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Sugar Technologists

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CONTENTS

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Loss on ignition	8·4
SiO_2	32·7
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The Chairman thanked the author for presenting such an interesting paper which had led to a most lively discussion.

Some Improvements in the Bybrook Distillery

PETER S. SKINNER
United Estates Limited, Bog Walk

(MR. A. M. BLOOMFIELD in the Chair)

Wash Mixing

Wash mixing consisted of manually "plunging" molasses and water in a wooden trough with holes at the bottom, and further in the mixing cistern using compressed air. This led to uneven mixing, dependent on the viscosity of the molasses, and invariably resulted in an adjustment period being necessary before completing a mix. In this manner the rate of mixing wash was approximately 1,300 gal./hr.

An electrically driven mechanical wash mixer was installed during the 1957 rum crop, see Figure 1, and immediately the previous difficulties of wash-mixing were obviated. The rate of mixing then increased to 4,000 gal./hr. enabling us to mix all our wash requirements in the day shift only, under better supervision facilities, etc.

Pre-Heating Wash

No pre-heating of wash was done at Bybrook during recent years, but for 1957 crop a pre-heater, see Figure 2, was installed. The above heater was capable of holding one complete still charge and raising the temperature of the wash to 155° F. in two hours using vapour at 5 p.s.i.g.

The heater was lagged to retain heat and operated under a closed system to prevent any alcohol loss. Two copper coils were used of 35 sq. ft. heating surface each; a relief arrangement was incorporated by a 2 in. liquid seal.

Calandria vs. Coils in Pot Stills

The two pot stills at Bybrook each of 1,200 gal. capacity, are identical in every respect as to shape, goose necks, retorts and coolers, etc.

The coils in the No. 1 still were in bad condition, and it was decided to replace these by a calandria for the 1957 crop, see Figure 3, the object being to use vapour from the evaporator first cell at a pressure of 5 p.s.i.g., of which there was a surplus available.

The calandria is of the drum type 6 ft. diameter and contains 600 tubes 2 in. O.D. × $8\frac{7}{8}$ in. long, the material being copper throughout. The heating surface based on the O.D. of the tubes is 225 sq. ft., and whilst there is a further 44 sq. ft. in the wrapper plate and tube sheets, no attempt was made to descale these so that the effective heating surface is only that due to the tubes. The vapour inlet is 4 in. bore, and the calandria is baffled, vented and drained to ensure that the heating surface is fully effective. The calandria is placed as low as practicable in the pot, and the wash circulates positively up through the tubes and down the annular space between the periphery of the calandria and the side of the pot, which is 9 ft. diameter at that point.

The No. 2 pot still has two copper coils 4 in. O.D. providing a total heating surface of 100 sq. ft. and using live steam, and experience has shown what pressure of steam should be maintained in the coils at different stages of a distillation, and whether one or both coils should be in use. It was decided, therefore, to install recording thermometers on each still so that the appropriate pressures to be maintained in the calandria could be determined from the desirable temperatures at each part of a distillation.

It was soon found that the time taken to run low wines was much too long when using vapour, so arrangements were made to use exhaust steam at pressure not exceeding 8 p.s.i.g. during that stage of the cycle.

