# International Sugar Journal



* * *

*Published by*
**The International Sugar Journal Ltd.**
23a Easton Street, High Wycombe,
Bucks.
*Telephone:* High Wycombe 29408
*Cable:* Sugaphilos, High Wycombe

* * *

**Annual Subscription: 32s 0d or $5.00 post free**
**Single Copies: 2s 6d or 45 cents plus postage**

VOL. 68 *September 1966* No. 813

PAGE

**Notes and Comments** .. .. .. .. .. .. .. .. .. 257
E.E.C. sugar policy. U.S. sugar quotas, 1966.

* * *

**Filtration-Impeding Materials in Raw Sugars of Various Origins** .. .. .. .. .. .. .. 259
Part III. The effect of insoluble matter in affined sugars on their filtrability.
By Takeo Yamane, Sc.D., Kazumasa Suzuki, Sc.M. and Toshio Kaga, Sc.M.

**Galactinol in Beet Molasses** .. .. .. .. .. 261
Part II. The Determination of Galactinol by Thin Layer Chromatography.
By J. V. Dutton

**Beet Reception & Beet Costing** .. .. .. .. .. 264
By N. H. Brinton and J. F. Warriner
Part I. Beet Reception

**The Effect of a Surface-Active Additive (Alpha-Methyl Glucoside Ester) in Pan Boiling** .. 267
By J. Kuse

* * *

**Agricultural Abstracts** .. .. .. .. .. .. .. .. .. 271
The effects of five legume crops on soil populations of the sugar beet nematode (*Heterodera schachtii*). Occurrence of the alfalfa mosaic virus in sugar beet in California *etc.*

**Sugar-House Practice** .. .. .. .. .. .. .. .. .. 274
Determination of the (flow) rate at which fluidization starts in white sugar drying. Reducing sugar losses in raw sugar processing. Graining method for *C*-strikes. Processing juices from cane growing in alkaline heavy soils. Loss in molasses at Sakarwadi *etc.*

**Beet Factory Notes** .. .. .. .. .. .. .. .. .. .. 276
Problem of the purification of juice from partly decayed beets. Fermentation of sugar factory diffusion waste waters *etc.*

**New Books and Bulletins** .. .. .. .. .. .. .. .. 278
F. O. Licht's Internationales Zuckerwirtschaftliches Jahr- und Adressbuch 1965/66 (International Sugar Economic Yearbook and Directory). The Measurement and Automatic Control of pH *etc.*

**Laboratory Methods and Chemical Reports** .. .. .. .. 279
Effect of non-sugars on the refractive index of sugar solutions. A mobile laboratory to visit sugar factories. Conductimetric measurement of ash in white sugars *etc.*

**By-Products** .. .. .. .. .. .. .. .. .. .. .. .. 281
Continuous pulping systems. Hemicellulose from bagasse. Production of pure absolute alcohol by pasteurization. Uses for sugar beet pulp *etc.*

**Patents** .. .. .. .. .. .. .. .. .. .. .. .. .. 282
Method, means and plant for continuous measurement and adjustment of sugar solution purity. Ion exchange treatment of sugar juices and molasses *etc.*

**Trade Notices** .. .. .. .. .. .. .. .. .. .. .. 285
"Fabcon I-12". Heat sealer *etc.*

**International Society of Sugar Cane Technologists** .. .. 286
XII Congress 1968, Taiwan

Brazil Sugar Exports .. .. .. .. .. .. .. .. .. 287

Swiss Sugar Imports .. .. .. .. .. .. .. .. .. 288

Stock Exchange Quotations.. .. .. .. .. .. .. .. 288

Brevities .. .. .. .. .. .. .. .. .. .. .. .. .. 287–8

*Index to Advertisers* .. .. .. .. .. .. .. .. .. xxxvi

THE
# INTERNATIONAL SUGAR JOURNAL

VOL. LXVIII | SEPTEMBER 1966 | No. 813

## NOTES AND COMMENTS

### E.E.C. sugar policy.

The E.E.C. countries have now agreed on policies to be adopted in respect of all agricultural products. At a meeting held toward the end of July the Council of Ministers came to further decisions regarding all farm products, including sugar, and the policy has been set down which will integrate the individual programmes of the various countries. The Sugar Decree is scheduled to come into force on 1st October 1967 with common prices being introduced from 1st July 1968. No text is yet available and many individual details still remain to be discussed. A synopsis of the arrangements as they now stand has been published by C. Carnikow Ltd.[1] Although this information is believed to present the situation as it currently stands, it is to be borne in mind that the Council has to consider, before 1st October 1967, whether the proposed prices for sugar or beet should be altered in the light of developments in cost structures then ruling.

"The key factors controlling sugar arrangements will be production quotas, a minimum level at which the European Fund guarantees to purchase a certain tonnage of sugar and minimum buying prices for beetroots. All prices have been designated in units of account, which are the equivalent of U.S. dollars.

"The level to be aimed at for the sale of locally produced white sugar of a defined standard on an ex-factory, free on rail or truck basis, throughout the Community will be known as the target price. Although there will be no physical restriction on imports of foreign sugar, producers within the Common Market will be safeguarded from competition from imported sugar by the operation of an import levy, fixed daily in the light of world quotations, which will raise the price at which such sugar can be sold to the target level. On the other hand, the fact that foreign sugar will be available at the target price will limit the extent to which the internal price can rise.

"The level at which the Fund will be ready to buy domestic sugar will be fixed at 5% below the target price and will be known as the intervention price. This will provide a guaranteed floor for all sugar produced within quota arrangements. In practice it is anticipated that the price level for sugar within the E.E.C. will range between the intervention and target prices.

"It should not be forgotten, of course, that production within the Community ranges over many types and qualities, the quotations for which will vary. Furthermore, in recognition of the fact that the production and consumption pattern varies throughout the E.E.C., provision has been made for the establishment of regional arrangements. In general there is on the one hand the large production area of northern France, Belgium, the Netherlands and West Germany and on the other the southern part of France and Italy, where production is below consumption. Basic levels may be considered to be those applying in the northern zone in which the target price is $22.35 per 100 kg, approximately equal to £81 2s 0d per long ton, and the intervention price $21.23 per 100 kg, which approximates to £77 0s 8d per long ton. For Italy these prices will be increased by $1.60 per 100 kg, which represents the notional freight from northern France, while in the intermediate area of southern France the basic levels will be raised by $1.24 per 100 kg. It has also been necessary to consider the situation of the French Overseas Departments, which are also part of the E.E.C. In these areas the intervention price has been fixed at $20.31 per 100 kg, which represents the level applicable in southern France, less the average freight rate from the Departments concerned to their nearest European E.E.C. narbour. Recognising that the production of sugar in the Overseas Departments will probably continue to be largely in raws, an intervention price will be available for raw sugar of these origins. An intervention price for raws will also initially be available for European producers but this will disappear at the end of 1969.

It is the essence of the E.E.C. sugar provisions that a free market shall prevail within the Community. Hence, just as a target price for sugar has been set which is an indicated maximum and not a firm assurance to the producer, so the beet price is to be permitted to move, the only stipulation being

[1] *Sugar Review*, 1966, (774), 143–144.

that factories must pay a minimum delivered price of $17.00 per metric ton, equal to about £6 3s 4d per long ton, for beet, basis 16% sugar content, in respect of all roots needed to produce sugar up to the quota limit. In excess of this level the beet price may be reduced, but it may not fall below $10.00 per ton.

"Production quotas will be established on both a national and a factory basis, individual quantities by countries in respect of 1968/69 being as follows, basis white sugar:—

| | *metric tons* |
|---|---|
| West Germany | 1,750,000 |
| France (including Overseas Departments) | 2,400,000 |
| Italy | 1,230,000 |
| Netherlands | 550,000 |
| Belgium | 550,000 |
| | 6,480,000 |

Within the various countries quotas will be allocated to each individual factory proportionately to average production during the five campaign years 1961/62 to 1965/66.

All sugar produced in the E.E.C. up to 105% of consumption, which is not otherwise disposed of, may be tendered to the Fund at the full intervention price. It will then be up to the Fund to decide whether and in what proportions such sugar should be stocked, released onto the market or subsidized for export outside the E.E.C. Export losses on production in excess of that tonnage, however, and up to an agreed maximum limit will be charged to the factories which have produced more than their individual authorized tonnages in such a way that they would be permitted to cover only their costs with no margin for profits. It is calculated that in 1968/69 consumption will amount to 6,280,000 metric tons, white value, so that the guaranteed level of 105% is 6,594,000 tons. The agreed maximum limit for the seasons 1968/69 to 1970/71 has been set at 135% of individual factories' basic quotas. For the years 1971/72 onwards the position will be reconsidered annually in the light of production and consumption levels then ruling. No price arrangements have been made in respect of sugar produced in excess of this agreed limit and producers who surpass this level do so at their own risk. Such sugar must be exported to the world market.

It is recognised that the Italian situation poses special difficulties and support arrangements will therefore apply for a period not exceeding ten years. Help will consist of a contribution to the growers which in 1968/69 will not exceed $1.10 per ton of beet, basis 16%, and a contribution to the industry not in excess of $1.46 per 100 kg, basis white sugar. These allowances will only be paid on sugar and roots produced in accordance with basic quota tonnages. For the first three years this help will be on a constant basis; thereafter it will be diminished by one-seventh annually for seven years when it will disappear, by which time it is intended that the Italian industry will be on a par with those of the other countries within the E.E.C.

**U.S. sugar quotas, 1966.**

On the 7th July the U.S. Dept of Agriculture raised the supply quota by 100,000 short tons to bring it to a total of 10,100,000 tons. The U.S. domestic sugar price was unaffected, remaining steady at 7.00 cents per lb, c.i.f., duty-paid, and the same situation continued after a second announcement on the 18th July raised the quota by a further 125,000 tons.

