FIFTY-FIRST ANNUAL REVIEW OF THE MILLING SEASON IN SOUTHERN AFRICA (1975-1976)

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Introduction

The titles and format of the tables in this report are the same as those of previous seasons. Any changes in data or method of calculation are commented on in the text. All data listed have been calculated from figures as supplied by the mills with the exception of sugar weights which were supplied by the Sugar Association and pol, brix and fibre factors as well as cane variety and transport data for South African mills which were obtained from the Sugar Industry Central Board.

Communications with Mozambique mills have not been easy and the figures listed for these mills contain many blank spaces because the required data were not received in time. The figures listed for AM are for the last monthly report for that mill (November) and are assumed to be its final figures.

The list of symbols used to designate each mill has not been changed and a key to the symbols can be found in Table 1 of the 1973/74 Review.

Highlights of the 1975/76 Season

South African mills produced 1 801 088 tons of sugar, a reduction of about 82 000 tons from the previous season and 113 500 tons short of the 1972/73 record. Refined sugar accounted for 22% of production. The local market absorbed 1 115 503 tons and the balance (685 585 tons) was exported.

Below average rainfall during the winter months and in October and November adversely affected cane growth and the weight of cane harvested (16 813 530 tons) was 81 840 tons lower than for the previous season.

With the closure of DK at the end of the last season, only 19 mills were in operation in 1975/76, the first reduction in the number of mills since Chakas Kraal closed down in 1961. Average cane crushed per hour was 191 tons, an increase of 22 tons over the last season and the first substantial increase for a number of years.

Cane quality has been poor. The average pol of 12,60 and fibre of 15,67 compare unfavourably with the previous season and in addition mixed juice purity (84,70) was 0,3 points lower. The net result was an ERC % pol in cane of 84,18 as against 84,64 in 1974/75 and a cane to sugar ratio of 9,33, an increase of 0,68 over 1974/75 and 0,38 points higher than the 10-year average. An increase in the extraneous matter in cane, especially sand and soil, has been reported by most mills.

Factory performance has been adversely affected by the lower cane quality and probably by a drop in time efficiency (1,58%). Both extraction (95,38) and boiling house recovery (88,68) were about 0,1 lower than in 1974/75. Purity of final molasses was 0,4 points higher but undetermined losses were lower by 0,2 points.

Mozambique produced 230 249 tons of sugar from 2 279 953 tons of cane, a reduction of about 96 000 tons of sugar from the record 1972/73 season. Cane quality was better than in 1974/75 but overall recovery (78,50) and time efficiency (61,70) were very low.

Both Swaziland mills increased their sugar production and total production of the country was 211 969 tons. Average pol % cane (13,09) was higher than in South Africa and the cane to sugar ratio was 8,96.

NH in Malawi produced 64 881 tons of sugar at a cane to sugar ratio of 8,57. Average cane throughput increased to 87,4 tch but time efficiency (63,7%) was low for the season.

The past 50 years

On the occasion of the 50th anniversary of the South African Sugar Technologists' Association, it is interesting to look back at the changes in cane quality and factory performance which have occurred over the past 50 years.

Unfortunately, there have been changes in analytical methods which may have affected the value of the parameters used in this comparison. Important modifications occurred in 1971 and 1972 and the following corrections have been applied to the 1972–75 averages to bring them in line with those of previous years.

Mixed juice purity — deduction of 2,0 points[2] to correct for change from sucrose to pol and from hydrometer to refractometer brix.

Sucrose % cane — addition of 0,05 points for the same reason.

Fibre % cane — deduction of 0,5 points to compensate for the correction for suspended solids.

Final molasses purity — deduction of 2,5 points[3] from molasses purity for the change from spindle to refractometer brix.

Changes in cane quality, milling performance, boiling house recovery and overall recovery are shown graphically in Figs. 1, 2 and 3. The data plotted are for five years' averages to reduce the effect of annual variations in weather.

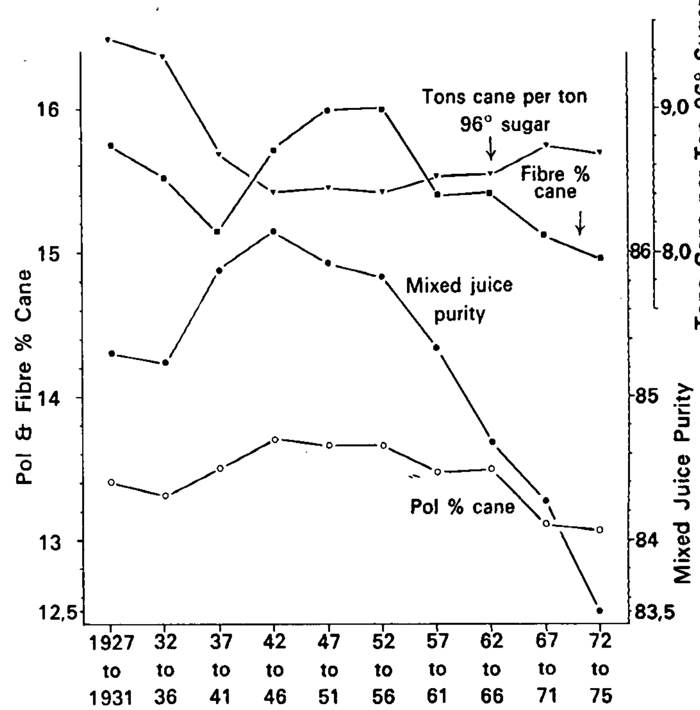

FIGURE 1 Cane quality 1927 to 1975.

Fig. 1 shows that except for fibre % cane, the other cane quality parameters have gradually improved up to the mid forties. Mixed juice purity then went into a decline and reached an all-time low of 12,5 in recent years. Pol % cane which was 13,4 for the 1927–31 period increased to a maximum of 13,7 in 1942–46 and remained at the same level until 1952–56 when it started a gradual decline to a record low of 13,0 for the 1972–75 period. Fibre % cane was 15,75 in 1927–31, increased to a maximum of 16,0 from 1947 to 1956 and then gradually decreased to a minimum of 15,0 in 1972–75.

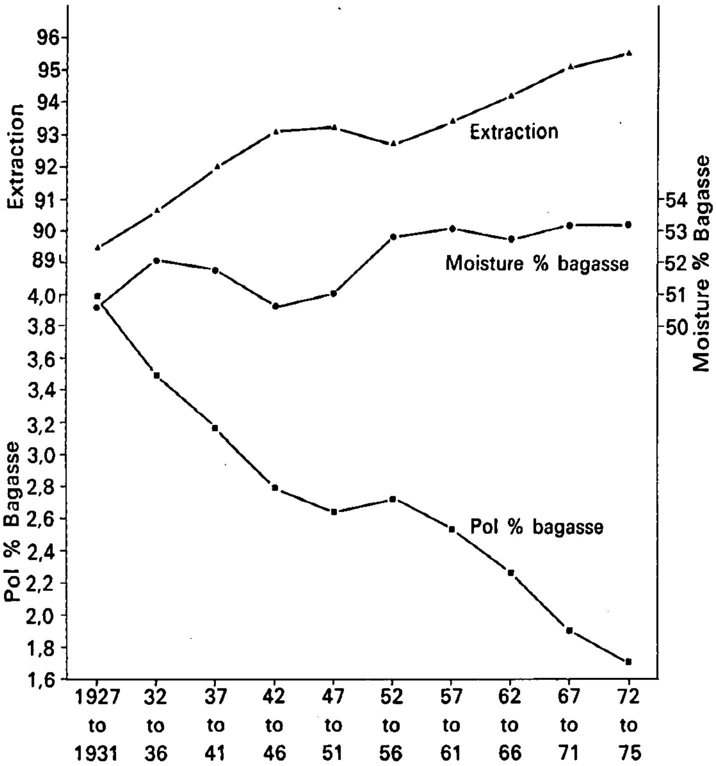

FIGURE 2 Milling performance 1927 to 1975.

Fig. 2 records the excellent progress made in milling during the past 50 years. Pol % bagasse has decreased from almost 4,0 to 1,7 while extraction increased from 89,4 to 95,5. The only blemish in this otherwise very bright picture is the increase in moisture % bagasse of almost three full points recorded during the period under review.

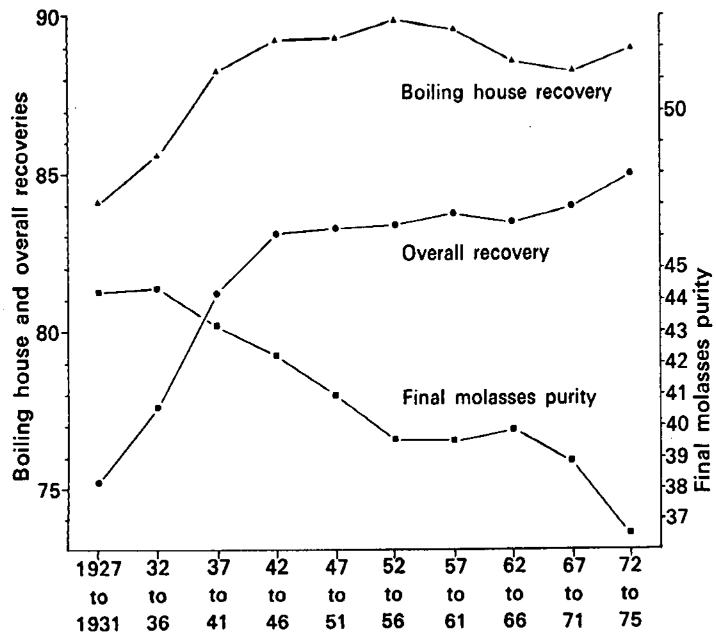

FIGURE 3 Boiling house performance and overall recovery 1927 to 1975.

Boiling house recovery has not kept pace with extraction. It increased steadily from 84,1 to a high of 89,9 for the 1952–56 period and then went into a gradual decline until 1967–71. For the last five years there has been a gradual increase to 89,0 in spite of the decrease in mixed juice purity during the same period and probably due to better molasses exhaustion. Molasses purities are more uncertain than other parameters because of changes in analytical technique but the trend has been a steady improvement comparable to that achieved in milling. The increase in extraction has compensated for the decrease in boiling house recovery from 1956 onwards and the overall recovery curve shows a sharp increase from 75,2 in 1927–31 to 83,2 in 1942–46. It then progressed more slowly until it reached 85 for the 1972–75 period.

The net result of these variations is reflected by the shape of the cane to sugar ratio curve of Fig. 1. In 1927–31 it took 9,5 tons of cane to make a ton of 96 pol sugar. This ratio decreased to 8,4 in 1952–56 but subsequently increased again to 8,7 where it has stood for the past decade as a result of the decrease in pol % cane.

The weather

The South African Sugar Experiment Station comments on the weather and its effect on the crop during the 1975/76 season as follows: "Rainfall was below average for the months of May through to August, 1975, while temperatures were above average for the same period. In May the crop was still standing up well but from June onwards progressively showed increasing symptoms of drought stress. July and August saw cane dying in patches which had to be cut immediately, this occurring mainly in the Midlands and on the South Coast. A few isolated, small fires occurred.

Welcome rains fell during September; the sugar belt, as a whole, receiving approximately 270% of the long-term average for this month. Crop recovery was remarkably rapid even though temperatures were below normal. October and November again saw below-average precipitation with the crop still showing slight drought effects in October from the long winter drought. Temperatures were below normal and, although the crop looked good in November, growth was slow due to the cool conditions and many overcast days.

The months of December through to February 1976 experienced above average rainfall and the crop improved steadily. Below average temperatures continued into December and this, coupled with many overcast days, slowed crop growth notwithstanding favourable moisture conditions."

