THIRTY-NINTH ANNUAL SUMMARY OF CHEMICAL LABORATORY REPORTS

OF SOUTHERN AFRICA SUGAR FACTORIES (SEASON 1963-64)

By C. G. M. PERK

N.B.—The figures in this Annual Summary are as declared by the Mills in their Final Monthly Laboratory Reports.

A.—GENERAL (S.A. Factories)

Introduction: For a number of reasons the 1963/64 season will go down in the annals of the South African Sugar Industry's history as one of particular significance. It saw the Industry advance from a number of years of *restricted* production into one of *full* production. Also of historical importance is the decision taken to expand the industry even further by bringing new land under cane which in its turn led to plans to extend the number of sugar factories and to increase the capacities of the existing ones. Another far-reaching decision taken during the 1963/64 season is that of erecting a 200,000 short tons bulk sugar terminal at the port of Durban, in order to cope with increased volume of export sugar and to keep in step with the modern trend to transport raw sugar in bulk.

However, the 1963/64 season will also have to be remembered for the devastating floods which affected many Zululand farms. Floodwaters which followed torrential rains damaged cane fields and tram lines on the Umfolozi Flats, forcing the Umfolozi mill to interrupt crushing for a considerable time. In addition 350,000 tons of cane—corresponding with approximately 38,000 tons of sugar—was lost, while many acres of caneland were rendered unsuitable for further cultivation.

Elsewhere, in the lower-lying areas of Zululand, floods also caused damage to individual farms. At the Umhlatuzi Valley Sugar Co. Ltd., near Felixton, the Umhlatuzi River broke through the flood defence banks in two places, damaging the main tramline and flooding canelands.

An aftermath of the floods was also experienced by those factories where cane came to the factories covered with silt and bringing sand and other extraneous matter into the mixed juice. We have often wondered why here in Natal the method customary in other countries is not introduced, i.e., the determination of the sediment in mixed juice. Even if we are not allowed to subtract the weight of the sediment from the mixed juice weight, keeping a record of the percentages of sediment would give us a valuable insight into low recoveries, high undetermined losses, high filter cake weights, etc.

Note: When the juice contains sand, the weight as indicated by the juice scales is higher than the actual juice weight; favouring in this manner: sucrose % cane, extraction, etc., but affecting adversely boiling house figures.

These considerations do not include the actual losses caused by the sediment, such as higher losses in filter cake owing to a higher filter cake weight. A glance at the percentages of filter cake on cane, shown in Table No. 3 of this Summary, will reveal which factories had to struggle with an increase in filter cake owing to abnormal quantities of sediment in their juices.

Cane and Sugar Productions: After three seasons in succession commenced under the ban of restriction, the 1963/64 season was granted unrestricted production direct from the beginning, leading to another season of more than ten million tons of cane to be crushed.

Season	Tons Cane	Tons Sugar	Tons Cane per Ton Sugar
1958/59 . . .	10,257,876	1,128,187	9.09
1959/60 . . .	9,123,395	1,043,301	8.74
1960/61 . . .	8,649,616	994,363	8.70
1961/62 . . .	9,384,090	1,098,812	8.54
1962/63 . . .	10,749,410	1,193,270	9.01
1963/64 . . .	10,956,448	1,264,704	8.66

Note: Except when otherwise indicated, all tonnages are (short) tons of 2,000 lbs. and all sugars are "telquel".

In order to conform with the records of the International Sugar Council and in order to comply with a resolution taken at the Third Congress of the I.S.S.C.T., the crop results are shown once more, but now in metric tons.

Crop Results in Tons of 1,000 kg.

Season	Tons Cane	Tons Sugar	Tons Cane per Ton Sugar
1958/59 . . .	9,305,801	1,023,475	9.09
1959/60 . . .	8,276,617	946,469	8.74
1960/61 . . .	7,846,805	902,071	8.70
1961/62 . . .	8,513,085	996,926	8.54
1962/63 . . .	9,751,707	1,082,525	9.01
1963/64 . . .	9,939,529	1,147,321	8.66

Duration of the Seasons: Up till now there have been three seasons in which more than ten million tons of cane had to be crushed, to wit: the 1958/59, the 1962/63 and the season under discussion, i.e., the 1963/64 season. In the following table data regarding these three seasons are collected in order to give an impression of the time it took to handle these bumper crops.

Season	1958/59	1962/63	1963/64
Total Tons Cane Crushed	10,257,876	10,749,410	10,956,448
Number of Mills crushing	18	17	17
Total hours Mills open	106,573	97,100	91,038
Total hours actual crushing	97,558	90,034	82,111
Overall Time efficiency	92	93	90
Hours Cane shortage% hours mills open	3	3	6
Total tonnage of cane crushed per average week	249,486	271,005	292,016
Average number of weeks per season	41	40	37½

The table shows that owing to the increased weekly tonnage the past season was shorter than those of the previous crops, when more than ten million tons of cane had to be handled.

Expansion Programme: Ever since the launching of the Sugar Production Expansion Programme in 1949, mill owners have taken measures to increase the crushing capacities of their mills. The following table, showing the combined throughput in tons of cane per week and the average duration of the season in weeks, gives an impression of how far the increase in crushing capacity could keep up with the increase in cane production:

the crushing seasons, a further increase in mill capacities is at present carried out. For example, the existing 100 t.c.h. Amatikulu mill will be replaced by a modern sugar factory of more than twice the capacity of the old mill. In order to reduce the cost of cane transport and in connection with the extension of cane land two new sugar factories will be erected in the Noodsberg area. Sezela will also increase its capacity considerably, viz., from the present 150 t.c.h. to 330 t.c.h. These are only a few examples of capacity extensions as nearly all mills are planning or are occupied with an extension programme.

Quality of Cane and Juice: In years when cane grown under abnormal conditions is brought to the mills, we should refrain from trying to indicate the quality of the cane—from a point of view of processing—by the purity of its juice. This statement is confirmed by the abnormal boiling house figures obtained when processing juices of abnormal composition. In the formula for calculating boiling house performance the sucrose, which is not crystallizable, due to the presence of nonsugars in mixed juice, is accounted for; the calculation accounting in this manner for the variations in juice purities. However, what is "purity of the juice" as a matter of fact? What is called "purity" is nothing else than the proportion between sucrose content and the specific gravity of the juice, as indicated by the Brix spindle reading.

By applying the Clerget method we can eliminate the effect of the nonsucrose substances present in the juice on the result of the sucrose determination in

Season	1950/51	1951/52	1952/53	1953/54	1954/55	1955/56
Tons Cane/Week	181,646	176,423	185,237	187,915	199,609	228,451
Number of Weeks	31	27	31	33	37	35
Season	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62
Tons Cane/Week	231,188	227,298	249,486	251,602	268,939	285,981
Number of Weeks	32	37	41	36	32	33
Season	1962/63	1963/64				
Tons Cane/Week	271,005	292,016				
Number of Weeks	40	37½				

Note (i) During the 1953/54 season Esperanza had stopped crushing, while Pongola had not yet started up.
Note (ii) Commencing with the season 1958/59 Glendale is included in the averages.

The review shows that the combined capacity of the mills increased from 185 thousand to 290 thousand tons of cane per week, or by 57 per cent when comparing the past season with that before a general increase in mill capacities was undertaken. However, now quota cane growers are permitted to deliver all millable cane they are able to produce from their registered quota land and in addition new land will be brought under cane, even bigger crops than that of the past season may be expected. In connection with this expectation and the general desire to shorten

juice. However, we cannot eliminate the varying effects of the nonsucrose substances in juice on the Brix spindle readings. Even less can we account for the varying effects of the nonsucrose substances on the processing results when the composition of the juice changes.

It is therefore no wonder that when we extend the application of formulae based on experience with juices of normal composition, to juices derived from cane grown under abnormal conditions and/or abnormal age, these formulae fail to hold.

With normal juices the S.A. Sugar Industry is capable of achieving as an average a Boiling House Performance of more than 98 per cent. With cane as arrived at the mills in the past years, the Industry is not able to do this, notwithstanding the fact that neither staff nor installation have changed.

B.—CANE VARIEITES (S.A. Factories)

From the older varieties such as Uba, P.O.J., Co. 281, Co.290, Co.301 and Co.331, only Co.331 is still recorded because it accounts for more than 1 per cent of all cane harvested. With regard to the newer varieties, it appears that only N:Co.376 has gained popularity, while it is still too early to speculate on the future of N:50/211, the first completely Natal-bred cane appearing on our records.

Percentages of Cane Varieties crushed during the past five years

Season	1959/60	1960/61	1961/62	1962/63	1963/64
Co.331	15.75	12.81	8.97	8.89	6.40
N:Co.292	3.00	2.83	2.36	2.28	2.06
N:Co.293	4.74	4.94	5.23	4.62	4.97
N:Co.310	58.81	59.06	55.65	54.00	51.41
N:Co.334	0.09	0.36	0.42	0.33	0.29
N:Co.339	4.74	4.74	4.75	3.67	3.28
N:Co.376	6.60	10.42	17.03	18.04	21.68
N:Co.383	0.04	0.42	1.11	1.92	1.51
N:50/211	—	—	0.01	0.22	1.04

C.—COMPARISON OF CANE HARVESTED DURING THE OPTIMUM PERIOD AND CANE REAPED BEFORE AND AFTER THE OPTIMUM PERIOD

As it is of interest for the suppliers of cane to compare the results of cane harvested during the period of 18 weeks in the middle of the season with the results of cane crushed before July and after October, the following table is inserted, showing comparative results for recent years.

Season	Percentage of Crop	Percentage Cane		Mixed Juice Purity	Cane to Sugar Ratio
		Sucrose	Fibre		
1959/60—					
Optimum Period	65	13.99	15.67	86.06	8.47
Balance of Crop	35	13.05	16.22	84.68	9.19
TOTAL CROP	100	13.66	15.92	85.52	8.74
1960/61—					
Optimum Period	69	14.11	15.16	86.10	8.38
Balance of Crop	31	12.72	15.34	84.37	9.62
TOTAL CROP	100	13.69	15.22	85.63	8.70
1961/62—					
Optimum Period	69	14.11	14.46	86.69	8.23
Balance of Crop	31	12.98	14.63	84.52	9.18
TOTAL CROP	100	13.75	14.52	86.04	8.54
1962/63—					
Optimum Period	44	14.10	15.07	83.48	8.41
Balance of Crop	56	12.67	15.81	83.25	9.47
TOTAL CROP	100	13.30	15.49	83.36	9.01
1963/64—					
Optimum Period	49	13.90	15.36	86.16	8.35
Balance of Crop	51	13.21	15.63	84.51	8.90
TOTAL CROP	100	13.55	15.50	85.30	8.63

The table shows how, during the years of restriction the percentage of cane harvested outside the optimum months was reduced to 31 per cent but it shows too how it increased to more than 50 per cent when the restriction ban was lifted.