In the increases, Ireland was omitted, while in the second increase the Hawaiian quota was increased by 26,753 tons under a section of the Sugar Act which entitles Hawaii, Puerto Rico and the Virgin Islands to quotas as high as their marketing availability in the continental United States during the previous year; only Hawaii has been able to take advantage of this section.

On the 25th July the Philippine Sugar Quota Administration advised that the Philippines would not be able to fill 100,000 tons of their increased quota, and action by the U.S.D.A. in respect of the shortfall is awaited. The individual quotas appear below.

| | *Quotas up to 7th July* | *Quotas from 18th July* |
|---|---|---|
| | *short tons,* | *raw value* |
| Domestic Beet | 3,025,000 | 3,025,000 |
| Mainland Cane | 1,100,000 | 1,100,000 |
| Hawaii | 1,173,474 | 1,200,227 |
| Puerto Rico | 730,000 | 730,000 |
| Virgin Islands | 10,000 | 10,000 |
| Philippines | 1,278,543 | 1,302,978 |
| Argentina | 50,904 | 54,871 |
| Australia | 177,019 | 182,313 |
| Bolivia | 4,925 | 5,310 |
| Brazil | 413,800 | 446,046 |
| British Honduras | 12,042 | 12,309 |
| British West Indies | 165,301 | 168,973 |
| Colombia | 43,788 | 47,201 |
| Costa Rica | 50,138 | 54,045 |
| Dominican Republic | 413,800 | 446,046 |
| Ecuador | 60,209 | 64,901 |
| Fiji | 38,846 | 40,008 |
| French West Indies | 51,998 | 53,153 |
| Guatemala | 42,251 | 45,543 |
| Haiti | 22,988 | 24,781 |
| India | 70,808 | 72,926 |
| Ireland | 5,351 | 5,351 |
| Malagasy | 8,359 | 8,609 |
| Mauritius | 16,227 | 16,712 |
| Mexico | 423,104 | 456,077 |
| Nicaragua | 50,138 | 54,045 |
| Panama | 30,651 | 33,041 |
| Peru | 330,054 | 355,775 |
| Salvador | 30,984 | 33,400 |
| South Africa | 52,122 | 53,681 |
| Swaziland | 6,392 | 6,583 |
| Taiwan | 73,758 | 75,964 |
| Thailand | 16,227 | 16,712 |
| Venezuela | 20,799 | 22,419 |
| | 10,000,000 | 10,225,000 |

**Malaysia sugar factory plans**[1].—It is planned to build a new sugar factory near Ayar Hitam in South Malaya. The project still awaits government consent, however.

[1] F. O. Licht, *International Sugar Rpt.*, 1966, **98**, (19), 17.

# FILTRATION-IMPEDING MATERIALS IN RAW SUGARS OF VARIOUS ORIGINS

## Part III. The effect of insoluble matter in affined sugars on their filtrability

By TAKEO YAMANE, Sc.D., KAZUMASA SUZUKI, Sc.M. and TOSHIO KAGA, Sc.M.

(Research Laboratory, Shibaura Sugar Co. Ltd., Tokyo, Japan)

In Part I of a series of studies on factors which affect filtration, significant correlations were found between the filtrability of raw sugar or of affined sugars and the content of gum,silica, wax and $P_2O_5$, while the effect of starch was a little ambiguous[1].

In Part II a remarkably close relationship was found between the filtrability of laboratory carbonatation slurries of melt liquors and the starch content in affined sugars, and starch seemed most deleterious so far as the filtrability of carbonatation slurries was concerned[2].

C. C. Tu found[3] that the suspended particles in the sugar solutions were mainly responsible for the poor filtrability of the solutions of Hawaiian commercial sugars and the filtration rates of the test solutions were improved by 16–120% after removing suspended particles by centrifuging at 105,400 *g* for one hour.

In this paper the effect of insoluble matter in affined sugars on the filtrability of affined sugars and carbonatation slurries is discussed.

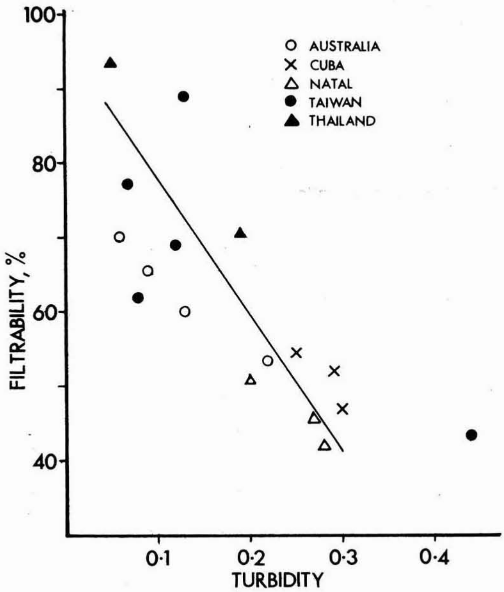



Fig. 1. Relationship between turbidity of test solutions and filtrability of affined sugars. Correlation coefficient = —0·76**

The turbidity of test sugar solutions was measured and the content of insoluble matter of affined sugars was determined.

As seen in Figs. 1 and 2, quite significant correlations were found between the turbidity or insoluble matter content and the filtrability of affined sugars, while, as shown in Figs. 3 and 4, poor correlation was found between the above-mentioned two factors and the filtrability of carbonatation slurries. Such a result seems due to the fact that carbonatation slurries themselves consisted of suspended matter, independently of the insoluble matter content of affined sugars.

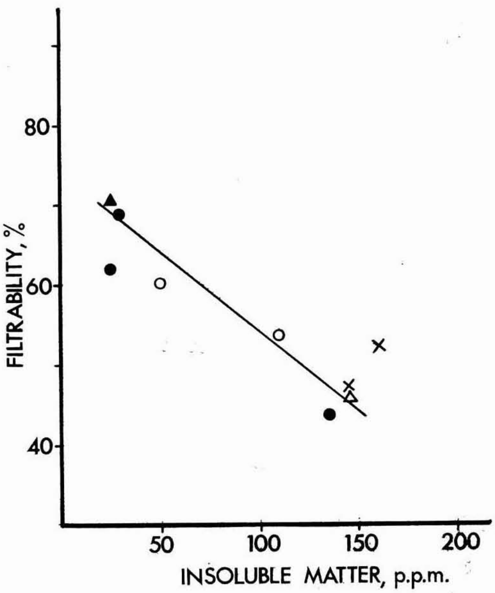



Fig. 2. Relationship between content of insoluble matter and filtrability of affined sugars. Correlation coefficient = —0·92**

The test filtrability figures, as seen in Table II, were improved by factors of 3–12 by removal of the insoluble matter (25–145 p.p.m. on solids). The

[1] YAMANE *et al.: I.S.J.*, 1965, **67**, 333.
[2] KAGA *et al.: I.S.J.*, 1966, **68**, 3.
[3] *Rpts. 22nd Meeting Hawaiian Sugar Tech.*, 1963, 22; *Paper presented to 12th Congr. I.S.S.C.T.*, 1965.

detrimental effect of insoluble matter on the filtrability seemed not so significant as Dr. TU reported, as the amount in affined sugars was not so high, but the insoluble matter should be considered to be one of the impurities intimately related to the retardation of filtration.

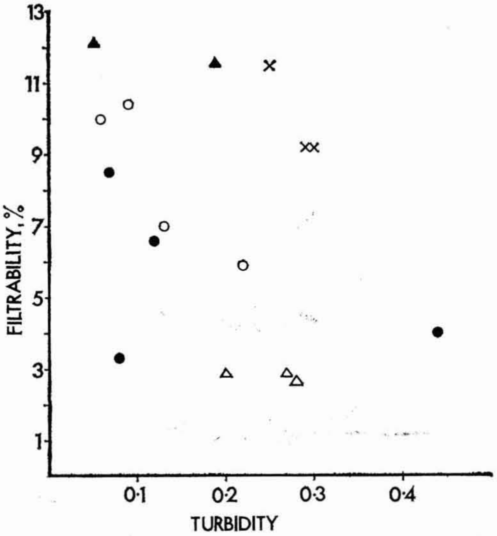



Fig. 3. Relationship between turbidity of test solutions and filtrability of carbonatation slurries. Correlation coefficient = —0·35

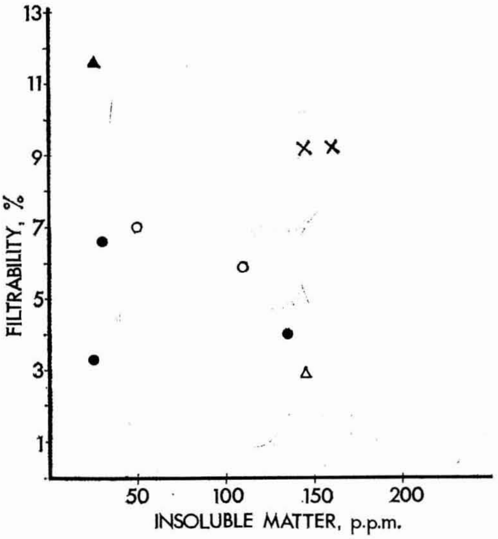



Fig. 4. Relationship between content of insoluble matter and filtrability of carbonatation slurries. Correlation coefficient = —0·10

The samples listed in Table I and II in this paper correspond to those listed in the previous papers.

*Experimental*

*Turbidity measurement:* The turbidity was measured by Balch's method. After the 50°Bx test solution had been passed through 65-mesh wire screen, the transmittancy of the solution was measured at 720 mμ, using as a reference standard a sugar solution prepared by filtering the test solution mixed with "Celite 505" (0·5% on solids).

$$\text{Turbidity} = \frac{(-\log T) \times 100}{l \times \text{Bx} \times g} = \frac{-\log T \times 100}{l \times 50 \times 1{\cdot}23}$$

where $T$ = transmittancy, $l$ = cell length (cm), $g$ = specific gravity.