Length of season, time efficiency, cane throughput

The average number of crushing days was 259 and the crop stretched over a total of 46 weeks from 16.4.75 when ME started grinding to 29.2.76 when ML shut down.

The season was shorter than the previous one and this is partly due to the lower tonnage of cane. The average grinding rate (191,35 tch) also contributed to reduce the length of the season. This is the first time for a number of years that there has been an appreciable increase in the crushing rate which had been more or less static at about 168 tch. The closing of one of the smaller mills (DK) has contributed to this increase and several mills have also improved their cane throughput, notably ML, PG, AK, DL, UC, ME and IL.

Unfortunately, the industrial average time efficiency (74,79) has dropped to its lowest value since the present method of calculating this parameter was started in 1969. This is a drop of 1,58 points from the previous season and is due to the very poor time efficiency reported by ML and UC which experienced considerable trouble with new equipment. Four single tandem mills (EN, DL, GH and SZ) achieved time efficiencies of over 80.

Analysis of the industrial average time account shows an increase of 2,27% for "other stops" which are mostly mechanical breakdowns and operational stops and a slight decrease in scheduled stops. Stops for lack of cane were almost unchanged from last season but were quite appreciable at some mills, notably ML (8,33) and GD (10,42).

Time efficiency of Mozambique mills (61,7) was very low with MA reporting the exceedingly low efficiency of 35,1%. MH in Swaziland on the other hand shows that a very high throughput can be maintained with a good time efficiency (81,45%). This factory has done an average of 196 tons of cane per hour on six 1 676 mm mills with only 5,86% of "other stops" and an overall recovery of 82,75.

Cane transport

There has been no marked change in the industrial average cane transport pattern listed in Table H. About half the cane is still transported by Hilo and the percentage has increased by 1,9% since last season. Lorry and tractor transport have accounted for 8,6 and 11,2% of the cane respectively while trailers transported 3,4%. Rail transport has remained unchanged for trams (14,0%) and decreased slightly for South African Railways (12,0%) and bogie trucks (0,5%), which were only used at Illovo.

Cane varieties

Table G lists the cane varieties (expressed as a percentage by weight) for South African and affiliated mills except LB and MR, from which no returns were received. The dominant variety in South Africa was still NCo 376 (56,5%), followed by N 55/805 (11,7%) and NCo 310 (8,4%). The percentage of both NCo 376 and N 55/805 has increased by 2% since last season.

In Swaziland, both MH and UR report an increase in the percentage of NCo 376 and a corresponding decrease in NCo 310.

Cane quality

The industrial average pol % cane (12,60) was the lowest on record since 1934* and the fibre content of the cane (15,67) the highest since 1959.* Mixed juice purity (84,70) was not as bad as the other two parameters since we only have to go back to 1969 to find a lower average purity.* Obviously this combination of adverse factors has influenced the estimated recoverable crystal % pol in cane. The industrial average was 84,18 compared to 84,61 in 1974/75 and 85,08 in 1973/74.

This is the third consecutive season for which ERC % pol has been used as a measure of the recoverable sugar in cane. The formula used (ERC = aS − bN − cF) contains three factors: a, b and c, which are worked out from average industrial data at the end of the season and applied to calculate monthly values during the next season. Values of the factors for the last three seasons are listed in Table 1.

TABLE 1

ERC factors for the past three seasons

	1973/74	1974/75	1975/76
Factor a	0,987037	0,986288	0,988149
Factor b	0,466333	0,461679	0,460233
Factor c	0,037198	0,037831	0,037143

* Based on data uncorrected for changes in analytical methods.

The difference between the values of the factors is very small and no appreciable error is introduced by the fact that the correct factor is only obtained at the end of the season.

The effect ERC can have on the calculation of available sugar from cane is illustrated by Table 2 in which pol % cane, ERC % pol in cane and ERC % cane are compared for all South African mills.

TABLE 2

Pol % cane and ERC % cane for South African mills

Mill	Pol % cane	ERC % pol in cane	ERC % cane
ML	13,32	83,99	11,19
PG	13,25	86,14	11,41
UF	12,80	85,32	10,92
EM	12,41	83,68	10,38
FX	12,29	84,57	10,39
EN	13,22	86,52	11,43
AK	12,48	84,19	10,51
GD	13,11	85,24	11,17
DL	12,58	85,01	10,69
GH	12,15	84,77	10,30
MV	12,09	83,38	10,08
JB	12,22	83,53	10,21
UC	11,80	81,83	9,66
TS	12,25	84,99	10,41
ME	12,68	84,09	10,66
IL	12,79	84,56	10,82
RN	13,02	83,92	10,93
SZ	12,87	83,71	10,77
UK	13,13	85,04	11,17
Ind. Av.	12,60	84,88	10,69

The highest pol in cane was reported by the two Transvaal mills, ML and PG with 13,32 and 13,25 respectively; but because of its lower fibre and higher purity, 86,14% of the sugar in the cane at PG could be recovered under average factory conditions as compared to only 83,99% at ML. As a result, the estimated recoverable crystal % cane at ML was only 11,19 while it was 11,41 at PG. Expressed in simple terms this means that a ton of cane from PG could be expected to yield 2,2 kg of sugar more than the same weight of higher pol cane from ML.

The best ERC % pol in cane (86,52) was reported by EN which had also the highest ERC % cane (11,43). The poorest cane was from the Midlands with 10,21 ERC % cane at JB and 9,66 at UC.

The recoverable sugar concept of assessing cane quality is a great progress over the pol % cane or Java ratio method. Unfortunately the ERC as calculated at present is only indirectly affected by extraneous matter delivered with cane and does not compensate fully for its effect on mill performance. During the past season there have been general complaints throughout the industry with regard to the amount of sand and soil supplied with the cane. Severe damage to mill rollers, conveyors and boilers has been reported but, as yet, no suitable methods are available for assessing the influence of these impurities on recovery.

Extraction plant

This season saw the commissioning of two more cane diffusers at ML and UC. The fact that these two mills also report very low time efficiencies should not be attributed to the diffusers, which have operated well under difficult conditions caused by the breakdown of other new equipment commissioned at the same time.

More mills have become conscious of the importance of good cane preparation and all but one measure and report regularly Preparation Index. The average for the season was 88 with eight mills reporting PI's of 90 or over.

The old controversy on the best factor to use for judging milling work is still very much alive and during the 1975/76 season, a new parameter "corrected reduced extraction" (CRE) was used. The derivation of this factor has been reported by Rein[1] and the CRE of all mills are listed in Tables B1 and B2. The constants used in this formula have been calculated on limited data from a few mills and the accuracy of the formula will no doubt be improved when these constants can be based on more data from a larger number of mills. Some suspicion will, however, always remain on the accuracy of any mill control parameter unless it can be proved experimentally that the value of the factor does not fluctuate when an extraction plant is operated under steady conditions of throughput and imbibition.

In view of the uncertainty which still exists over what factor to use, the milling work of the five factories with the highest extraction is expressed in terms of extraction, pol % bagasse, pol % fibre in bagasse and corrected reduced extraction in Table 3.

TABLE 3
Milling performance data

Factory	Pol % bagasse	Extraction	Corrected reduced ext.	Pol % fibre in bagasse
JB	1,36	96,43	96,32	3,03
EN*	1,45	96,24	95,88	3,46
PG*	1,70	96,15	95,59	3,67
IL	1,62	95,99	95,53	3,68
ME	1,51	95,97	95,80	3,47

* Diffusion factories

There is no doubt that JB and EN did the best milling work in the industry. The very good work done by PG and IL, newcomers to the top five, deserves special mention. The position of the other mills depends on what parameter is used to compare their performance and on the basis of CRE, EM (95,59), FX (95,63 and 95,75), DL (95,71), GH (95,58), MV (95,67), UC (95,60) and TS(B) (95,96) show a better performance than some of the mills listed in Table 3.

The performance of UC shows that a low pol in bagasse (1,41) is not sufficient in itself to ensure good milling work. UC had a very high moisture % bagasse (56,98) because of difficulties with the diffuser dewatering mills and this has lowered what would otherwise have been a very good mill performance. High moisture content of bagasse is not objectionable only from a fuel point of view. Moisture in bagasse is not free water but thin juice and it can be calculated that an increase of three points in moisture content of bagasse brings about a drop of about 0,6 in extraction.

For the industry as a whole, there has been a slight drop in extraction (from 95,49 in 1974/75 to 95,38 in 1975/76) which may be due to the poor cane quality since other parameters such as pol % fibre in bagasse (3,87) and pol % bagasse (1,68) are lower than last season. If one considers that all but two of the mills which contributed to the average increase in throughput of 22 tch had no major change in extraction equipment between the two seasons, the milling performance of last season is very creditable.

Industrial average imbibition % fibre (279) was lower than for the previous season but the only mill of the five listed in Table 3 which had a lower than average imbibition was ME (241).

An interesting new development in milling has been the installation of a high-speed rubber intermediate carrier feeding a Donnelly chute at MV. This carrier is reported to have operated satisfactorily and should be less costly to maintain than the slat carrier which it replaced.

Processing

Industrial average boiling house recovery was 88,68, the lowest recorded since 1970 but still 0,19 points higher than the average for the past 10 seasons. In view of the low mixed juice purity this comparatively low boiling house recovery is not surprising.

Inspection of boiling house losses shows that compared to the previous season there was a slight increase in filter cake losses (0,49) and an increase of 0,26 points in final molasses losses (9,52). There was an improvement of 0,22 points in undetermined losses (0,79) but total boiling house losses (10,80) were still higher than in 1974/75.

For the first time an all-pol balance is also included in Table B.

The boiling house data of the five mills with the highest boiling house recovery are listed in Table 4.

MV and DL have been among the top five for a number of years and TS has not been far behind, but the progress made by UF and PG is outstanding.

Filter cake losses of PG (0,15) and MV (0,29) are very low and, in both cases, are due to a very low pol in cake. PG reports the best filter work for the season with a pol of 0,46 while the industrial average is 1,33. Both mills also have a lower than average weight of cake on cane. In the case of PG the diffuser must have contributed in reducing the cake weight while at MV the percentage of 3,76 is very low for a straight milling factory. In this connection it is interesting to note the influence of cane diffusion on cake weight. ML reports 3,43%, AK 2,83% and UC only 0,95%, a suspiciously low figure. Industrial average was 4,62%.

TABLE 4
Boiling house data

Factory	Mixed juice purity	Boiling house recovery	Filter cake losses % pol in cane	Final molasses losses % pol in cane	Undetermined losses % pol in cane	Molasses at 85° Bx % cane	Molasses factor	Non suc. ratio	Purity final molasses	Average difference true and target molasses purity
MV	84,57	91,10	0,29	8,50	− 0,41	3,31	49,5	0,88	36,90	− 0,4
DL	85,52	90,48	0,59	9,37	− 0,86	3,55	57,9	0,92	39,12	1,9
UF	84,69	90,37	0,55	8,43	0,21	3,27	52,2	0,81	38,80	2,4
PG	85,28	90,33	0,15	8,26	0,89	3,53	49,8	0,88	36,48	0,4
TS	85,31	90,26	0,65	8,57	0,09	3,34	49,4	0,91	37,01	− 0,8

Negative undetermined losses have of course contributed in putting MV and DL at the top of the list. On a pol balance the negative losses disappear but the undetermined losses of both these mills are still the lowest in South Africa. The sugar balance of these two factories were thoroughly investigated by the SMRI during the season and found to be correct. One must therefore presume that the abnormally low undetermined losses which they report are due to inaccuracies in the optical method for measuring pol and sucrose in impure solutions.