D.—FACTORY OPERATION

Fuel Supply and Demand

The following table reviews the fuel position; all amounts indicated are btu's available in fuel (bagasse or additional fuel) *per lb. Brix in mixed juice.*

The first column indicated the btu's available in bagasse from cane, per lb. Brix in mixed juice. The second column shows the btu's in additional fuel fired under the factory boilers and the third column gives the total btu's available in bagasse plus additional fuel, again per lb. of Brix in mixed juice. Finally, the fourth and fifth columns disclose the total btu's in bagasse plus additional fuel in 1962/63 and 1961/62.

Mill	I	II	III	IV	V
PG . .	5,449 +	661 =	6,110	6,680	6,456
UF . .	6,217 +	2,061 =	8,277	8,402	8,101
ZM . .	7,754 +	197 =	7,951	8,204	7,256
FX . .	6,996 +	1,755 =	8,750	7,820	7,470
EN . .	6,829 +	234 =	7,063	7,047	6,694
AK . .	7,628 +	218 =	7,845	7,963	7,463
DK . .	7,395 +	159 =	7,554	7,876	7,265
GD . .	7,733 +	147 =	7,882	8,939	8,676
DL . .	7,219 +	30 =	7,249	7,260	6,577
GH . .	7,295 +	612 =	7,907	7,671	7,589
MV . .	7,389 +	470 =	7,859	8,062	7,295
TS . .	7,279 +	826 =	8,105	8,851	7,507
NE . .	6,985 +	130 =	7,115	—	—
IL . .	6,793 +	1,003 =	7,795	8,150	8,507
RN . .	7,250 +	Nil =	7,250	7,416	6,638
SZ . .	7,458 +	497 =	7,955	7,905	7,646
UK . .	7,455 +	4 =	7,459	7,346	7,003
MH . .	5,830 +	N.A. =	—	7,483	—
UR . .	6,249 +	314 =	6,563	6,614	—
LB . .	6,604 +	180 =	6,784	6,937	—
MR . .	7,471 +	122 =	7,593	7,341	—

Note: Bagasse used for paper manufacture or for cattle feed is converted into coal equivalent, while the kWh's supplied for irrigation purposes are treated in the same manner.

The following particulars should be mentioned in connection with the heat consumption of the different factories:

Pongola produced raw sugars (Golden Brown) during the past season, compared with 31 per cent mill white in 1962/63 and 7½ per cent mill white in 1961/62. Time efficiency was high in all three seasons, and the same can be said about the syrup densities. Two tandems have been in operation during 85 per cent of the time in the past season, compared with only one tandem in the previous seasons.

Umfolozi remelted during the past season the double-cured C-sugar in addition to all B-sugar. In the 1962/63 season, in addition to export quality raw sugar, refined sugar was manufactured. For the latter purpose all A-sugar and part of the B-sugar had to be remelted, while for the export quality raw sugar all C-sugar plus part of the B-sugar had to be dissolved and reboiled. Finally, in the 1961/62 season 56 per cent refined sugar in addition to ordinary raws and golden brown was turned out. The density of the syrup was in all three seasons between 58° and 59° Brix. Excluding the long stop caused by the floods during the past season, the time efficiency in all three seasons was more than 90 per cent.

Z.S.M.P. did not remelt sugar, producing an ordinary raw sugar not for export. All three seasons show a good time efficiency and syrup densities between 58° and 60° Brix. There is an excess of exhaust steam owing to the high steam consumption of the turbines (all mill turbines and two-thirds of the power-house turbines are only equipped with a Curtiss wheel and no Rateau stages).

Felixton did not remelt sugar, turning out an ordinary raw sugar, not for export. The densities of the syrup are low; ranging between 52° and 54° Brix. Overall Time Efficiencies are more than 90 per cent for all three seasons under discussion.

Amatikulu. What has been said about Felixton holds also for this factory.

Note: These low syrup densities remind us of the discussions at Mount Edgecombe on the 22nd January, 1963, on sugar quality and remelting, viz., the remark of Mr. A. van Hengel that the excess of water left in the syrup, by a number of factories, is more than is required for remelting of sugars to improve the quality. For example, when the syrup contains 15 per cent. Brix on cane, there will be 28 per cent syrup on cane when the syrup Brix is equal to 53.6° and 23 per cent syrup on cane when the syrup Brix is 65°. In the first case 28-23 or 5 per cent more water on cane is left in the syrup than in the second instance. If we remelted all B- and all (double-cured) C-sugar in the syrup of 53.6° Brix, the density would be raised to 63.9° Brix; no water for remelting being required.

Entumeni produces mill white sugar by remelting of the A-sugar. The past season difficulties were experienced with the quadruple which scaled quicker than usual, even for a sulphitation factory. Entumeni shows always a low fuel consumption for a sulphitation factory which remelts the A-sugar, due to extensive bleeding of vapours. The high time efficiency is a further help in achieving this low fuel consumption.

Doornkop produced the past season as well as the 1962/63 season Japanese Assortment by remelting of all double-cured C-sugar plus part of the B-sugar. The past season more vapour was bled than the previous seasons. In 1961/62 Doornkop produced mill white and raws according to the sulphitation process.

Glendale turned from a sulphitation factory manufacturing mill white and raws (Golden Brown) into a 100 per cent raw sugar factory applying the defecation process. The improvement in fuel consumption is not only a result of the change from white to raws, but also caused by a higher syrup Brix and a better time efficiency.

Darnall turns out ordinary raws, no remelting of sugars. Good time efficiencies and a high syrup Brix help to keep the fuel consumption low, notwithstanding the high imbibition rate.

Gledhow and Sezela are both sugar factories-*cum*-refineries and they have equal estimated fuel consumptions. They have both good time efficiencies, but also both syrup densities are below 60° Brix.

Melville manufactured an ordinary raw sugar in the 1961 season; the syrup Brix being 56°. The next season (1962) the density of the syrup dropped to 51°, while at the end of the season a start was made with remelting of sugars. Finally, in the past season (1963) all double-cured C-sugar and part of the B-sugar was remelted, however, owing to the higher Brix of the syrup the estimated btu consumption dropped below that of the 1962 season, but was still higher than that of the 1961 season.

Note: Perusing the figures there seems to be a trend of higher btu consumption in the 1962 season aud a low consumption in 1961, the latter being a more favourable year as far as fuel consumption is concerned.

Overall Time Efficiency and Syrup Brix

	Time Efficiency			Brix of Syrup		
	1963	1962	1961	1963	1962	1961
PG	93	95	94	63	61	62
UF	93*	95	95	59	58	58
ZM	90	94	96	60	58	62
FX	92	95	95	53	52	54
EN	96	98	98	57	62	63
AK	92	96	96	54	52	52
DK	90	93	95	58	58	57
GD	87	74	85	58	56	47
DL	90	94	94	62	62	62
GH	95	96	99	56	53	53
MV	89	90	94	60	51	56
TS	94	92	97	58	62	56
NE	92	94	98	60	59	58
IL	78	89	92	61	62	68
RN	95*	94	98	53	57	57
SZ	90	94	97	54	61	55
UK	92	95	97	59	60	60
MH	80	92	83	58	60	51
UR	89	85	75	64	61	63
LB	93	91	92	60	60	59
MR	92	91	88	65	64	65

* Exclusive of hours of stoppages for floods.

Tongaat has a high fuel consumption notwithstanding good time efficiency and a syrup Brix not far below 60°. Here is again a case of a higher exhaust steam production than required for processing, or in other words a negative margin against blowing off. A condensing-passout turbo-set will be installed to reduce the exhaust steam production.

Illovo in the past season had a low time efficiency, but they maintained the syrup density above 60°. Here the same boiling system as at Doornkop was followed to improve the quality of the raw sugar.

Natal Estates. The greater part of the coal fired under the factory boilers appears to be burnt on behalf of irrigation; only 1,540 tons being fired as supplementary fuel for the factory operation. Natal Estates has a good time efficiency and a syrup Brix of 60°, while only double-cured C-sugar is remelted. *Five of the seven mills are electrically driven, viz., less heat radiation losses.*

Renishaw had a lower fuel consumption in 1963 than in 1962 when also export raws were manufactured. However, in 1961 the lowest consumption was recorded, notwithstanding the fact that 59 per cent mill white was produced. Renishaw has always a good time efficiency, but a low syrup density, while no vapour bleeding is practised.

Umzimkulu produces an ordinary raw; no remelting, no vapour bleeding, a good time efficiency and a syrup Brix of approximately 60°.

Ubombo Ranches turn out part of the sugar as refined. Vapour bleeding for all pans (refined and raw pans) and all juice heating, in addition to a good syrup Brix explains the low btu consumption per pound of Brix in mixed juice.

In general the following can be said:

Analysing the btu consumption of Pongola which has the lowest figure for btu's available in fuel, i.e., 6,110 btu/lb. Brix, we arrive at the following conclusions:

Assuming a boiler efficiency of 70 per cent, 0.70 × 6,110 btu's are transmitted to the boiler feed corresponding with 4.4 lbs. steam F/A 212° F. per lb. Brix processed, which is high for a raw sugar factory. (Of course, if the boiler efficiency had been only 65 per cent, 4.1 lb. steam would have been available for processing 1 lb. of Brix.) The steam consumption can be reduced by bleeding vapour; a ratio of 3.8 lbs. steam F/A 212° F. can be achieved when manufacturing ordinary raw sugar without extensive vapour bleeding.

Analysing the available btu's in fuel at Big Bend in the same manner, viz., assuming a boiler efficiency of 70 per cent, we arrive at the conclusion that 0.70 times 6,563/970 or 4.74 lbs. steam of F/A 212° F. per lb. of Brix processed. This too is on the high side, taking into account that full vapour bleeding is practised. Again, if the boiler efficiency is only 65 per cent. the ratio becomes 4.4 lb. steam per lb. Brix.

These closer inspections of the figures of Pongola and Big Bend were made in order to emphasize, once more, the urgency of either measuring the boiler feed or recording the boiler output. Only when we know the quantity of steam produced by the boilers will we be able to obtain an insight into the questions: Why does the factory use so much fuel? Is the boiler efficiency low? Does the factory lose too much heat in tailwaters of the condensers (*inclusive* of the heat lost in the tailwater of the condenser of the condensing turbines!), blowing off excess exhaust steam, open drains of the engines, lack of insulation, etc.?

Mill Performance

The following table will throw some light on the performance of the milling tandems. The first column indicates the results, expressed as percentages of lost absolute juice on fibre in final bagasse. The second column presents the specific feed rates or unit loads of the different tandems, indicated as lbs. of fibre milled per hour, per cu. ft. of Total Roller Volume. The third column shows the imbibition applied, per 100 fibre in cane. The fourth column reveals how many times the imbibition water is re-applied, indicated as the number of imbibition steps. Finally, the last column gives the Dilution Ratios as a yardstick of the effect of the imbibition.