*Measurement of insoluble matter content:* After removing large insoluble particles in the manner described above, 600 g of the test solution was centrifuged at 41,600 *g* for one hour at 20°C, using a Hitachi 20P type ultracentrifuge. After the supernatant solution had been discarded, 100 ml of distilled water was added to the precipitate and after mixing thoroughly, it was centrifuged again for 15 minutes. This procedure was repeated three times, and the precipitate was dried at 105°C and weighed.

The supernatant sugar solution after centrifuging was not perfectly clear.

The test filtrability procedure for centrifuged and uncentrifuged test solutions was the same as described in previous papers, except that in the present experiments 50°Bx and 20 p.s.i. were employed, in contrast to 60°Bx and 50 p.s.i. in previous experiments. These new conditions are those used in the filtration tests in Hawaii.

*Results*

The turbidity and content of insoluble matter of the test solutions and the filtrability of affined sugars and carbonatation slurries are listed in Table I.

**Table I**
**Turbidity, insoluble matter and filtrability of affined sugars and laboratory carbonatation slurries**

| *Samples* | | *Turbidity of 50°Bx solutions* | *Insoluble matter (p.p.m. on solids)* | — *Filtrability* — *Affined sugars*[1] | *Carbonatation slurries*[2] |
|---|---|---|---|---|---|
| Australia | C | 0·06 | — | 70·0 | 10·0 |
| | D | 0·09 | — | 65·5 | 10·4 |
| | M | 0·13 | 50 | 60·0 | 7·0 |
| | F | 0·22 | 110 | 53·5 | 5·9 |
| Cuba | A | 0·25 | — | 54·5 | 11·5 |
| | C | 0·29 | 160 | 52·0 | 9·2 |
| | E | 0·30 | 145 | 47·0 | 9·2 |
| Natal | A | 0·20 | — | 51·0 | 2·9 |
| | C | 0·27 | 145 | 45·5 | 2·9 |
| | E | 0·28 | — | 42·0 | 2·7 |
| Taiwan | A | 0·13 | — | 89·0 | — |
| | C | 0·07 | — | 77·0 | 8·5 |
| | G | 0·12 | 30 | 69·0 | 6·6 |
| | F | 0·08 | 25 | 62·0 | 3·3 |
| | I | 0·44 | 135 | 43·5 | 4·0 |
| Thailand | A | 0·05 | — | 93·5 | 12·1 |
| | B | 0·19 | 25 | 70·5 | 11·6 |

The test filtrability of the solutions was measured after removal of the insoluble matter in test solutions by centrifuging. The results are listed in Table II.

**Table II**

**The improvement of filtrability by removal of insoluble matter**

| *Samples* | | *Amount of insoluble matter removed (p.p.m. on solids)* | *Filtrability of untreated solutions* | *Filtrability of treated solutions* | *Improvement of filtrability* |
|---|---|---|---|---|---|
| Australia | M | 49 | 61·5 | 69·0 | 7·5 |
| Cuba | E | 145 | 49·0 | 56·0 | 7·0 |
| Natal | C | 145 | 49·5 | 59·5 | 10·0 |
| Taiwan | I | 135 | 47·0 | 59·0 | 12·0 |
| Thailand | B | 25 | 67·5 | 70·5 | 3·0 |

(50°Bx, 20 p.s.i., with no addition of buffer solutions)

*Summary*

An intimate relationship was found between the turbidity or content of insoluble matter and the filtrability of affined sugars, but no correlation was found in the case of the filtrability of carbonatation slurries.

The insoluble matter would seem to be one of the impurities exerting a deleterious effect on the filtration of affined sugars.

*Acknowledgment*

The authors' thanks are due to Dr. C. C. Tu, Experiment Station, Hawaiian Sugar Planters' Association, who provided information on the method of determination of insoluble matter in affined sugars.

# GALACTINOL IN BEET MOLASSES

## Part II. The Determination of Galactinol by Thin Layer Chromatography

By J. V. DUTTON

(British Sugar Corporation Research Laboratory, Bramcote, Nottingham)

### Introduction

A PRELIMINARY examination of British beet molasses samples on paper chromatograms indicated that the concentration of galactinol was lower than 0·5%. The chromatographic method of Serro and Brown[1] for determining galactinol in the range 0·1 to 0·6% on sugar in juices and 1·0 to 8·0% on sugar in molasses or saccharate syrups was not applicable and it was clear that a purification stage would be necessary for the determination of galactinol in British samples.

A method for the determination of galactinol at low concentration was therefore developed from the procedure previously reported in Part I of this paper[2] for the isolation of galactinol. It employs lead precipitation, ion-exchange resin treatment and final visual estimation on thin layer chromatograms.

### Experimental

*Materials*

Neutral lead acetate A.R., $(CH_3COO)_2Pb, 3H_2O$ and basic lead acetate A.R., approximately $(CH_3COO)_2Pb, Pb(OH)_2$, were obtained from British Drug Houses Ltd. "ZeoKarb 225" (14–52 mesh, 8% DVB) and "De-Acidite FF" (52–100 mesh, 7–9% average crosslinking) ion exchange resins were obtained from the Permutit Company Ltd.

Three solutions of basic lead acetate were employed: Solution 1 was prepared by dissolving 1 kg of basic lead acetate in about 3 litres of water to give a solution having s.g. = 1·26. This reagent was used in the standard procedure for the determination of galactinol.

Solution 2 was prepared by dissolving both basic and neutral lead acetates in water to give a solution containing 9·5 to 10·5 grams of basic lead as PbO/100 ml and having s.g. = 1·24.

Solution 3 was also prepared by dissolving a mixture of basic and neutral lead acetates to give a total lead content and s.g. = 1·24.

The thin-layer chromatograms were prepared with "Kieselgel G" (E. Merck A.G., Darmstadt, West Germany).

*Methods*

*Determination of the basicity of lead acetate solutions*

50 ml of 0·5N oxalic acid solution was added to 10 ml of basic lead acetate solution and the volume was adjusted to 200 ml. The suspension was shaken thoroughly and filtered.

Basic lead was determined by titrating 40 ml aliquots of the filtrate with 0·1N sodium hydroxide and total lead was determined by titrating 40 ml aliquots of the filtrate with 0·1N potassium permanganate at 60–70°C in the presence of a few ml of dilute sulphuric acid.

$$\text{Basic lead \% total lead} = \frac{50 - \text{ml } 0{\cdot}1\text{N NaOH}}{50 - \text{ml } 0{\cdot}1\text{N KMnO}_4} \times 100.$$

Using this method the results obtained for the three solutions of basic lead acetate were as recorded in Table I.

[1] *Anal. Chem.*, 1954, **26**, 890.
[2] *I.S.J.*, 1966, **68**, 235.

**Table I. Analysis of basic lead acetate solutions**

| | *grams PbO/100 ml* *Basic* | *Total* | *Basic lead* *% Total lead* | *Specific gravity* |
|---|---|---|---|---|
| Solution 1 | 12·2 | 27·0 | 45·2 | 1·26 |
| 2 | 10·0 | 24·5 | 40·8 | 1·24 |
| 3 | 8·5 | 23·7 | 35·9 | 1·24 |

*Standard procedure for the determination of galactinol*

10·00 grams of molasses were washed into a centrifuge tube with about 30 ml of water. 10 ml of basic lead acetate solution 1 was added, mixed thoroughly and the suspension centrifuged at 2500 r.p.m. for 15 minutes. The supernatant solution was discarded and the precipitate washed three times with 50 ml portions of water, centrifuging after each wash and discarding the supernatant washings.

The washed precipitate was well mixed with 50 ml of "ZeoKarb 225" (hydrogen form, 14–52 mesh) until dissolved and the slurry transferred to a 26 × 2·1 cm column. The column was allowed to drain directly on to a 26 × 1·1 cm column of "De-Acidite FF' (hydroxide form, 52–100 mesh) and both columns were washed with water until a total effluent of 150 ml had been collected.

Galactinol in the effluent was estimated by thin layer chromatography. It was desirable that the solution for chromatography should contain 0·2 to 2·0 µg of galactinol per 3 µl. For molasses with an original galactinol content of 0·02 to 0·20%, this required that 50 ml of the ion exchange effluent be concentrated to 10 ml by distillation under vacuum before application to the thin layer chromatogram.

3 µl applications of the molasses concentrates were made on thin layers of "Kieselgel G" at 3-cm intervals, 3 cm from one end of 20 cm plates. Standard solutions of galactinol hydrate were prepared, equivalent to anhydrous galactinol concentrations of 0·2, 0·4, 0·6 . . . 2·0 mg/3 ml, and 3 µl applications of standards were spotted at 3-cm intervals, alternately between the molasses spots.

The chromatograms were developed in 2:2:1 *n*-propanol:ethyl acetate:water (proportions by volume) for 2 hours, dried and sprayed with the α-naphthol-sulphuric acid reagent[2]. The colour reaction was brought about by heating at 80–90°C. Galactinol reacted to give a pink spot and the concentration in the molasses was estimated by visual comparison with the galactinol standards.

The molasses extracts usually contained only galactinol and inositol, the latter not reacting with the α-naphthol reagent. However, occasionally polysaccharides, raffinose or sucrose could be detected, indicating that the "De-Acidite" column had been overloaded with these carbohydrates. For this reason it was essential to develop the thin layer chromatograms for 2 hours to guarantee complete separation of galactinol from raffinose.

## RESULTS

*Determination of galactinol in British molasses samples*

The concentrations of galactinol measured in eight samples of molasses obtained from British Sugar Corporation factories in December 1964 are recorded in Table II.

