THE REFINING PROCESS AT ILLOVO

By E. BEESLEY

Introduction and History

The present method of refining sugar at Illovo has evolved during the past five years in the following manner.

In 1926-28 an activated carbon method of refining was installed at Illovo and operated until the end of 1954. The method was not highly satisfactory in as much as filterability was for the most part very poor, even with low Brix melts and carbon usage was very high, which necessitated revivification, which in turn precluded the addition of filter aid. However, new carbon addition under these conditions was quite low (see Table I). Also sucrose losses were rather high which is believed to be due to the low Brix of the melt. The sugar quality was good.

At the beginning of 1954, sugar production was reviewed and it was decided to produce only quota requirements of refined sugar instead of 100 per cent refined as made previously. It was hoped that this step would mean improved refinery operation due to only A sugar being treated. However, the improvement still did not compensate for (*a*) the difference in price received for mill white and refined (£1); (*b*) the demand for mill white, and (*c*) the fact that test strikes indicated that very good quality mill white sugar could be made by simply omitting the carbon treatment and filtration from the normal refining process.

During the next few years this remelt production of mill white was standard practice, however, it was obvious that the demand for refined sugar was increasing. Hence the problem of refining by some method other than activated carbon or by some drastic modification of this method had to be solved. The first thought was to put mill white sugar over carbon and it was found that the carbon required to decolourise the liquor was much less than the old method and also that the filter rate at 65° Bx was much higher than the old method at 43° Bx.

Table I gives a comparison of the two.

TABLE I

	Old Method	*New Method*
Melt Brix	43	65
lbs. Bx/sq. ft./hr.	1.5	4.5
Imp. gall./sq. ft/hr.	0.29	0.53
New carbon addition, lbs./ton sugar	3.23	4
Total carbon addition, lbs./ton sugar	36.21	12

The refined sugar produced was tested by the S.M.R.I. (13th September, 1957) and gave the following figures:

TABLE II

	1st Massecuite Sugar	*2nd Massecuite Sugar*
a_c* 420	10	46
a_c* 720	1	12
Colour Index	8	22
Brightness	87.0	82.2
Dom. Wavelength	none	574.8
Col. Purity	zero	1.76
Ash (calc.)	0.003%	0.006%

These figures were so good that it was decided to go into limited production and sell the total output in pre-packed form.

Subsequent experience has indicated that it is worthwhile to install the necessary extra equipment to produce all our refined sugar for 1960-61 by this method.

The procedures mentioned above may be summarized by referring to Figure I which is a Brix diagram of the present method starting from the affinated raw sugar stage. Splitting the diagram at A shows the old refining method to the right and the method of mill white production to the left (provided the return of 3rd Refined Run-Off to the 2nd Mill White massecuite is eliminated).

Again referring to Figure I it will be seen that the mill white section of the diagram can be regarded as a physical clarification process as against the normal chemical methods (Williamson, etc.) used in conjunction with activated carbon.

The Flow Diagram

The Brix Flow Diagram mentioned above (Figure I) is calculated to give a general representation of the method; the basic criteria used are as follows:

TABLE III

	Bx	*Pol.*	*Pty.*	*lbs. Bx.*
1. Refined Sugar	99.97	99.94	99.97	100,000
2. Ref. Sugar and Lumps before drier.	99.00	—	99.97	—
3. Refined Liquor after evaporator	70.00	—	—	—
4. Refined Liquor before evaporator	64.00	—	—	—
5. Mill White melt	65.00	—	—	—
6. Mill White sugar	98.50	98.11	99.60	—
7. Affinated Sugar melt	70.00	—	—	—
8. Affinated Sugar	98.50	97.61	99.10	—
9. All White Massecuites	90.00	—	—	—
10. All White Run-Offs	70.00	—	—	—
11. Sweetwater to Melt	6.70	6.47	96.50	600
12. Sweetwater to Raws	5.50	5.25	95.50	600
13. Refinery tank bottoms	45.00	42.08	93.50	1,000
14. Mill White tank bottoms	45.00	42.08	93.50	1,000
15. Lumps	99.90	99.40	99.50	500

Brix yield of all White Massecuites = 48 per cent

Plant Requirements

It is estimated that for the 1960-61 crop, the following plant will yield 800 to 825 tons refined sugar per week.

