

OLIVER-CAMPBELL BAGACILLO

By L. F. CHIAZZARI.

It cannot be denied that the standard of sucrose recovery in the Natal industry has now attained a position of high efficiency; and, to effect a further improvement, the manufacturing superintendent must look very far afield. Indeed, the search for improvement is becoming one for the specialist, and means delving into the minutest details.

Purity.

The subject of sucrose recovery can be reduced, broadly, to terms of purity. A high initial purity in the raw material with a low purity in final molasses is the ideal. To accomplish this, the clarification station must remove impurities and increase the initial purity, and thus afford a better working product right through the process, with the attendant lower quantity and purity of final molasses. The necessity of eliminating existing impurities and avoiding the introduction of new ones cannot be overstressed. This may well be condensed to give us the axiom:—"Watch the non-sugars and the sugars look after themselves."

The Oliver-Campbell Filter.

The Oliver-Campbell filter has been an important adjunct to the Natal industry for some fifteen years and has caused more discussion than any other innovation of recent date. It must be agreed that it is a great boon to us in many ways, and probably none of us would care to resort to the old plate and frame presses: but, it must be admitted, it has certain shortcomings. It has been referred to as a poor type of strainer which should really be operated with a pre-coating of some filter aid, that the scum should be thickened before filtering, that the filtrates should be further separately defecated, and sundry other points. There is one aspect, however, that may have been realised but has never received much attention; that is, the introduction of impurities to the process by the bagacillo filter medium generally used.

The average composition of dry bagasse is:—

Cellulose	40 to 45 per cent.
Pentosans	25 to 30 per cent.
Lignin	22 to 27 per cent.
Ash	2 to 3 per cent.

and, to quote from C. A. Browne, we find:—"By the treatment of plant membranes with hot solutions of dilute alkalis and acids the lignin, pentosans and other so-called 'encrusting substances' are split off from the complex, leaving the cellulose behind as an insoluble residue." Hence it would appear to be a distinct possibility that part of the bagacillo,

in its normal use in the Oliver-Campbell filter, would dissolve and introduce additional impurities in the filtrate. It also seems desirable to increase the effectiveness of the bagacillo by having it as an aid rather than just a filtering medium.

Bagacillo Treatment.

With these objects in view, the following tests were carried out at Gledhow. The bagacillo was digested in an abundance of water for fifteen minutes, with a small addition of lime to a pH of about 9.0, the extract roughly expressed by hand and then subjected to a further digestion with pure water. Finally, a thorough washing with cold water was given. From observations it would seem that the quality of the cane has a tremendous bearing on the quality of bagacillo. A study of this aspect once again reveals the importance of a good and clean cane supply. Besides the impurities already mentioned, a surprising amount of grit and sand prevails and, when a process is designed to lixiviate the medium, this removal of sand must also be considered. In the thorough lixiviating and drying of bagacillo a good, fairly white, fluffy medium can be obtained, which, when puddled with water, has the appearance of a paper pulp. Paper pulp, as you are aware, is used in conjunction with Vallez filters fairly extensively overseas, in a patented process.

Laboratory Results.

Samples of scum were mixed with treated and untreated bagacillo in average factory proportions, filtered, and the filtrates analysed for purity and colour, with the following results:—

Untreated Bagacillo.				Treated Bagacillo.			
Bx.	Pol.	Pur.	Light Absorption.	Bx.	Pol.	Pur.	Light Absorption.
7.81	6.63	84.89	68	7.85	6.71	85.48	55
9.14	7.85	85.89	94	9.07	7.83	86.33	74
8.76	7.50	85.62	69	8.79	7.55	85.89	51
8.49	7.31	86.10	88	8.55	7.36	86.08	75
10.63	9.06	85.23	74	10.58	9.10	86.01	61
9.81	8.34	85.02	55	9.60	8.31	86.56	40
7.99	6.86	85.86	93	8.01	6.92	86.39	68
9.53	8.22	86.25	31	9.36	8.19	87.50	19
8.04	6.81	84.70	77	7.90	6.79	85.95	49
9.11	7.77	85.29	47	9.07	7.77	85.67	33
9.70	8.25	85.05	107	9.71	8.31	85.58	82
8.13	6.99	85.98	49	8.00	7.00	87.50	39
8.75	7.47	85.37	63	8.69	7.46	85.84	43
9.06	7.81	86.20	76	9.08	7.83	86.23	55
8.81	7.56	85.81	51	8.69	7.61	87.57	29
Av. 8.92	7.63	85.54	69.5	8.86	7.65	86.34	51.5

The above figures show a higher purity and greatly improved clarity of the filtrate resulting from the use of treated bagacillo as compared with

that from the untreated material. The removal of colour and turbidity was very apparent and a clear, sparkling juice was frequently obtained.