**Table II. Galactinol* in British beet molasses samples**

| *Factory* | *% Galactinol* | *Factory* | *% Galactinol* |
|---|---|---|---|
| Cupar ...... | 0·15 | Newark ...... | 0·09 |
| Ipswich ...... | 0·09 | Peterborough | 0·13 |
| Kidderminster | 0·11 | Wissington .. | 0·22 |
| King's Lynn | 0·17 | York ........ | 0·15 |

* All results are as anhydrous galactinol.

The concentrations of galactinol in weekly composites of molasses from Peterborough factory during the 1964–1965 campaign are recorded in Table III.

**Table III. % Galactinol in Peterborough molasses during the campaign 1964/65**

| *Sample Week-ending* | *% Galactinol* | *Sample Week-ending* | *% Galactinol* |
|---|---|---|---|
| 12.10.64 .... | 0·12 | 4.1.65 .... | 0·08 |
| 2.11.64 .... | 0·13 | 25.1.65 .... | 0·02 |
| 23.11.64 .... | 0·13 | 8.2.65 .... | 0·02 |
| 14.12.64 .... | 0·13 | | |

These results indicate that the galactinol concentration in British molasses samples may range from 0·02 to 0·22% and that the lower levels are found towards the end of the campaign.

*Recovery of galactinol added to molasses*

In order to assess the accuracy of the standard procedure, galactinol was added to molasses and its recovery determined. The results are recorded in Table IV.

**Table IV. The recovery of galactinol added to molasses**

| *Molasses sample* | *% Galactinol* 1. *In molasses* | 2. *Added* | 3. *Measured* | 4. *Recovered* | *% Recovery* |
|---|---|---|---|---|---|
| Cupar ...... | 0·15 | 0·10 | 0·28 | 0·13 | 130 |
| Kidderminster | 0·11 | 0·10 | 0·20 | 0·09 | 90 |
| King's Lynn | 0·17 | 0·10 | 0·26 | 0·09 | 90 |
| Peterborough | 0·13 | 0·10 | 0·22 | 0·09 | 90 |
| Wissington .. | 0·22 | 0·10 | 0·34 | 0·12 | 120 |
| Ipswich ...... | 0·09 | 0·20 | 0·28 | 0·19 | 95 |
| Newark .... | 0·09 | 0·20 | 0·28 | 0·19 | 95 |
| York ........ | 0·15 | 0·20 | 0·33 | 0·18 | 90 |
| King's Lynn.. | 0·17 | 0·50 | 0·60 | 0·43 | 86 |
| Wissington .. | 0·22 | 0·50 | 0·70 | 0·48 | 96 |

The accuracy of the visual estimation on thin layer chromatograms is about ±0·01% and the recoveries, which range from 86–130%, are in keeping with this being the main source of error. The lead precipitation and ion exchange treatment are therefore not considered to have resulted in significant losses.

*Determination of galactinol in other molasses samples*

The concentrations of galactinol in four samples of American molasses and one sample of Chilean molasses were determined for comparison with the results obtained with the British samples.

In this connexion it is important to mention that 10 g of British molasses normally required about 6·5 ml of basic lead acetate solution for complete precipitation so that in the standard procedure 3·5 ml excess lead was employed. It was found that the same applied to the Chilean molasses, but with the American molasses lead-insoluble material continued to be precipitated until 13 ml of basic lead acetate had been added. To determine whether 10 ml of basic lead acetate was sufficient for complete precipitation of galactinol from the American molasses, two samples were treated with 10, 13 and 26 ml of basic lead acetate solution. The results are listed in Table V.

**Table V. Determination of galactinol in other molasses samples**

| | | | % Galactinol taking 10 g molasses | | |
|---|---|---|---|---|---|
| | | | *+10 ml BLA* | *+13 ml BLA* | *+26 ml BLA* |
| Clarksburg No. 3 | 7.6.63 | U.S.A. | 0·10 | 0·09 | 0·11 |
| Clarksburg No. 100 | 29.3.64 | U.S.A. | 0·09 | — | — |
| East Grand Forks | 2.2.64 | U.S.A. | 0·11 | — | — |
| Moorhead | 2.2.64 | U.S.A. | 0·10 | 0·09 | 0·08 |
| Linares | 1964 | Chile | 0·14 | — | — |

These samples of molasses were kindly made available respectively by Mr. P. HANZAS, of the American Crystal Sugar Co., Rocky Ford, Colo., U.S.A., and Mr. H. TORTE, of Industria Azucarera Nacional S.A., Linares, Chile.

The results obtained do not differ significantly with increasing amounts of basic lead acetate and the individual results are all of the same order as those obtained for British molasses.

### *Comparison of basic lead acetate solutions*

A comparison was made of the results obtained using the standard procedure and two similar determinations in which basic lead acetate solutions 2 and 3 were substituted for solution 1. A sample of Nottingham factory molasses from the 1963–1964 campaign was taken for the tests. The results are recorded in Table VI.

**Table VI. Comparison of basic lead acetate solutions**

| *BLA employed* | *% Galactinol* |
|---|---|
| Solution 1 .......... | 0·17 |
| „ 2 ............ | 0·16 |
| „ 3 .......... | 0·17 |

With this sample of molasses the basicity of the lead acetate clearly had no effect on the result.

In order to determine the amount of galactinol precipitated in carrying out a half-normal polarization of molasses, 13 g aliquots of the same sample of molasses were each treated dropwise with basic lead acetate solutions 1, 2 and 3 until no further visible precipitation occurred. The necessary volume in each case was 8·5 ml. The suspensions were made up to 100 ml, centrifuged and galactinol extracted

**Table VII. Galactinol remaining in polarization solution**

| | *Total % galactinol* | *% galactinol precipitated in polarization* | *Calculated % galactinol remaining in polarization solution* |
|---|---|---|---|
| Solution 1 .. | 0·17 | 0·14 | 0·03 |
| „ 2 .. | 0·16 | 0·14 | 0·02 |
| „ 3 .. | 0·17 | 0·13 | 0·04 |

from the precipitates and estimated in the usual way. The calculated concentration of galactinol remaining in the polarization solution is recorded in Table VII.

This shows that on average 0·03% galactinol was not precipitated. Since the specific rotation of galactinol is +150° this would be equivalent to $\frac{0{\cdot}03 \times 150\%}{66{\cdot}5}$ or 0·07% sucrose by direct polarization.

The polarization of this molasses sample was determined by treating 13-g portions with the minimum amount of basic lead acetate solution necessary for complete precipitation, i.e. 8·5 ml. For comparison, 13-g portions of molasses were also treated with 13 ml of basic lead acetate solution, to simulate the ratio of lead acetate to molasses which is employed in the standard procedure for the determination of galactinol. Galactinol was also added to molasses before lead treatment and polarization. The results are recorded in Table VIII.

**Table VIII. Effect of lead acetate and galactinol on the polarization of molasses**

| | Polarization | | | |
|---|---|---|---|---|
| | *13 g molasses* | | *13 g molasses + 50 mg galactinol* | |
| | *+ 8·5 ml BLA* | *+ 13 ml BLA* | *+ 8·5 ml BLA* | *+ 13 ml BLA* |
| Solution 1 | 54·06<br>54·36<br>54·04<br>54·02 | 53·84<br>53·80 | 54·30<br>54·22 | 54·00 |
| Soln. 1 Mean | 54·12 | 53·82 | 54·26 | 54·00 |
| Solution 2 | 54·10<br>54·40<br>54·18 | 54·00 | 54·38 | — |
| Soln. 2 Mean | 54·23 | 54·00 | 54·38 | — |
| Solution 3 | 54·20<br>54·40<br>54·18<br>54·24 | 54·20<br>54·10 | 54·42<br>54·16 | 54·20 |
| Soln. 3 Mean | 54·26 | 54·15 | 54·29 | 54·20 |

It will be seen that the polarizations are generally lower where 13 ml of basic lead acetate have been used instead of 9·5 ml, as would normally be used. The differences obtained in replicate determinations are however greater than the anticipated difference caused by any residual galactinol, and presumably the results could be further complicated by the possibility that other dextrorotatory material is precipitated by the additional basic lead acetate. The addition of galactinol up to a level of 0·55% on molasses does not significantly affect the polarization of the lead clarified solution.

## CONCLUSIONS

A method employing lead precipitation, ion exchange resin treatment and thin-layer chromatography has been developed for the determination of galactinol in beet molasses. The procedure is applicable to samples in which the galactinol concentration is as low as 0·02%. In analysis of samples of British beet molasses, the galactinol content was found to be in the range 0·02 to 0·22%.

Up to a level of 0·55%, galactinol is almost completely precipitated by basic lead acetate when carrying out a polarization of molasses and it may therefore be concluded that galactinol has a negligible effect on the polarization of a lead clarified solution of molasses.

ACKNOWLEDGMENTS

The author wishes to thank Dr. A. CARRUTHERS and Mr. J. F. T. OLDFIELD for their encouragement and helpful advice in the work reported. He also thanks Mr. R. W. MURDEN for his invaluable assistance in the practical work.

**Corrigendum.**—On p. 236, line 5 of column 2, the words "successively with reagents (i) and (ii)" should read "for 1 hour, one with reagent (i) and the other with reagent (ii)".

# BEET RECEPTION & BEET COSTING

by N. H. BRINTON and J. F. WARRINER

*Paper presented to the 18th Technical Conference of the British Sugar Corp.*, 1966

## PART I. BEET RECEPTION

THE contract which the B.S.C. has had with its growers has always been based on the principle that each farmer should receive payment for the amount of sugar which he delivers to the factory. This demands an analysis of deliveries for sugar content, and the Corporation, and indeed the individual companies prior to the amalgamation, always sampled and analysed every load delivered. This is in complete contrast to the condition in many continental European countries.