Mill	Lost Abs. Juice % Fibre	Specific Feed Rate	Imbibition % Fibre	Number of imb. Steps	Dilution Ratio
PG .	33.6	30.7	281	5	80.4
UF .	39.4	27.6	280	6/5	73.6
ZM .	41.4	61.4	282	5	77.2
FX .	41.4	35.3	273	5/5	73.0
EN .	39.4	46.8	233	4	67.5
AK .	38.3	47.8	253	5	70.6
DK .	43.9	57.0	244	5	68.6
GD .	55.8	51.3	254	3	62.3
DL .	28.4	53.4	372	5	84.4
GH .	40.5	48.1	201	5	82.1
MV .	47.3	61.5	216	5	69.8
TS .	32.4	38.2	222	6/5	78.4
NE .	33.9	43.2	230	6	78.7
IL .	37.4	46.5	258	5	77.0
RN .	39.6	44.6	203	5	71.1
SZ .	36.3	46.3	221	4/4	71.7
UK .	47.3	56.5	221	5	67.1
MH .	43.7	29.4	238	5	72.8
UR .	31.8	45.6	234	4	77.5
LB .	37.9	58.0	232	5	70.9
MR .	60.6	72.5	163	4	65.7

Dilution Ratio was introduced as a measure to gauge imbibition effectiveness in the article: "Again, Imbibition", published in the Quarterly Bulletin of the S.M.R.I. No. 17 (S.A. Sugar Journal; January 1961 issue).

The better the imbibition liquids (diluted juices and water) are mixed with the residual juices left in the intermediate bagasses, the higher the dilution ratio will be. This statement points in the first place to the manner of application (distribution) of the imbibition liquids (La Riviere system), but also to a greater number of imbibition steps, a higher imbibition ratio and, last but not least, a good squeezing first unit *preceded* by efficient cane preparation implements (Meinecke knives, shredders). It is obvious that the less original cane juice is present in the bagasse at the moment the first imbibition step is applied, the bigger the effect of this step will be.

These "rules" should be kept in mind when comparing the Dilution Ratios of the different factories. Also connected with the dilution ratio, and therefore with the milling results, is the specific feed rate or unit load. The lower the specific feed rate, the slower the mills can run and the more time there is for drainage, or in the case of turbine driven mills the thinner the bagasse layers can be.

We want to draw attention to the wide divergence in imbibition rates (Marromeu 163 per cent, against Darnall 372 per cent on fibre) and the variation in imbibition steps (Glendale with four mills: 3 steps; Sezela, Big Bend and Marromeu with five mills: 4 steps; etc.).

In addition to the lowest imbibition ratio, Marromeu has also the highest specific feed rate, a low number of imbibition steps and only one set of knives. (Next season a second set will come into operation.) These factors adversely affected the milling result; the lost juice being 60.6 per cent on fibre.

Another figure we want to draw attention to is the Dilution Ratio of Darnall, which is 84.4 per cent. Here the cane is well prepared *before* the first squeeze; the shredder *preceding* the first unit, while the imbibition ratio is the highest of all mills. (Imbibition steps being moderate, i.e., 5.) The high Dilution Ratio combined with the high imbibition ratio are *two* of the factors which led to the low percentage of lost juice, i.e., 28.4 per cent (notwithstanding the fact that the specific feed load was higher than average, viz., 53 lbs. against an average of 46 lbs./hour/cu. ft. T.R.V.).

The Performance of the Boiling House

Mill	B.H.P.	Sucrose Losses in:			Purity Final Molasses
		Filter Cake	Final Molasses	Undetermined	
PG	98.2	0.68	7.35	1.49	38.0 (AP)
UF	97.0	0.88	7.75	2.87	41.4
ZM	97.2	0.64	8.37	0.95	40.0
FX	96.5	0.86	9.31	1.50	41.0
EN	97.2	0.28	6.30	1.96	39.8 (AP)
AK	96.2	0.35	8.66	1.76	40.9
DK	96.4	0.84	6.84	1.45	41.5
GD	98.1	0.29	7.32	0.57	40.4 (AP)
DL	98.1	0.29	8.04	1.20	39.7
GH	97.6	0.64	7.20	0.53	40.5
TS	98.1	0.86	7.40	0.52	40.0
NE	97.8	0.34	8.26	0.89	38.5
IL	96.1	0.31	7.27	2.69	38.4
RN	96.5	0.26	7.72	2.38	38.9 (AP)
SZ	96.3	0.58	7.72	1.53	39.3
UK	98.6	0.55	5.85*	1.23	36.5
Mean	97.2	0.56	7.79	1.42	39.4
MH	96.0	0.50	8.53	1.52	42.4 (AP)
UR	98.5	0.59	8.94	0.53	39.6
LB	97.7	0.79	8.30	0.18	39.6
MR	96.1	1.06	8.46	0.67	43.8

B.H.P. stands for Boiling House Performance.
Sucrose Losses are per 100 sucrose in cane.
(AP) stands for apparent purity.

* The loss in molasses is calculated with the aid of a N.S. factor of 0.81 (the Natal average).

We refer to Table 8 at the end of this Summary for comparison of mean B.H.P. figures and Final Molasses Purities of previous years with those of the past season. This table (No. 8) shows that the highest mean B.H.P. ever was recorded in the season 1957/58, viz., 98.5 per cent, compared with this season's 97.2 per cent. In the same season the lowest mean final molasses purity was obtained, viz., 38.5°, against the past seasons' 39.4°. The average undetermined loss was only 1.04 per cent in 1957/58 against this season's 1.42 per cent. on sucrose in cane. As mentioned previously, the B.H.P. and the Undetermined Losses of those factories where the mixed juice contained abnormal quantities of sand, etc. were adversely affected owing to a too high calculated sucrose in cane. In addition these factories lost more sucrose in filter cake due to a higher than normal filter cake weight.

The average final molasses purity of the period 1925-1934 was 45.3° according to Table No. 8; 43.3° for the period 1935-1944; and 40.7° for the period 1945-1954. This downward trend was maintained till the 1957/58 season when it reached 38.5°. After this season, the final molasses purity has always been above 39.0°.

Regarding the individual achievements, the following table shows the final molasses purities obtained by a number of factories in recent years:

Mill	1963/64	1962/63	1961/62	1960/61
PG	38.0 (AP)	37.4 (AP)	38.4 (AP)	36.8 (AP)
NE	38.5	37.9	39.6	45.0 (Carb.)
IL	38.4	37.1	37.6	37.6
SZ	39.3	37.2	37.5	36.5
UK	36.5	38.1	36.6	38.3
UR	39.6	37.0	34.4 (AP)	34.6 (AP)
LB	39.6	39.2	36.8	38.7

AP indicates Apparent Purity.

It shows how the two factories which are well-known because of their efforts to obtain the lowest final molasses purities, viz., Illovo and Sezela, could not keep the purity down during the past season. Illovo's purity has gone up from 37.1° (1962) to 39.3° (1963), while Sezela's molasses purity increased from 36.5° (1960) to 39.3° (1963). We see the same increase at Pongola in the apparent purities, i.e., from 36.8° (1960) to 38.0° (1963).

A similar increase occurred at Big Bend: 37.0° (1962) to 39.6° (1963).

We mentioned these facts as a kind of confirmation that the mixed juice quality of the 1963/64 season led to higher molasses purities, one of the reasons of a lower mean B.H.P. figure.

Regarding the low final molasses purity achieved by Umzimkulu, it should be mentioned that the analysis of a sample of Umzimkulu's molasses showed that a lower purity was obtained than the target purity calculated with the aid of the Douwes Dekker formula; a fine achievement.

The following item to be discussed is the so-called "Non-Sugar Account", viz., the ratio between non-sugars present in mixed juice and those calculated in weighted final molasses plus in the molasses film adhering to the sugar crystals.

Non-Sugar Account for Recent Years

Mill	1963	1962	1961	1960	1959
PG . . .	74	78	81	81	78
UF . . .	66	77	83	85	83
ZM . . .	80	86	84	81	?
FX . . .	81	83	74	77	78
EN . . .	87	85	80	86	83
AK . . .	81	85	77	78	78
DK . . .	82	79	92	86	?
GD . . .	81	90	?	85	77
DL . . .	78	83	79	77	80
GH . . .	79	85	71	71	77
MV . . .	83	82	75	76	74
TS . . .	77	?	?	?	74
NE . . .	84	90	87	66c	58c
IL . . .	83	92	90	98	89
RN . . .	83	89	86	89	86
SZ . . .	92	90	88	93	90
UK . . .	?	?	?	?	?
Mean . .	79	85	81	81	81
MH . . .	75	78	83	90	—
UR . . .	73	88	105	?	?
LB . . .	88	80	80	—	—
MR . . .	76	75	79	—	—

Note: The means for the S.A. factories are weighed averages. For those factories which did not declare their final molasses weights, the N.S. factor = 81 per cent has been assumed. C indicates Carbonatation applied.

Hereunder the Reducing-Sugars Accounts of the last two seasons are shown:

SEASON 1963/64				SEASON 1962/63			
Mill	Clarified Juice	Syrup	Total Final Molasses	Mill	Clarified Juice	Syrup	Total Final Molasses
PG	94	78	n.a.	PG	97	85	n.a.
UF	100	101	86	UF	104	101	101
ZM	95	93	97	ZM	96	90	104
FX	88	84	88	FX	87	83	107
EN	109	49	n.a.	EN	103	77	n.a.
AK	94	88	97	AK	93	85	97
DK	n.a.	93	103	DK	n.a.	88	82
GD	86	75	n.a.	GD	n.a.	n.a.	n.a.
DL	95	89	91	DL	94	87	100
GH	85	84	84	GH	n.a.	92	98
MV	93	86	87	MV	90	90	94
TS	n.a.	84	.91	TS	n.a.	81	n.a.
NE	85	86	101	NE	84	83	102
IL	100	85	91	IL	101	92	101
RN	94	104	n.a.	RN	95	102	n.a.
SZ	99	83	119	SZ	94	66	122
UK	n.a.	n.a.	n.a.	UK	n.a.	n.a.	n.a.
MH	n.a.	n.a.	n.a.	MH	n.a.	n.a.	n.a.
UR	95	81	n.a.	UR	98	79	90
LB	100	84	100	LB	87	83	90
MR	102	92	113	MR	96	82	90

Comparing the results of the Non-Sugar Account with the figures shown for Reducing-Sugars Account, doubt arises if the final molasses weights of all factories are correct. For example, if we increase the final molasses weight of Umfolozi to the extent that the N.S. percentage becomes 81 instead of 66 per cent, the R.S. account for Total Final Molasses becomes 105 per cent, which is more in accordance with the figure of the 1962/63 season and also agrees better with the other percentages of the 1963/64 season. At the same time the undetermined sucrose losses drop to 1.07 per cent (instead of 2.86 per cent). Another example is Sezela. Here the high N.S. Accounts in 1962 and 1963 coincide with high reducing sugars percentages in Total Final Molasses, which could be caused by a too high molasses weight. It is therefore recommended that every factory studies its own figures. In the Manual new recommendations for the determination of reducing sugars are published. Finally, the fact should not be overlooked that drawing up a Brix Balance (Brix in Clarified Juice = 100 per cent) will also enhance insight into the matter under discussion.