Of the five mills under consideration, the lowest molasses losses are those of PG (8,26) followed by UF (8,43). The low molasses losses at PG are due mainly to a low purity of final molasses (36,48) and since the average difference between true and target purity for PG is 0,4, the low purity is due to good exhaustion rather than a favourable reducing sugars ash ratio. The exhaustion at UF could be improved as indicated by the 2,4 points difference between true and target purity and the comparatively higher molasses factor (sucrose in molasses % non-sucrose in mixed juice). On the other hand, UF has produced less molasses % cane (3,27) than PG (3,53) in spite of a lower mixed juice purity. DL had the highest mixed juice purity (85,52) of all five mills and yet produced more molasses per ton of cane (3,55). Its exhaustion was not very good and the combination of high molasses purity and high molasses % cane shows up in a high molasses factor (57,9).

There is no apparent relationship between the non-sucrose ratios listed and either molasses weight or purity.

The trend towards fast trayless clarifiers has increased and units of this type have operated satisfactorily at UF, PG and UC during the season. The main disadvantage of this type of clarifier is the necessity of working at a higher flocculant level than with conventional units. At UC for example flocculant addition was 40% higher than for the previous season. There has been a general increase in the rate of addition of flocculants which are now used by all mills. The industrial average has gone up from 2,72 ppm on mixed juice in 1974/75 to 2,97 for the past season. The heaviest users are the Midlands mills (JB and UC) which also have to add phosphoric acid to their mixed juice. Phosphoric acid at EN and sulphur at ML, PG, GH and SZ reported in Table D1 are used only in the refineries and not for raw house clarification.

The pH of clarified juice has ranged from 7,4 at EN and PG to 6,9 at FX and RN, and that of syrup from 6,9 at EN to 6,1 at FX and EM. The arithmetic average for the industry was 7,12 for clarified juice and 6,39 for syrups and this was accompanied by a drop of 0,17 points in reducing sugars/sucrose ratio from mixed juice to syrup. PG with its high liming reports a drop in RS ratio of 0,29 points and FX with a low pH a drop of 1,52 points. This is inconsistent with the fact that reducing sugars are destroyed by heat in an alkaline medium and formed under acid conditions. It would appear that more attention should be paid to both pH control and reducing sugars determination in a number of mills.

The industrial average shows a purity rise from mixed juice (84,70) to clear juice (84,75) and then to syrup (85,06). Three mills, however, have a drop of purity across the clarifier and four a drop from clarified juice to syrup. In one mill a direct relation has been found between purity drop from mixed to clarified juice and undetermined losses and the purity drop was traced to deterioration in the clarifiers.

Data on massecuites and molasses are listed in Table D. There has been a very slight increase in the volume of all three massecuites per ton of brix in mixed juice (0,1 in each case) although there has been no change in boiling process. Industrial average volume of all raw house massecuites per ton of brix in mixed juice was 1,71 m^3. Of this volume A-massecuite accounted for 62%, B-massecuite for 22% and C-massecuite for 16%.

The lowest massecuite volume is reported by MV (1,35), a reduction of 10% from the previous season which was achieved by better exhaustion of A-massecuite. The purity drop between A-massecuite and molasses was 21,8 points at MV (industrial average 16,2). This high purity drop was obtained by cooling massecuites to 39°C in water-cooled crystallizers.

The general trend is to boil C-massecuites to lower purities in order to improve molasses exhaustion. Average purity of C-massecuite was 55,1, one full point in purity lower than for the previous season and 5 points lower than 10 years ago. Working at lower purities has been made possible by the installation of continuous centrifugals which now have replaced batch machines in all mills except Felixton. It seems that vacuum pans are now the limiting equipment to even lower purities. A recent survey has shown that almost all pans boiling viscous C-massecuites have to rely on artificial circulation created by injection of steam under the calandrias.

Data on C-massecuite and final molasses of the five mills with lowest molasses purities are listed in Table 5.

The lowest C-massecuite purities are reported by MV (50,11) and JB (50,93) but the highest exhaustions are reported by ME (60,83) and PG (59,27) which boil massecuites at 56,25 and 54,95 respectively.

It is obvious from inspection of this Table that at lower purities the crystallization rate must be retarded since purity drop and exhaustion decrease. Brix must also have an effect on this and PG with a comparatively low brix (94,70) reported the lowest final molasses purity. Factory scale experiments carried out at two mills have indicated that purity drop may well be lowered by concentrating C-massecuite to a very high brix (over 98). The nutsch purity drop obtained at the pan discharge was higher than for a 96 Bx massecuite but the increase in purity drop in the crystallizer lower and total purity drop from massecuite to final molasses favoured boiling to the lower brix.

TABLE 5
C-massecuite and final molasses

Factory	Final molasses purity sucrose/ ref. brix	Final molasses pol/ref. brix	C-massecuite purity	Purity drop	C-massecuite brix	Exhaustion	Crystal content
PG	36,48	33,19	54,95	21,76	94,70	59,27	30,84
JB	36,87	32,22	50,93	18,71	96,54	54,19	26,64
MV	36,90	33,03	50,11	17,08	96,70	50,89	24,66
TS	37,01	33,71	54,16	20,45	96,11	56,95	29,64
SZ	37,11	33,68	53,87	20,19	96,51	56,51	29,38

In evaluating process work one should however guard against analysing in isolation exhaustion of A, B and C massecuite. The aim of good process work should be:

(1) To obtain the maximum purity drop from syrup to final molasses.

(2) To boil the least possible amount of massecuite.

Of the factories listed in Table 4 only MV has achieved those two results.

Overall factory performance

The factory performance index of above average factories for the past three seasons is listed in Table 6. By this standard MV is the most efficient factory with a close race for second position between ME, JB and DL.

TABLE 6
Factory performance index of above average factories

Factory	1975/76	1974/75	1973/74
MV	103,72	102,74	103,94
ME	101,82	101,84	98,57
JB	101,68	102,90	100,63
DL	101,62	102,58	102,64
PG	101,08	96,14	97,66
TS	101,06	100,92	101,14
RN	100,88	100,92	95,19
SZ	100,55	100,53	100,45
UF	100,53	98,79	99,37

The progress made by PG and UF merits special mention. Both these mills had well below average FPI's in 1974/75, and PG has moved from 19th to 5th position in only one season. It was also the only factory to figure among the first five in both extraction and boiling house work.

Boilers and fuel

Data on additional fuel listed in Table D, have always had to be interpreted with caution because of sale of bagasse to other industries by some mills and power generation for outside purposes by others. The situation has been further confused by severe problems encountered with new boilers in several mills. These boilers have not been able to produce steam at rated capacity when fed with bagasse with a high moisture content and a large proportion of sand and soil.

At AK for example a very large incinerator is operated on excess bagasse while coal has to be added to the boilers at a rate of 17,87 tons per 1 000 tons of cane.

An attempt has been made to compare the thermal efficiency of mills on the basis of kJ in bagasse and extra fuel per ton of brix in mixed juice. For this calculation it has been assumed that all bagasse produced was used as fuel which is not the case in a number of mills as pointed out in the comments listed next to these mills in Table 7.

The most thermally efficient raw sugar factory was UF with 15 247 kJ/ton brix in mixed juice, followed by ME (16 385), JB (16 501), RN (16 792) and UK (16 929).

TABLE 7
Calorific value (kJ) of bagasse and extra fuel per ton brix in mixed juice 1975-76

ML	=	24 358	98% refined — irrigation load
PG	=	19 736	71% refined
UF	=	15 247	
EM	=	20 145	
FX	=	25 333	Bagasse to paper mill
EN	=	19 774	52% refined
AK	=	20 655	
GD	=	20 287	Irrigation load
DL	=	17 602	
GH	=	20 934	98% refined
MV	=	19 907	Bagasse to by-products
JB	=	16 501	
UC	=	18 399	Power to wattle factory
TS	=	19 419	Power and bagasse to by-products
ME	=	16 385	
IL	=	17 930	
RN	=	16 792	
SZ	=	20 083	61% refined — bagasse to by-products
UK	=	16 929	

A comparison of thermal efficiency of factories was made in 1972/73 Annual Review and, at that time, UF reported 16 800 kJ/ton brix in mixed juice. The improvement in thermal efficiency appears to be the result of better evaporation. Brix of syrup was 60,95 in 1972/73 and 66,77 for the past season. Assuming 70% boiler efficiency the thermal requirements of UF can be converted to a steam requirement of 57,5% on cane. By international standards this is still fairly high; the steam consumption of an efficient raw sugar mill being generally estimated at 45 to 50% on cane. The reasons for the higher consumption in South Africa are probably the higher imbibition rates and our boiling system which, because of the remelting involved, requires the boiling of a greater volume of massecuite per ton of cane.

Because of its low fibre (13,43) UF had to burn coal and had therefore a strong incentive to be thermally efficient. This was not the case for ME, RN and UK which burned negligible amounts of extra fuel and had no incentive in saving fuel because of the high cost of disposal of surplus bagasse. Another example of this is DL with a comparatively high thermal efficiency but with negligible extra fuel consumption. This factory has even gone to the length of modifying its evaporator so that it can operate either as a triple effect or as a quadruple effect depending on the accumulation of surplus bagasse.

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REFERENCES

1. Rein, P. W. (1975). A statistical analysis of the effect of cane quality on extraction performance. SASTA Proc. **49**: 43-48.
2. Archibald, R. D. and Smith, I. A. (1975). The effect of low juice purities at Darnall on boiling house recovery. SASTA Proc. **49**: 63-73.
3. McGrath, G. D. (1970). Dry solids, spindle and refractive brix data. SASTA Proc. **44**: 48-50.

TABLE A
SOUTH AFRICAN SUGAR ASSOCIATION FINAL PRODUCTION 1975/76 SEASON
(Metric tons)

Mill	Local Market			Export Market			Total
	White	Refinery Raws	Brown	Very High Pol	Sugar for HT Molasses Production	Raws for Refined Export	
Malelane	107 474	—	2 026	—	—	—	109 500
Pongola	60 598	—	25 175	—	—	—	85 773
Umfolozi	—	543	13 423	120 793	—	—	134 759
Empangeni	—	82 186	227	6 998	6 750	18 559	114 720
Felixton	—	53 726	125	42 533	—	—	96 384
Entumeni	11 807	—	2 380	8 430	—	—	22 617
Amatikulu	—	107 457	170	49 409	—	—	157 036
Glendale	—	18 924	63	—	—	—	18 987
Darnall	—	120 443	225	19 771	—	—	140 439
Gledhow	138 305	2 224	27	—	—	—	140 556
Melville	—	17 812	2 162	14 859	—	—	34 833
Jaagbaan	—	6 097	—	104 346	—	—	110 443
Union Co-op	—	24 877	81	200	—	—	25 158
Tongaat	—	64 383	427	115 086	—	—	179 896
Mount Edgecombe	—	43 080	70 833	—	—	—	113 913
Illovo	—	8 384	27 181	28 242	—	—	63 807
Renishaw	—	—	20 263	18 291	—	—	38 554
Sezela	74 848	5 473	107	42 323	—	—	122 751
Umzimkulu	—	1 922	45	88 995	—	—	90 962
Total	393 032	557 531	164 940	660 276	6 750	18 559	1 801 088

TABLE B[1]