Another important difference is that owing to the favourable climate, British factories are able to accept deliveries over the whole of the campaign. This is done on a very carefully regulated basis and each factory takes each week only the beet it requires for that week. This is achieved by the use of a permit system whereby, after individual crops are estimated in August, each grower is sent sufficient permits to enable him to deliver his beets in equal amounts over the whole campaign. The permit is valid for only one day and by judicious allocation of these, a very steady flow of traffic is achieved. Registration of lorries hauling beet also helps to avoid queues at the factories. The number of lorries which hauliers may use is restricted but growers are not. The basis of the registration is that each vehicle should be capable of delivering a tonnage of beet which depends on the approximate distance of the growers, for whom he is delivering, from the factory. This helps to keep lorries occupied and also to prevent too many arriving at the factory at the same time.

The contract stipulates the delivery conditions including the method of weighing, sampling and analysis and contains a clause allowing rejection of loads considered unsuitable for sugar manufacture. Excessive dirt, loose leaves and badly topped beet as well as deteriorated ones would be adequate grounds for rejection. All such cases are referred to the chief local National Farmers' Union representative at the factory and his co-operation sought. The N.F.U. representatives supervise all aspects of the beet reception work and must be allowed facilities for this, and the contract lays down the information with which they must be supplied.

On arrival at the factory, the permit is presented at the weighbridge and the lorry weighed in. There are, at present, a number of different systems in use. The oldest simply uses a numbered ticket on which the weighman records the grower's name and contract number from the permit and on which the weight is printed. A tear-off portion bearing the same number is given to the driver and is used to identify the sample. After unloading, the tare weight is printed on the same ticket at the "OUT" weighbridge. The first modification of this system towards an automatic one suitable for data processing is still in operation at the majority of B.S.C. factories. This uses an Avery weighbridge fitted with an analogue generator giving an electrical output proportional to the weight. This signal is converted to a digital display and also fed to a card punch. Where the weight is punched into the card there is a normal dial with a pointer which can also be seen by the driver. Identification of the load is achieved by reading a number from a stub card in which the number is represented by holes. This is then given to the driver and later placed with the sample. At the "IN" weighbridge therefore, for each load, there are a permit bearing the grower's name and contract number, and a punched card containing an identifying number and the gross weight. This card is known as the No. 1 card.

At each weighbridge there is a series of pre-punched cards, one for each grower, bearing the name and contract number and any other details required. These are arranged in contract number order and after the load has been weighed in, the appropriate pre-punched card, known as a grower's name card, is selected from the file and placed with the permit and the punched card containing the identifying number and gross weight, that is, the No. 1 card.

On the permit the weighbridge operator writes the lorry registration number to help in identification when the lorry returns to the "OUT" weighbridge. When the lorry is returning to the "OUT" weightbridge the grower's name card and the No. 1 card are read in a card reader and the information punched into a further card referred to as the No. 2 card. When the lorry is weighed the tare weight is recorded in the same No. 2 card so that all the information required concerning weight and identification is contained in this card. Simultaneously, an electric typewriter controlled from the card reader and weighing machine produces a haulage receipt note on continuous stationery in duplicate. This gives the grower's name and contract number, date, factory, registration number of the vehicle, gross and tare weights together with identification numbers of the receiving and contracting factories. One copy of this is given to the haulier in place of a copy of the weighbridge ticket normally used.

A refinement of this system, produced by Allen West Automation, is in use at one factory where punched tape is produced instead of the punched cards. Otherwise the system in so far as it applies to the weighbridge is identical to the one previously described.

The third system, tried out only last campaign, was a modification of the system used in the Danish Sugar Corp. using punched tape. This requires a weighbridge headwork having stepped discs and the B.S.C. has used an Ashworth-Ross machine for this purpose. The tape punch is then operated by Bowden cables attached to feelers which enter the appropriate steps on the discs. At the same time the feelers turn print discs which enable a printed record to be obtained simultaneously. In this system the permit is used as the weigh ticket, eliminating the grower's name cards, an operator for finding the correct cards and re-filling them, and the typewriter which has proved the least reliable of the other equipment. Identification of the load is again achieved by reading a numbered stub card and this is read mechanically in a similar manner to the weight. Thus, at the "IN" weighbridge there is produced a punched tape giving the factory, identification of "IN" weighbridge, contracting factory, stub card number, grower's contract number, the gross weight and the factory registration number of the vehicle. The permit is stamped with the majority of this information and the date. The stub card number and the weight are automatically punched and printed and the contract number, the contracting factory if different to the receiving factory, and the grower's contract number are hand keyed on the weighbridge. Punching and printing is then automatic.

After weighing-in, the vehicle proceeds to the sampling point. Where manual sampling is in operation, the rear door of the vehicle is dropped and sufficient beet raked out of the load to enable the sample bucket, which is capable of holding some 28 lb, to be stood on the floor of the vehicle close to the face of beet exposed. A sample is then raked into the bucket from approximately the centre of the face exposed. The identifying stub card is placed with the sample. In at least 5% of all deliveries the side of the vehicle is lowered and sample taken from here and not from the back. An allowance of 2 lb/cwt is added in all cases to compensate for soil on the floor of the vehicle.

Recently an automatic sampler has been developed which is gradually being introduced. It has so far operated at one factory for two years and at a second for one year only. This sampler consists of a cylindrical tube of 19 in (48 cm) diameter fitted at the bottom with flights. These are supported on rods attached to a plate in the top of the tube which can be moved downwards, removing the flights from the tube. The tube is rotated and at the same time moved downwards into the load, the flights guiding the beet up into the cylinder with little or no damage to the roots. The tube then quickly withdraws and returns to a position over a hopper where the sample is discharged by lowering the flights. In order to achieve the maximum throughput, one probe tube operates over two bays where the lorries stand, allowing one lorry to be positioned whilst the other is being sampled. In this manner a throughput of 55–60 samples per hour is achieved.

The size of sample naturally depends on the depth of beet in the lorry but it is usually about 180 lb (80 kg). As B.S.C. tarehouses are equipped to deal with 28 lb (11 kg) samples only, the larger sample has to be reduced. This is achieved by attaching to the hopper receiving the sample, a trough which is given a backwards and forwards motion causing the beets and soil to move along the trough. At the end of this are two rotating buckets which pass through the falling stream of beet and soil. One bucket is normally taken as the official sample, but with small loads it is sometimes necessary to combine the contents of the two buckets.

Although damage to the beets is slight there is an increase in the quantity of beet material which passes through the washers and for this reason the loose soil allowance was reduced, when using the probe, from 2 lb/cwt to 1 lb/cwt.

Experiments have been made with the "Rupro" sampler but the N.F.U. are not prepared to accept this method of sampling on account of the large proportion of beets that are cut.

In the tarehouse, the sample is weighed and the weight either written on the torn-off portion of the weigh ticket bearing the same number as the weigh ticket, or automatically produced on punched card or tape. In the latter case, the sample is identified by using a reader to read the holes in the stub card and punching this number in the card or tape. These stub card readers are of three types: in the first type, a spring loaded feeler makes electrical contacts through the holes; in the second, photo-electric type light passes through the stub card holes and in the third, a mechanical type, feelers operate Bowden cables to position punch shoes.

Washing is achieved by use of high pressure jets of water, at 150 p.s.i. (10 atmospheres), spraying on the beets as they pass along a cylindrical rotating drum consisting of alloy laths having spaces between them of $\frac{3}{4}$ in (1·9 cm). The beets are transported along the washer, which is 7 ft 4 in long (224 cm) by a continuous spiral fixed to the slats. The washers normally rotate at approximately 10 r.p.m. but this is variable between 2 and 20 r.p.m. At the end of the washer the beets fall into a wire basket where they are allowed to drain before topping and re-weighing.

It is a condition of the contract that the amount of tops removed is notified to the grower so they must be weighed. Topping is done manually with a knife pivoted at one end, the beet being held on a shaped block. During the topping process the beets are counted and transferred to a weighing scoop attached to the scale. Identification of the sample is the same as at the dirty beet scale and this and the weight are automatically recorded in the punched card or tape system. The weight of tops and the number of beet are hand keyed into the card or tape. In the hand system the information is written on the tear-off portion of the weigh ticket and also the whole of the information concerning the sample so far received is transferred to a printed form which will take the information for 20 samples.

Where the automatic system is in operation, both scales have analogue generators and are similar to the weighbridge equipment. Otherwise they are normal dial weighers without printers. A pair of scales using stepped discs and feelers are being tried next campaign. They incorporate a stub card reader.

After weighing, the clean washed sample is tipped into a multiple saw machine. This consists of seven saws, each of 16 in (40 cm) diameter, having 480 teeth, which rotate at 480 r.p.m. Unlike saws in continental Europe, the beets are fed through the blades by a carrier. This is a cast cylinder with an axis parallel to the saw axis, but having four hollowed-out portions into which the beets fall. There are slots in the carrier in which the blades run and as it rotates the beets are carried over the saws. The carrier rotates at 6·25 r.p.m. The brei is thrown onto a rotating brass drum from which it is collected by a scraper. After mixing, the brei and its identifying stub card pass into the laboratory. Here the normal Sachs-le-Docte method of cold water digestion is used, but this has been automated. The first process is to proportion the quantity of lead acetate solution according to the weight of brei. The brei is placed on the pan of the reagent-adder on a non-porous paper and the beam of the balance takes up the appropriate position. On the other end of the beam is a palladium wire probe which hangs in the parallel-sided neck of a pipette. On initiating the instrument, the lead acetate enters the pipette and continues to flow in until the liquid enters the pipette and continues to flow in until the liquid touches the palladium wire. This closes the inlet valve and opens the outlet. The lead acetate solution discharges into a metal capsule which is attached to a continuous chain.

