

A PRELIMINARY REPORT ON CANE WASHING IN LUABO, MOÇAMBIQUE

By T. COVAS

Sena Sugar Estates Ltd.

When it was decided to increase the capacity of Luabo Factory in consecutive phases, first consideration was given to replacement of the old rake-type "Wicks" off-loaders by an up-to-date turn-over rail-car unloader and cane washer feeder table. This was because of the intention to introduce partial mechanical loading of cane, which would inevitably result in trashy, and often muddy, cane being received, especially during the adverse climatic conditions that are invariably experienced in the earlier part of the crop period. However, the introduction of mechanical loading had to be postponed for one year and the opportunity therefore arose of evaluating the effectiveness of cane washing and de-trashing under conditions similar to those experienced during previous crops.

The turn-over railcar unloader has a capacity of twelve tons and takes two cars at a time. The cars are secured to the platform by clamps and the lifting and lowering of the platform is carried out by hydraulic rams.

Cane is dumped on to the cane washer feeder table, which has a series of carrier chains on a perforated plate. Two sets of levellers ensure an even blanket of cane. Four rows of water sprayers are spaced evenly. The last washing is at the point where the thin blanket of cane is discharged on to the trash rolls. The trash rolls consist of a series of fast-revolving cams which remove practically all the loosely adhering trash from the washed cane. They can be reversed, in which case they revolve in the direction of flow of the cane and act more as a carrier, removing only a limited quantity of trash. The used wash-water and the removed trash are collected under the feeder table and discharged into the main factory drain.

The quantity of wash-water applied depends on the quantity of extraneous matter to be removed and the means to dispose of it. The pump delivering the wash-water is designed to handle 4,500 gallons of water per minute at a pressure of 30 psi at the feeder table and has adequate capacity for two feeder tables.

The quantity of cane which the feeder table could handle was rated as being 125 tons per hour with dirty cane and 166 tons per hour with clean cane, but no difficulties were experienced during the last crop in handling as much as 180 tons and occasionally 200 tons cane per hour.

Luabo Factory employs a simple sulphitation system to manufacture a mill white sugar, which, owing to the requirements of the market, does not have to be of the best quality. To achieve this in previous years approximately 1,200 mg of SO₂ per litre of mixed juice were used, corresponding to 0.8

to 0.9 kilos sulphur per ton of cane. Lime used averaged 2.8 kilos per ton of cane.

When cane washing was introduced it was evident from the start that, applying the same quantity of imbibition water, the colour of the mixed juice and syrup was considerably lighter. Colour determinations were carried out on 5 Brix solutions of syrup using a Spekker Absorptiometer and filters of 560 m μ . Average reading of a sulphitation syrup showed a colour value of 5.0 which dropped after the introduction of cane washing to 2.5 to 3.0. This permitted us to experiment with reduced quantities of sulphur and lime and still achieve results similar to those before cane washing. Different quantities were experimented with, comparing syrup colours, settling rate and colour of mill white sugars.

The best results were achieved with about 300 mg SO₂ per litre mixed juice representing 0.25 kilos sulphur per ton cane and 1.20 kilos of lime per ton cane. The colour of 5 Brix syrup returned to 5.0 level and the colour index of the mill white sugar settled at an average of 120/150.

During crop 1966, the expenditure of sulphur and lime amounted to Esc. 40\$00 (R1.00) per ton sugar, but the expenditure during crop 1967 amounted only to Esc. 16\$00 (R0.40). This difference of Esc. 24\$00 (R0.60) per ton sugar represented, on a 63,000-ton sugar crop, a saving of Esc. 1,512,000\$00 (R37,800.00).