Recovered Crystal per 100 Sucrose in the Massescuities

Mill	A-m.c.	B-m.c.	C-m.c.
PG	63	56	59
UF	58	57	57
ZM	62	65	57
FX	59	61	55
EN	57	59	53
AK	64	66	56
DK	68	59	56
GD	67	63	56
DL	62	66	60
GH	68	61	57
MV	64	62	51
TS	61	54	55
NE	62	54	55
IL	59	62	66
RN	57	63	61
SZ	59	55	59
UK	65	61	60
MH	58	54	54
UR	64	65	59
LB	60	51	57
MR	61	56	53

Here again, each factory should study its own results and compare them with those of other factories as a general discussion would only be possible if completely conversant with local conditions. In general it can be said that each kind of strike, viz., A-, B- and C-massecuites should obtain 60 per cent recovered crystal per 100 sucrose present before curing. In the case of C-strikes, low recovering percentages are often caused by a too small crystal surface area, either intentionally or caused by incorrect boiling technique.

Finally, the following table will show the non-sugar circulation inside the system C-strike and C-centrifugals. It is calculated by dividing the quantity of non-sugar present in the C-strike by the amount of non-sugar present in the weighed molasses. The magnitude of the circulation depends on the quality of the pre-cured C-sugar, because it is the final molasses film adhering to C-sugar crystals which causes the circulation.

Again, we want to warn against the practice (in the case of double curing of the C-massecuite) of returning the wash of the C-sugar afterworkers to the B-massecuite, as it nullifies the advantage of double curing. We want to emphasize once more the importance of mingling the precured C-sugar into a magma with fresh B-molasses and returning the wash of the afterworkers for C-sugar to the B-molasses storage tanks. *Do not label this liquid "C-wash" or advertise its purity, but call it B-molasses and no pan men will be tempted to draw it into a B-m.c. pan.*

NON-SUGAR CIRCULATION WITHIN THE SYSTEM

C-m.c. Pan, C-m.c. Centrifugals and Weighed Final Molasses
(Percentages for recent years)

Mill	1963	1962	1961	Mill	1963	1962	1961
PG	132	121	114	TS	143	n.a.	n.a.
UF	159	123	105	NE	139	132	140
ZM	132	114	125	IL	172	147	137
FX	130	114	124	RN	130	100	114
EN	121	111	124	SZ	133	120	127
AK*	191	102	119	UK	not available		
DK	155	130	129				
GD*	144	118	n.a.	MH	121	106	102
DL	116	104	118	UR	143	115	108
GH	137	111	144				
MV	135	121	111	LB	151	148	144
				MR	155	146	n.a.

* Equipped with low "g" centrifugals.

† The N.S. Circulation is calculated with the aid of the cu. ft. of C-massecuite, the final molasses weight and the analysis of C-massecuite and molasses.

The N.S. Circulation gives an insight into the quality of the (pre-cured) C-sugar; the smaller the molasses film still adhering to the C-sugar crystals after the (first time) curing, the lower the circulation percentage will be.

Double-curing does not affect the circulation with regard to magnitude, it only limits the circulation to the system "C.-m.c. pan and C-m.c. centrifugals", *if the C-wash is returned to the C-m.c. pan.*

When single-cured C-sugar is used in the form of C-sugar magma for the A- and the B-strikes, or when the single-cured C-sugar is remelted, the nonsugar adhering to the C-sugar crystals is boiled back into the A- and the B-strikes.

Double-curing may never be considered as a correction on poor fore-curing; fore-curing should remain the most essential operation.

Note: Here again the different factories and their N.S. circulation percentages will not be discussed. Each factory should derive its own conclusions.

TABLE 1

Sugar Production, Season 1963/64, according to Data supplied by the South African Sugar Association

Factory	White Sugar	Cargo Refining	Normal Export	Japanese Assortment	Golden Brown	Special Sugar	TOTAL
Pongola	161	—	19,130	—	44,866	—	64,157
Umfolozi	—	—	—	79,971	7,065	—	87,035
Z.S.M. & P.	—	98,193	14,329	—	2,308	—	114,831
Felixton	—	67,933	26,301	—	265	—	94,500
Entumeni	7,296	—	5,750	—	1,321	—	15,728
Amatikulu	—	48,418	20,987	—	290	—	69,695
Doornkop	—	—	1,421	31,625	2,500	—	35,546
Glendale	—	—	10,007	—	699	—	10,707
Darnall	—	108,679	22,502	—	377	—	131,558
Gledhow	100,117	—	21,309	—	105	—	121,532
Melville	—	3,914	—	25,247	2,601	547†	32,309
Tongaat	—	105,894	25,759	23,011	422	—	155,086
Natal Estates	—	—	110,137*	—	—	—	110,137
Illovo	—	1,572	940	56,172	1,847	2,594‡	63,126
Renishaw	—	—	—	32,859	35	—	32,894
Sezela	76,740	—	10,455	—	167	—	87,362
Umzimkulu	—	—	2,500	—	36,001	—	38,501
SOUTH AFRICA	184,314	434,604	292,890	248,885	100,870	3,141	1,264,704
Ubombo R's	26,889	—	20,942	—	5,169	—	53,000
Mhlume	13,053	—	24,843	—	3,504	—	41,400
SWAZILAND	39,942	—	45,785	—	8,673	—	94,400
TOTAL GENERAL	224,256	434,604	338,675	248,885	109,543	3,141	1,359,104

* for Canada. † Special White. ‡ Special Brown.

Note: Tonnages of the Swaziland factories are estimated as the crushing seasons are not yet completed.

Table 2.—CANE CRUSHED, SUGAR MADE, VARIETIES AND THROUGHPUT

FACTORY	PG	UF	ZM	FX	EN	AK	DK	GD	DL	GH	MV	TS	NE	IL	RN	SZ	UK	Totals and Means
Crushing Season from	17.5.63	1.5.63	3.5.63	1.5.63	8.5.63	1.5.63	20.5.63	24.6.63	2.5.63	2.5.63	7.5.63	1.5.63	8.5.63	29.5.63	23.4.63	6.5.63	16.5.63	1.5.63
End of Season	18.12.63	12.1.64	15.2.64	16.2.64	19.12.63	15.2.64	1.1.64	24.12.63	23.2.64	2.2.64	14.1.64	31.1.64	2.2.64	27.2.64	17.1.64	5.2.64	27.1.64	27.2.64
TONS CANE CRUSHED	509,878	745,577	1,005,856	881,536	129,583	621,232	300,544	95,756	1,116,487	1,078,431	276,247	1,325,968	953,264	536,459	288,686	763,047	327,89	10,956,448
CANE DATA																		
Sucrose % Cane	14.42	13.76	13.64	12.86	14.09	13.43	13.79	13.41	13.54	13.58	13.63	13.43	13.32	13.58	13.24	13.74	13.80	13.55
Fibre % Cane	12.90	13.94	16.87	16.06	14.46	16.18	15.53	15.40	16.12	15.56	15.45	15.56	15.07	14.83	15.20	15.94	15.47	15.50
Java Ratio	80.46	79.42	77.09	77.40	79.30	77.36	78.54	76.19	78.24	79.06	77.18	77.75	78.12	79.40	79.28	79.47	78.88	78.39
Tons Cane per Ton Sugar	7.95	8.57	8.76	9.33	8.23	8.91	8.46	8.94	8.48	8.70	8.55	8.55	8.66	8.49	8.78	8.45	8.52	8.63
Tons Cane per Ton 96° Sugar	7.72	8.43	8.50	8.84	7.97	8.66	8.31	8.70	8.25	8.44	8.40	8.33	8.44	8.35	8.64	8.24	8.25	8.41
CANE VARIETIES																		
Percentage Co.311	0.08	3.50	0.89	6.24	9.56	7.75	3.57	31.97	5.62	3.28	10.00	3.46	6.91	23.14	6.48	13.89	6.91	6.40
,, N:Co.310	90.41	81.65	83.98	52.82	15.60	89.75	31.85	39.52	58.11	41.26	48.44	40.54	29.90	28.58	20.06	21.55	35.18	51.41
,, N:Co.292	0.24	0.55	0.74	2.05	2.14	0.30	1.96	Nil	0.53	1.35	0.55	1.48	6.34	0.64	9.31	6.35	1.08	2.06
,, N:Co.293	1.12	0.23	0.20	0.05	48.74	0.04	28.40	6.37	1.57	3.00	8.71	3.30	2.27	35.36	5.47	4.73	6.36	4.97
,, N:Co.339	0.23	3.23	1.96	3.57	2.34	0.02	1.28	1.05	2.93	2.91	28.36	8.17	3.28	1.80	3.66	2.89	1.65	3.28
,, N:Co.376	7.53	8.34	11.38	20.74	21.16	1.89	27.85	17.68	17.67	33.82	0.38	33.02	14.82	8.70	44.95	39.51	47.58	21.68
,, N:Co.382	Nil	1.47	0.24	2.96	0.25	0.06	0.82	Nil	0.66	1.63	0.03	3.99	2.37	1.66	3.85	Nil	0.45	1.51
,, N.50/211	0.05	1.86	0.57	0.99	Nil	0.19	Nil	Nil	1.24	0.21	Nil	4.09	0.05	0.10	5.22	—	0.22	1.04
TOTAL RAINFALL (ins.)	21.59	41.76	56.84	59.67	50.04	43.05	42.30	28.11	46.67	41.68	41.07	35.69	37.90	54.22	46.70	52.06	64.78	43.77
TONS SUGAR MADE	64,157	87,035	114,845	94,507	15,744	69,702	35,546	10,707	131,570	123,904	32,307	155,126	110,137	63,212	32,894	90,265	38,501	1,270,159‡
Percentage of White Sugars	Nil	Nil	Nil	Nil	46	Nil	Nil	Nil	Nil	83	Nil	Nil	Nil	Nil	Nil	88	Nil	15
Average Pol of All Sugars	98.78	97.58	98.85	98.84	99.12	98.76	97.69	98.72	98.70	99.02	97.72	98.54	98.49	98.54	97.49	98.54	99.14	98.51
TIME ACCOUNT																		
Time Crushed % Time Mills Open	93.38	92.70¶	90.42	92.21	96.39	92.11	90.01	86.97	89.84	95.15	89.16	94.21	91.87	72.65	95.35*	89.86	91.75	90.04
Cane Shortages % Time Mill Open	1.45	2.42	3.87	4.51	2.64	4.05	7.04	6.96	5.10	1.75	7.33	0.80	4.79	10.17	2.32	7.32	4.04	5.54†
Other Stoppages % Time Mills Open	5.16	4.88	5.71	3.28	0.92	3.84	2.95	6.08	5.06	3.10	3.51	4.99	3.34	17.18	2.96	2.82	4.21	4.42
THROUGHPUTS (per hour actual crushing)																		
Tons of Cane Crushed	127.11	190.55	183.47	157.26	27.96	110.16	71.98	29.71	200.73	197.88	60.56	221.95	173.76	117.47	55.99	151.21	69.14	132.44
Tons of Fibre Milled	16.39	26.57	30.96	25.26	4.04	17.82	11.18	4.57	32.36	30.78	9.36	34.54	26.19	17.42	8.51	24.11	10.70	20.53
Tons of Brix Processed	20.70	29.72	27.38	24.07	4.19	16.24	10.60	4.17	30.67	29.42	8.81	32.87	25.87	17.69	8.21	22.68	10.05	19.79
Tons of Sugar Bagged	16.02	22.24	20.95	18.28	3.40	12.36	8.51	3.32	23.65	22.73	7.08	25.97	18.44	13.84	6.38	17.89	8.12	15.35