CANE CRUSHED AND SUGAR MADE, CANE COMPOSITION, SOUTH AFRICAN MILLS

SYMBOLS OF FACTORIES	ML	PG	UF A	UF B	EM	FX A	FX B	EN	AK
Tons sugar made*	109 500	85 773	134 759		114 720	96 384		22 617	157 036
Percentage of white sugar made	98	71	—		—	—		52	—
Average pol of all sugars made	99,81	99,56	99,29		99,42	99,37		99,69	99,43
Tons crystal made in raw house	109 888	85 620	133 294		113 724	95 561		22 597	155 578
Tons of cane crushed — Total	1 004 474	742 049	1 212 941		1 109 088	932 053		206 480	1 495 640
Tons of cane crushed — Per tandem	—	—	364 876	848 065	—	596 905	335 148	—	—
Season started on	27.5.75	8.5.75	1.5.75		1.5.75	1.5.75		20.5.75	1.5.75
Season completed on	29.2.76	29.1.76	19.1.76		26.1.76	26.1.76		23.12.75	1.2.76
Number of crushing days	279	267	264		271	271		217	277
Time account									
Hours crushing % available hours	60,74	70,73	70,08	78,90	79,41	82,34	76,33	81,02	71,88
Hours scheduled stops % available hours	8,61	14,69	2,02	2,83	9,87	9,92	10,17	10,22	9,71
Hours lack of cane % available hours	8,33	5,07	8,75	1,93	2,68	2,12	6,81	2,59	3,23
Hours other stops % available hours	22,32	9,52	19,15	16,33	8,04	5,62	6,69	6,17	15,18
Throughputs per hour actual crushing									
Tons of cane crushed	247,64	164,59	82,64	170,61	215,42	111,82	69,56	48,77	314,90
Tons of fibre milled	38,10	22,84	10,50	21,28	36,39	17,77	11,44	7,01	47,51
Tons of brix processed	37,55	24,59	36,48		26,97	24,92		7,18	44,25
Tons of sugar produced	26,99	19,02	28,14		22,30	18,81		5,34	33,06
Composition of cane crushed									
Pol % cane	13,32	13,25	12,80		12,41	12,29		13,22	12,48
Fibre % cane	15,92	14,46	13,43		17,51	17,16		14,99	15,46
Brix % cane	16,32	15,73	15,44		15,08	14,83		15,54	15,20
Tons cane per ton sugar	9,17	8,65	9,00		9,66	9,66		9,13	9,53
Tons cane per ton of 96 sugar	8,82	8,34	8,70		9,33	9,33		8,79	9,20
ERC % pol in cane	83,99	86,14	85,07	85,56	83,68	84,39	83,75	86,52	84,19
Performance									
Imbibition % cane	49,19	50,75	41,65	33,38	43,25	46,39	46,35	45,57	47,62
Imbibition % fibre	309	351	306	250	247	275	267	304	308
Java ratio	—	80,65	78,31	77,99	75,95	75,91	75,34	79,87	—
Extraction	94,69	96,15	94,93	95,58	94,94	95,33	95,25	96,24	94,89
Corrected reduced extraction	94,60	95,59	93,65	94,45	95,59	95,63	95,75	95,88	94,88
Preparation index	90	90	80		86	89		—	91
Fibre factor	100,12	99,99	100,00	100,00	101,42	100,00	101,20	100,18	99,97
Pol factor	99,85	100,09	99,10	100,40	100,38	99,70	97,80	100,47	98,36
Brix factor	101,53	100,89	101,00		101,70	101,04	100,03	101,32	100,37
Pol % fibre in bagasse	4,59	3,67	4,71		3,72	3,61		3,46	4,22
Boiling house recovery	86,29	90,33	90,37		87,38	87,85		85,85	88,10
Overall recovery	81,71	86,85	86,19		82,95	83,72		82,62	83,60
Factory performance index	97,82	101,08	100,53		98,82	99,21		95,70	98,95
Sucrose balance									
Lost in bagasse (*a*)	5,31	3,85	4,62		5,06	4,70		3,76	5,11
Lost in filter cake (*b*)	0,47	0,15	0,55		0,60	0,72		1,07	0,30
Lost in final molasses (*c*)	11,85	8,26	8,43		9,93	9,69		10,11	10,16
Undetermined losses (*d*)	0,67	0,89	0,21		1,46	1,18		2,44	0,83
Boiling house losses ($b+c+d$)	12,99	9,30	9,19		11,99	11,59		13,62	11,29
Sum of all losses ($a+b+c+d$)	18,30	13,15	13,81		17,05	16,29		17,38	16,40
Pol balance									
Lost in bagasse	5,31	3,85	4,62		5,06	4,70		3,76	5,11
Lost in filter cake	0,47	0,15	0,55		0,60	0,72		1,07	0,30
Lost in final molasses	10,72	7,52	7,95		9,67	9,22		9,98	9,52
Undetermined losses	1,80	1,64	0,68		1,71	1,64		2,57	1,46

* Figures supplied by S.A. Sugar Association

THROUGHPUTS AND TIME ACCOUNTS, PERFORMANCES AND LOSSES
(Season 1975 - 1976)

GD	DL	GH	MV	JB	UC	TS A	TS B	ME	IL	RN	SZ	UK	Averages
18 987	140 439	140 556	34 833	110 443	25 158	179 896		113 913	63 807	38 554	122 751	90 962	1 801 088
—	—	98	—	—	—	—		—	—	—	61	—	22
99,42	99,44	99,93	99,25	99,44	99,53	99,47		99,20	99,35	99,12	99,80	99,49	99,49
18 862	139 466	141 375	34 464	109 473	24 974	178 407		112 495	63 046	37 994	122 928	90 146	1 790 221
169 604	1 285 115	1 383 990	329 782	1 055 187	267 885	1 694 364		1 036 444	582 992	344 620	1 135 090	825 934	16 813 530
—	—	—	—	—	—	572 278	1 122 086	—	—	—	—	—	—
29.4.75	24.4.75	11.5.75	27.4.75	17.4.75	27.5.75	22.4.75		16.4.75	22.5.75	24.4.75	22.4.75	19.5.75	16.4.75
1.12.75	18.1.76	8.2.76	13.12.75	10.1.76	25.2.76	10.2.76		8.1.76	19.2.76	26.11.75	11.12.75	31.1.76	29.2.76
217	270	274	231	269	275	295		268	274	217	234	258	259
72,93	81,71	81,25	75,66	76,69	51,58	76,94	83,58	78,67	71,67	79,94	80,13	75,55	74,79
10,53	9,22	14,62	8,59	7,85	13,36	4,08	5,46	11,01	9,47	12,58	12,39	15,05	10,21
10,42	5,27	1,50	7,28	7,55	6,61	8,05	1,09	6,51	7,16	2,98	1,97	4,19	5,14
6,12	3,80	2,63	8,47	7,91	28,46	10,93	9,87	3,81	11,69	4,50	5,51	5,21	9,86
44,74	243,42	258,69	78,63	218,47	81,00	106,08	191,48	206,91	124,07	83,33	252,13	176,53	191,35
6,24	37,69	40,86	12,61	31,55	11,28	15,89	28,80	30,39	17,28	12,42	39,35	26,05	28,72
6,52	34,24	34,80	10,71	30,95	11,35	40,79		29,91	18,01	12,11	36,58	25,78	27,16
5,02	26,65	26,27	8,32	22,87	7,61	31,59		22,75	13,55	9,32	27,27	19,42	20,51
13,31	12,58	12,15	12,09	12,22	11,80	12,25		12,68	12,79	13,02	12,87	13,13	12,60
14,36	16,02	16,56	16,53	15,72	14,35	15,55		15,27	14,54	15,47	16,31	15,28	15,67
16,08	15,06	14,52	14,82	15,00	14,99	14,66		15,50	15,57	15,98	15,78	15,82	15,27
8,91	9,13	9,85	9,46	9,55	10,64	9,42		9,10	9,15	8,94	9,24	9,09	9,33
8,60	8,81	9,45	9,14	9,22	10,26	9,09		8,80	8,84	8,66	8,89	8,77	9,00
85,24	85,01	84,77	83,38	83,53	81,83	84,78	85,19	84,09	84,56	83,92	83,71	85,04	84,48
41,21	45,02	41,07	49,09	48,42	34,73	38,64	35,97	36,80	41,44	38,36	52,35	44,46	43,72
287	281	248	297	308	242	249	231	241	285	248	321	291	279
79,68	77,65	77,82	76,79	79,70	—	76,98	76,47	77,24	79,48	77,58	—	78,48	77,77
93,70	95,66	95,25	95,27	96,43	95,87	94,71	95,93	95,97	95,99	94,49	95,18	94,85	95,38
92,81	95,76	95,58	95,67	96,32	95,60	94,71	95,96	95,80	95,53	94,27	95,29	94,55	95,33
89	87	84	84	89	89	92		91	90	84	91	91	88
100,24	100,34	103,42	105,06	105,78	100,01	98,91	99,00	102,74	104,01	105,04	101,81	103,93	101,50
100,21	99,88	98,48	100,00	99,90	93,69	98,88	99,30	98,66	98,78	96,74	100,06	99,20	99,27
101,26	100,90	99,31	100,80	100,95	98,44	99,49	99,93	99,45	99,65	98,58	102,54	100,13	100,44
6,02	3,52	3,65	3,57	3,03	3,51	3,65		3,47	3,68	4,81	3,97	4,59	3,87
89,47	90,48	87,70	91,10	88,38	82,72	90,26		89,61	88,45	90,11	88,13	87,92	88,68
83,84	86,55	83,53	86,79	85,22	79,30	86,21		86,00	84,90	85,15	83,88	83,40	84,58
98,22	101,62	99,18	103,72	101,68	96,65	101,06		101,82	99,89	100,88	100,55	97,71	100,00
6,30	4,34	4,75	4,73	3,57	4,13	4,48		4,03	4,01	5,51	4,82	5,15	4,62
0,38	0,59	0,48	0,29	0,69	0,20	0,65		0,39	0,40	0,49	0,31	0,42	0,49
8,73	9,37	9,59	8,60	10,08	13,62	8,57		9,19	9,92	8,09	9,47	8,74	9,52
0,76	−0,86	1,65	−0,41	0,44	2,75	0,09		0,39	0,76	0,76	1,52	2,29	0,79
9,87	9,10	11,72	8,48	11,21	16,57	9,31		9,97	11,08	9,34	11,30	11,45	10,80
16,17	13,44	16,47	13,21	14,78	20,70	13,79		14,00	15,09	14,85	16,12	16,60	15,42
6,30	4,34	4,75	4,73	3,57	4,13	4,48		4,03	4,01	5,51	4,82	5,15	4,62
0,38	0,59	0,48	0,29	0,69	0,20	0,65		0,39	0,40	0,49	0,31	0,42	0,49
8,71	8,44	8,79	7,68	8,80	12,72	7,80		8,20	8,85	7,35	8,41	8,39	8,75
0,77	0,07	2,45	0,50	1,71	3,64	0,86		1,39	1,84	1,51	2,58	2,65	1,56

