

SOME IMPRESSIONS OF THE SUGAR INDUSTRIES OF MAURITIUS AND REUNION

By J. R. GUNN

The Tongaat Sugar Company Limited

During September 1969 the author visited both Mauritius with peaks not much higher than 1 000 latest technical developments on those two islands. The first comment that must be made is that at both places the hospitality of the officials of the sugar companies is overwhelming and there is real evidence of great progress in their industries. There is also a tremendous contrast between the two islands both in geophysical nature and in economic background. Réunion, with its tallest peak of 3 069 metres, has a very high labour wage whereas Mauritius and Réunion for a short survey of the metres still benefits from relatively lower labour costs. Sugar from Réunion is sold in the European Common Market at a high price because that island is considered to be part of metropolitan France and, of course, at the moment, Mauritius has the advantage of British Commonwealth preference price.

Milling

On both islands the cane is delivered to the mills in a spotless trash-free condition and it has not been found necessary to install high vertical feeding hoppers to assist feeding the mills. A number of the mills which were visited successfully employed high-speed rubber belts as inter-carriers. The mill managers claim a substantial reduction in maintenance and down time.

Extra heavy-duty shredders are now becoming more popular in Mauritius.

At Savanna factory in Réunion, Messrs. Fives Lille have an experimental turbine-driven gear train coupled to one mill. This is virtually a king-size torque arm gear box with the output gear shaft rigidly coupled to the square of the top roller. The reduction gears are carried in a housing which floats up and down with the top roller and which applies the torque reaction to a robust link which is attached to the housing and anchored to the ground. The turbine is mounted on a fixed foundation and is coupled to the conveyor belt to the de-watering mills. Stella coupled drive shaft. This gearing was completing its second season and had caused no trouble at all.

Diffusion

A D.D.S. diffusion system is operating at Stella in Réunion using crusher bagasse followed by three de-watering mills. This is a fairly old diffuser with a bucket-wheel for transferring the diffuser bagasse to the conveyor belt to the de-watering mills. Stella has experienced trouble with the system and had

to remove the shredder before any reasonable results were obtained. No settling or liming of press water is practised.

All the factories visited in Réunion used bacterial disinfectants on the milling trains.

Clarification

All the factories visited in Mauritius employed hot liming, some before and some after the flash tank. Most of them were using a saccharate principle which they claimed gave a higher filterability sugar than by injecting milk of lime. Syrup from the fourth vessel of the evaporator is used to prepare the saccharate.

No factories in Mauritius use enzymes for starch degradation as they claim that the natural enzymes process is adequate and that there is no detectable sucrose destruction. In Réunion there is no starch problem.

Of the eight factories visited in Mauritius, two were employing the Rapifloc filtering system and were sending the filtrate through to the evaporators. Some of the factories were using a clarification flocculant aid continuously and some intermittently. All the factories passed the clarified juice through stationary wire mesh screens before it was pumped to the clarifier. They claim that the screens gather a significant amount of foreign matter immediately after a week-end shut down.

In order to change clarification techniques and in particular to reduce residence time in the clarifier, Mr. Emile Hugo of Réunion has installed a system which could deal with clarification and filtration of mixed juice in 20 minutes. Briefly it consists of a large tank for progressively liming heated juice with a residence time of 10 minutes followed by 10 minutes' treatment in a pressure filter which produces clear juice and filter cake. It appears that there has been some difficulty in achieving successful operation of this plant.

Pan Boiling and Crystallisation

The use of a two-boiling system is common practice in Mauritius. The A massecuites are cooled for a period of about four hours in rapid water-cooled crystallisers and a drop in purity of between 25 and 27 degrees is expected between A massecuite and A mollasses. A mollasses is then boiled into C massecuite which is water cooled and then mainly single cured on continuous centrifugals. Electric resistance reheating is now gaining favour in Mauritius and Réunion.

All the factories visited in Réunion were using the three massecuite system except for one which was boiling four massecuites. In all cases the B or penultimate molasses was being centrifuged to remove scum and solids which were then mixed with the final molasses. The amount of reject material was very small. In Réunion, both A and B massecuites are cooled in the crystallisers.

Power Generation and Air Pollution

In Mauritius all the factories visited supply power to the Central Electricity Board and therefore they are in a position to somewhat control the amount of surplus bagasse and also to turn the surplus bagasse to a financial advantage. At La Mare in Réunion, the surplus bagasse is being very successfully converted into "Bagaplan" bagasse particle board for which there is a ready market in the French territories.

At one factory in Mauritius the exhaust steam of the back pressure turbo-alternator feeding the grid system has been connected to the vapour one system of the factory to give a larger pressure drop across the turbine so that more power can be expected for the same quantity of steam.

Very little is done regarding air pollution and in all cases where some action is being taken the problem has been tackled by using expansion chambers equipped with water sprays through which the flue gasses pass. The smutty water is either used as surface irrigation or is passed over vibrating screens to separate the smuts from the water. It was interesting to note the difference in smoke emission at one factory which had two boilers of equal capacity but of different design and each with its own stack. The stack connected to the boiler using "spreader" firing was positively worse than the other boiler which employed a stepped-grate type of furnace.