Identity of the Symbols used to indicate the Factories:

PG Pongola S.M.C. Ltd.
UF Umfolozi C.S.P. Ltd.
ZM Zululand S.M. & P. Ltd.
FX Sir J. L. Hulett's Felixton
EN Entumeni S.M.C. (Pty.) Ltd.
AK Sir J. L. Hulett's Amatikulu
DK Doornkop Industries Ltd.
GD Glendale Sugar Millers.
DL Sir J. L. Hulett's Darnall
GH Gledhow-C.K.S.C. Ltd.
MV Melville S.E.
TS Tongaat S.C. Ltd.
NE Natal Estates Ltd.
IL Illovo S.E. Ltd.
RN Crookes Brothers' Renishaw
SZ Reynolds Brothers' Sezela
UK Umzimkulu S.C. Ltd.

* 94.91% inclusive hours of stoppages for floods.
† Inclusive hours of stoppages for floods and rains.
‡ According to Laboratory Reports.
¶ 75.61%, inclusive hours of stoppages for repairs of flood damage.

Table 3.—SUCROSE BALANCE, RECOVERIES, ANALYSIS OF BAGASSE, JUICES, CAKE AND SYRUP

FACTORIES	PG	UF	ZM	FX	EN	AK	DK	GD	DL	GH	MV	TS	NE	IL	RN	SZ	UK	Totals and Means
SUCROSE BALANCE (% sucrose in cane):																		
Lost in Bagasse (A)	4.27	5.71	7.26	6.87	6.02	6.74	7.07	9.49	4.59	6.12	7.79	5.40	5.13	5.11	6.05	5.30	7.97	5.92
Lost in Filtre Cake (B)	0.68	0.88	0.67	0.81	0.28	0.35	0.84	0.29	0.29	0.36	0.64	0.86	0.34	0.31	0.26	0.58	0.55	0.56
Lost in Final Molasses (C)	7.35	7.75	8.37	9.31	6.30	8.66	6.84	7.32	8.04	7.93	7.20	7.40	8.26	7.27	7.72	7.72	5.85*	7.79
Undetermined Losses (D)	1.49	2.87	0.95	1.50	1.96	1.76	1.45	0.57	1.20	1.83	0.53	0.52	0.89	2.69	2.38	1.53	1.23	1.43
Boiling House Losses (B)+(C)+(D)	9.52	11.50	9.99	10.71	8.54	10.77	9.13	8.18	9.53	10.12	8.37	8.78	9.49	10.27	10.06	9.83	7.64	9.78
Total of All Losses (A)+(B)+(C)+(D)	13.79	17.21	17.25	17.58	14.56	17.51	16.20	17.67	14.12	16.24	16.16	14.18	14.62	15.38	16.11	15.13	15.61	15.70
OVERALL RECOVERY	86.21	82.79	82.75	82.42	85.44	82.49	83.80	82.33	85.88	83.76	83.84	85.82	85.38	84.62	83.89	84.87	84.39	84.30
BOILING HOUSE PERFORMANCE	98.19	96.95	97.17	96.46	97.20	96.17	96.36	98.12	98.07	97.03	97.57	98.09	97.83	96.06	96.49	96.26	98.60	97.19
BOILING HOUSE RECOVERY	90.06	87.80	89.23	88.50	90.91	88.45	90.18	90.96	90.01	89.22	90.93	90.72	90.00	89.17	89.29	89.62	91.70	89.60
LOST ABSOLUTE JUICE % FIBRE	33.58	39.44	41.41	41.42	39.44	38.34	43.92	55.80	28.32	40.51	47.29	32.35	33.86	37.42	39.59	36.31	47.30	37.47
Imbibition % Fibre	300	280	282	273	233	253	244	254	372	201	216	222	230	258	203	221	221	258.26
SPECIFIC FEED RATE (lb. fibre/h./cu. ft. T.R.V.)	30.7	27.6	61.4	35.3	46.8	47.8	57.0	51.3	47.8	48.1	61.5	38.2	43.2	46.5	44.6	46.3	56.5	45.91
Sucrose Extraction	95.73	94.29	92.74	93.13	93.98	93.26	92.93	90.51	95.41	93.88	92.21	94.60	94.87	94.89	93.95	94.70	92.03	94.08
Brix Extraction	95.02	93.61	91.59	92.07	93.33	92.60	91.93	89.84	94.55	92.54	91.36	94.04	—	93.48	92.92	93.11	—	93.13
Imbibition % Cane	33.79	39.06	47.56	43.93	33.68	40.96	37.95	39.19	59.89	31.31	33.43	34.54	34.65	38.27	30.82	35.18	34.15	39.84
FINAL BAGASSE:																		
Sucrose % Bagasse	2.11	2.48	2.44	2.42	2.76	2.50	2.78	3.51	1.74	2.36	2.92	2.15	2.04	2.04	2.38	2.11	3.09	2.29
Moisture % Bagasse	52.91	52.51	55.07	52.73	49.46	52.11	52.01	52.06	52.54	52.36	53.68	51.07	52.25	53.27	51.42	50.54	52.68	52.46
Fibre % Bagasse	44.17	44.12	41.56	43.94	47.06	44.64	44.30	42.55	45.00	44.23	42.53	46.17	44.91	43.64	45.25	46.24	43.45	44.38
Bagasse % Cane	29.20	31.61	40.60	36.55	30.73	36.23	35.06	36.19	35.82	35.17	36.33	33.70	33.56	33.98	33.59	34.48	35.62	34.92
Lower Calorific Value (btu/lb.)	3040	3068	2848	3051	3327	3103	3106	3002	3079	3084	2959	3199	3099	3013	3164	3245	3043	3066
FIRST EXPRESSED JUICE:																		
Degrees Brix	20.59	20.05	20.40	19.09	19.82	19.82	19.82	19.95	19.91	19.68	19.88	19.76	19.57	19.49	19.38	19.50	19.66	19.78
Apparent Purity	87.03	86.38	86.71	87.00	89.70	87.62	88.56	88.2	86.94	87.2	88.8	87.4	87.12	87.79	86.2	88.67	88.96	87.37
LAST EXPRESSED JUICE:																		
Degrees Brix	2.74	3.57	2.79	3.03	1.77	2.59	3.38	4.00	1.55	3.10	2.77	2.44	2.86	1.94	3.26	2.61	3.70	2.83
Apparent Purity	72.26	73.74	72.38	72.64	79.30	76.90	75.57	80.0	70.64	69.2	77.5	77.4	71.80	67.01	72.2	65.90	80.00	72.66
MIXED JUICE:																		
Degrees Brix	14.87	14.52	13.94	13.15	14.54	14.08	14.31	13.64	12.31	15.46	14.98	14.68	14.73	14.44	15.08	14.90	14.75	14.24
Gravity Purity	84.74	n.a.	84.81	84.81	88.48	84.99	87.33	n.a.	84.58	85.77	n.a.	85.81	84.93	85.59	n.a.	86.71	n.a.	}85.30
Apparent Purity	84.74	83.16	n.a.	n.a.	88.48	n.a.	87.01	86.36	n.a.	n.a.	86.38	n.a.	n.a.	85.10	84.85	n.a.	87.32	
Reducing Sugars/Sucrose Ratio	2.71	3.05	3.41	4.17	2.72	3.54	2.73	2.75	3.85	3.32	3.1	3.64	3.59	4.72	3.47	2.96	n.a.	3.44
CLARIFIED JUICE:																		
Degrees Brix	15.36	13.82	13.20	12.42	14.66	13.80	14.89	13.29	11.64	14.59	14.06	14.80	13.64	14.48	15.05	14.98	15.35	13.96
Apparent Purity	86.13	85.45	85.97	85.62	88.10	85.49	87.87	87.00	85.38	87.0	86.8	87.1	85.78	86.19	85.8	86.58	88.08	86.27
Reducing Sugars/Sucrose Ratio	2.57	3.07	3.27	3.69	2.97	3.34	n.a.	2.43	3.66	2.82	2.7	n.a.	3.06	4.73	3.26	2.96	n.a.	3.20
Average pH	7.3	6.9	7.1	7.2	7.7	7.4	7.0	7.2	7.5	7.2	7.1	7.2	7.4	7.7	7.1	7.1	7.2	7.2
FILTER CAKE:																		
Sucrose % Filter Cake	2.28	2.08	1.58	1.37	0.80	0.62	2.28	0.78	0.74	0.84	1.74	2.13	0.80	1.27	0.69	1.60	1.91	1.37
Filter Cake % Cane	4.31	5.82	5.78	7.64	5.00	7.56	5.00	5.00	5.36	5.86	5.00	5.43	5.65	3.33	5.00	5.00	4.00	5.57
EVAPORATOR SYRUP:																		
Degrees Brix	62.99	58.74	60.42	52.60	56.69	54.12	57.93	58.29	61.94	56.04	59.50	58.3	60.45	60.81	53.32	53.54	58.65	58.06
Apparent Purity	85.49	85.91	85.78	85.83	88.10	85.97	87.95	87.10	85.65	87.2	87.7	87.6	85.43	85.71	85.5	86.59	88.10	86.38
Reducing Sugars/Sucrose Ratio	2.12	3.10	3.18	3.54	2.35	3.11	2.57	2.13	3.44	2.80	2.7	3.07	3.09	4.04	3.63	2.48	n.a.	3.18
Average pH	7.0	6.5	6.4	6.7	7.4	6.8	6.5	6.9	7.0	7.1	6.7	n.a.	7.0	6.5	7.0	6.9	6.6	6.8

* Estimated.