TABLE C[1]
ANALYSIS OF BAGASSE, JUICES, FILTER
SOUTH AFRICAN MILLS

SYMBOLS OF FACTORIES	ML	PG	UF A	UF B	EM	FX A	FX B	EN	AK
Final bagasse									
Pol % bagasse	1,95	1,70	2,20	1,93	1,62	1,59	1,57	1,45	1,79
Moisture % bagasse	54,36	51,04	53,95	53,67	53,48	53,34	53,03	55,69	54,38
Fibre % bagasse	42,46	46,30	42,19	42,87	43,52	43,32	43,98	41,96	42,38
Bagasse % cane	36,24	29,97	30,12	29,09	38,81	36,03	37,39	34,27	35,60
LCV in kJ per kg bagasse	6 787	7 464	6 859	6 926	6 977	7 007	7 070	6 540	6 789
First expressed juice									
Brix	—	18,81	19,24	18,63	18,62	18,41	18,90	18,64	—
Apparent purity	—	87,37	86,82	87,26	87,75	87,67	86,83	88,76	—
Last expressed juice									
Brix	2,68	—	1,98	2,68	—		—	1,26	—
Apparent purity	77,48	—	72,21	73,44	—		—	56,02	—
Purity drop	—	—	14,61	13,82	—		—	32,74	—
Residual juice purity	61,27	64,28	55,94	57,00	54,10	52,76	52,76	61,43	55,30
Purity drop	—	23,09	30,88	30,26	33,65	34,91	34,07	27,33	—
Mixed juice									
Mixed juice % cane	111,37	118,79	108,81	102,07	102,85	107,73	106,50	109,45	110,89
Brix	13,61	12,58	13,53	13,96	13,53	12,66	13,05	13,46	12,67
Apparent purity	83,13	85,28	84,33	85,04	84,67	85,60	84,73	86,37	84,31
Purity drop	—	2,09	2,49	2,22	3,08	2,07	2,10	2,39	—
Reducing sugars/pol ratio	6,98	5,31	3,75		3,53	4,67		3,59	4,96
Suspended solids % mixed juice	0,48	0,49	0,83	0,86	0,60	1,06	0,86	0,56	0,34
Clarified juice									
Brix	13,74	12,11	13,48		13,30	12,05		13,57	11,99
Apparent purity	83,68	84,76	85,72		84,30	84,70		85,78	84,48
Reducing sugars/pol ratio	7,04	5,57	3,81		3,59	4,35		3,62	4,63
Average pH	7,11	7,41	7,04		7,11	6,90		7,44	7,32
Filter cake									
Pol % filter cake	1,81	0,46	1,41		1,61	1,48		2,83	1,33
Filter cake % cane	3,43	4,29	5,00		4,58	5,98		4,99	2,83
Syrup									
Brix	63,48	67,97	66,77		63,90	64,82		62,85	62,80
Apparent purity	83,76	85,25	86,02		84,54	85,99		86,27	85,35
Reducing sugars/pol ratio	7,92	5,02	3,98		3,94	3,15		4,29	4,02
Average pH	6,16	6,46	6,26		6,11	6,10		6,88	6,58
Final molasses									
Refracto brix	81,87	85,56	83,19		85,70	88,13		80,45	85,33
Pol/refracto brix purity	37,27	33,19	36,63		38,80	38,20		40,66	37,85
Sucrose/refracto brix purity	41,21	36,48	38,80		39,74	40,13		41,17	40,37
Percentage reducing sugars	21,55	15,83	15,98		15,07	17,23		11,82	18,05
Percentage sulphated ash	10,90	—	15,98		14,10	—		11,38	13,78
Reducing sugars/ash ratio	1,98	—	1,00		1,07	—		1,04	1,31
Molasses at 85 refracto brix % cane	4,50	3,53	3,27		3,65	3,49		3,82	3,70

CAKE, SYRUP AND FINAL MOLASSES
(Season 1975 - 1976)

GD	DL	GH	MV	JB	UC	TS A	TS B	ME	IL	RN	SZ	UK	Averages
2,61	1,54	1,60	1,61	1,36	1,41	1,84	1,43	1,51	1,62	2,11	1,72	1,93	1,68
51,97	53,48	53,21	51,50	52,48	56,98	54,34	54,35	53,32	52,63	51,88	53,16	54,40	53,52
43,36	43,73	43,83	45,14	44,92	40,18	42,46	43,20	43,56	44,03	43,83	43,32	42,05	43,38
32,16	35,40	36,03	35,52	32,15	34,65	35,28	34,82	33,71	31,64	34,00	36,03	35,10	34,59
7 239	6 981	7 032	7 376	7 189	6 283	6 795	6 810	7 014	7 148	7 150	7 295	7 029	6 967
19,18	18,49	17,75	18,07	18,00	—	18,23	18,27	18,85	18,60	19,37	—	19,31	18,52
87,10	87,59	87,97	87,16	85,15	—	87,53	87,58	87,11	86,49	86,66	—	86,63	87,19
—	—	—	—	—	—	—	—	—	—	2,30	—	—	—
—	—	—	—	—	—	—	—	—	—	73,63	—	—	—
—	—	—	—	—	—	—	—	—	—	13,03	—	—	—
56,13	55,33	54,26	48,04	52,22	49,70	57,47	58,35	49,58	48,50	48,30	48,86	55,49	54,41
30,97	32,26	33,71	39,12	32,93	—	30,06	29,23	37,53	37,99	38,36	—	31,14	32,78
107,92	108,14	103,19	112,16	112,40	99,08	102,04	99,96	101,73	108,10	102,99	114,07	107,92	107,30
13,50	13,01	13,04	12,15	12,61	14,14	13,37	13,75	14,21	13,42	14,11	12,72	13,53	13,23
85,57	85,52	86,00	84,57	83,14	80,71	85,25	85,38	84,18	84,55	84,69	84,44	85,25	84,70
1,53	2,07	1,97	2,59	2,01	—	2,28	2,20	2,93	1,94	1,97	—	1,38	2,49
4,76	5,04	4,66	5,18	7,44	7,66	5,44		5,69	7,15	5,04	5,31	5,87	5,31
0,39	0,50	0,75	0,44	1,13	0,44	0,53	0,53	0,58	0,57	0,55	0,61	0,49	0,62
13,14	11,96	12,58	11,49	13,07	14,19	12,78		13,48	13,19	14,02	12,36	13,48	12,95
86,08	85,97	85,83	84,87	83,29	80,95	85,15		84,38	84,63	85,78	84,86	85,24	84,75
4,96	4,80	4,59	4,99	6,91	7,43	5,03		5,84	6,64	4,56	5,28	5,70	5,26
7,01	7,20	7,16	7,04	7,00	7,00	7,23		7,20	7,10	6,90	6,98	7,19	7,12
1,17	1,52	1,16	0,94	1,51	2,47	1,64		1,03	1,22	1,36	0,64	1,38	1,33
4,37	4,86	5,02	3,76	5,64	0,95	4,84		4,80	4,22	4,66	6,26	4,00	4,62
63,15	63,35	72,03	65,02	60,06	59,02	66,30		64,27	65,08	65,67	65,92	62,72	64,51
86,56	86,25	85,83	85,31	83,30	81,10	85,09		85,26	84,41	85,52	85,36	85,60	85,06
4,39	4,54	4,48	5,54	6,57	7,25	4,91		6,09	6,26	4,00	5,13	5,67	5,14
6,50	6,30	6,31	6,70	6,60	6,40	6,16		6,40	6,28	6,20	6,43	6,50	6,39
83,92	87,68	83,73	82,74	80,51	84,29	87,95		82,22	78,27	82,28	84,23	80,94	84,14
37,74	35,20	36,39	33,03	32,22	37,99	33,71		33,49	35,70	34,26	33,68	35,94	35,61
37,82	39,12	39,78	36,90	36,87	40,67	37,01		37,60	40,02	37,74	37,11	37,45	38,74
16,66	15,12	17,14	17,68	16,22	18,05	19,95		18,99	17,73	18,20	18,82	17,16	17,58
17,48	—	—	15,27	12,50	10,38	15,54		—	—	14,01	13,64	—	13,75
0,95	—	—	1,16	1,30	1,74	1,28		—	—	1,30	1,38	—	1,28
3,61	3,55	3,45	3,31	3,93	4,65	3,34		3,65	3,73	3,28	3,86	3,61	3,64

TABLE D[1]

MASSECUITES, EXHAUSTIONS, CLARIFYING SOUTH AFRICAN MILLS

SYMBOLS OF FACTORIES	ML	PG	UF	EM	FX	EN	AK	GD
Brix in mixed juice % cane	15,16	14,94	14,39	13,91	13,73	14,73	14,05	14,57
A-massecuite								
m^3 per ton brix in mixed juice	1,41	1,16	0,97	0,99	0,98	1,36	0,97	1,03
Brix of massecuite	91,52	92,44	92,77	92,60	91,76	90,99	92,69	91,65
Purity of massecuite	83,27	87,45	86,86	86,20	85,70	86,43	87,68	88,15
Purity of A-molasses	71,51	73,04	70,35	71,00	69,90	75,22	67,92	73,70
Purity drop	11,76	14,41	16,51	15,20	15,80	11,21	19,76	14,45
Exhaustion*	49,57	61,12	64,10	60,80	61,25	52,34	70,25	62,32
Purity A-massecuite — purity syrup	−0,49	2,20	0,84	1,66	−0,29	0,16	2,33	1,59
B-massecuite								
m^3 per ton brix in mixed juice	0,52	0,44	0,37	0,39	0,32	0,69	0,36	0,41
Brix of massecuite	93,60	93,56	94,30	94,80	93,21	95,35	92,58	93,58
Purity of massecuite	72,44	74,07	70,86	70,50	70,80	74,87	70,20	72,43
Purity of B-molasses	49,15	49,34	47,50	50,80	49,20	53,32	48,56	50,47
Purity drop	23,29	24,73	23,36	19,70	21,60	21,55	21,64	21,96
Exhaustion*	63,22	65,90	62,79	56,79	60,05	61,66	59,92	61,21
C-massecuite								
m^3 per ton brix in mixed juice	0,36	0,31	0,22	0,27	0,35	0,25	0,27	0,23
Brix of massecuite	96,67	94,70	95,30	97,90	95,86	96,84	96,13	94,79
Purity of massecuite	58,79	54,95	53,33	56,10	60,00	57,22	55,44	55,24
Purity of C-molasses	37,27	33,19	36,63	38,80	38,20	40,66	37,85	37,74
Purity drop	21,52	21,76	16,70	17,30	21,80	16,56	17,59	17,50
Crystal content**	33,16	30,84	25,11	27,67	33,81	27,02	27,20	26,64
Exhaustion*	58,35	59,27	49,42	50,38	58,79	48,77	51,05	50,88
White sugar massecuites								
Kg sugar per m^3	583	590	—	—	—	499	—	—
Total volume of all raw massecuites								
m^3 per ton brix in mixed juice	2,29	1,91	1,56	1,66	1,65	2,30	1,60	1,67
Clarifying agents								
Tons limestone per 1 000 T.C.	—	5,54	—	—	—	—	—	—
Tons coke per 1 000 T.C.	—	0,56	—	—	—	—	—	—
Tons lime per 1 000 T.C.	2,59	—	0,57	0,88	0,66	1,31	0,74	0,64
Tons sulphur per 1 000 T.C.	0,06	0,007	—	—	—	—	—	—
Phosphoric acid ppm mixed juice	—	—	—	—	—	66,37	—	—
Flocculents ppm mixed juice	2,32	1,47	4,23	2,16	1,50	5,75	0,82	2,89
Additional Fuels per 1 000 T.C.								
Tons of fuel oil	—	—	—	—	—	—	—	—
Tons of coal	45,43	23,83	5,61	1,56	31,78	22,08	17,87	20,6
Tons of wood	—	—	—	6,07	—	11,94	—	3,60
Converted into bagasse***	181,72	95,34	22,44	13,53	127,12	102,67	71,49	86,72

$$\text{* Exhaustion} = \frac{10\,000\ (\text{Pty massecuite} - \text{Pty run off})}{\text{Pty massecuite}\ (100 - \text{Pty run off})}$$

$$\text{** Crystal content} = \frac{(\text{Pty massecuite} - \text{Pty run off})}{(100 - \text{Pty run off})} \times \text{Bx. Massecuite}$$

AGENTS AND ADDITIONAL FUELS
(Season 1975 - 1976)

