THE DOUBLE MAGMA BOILING SYSTEM AT UMZIMKULU

By A. E. RABE

While the Double Magma System has been in use in various parts of the world for a long time, it is only as recently as 1958 that Perk & Beesley[2] advocated its use in Natal. This is to be understood, as the 3-Boiling System, of which the Double Magma is a variation, was only established here about ten years ago. It is felt that this system, employed in the manufacture of raw sugars and in refinery recovery houses is such a useful one, that some repetition is warranted, especially as the subject has not, to the writer's knowledge, been raised at Congress before. A description of our experience with it is therefore given.

The C massecuite is grained on A molasses (70° pur), using a laboratory prepared fondant slurry (Appelboom)' and run up on B molasses. The whole operation is Cuitometer controlled. The massecuite is left in crystallizers for ± 48 hours, reheated, and cured in 4/42 in. x 24 in. Broadbent centrifugals, the sugar being mingléd with A molasses and pumped to a storage crystallizer next to the "B" Pan.

The "B" massecuite is boiled on this footing, run up on A molasses and left in crystallizers for 12-14 hours, then cured in 6/36 in. x 18 in. water driven centrifugals, the sugar this time being mingled with syrup and pumped to storage.

The A massecuite is then boiled on this footing, run up on syrup, cured hot in 8/36 in. x 18 in. water driven centrifugals, steam, wash water and a small drier being used to control polarisation and moisture.

The Pans in use are:—

C Massecuite	One 800 cu. ft.	Calandria pan
B Massecuite	One 600 cu. ft.	,, ,,
A Massecuite	One 600 cu. ft.	,, ,,
	One 800 cu. ft.	,, ,,

This gives 43 cu. feet per ton of cane per hour at a crushing rate of 65 tons per hour.

Each pan boils only one grade of massecuite.

One pan boiler with a runner handles four pans which are controlled from a central station through which all feed pipes pass from tanks to the pans, and where all instruments, Cuitometers, vacuum and steam pressure guages are duplicated on a control panel. Cuitometer recorders are mounted on the pans so that control can be shifted at will to any pan requiring special attention.

Some plant changes are being made for the coming season. Our old "A" centrifugal battery is being replaced by 3/42 in. x 30 in. Broadbents. The old "A" battery will replace the "B" battery which is scrapped. Additional crystallizers have been installed so that C massecuite will be kept longer before curing.

Our main object in changing to the Double Magma system was to produce a uniform grade of sugar conforming in all respects with the S.A. Sugar Association specification. The elimination of the large grained "B" sugar which so often gives trouble in boiling and curing, was considered adequate compensation for the additional volume of massecuite which would have to be handled.

The change-over came up to expectations. All process men will appreciate what it means to bag "A" Sugar only—we do, and it does compensate fully for the extra volume of massecuite. The actual increase in volume was from 41.5 cu. ft./ton Brix in mixed juice on the 3-Boiling system in 1958, to 50.2 cu. ft. on the Double Magma system in 1960. The 1960 figure is excessive due to the washing of Golden Brown sugar which increased the "B" massecuite from 10.5 to 12.3 cu. ft./ton Brix. We feel that the total massecuite figure can be reduced to 48 cu. ft. per ton Brix, by the elimination of wash, and should be possible with our new centrifugal station.

We have done nothing to control grain size so far.

S.G.S. determinations from S.M.R.I. screen tests have been between 0.6 and 0.7 mm. Should a larger grain size be required it will be easy to attain by melting a portion of the C sugar, and returning this to syrup.

Supervision of the boiling house is simple, as we virtually have a production line with crystal running counter flow to the stream of impurities. The storage tanks are indicators which immediately show any hold-up along the line, enabling overseers to recognise and rectify them without delay.

The easiest part of any boiling is the "run up", and is utilized to the fullest extent. This of course applies to the 3-Boiling system, but the advantage with Double Magma lies in that no mixtures are made in the pans. Each strike is prepared in the mingler and is completed in the pan with the same ingredients.