On completion of the discharge, the chain is moved forward automatically until the capsule is over a rotating magnet. Whilst the liquid is being discharged, a small piece of iron wire is put into the capsule followed by the brei and paper. The movement of the chain brings a clean capsule under the discharge of the reagent added. This process is repeated as each capsule passes over four stirrers before being discharged into a filter funnel which is carried with a beaker on another chain synchronized with the chain carrying the capsule. After discharging the well-stirred mixture, the capsule passes under the stirring motors and is automatically washed and dried before returning to the reagent-adder.

The filter funnels and beakers move round until they reach the saccharimeter where an operator removes the old filter paper and replaces it with a new one and also puts a fresh beaker in position. A belt, driven by the same motor which moves the capsules and filter funnels, transports the brei container and identifying stub card from the reagent-adder to the saccharimeter.

The saccharimeters B.S.C. uses are the ETL/NPL automatic type made by Bendix Electronics Ltd. which give a digital display and an output to a card or tape punch. A stub card reader is also necessary.

The instrument, which uses the Faraday effect, has a cell 2 cm long which is fed by a siphon. The operator only needs to put the siphon into the beaker and press the button. The cell is then thoroughly purged by the new sample (two separate flushes of about 40 ml each) and the instrument initiated. When the result is displayed, the stub card reader handle is depressed and the result punched. Where a manual system is still operated the sugar content recorded is written on the tear-off portion of the weigh ticket and also on the record sheet. Although it is not necessary with B.S.C. equipment, the saccharimeter is capable of making about 200 readings per hour.

Where cards are produced it has been felt necessary to put the cards through a reader to have a printed record of the tarehouse results, largely in case of loss of cards during transit. With the Allen West Automation system all the information is fed to a central point where a typewritten record is produced at the time of punching the tape. With the Danish system a printed record is produced at each of the three stations: dirty beet scale, clean beet scale and saccharimeter.

Unloading of vehicles is by tipping or washing-out, the proportion of each varying from factory to factory. Over all about half the beet received by road is tipped and half washed out, but at some factories up to 80% of road deliveries are tipped.

Overhead roads were built at many factories to facilitate tipping but more recent installations have been belts which are usually cheaper and cause less damage to the beet. Wash-out points are equipped with guns controlled either pneumatically or electrically. Water pressures vary considerably but are usually of the order of 35 p.s.i. (2·5 atm) and the rate of discharge is about 120 tons per gun per hour. The beet dealt with in this manner is fed to the factory, any surplus being diverted to a special silo. Normally the beets and water are separated on screens before the beet is discharged into the silo.

Weighing, sampling, taring and the labour used in the first handling of the beet requires about 28 man-minutes per sample. At the best factories this as as low as 21 minutes. As each sample represents approximately 8 tons of beet, the average labour required is about 3½ man minutes/ton of beet. Including overtime payments and the cost of supplies, the total cost is between 5 and 6 pence/ton of beet.

*(To be continued)*

# THE EFFECT OF A SURFACE-ACTIVE ADDITIVE (ALPHA-METHYL GLUCOSIDE ESTER) IN PAN BOILING

By J. KUSE (Hodag Chemical Corp., Skokie, Ill., U.S.A.)

*Condensation of a paper presented to the American Society of Sugar Beet Technologists*, February 1966

THE literature is full of information regarding the introduction of minute amounts of surface-active additives or impurities to affect crystallization. The effects produced may be in the form of change in crystal habit and size, or in speed of nucleation or crystallization.

Most investigations cited involve aqueous solutions and indicate improvements when the surface tension of the liquid is lowered.

It would be well to point out that additives or impurities may have a non-beneficial effect on crystallization. Some impurities cause melassigenic effects in sugar crystallizations, and the same may be true of some surface active agents in sugar crystallization, especially if they tend to be adsorbed on the crystal surface.

Experiments have been carried out to determine the effect of a specific surface-active additive, namely, alpha methyl glucoside ester, in sugar boiling. This ester was developed by the Hodag Chemical Corporation and is being marketed in the beet and cane sugar industries under the trade name of "Hodag CB-6".

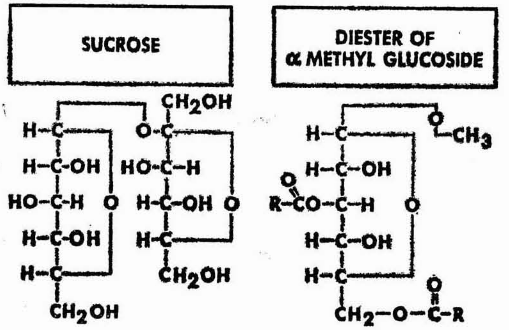



Fig. 1

Alpha-MGE is nonionic in nature and, as can be seen in Fig. 1, has certain marked similarities to the structure of sucrose, which, in part, is believed to explain its compatibility in concentrated sugar syrups. It is conceivable that other surface active additives, especially ionic ones, might be less active, show no activity or, indeed, be harmful in concentrated syrups and massecuites owing to incompatibility.

Certain data have been obtained in the laboratory on the effect of alpha-MGE on such physical properties as viscosity and surface tension.

By addition of 0·5% of alpha-MGE the surface tension of factory molasses was reduced by 45% from 64·0 to 35·1 dynes/cm, and the viscosity by 18·5%, from 30·8 to 25·1 poises at 50°C.

Some of these effects can be observed on a laboratory scale; others, however, only on a factory scale. Experience under actual factory operating conditions show practical benefits in sugar boiling due to the addition of alpha-MGE to the vacuum pans, including reduction in surface tension, increase in fluidity of the massecuites, and decrease in agglomerate formation, while other effects of the additive include shorter pan cycles, easier handling of massecuites, improved purging and greater crystal uniformity, purity and colour.

Here, unfortunately, much of the information is qualitative rather than quantitative. Attempts have been made, however, to run some controlled tests on these overall physical changes due to alpha-MGE on a plant scale. Massecuite fluidity, for example, is a difficult property to measure, and the correlation between laboratory measurements of mother liquor "true" viscosity and factory massecuite fluidity is normally very poor. The effect of entrapped air or foam, geometry of equipment and temperature all influence the flow characteristics. Conventional laboratory viscometers are not suitable when dealing with a system of liquid, crystals and air.

At Okeelanta Sugar Refinery Inc., in Florida, a good comparison was obtained by measuring flow through the discharge valve of the pan as an orifice and measuring the time to discharge pans of equal volume, while controlling the Brix and temperature as closely as possible.

In all cases, increased fluidity was apparent with the use of "Hodag CB-6". The differences in times were considered significant. The time to empty No. 1 pan was reduced from 7 minutes to 4·5 minutes; No. 2 pan from 7·6 minutes to 4·3 minutes; No. 3 from 20·2 minutes to 12 minutes.

Another test was run at the Hutchinson Sugar Company in Hawaii, where very viscous massecuites are normally experienced. A crystallizer was split and alpha-MGE was added to half. In emptying the treated half, the fluidity was noticeably improved. It was also observed that the treated massecuite was considerably easier to handle in the continuous centrifugal and the capacity increased from 29·4 to 34·5 cu. ft. per hour, again indicating the improvement in fluidity (Figs. 2 and 3).

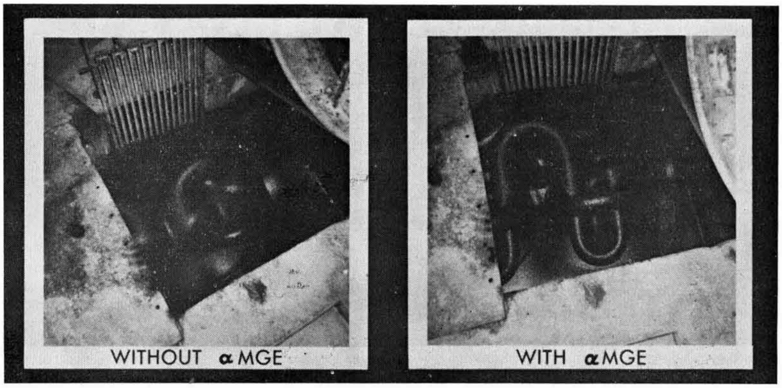



Fig. 2. Trough below crystallizer

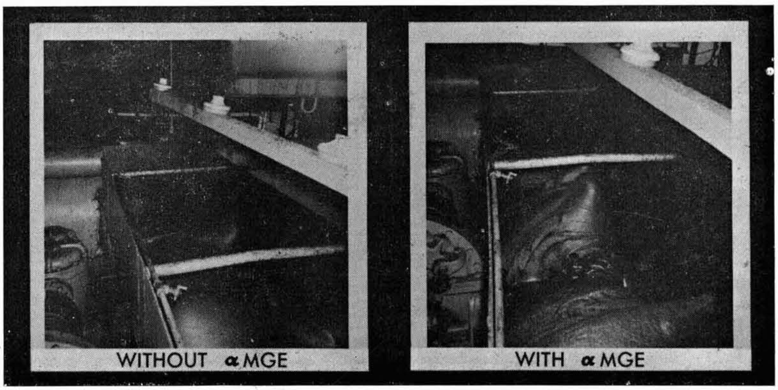



Fig. 3. Mixer above continuous centrifugal

An increase in the rate of heat transfer is another property which may be ascribed to the addition of alpha-MGE. This improvement may be attributed both to lower viscosity and reduced surface tension and it is difficult to separate the two.

The fact that lower viscosity results in improved circulation and therefore better heat transfer is quite evident.

With respect to interfacial tension, if the interfacial tension is low at the interface between the liquid and the heating surface, or in other words, if the liquid has a high tendency to wet the surface, the vapour bubbles will be pinched in at the heating surface and readily set free, as shown in Fig. 4.