The following are the average time cycles and steam

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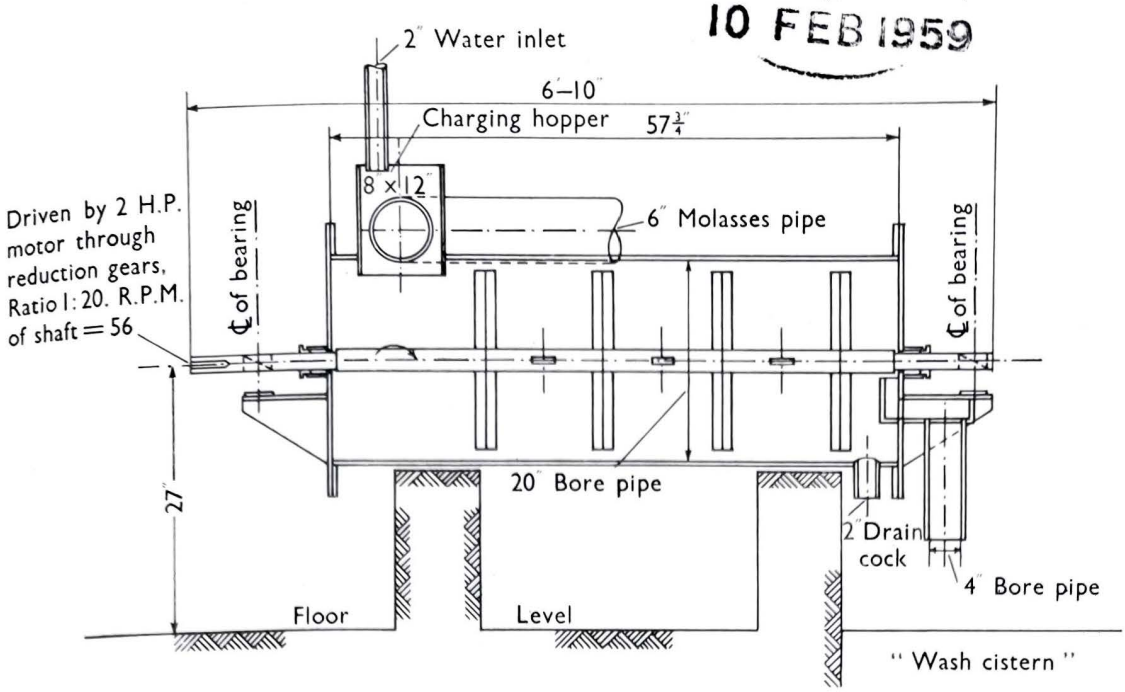

FIGURE 1

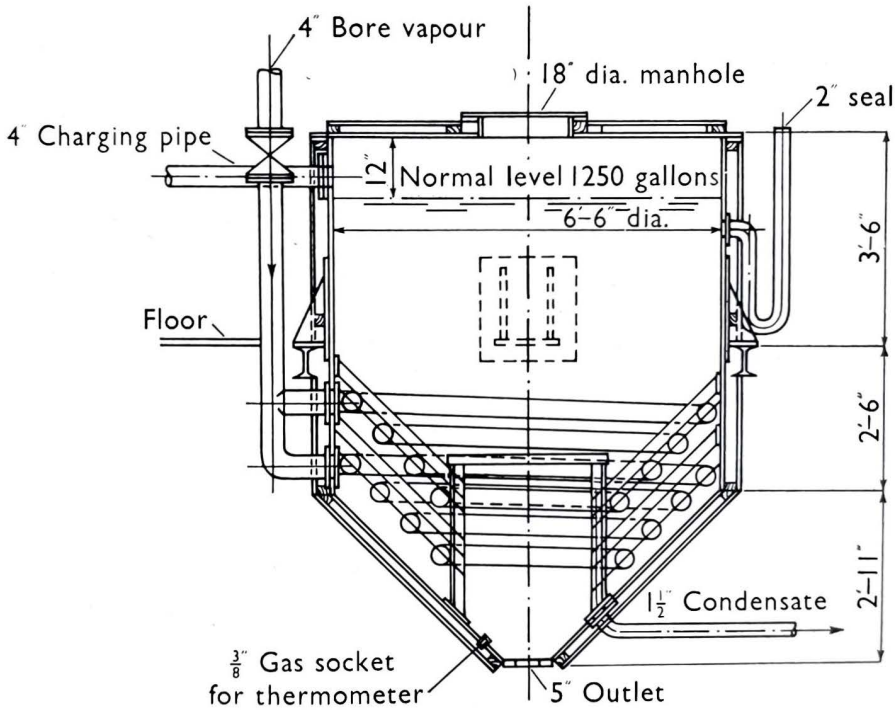

FIGURE 2

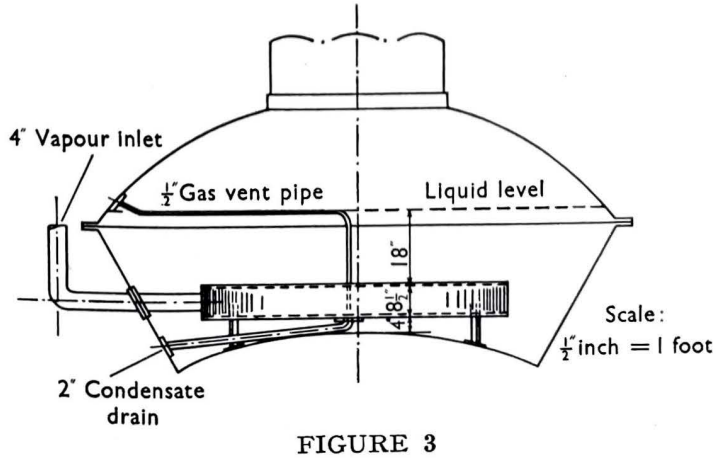

FIGURE 3

pressures with clean heating surfaces, together with the average yields of rum.

