuite	95.31	97.94	98.91	94.90	95.36	99.27	95.07	97.77	98.88	96.80	96.86
Purity of massecuite	57.18	62.69	59.79	60.42	60.44	58.20	60.91	61.24	54.87	59.60	60.80
Purity of Final Molasses	38.50	39.46	40.66	42.23	37.83	41.20	38.47	38.94	34.54	40.40	38.90
Drop in purity	18.68	23.23	19.13	18.19	22.61	17.00	22.44	22.30	20.33	19.20	21.90
Crystal % C-Massecuite	**28.95**	**37.58**	**31.89**	**31.52**	**34.68**	**28.70**	**34.67**	**35.71**	**30.71**	**31.18**	**34.72**
Exhaustion**	**53.12**	**61.21**	**53.92**	**54.98**	**60.17**	**49.68**	**59.88**	**59.64**	**56.60**	**54.05**	**58.95**
Clarifying Agents:											
Per 1000 tons of Cane											
Tons Limestone	—	6.19	—	—	—	—	—	—	—	—	5.25
Tons Coke	—	0.65	—	—	—	—	—	—	—	—	0.81
Per ton of Cane											
Lb. of Lime	?	—	1.22	1.81	1.14	3.04	1.02	1.03	1.05	1.26	1.85
Lb. of Sulphur	?	1.06	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	?
p.p.m. Juice											
Phosphoric Paste	?	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	135.22	Nil
Flocculants	?	2.21	1.22	Nil	0.42	1.27	Nil	1.59	1.46	4.93	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	?	12.52	4.24	3.11	9.51	4.32	0.51	Nil	Nil	Nil	14.83
Tons of Wood	?	Nil	0.29	4.80	0.22	9.21	Nil	8.12	1.53	0.57	2.12
Converted into tons of Bagasse***	?	50.10	17.31	18.23	38.30	28.33	2.04	9.75	1.84	0.68	61.86

*per ton of brix present in mixed juice.
**parts of recovered crystallized sucrose per 100 parts of massecuite.
***1 m fuel oil equivalent to 6.1 tons of bagasse.
1 ton fuel oil equivalent to 6 tons of bagasse.
1 ton coal equivalent to 4 tons of bagasse.
1 ton fire wood equivalent to 1.2 tons of bagasse of 3000 btu/lb.

