REPORT ON TESTS ON THE ESCHER WYSS CONTINUOUS CENTRIFUGAL AT ILLOVO DURING NOVEMBER, 1955

By E. BEESLEY

INTRODUCTION

In the 1955 Proceedings of this Congress we were given an excellent paper on the performance of one of these machines (Escher Wyss Continuous Sugar Centrifugal, Model C 4/4) in Mauritius by Mr. P. E. Bouvet of that country.

In the discussion on this paper Mr. Farquharson mentioned that he had always been led to believe that Natal sugars were more "difficult" to process than elsewhere in the world and, for this reason, he wondered if the performance of such a machine could be repeated in Natal.

This, the author thinks, expressed the feelings of quite a number of the technologists present, hence the results of the tests at Illovo have added interest.

The answer appears to be that the machine can handle Natal massecuites equally well as those of Mauritius.

DESCRIPTION OF THE MACHINE

Bouvet in the aforementioned paper[1] gave a very good description of the C 4/4 Type Escher Wyss Continuous Sugar Centrifugal and hence it seems redundant to redescribe it here.

The Illovo machine was equipped with the more powerful oil pump (allowing up to 48 strokes per minute) for all the tests.

The screen slot width was 0.30 mm.

The set-up of the machine was such that the A massecuites to be tested, were struck into B crystallizers and hence transferred by screw conveyor and pump to a large mixer above the centrifugal.

B massecuites were transferred to this mixer in the same way, and white strikes were struck directly into it from No. 1 pan.

The discharge from this mixer was manually controlled into a small, hot-water-jacketed, stirred vessel in which the massecuite level was maintained at a constant head and then discharged *via* a variable head weir into the centrifugal feed pipe, the variable head weir being used to regulate the rate of feed to the machine.

TESTS AND RESULTS

As there were two distinct types of massecuite to be tested, that is, Mill White massecuites and Raw Sugar massecuites, the results and comments are best divided into three sections:

1. Mill White
2. Raw Sugar
3. General

1. Mill White Tests

The main objects of the tests on Mill White massecuites were to determine—

(*a*) the capacity of the machine, both input of massecuite and output of sugar;

(*b*) the quality of sugar;

(*c*) the quantity of wash water required to achieve this quality.

The results are tabulated in Tables I, II and III.

TABLE I

General Results Obtained with the Mill White Massecuite Tests

Product	White	White	White	White
Massecuite Type	First	First	Second	Third
Test No.	1	12	2	3
Date	1 Nov. 1955	24 Nov. 1955	3 Nov. 1955	3 Nov. 1955
Masse. Bx.	89.0	89.5	89.9	89.75
Masse. Apparent Pty.	99.8	99.8	99.7	99.4
Run-off Bx	76.25	75.5	78.25	79.0
Run-off Apparent Pty.	98.1	99.4	98.6	97.6
Sugar Moisture per cent	1.13	1.77	1.60	2.08
Sugar Reducing Sugar per cent	Nil	—	Nil	0.006
Sugar Ash per cent	0.004	0.006	0.008	0.019
Sugar Col. Index	31	N.D.	59	110
Sugar SGS (Sieve Test)	0.53	N.D.	0.48	0.43
Masse. Temp. °C.	65.0	68.5	69.0	72.0
Wash Water Temp. °C.	87.5	89.0	96.0	95.0
Run-off Temp. °C	64.0	64.8	66.3	69.1
Wash Water Flow Rate l/m.	5.15	3.80	5.55	6.66
Wash Water Flow Rate gall./cu. ft. Masse.	N.D.	0.19	0.30	0.24
Revs. per minute	870±	877	870±	870±
Strokes per minute	38±	37.8	38±	38±
Current amp	35–39	35–39	35–39	35–39
Masse. Curing Rate cu. ft./min.	N.D.	4.38	4.05	6.08
Masse. Curing Rate tons /hour	N.D.	12.16	11.20	13.60
Sugar Output tons/hr.	N.D.	5.06	4.48±	5.44±
Sugar per cent Masse. Output	N.D.	41.6	40±	40±
Visc. Run-off at Run-off Temp. cp	85.0	N.D.	N.D.	N.D.