In addition the following advantages should also be mentioned:

- (1) The capacity of the milling train increased from an average of 143 tons/hour in 1966 to an average of 162 tons/hour. The probable explanation for this is that the bulk of trash and mud, which previously had to pass the mills was eliminated this year in the washing process, thus leaving the mills to deal only with fibre. This has been substantiated by measurements of total solids in the discarded wash-water, which averaged 1,200 ppm against 200 ppm in the original water. Actual trash removed and air-dried weighed 0.7 per cent on cane, or 27 tons a day.
- (2) The capacity of the clarifier (one 36 ft. Rapi-Dorr) increased. Often during previous crops only the addition of massive doses of Separan made it possible to continue crushing. This year, with 15 per cent increase in the crushing rate, good clarification was maintained without any Separan being used. The explanation for this is a much quicker settling rate of juice after removal of suspended fine clay, etc., at the washing plant. This was confirmed in laboratory tests, when it was found that the

mud volume of juice after cane washing in a 1,000 ml cylinder in 10 minutes was 249 cc, while the same juice without cane washing and under identical conditions had a mud volume of 366 cc.

- (3) The capacity of the filter station increased proportionally. Of the three available Oliver filters, all of which had been in continuous operation previously, only one or two were needed during the past crop. The reason for this was that the amount of mud decreased and it was more compact.
- (4) The capacity of the evaporator increased. In previous years heavy scaling of the evaporator tubes was experienced, due to high sulphitation and liming. The reduced quantity of sulphur and lime used this crop drastically diminished the rate of scaling. This meant that the second evaporator, which in previous years had to be commissioned every Tuesday after the weekend shut down and cleaning, was only very occasionally in use and then for a short time only, thus effecting economy in use of steam.

However, cane washing also posed some problems, which still have to be solved:

- (a) The quantity of trash and mud removed was such that the factory drain became blocked after a short time. This problem became so acute that on several occasions washing of cane had to be discontinued while the drain was cleared. Most of the time the trash rolls could not be fully used for the same reason. It is planned in the next crop to introduce mechanical removal of trash from the wash-water effluent drain, before it reaches the main factory drain.
- (b) The added unweighed water results in the factory control figures being unreliable. Two possibilities have been considered to rectify this; either to compare first-expressed juice brixes from washed cane with those of unwashed cane and apply correction, or to determine the fibre per cent cane by the direct method and apply correction. Both these methods are unsatisfactory due to difficulties in selecting reliable average samples. The logical solution appears to be that recommended by the S.M.R.I., i.e. to install final bagasse weighing on a belt conveyor-scale. This problem is now receiving attention.

In general, it can be said that, although at the beginning of the season, there were some mechanical difficulties, mainly with hydraulic pumps, the cane-

washing plant has proved to be an unqualified success. We are looking forward with considerable interest to results in following years, when mechanical loading of cane will be in full operation.

Discussion

Mr. Gunn (in the chair): This paper makes us realise the urgency of introducing a new cane payment system. At present we have to use mills with a diffusion plant so as to get first expressed juice.

A washing plant would create sampling difficulties under the present cane payment system.

Please note that I am quite impartial in regard to this matter of cane payment and that I speak solely as a technologist.

Dr. Matic: Is it possible to attribute the benefits such as better colour, etc., to either removal of trash or removal of dirt in the washing plant?

Mr. Covas: The colour of the first expressed juice was related directly to the amount of wash-water and not to the amount of trash removed.

We did not always operate the trash rolls owing to difficulties in disposing of the trash removed.

Trash in our cane averages from about 5% to 7% but is sometimes as high as 20%.

Mr. Rault: When Mr. Covas talks about colour is he not possibly referring to turbidity?

Mr. Covas: I am only quoting figures for comparative purposes and am not attempting to give absolute values.

Mr. Ashe: Did Mr. Covas measure the loss in sucrose due to washing? One can imagine if chopped cane was washed that sucrose losses would be heavy.

In Puerto Rico there is a factory using trash rolls as described in this paper. The trash falls on to a conveyor and is moved outside and loaded into trucks for removal.

Mr. Covas: We did measure the wash-water effluent but could not obtain a reading on a spindle or in a polariscope. The amount of sucrose was negligible.

For removal of trash, an old bucket dredger from the river will be positioned over the washing plant effluent drain and will scoop up the trash.

Mr. Alexander: As some of our factories may wish to install washing plants in the not too distant future can Mr. Covas let us have some idea of the costs involved?

Mr. Covas: The total installed cost was R180,000.