Table 4.—MASSECUITES AND MOLASSES: LIME, SULPHUR AND PHOSPHORIC PASTE CONSUMPTIONS

FACTORIES	PG	UF	ZM	FX	EN	AK	DK	GD	DL	GH	MV	TS	NE	IL	RN	SZ	UK	Arithmetical Averages
Brix in Mixed Juice % Cane*	16.30	15.60	14.91	14.11	14.97	14.74	14.73	14.05	15.28	14.87	14.55	14.81	14.89	15.06	14.66	15.00	14.54	14.94
A-MASSECUITE:																		
Cubic Feet per Ton Brix**	24.20	35.35†	22.09	22.23	27.74	22.13	29.88	25.37	22.64	24.82	34.31	23.27	23.53	40.00	21.07	24.02	30.70	26.67
Brix of Massecuite	92.16	92.14	93.30	92.63	91.29	92.61	93.20	93.45	93.5	92.08	90.98	92.4	95.6	90.71	92.88	92.75	91.95	92.57
Purity of Massecuite	84.57	87.29	85.61	85.03	85.0	84.93	90.16	84.02	84.8	89.2	89.0	86.5	84.4	86.91	84.7	85.38	86.13	86.10
Purity of Molasses	67.13	74.17	69.06	69.82	70.7	66.68	74.44	63.78	67.7	72.8	74.2	71.2	67.0	73.25	70.3	70.35	68.75	70.08
Drop in Purity	17.44	13.12	16.55	15.21	14.3	18.25	15.72	20.24	17.1	16.4	14.8	15.3	17.4	13.66	14.4	15.03	17.38	16.02
Exhaustion	62.73	58.19	62.48	59.27	57.4	64.49	68.21	66.51	62.4	67.6	64.4	61.4	62.5	58.76	57.2	59.37	64.57	62.18
B-MASSECUITE:																		
Cubic Feet per Ton Brix**	8.10	9.83	9.94	10.49	9.82	10.46	10.61	11.41	9.67	12.65	13.16	10.74	10.72	13.50	12.34	13.89	10.17	11.03
Brix of Massecuite	94.69	95.83	95.75	93.73	93.77	94.75	93.68	96.36	96.2	94.17	93.52	94.1	97.1	92.39	95.78	96.02	93.23	94.77
Purity of Massecuite	70.79	73.87	75.23	75.03	73.0	74.38	75.43	71.30	72.8	73.8	75.10	74.8	68.9	74.49	75.50	71.25	71.89	73.38
Purity of Molasses	51.58	54.80	51.47	53.99	52.3	50.99	55.52	48.09	47.6	52.4	53.20	55.0	50.2	52.71	53.0	52.80	50.01	52.10
Drop in Purity	19.21	19.07	23.76	21.04	20.7	23.39	19.91	23.21	25.2	21.4	21.90	19.8	18.7	21.78	22.5	18.45	21.89	21.29
Exhaustion	56.04	57.11	65.08	60.95	59.4	65.50	59.34	62.71	66.1	60.9	62.31	58.8	54.5	61.83	63.40	54.86	60.90	60.54
C-MASSECUITE:																		
Cubic Feet per Ton Brix**	7.49	8.55	8.12	8.49	5.98	8.11	8.20	7.56	7.30	7.96	7.17	8.03	8.43	10.00	8.17	8.13	6.88	7.92
Brix of Massecuite	99.13	99.82	98.26	96.25	99.59	96.62	96.77	98.81	98.3	95.67	96.09	97.3	99.1	96.13	97.90	98.72	96.71	97.72
Purity of Massecuite	59.62	61.44	58.89	60.20	58.6	61.44	61.32	57.68	61.0	60.2	58.10	59.9	58.2	59.99	62.00	60.52	57.52	59.80
Purity of Final Molasses	37.96	40.83	39.12	40.67	39.8	40.95	41.0	40.26	38.7	39.4	40.40	39.6	38.56	33.63	38.93	38.79	35.36	39.06
Drop in Purity	21.66	20.61	20.77	19.53	18.8	20.49	20.32	17.42	22.3	20.8	17.70	20.3	19.6	26.36	23.07	21.73	22.16	20.76
Exhaustion	58.56	56.69	56.96	54.68	53.3	56.48	56.16	50.55	59.6	57.0	51.13	56.1	54.9	66.20	60.90	58.66	59.60	56.95
Crystal % Masse Cuite	34.61	34.77	33.52	31.68	31.1	33.53	33.33	28.81	35.8	32.8	28.54	32.7	31.7	38.18	36.97	35.05	33.15	33.28
Total C.F. of Massecuites:																		
Per Ton Sugar made	51.52	71.80	53.32	54.26	53.66	53.53	60.62	55.72	51.36	58.79	68.00	53.20	54.99	81.15	53.53	58.39	59.11	58.80
Per Ton Brix processed**	39.79	53.73	40.82	41.21	43.54	40.70	48.69	44.34	39.61	45.43	54.65	42.03	42.68	63.49	41.58	46.04	47.75	45.62
FINAL MOLASSES:																		
Degrees Brix	92.57	91.92	93.00	89.02	91.75	90.33	89.27	88.94	92.59	90.38	91.53	90.4	90.58	92.5	92.25	91.99	92.03	91.21
Gravity Purity	n.a.	41.36	39.97	39.57	n.a.	40.86	41.51	n.a.	38.85	39.72	40.47	40.0	38.51	38.40	n.a.	39.26	36.48	} 39.45
Apparent Purity	37.96	40.83	39.12	40.67	39.81	40.95	41.00	40.36	38.7	39.4	40.40	39.6	38.56	33.58	38.93	38.79	35.36	
% Reducing Sugars	n.a.	11.92	13.53	14.18	n.a.	12.89	11.35	n.a.	13.96	11.60	12.45	14.24	12.48	16.95	n.a.	15.53	n.a.	13.42
% Sulphated Ash	n.a.	14.34	13.64	13.45	n.a.	10.81	12.80	n.a.	12.80	n.a.	n.a.	n.a.	14.57	8.83	n.a.	13.36	n.a.	12.76
Reduced Sugars/Ash Ratio	n.a.	0.83	0.99	1.05	n.a.	1.19	0.89	n.a.	1.09	n.a.	n.a.	n.a.	0.86	1.92	n.a.	1.16	n.a.	1.11
Molasses (85° Brix) % Cane	3.28	3.04	3.36	3.20	2.72	3.35	2.71	2.86	3.30	3.19	2.85	2.92	3.36	3.03	3.09	3.17	2.74‡	3.15
CLARIFYING AGENTS:																		Def. / Sulph.
Lime lb. per Ton Cane	1.33	1.42	1.22	1.58	4.69	1.37	1.12	0.92	1.14	5.04	1.37	1.34	3.71	1.24	4.58	4.43	0.98	1.25 / 4.49
lb. per Ton Sugar	10.60	12.17	10.63	14.71	38.62	12.22	9.45	8.28	9.71	43.87	11.70	11.47	32.14	10.50	40.13	37.42	8.31	10.80 / 38.44
lb. per Ton Brix**	8.18	9.11	8.14	11.17	31.34	9.30	7.59	6.56	7.49	33.90	9.40	9.06	24.94	8.22	31.19	29.51	6.71	8.38 / 30.18
Sulphur per Ton Cane	Nil	Nil	Nil	Nil	1.62	Nil	Nil	Nil	Nil	1.15	Nil	Nil	1.24	Nil	2.74	2.27	Nil	Nil / 1.80
per Ton Sugar	Nil	Nil	Nil	Nil	13.42	Nil	Nil	Nil	Nil	9.98	Nil	Nil	10.73	Nil	15.62	19.21	Nil	Nil / 13.79
per Ton Brix**	Nil	Nil	Nil	Nil	10.82	Nil	Nil	Nil	Nil	7.71	Nil	Nil	8.33	Nil	12.15	15.15	Nil	Nil / 10.83
Phosphoric lb. per Ton Cane	Nil	Nil	Nil	Nil	0.28	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0.35	Nil	0.13	0.00 / 0.01
lb. per Ton Sugar	Nil	Nil	Nil	Nil	2.29	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	3.04	Nil	1.14	0.03 / 0.10
lb. per Ton Brix**	Nil	Nil	Nil	Nil	1.86	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	2.36	Nil	0.92	0.03 / 0.08

* $\frac{\text{Tons Brix in mixed juice}}{\text{Tons Cane}} \times 100$

** Tons Brix in mixed juice

† Actually two A-strikes are boiled, i.e., an A-1 and an A-2; the figures shown are the weighed averages of the analysis of these two strikes. Both strikes are grained on melt liquor; the A-1 developed with liquor and the A-2 with evaporator syrup.

‡ Estimated

Table 5.—DATA OF MHLUME, UBOMBO RANCHES, LUABO AND MARROMEU

FACTORY	Mhlume	Ubombo R.	Luabo	Marromeu
Season started on	17.4.63	1.5.63	13.5.63	13.5.63
Final data of	7.12.63	28.12.63	2.11.63	12.11.63
Tons Cane crushed	282,893	379,978	510,349	571,758
Tons Cane per hour	86	85	148	158
Overall Time Efficiency	80	89	93	92
Tons Sugar manufactured	33,794	44,327	63,833	67,871
Percentage White Sugar	30	52	62	24
Sucrose % Cane	14.18	13.72	14.59	14.56
Fibre % Cane	13.03	14.07	15.00	14.60
Tons Cane per Ton Sugar	8.37	8.46	7.99	8.42
Java Ratio	78.54	78.64	79.95	79.83
Brix of First Expressed Juice	20.48	19.89	20.82	20.94
Purity of First Expressed Juice	88.16	87.71	87.66	87.10
LOST ABSOLUTE JUICE % FIBRE	43.66	31.82	37.93	60.64
Specific Load (lb. fibre/h/cu. ft. T.R.V.)	29.4	45.6	58.0	72.5
Imbibition % Fibre	238	234	232	163
SUCROSE EXTRACTION	93.92	95.37	94.62	90.52
Imbibition % Cane	31.02	32.96	34.79	23.78
Sucrose % Bagasse	2.85	2.09	2.57	4.01
Moisture % Bagasse	53.28	50.65	50.45	52.43
Bagasse % Cane	30.21	30.27	32.59	34.43
Lower Calorific Value (btu/lb.)	**2,995**	**3,237**	**3,245**	**3,348**
BOILING HOUSE PERFORMANCE	96.03	98.58	97.67	96.06
Boiling House Recovery	88.74	89.64	90.17	88.75
Overall Recovery	83.55	85.49	84.99	80.33
SUCROSE BALANCE:				
Lost in Bagasse	6.08	4.63	5.74	9.48
Lost in Filter Cake	0.50	0.60	0.79	1.06
Lost in Final Molasses	8.53	8.50	8.30	8.46
UNDETERMINED LOSSES	1.52	0.78	0.18	0.67
Total of All Losses	16.63	14.51	15.01	19.67
PURITY OF MIXED JUICE	85.78	83.48	86.17	85.44
Reducing Sugars/Sucrose Ratios:				
of Mixed Juice	n.a.	3.84	3.34	3.06
of Clear Juice	n.a.	—	3.36	—
of Syrup	n.a.	3.13	2.84	2.82
of Final Molasses	n.a.	n.a.	40.21	36.18
Degrees Brix of Syrup	58.24	64.00	60.36	64.90
Sucrose % Filter Cake	1.86	1.65	2.90	3.87
Filter Cake % Cane	3.81	5.00	4.00	4.00
FINAL MOLASSES:				
Degrees Brix	92.26	92.70	93.46	91.29
Gravity Purity	42.45	39.50	39.57	43.76
Apparent Purity	n.a.	37.00	36.93	40.60
Molasses (85° Brix) % Cane	3.09	3.50	3.41	3.08
CUBIC FEET PER TON BRIX:				
A-massecuite	25.70	28.01	34.21	24.69
B-massecuite	10.13	12.17	15.16	13.64
C-massecuite	7.20	8.83	8.92	8.33
Total of All Massescuites	43.02*	49.02*	58.29	46.66*
Percentage of N:Co.310 crushed	n.a.	n.a.	65.60	72.00
Rainfall for the year 1963	27.70	9.96	46.73	55.50

* Exclusive white sugar massescuites.