TABLE II

Comparison of Sugars produced from the same Massecuite by the Continuous Centrifuge and the 36″ × 1000 rpm Vertical Machines

Massecuite—First White Test—No. 1 Date—1/11/55

Centrifugal	Moisture per cent.	Red Sug. per cent.	Ash per cent.	Colour Index	S.G.S. (Sieve Test)
Escher Wyss	1.13	Nil	0.004	31	0.53
36″ Vertical	1.12	Nil	0.006	47	0.70

TABLE III

Table showing the Percentage of Lumps returned to Process from the Finished Sugar from the Continuous Centrifugal and from the 36″ × 1000 rpm Vertical Machines

Masse. Type	First White	Second White	First White	First White	Second White
Test No. ...	12	—	—	—	—
Date	24 Nov.	22 Nov.	15 Nov.	24 Nov.	24 Nov.
Escher Wyss	1.85	2.43	—	—	—
36″ Vertical	—	—	1.32	1.28	0.82

Comments

(*a*) *Massecuite Quality*

The massecuite quality, as indicated by both analyses and appearance, was normal for all the massecuites used in the tests. The massecuites were all spun as soon as they were struck from the pan, as this is normal practice.

In the case of Test No. 1 the massecuite was split, half into the continuous centrifugal mixer and half into the mixer feeding the normal white sugar battery for sugar quality comparison. This latter battery consists of 7 × 36″ × 1,000 r.p.m. belt - driven machines, which have fixed steam supply and manual washing (hose) and discharge.

(*b*) *Sugar Quality*

The quality of the sugar is assessed from the figures given in Tables I, II and III.

It will be seen from the figures in Table II, which were determined for the "split" strike mentioned above, that the sugar from the continuous centrifugal was highly comparable to that from the verticals in moisture, reducing sugars and ash content, somewhat better on colour index and gave a considerably smaller specific grain size by sieve test.

The latter two points require further comment.

Firstly, at the time that these tests were conducted the spectrophotometer normally used for colour determination at the S.M.R.I. was out of order and hence all the colour determinations recorded for these tests were carried out on the stand-by instrument, which is not as accurate and which does not give results comparable to the standard machine.

However, the figures (Tables I and II) do indicate that the colour index of the continuous centrifugal sugars was better than that of the conventional machines, which in turn indicates better washing.

Secondly, the sugar samples were collected prior to the sugar-drier and hence had to be dried in the laboratory before determining the specific grain size. This is an unsatisfactory operation due to the likelihood of crystals sticking together while drying, so giving an inflated value to the S.G.S. Hence the most that can be said about the specific grain size figures is that the sugar from the continuous centrifugal was finer than from the conventional machines. This could be caused by a grinding or crushing action on the crystals, mainly in the layer adjacent to the basket wall, as the sugar is pushed through the machine.

Further evidence that crystals were being crushed is that the appearance of the sugar from the continuous machine was duller than is normal. Unfortunately, brightness figures cannot be quoted due to the spectrophotometer at the S.M.R.I. being out of order as mentioned previously.

Table III gives confirmation to the observation by the Illovo staff that a higher percentage of lumps of sugar rejected by the final screen (before bagging), resulted from the massecuites processed in the continuous centrifugal. However, the increase does not appear to be more than about 1 per cent. on sugar produced.

(*c*) *Wash Water Requirements*

The figures shown in Table I and wash water requirements determined for seven strikes processed by the 36-in. conventional machines, show that the continuous centrifugal required only half the quantity of water (0.25 gall./cu.ft. massecuite compared to 0.5 gall./cu.ft.) and no steam, to achieve the same degree of washing. This is presumably because of the tumbling action of the sugar as it passes from basket to basket.

(*d*) *Capacity*

All the tests were conducted such that the output of sugar was at the normal rate required by Illovo, which appeared to leave the machine with ample capacity in hand.