If the liquid has a low tendency to wet the surface, the vapour bubbles will spread out at the surface and be set free only when comparatively large. Therefore, since the coefficient of heat transfer to a liquid is greater than that to a vapour, improved evaporation might be expected in the pans if the wetting properties of the sugar juices are improved. Data in Table I, obtained at Hutchinson Sugar Co., illustrate this.

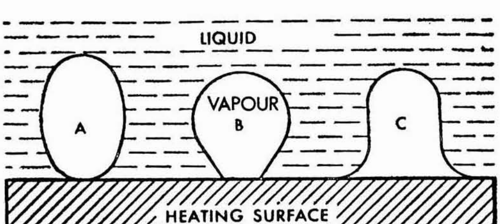



Fig. 4. Effect of interfacial tension on shape of bubbles of vapour

Alpha-MGE was added at a concentration of 100 p.p.m. based on pan capacity. The average pan times were reduced in *A*, *B* and low-grade strikes.

In tests run at Okeelanta Sugar Co., Florida, the average pan time for No. 1 pan (*C*-strike) was reduced from 132 minutes to 77 minutes. The time for No. 2 pan (*C*-strike) was reduced from 142 minutes to 73 minutes, and for No. 3 pan (*A*-strike) from 153 minutes to 93 minutes. Of interest, also, is the fact that one strike in No. 2 pan took only 57 minutes, as compared to the 142-minute average without the additive.

The same magnitude of improvement in pan times has not been experienced in all cases, and the above serve only as illustrations. Other factors, such as pan design, mechanical stirrers, available steam, etc. also have a large influence in this regard. Another contributing factor is the variability of the material being worked. To take this factor into consideration, in several cases, special tests have been devised.

At Okeelanta, during the *C*-pan cycles, No. 1 and No. 2 pans were occasionally boiled on the same footings. Half of No. 1 pan was split to No. 2 and both pans grown and dropped to the crystallizers. In an attempt to get a further comparison, alpha-

MGE was added to one pan and not the other and the pans were boiled simultaneously to approximately the same Brix. To eliminate the possible effect of mechanical differences in the pans, the procedure was then reversed and alpha-MGE was added to the other pan.

**Table I**

| *A*-strikes: *Strike No.* | *Boiling time (min)* |
|---|---|
| | Without alpha-MGE |
| 139 | 370 |
| 140 | 350 |
| 141 | 380 |
| 142 | 310 |
| 143 | 420 |
| 144 | Discarded over shutdown |
| 145 | 455 |
| 146 | 405 |
| 147 | 375 |
| 149 | 395 |
| 154 | 370 |
| Average | 383 |
| | With alpha-MGE |
| 148 | 350 |
| 150 | 305 |
| 151 | 335 |
| 152 | 300 |
| 153 | 375 |
| 155 | 370 |
| 156 | 325 |
| 157 | 310 |
| Average | 346 |
| Average reduction | 37 min = 9·7% |

| *B*-strikes: *Strike No.* | *Boiling time (min)* |
|---|---|
| | Without alpha-MGE |
| 54 | 410 |
| 55 | 465 |
| 56 | 425 |
| 58 | 405 |
| Average | 426 |
| | With alpha-MGE |
| 57 | 340 |
| 59 | 430 |
| 60 | 380 |
| Average | 383 |
| Average reduction | 43 min = 10·1% |

| Low-grade strikes: *Strike No.* | *Boiling time (min)* |
|---|---|
| | Without alpha-MGE |
| 50 | 975 |
| 51 | 745 |
| 52 | 780 |
| 53 | 725 |
| Average | 815 |
| | With alpha-MGE |
| 54 | 620 |
| 55 | 665 |
| 56 | 705 |
| 57 | 685 |
| Average | 668 |
| Average reduction | 147 min = 18% |

When the additive was used in No. 2 pan, the time of the strikes was 70 minutes compared with 110 minutes for the No. 1 pan. When the procedure was revised, the pan with Alpha-MGE was dropped in 68 minutes compared with 123 minutes for the pan without.

At Hutchinson Sugar Co., a low-grade pan was boiled to approximately 550 cu. ft. and given two equal "drinks" of diluted *B*-molasses. The boiling point elevation chart was observed and the time required to bring the pan back to the same B.P.E. was recorded. Without the alpha-MGE, 22 minutes were required, but with the additive, only 15 minutes —a reduction of about one-third. It was also noted that the temperature of the massecuite after the addition increased from 156° to 160°F, indicating improved circulation and heat transfer.

Another improvement due to increased fluidity of massecuite may be, of course, realized in the purging cycle. The evidence of increased continuous centrifugal capacity was mentioned earlier.

To determine the effect of alpha-MGE on massecuite purging at the Carlton factory of the Holly Sugar Corporation, Brawley, California, it was decided, at the suggestion of the factory personnel, to measure spectrophotometric transmissions of wet samples from the low-grade centrifugals, with and without alpha-MGE in the pan boiling, to determine the amount of colour bodies present, thereby indicating the efficiency of molasses removal.

A substantial improvement in transmission was noted during the test. The average transmission for samples from the treated pans was 51% compared with 32% for the untreated pans, an improvement of 63%.

It may be mentioned here, in passing, that alpha-MGE exhibited excellent defoaming properties in sugar juices. In fact, it proved generally superior to the distillate-based antifoaming agents at present on the market. As foam will interfere with heat transfer in the pans and purging in the centrifugals, not to mention limiting the capacity of the pans, crystallizers and molasses storage tanks, this property should not be overlooked.

Faster pan times, lower steam consumption and improved purging are extremely important. Perhaps, however, the greatest benefit to be gained from the use of a surface-active material such as alpha-MGE is the possibility of greater extraction or lowering of the final molasses purities.

Since alpha-MGE reduces viscosity, lowers surface tension and acts upon the melassigenic impurities of syrups and massecuites, with alpha-MGE it should be possible to improve extraction by taking the pans to a higher Brix and to cool the massecuite further in the crystallizers without creating operating problems in handling the massecuite. This, in return, would result in the recovery of more sugar from the molasses.

Such factors as invert sugars, impurities, etc., govern the theoretical exhaustibility of molasses, of course, and there are practical limits to reducing purities owing to slowing the rate of crystallization. However, factories do not operate in practice at these ideal levels.

Viscosity, *per se*, neither increases nor decreases recovery, but it does, in many cases, set the mechanical limits against which the factory must work to obtain maximum sugar recovery.

By using alpha-MGE as a tool and by modifying sugar boiling habits, sugar recovery may be improved in the factory. By utilizing the properties of improved fluidity or reduced viscosity and modification of surface tension characteristics, it should be possible to take the pans 1 to 2 points higher in Brix. Reduction or elimination of dilution water in the crystallizers, where used, should be possible. Additional cooling and less re-heating of the massecuite in the crystallizer may be realized.

A test was made during the 1965/66 campaign at the Caro, Michigan, factory of Michigan Sugar Company. Eight low raw pans were boiled without alpha-MGE, eight with, and eight more without. The results are presented in Table II.

**Table II. Effect of alpha-MGE on purity drop in low raw massecuites**

| | Brix | *Massecuite apparent purity* | *Final molasses apparent purity* | *Purity drop* |
|---|---|---|---|---|
| No alpha-MGE | 93·1 | 78·2 | 62·4 | 15·8 |
| With alpha-MGE | 94·2 | 79·2 | 62·6 | 16·6 |
| No alpha-MGE | 92·6 | 78·6 | 63·0 | 15·6 |

As may be seen, the Brix was increased by 1–1½ points and purity drop was approximately 1 point greater.

Similar tests have also been carried out in raw cane sugar factories and cane refineries. Table III illustrates data obtained during an evaluation of alpha-MGE at the Yonkers, New York, refinery of Refined Syrups and Sugars Inc.

The tests were run on *A*-remelt pans. Again higher Brix was obtained and evidence of improved extraction was given by increased purity drop.

Data in Table IV were collected at Central Fajardo, Puerto Rico, during tests run on low-grade strikes.

**Table IV**

| *Additive* | *"C" massecuite* Brix | Pol | Apparent purity | *Cyclone molasses purity* |
|---|---|---|---|---|
| None ...... | 94·86 | 57·52 | 60·45 | 48·80 |
| Alpha-MGE .. | 95·52 | 58·60 | 60·30 | 46·86 |

The use of alpha-MGE permitted tighter boiling of the pans with a resultant increase in extraction. At Reform Sugar Factory in Trinidad similar results were obtained (Table V): higher Brix, faster pan times, greater purity drop. These data were averaged from 20 strikes with, and 20 without alpha-MGE.

Admittedly, the data presented indicate comparatively small increases in Brix and extraction through the use of a surface-active chemical. However, there is a natural reluctance to make any major change without first making gradual changes, for fear of the difficulties that could be encountered in the factory if the additive did not perform as expected.

Many factories which have now had experience with alpha-MGE over several seasons are effecting major changes in the boiling cycle through its use.

One method is to use lower purity feed to the low-grade pans by mixing *B*-molasses with higher purity seed footing, maintaining the same purity drop in the pan and crystallizer and thus lowering final molasses purities. For example, if seed footing of a 75 purity and *B*-molasses of 47 purity is available for boiling a *C*-strike, the balance of footing to molasses is adjusted to reduce the massecuite purity. Generally this reduction is in the area of 2 to 3 points.

Another method is to cool the *A*-massecuite in crystallizers for several hours to reduce the purity of the *A*-molasses so that the final boiling is on *A*-molasses. This method needs to utilize the effect of a surface-active chemical to the fullest in order to obtain the maximum purity drop in both boilings, so that final molasses purities are not increased. The obvious advantages of this system, of course, is a reduction in circulation of non-sugars in the factory.