	No. 1 still (calandria)		No. 2 still (coils)	
	Hours	p.s.i.g.	Hours	p.s.i.g.
Boiling ..	0·28	5	0·24	25 (2 coils)
Running rum ..	0·66	2½	1·03	7 (1 coil)
Running high wine	1·14	3½	1·49	10–12 (1 coil)
Running low wine	1·78	4–8	1·28	15–30 (2 coils)
Total distillation	3·86	—	4·04	—
Yield of rum ..	65·43 gal. at 50 O.P.		65·09 gal. at 50 O.P.	

Note that rum and high wines could be distilled at a much faster rate in No. 1 still than in No. 2, as the latter would boil over if more steam were used; this can only be due to the more even boiling level made possible by the well defined circulation of the boiling wash when using a calandria.

For the 1958 crop the calandria will be stayed to permit of using a steam pressure up to 15 p.s.i.g. when running low wines, and it is confidently anticipated that the total distillation cycle in No. 1 still will then be 20% less than that of No. 2 still, whilst using vapour for approximately two-thirds of the time.

The above time cycles were on the day following cleaning, and it was usual to stop for cleaning when the total cycle had increased to five hours. In No. 2 still this was necessary every seventh day, but in No. 1 still only on the eleventh day, effecting thereby not only a saving of labour but more production. Further to this, the No. 1 still could be easily cleaned in 2¼ hours using mechanically driven tube brushes, whereas No. 2 still required 3½ hours of hand chipping and burnishing, and even so was imperfectly cleaned.

The installed cost of the calandria is approximately double that of the usual two coil arrangement, but as and when the coils of No. 2 still have to be replaced there is no doubt that a calandria will be used instead of coils. An additional advantage of the calandria is that only one steam trap is required as compared to two with coils.

Acknowledgements

The author records his gratitude for the help and encouragement received from Mr. C. R. D. Shannon in writing this paper, and also to Mr. D. DuBoulay who prepared the illustrations.

DISCUSSION

Mr. P. S. Skinner explained the reasons for the changes made, which largely hinged on the need to economize in the use of live steam due to low boiler capacity.

Mr. L. D. Corsbie asked the Chairman if he, as an engineer, had found benefit to the steam supply by using vapour.

The Chairman replied that great benefit had resulted and there had not been the same necessity as formerly to curtail the work of the distillery, due to low steam.

Mr. H. C. Nurse asked whether the fact that the scale was less thick in the calandria than on the coils might not be due to the calandria having a heating surface of 225 sq. ft. as compared to 100 sq. ft. in the coils. Also, was the scale more easily removed from the calandria.

Mr. P. S. Skinner replied that the scale was much easier to remove from the calandria as it was possible to use rotary brushes. The lesser thickness of scale in the calandria was doubtless due to the larger area of heating surface.

Mr. H. C. Nurse asked if the scale had been analysed and suggested that as the temperature of steam used in the calandria was lower than in the coils that that could have had an influence on the structure of the scale.

Mr. P. S. Skinner replied that the scale had not been analysed.

Mr. J. W. T. Dunlop pointed out that cleaning coils in stills was not only difficult but injurious to the coils and it might well be that although the calandria was twice the cost of coils, it would probably outlast two sets of coils and so be in the end more economical than coils. He applauded the new application of a calandria.

Mr. H. C. Nurse said that he had installed a calandria in a still at Barnett in 1948 and asked Mr. Youngman whether it was still in use.

Mr. J. S. Youngman replied in the affirmative and added that they considered it very satisfactory.

Mr. M. B. Floro opined that the days of coils in a sugar factory were coming to an end, and asked Mr. Skinner whether he was completely satisfied with the design or would it be modified in any future installation.

Mr. P. S. Skinner said that he was quite satisfied with the design but that steps were being taken to use a higher pressure steam when boiling low wines so as to reduce the time cycle.

Mr. M. B. Floro suggested that an improved design of calandria might obviate the use of higher pressure steam, for instance, a deeper calandria would reduce the hydrostatic head.