The sugar per cent. massecuite figure for Mill Whites at Illovo is normally rather low (of the order of 40 to 45 per cent.) and hence the figures for massecuite curing rate rather than sugar output give a better idea of the machine's capacity under easy conditions.

2. Raw Sugar Tests

The Raw Sugar tests were complicated by the fact that both A and B massecuites had to be tested; the former for the production of both raw sugar and affinated sugar for mill white production, and the latter (B massecuites) for the production of raw sugar only.

Again, the main object of the tests were to determine:

(*a*) the capacity of the machine, both input of massecuite and output of sugar;

(*b*) the quality of the sugar;

(*c*) the quantity of wash water required to achieve this quality.

The results of the tests are shown in Table IV.

TABLE IV

General Results Obtained with the Raw Sugar Massecuites

Product...	AFF.	AFF.	RAW	RAW	RAW	RAW		RAW
Massecuite Type...	A	A	A	A	A	A		B
Test No.	8	10	4	5	6	11A	11B	9
Date	15 Nov. 1955	17 Nov. 1955	10 Nov. 1955	11 Nov. 1955	14 Nov. 1955	18 Nov. 1955		16 Nov. 1955
Massecuite Brix ...	91.75	90.50	91.75	92.75	91.50	91.00		93.25
Massecuite Apparent Purity ...	86.9	87.5	89.6	87.5	87.4	87.9		76.6
Mother Liquor Brix ...	82.25	81.25	N.D.	N.D.	N.D.	81.5		88.25
Mother Liquor Apparent Purity ...	70.5	75.1	N.D.	N.D.	N.D.	75.0		59.5
Molasses Brix ...	79.79	78.75	83.0	84.25	82.5	80.0	79.25	84.5
Molasses Apparent Purity...	73.2	77.0	74.7	70.9	70.6	75.3	75.4	60.9
Purity Rise ...	2.7	1.9	N.D.	N.D.	N.D.	0.3	0.4	1.4
Sugar Pol ...	97.4	97.65	97.9	97.75	97.4	96.5	95.7	97.8
Sugar Moisture ...	1.75	1.95	1.23	1.01	1.35	2.08	2.83	1.07
Sugar Purity ...	99.14	99.59	99.12	98.75	98.73	98.55	98.49	98.86
Lumps Pol ...	95.0	94.7	N.D.	92.8	93.0	92.7	92.5	93.8
Lumps Moisture ...	3.57	3.71	N.D.	3.76	3.80	4.37	4.62	3.67
Lumps Purity ...	98.5	98.3	N.D.	96.4	96.7	96.9	97.0	97.4
Percentage Lumps ...	2.55	2.79	N.D.	N.D.	4.73	2.44	4.11	6.88
Massecuite Temperature °C ...	55.6	58.7	56.5	59.9	54.9	56.6	56.9	63.9
Wash Water Temperature °C ...	96.7	88.5	—	—	—	—	—	92.0
Molasses Temperature °C ...	51.9	56.45	56.5	56.6	50.2	51.5	51.4	55.8
Steam Press p.s.i.g. ...	16.6	16.5	—	16.0	16.8	—	16.4	16.4
Wash Water Flow Rate l/m ...	5.10	2.57	—	—	—	—	—	3.415
Wash Water Flow Rate gall./cu.ft.Masse.	0.245	0.113	—	—	—	—	—	0.384
Revs. per minute ...	942	951	840±	950±	954	871	825	988
Strokes per minute ...	36.2	35.6	35.5	36.0	34.9	35.6	36.4	40.7
Current amps ...	36–40	36–40	N.D.	39.6	36–40	36–40	36–40	36–40
Massecuite Curing Rate cu. ft./min. ...	4.58	4.99	4.08	4.52	3.67	4.33	4.33	1.96
Massecuite Curing Rate tons/hour ...	12.82	13.87	11.39	12.68	10.22	12.06	12.06	5.51
Sugar Output tons/hour ...	6.50	6.19	6.48	7.34	5.58	6.39	6.39	2.14
Sugar per cent. Massecuite Output ...	50.76	44.63	56.87	57.90	54.58	52.92	52.95	38.81
Viscosity Molasses at Molasses Temp. cp	395	246	635	1020	835	400	420	1130
Average Xal. Length of Massecuite mm.*	1.0±	0.508	1.0±	1.137	1.002	0.568		0.935
Average Xal. Breadth of Massecuite mm.*	0.7±	0.498	0.7±	0.733	0.707	0.537		0.678
Ratio Breadth/Length ...	0.7±	0.981	0.7±	0.645	0.706	0.946		0.725