CLARIFYING AGENTS AND OF ADDITIONAL FUELS

MV	JB	UC	TS	ME	IL	RN	SZ	UK	Averages	MH	UR	LB	MR	NH
14.47	14.51	14.41	14.37	14.78	15.26	14.30	15.06	14.80	14.86	15.21	14.85	14.47	15.36	15.18
34.52	30.25	30.38	25.89	—	40.06	21.28	26.67	30.70†	29.30	31.09	33.28	31.25	24.42	24.97
91.09	92.89	92.88	92.60	—	91.97	93.63	91.72	92.95†	92.66	91.46	91.80	94.10	93.08	90.30
87.80	86.40	84.12	86.90	—	87.62	84.00	84.46	85.72†	86.26	86.49	87.80	83.67	87.56	83.00
71.60	69.40	65.01	68.10	—	73.46	66.40	67.03	69.07†	68.90	69.10	72.40	68.98	71.55	69.40
16.20	17.00	19.11	18.80	—	14.16	20.00	17.43	16.65†	17.37	17.39	15.40	14.69	16.01	13.60
64.97	**64.30**	**64.93**	**67.80**	—	**60.89**	**66.14**	**62.59**	**62.79†**	**64.73**	**65.09**	**63.55**	**56.60**	**64.27**	**53.55**
+2.60	+3.40	+2.13	+1.90	—	+2.48	-0.60	-0.67	-0.14	+1.34	-1.21	+3.60	-2.80	+0.96	-0.54
12.18	11.17	14.13	12.74	—	11.27	12.54	14.16	8.65	11.67	12.94	12.53	18.10	13.82	14.46
93.64	94.56	94.47	94.70	—	93.25	95.45	94.40	95.56	94.51	92.57	94.20	94.73	96.20	92.96
73.20	74.40	69.83	72.50	—	74.47	72.00	72.85	72.55	72.61	73.07	75.60	73.49	75.46	75.70
47.70	53.50	45.88	52.00	—	51.86	49.50	52.41	51.01	51.25	53.34	51.80	54.74	51.07	58.00
25.50	20.90	23.95	20.50	—	22.61	22.50	20.44	21.54	21.36	19.73	23.80	18.75	24.39	17.70
66.61	**60.41**	**63.37**	**58.90**	—	**63.07**	**61.88**	**58.96**	**60.60**	**60.35**	**57.87**	**65.31**	**56.37**	**66.06**	**55.67**
8.89	10.30	10.83	9.46	—	10.77	9.14	10.23	7.85	9.25	8.72	10.74	12.78	8.48	11.07
96.02	96.95	95.68	97.20	—	95.86	97.06	98.46	97.34	96.93	94.97	98.20	98.79	101.23	95.44
58.00	60.70	56.68	59.30	—	61.90	59.70	61.77	60.46	59.72	61.86	61.30	60.02	58.18	62.40
39.68	39.71	38.15	38.80	—	37.72	39.10	41.51	38.66	39.40	39.48	36.84	39.04	35.64	42.82
18.32	20.99	18.53	20.50	—	24.18	20.60	20.26	21.80	20.32	22.38	24.46	20.98	22.54	19.58
29.16	**33.75**	**28.66**	**32.60**	—	**37.19**	**32.83**	**34.10**	**34.59**	**32.50**	**35.11**	**38.03**	**34.00**	**35.45**	**32.68**
52.36	**57.36**	**52.86**	**56.50**	—	**62.69**	**56.66**	**56.08**	**58.78**	**56.15**	**59.78**	**63.18**	**57.34**	**60.19**	**54.88**
—	—	—	—	—	—	—	4.28	—	—	—	—	—	—	—
—	—	—	—	—	—	—	0.48	—	—	—	—	—	—	—
										Defecation				
1.34	1.71	1.15	1.27	1.29	1.14	1.44	4.28	1.01	1.30	1.60	2.77	2.66	3.21	3.59
Nil	Nil	Nil	Nil	Nil	Nil	Nil	1.35	Nil	—	Nil	0.002	0.56	0.002	Nil
83.33	179.00	Nil	Nil	Nil	Nil	Nil	149.49	146.31	—	Nil	Nil	Nil	Nil	32.62††
7.91	4.96	2.43	0.07	Nil	6.75	Nil	10.12	7.20	—	1.66	1.46	2.47	2.24	Nil
Nil	0.09	Nil	Nil	Nil	Nil	Nil	0.34	?	—	Nil	Nil	Nil	0.63	Nil
6.56	Nil	25.33	8.34	0.07	8.58	Nil	11.09	?	—	0.62	6.92	0.90	Nil	Nil
1.50	10.21	0.69	0.70	Nil	9.69	0.46	1.03	?	—	Nil	Nil	11.84	14.95	36.69
27.89	12.79	102.15	34.20	0.28	45.97	0.55	47.67	?	—	2.47	27.67	17.81	21.78	44.03

†A-1 and A-2 m.c.'s combined.
††for phospho-defecation of melt.