Future Developments.

This short paper has been presented to the Conference with the idea of endeavouring to introduce the subject to others, in the hope that it will stimulate some interest and further experimenting. The newly-formed Natal Sugar Milling Research Institute has the facilities to carry the matter to finalisation; and then, if warranted, the engineers will find useful scope for their endeavours in effecting the best means of lixiviating.

A start in this connection was made last season, but unfortunately, owing to pressure of work, the mechanical staff could not complete the idea. Available space was also difficult. The intention was to take the evaporator sweet waters, mix them with the bagacillo and lime, bring to the boil in a juice heater, screen, maybe macerate again, and finally pass through a small mill or mangle to remove as much as possible of the extract. Experiments were also conducted to determine whether a centrifugal would suffice. The results were fair, but whether all impurities could be removed without a thorough pre-diffusing, and using the centrifugal just for drying, or effecting the extraction of impurities by heavy washing in the centrifugal itself, is a moot point; and unfortunately, in our case, this was not brought to a conclusion. There is no doubt, though, that the centrifugal offers possibilities. A disadvantage, however, is batch working and labour costs.

Conclusions.

It is most likely that impurities can be introduced into the factory process by way of the bagacillo used as a filtering medium in the Oliver-Campbell filter. Intensive lixiviation of this material in a hot alkaline medium is a promising method of improving it.

Experiments of a preliminary nature indicate that the effectiveness of bagacillo as a filter aid is also increased by the treatment described. The filtrate obtained when using such treated bagacillo shows a marked improvement in both purity and clarity, but further experimentation is needed to develop a satisfactory technique of carrying out the necessary lixiviation on a factory scale.

The PRESIDENT said that the paper, being a short, practical one, was particularly welcome. He had often wondered what changes might take place in the composition of juice during the milling process. What, for example, was the effect of exposure to the atmosphere and the bringing of juice repeatedly into intimate contact with the bagacillo?

Mr. DYMOND thought the work described in the paper was long overdue. He enquired what amount of solids was extracted from bagacillo by hot lixiviation at 9 pH, pointing out that he had found 13 per cent. of non-sugars were removed by hot water at neutrality.

Mr. RAULT asked why the Brix was so low. He considered that the extraction of solids from untreated bagacillo would increase the Brix of the filtrate. Many factory operatives had strong views on the probable deleterious effects of bagacillo on juice clarification, but while it was considered likely that impurities, including some which might colour white sugar, were being forced into the clarified juice, not enough research had yet been done on the effects of such impurities.

Mr. CHIAZZARI replied to Mr. Dymond that he had not been able to carry the work to finality and had not measured the amount of solids extracted by the lixiviation process used.

In reply to Mr. Rault, he said that the low Brix figures were due to the secondary juice at Gledhow being more dilute than the ordinary clarified juice in other factories. The figures seemed to indicate that the difference in purity was due to a difference in Brix rather than in polarization.

The filtration was not easy to accomplish. Dilution, pH and temperature were all important factors. In some cases the pH had to be corrected during filtration, and he had used a dilute solution of sodium hydroxide for this purpose.

The measurement of colour is attended by a certain amount of difficulty. He used a colorimeter of the photo-electric cell type, and although it is a good instrument he thought that all that could be hoped for was comparative figures.

Dr. DOUWES-DEKKER considered that the work done was a fine example of the kind of test which could be carried out in factory laboratories and more of this type should be done. He wished to know the amount of bagacillo used per unit of juice at Gledhow, and how it compared with that used at other factories.

Mr. CHIAZZARI said that the local agent for the Oliver-Campbell filter had told him that 20 per cent. (dry weight) of bagacillo on juice was about the average figure for this country, but he thought that at Gledhow they used more. For these tests, however, he used this 20 per cent. figure.

Dr. DUCHENNE asked if at Gledhow the filtrates were returned to the raw juice. He had found considerable drops in purity between the Oliver-Campbell filtrate and the clear juice. This had the effect of lowering the purity of the raw juice in the tempering tanks, so that those factories which re-

turned the filtrate to this point obtained a greater rise in purity between mixed juice and clarified juice during clarification than that recorded.

Mr. MORILLION enquired if the variety of cane from which the bagacillo was obtained were recorded.

Mr. DYMOND desired to know the moisture content of the bagacillo used. Dried bagacillo had a better

filter-aid effect than had that which contained the normal amount of moisture.

Mr. CHIAZZARI explained that at Gledhow the filtrate was returned to the raw juice. He had not a record of the variety of cane from which the bagacillo was derived, but it varied considerably, and some was rather dirty. All the bagacillo used, both treated and untreated, was air-dry.