* *Determined from photo-micrographs.*

Comments

(*a*) *Massecuite Quality*

On the whole, the quality of the massecuites was of the high standard normally associated with Illovo—that is a very large (1.0 mm.) even grain with negligible conglomerate or twins. There were two exceptions to this, for the massecuites for Tests 10 and 11 were grained on syrup as against the normal practice of using molasses grained C sugar as footing. This resulted in the crystals being less regular in shape, considerably smaller, and containing something like 10 per cent. conglomerate.

The effect of this poorer grain quality on the operation of the centrifugal was masked by the lower viscosity of the molasses at spinning temperature.

The lower viscosity was *definitely not due* to the fact that the strikes were syrup-grained as against boiled on a C sugar magma footing. This will be discussed further under "General."

In all cases, curing of the massecuites was commenced immediately after they were struck. As it is normal practice at Illovo to allow the A massecuite to stand approximately three hours before curing and the B massecuite about twelve hours, the mother liquor and molasses purities were somewhat higher than usual. Unfortunately, this procedure had to be adopted due to the necessity of curing the massecuites as hot as possible (that is, at as low a viscosity as possible), the small jacketed vessel feeding the machine being unable to reheat a massecuite.

(*b*) *Sugar Quality*

A Massecuites—In both raw sugar and affinated sugar production the quality of the sugar was quite satisfactory except for two things:

Firstly, the high moisture content of the sugars. This, of course, is of no consequence when affinated sugar is being produced as it is remelted long before any decomposition can take place. However, in the case of raw sugar it makes it essential to pass the sugar through a drier before bagging, otherwise the safety factor is far too high and severe deterioration on storage is inevitable.

Secondly, the formation of lumps. As mentioned under the mill white tests, it appears that the layer of sugar in contact with the basket undergoes a grinding action which results in some of the crushed crystal passing into the molasses whilst the remainder passes out with the sugar. Now, as this crushed crystal is very fine compared to the normal crystals, drainage is poor and so the moisture content is high, hence when it leaves the last basket it would tend to cling together and form lumps of damp sugar chips of somewhat lower purity than the rest of the sugar.

Again, in the case of affination this production of lumps is of no major consequence, as remelting takes place immediately and the quantity is so small that the slightly lower purity has no material effect.

However, in the case of raw sugar the lumps are a disadvantage, as due to their fine structure (crystal chips), and high moisture content, it is possible that a normal sugar drier would not dry them sufficiently to prevent their being initial points for decomposition to set in and, therefore, appears as though it may be necessary to screen the sugar after drying and return the lumps to process.

It is extremely unlikely that the returns to process would be as high as the percentage lumps figure quoted in Table IV due to break-up in the drier.

B Massecuite—The raw sugar produced from B massecuite suffered from the same defects as for A raw sugar. Further, its quality varied considerably due to the machine being very sensitive to feed rate on B massecuite, which in turn was probably due to the high viscosity of the massecuite mother liquor as it *entered* the machine. (Actually, this figure was 8,000$\pm$ cp compared to 1,000$\pm$ cp for the most viscous of the A massecuites.)

(c) Wash Water Requirements

A Massecuite (Affination)—For the affination tests on A massecuite, both steam and wash water were used, however, from the raw sugar tests the indications are that the only effect of the steam was to increase the moisture content of the sugar.

The wash water requirements were very satisfactory. The rate of application when affinating in 40″ × 30″ × 1,450 r.p.m. machines normally varies between 0.28 and 0.38 gall./cu.ft. massecuite, whereas the continuous centrifugal used only 0.245 and 0.113 gall./cu.ft. for the two tests respectively.