3 × Batch Melters.
1 × 1100 cu. ft. Vacuum pan (exhaust steam) for Mill White boiling
1 × 800 cu. ft. Vacuum pan (exhaust steam) for Refined boiling
4 × 900 sq.ft. Auto-Suchar filters (over capacity).
3 × Plate and Frame presses for sweetening off (over capacity)
1 × 3,500 sq.ft. Triple evaporator.
5 × 36″ × 18″ × 1,100 r.p.m. B.D. centrifugals for Mill White curing
2 × 36″ × 18″ × 1,100 r.p.m. B.D. centrifugals plus.
1 × 42″ × 27″ × 960 r.p.m. E.D. centrifugal for Refined sugar curing

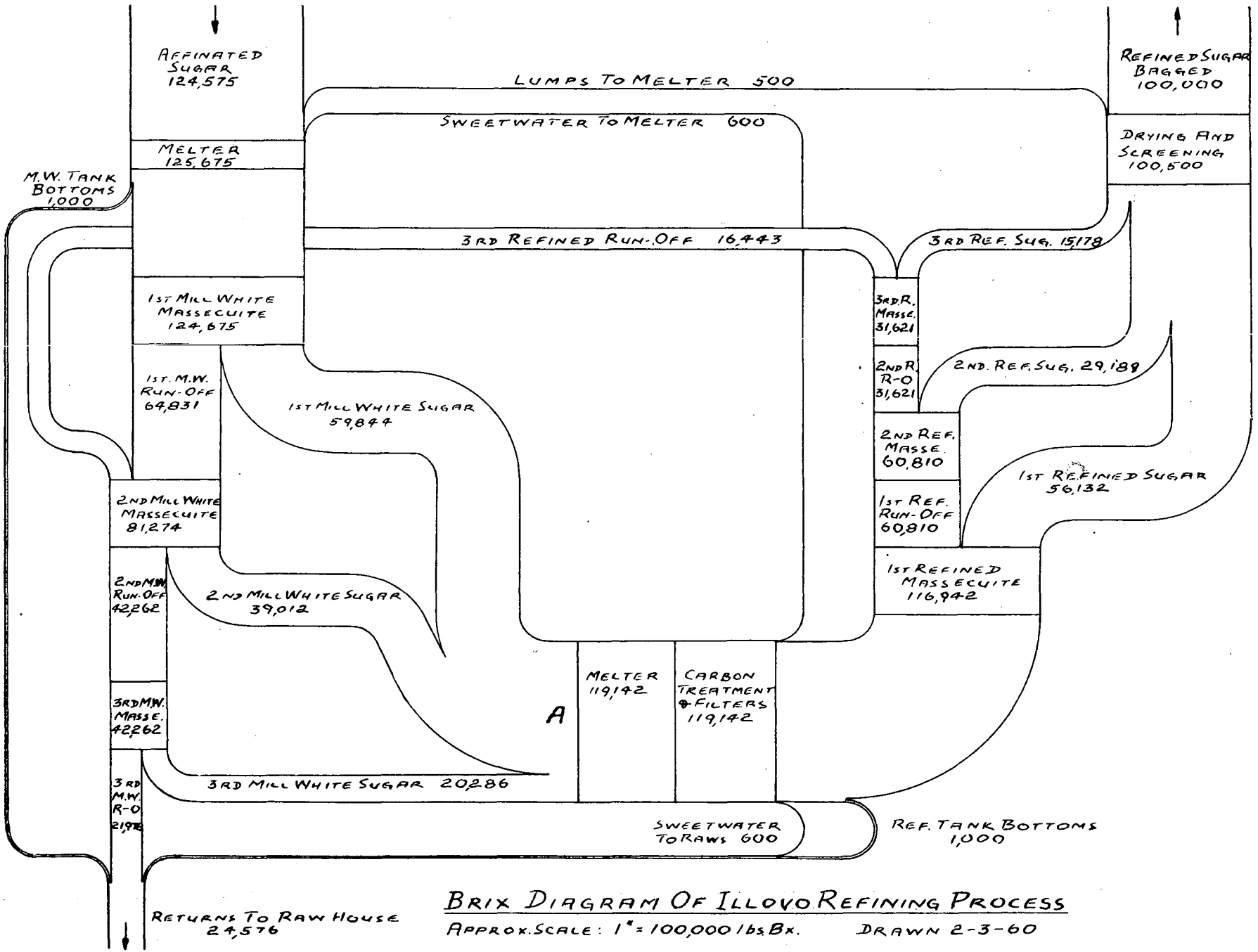
ILLOVO SUGAR ESTATES
March, 1960

It is also estimated that sufficient steam will be generated from bagasse alone to operate the process in 1960.

Acknowledgments

The author wishes to thank the Management of Illovo Sugar Estates for permission to publish the paper, especially Mr. K. W. Pearce, who as Factory Manager, originated and developed the process through its logical steps.

For discussion on this paper see page 125



BRIX DIAGRAM OF ILLOVO REFINING PROCESS

APPROX. SCALE: 1" = 100,000 lbs Bx. DRAWN 2-3-60