Research in Mauritius

The Mauritius Sugar Industry Research Institute is a very active organisation which is investigating many of the industry's problems on an industrial basis and also those particular to an individual factory. They have evolved a satisfactory regression formula for the exhaustion of final molasses. However, as this was developed from data obtained from existing plant and it is expected that techniques and equipment will improve, three degrees of purity are deducted from the derived result so that the difference between achieved and expected purities will not be negative.

Extensive work has been done on particle size and distribution of crystals in massecuites. This has led to an investigation of particle size and distribution of slurries used for pan seeding. The M.S.I.R.I. is of the opinion that false grain is being developed by using insufficient slurry in the pan and because of this there is a shortage of nuclei on which sucrose can be deposited. The thought is put forward that it is infinitely better to have too much than too little slurry for pan seeding.

Discussion

Mr. Buchanan (in the chair): A wage comparison between Mauritian and South African workers in the sugar industry would be most interesting.

I think the relationship between clean cane, low fibre and surplus bagasse is interesting. Has the effective fuel value of trash something to do with this?

Mr. Moor: As Mr. Gunn is unfortunately away ill, I will try to answer the questions on his behalf.

(a) Mr. Gunn has commented that although wages in Reunion are much higher than in Mauritius, the cost of living was correspondingly higher, resulting in a comparable standard of living.

(b) In Mauritius bagasse moistures down to forty-five are achieved, compared to our fifty % or more. Yet Mr. Gunn observed that even when this very dry bagasse falls ten feet after leaving the final mill, little or no dust is generated, whereas the relatively damp South African bagasse dusts badly in similar circumstances. It appears possible that lack of trash is responsible for this absence of dust.

Mr. Buchanan: Yes, but is the calorific value of trash different from that of fibre, and is this why there is a surplus of bagasse in Mauritius despite the low fibre content of the cane?

Mr. Magasiner: I think the main reason for the bagasse surplus is the moisture content of the fuel.

Mr. Lenferna: Cane is trashed while it is growing in Mauritius due to the heavy rainfall and the strong winds.

It is also cut much younger than in South Africa.

Mr. Renton: I am interested in the torque arm gear box attached to the top roller at Savannah mill. Is it a single or a multiple drive unit?

Mr. Moor: I believe it is a triple reduction gear train with the output shaft rigidly connected to the square of the top roller with a flexible input shaft from the turbine.

Dr. Matic: Regarding clarification, how much saccharate is used for liming and is there colour formation during the preparation of saccharate?

Also, in connection with use of natural enzymes, how is the juice obtained and what are the pH's like?

Dr. Graham: I presume the application of natural enzymes would be under similar conditions to those used previously in South Africa.

Mr. Pershouse: In Australia syrup is mixed with the lime to a deep chocolate colour. Although there is a problem of high pH, the retention times are short in Australia.

Some factories put the saccharate into the eye of the final juice pump before the juice goes through the heater.

Mr. Carter: I believe in Australia they make a 24° Brix syrup solution, using 8° Bé lime.

Dr. Matic: Our experience has been that there is not much difference in sugar quality whether hot or cold liming is used.

Mr. Young: Mr. Gunn mentions an expected purity of final molasses with a formula derived from a regression analysis.

It is implied that the expected purity is used for practical purposes instead of the normal molasses formula.

I am interested to know what parameters were used in determining the regression formula.

Mr. Lamusse: They were Brix converted to dry matter, reducing sugar and ash.

Thirty percent of the factories were getting better than the expected purities.

Mr. Williams: I noticed the absence generally of shredders in Mauritius, but the preparation was excellent through the use of knives. A 72" mill might have as many as 100 knives, and would often give as good a preparation as a shredder.

Mr. Buchanan: I also noted this in Mauritius, but we hold generally that a shredder is necessary for good milling performance.

Mr. Hulett: In Mauritius, is it customary to have the knives running backwards or forwards?

Mr. Williams: I did not observe the direction of rotation, but I did notice that the speed employed for

the secondary set was 600 rpm compared to 500 rpm for our factories.

Dr. Matic: I understand that the preparation by knives is good enough to be considered suitable preparation for a diffuser. Some of the knives were shaped differently to ours.

Dr. Graham: A two boiling system is used in Mauritius, starting with a massecuite purity of 88, but A-masseccuites are water cooled.

This should contribute to reduced losses from decomposition in the boiling house, as well as making possible the phenomenal purity drops in the A masseccuites of up to 27°.

The boiling house recovery shows figures ranging up to 93, and they have high overall recoveries because of high mill extractions.

Mr. Buchanan: This paper indicates the value to our industry of trips overseas undertaken by experienced technologists.

Our S.M.R.I. should be interested in the work being done by the Mauritius Research Institute on particle size and distribution of slurries used for pan seeding.