A Massecuite (Raw Sugar)—No wash water was required to produce raw sugar and Test 11 was conducted especially to determine whether steam was necessary or not.

The results of this test indicate that the only effect of the steam was adverse, in that the moisture content of the sugar and the quantity of lumps produced are both much higher with steam than without.

It must be pointed out, however, that the steam used was in all probability quite wet and it is quite possible that superheated steam would have the opposite effect.

B Massecuite—A considerable quantity of wash water was required to produce raw sugar from B massecuite, i.e. 0.384 gall./cu. ft. massecuite. This does not compare too well with the 40″ × 30″ × 1,450 r.p.m. vertical machines, where 0.43 to 0.52 gall./cu. ft. is all that is required to *affinate* B massecuite even after 12$\pm$ hours in the crystallizers.

Steam was also used for the B massecuite test.

(d) Capacity

The average capacity of the machine when treating A massecuites (both affination and raw) was 12.2 tons per hour massecuite and 6.41 tons per hour sugar output, and it appeared certain that it could give a sugar output of 7.0 tons per hour quite satisfactorily.

On the other hand, the capacity when working on B massecuite was very low (5.51 and 2.14 tons/hour massecuite and sugar respectively).

It is felt that the low throughput of B massecuite combined with the high wash water rate and high initial mother liquor viscosity, accounts for the machine being so sensitive to feed rate on B massecuite, hence giving marked variation in sugar quality.

3. General

The following comments apply equally well to all the types of massecuite tested:

(a) Power Demand

It is inherent to any continuous process that the power demand should be steadier than a similar batch process and in very few instances is this more marked than with centrifugals, especially when the comparison is against high capacity, short cycle, individually-driven modern machines.

Hence it is only natural that the power demand of the Escher Wyss Continuous Centrifugal varies only with the rate of feed.

The actual power consumption for the two centrifugal drive motors and the molasses pumps for all the tests, varied between 35 and 41 amps on a 500-volt three-phase supply (i.e. 30 to 40 h.p.).

(b) Handling Characteristics

Apart from the trouble experienced with feed variations when curing B massecuite as mentioned earlier in the report, the machine was very easy to control. The operator adjusted the feed rate by the appearance and quantity of the sugar issuing from the machine.

(c) *Viscosities*

Viscosity determinations were carried out on most of the molasses resulting from these tests.

The determinations were carried out with the Hoeppler falling ball viscometer on deaerated composite samples of the undiluted molasses, which had been heated until all the crystal had dissolved.

The results obtained are set out in Table V.

TABLE V

Table showing Viscosity (Centipoises), Temperature (°C) Relationships for Most of the Molasses Obtained during the Tests

Test No.	*Massecuite Type*	*Molasses Purity*	*Molasses Brix*	TEMPERATURE °C 30	40	50	60	70
1	1st White	98.1	76.25	970	388	188	104	64
10	A	77.0	78.75	2160	790	370	197	116
4	A	74.7	83.00	7550	2500	1050	525	290
5	A	70.9	84.25	14100	4300	1710	800	422
6	A	70.6	82.50	5950	1970	860	426	240
11A	A	75.3	80.00	2380	920	440	240	144
11B	A	75.4	79.75	2600	970	460	245	144
9	B	60.9	84.50	14100	4350	1740	815	450

Taking these results and plotting Viscosity to Brix at constant temperature the family of curves shown in Figure I is obtained.

Examination of these curves leads to the rather interesting conclusion that, although the mill white run-off does not fit the curves, all the values for the raw house A and B molasses fit extremely well, even though the purity range covered is 60 to 78 and some of the strikes were boiled on magma grain whilst others were boiled on virgin syrup grain.

The "fit" of the points on the curves was considered to be so good, in fact, that the curves were used to determine the Viscosity of Molasses at Molasses Temperature for Test No. 8 which, unfortunately, could not be determined directly.

Also the above curves led to the statement earlier in the report that it was merely the low brix that gave the low viscosity figures to Tests 10 and 11, not the fact that they were boiled on virgin syrup grain.