TABLE E

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

SEASON	1968/69	1967/68	1966/67	1965/66	1964/65
CANE					
Sucrose % Cane	13.11	12.92	13.72	12.99	13.90
Fibre % Cane	15.32	15.01	15.09	15.57	15.38
JUICES					
Brix° First Expressed Juice	19.54	19.16	19.84	19.27	20.27
Purity of First Expressed Juice	85.49	85.26	86.97	86.30	87.54
Purity of Last Expressed Juice	69.72	71.43	72.43	72.30	74.30
DROP in Purity	15.77	13.83	14.54	14.00	13.24
Purity of Mixed Juice	83.60	84.44	85.06	84.22	85.52
Reducing Sugars/Sucrose Ratio	4.23	4.46	3.62	3.73	3.32
MILLING					
Imbibition % Fibre	268.34	260.88	262.00	260.53	256.00
LOST ABSOLUTE JUICE % FIBRE	34.38	38.32	37.91	37.58	36.98
Imbibition % Cane	41.12	39.15	39.60	40.57	39.37
EXTRACTION	94.74	94.15	94.22	93.99	94.16
Sucrose % Bagasse	1.98	2.19	2.29	2.20	2.34
Moisture % Bagasse	53.52	53.47	53.52	52.98	52.64
Bagasse % Cane	34.93	00.00	34.56	35.42	34.36
Lower Calorific Value (btu/lb.)	**3,008**	**2,991**	**2,985**	**3,033**	**3,061**
Available btu per lb. Brix	**7,070**	**7,084**	**6,788**	**7,414**	**6,870**
RECOVERIES					
BOILING HOUSE PERFORMANCE	96.19	95.82	95.96	95.65	97.07
Boiling House Recovery	87.40	87.52	88.38	87.67	89.65
Overall Recovery	82.72	82.33	83.27	82.40	84.52
Tons Cane per Ton Sugar	9.06	9.28	8.63	9.20	8.42
FILTER CAKE					
Sucrose % Cane	2.08	2.10	2.16	1.57	1.30
Filter Cake % Cane	4.71	4.71	5.21	5.62	5.25
FINAL MOLASSES					
GRAVITY PURITY	39.40	38.75	40.65	39.91	39.87
Degree Brix	91.81	92.03	93.45	91.72	91.58
Weight at 85° Brix % Cane	3.78	3.69	3.47	3.59	3.33
AVERAGE SUGAR POLARISATION	98.42°	98.34°	98.58°	98.49°	98.60°
SUCROSE BALANCE					
Lost in Filter Cake	0.77	0.80	0.82	0.68	0.52
Lost in Final Molasses	9.64	9.30	8.75	9.38	8.13
Undetermined Losses	1.51	1.57	1.38	1.53	1.09
LOST IN BOILING HOUSE	11.92	11.75	10.95	11.59	9.73
Lost in Bagasse	5.36	5.92	5.78	6.01	5.84
TOTAL OF ALL LOSSES	5.36	5.92	5.78	6.01	5.84
CU. FT. OF MASSECUITES PER TON BRIX					
A-massecuite	29.30	29.44	29.02	27.89	27.79
B-massecuite	11.67	11.74	10.30	11.78	11.27
C-massecuite	9.25	9.59	8.83	9.14	7.98
TOTAL	50.22	50.77	48.15	48.81	47.03
EXHAUSTION OF MASSECUITES					
A-massecuite	64.73	65.05	62.85	62.78	62.45
B-massecuite	60.35	61.31	58.36	59.53	60.39
C-massecuite	56.15	58.28	55.59	56.37	56.80
PURITY RISE					
A-massecuite purity	86.26	86.07	86.68	85.91	86.68
Syrup purity	84.92	84.59	86.03	85.06	86.70
RISE	+1.34	+1.48	+0.65	+0.85	−0.02
DENSITY (°BRIX) OF SYRUP	61.23°	59.96°	60.35°	59.33°	58.77°

TABLE F

AVERAGE MANUFACTURING RESULTS BY MONTHLY PERIODS FOR SOUTH AFRICAN MILLS
(Season 1968/69)