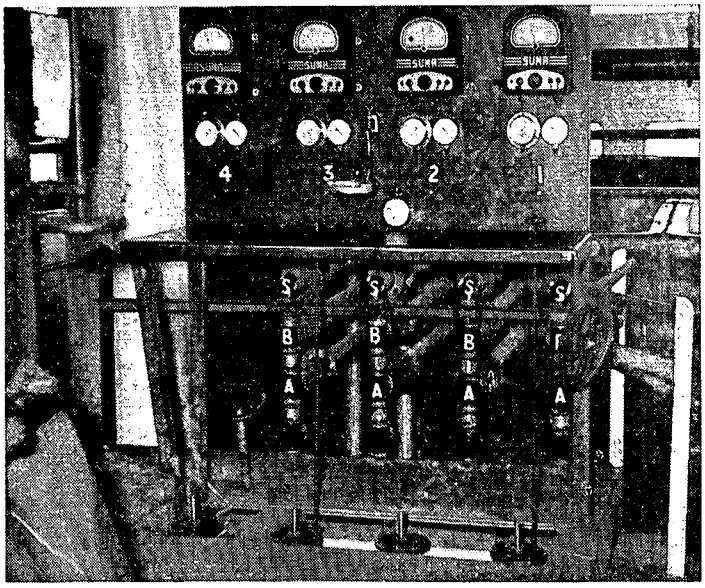
The only difficult operation which remains is the graining of C massecuite. In the raw house this is difficult to overcome, but in the Refinery recovery house the Double Magma system could be extended to a triple Magma by using screened fines from 3rd and 4th refined boilings which are free of conglomerates as a footing for C massecuite.

At Umzimkulu the Double Magma System has come to stay, as it has been the answer to producing good quality raws consistently.