Figures taken from Figure I are tabulated in Table VI to show the Viscosity, Brix, Temperature relationship for the A and B molasses tested.

TABLE VI

Table showing Viscosity (Centipoises), Brix Relationships derived from Table V and Figure I for the A and B Molasses Tested

Temp. °C	BRIX 79	81	83	85
30	2060	3620	7400	19500
40	800	1330	2450	5900
50	377	585	1030	2200
60	201	302	506	1030
70	121	174	284	555

SUMMARY OF CONCLUSIONS

1. That the centrifugal handles Mill White massecuites very well with very small wash water requirements. A slight increase in the quantity of lumps returned from the sieve to remelt is, however, apparent.

2. That the machine is not satisfactory from the point of view of sugar quality and capacity on Illovo B massecuite.

3. That the centrifugal handles A massecuite for raw sugar production at a satisfactory rate, but that the quality of the sugar would definitely call for a sugar drier possibly followed by a coarse mesh screen.

4. That the machine handles A massecuite for affination and remelt at a satisfactory rate, producing sugar of good quality for remelting with very small wash water requirements.

A sugar affination is definitely the most valuable role for this centrifugal in Natal, where raw sugar driers are not used.

5. That the power demand of the machine is most pleasingly small and steady, no matter what massecuite is being cured.

SUMMARY OF THE REPORT

The report covers tests carried out on an Escher Wyss Continuous Centrifugal (Type C 4/4) at Illovo Sugar Mill during November 1955.

Massecuites handled were:

First, Second and Third Mill White Massecuites with purities of the order 98 to 99+.

A Raw Sugar massecuites for both affination and raw sugar production.

B Raw Sugar massecuite for raw sugar production.

Further, there are some general remarks on the operation of the machine and Viscosity, Brix, Temperature relationship for the molasses are given.

Special Note

In fairness to Escher Wyss Limited, it must be emphasized that not only was the above machine the first continuous centrifugal in the Natal sugar industry, but that the tests reported in this paper were carried out on practically the first massecuites to be processed in the machine (actually a few Mill White massecuites only had been processed prior to Test No. 1) hence the makers had no opportunity to adjust the machine to best suit local conditions prior to the above tests being carried out. This rather unfair state of affairs was due to the approach of the end of the crushing season.

It may be mentioned that Escher Wyss' experience in other parts of the world indicate that modifications or adjustments such as altering the length of the baskets, using different screens, changing the rotor speed, etc., can reduce to a large extent the disadvantages brought to light in the above test.

Further, it appears that the makers have developed an efficient automatic feed device as uniform feed rate is naturally most important to the satisfactory operation of a continuous process.

It is quite likely that the results reported for the B massecuite in this paper (Test No. 9) would have been far more satisfactory had this device been available at Illovo.