END OF MONTHLY PERIOD:		April 27 1968	June 1 1968	June 29 1968	July 27 1968	Aug. 31 1968	Sept. 28 1968	Nov. 2 1968	Nov. 30 1968	Dec. 28 1968	Feb. 1 1969	March 1 1969	March 15 1969
TONS CANE CRUSHED . . .	Month	69,090	1,103,629	1,862,784	1,897,851	2,214,344	1,814,085	2,230,160	1,693,849	1,098,294	868,523	215,707	55,015
	To date	69,090	1,172,719	3,035,503	4,933,354	7,147,698	8,961,783	11,191,943	12,885,792	13,984,086	14,852,609	15,068,316	15,123,331
TONS SUGAR M & E.	Month	6,197	113,214	202,565	207,294	239,321	173,580	229,679	170,079	104,063	76,506	18,983	4,668
	To-date	6,197	119,411	321,976	529,270	768,591	960,171	1,189,850	1,359,929	1,463,992	1,540,498	1,559,481	1,564,149
TONS CANE CRUSHED . . . per hour actual crushing . . .	Month	172	169	174	175	172	172	169	168	167	157	165	174
	To-date	172	170	172	175	174	173	173	173	173	172	172	172
SUCROSE % CANE.	Month	11.95	12.90	13.61	13.64	13.60	13.27	13.03	12.72	12.30	12.10	11.63	10.62
	To-date	11.95	12.89	13.33	13.45	13.50	13.45	13.36	13.28	13.20	13.14	13.12	13.11
FIBRE % CANE	Month	16.35	15.06	14.69	14.87	15.40	15.29	15.43	15.72	16.18	16.37	15.60	14.69
	To-date	16.35	15.07	14.84	14.85	14.94	15.01	15.09	15.18	15.26	15.32	15.32	15.32
TONS CANE PER TON SUGAR	Month	11.15	9.23	8.60	8.58	8.67	8.88	9.12	9.36	9.74	10.23	11.36	11.79
	To-date	11.15	9.33	8.87	8.76	8.73	8.75	8.83	8.90	8.96	9.02	9.05	9.06
LOST ABSOLUTE JUICE . . . % FIBRE	Month	41	35	36	34	33	34	36	33	33	36	41	41
	To-date	41	35	36	35	35	35	36	35	34	35	35	35
IMBIBITION % FIBRE. . . .	Month	308	261	265	269	280	270	271	272	274	266	243	246
	To-date	308	262	263	265	270	270	270	270	270	269	269	268
SUCROSE EXTRACTION. . .	Month	93.32	94.43	94.80	94.94	94.95	94.82	94.78	94.52	94.30	94.18	94.13	94.38
	To-date	93.32	94.43	94.66	94.77	94.82	94.83	94.82	94.78	94.78	94.74	94.74	94.74
SUCROSE % BAGASSE	Month	2.06	2.07	2.10	2.03	2.00	1.98	1.94	1.94	1.77	1.88	1.86	1.71
	To-date	2.06	2.07	2.09	2.07	2.05	2.03	2.01	2.00	1.98	1.98	1.98	1.98
MOISTURE % BAGASSE . . .	Month	54.63	53.67	53.30	53.25	53.14	53.12	53.11	53.38	53.26	53.42	54.39	54.46
	To-date	54.63	53.67	53.49	53.40	53.32	53.27	53.24	53.26	53.26	53.27	53.29	53.32
BOILING HOUSE PERFORMANCE	Month	—	—	96.76	97.05	96.76	96.36	95.92	—	95.55	91.56	89.84	94.99
	To-date	—	—	96.47	96.69	96.72	96.65	96.51	96.42	96.39	96.27	96.19	96.19
BOILING HOUSE RECOVERY	Month	79.78	86.82	88.95	88.44	87.80	87.82	86.65	87.78	86.38	84.54	79.43	83.69
	To-date	79.78	86.80	87.78	88.26	88.12	88.06	87.79	87.79	87.68	87.52	87.41	87.40
OVERALL RECOVERY	Month	74.47	81.91	84.07	83.90	83.31	83.21	82.04	82.86	81.72	79.49	74.77	78.99
	To-date	74.47	81.90	83.35	83.57	83.49	83.43	83.15	83.13	83.02	82.84	82.73	82.72
PURITY OF MIXED JUICE .	Month	80.39	83.08	84.60	83.86	83.37	83.94	83.55	83.50	82.68	82.12	80.58	80.39
	To-date	80.39	83.06	84.22	84.08	83.86	83.88	83.81	83.77	83.70	83.61	83.60	83.60
REDUCING SUGARS/ SUCROSE RATIO	Month	7.23	4.30	4.03	4.53	4.40	3.93	4.00	4.16	4.65	5.04	6.27	4.82
	To-date	7.23	4.35	4.07	4.23	4.29	4.21	4.18	4.17	4.19	4.20	4.23	4.23
GRAVITY PURITY OF FINAL MOLASSES.	Month	37.22	38.15	38.64	38.43	38.96	39.60	39.85	40.66	39.50	39.90	39.27	42.53
	To-date	37.22	38.10	38.42	38.42	38.60	38.80	39.01	39.23	39.28	39.31	39.39	39.40
SUCROSE LOST IN MOLASSES % SUCROSE IN CANE . . .	Month	9.87	9.40	8.46	8.96	9.60	9.53	9.65	10.19	10.78	10.91	13.95	15.74
	To-date	9.87	9.42	8.83	8.88	9.10	9.19	9.28	9.40	9.49	9.57	9.62	9.64
UNDETERMINED LOST SUCROSE % SUCROSE IN CANE	Month	8.27	2.00	1.18	1.26	1.22	1.30	1.60	1.40	1.35	3.04	4.81	1.69
	To-date	8.27	2.02	1.57	1.45	1.38	1.36	1.38	1.39	1.39	1.47	1.52	1.51
MONTHLY RAINFALL (inch) TOTAL FROM 1st JAN. 1968	Month	1.36	0.60	0.90	0.24	3.75	2.42	2.86	3.21	3.94	1.61	3.42	—
	To-date	15.02	15.45	16.59	16.44	19.92	22.29	24.93	28.35	32.45	1.61	5.15	—

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 1935–1944	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	93.44	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	92.24	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	34.5	261	83.41	4.46	39.4	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