Table 6.—AVERAGE MANUFACTURING RESULTS BY MONTHLY PERIODS FOR THE 17 S.A. SUGAR FACTORIES

(Season 1963—1964)

MONTHLY PERIOD ENDED ON		June 1 1963	June 29 1963	July 27 1963	August 31 1963	September 28 1963	November 2 1963	November 30 1963	December 28 1963	February 1 1964	February 27 1964
TONS CANE CRUSHED	Month	965,379	1,162,291	1,043,907	1,504,453	1,256,042	1,512,990	1,191,087	1,042,564	1,070,137	208,250
	To-date	—	2,127,670	3,171,577	4,676,030	5,932,072	7,444,410	8,635,497	9,678,061	10,748,198	10,956,448
TONS CANE CRUSHED PER HOUR ACTUAL CRUSHING	Month	126	132	125	129	130	129	129	131	150	146
	To-date	—	—	130	129	130	129	129	130	131	132
TONS SUGAR MADE AND ESTIMATED	Month	102,329	129,789	118,416	180,250	153,238	184,650	142,353	120,061	117,459	21,589
	To-date	—	232,142	350,558	530,808	684,046	868,696	1,011,049	1,131,111	1,248,570	1,270,159
TONS CANE PER TON SUGAR	Month	9.43	8.96	8.82	8.35	8.20	8.19	8.37	8.68	9.11	9.65
	To date	—	9.17	9.05	8.81	8.67	8.57	8.54	8.56	8.61	8.63
SUCROSE % CANE	Month	12.62	13.04	13.23	13.91	14.09	14.21	13.97	13.54	12.94	12.35
	To-date	—	12.85	12.98	13.28	13.45	13.60	13.65	13.64	13.57	13.55
FIBRE % CANE	Month	15.70	15.08	15.21	15.25	15.37	15.57	15.51	15.58	16.16	16.50
	To-date	—	15.36	15.31	15.29	15.30	15.36	15.38	15.40	15.48	15.50
LOST ABSOLUTE JUICE % FIBRE	Month	37.5	38.4	37.3	38.1	37.5	36.7	38.1	36.1	38.5	36.8
	To-date	—	37.8	37.6	37.8	37.7	37.5	37.6	37.4	37.5	37.47
SUCROSE EXTRACTION	Month	94.02	94.15	94.18	94.14	94.37	94.18	94.19	94.09	93.63	93.67
	To-date	—	94.10	94.12	94.13	94.13	94.14	94.15	94.14	94.09	94.08
IMBIBITION % FIBRE	Month	252	255	251	250	270	259	262	241	263	316
	To-date	—	253	252	251	255	255	256	254	255	258
SUCROSE % BAGASSE	Month	2.15	2.26	2.23	2.37	2.36	2.33	2.36	2.24	2.23	2.05
	To-date	—	2.21	2.22	2.27	2.29	2.30	2.31	2.30	2.29	2.29
MOISTURE % BAGASSE	Month	52.01	52.32	52.10	52.25	52.46	52.52	52.67	52.35	52.90	53.05
	To-date	—	52.18	52.16	52.19	52.25	52.31	52.35	52.35	52.41	52.46
BOILING HOUSE PERFORMANCE	Month	97.50	97.00	97.30	97.61	97.56	97.00	96.82	97.03	97.12	96.80
	To-date	—	97.21	97.23	97.36	97.40	97.31	97.24	97.08	97.26	97.19
BOILING HOUSE RECOVERY	Month	88.39	89.46	89.40	90.22	89.88	89.90	89.71	89.30	89.15	88.41
	To-date	—	88.99	89.22	89.58	89.70	89.74	89.73	89.68	89.63	89.60
OVERALL RECOVERY	Month	83.11	84.23	84.20	84.94	84.82	84.67	84.50	83.94	83.46	82.82
	To-date	—	83.73	84.00	84.32	84.43	84.48	84.48	84.42	84.33	84.30
PURITY OF MIXED JUICE	Month	83.79	84.34	85.81	85.88	86.30	86.59	86.16	85.90	84.11	83.21
	To-date	—	84.11	84.66	85.07	85.33	85.60	85.62	85.77	85.35	85.30
REDUCING SUGARS TO SUCROSE RATIO	Month	4.47	3.77	3.25	3.20	3.15	2.92	3.08	3.36	3.92	4.85
	To-date	—	4.02	3.68	3.60	3.53	3.29	3.27	3.27	3.20	3.44
SUCROSE IN MOLASSES % SUCROSE IN CANE	Month	9.14	7.53	8.24	7.36	7.76	7.26	7.55	8.13	8.42	8.60
	To-date	—	8.25	8.15	7.88	7.85	7.73	7.70	7.75	7.77	7.79
UNDETERMINED LOST % SUCROSE IN CANE	Month	1.20	1.87	1.15	1.30	1.18	1.66	1.58	1.46	1.19	1.75
	To-date	—	1.22	1.21	1.26	1.29	1.36	1.41	1.41	1.39	1.42
GRAVITY PURITY OF FINAL MOLASSES	Month	38.17	38.94	39.65	39.79	39.98	40.72	40.07	39.60	39.15	39.25
	To-date	—	38.87	38.95	39.22	39.36	39.50	39.58	39.58	39.54	39.45
MOLASSES (85° BRIX) % CANE	Month	3.52	2.97	3.49	2.88	3.16	3.16	3.31	3.26	3.25	3.23
	To-date	—	3.13	3.18	3.08	3.10	3.11	3.12	3.13	3.15	3.15
TOTAL MONTHLY RAINFALL	Month	0.20	4.49	6.62	0.44	0.86	3.55	3.49	4.12	8.52	2.69
TOTAL FROM 1st JANUARY	To date	20.17	24.81	31.22	31.43	32.48	36.31	39.78	43.77	8.52	11.33

Table 7.—COMPARISON OF FINAL RESULTS FOR S.A. SUGAR FACTORIES
(Season 1953 to Season 1963 inclusive)

SEASON	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Cane											
Sucrose per cent	13.93	13.34	13.87	13.35	13.11	13.12	13.66	13.69	13.75	13.29	13.55
Fibre per cent	16.31	16.03	15.74	15.81	15.38	15.92	15.92	15.22	14.52	15.50	15.50
JUICE											
Brix per cent First Expressed Juice	20.6	19.6	19.8	20.3	19.6	19.2	19.6	20.1	19.6	19.7	19.8
Purity of First Expressed Juice	87.5	87.9	88.0	87.3	87.3	86.7	87.7	87.8	88.0	85.5	87.4
Purity of Last Expressed Juice	76.5	76.8	76.7	75.8	76.1	74.4	75.0	75.6	74.7	71.5	72.7
Purity of Mixed Juice	85.6	85.9	86.0	85.5	85.1	84.5	85.5	85.6	86.0	83.4	85.3
Reducing Sugars/Sucrose Ratio	3.7	3.3	3.4	3.3	3.7	4.3	3.5	3.3	3.3	5.1	3.4
MILLING DATA											
Imbibition per cent Fibre	200	191	204	222	224	207	210	238	253	266	258
Lost Absolute Juice per cent Fibre	41.7	44.1	45.5	42.1	40.9	42.3	43.0	42.0	39.0	37.4	37.5
Imbibition per cent Cane	32.7	30.7	32.1	35.2	34.5	32.9	34.6	36.2	36.7	41.2	39.8
Sucrose Extraction	92.7	92.4	92.3	92.9	93.4	92.9	92.9	93.4	94.2	94.2	94.1
Sucrose per cent Bagasse	2.75	2.75	2.91	2.60	2.47	2.55	2.66	2.60	2.43	2.24	2.29
Moisture per cent Bagasse	52.47	52.92	53.18	53.12	53.06	53.28	53.26	53.01	52.54	52.17	52.46
Lower Calorific Value	**3,067**	**3,028**	**3,003**	**3,014**	**3,021**	**3,000**	**3,000**	**3,023**	**3,067**	**3,105**	**3,066**
RECOVERIES											
Overall Recovery	82.8	83.2	83.6	83.4	84.4	83.1	83.0	83.4	84.5	82.7	84.3
Boiling House Recovery	89.4	90.0	90.5	89.8	90.4	89.5	89.4	89.4	89.7	87.8	89.6
Boiling House Performance	96.9	97.4	97.9	97.4	98.5	97.8	97.1	96.9	97.0	96.6	97.2
Tons Cane per Ton Sugar	8.58	8.90	8.53	8.88	8.95	9.09	8.74	8.70	8.54	9.01	8.63
FILTER CAKE											
Sucrose per cent Cake	1.05	1.18	1.18	1.12	1.03	1.30	1.57	1.66	1.63	1.27	1.37
Cake per cent Cane	5.86	5.48	5.28	5.08	5.76	5.70	5.95	6.10	5.43	5.28	5.57
FINAL MOLASSES											
Gravity Purity	39.5	39.3	39.6	39.9	38.5	39.1	40.3	40.3	39.5	39.6	39.4
Brix per cent	90.0	89.7	90.0	89.9	90.3	90.2	90.6	90.9	92.5	89.1	91.2
Weight per cent Cane	3.44	2.88	2.95	3.02	2.98	3.24	3.13	3.22	3.16	3.91	3.15
UNDETERMINED LOSSES											
Per cent Sucrose in Cane	1.59	1.44	1.21	1.44	1.04	0.99	1.28	0.97	1.32	1.07	1.42
AVERAGE POLARIZATION of All Sugars	98.66	98.51	98.65	98.83	98.83	98.92	98.98	98.88	98.90	98.78	98.51