Acknowledgments

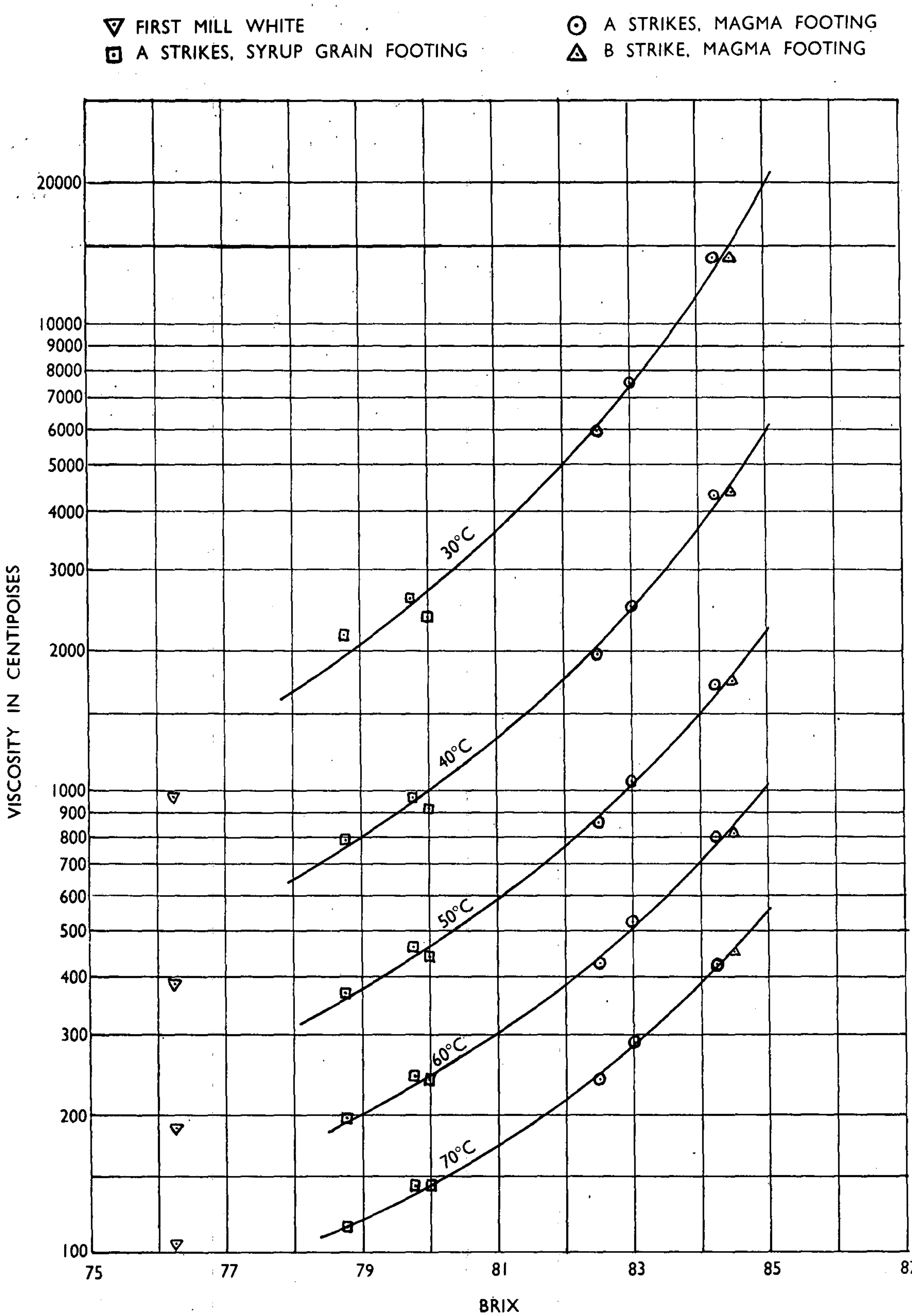
Thanks are due to the Illovo Sugar Estates Ltd., and Escher Wyss Ltd. of Switzerland, for enabling these tests to be carried out; to the staff at Illovo for their usual cheerful co-operation; to Mr. Matossi of Escher Wyss Ltd., who was in charge of the machine and who assisted greatly in carrying out the tests; and to the laboratory staff of the S.M.R.I. for carrying out the analyses.

REFERENCES

[1] Bouvet, P. E. (1954): Report on the Performance of a Continuous Sugar Centrifugal, Manufactured by the Escher Wyss Co. of Switzerland. Proc. S.A. Sug. Tech Assoc., **29,** 88.

FIGURE I

VISCOSITY TO BRIX CURVES AT CONSTANT TEMPERATURE FOR FIRST MILL WHITE RUN-OFF AND A AND B MOLASSES



The Chairman, Mr. Rault, said we should all be interested in this type of machine for the sugar industry, in common with other industries, was tending towards continuous operation, in all factory processes. With labour difficulties appearing on the horizon it was imperative that new labour-saving devices should be thoroughly tested.

Mr. D. Hastilow asked Mr. Beesley what his experience was as far as increasing the speed of the machine was concerned. With a similar type of machine at the Refinery it was found that with the increase of speed a large quantity of small sugar crystals was produced in the syrup. He gave run-off purities comparing the continuous machine with the conventional type of high-speed centrifugal.