DL	GH	MV	JB	UC	TS	ME	IL	RN	SZ	UK	Averages
14,06	13,45	13,62	14,17	14,01	13,71	14,46	14,51	14,53	14,51	14,60	14,19
0,98	1,02	0,88	1,07	0,98	1,09	0,99	1,08	1,00	1,03	0,95	1,05
93,24	91,68	92,42	92,56	91,97	93,34	93,37	91,76	91,17	92,17	91,91	92,21
87,50	89,28	86,40	84,58	83,06	85,73	85,28	86,69	87,11	86,46	85,89	86,30
70,77	71,66	64,60	67,49	65,98	69,01	71,02	69,62	70,98	69,25	69,32	70,12
16,73	17,62	21,80	17,09	17,08	16,72	14,26	17,07	16,13	17,21	16,57	16,18
65,41	69,63	71,27	62,15	60,44	62,93	57,69	64,81	63,80	64,73	62,88	62,74
1,25	3,45	1,09	1,28	1,96	0,64	0,02	2,28	1,59	1,10	0,29	1,24
0,32	0,34	0,26	0,36	0,45	0,42	0,37	0,38	0,38	0,38	0,30	0,38
93,74	93,68	93,78	93,61	92,67	93,55	95,15	92,51	92,69	93,68	93,56	93,66
70,69	71,93	65,40	67,01	67,46	69,18	70,53	70,58	71,48	70,05	69,71	70,54
46,77	49,18	42,70	43,45	46,74	47,22	51,02	48,22	47,09	46,15	45,25	48,00
23,92	22,75	22,70	23,56	20,72	21,96	19,51	22,36	24,39	23,90	24,46	22,54
63,55	62,23	60,57	62,17	57,66	60,14	56,47	61,18	64,48	63,35	64,08	61,44
0,23	0,28	0,21	0,26	0,33	0,28	0,30	0,30	0,28	0,31	0,29	0,28
98,00	96,55	96,70	96,54	92,95	96,11	98,00	95,89	94,36	96,51	95,30	96,06
53,40	55,39	50,11	50,93	54,95	54,16	56,25	57,26	53,84	53,87	55,60	55,10
35,20	36,39	33,03	32,22	37,99	33,71	33,49	35,70	34,26	33,68	35,94	35,92
18,20	19,00	17,08	18,71	16,96	20,45	22,76	21,56	19,58	20,19	19,66	19,18
27,52	28,83	24,66	26,64	25,42	29,64	33,53	32,15	28,10	29,38	29,24	28,75
52,59	53,92	50,89	54,19	49,77	56,95	60,83	58,55	55,31	56,51	55,19	54,32
—	732	—	—	—	—	—	—	—	583	—	597
1,53	1,64	1,35	1,69	1,76	1,79	1,66	1,76	1,66	1,73	1,54	1,71
—	4,52	—	—	—	—	—	—	—	2,92	—	—
—	0,50	—	—	—	—	—	—	—	0,38	—	—
0,76	1,22	0,51	0,84	0,86	0,65+	0,65	0,53	0,56	1,75	0,55	0,90
—	0,002	—	—	—	—	—	—	—	0,005	—	—
—	—	—	48,81	101,80	—	—	—	—	—	—	—
1,74	2,46	1,86	8,01	7,52	1,55	2,54	7,52	0,56	0,78	0,84	2,97
—	—	—	—	—	—	—	—	—	0,06	—	—
—	9,74	2,67	—	15,84	10,19	0,15	7,84	—	9,65	—	—
0,43	1,09	1,44	3,12	0,34	0,13	0,07	13,52	1,04	0,18	0,53	—
0,52	40,07	12,40	3,75	63,77	40,92	0,70	47,58	1,24	39,17	0,64	45,56

+ includes 579 Tons Carbide Sludge

*** 1 m³ fuel oil is equivalent to 5,5 tons of bagasse of 6 978 kJ/kg
1 ton fuel oil is equivalent to 6 tons of bagasse of 6 978 kJ/kg
1 ton coal is equivalent to 4 tons of bagasse of 6 978 kJ/kg
1 ton firewood is equivalent to 1,2 tons of bagasse of 6 978 kJ/kg

TABLE B2

CANE CRUSHED AND SUGAR MADE, CANE COMPOSITION, THROUGHPUTS AND TIME ACCOUNTS, PERFORMANCES AND LOSSES

MOZAMBIQUE, SWAZILAND AND MALAWI MILLS

(Season 1975 - 1976)

SYMBOLS OF FACTORIES	LB	MR	AM	BZ	IC	MA	Mozambique Totals and Averages	MH	UR	NH A	NH B
Tons sugar made	51 102	48 003	59 880	24 895	34 115	12 253	230 249	110 548	101 421	64 881	
Percentage of white sugar made	69	47	33	53	56	42	50	1	12	28	
Average pol of all sugars made	99,16	98,98	98,84	98,69	99,06	97,94	98,91	98,44	98,77	97,02	
Tons crystal made in raw house	50 669	47 398	58 914	24 492	33 756	11 897	227 127	107 896	99 545	61 961	
Tons of cane crushed — Total	548 182	518 495	533 280	234 414	326 306	119 279	2 279 953	1 002 156	897 367	556 179	
Tons of cane crushed — Per tandem	—	—	—	—	—	—	—	—	—	285 015	271 164
Season started on	28.4.75	20.5.75	20.5.75	27.5.75	18.6.75	30.6.75	28.4.75	1.5.75	2.5.75	3.4.75	
Season completed on	7.12.75	21.12.75	22.11.75	10.11.75	25.1.76	16.12.75	25.1.76	11.1.76	23.1.76	6.11.75	
Number of crushing days	224	216	187	168	222	170	198	256	267	218	
Time account											
Hours crushing % available hrs.	65,72	71,24	64,96	67,18	58,23	35,06	61,70	81,45	75,88	69,67	57,68
Hours scheduled stops % available hrs.	6,70	9,00	18,93	13,82	17,17	6,53	12,13	8,40	7,00	8,71	9,89
Hours lack of cane % available hrs.	14,44	7,25	9,48	10,99	13,10	1,02	9,92	4,29	11,13	10,44	15,63
Hours other stops % available hrs.	13,14	12,50	6,62	8,01	11,50	57,38	16,25	5,86	5,99	11,18	16,80
Throughputs per hour actual crushing											
Tons of cane crushed	155,96	141,21	183,27	87,36	105,88	101,98	133,87	195,66	183,44	80,20	94,62
Tons of fibre milled	20,20	20,82	26,16	13,99	15,36	14,29	19,09	28,70	25,26	12,08	13,92
Tons of brix processed	19,87	18,56	27,76	12,18	14,86	15,94	18,54	28,75	27,17	26,44	
Tons of sugar produced	14,53	13,07	20,58	9,27	11,06	10,47	13,51	21,58	20,73	20,39	
Composition of cane crushed											
Pol % cane	12,04	12,07	13,96	12,68	12,71	13,30	12,72	13,12	13,06	13,60	
Fibre % cane	12,95	14,74	15,13	16,02	15,16	14,01	14,56	14,87	13,77	14,89	
Brix % cane	14,07	14,64	16,48	15,66	15,57	19,05	15,40	15,94	15,65	16,16	
Tons cane per ton sugar	10,73	10,80	8,91	9,42	9,56	9,73	9,90	9,07	8,85	8,57	
Tons cane per ton 96° sugar	10,38	10,47	8,64	9,15	9,26	9,54	9,61	8,84	8,59	8,47	
ERC % pol in cane	87,06	84,51	86,48	83,31	84,01	75,02	84,88	84,73	85,75	86,25	85,96
Performances											
Imbibition % cane	31,08	24,32	51,89	26,75	33,65	22,84	33,78	25,13	28,09	37,35	32,51
Imbibition % fibre	240	165	343	167	222	163	232	169	204	248	221
Java ratio	80,93	81,57	79,25	73,89	77,43	73,90	78,94	81,61	80,37	80,45	79,32
Extraction	91,46	90,51	92,84	90,26	91,39	92,95	91,56	92,77	95,63	95,54	93,46
Corrected reduced extraction	89,94	90,37	91,85	90,77	90,90	91,95	90,84	92,26	94,96	95,27	92,83
Pol % fibre in bagasse	7,94	7,77	7,00	7,71	7,53	6,69	7,53	6,47	4,15	4,02	6,08
Boiling house recovery	83,92	83,86	85,63	91,55	89,19	81,37	85,73	89,20	89,39	88,03	
Overall recovery	76,76	75,91	79,50	82,63	81,51	75,63	78,50	82,75	85,48	83,21	
Factory performance index	88,16	89,61	91,51	98,87	96,91	99,95	92,23	96,83	99,06	95,12	
Sucrose balance											
Lost in bagasse (a)	8,54	9,49	7,16	9,74	8,61	7,05	8,44	7,23	4,37	5,48	
Lost in filter cake (b)	0,69	0,72	0,22	0,62	0,28	1,04	0,53	0,63	0,42	0,49	
Lost in final molasses (c)	8,87	10,81	9,83	8,85	8,37	11,46	9,60	8,41	8,29	8,86	
Undetermined losses (d)	5,14	3,08	3,29	—1,84	1,23	4,81	2,93	0,97	1,44	1,96	
Boiling house losses (b+c+d)	14,70	14,61	13,34	7,63	9,88	17,31	13,06	10,01	10,15	11,31	
Sum of all losses (a+b+c+d)	23,24	24,10	20,50	17,37	18,49	24,36	21,50	17,24	14,52	16,79	

TABLE C[2]

ANALYSIS OF BAGASSE, JUICES, FILTER CAKE, SYRUP AND FINAL MOLASSES MOZAMBIQUE, SWAZILAND AND MALAWI (Season 1975 - 1976)

SYMBOLS OF FACTORIES	LB	MR	AM	BZ	IC	MA	Mozambique Averages	MH	UR	NH A	NH B
Final bagasse											
Pol % bagasse	3,45	3,34	3,07	3,41	3,37	2,68	3,28	2,94	1,91	1,64	2,56
Moisture % bagasse	52,12	52,63	52,03	50,99	50,62	50,16	51,77	50,68	51,24	56,98	54,23
Fibre % bagasse	43,45	42,98	43,86	44,23	44,75	40,06	43,54	45,44	46,02	40,80	42,10
Bagasse % cane	29,83	34,27	32,53	36,19	32,48	34,97	32,77	32,26	29,96	36,87	34,89
LCV in kJ per kg bagasse	7 174	7 076	7 208	7 043	7 479	7 600	7 251	7 485	7 415	6 273	6 787
First expressed juice											
Brix	16,91	S17,58	20,22	20,03	19,23	21,65	18,74	19,16	18,91	19,49	19,81
Apparent purity	88,08	84,19	87,09	85,70	85,34	83,14	86,02	83,91	85,92	86,35	86,98
Last expressed juice											
Brix	—	7,18	—	5,05	4,42	S3,99	—	S4,42	1,62	3,05	2,91
Apparent purity	—	76,74	—	71,48	71,51	57,76	—	76,47	68,83	76,39	71,13
Purity drop	—	S7,45	—	14,22	13,83	25,38	—	7,44	17,09	9,96	15,85
Mixed juice											
Mixed juice % cane	101,27	90,09	116,47	90,60	99,73	87,89	100,27	92,50	98,07	100,41	97,65
Brix	12,58	S14,59	13,00	15,39	14,07	17,79	13,82	15,88	15,10	15,15	15,39
Apparent purity	86,44	83,14	85,55	82,10	82,71	79,08	84,07	82,84	84,29	85,01	84,95
Purity drop	1,64	1,05	1,54	3,60	2,63	4,06	1,95	1,07	1,63	1,34	2,03
Suspended solids % mixed juice	—	—	0,74	—	0,65	—	—	0,22	—	—	—
Reducing sugars/sucrose ratio	5,82	3,67	6,17	11,06	5,18	4,33	5,81	5,39	5,04	4,31	
Clarified juice											
Brix	—	S14,30	—	15,03	14,11	S17,73	—	S15,59	14,65	14,87	
Apparent purity	—	84,34	—	84,16	84,05	81,05	—	85,36	85,30	86,68	
Reducing sugars/pol ratio	5,28	3,72	5,42	9,12	5,00	4,80	5,46	4,92	4,47	3,95	
Average pH	—	7,00	—	6,68	6,90	7,00	—	7,00	6,90	7,20	
Filter cake											
Pol % filter cake	1,52	1,73	1,14	2,13	1,03	2,77	1,60	2,90	1,06	2,13	
Filter cake % cane	5,49	5,00	2,66	3,72	3,43	5,00	4,21	2,85	5,13	3,16	
Syrup											
Brix	61,63	62,53	57,00	54,00	55,88	60,26	58,67	65,13	64,30	66,40	
Apparent purity	83,93	84,31	85,59	86,80	84,68	82,81	84,69	83,46	85,20	85,30	
Reducing sugars/pol ratio	3,98	3,18	5,69	7,12	5,19	7,45	5,21	4,61	4,54	3,71	
Average pH	—	6,80	—	6,57	6,61	6,00	—	6,60	6,20	6,50	
Final molasses											
Refracto brix	83,08	S86,09	83,46	85,91	S93,02	84,11	85,94	86,62	S88,91	78,17	
Pol/refracto brix purity	—	—	—	41,67	38,02	38,53	—	36,67	—	39,16	
Sucrose/refracto brix purity	41,81	42,39	40,35	43,61	—	45,63	—	39,54	35,97	40,82	
Percentage reducing sugars	15,34	18,86	17,49	18,11	18,83	25,68	19,05	18,60	—	11,68	
Percentage sulphated ash	—	—	—	—	13,04	13,01	—	—	—	—	
Reducing sugars/ash ratio	—	—	—	—	1,44	1,97	—	—	—	—	
Molasses at 85 refracto brix % cane	3,00	—	4,00	3,03	—	S3,93	—	3,29	3,54	3,47	