Table 8.—COMPARATIVE DATA OF REPORTING S.A. FACTORIES FROM 1925 TO 1963 INCLUSIVE

	Per cent Cane		Tons of Cane per ton of		Extraction	Boiling House Recovery	Overall Recovery	IMBIBITION		BAGASSE		LOST Absolute JUICE per cent FIBRE	MIXED JUICE		Purity Final Molasses	BOILING HOUSE PERFORMANCE	Number of factories reporting of factories in operation	Percentage of crop covered
	Sucrose	Fibre	Sugar	96° Sugar				Per cent Cane	Per cent Fibre	Per cent Sucrose	Per cent Moisture		Purity	Reducing Sugar RATIO				
Average 1925-1934 ..	13.19	15.78	9.86	9.64	89.83	83.67	75.12	27.6	175	3.88	50.57	58.4	85.09	3.65	45.3	90.6	15 of 23	85.9
1935..	13.65	15.92	9.19	8.96	90.64	86.52	78.40	33.0	208	3.48	51.93	54.2	86.49	**2.65**	46.6	93.0	17 of 23	97.1
1936..	13.30	15.01	9.29	9.06	91.08	87.44	79.64	32.4	216	3.40	52.76	55.6	85.43	3.04	43.9	94.6	17 of 23	96.2
1937..	13.92	15.14	8.80	8.58	91.53	87.85	80.41	31.8	210	3.40	**52.01**	52.4	85.60	3.23	43.7	95.0	17 of 23	96.4
1938..	13.64	**14.51**	8.89	8.66	91.90	88.48	81.31	31.7	218	3.30	52.17	53.1	86.36	3.08	43.1	95.4	17 of 23	96.6
1939..	13.41	14.85	8.95	8.73	92.24	88.88	81.98	31.3	211	3.11	51.79	49.6	86.46	3.27	42.7	95.7	19 of 22	98.5
1940..	13.19	15.56	9.26	9.03	91.91	87.98	80.86	32.6	209	3.02	51.60	48.9	85.34	3.81	42.9	95.3	19 of 22	99.0
1941..	14.00	15.66	8.62	8.39	92.37	88.40	81.66	34.8	222	3.03	51.50	45.1	85.67	3.35	43.4	95.6	19 of 22	98.5
1942..	13.40	15.24	8.93	8.69	92.69	88.98	82.48	32.8	215	2.88	51.24	45.1	85.96	3.07	43.2	96.2	19 of 22	98.4
1943..	13.14	15.26	8.98	8.74	92.97	88.84	83.52	31.6	207	2.76	50.80	43.8	**86.56**	3.18	41.8	96.7	19 of 22	98.6
1944..	13.67	15.83	8.67	8.44	93.13	89.27	83.14	33.7	213	2.73	50.23	41.1	86.19	3.49	42.4	96.4	19 of 22	98.4
Average 1935-1944..	13.53	15.30	8.96	8.73	92.05	88.36	81.34	32.6	213	3.11	51.60	48.9	86.01	3.22	43.3	95.4	18 of 22	97.8
1945..	**14.28**	15.99	**8.29**	**8.08**	93.28	89.29	83.30	35.0	219	2.77	**50.19**	39.3	86.23	3.38	42.0	96.4	19 of 21	99.0
1946..	14.21	16.21	8.36	8.14	93.07	89.12	82.94	35.2	217	2.79	50.32	40.5	85.86	3.30	41.8	96.7	19 of 21	99.2
1947..	13.32	15.80	8.84	8.60	93.44	89.61	83.73	34.4	218	2.54	50.46	39.8	86.24	2.95	41.1	96.8	18 of 20	99.8
1948..	13.89	15.90	8.55	8.31	93.32	89.14	83.19	34.1	214	2.67	50.53	39.8	85.92	3.67	41.5	96.5	18 of 20	99.1
1949..	13.52	16.19	8.76	8.52	92.24	89.68	83.35	33.7	208	2.66	50.84	41.0	86.22	3.11	41.4	96.9	18 of 20	99.2
1950..	14.19	15.80	8.32	8.09	93.33	89.63	83.65	32.8	206	2.72	51.22	39.3	86.40	3.12	40.5	96.9	17 of 19	99.2
1951..	13.33	16.29	8.98	8.73	92.98	88.72	82.50	35.0	215	2.57	51.71	40.2	84.92	3.52	40.3	96.7	17 of 19	99.5
1952..	13.87	16.10	8.50	8.27	93.00	89.96	83.66	34.9	217	2.65	52.53	40.8	86.25	2.92	39.3	97.2	17 of 19	99.3
1953..	13.93	16.31	8.55	8.24	92.67	89.36	82.81	32.7	200	2.75	52.47	41.7	85.61	3.66	39.5	96.9	16 of 18	99.3
1954..	13.34	16.03	8.87	8.65	92.40	90.04	83.20	30.7	191	2.75	52.92	44.1	85.86	3.28	39.3	97.4	17 of 19	99.2
Average 1945-1954..	13.79	16.06	8.60	8.36	93.04	89.46	83.23	33.8	210	2.69	51.32	40.6	85.95	3.29	40.7	96.8	18 of 20	99.3
1955..	13.87	15.74	8.51	8.28	92.32	**90.51**	83.56	32.1	204	2.91	53.18	45.5	85.96	3.40	39.6	97.9	17 of 19	99.1
1956..	13.35	15.81	8.87	8.62	92.93	89.79	83.44	35.2	222	2.60	53.12	42.1	85.49	3.32	39.9	97.4	17 of 18	99.2
1957..	13.11	15.38	8.93	8.67	93.36	90.43	84.42	34.5	224	2.47	53.06	40.9	85.10	3.69	**38.5**	**98.5**	17 of 18	99.2
1958..	13.12	15.92	9.09	8.82	92.87	89.49	83.11	32.9	207	2.55	52.38	42.3	84.46	4.30	39.1	97.8	18 of 18	100.0
1959..	13.66	15.92	8.74	8.44	92.86	89.42	83.04	34.6	218	2.66	53.26	43.0	85.52	3.51	40.3	97.1	18 of 18	100.0
1960..	13.69	15.22	8.70	8.41	93.35	89.40	83.45	36.2	238	2.60	53.01	42.0	85.63	3.31	40.3	96.8	18 of 18	100.0
1961..	13.75	14.52	8.54	8.26	**94.21**	89.72	**84.53**	36.7	253	2.43	52.54	39.0	86.04	3.31	39.5	97.1	18 of 18	100.0
1962..	13.29	15.50	9.01	8.91	94.15	87.81	82.67	**41.2**	**266**	**2 24**	52.17	**37.4**	83.36	5.11	39.6	96.6	17 of 17	100.0
1963..	13.55	15.50	8.66	8.42	94.08	89.60	84.30	39.8	258	2.29	52.46	37.5	85.30	3.44	39.4	97.2	17 of 17	100.0

Mr. Gunn (in the chair): I wish to mention the "La Riviere" system of imbibition which has been practised at certain factories. It has not been too successful at Tongaat and will not be used next season.

Mr. Perk: Except for Table 1 and the figures on the first page, the figures shown in the Annual Summary are as declared by the factories in the monthly laboratory reports.

Although the "La Riviere" system of imbibition is mentioned on page 6 this should not be taken as meaning that this system is being advocated.

I would like to emphasize that turbines with only a Curtiss wheel are sometimes referred to as "multi stage" turbines. This is an incorrect description because though a Curtiss wheel has more than one row of blades, it expands the steam in one stage only, from stopvalve pressure to back pressure.

References to juice or sugar quality have intentionally been omitted from the paper, in view of the wide circulation of the Annual Summary.

Mr. Ashe: Mr. Perk expressed surprise that Meinicke knives are not used in South Africa, and said that if they were fitted, shredders would not be necessary. We introduced Meinicke knives about five years ago, about one knife per inch.

But we have been advised at Umfolozi by the S.M.R.I. to install a shredder, in addition to Meinicke knives, and we have done so. If our figures do not improve next season I shall have to refer back to Mr. Perk.

Dr. Dodds: This paper has as usual covered a lot of ground and might be difficult to follow for those not well grounded in mill practice. I think Mr. Perk has made a good case for the determination of sediment in mixed juice.

Mr. Covas: If the amount of sediment or sand in mixed juice is high, will this affect the milling data materially.

Mr. Perk: We must differentiate between cane, weighed with sand adhering to it, which later goes through a washing plant, as at Marromeu, and cane that is not washed, as at Luabo. In the latter case tons sucrose in cane will be too high because tons sucrose in mixed juice will be overstated, and extraction will thus be flattered.

Mr. Alexander: Referring to Table 1 there appears to be a deficiency in white sugar production.

Mr. Perk: This table includes the raw sugar going to the refinery, but not the refined output of Hulsar.

Mr. Rault: It is interesting to see the low molasses purity obtaining at Umzimkulu. Is this due to special equipment, or the staff, or the type of juice. There is a big difference between the apparent purity and the sucrose purity.

Mr. Perk: Regarding the good exhaustion obtained by Umzimkulu, this was the first Natal factory to introduce graining on molasses and the full magma system. The staff at the factory have published two papers on this.

We can assume that part of the reason for the good exhaustion is the high standard of boiling at this factory.

It may also be due to less NCo.310 being crushed by Umzimkulu.

Mr. Rault: I think they start with a high juice purity and end with a very low purity. Darnall also shows good results. They have very efficient water absorption despite a very high imbibition factor. Their first mill extraction is excellent.

Mr. Rabe: We are often asked at Umzimkulu about the low purity of our final molasses. I think there is a major reason for this which has nothing to do with the factory operations. We only crush fresh cane. Cane arrives at the mill having been cut at the latest the day before. This I am sure helps us to exhaust to a lower purity than those factories whose cane has been standing in the field or in transport up to ten or fourteen days.

Mr. Fourmond: Unfortunately there is no reducing sugar ratio given for Umzimkulu so we cannot tell what bearing this might have. Mr. Rabe, is there a high reducing sugar ratio?

Mr. Rabe: We have not the staff or equipment to do the reducing sugar analysis. The analyses referred to in Mr. Perk's paper were done by the S.M.R.I.

Mr. du Toit: The percentage of N:Co.310 crushed by Umzimkulu is given as a possible reason for the low molasses purity. But Umzimkulu crushes the highest percentage of N:Co.310 south of Tongaat. These figures do not support the contention that the N:Co. variety is to blame.

Mr. Ashe: Mr. Perk, how do you determine the amount of sediment if it will not settle properly?

Mr. Perk: The April, 1964 *S.A. Sugar Journal* has an article describing the determination of percentage sediment in mixed juice. It mentions a settling time for sand of half an hour but for the type of silt at Umfolozi it says "it will take a longer time".

Mr. Chiazzari: Speaking from memory, I recall getting Boiling House Performances of 99, some factories over a 100 per cent. The highest last year was 98.6, going down to 96.1 per cent. Why this drop?

Mr. Perk: Boiling House Performance is nothing other than "Winter Rendement", which is statistically derived from results obtained from normal healthy juice. Abnormal juices contain more and different impurities, giving worse results. The formula for B.H.P. given in the paper contains "purity of juice" as one of the factors. Purity is a good measure of quality for healthy juice but fails in the case of abnormal juice.

Dr. Douwes Dekker: Fluctuations in the B.H.P. figures are not too bad. From Table 7 taking the last four years, the figures are 96.9, 97.0, 96.6 and 97.2, they certainly do not go up to 99. Individual factories may be affected by purity fluctuations.

Mr. Chiazzari: In that case our cane is not too abnormal.