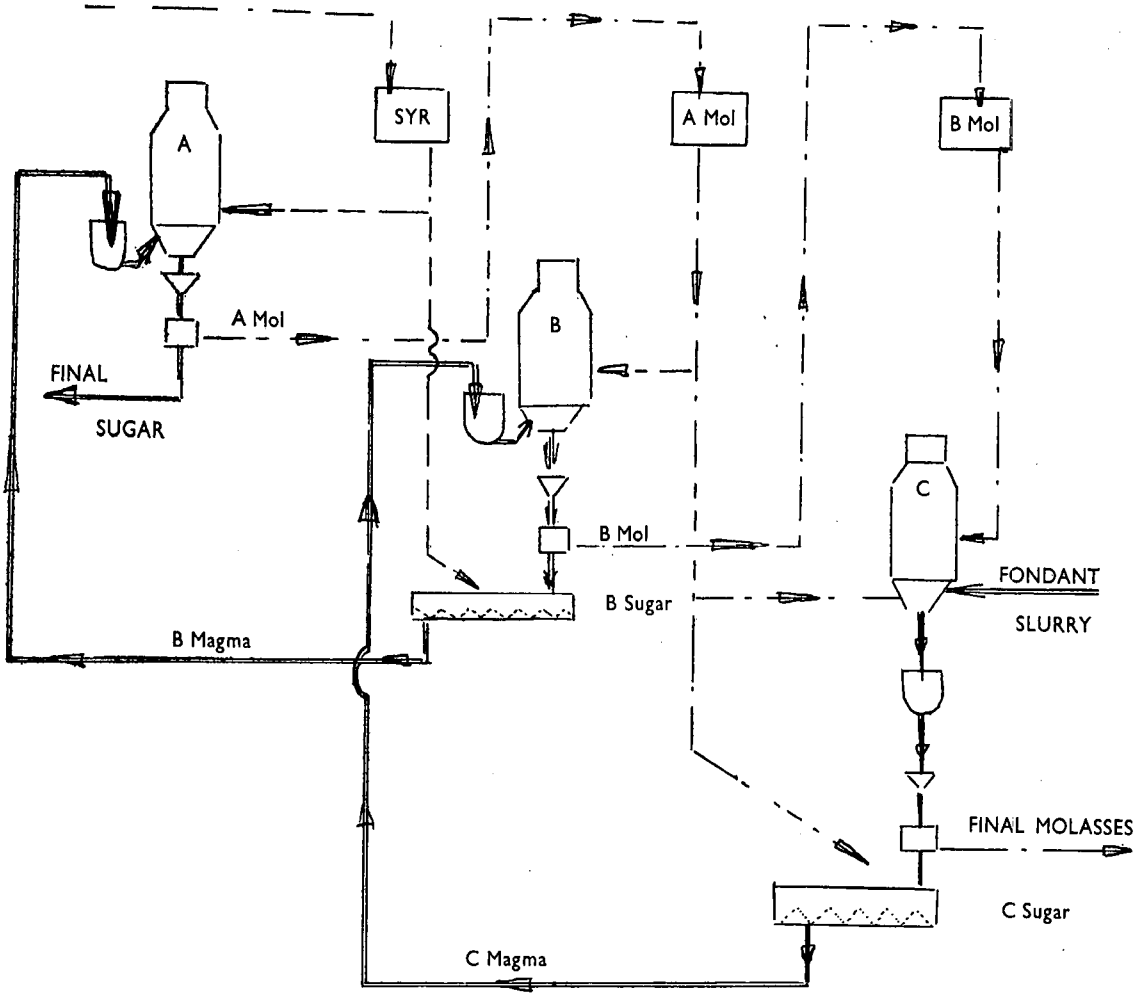
References

[1]Appelboom, I.S.J., April, 1956,

[2]Perk Chs. G.M. and E. Beesley, 1958 April, Double-Magma System. S.A.S.J. Vol. 45—No. 4 pp. 311-3.



PAN CONTROL PANEL



DOUBLE MAGMA SYSTEM DIAGRAM

Mr. Rault (in the Chair) said that the Umzimkulu factory had pioneered improvement in pan boiling in the past and it was interesting to learn that that factory was in the forefront again.

Mr. Thumann suggested that the double magma system needs more pan and crystalliser capacity so that a factory with a small capacity would find it difficult to work this system.

Mr. Perk said that one of the chief advantages of the D.M. System was a noticeable increase in grain size and we should do everything possible to improve the quality of the grain.

Dr. van der Pol thought that the volume of masecuite was less important than the time taken in boiling. By starting a footing of grain the over-all time of boiling was not greater than that taken by the older methods.

Mr. Rabe made reference to the article on the subject by Mr. Perk and Mr. Beesley in which they give data on the effect the volume would have on the plant. He found that in spite of an extra 20 per cent massecuite, there was no difficulty in handling the increase as the A Massecuite cured so freely that no time was lost.

The quality of the sugar however was the biggest consideration in making the change, even if extra plant had to be installed. By eliminating the bagging of B Sugar, which lowered the quality of the total output, this was achieved, so much so that some difficulty was experienced in keeping the polarisation down.

Mr. Turner asked if Mr. Rabe found that if with regard to the crystal content of B massecuite did he always have sufficient quantity of C magma?

Mr. Rabe replied that during a time when the C massecuite pan had been held up due to mechanical breakdown, there was a shortage of C magma and afterwards until the process was in balance again there was too much.

In replying to a question about Appelboom's fondant method of preparing slurry, said that some difficulty was experienced at first because of incomplete inversion of the invert sugar solution, making the purity of the final mixture too high. This resulted in a coarse fondant, which made the grain size too large thereby increasing the danger of false grain.

The quantity of fondant used was 800 grams for 850 cubic feet massecuite.

Mr. N. V. Sargent said that the difficulty he had experienced at Mount Edgecombe was due to the pan used, which made it difficult to prepare a regular grain.

Mr. A. F. Ducasse enquired at what temperature the magma was introduced into the pan. If too cool, it would cause entrainment by forming froth.

Mr. Rabe replied that the temperature was not controlled but he had not experienced entrainment. There was a small amount of frothing but this never went more than six inches to one foot above the level in the pan when the magma was introduced.

Mr. Perk said that frothing depended on the amount of air worked into the magma in the mixer, either through the molasses not being diluted enough or through the mixer being run too fast, acting as an egg-beater.

Mr. Thumann said that when he found frothing troublesome it could be cured by the introduction of a little "Gencolene", a sulphonated whale oil. He considered that an excess of "C" massecuite was not understandable with a high purity. With a low purity there would be an excess, with a smaller grain size. Quality of sugar was affected by other factors than grain size. He had been warned that in the refinery, "B" sugar, even if double washed, might give difficulty in producing a good refined sugar because of the occluded impurities. These would go through to the melt. The concentration therefore should be on producing a maximum of "A" sugars and the double magma system would be of advantage only provided that the sugar was not an improved "B" sugar with all its disadvantages.

Mr. Perk said that although the Sugar Milling Research Institute had written papers on the subject, the double magma system had been introduced into this country by Mr. Chris. Jelley.

Mr. C. M. Young asked if the no-steam technique was used in graining a "C" massecuite pan charge.

Mr. Rabe replied that a small amount of steam was used at the discretion of the pan-boiler.