S = Spindle brix

TABLE D[2]

MASSECUITES, EXHAUSTIONS, CLARIFYING AGENTS AND ADDITIONAL FUELS MOZAMBIQUE, SWAZILAND AND MALAWI MILLS

(Season 1975 - 1976)

SYMBOLS OF FACTORIES	LB	MR	AM	BZ	IC	MA	MH	UR	NH
Brix in mixed juice % cane	12,74	13,14	15,14	13,94	14,03	15,63	14,69	14,81	15,13
A-massecuite									
m³ per ton brix in mixed juice		0,67		0,80	0,98	0,76	0,96	0,92	0,88
Brix of massecuite		S92,19		90,25	91,66	S92,13	92,62	S91,76	91,79
Purity of massecuite		85,92		85,39	85,79	82,46	84,43	85,30	83,40
Purity of A-molasses		70,49		71,62	70,09	64,39	67,54	67,90	66,33
Purity drop		15,43		13,77	15,70	18,07	16,89	17,40	17,07
Exhaustion		60,85		56,82	61,18	61,53	61,62	63,54	60,78
Purity of A-massecuite — Purity of syrup		−1,61		1,41	−1,11	0,35	−0,97	−0,10	1,90
B-massecuite									
m³ per ton brix in mixed juice		0,47		0,43	0,33	0,37	0,41	0,43	0,39
Brix of massecuite		S94,40		90,03	94,43	S92,95	93,93	S94,35	93,38
Purity of massecuite		74,56		76,22	73,17	73,28	73,81	73,10	74,21
Purity of B-molasses		52,36		58,82	52,35	54,76	49,17	50,17	51,81
Purity drop		22,20		17,40	20,82	18,52	24,64	22,93	22,40
Exhaustion		62,49		55,43	59,71	55,86	65,67	62,95	62,63
C-massecuite									
m³ per ton brix in mixed juice		0,32		0,28	0,24	0,54	0,23	0,30	0,26
Brix of massecuite		S98,70		92,15	97,10	S95,20	97,55	S98,72	96,99
Purity of massecuite		60,40		63,39	60,12	60,41	58,51	57,20	57,42
Purity of C-molasses		34,18		41,67	38,02	38,53	36,67	35,97	39,16
Purity drop		26,22		21,72	22,10	21,88	21,84	21,23	18,26
Crystal content		39,31		34,31	34,62	33,88	33,64	32,73	29,10
Exhaustion		65,95		58,74	59,30	58,92	58,94	57,96	52,26
White sugar massecuites									
Kg sugar per m³		638		624	568	—	447	419	628
Total volume of all raw massecuites									
m³ per ton brix in mixed juice		1,46		1,51	1,55	1,67	1,60	1,65	1,53
Clarifying agents									
Tons lime per 1 000 T.C.		1,70		1,68	1,12	—	0,96	1,00	1,72
Tons sulphur per 1 000 T.C.		0,005		0,04	0,13	—	—	0,004	—
Phosphoric acid ppm mixed juice		—		—	0,92	—	—	—	40,04
Flocculents ppm mixed juice		—		4,24	1,54	—	2,70	1,06	5,97
Additional fuels per 1 000 T.C.									
Tons of fuel oil		1,67		—	—	—	—	—	—
Tons of coal		8,47		—	—	—	2,49	9,67	—
Tons of wood		9,75		51,19	1,84	—	—	—	21,57
Converted into bagasse		55,60		61,43	2,21	—	9,96	38,68	25,88

Note: Total and averages for Mozambique mills have not been calculated because data from LB and AM were not received in time.

TABLE E
COMPARATIVE MANUFACTURING DATA OF RECENT YEARS
(South African Mills)

SEASON	1975/76	1974/75	1973/74	1972/73	1971/72
CANE					
Pol % cane	12,60	13,08	13,08	13,26	12,97
Fibre % cane	15,67	15,59	15,64	14,82	14,82
JUICES					
Brix of first expressed juice	18,52	19,16	18,99	18,95	18,55
Purity of first expressed juice	87,19	87,31	87,84	88,67	86,83
Purity of mixed juice	84,70	85,01	85,66	86,66	83,14
Reducing sugars/pol ratio (mixed juice)	5,31	5,05	4,70	4,17	4,29
MILLING					
Imbibition % fibre	279	286	288	279	277
Imbibition % cane	43,7	42,8	45,0	41,4	41,1
Extraction	95,38	95,49	95,55	95,55	95,91
Pol % bagasse	1,68	1,73	1,69	1,75	1,61
Moisture % bagasse	53,52	53,10	53,19	52,85	52,66
Bagasse % cane	34,59	34,18	34,33	33,70	32,97
LCV bagasse kJ/kg	69,67	70,49	70,33	70,99	71,43
Available kJ in bagasse/kg Bx mixed juice	16,983	16,348	16,537	16,183	16,119
RECOVERIES					
Boiling house recovery	88,68	88,76	89,13	89,48	89,41
Overall recovery	84,58	84,76	85,17	85,50	85,76
Tons cane per ton sugar	9,33	8,97	8,93	8,77	8,93
FILTER CAKE					
Pol % filter cake	1,33	1,28	1,30	1,34	1,34
Filter cake % cane	4,62	4,70	4,85	4,77	4,73
FINAL MOLASSES					
Gravity purity	38,75	38,39	39,16	40,03	39,40
Weight @ 85 Bx % cane	3,64	3,71	3,52	3,30	3,26
AVERAGE SUGAR POLARISATION	99,49	99,50	99,45	99,46	99,36
SUCROSE BALANCE					
Lost in filter cake	0,49	0,46	0,48	0,48	0,49
Lost in final molasses	9,52	9,26	8,96	8,46	8,43
Undetermined losses	0,79	1,01	0,94	1,11	1,23
Lost in boiling house	10,80	10,73	10,39	10,05	10,15
Lost in bagasse	4,62	4,51	4,45	4,45	4,09
Total losses	15,42	15,24	14,83	14,50	14,24
m^3 MASSECUITE PER TON BRIX MIXED JUICE					
A-massecuite	1,05	1,04	1,04	1,01	1,02
B-massecuite	0,38	0,36	0,36	0,36	0,35
C-massecuite	0,28	0,27	0,27	0,23	0,26
TOTAL	1,71	1,67	1,67	1,60	1,63
EXHAUSTION OF MASSECUITES					
A-massecuite	62,74	63,59	64,43	64,10	63,38
B-massecuite	61,44	62,09	60,48	60,57	60,72
C-massecuite	54,32	56,08	56,00	54,87	56,85
PURITY RISE					
A-massecuite purity	86,30	86,83	87,61	88,22	87,60
Syrup purity	85,06	85,82	86,82	87,36	86,53
Rise	1,24	1,01	0,79	0,86	1,07
BRIX OF SYRUP	64,51	64,72	64,20	63,22	62,53

TABLE F
AVERAGE MANUFACTURING RESULTS BY MONTHLY PERIODS FOR SOUTH AFRICAN MILLS
(Season 1975 - 1976)

END OF MONTHLY PERIOD		May 31 1975	June 28 1975	July 2 1975	August 30 1975	Sept. 27 1975	Oct. 29 1975	Nov. 29 1975	Dec. 27 1975	Jan. 31 1976	Feb. 28 1976
TONS SUGAR MADE AND ESTIMATED	Month	175 235	202 008	268 524	230 787	198 144	256 051	190 788	141 451	121 487	16 613
	To-date	175 235	377 243	645 767	876 553	1 074 697	1 330 749	1 521 536	1 662 987	1 784 473	1 801 088
TONS CANE CRUSHED	Month	1 791 218	1 874 577	2 355 402	1 961 639	1 778 572	2 347 585	1 794 556	1 384 050	1 311 284	214 647
	To-date	1 791 218	3 665 796	6 021 198	7 982 836	9 761 408	12 108 993	13 903 549	15 287 599	16 598 883	16 813 530
TONS CANE CRUSHED PER HOUR ACTUAL CRUSHING	Month	187,16	185,89	190,34	191,08	186,25	189,50	193,13	200,32	211,92	173,41
	To-date	187,16	186,51	187,34	188,74	188,28	188,52	188,97	190,04	191,60	191,35
POL % CANE	Month	11,53	12,55	13,25	13,68	13,09	12,77	12,49	12,15	11,39	10,48
	To-date	11,53	12,05	12,52	12,80	12,86	12,84	12,80	12,74	12,63	12,60
FIBRE % CANE	Month	15,58	15,26	15,27	15,21	15,70	15,91	15,93	16,15	16,52	16,94
	To-date	15,58	15,42	15,32	15,29	15,37	15,47	15,53	15,59	15,66	15,67
TONS CANE PER TON 96 SUGAR	Month	9,87	8,87	8,46	8,20	8,66	8,84	9,08	9,44	10,39	12,17
	To-date	9,87	9,38	8,99	8,79	8,76	8,78	8,82	8,87	8,97	9,00
CORRECTED REDUCED EXTRACTION	Month	95,56	95,26	95,14	95,00	95,34	95,43	95,44	95,38	95,54	95,15
	To-date	95,56	95,41	95,30	95,23	95,25	95,29	95,31	95,31	95,33	95,33
IMBIBITION % FIBRE	Month	273	277	281	286	288	277	277	274	275	264
	To-date	273	275	278	280	282	281	280	280	279	279
POL EXTRACTION	Month	95,40	95,44	95,47	95,45	95,50	95,44	95,39	95,17	95,00	94,09
	To-date	95,40	95,42	95,46	95,45	95,46	95,46	95,45	95,43	95,40	95,38
POL % BAGASSE	Month	1,54	1,70	1,79	1,85	1,71	1,66	1,64	1,64	1,56	1,61
	To-date	1,54	1,62	1,68	1,72	1,72	1,71	1,70	1,69	1,68	1,68
MOISTURE % BAGASSE	Month	53,79	53,42	53,78	53,20	53,27	53,48	53,56	53,72	53,85	54,69
	To-date	53,79	53,60	53,62	53,45	53,42	53,43	53,45	53,47	53,50	53,52
BOILING HOUSE RECOVERY	Month	88,43	89,49	89,64	89,69	88,64	89,03	88,76	87,86	85,34	79,94
	To-date	88,43	89,00	89,27	89,38	89,24	89,20	89,14	89,03	88,77	88,68
OVERALL RECOVERY	Month	84,37	85,41	85,59	85,61	84,65	84,97	84,67	83,62	81,08	75,22
	To-date	84,37	84,92	85,21	85,31	85,19	85,15	85,09	84,96	84,68	84,58
MIXED JUICE PURITY	Month	83,61	84,76	84,89	84,28	84,97	85,54	85,23	85,05	83,74	80,96
	To-date	83,61	84,21	84,49	84,44	84,54	84,73	84,79	84,81	84,74	84,70
R.S/POL RATIO	Month	6,05	5,15	5,14	5,77	5,02	4,87	4,90	5,01	5,89	8,10
	To-date	6,05	5,57	5,39	5,49	5,41	5,30	5,25	5,23	5,28	5,31
PURITY OF FINAL MOLASSES	Month	37,86	37,87	37,85	37,22	38,90	39,69	39,59	39,41	40,49	40,77
	To-date	37,86	37,86	37,86	37,68	38,06	38,33	38,48	38,57	38,72	38,75
SUCROSE LOST IN FINAL MOLASSES % POL IN CANE	Month	9,95	9,02	8,75	9,29	9,52	9,30	9,53	9,94	11,06	11,80
	To-date	9,95	9,45	9,16	9,19	9,29	9,29	9,32	9,37	9,49	9,52
UNDETERMINED LOST SUCROSE % POL IN CANE	Month	0,63	0,56	0,70	0,14	0,83	0,64	0,66	1,07	2,29	—
	To-date	0,63	0,59	0,64	0,51	0,53	0,55	0,57	0,61	0,73	0,79