Mr. C. R. D. Shannon explained that no design data had been available but as the intention was to use a vapour pressure of 5 p.s.i.g. with which the temperature difference was much less than that in the coil still, they had more than doubled the heating surface. The calandria was of all copper with welded joints and the depth of 8½ in. was selected so as to keep the heating surface as low as possible in the pot. The diameter of tube was the same as in the evaporator so that the same rotary brushes could be used. It had been found that at 5 p.s.i.g. the low wines cycle was too long and so they had boosted this to 8 p.s.i.g. which was the highest pressure the calandria could stand. For next crop the calandria was being stayed to allow of pressures up to 15 p.s.i.g., and it was expected that the total time cycle would then be no more than 3·2 hours.

Continuing, Mr. SHANNON said he would be interested in having Mr. Floro's suggestions as to how the design might be improved.

Mr. M. B. Floro said that the point he had tried to make about hydrostatic head was that the upper coil in a coil still was nearer the surface of liquid.

Mr. C. R. D. Shannon explained that at Bybrook the coils were in the same place, one meshing inside the other, and that there was a negligible difference in hydrostatic head as between the coils and calandria.

Mr. J. G. Davies asked whether any chemicals were boiled prior to brushing.

Mr. P. S. Skinner replied that a 50° Brix caustic soda solution was boiled for three hours.

Mr. H. C. Nurse, on being informed that there was no central downtake, suggested that faster boiling with less risk of entrainment would result from the use of a central downtake.

Mr. C. R. D. Shannon said that he did not agree with Mr. Nurse as the downward circulation was between the periphery of the calandria and the sides of the pot. Further, he agreed with the suggestion that that type of circulation would tend to reduce "creep" of liquid up the sides of the pot.

Commenting on the wash mixer, Mr. SHANNON explained that that was only half full of liquid by virtue of the internal overflow arrangement and so a vigorous agitation was ensured.

Mr. M. B. Floro said that a simple and effective wash mixer, and a preheater, had been in use at Frome since 1939, and he had thought preheating was standard practice.

Mr. H. C. Cahusac complimented Mr. Skinner on the straightforward way in which he had presented his paper and expressed the hope that more of the younger members would come forward and bring to the meetings improvements which would be of benefit to the industry.

The Chairman, on behalf of the author, thanked Mr. Cahusac for his complimentary remarks and in closing the discussion, thanked Mr. Skinner for his interesting paper.

Further Notes on the Operation of Frome Bulk Sugar Store—Crops 1956 and 1957

(BREVITY)

M. B. Floro
The West Indies Sugar Co., Limited, Frome

(Mr. J. G. Davies in the Chair)

In a previous brevity presented before this Association we gave our observations on the first crop's operation of the Frome bulk sugar store.

Another two crops have passed and with them further observations have been taken and results recorded of the operation of the bulk store. Because of the extreme variations in conditions of operation, particularly in the direction of sugar movements from the store as governed by shipping, it is very difficult to draw definite conclusions from mere comparison of results However, further points noted in the behaviour of the stored sugar should be of interest particularly in view of the changes taking place in the industry towards bulk storing and shipping of sugar.

We had mentioned before that the Frome bulk store was the initial step in the proposed change over to complete bulk handling and shipping of sugar. We will be ready in the 1958 crop for the final step, bagging only such sugars as the local and a special quantity for the port of Lucea.

We give below pertinent data for the 1956 and 1957 crops operation of bulk store:—

1. Total crop production — 1956—69,713·30 tons; 1957—83,772·00 tons
2. Passed through bulk store — 1956—58,271·20 tons; 1957—50,194·70 tons
3. Shipped through bulk store in crop — 1956—38,219·90 tons; 1957—40,321·70 tons
4. Sugar stored in bulk after crop — 1956—20,051·30 tons; 1957—9,873·00 tons
5. Duration of storage after end of crop — 1956—130 days; 1957— 43 days
6. Analytical:—

Crop 1956

	Sugar into bulk store	Out of bulk store		Average	Difference
		In crop	Out of crop		
*Quantity	58,271·20	38,219·90	20,071·60		+20·30
Pol, %	97·10	97·07	96·65	96·93	−0·17
Moisture, %	0·77	0·76	0·89	0·80	+0·03
R. sugars, %	1·19	1·20	1·04	1·14	−0·05
Sucrose, %	97·37	97·39	97·00	97·26	−0·11
Ash, %	0·501	0·496	0·487	0·493	−0·008