Mr. Beesley replied that the continuous centrifugal at the Refinery was vastly different in design and operation from that at Illovo and that although two speeds were used on the Illovo machine the results were inconclusive.

In view of the fact that no wash water or steam was applied to the refinery machine, the purity figures quoted by Mr. Hastilow made it appear obvious that sugar was passing through the screen.

Mr. Hastilow mentioned that even with the high-speed conventional centrifugal the smaller crystals were sometimes evident but not to a serious extent.

Mr. Beesley pointed out that in the case of the conventional type centrifugal, the sugar was more or less static against the sieve, hence the slots were soon covered by a layer of large crystals which prevented the smaller ones passing through into the molasses. Invariably a few of the finer crystals escaped before this static condition arose but only in negligible quantities.

In the case of a continuous machine however, a new layer of crystals was continuously being presented to the slots hence crystals of smaller size than the slots could pass into the molasses.

Also due to the continual movement of the crystals a certain amount of grinding was inevitable (the higher the gravity factor the worse this would be) and this would give rise to crystal chips in the molasses.

The Chairman enquired about the size of the screens.

Mr. Beesley in reply to the Chairman stated that in the case of C sugars say, the slot width was normally 0.35 to 0.4 mm. this would successfully retain sugar with an average length of 0.35 m.m. In fact in the case of a certain mill circular perforations of 0.8 m.m. diameter were being used for C massecuites of average crystal length 0.45 m.m., without loss of crystal.

The Chairman commented favourably on the low ash content of Illovo "mill whites," which was at a level not always reached by some refined sugars.

He also asked Mr. Beesley if he considered the amount of wash water reasonably small for the colour of sugar produced.

Mr. Beesley replied that under Illovo conditions where the conventional machines required 0.5 gall. per cubic foot of mill white massecuite, the figure of 0.25 gall. per cubic foot was low.

The Chairman stated that for 8 cubic foot massecuite and refined sugar they used only 2½ gallons of wash water in the conventional type of machine.

Mr. Camden-Smith said that he had had the privilege of witnessing the functioning of this machine last year and he considered that from the mechanical point of view and from the point of view of labour-saving it worked very well. He certainly gained the impression, however, that the pushing action in the basket tended not only to push the crystals forward but also through the screen. This was the only point which he considered should be improved upon to ensure the efficient operation of the machine.

Mr. Beesley stated that crystal chips were definitely present in the molasses from the continuous machine, and that it appeared as though they derived from the layer of crystal next to the basket. However, he pointed out that the quantity of chips must be very small as in Test II, which was spun dry (i.e. no steam or wash water was used), the purity rise from massecuite mother liquor to molasses was only 0.3 of a unit even though the crystal quality for this test was not nearly as good as normal.

He thought that there were possibilities that this disadvantage could be overcome to a great extent.

Mr. Bentley asked Mr. Beesley to enlarge upon the fact that apparently the conventional type belt-driven machines were handling only half the massecuites they would normally do, and that the comparison was between 3–4 conventional type against the continuous one. He wondered if the installation of such continuous machines would be economical from the capital cost point of view.

Mr. Beesley replied that the continuous machine was handling mill white massecuite at the same rate as the 7 conventional belt driven machines. The comparison would therefore be between 7 x 36 in. x 100 r.p.m. belt driven machines and the continuous centrifugal.

The Chairman drew attention to the low yield of sugar per cubic foot of the first massecuite, as shown in the paper. He thought this probably meant that slack massecuite was cured which undoubtedly helped the machine.

Mr. Beesley replied that apparently 40 to 45 per cent was the normal crystal content of Illovo mill white massecuites. However, from the point of view of its assisting capacity, he pointed out that the Raw Sugar A Massecuites were handled at a similar massecuite rate even though the crystal content and viscosity were much higher.

The Chairman complimented the Escher Wyss Co. and the Illovo Sugar Estates on their pioneer work in exploring the field of continuous curing of sugar under South African conditions.