TABLE G
CANE VARIETIES AND RAINFALL
(Season 1975 - 1976)

SYMBOLS OF FACTORIES	CANE VARIETIES CRUSHED (Percentage by weight)																				RAINFALL DURING 1975 mm
	NCo 376	NCo 310	NCo 293	N 50/211	NCo 382	CO 331	NCo 339	NCo 292	NCo 334	CO 301	N 51/539	N 51/168	N 53/216	CB 36/14	CB 38/22	N 55/805	N 6	N 41/227	Mixed Vari's	Un-known	
ML	83,3	4,0			0,2				5,7							0,2			0,1	6,2	624
PG	65,7	29,9							1,1					0,2	0,1	0,2			2,4		737
UF	9,3	48,9			7,0		0,6				0,1	0,1		0,7	0,1	15,9			16,8		1 064
EM	39,1	15,0		0,3	3,9	0,2	0,3					0,9	0,8	0,2		12,3			0,2	26,1	1 378
FX	33,2	20,8		0,2	4,2								1,2	0,5		16,7	0,3		1,1	21,1	1 311
EN	74,1	2,4	14,5		0,7								0,8	1,9	0,5	4,5					1 179
AK	57,9	1,6	0,4		0,2								0,3	0,5		12,5			1,1	24,8	1 354
GD	74,2	7,5	0,1	0,1		2,2						0,1	0,3			14,7			0,3		778
DL	74,7	1,2	0,3		0,2								0,1			19,7			3,0	0,2	1 196
GH	66,9	1,3	0,5	0,1	0,3		0,1						1,2	0,8		14,7			8,6	4,9	1 106
MV	54,8	0,8												0,5		3,9			39,6		984
JB	18,0		46,4	0,6	20,1	0,7		0,1					2,5	3,2		0,6			4,8	2,4	790
UC	6,7		76,0		15,0	0,3							0,3	1,0					0,1		889
TS	73,4	1,7	0,2	0,4	0,7								0,3	0,3		18,3	0,1		3,9		944
ME	47,1	2,8	2,2	0,1	0,3											22,3			24,7		1 037
IL	48,1	2,0	23,5	0,1	3,5			1,1					0,6	1,0		7,4	1,4		0,4	10,4	1 129
RN	80,9	3,1			0,8			0,2					1,1	0,6		11,4	1,1		0,4		762
SZ	85,9	2,4	0,4		0,6								1,0	1,1		5,4			2,2	0,5	973
UK	76,8	1,6	3,0		0,2								0,8	0,2		11,9	0,4		0,3	4,2	894
Average South African Mills	56,5	8,4	5,5	0,1	2,9	0,1			0,4			0,1	0,6	0,6		11,7	0,1		5,6	6,6	—
MR																					1 003
BZ	95,0	5,0																			744
IC	88,4				1,4						0,2	0,4			7,2	0,5			2,0		667
MA		100,0																			—
MH	94,8	1,5							3,7												958
UR	84,7	9,4							5,7										0,2		351
NH	13,0	84,0													0,1				3,0		886

TABLE H

TRANSPORT SUMMARY SOUTH AFRICAN MILLS

(Season 1975 - 1976)

Percent of Cane Transported

MILLS	ML	PG	UF	EM	FX	EN	AK	GD	DL	GH	MV	JB	UC	TS	ME	IL	RN	SZ	UK	Average
South African Railways	15,1		27,7	29,6	57,4		7,9			14,0		15,6	3,5		15,0	2,8		1,5		12,0
Bogie trucks (narrow gauge)																17,0				0,5
Tram		100	70,1	33,5	42,5											0,9				14,0
Hilo	84,8			15,3			68,0	35,6	74,9	62,4	44,4	30,4	2,1	91,4	70,1	77,7	63,1	92,4		49,9
Lorry				3,3		11,7	2,1	29,0	8,9	3,1	24,3	35,3	72,3	1,1	14,1		15,2	5,5	27,4	8,6
Tractor			2,0	18,1		88,2	21,8	35,2	16,0	20,3	31,1	17,2	22,0	7,4	0,5	1,4	21,6	0,5	5,0	11,2
Trailer												1,3							67,5	3,4

TABLE J

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

PERIOD (SEASON)	Percent Cane		Cane/Sugar Ratio		Extraction	Pol % Fibre in Bagasse	Percent Bagasse		Imbibition Percent		Mixed Juice		Final Molasses Purity	Boiling House Recovery	Overall Recovery
	Sucrose	Fibre	Tel Quel	96 Pol Sugar			Pol	Moisture	Cane	Fibre	Purity	Reducing Sugar Ratio			
Average 1925–1934	13,19	15,78	9,86	9,64	89,83	8,86	3,88	50,57	27,6	175	85,09	3,65	45,3	83,67	75,12
Average 1935–1944	13,53	15,30	8,96	8,73	92,05	7,05	3,11	51,60	32,6	213	86,01	3,22	43,3	88,36	81,34
1945	14,28	15,99	8,29	8,08	93,28	6,01	2,77	50,19	35,0	219	86,23	3,38	42,0	89,29	83,30
1946	14,21	16,21	8,36	8,14	93,07	6,08	2,79	50,32	35,2	217	85,86	3,30	41,8	89,12	82,94
1947	13,32	15,80	8,84	8,60	93,94	5,53	2,54	50,46	34,4	218	86,24	2,95	41,1	89,61	83,73
1948	13,89	15,90	8,55	8,31	93,32	5,81	2,67	50,53	34,1	214	85,92	3,67	41,5	89,14	83,19
1949	13,52	16,19	8,76	8,52	92,94	5,82	2,66	50,84	33,7	208	86,22	3,11	41,4	89,68	83,35
1950	14,19	15,80	8,32	8,09	93,33	6,02	2,72	51,22	32,8	206	86,40	3,12	40,5	89,63	83,65
1951	13,33	16,29	8,98	8,73	92,98	5,74	2,57	51,71	35,0	215	84,92	3,52	40,3	88,72	82,50
1952	13,87	16,10	8,50	8,27	93,00	6,02	2,65	52,53	34,9	217	86,25	2,92	39,3	89,96	83,66
1953	13,93	16,31	8,55	8,32	92,67	6,25	2,75	52,47	32,7	200	85,61	3,66	39,5	89,36	82,81
1954	13,34	16,03	8,87	8,65	92,40	6,32	2,75	52,92	30,7	191	85,86	3,28	39,3	90,04	83,20
Average 1945–1954	13,79	16,06	8,60	8,36	93,04	5,95	2,69	51,32	33,8	210	85,95	3,29	40,7	89,46	83,23
1955	13,87	15,74	8,51	8,28	92,32	6,76	2,91	53,18	32,1	204	85,96	3,40	39,6	90,51	83,56
1956	13,35	15,81	8,87	8,62	92,93	5,98	2,60	53,12	35,2	222	85,49	3,32	39,9	89,79	83,44
1957	13,11	15,38	8,93	8,67	93,36	5,66	2,47	53,06	34,5	224	85,10	3,69	38,5	90,43	84,42
1958	13,12	15,92	9,09	8,82	92,87	5,89	2,55	52,38	32,9	207	84,46	4,30	39,1	89,49	83,11
1959	13,66	15,92	8,74	8,44	92,86	6,16	2,66	53,26	34,6	218	85,52	3,51	40,3	89,42	83,04
1960	13,69	15,22	8,70	8,41	93,35	5,98	2,60	53,01	36,2	238	85,63	3,31	40,3	89,40	83,45
1961	13,75	14,52	8,51	8,26	94,21	5,50	2,43	52,54	36,7	253	86,04	3,31	39,5	89,72	84,53
1962	13,29	15,49	8,97	8,73	94,15	5,02	2,24	52,17	41,2	266	83,36	5,11	39,6	87,81	82,67
1963	13,55	15,50	8,66	8,42	94,08	5,16	2,29	52,46	39,8	258	85,30	3,44	39,4	89,60	84,30
1964	13,90	15,38	8,42	8,20	94,16	5,23	2,34	52,64	39,4	256	85,52	3,32	39,9	89,65	84,42
Average 1955–1964	13,53	15,49	8,75	8,49	93,43	5,73	2,51	52,78	36,3	235	85,24	3,67	39,6	89,58	83,69
1965	12,99	15,57	9,20	8,97	93,99	5,00	2,20	52,98	40,6	261	84,22	3,73	39,9	87,67	82,40
1966	13,72	15,09	8,63	8,40	94,22	5,24	2,29	53,52	39,9	262	85,06	3,63	40,6	88,38	83,27
1967	12,92	15,01	9,28	9,06	94,15	5,04	2,19	53,47	39,2	261	83,41	3,81	38,8	87,52	82,33
1968	13,11	15,32	9,06	8,83	94,74	4,51	1,98	53,32	41,1	268	83,60	4,23	39,4	87,40	82,72
1969	12,88	15,03	9,10	8,86	94,98	4,30	1,89	53,30	41,2	274	84,25	4,17	38,3	88,58	84,13
1970	13,61	15,34	8,64	8,34	95,41	4,06	1,80	53,07	43,2	285	84,99	3,80	38,9	88,57	84,51
1971	12,97	14,82	8,93	8,63	95,91	3,58	1,61	52,66	41,1	277	85,14	4,20	39,4	89,41	85,76
1972	13,26	14,82	8,77	8,47	95,55	3,98	1,75	52,85	41,3	279	86,66	4,17	40,0	89,48	85,50
1973	13,08	15,64	8,93	8,62	95,55	3,87	1,69	53,19	45,0	288	85,66	4,70	39,2	89,13	85,17
1974	13,08	15,59	8,97	8,65	95,49	3,94	1,73	53,10	44,6	286	85,01	5,05	38,4	88,76	84,76
Average 1965–1974	13,16	15,22	8,95	8,68	95,00	4,35	1,91	53,15	41,7	274	84,80	4,15	39,3	88,49	84,06
1975	12,60	15,67	9,33	9,00	95,38	3,87	1,68	53,52	43,7	279	84,70	5,31	38,8	88,68	84,58