**Table III. Effect of alpha-MGE on boiling low-grade remelt strikes**

| *No. of strikes* | *Additive* | *A-massecuite* Brix | Purity | *A-molasses* Brix | Purity | *Purity Drop* |
|---|---|---|---|---|---|---|
| 15 ...... | None ........ | 94·09 | 77·22 | 87·05 | 56·03 | 21·35 |
| 13 ...... | Alpha-MGE .... | 94·70 | 77·73 | 88·59 | 55·77 | 23·13 |

**Table V**

| *No. of strikes* | *Additive* | *Boiling time (min)* | *Massecuite* Brix | Apparent purity | *Final molasses* Brix | Apparent purity | *Purity drop* |
|---|---|---|---|---|---|---|---|
| 20 ........ | None ........ | 495 | 98·14 | 56·51 | 89·02 | 28·08 | 28·43 |
| 20 ........ | Alpha-MGE .. | 425 | 98·34 | 56·72 | 89·36 | 27·67 | 29·05 |


**The effects of five legume crops on soil populations of the sugar beet nematode** (*Heterodera schachtii*). A. E. STEELE and C. PRICE. *J. Amer. Soc. Sugar Beet Tech.*, 1965, **13,** 314–317.—Microplots or troughs were used, the legumes being pole-beans, dwarf beans, peas, white clover and alfalfa or lucerne. Data from larval counts are given. These indicate that lucerne or white clover reduced the nematode population more than peas or beans. However, the nematode-trapping effect of these crops was not sufficient to affect subsequent population increases appreciably when sugar beets were grown.

* * *

**Occurrence of the alfalfa mosaic virus in sugar beet in California.** R. J. SHEPHERD, D. H. HALL and D. E. PURCIFULL. *J. Amer. Soc. Sugar Beet Tech.*, 1965, **13,** 374–377.—The occurrence of what is regarded as a new virus on sugar beet (stylet-borne) is reported. It was first observed on naturally infected sugar beet in three different fields in the Sacramento Valley in 1962. These fields were located near fields of alfalfa or lucerne.

* * *

**Improving sugar cane yields on Puerto Rico's north coast.** A. RIOLLANO. *Sugar y Azúcar*, 1965, **69,** (11), 56–57.—An account is given of attempts to reduce declining yields on 12 farms ranging from 300 to 600 acres, these being representative of the various soil and climatic conditions. Problems included drainage, irrigation, salinity, old ratoons and the use of inferior varieties. Remedial measures adopted are described, aircraft being used extensively to apply insecticides, herbicides and fertilizers.

* * *

**Response of sugar cane to different methods of application of nitrogenous fertilizers.** G. N. MISRA. *Indian Sugar*, 1965, **15,** 419–424.—Field trials with castor cake and ammonium sulphate, using four methods of application over four planting seasons, are reported. Differences were not significant and it was concluded that these two fertilizers could be applied at any time, e.g. in the furrows at planting time, provided soil moisture conditions are favourable.

* * *

**The present state of genetic monogerm breeding material.** K. H. BAROKA. *Zucker*, 1965, **18,** 654–660. The breeding of monogerm sugar beet varieties now presents no difficulty. The seed has a high rate of germination and of emergence. In trials in several different locations yields from monogerm seed were as high as those of multi-germ varieties. The extended use of monogerm varieties should save much labour.

**U.S. 59-16-1, a new sugar cane variety for South Florida.** F. LE GRAND. *Sugar J.* (La.), 1965, **28,** (7), 36–39.—Plant crop observations over four years with this variety are promising and indicate that it may be somewhat tolerant to frost. It may be well suited to cold areas in the vicinity of Lake Okeechobee.

* * *

**Relation of sugar cane growth to "Chlordane" and "Endrin" treatments in absence of insects.** R. MATHES, L. J. CHARPENTIER and W. J. MCCORMICK. *Sugar J.* (La.), 1965, **28,** (7), 44–45.—Sugar cane plants were grown in metal containers in sterilized soil and treated with these insecticides for control of insect pests, control plants being maintained. Both insecticides were equally effective in stimulating cane stooling, but neither had any direct effect on yields of cane at time of harvest. It was concluded that increased yields obtained by growers with these insecticides result from insect control.

* * *

**Louisiana State University breeding programme in sugar cane.** S. J. P. CHILTON. *Sugar J.* (La.), 1965, **28,** (7), 51–57.—The initial development of cane breeding work at Grand Isle and Baton Rouge in Louisiana is described and the methods used to induce flowering and seed production are reported. Details are given of selection work and the pros and cons of bunch planting.

* * *

**The Turkish sugar industry.** ANON. *Sugar J.* (La.), 1965, **28,** (7), 59–60.—The development of the sugar beet industry in Turkey from the establishment of the first factory at Alpullu in 1925 is discussed. The crop is now cultivated in 51 of the 67 provinces of Turkey and there are 17 factories. Large-scale or commercial seed production started in 1957. In southern Turkey, in the region known as Cukurova, sugar cane of the kind grown in the U.S.A. has been successfully grown experimentally.

* * *

**Breeding sugar cane varieties resistant to insect pests—a review. II.** R. A. AGARWAL. *Indian Sugar*, 1965, **15,** 475–477.—The writer summarizes the existing evidence of varietal resistance to individual insect pests of sugar cane that has accumulated in different parts of the world and discusses the possibility of this factor being considered in breeding.

* * *

**Methods to save sugar cane crops from lodging.** A. NATH and B. K. MATHUR. *Indian Sugar*, 1965, **15,** 479–483.—The causes and disadvantages of lodged cane are dealt with. The efficacy of earthing up and tying together of the canes of each stool, under Indian conditions, is discussed as a result of field trials over a period of 4 years.

**New aids in the selection of disease resistant varieties of sugar cane.** L. ANZALONE and S. J. P. CHILTON. *Sugar J.* (La.), 1966, **28**, (8), 16–17.—The advantages of 2¼-in peat moss pots, in place of traditional clay pots of similar size, in planting out seedlings is described, and the advantages of the new Holland mechanical transplanter now used are discussed. With this, 4 men did the work of 14 men employing the older method of hand planting using a tractor-mounted dibbler. The machine set the plants deeper and packed the soil more tightly around the seedlings. The final seedling stands were improved.

* * *

**A morphological study of the causal organism of cane smut in Taiwan.** TIEN-HUA CHEN and CHO-SAN WANG. *Taiwan Sugar Quarterly*, 1965, **12**, (4), 11–13.—Information is given on four different kinds of cane smut (*Ustilago*) that occur in Taiwan, including notes on their prevalence and distribution.

* * *

**Reproductive potential of the sugar cane grey borer.** Y. S. PAN, S. L. YANG and C. C. CHUANG. *Taiwan Sugar Quarterly*, 1965, **12**, (4), 23–29.—A better knowledge of the reproductive processes of this borer (*Eucosma schistaceana*) may, it is thought, have a definite bearing on future methods of control, e.g. use of attractants, release of sterilized males (gamma radiation), etc. Studies with both laboratory-raised and field-caught insects are reported.

* * *

**Performance of some foreign varieties of sugar cane to insect pests—a review. III.** R. A. AGARWAL. *Indian Sugar*, 1965, **15**, 541–549.—A summary is given of the recorded behaviour or resistance of various individual cane varieties to certain insect pests, each variety being considered separately.

* * *

**Relation of water soluble substances in fruits of sugar beet to speed of germination of sugar beet seeds.** F. W. SNYDER, J. M. SEBESON and J. L. FAIRLEY. *J. Amer. Soc. Sugar Beet Tech.*, 1965, **13**, 379–388. At least 10 substances, 9 being organic, may inhibit germination in sugar beet fruits. This paper reports a significant correlation between water-soluble oxalate in the fruit and speed of germination of sugar beet seeds. The oxalate was concentrated in the corky material of the fruit.

* * *

**Preplant weed control on sugar beets.** E. F. SULLIVAN, R. R. WOOD, R. L. ABRAMS and S. G. WALTER. *J. Amer. Soc. Sugar Beet Tech.*, 1965, **13**, 389–396. An account is given of experiments to determine the effectiveness of new herbicides and herbicide combinations in order to increase the spectrum of weed control on sugar beet. "Pyrazon" gave effective broad-leaved weed control but was ineffective in the control of grass, while CP 32179 and TD 282 gave additional control of grass. These were more effective on light than heavy soils. "Pyrazon" in combination with certain other insecticides effectively controlled some broad-leaved and grassy weeds.

**Breeding sugar beets for resistance to the cyst nematode, *Heterodera schachtii*.** C. PRICE. *J. Amer. Soc. Sugar Beet Tech.*, 1965, **13**, 397–405.—Lines showing promise of appreciable nematode resistance have been obtained from the curly top-resistant varieties US22, US56/2 and US33; other lines have been obtained from *Cercospora* leaf spot-resistant varieties. Some selections have shown resistance to a combination of nematode and *Rhizoctonia* root rot.

* * *

**Sugar beet tops and modern sugar beet production.** L. HARRIS, D. C. CLANTON and M. A. ALEXANDER. *J. Amer. Soc. Sugar Beet Tech.*, 1965, **13**, 432–447. Experiments during the last 12 years on the use of silage from sugar beet tops as roughage in lamb and cattle finishing rations are reported. With lambs, the sugar beet silage was eminently satisfactory, being as good as or better than corn silage. With cattle it was not so satisfactory and had a laxative effect.

* * *

**The search for disease resistant varieties of sugar cane in Madagascar.** P. BAUDIN. *Doc. Inst. Recherches Agron. Madagascar*, 1965, (59), 3–7.—Varieties that have shown promise in resistance to Fiji disease (a virus) include Co 290, CP 44-101, M 165-38, M 63-39, M 202-46, Pindar, Q 50, Q 57, Ragnar, Trojan, R 331 and S 17. Varieties resistant to leaf scald (*Xanthomonas albilineans*) include Q 57, M 112-34, B 46-364, CL 41-223, M 253-48, M 272-52, N: Co 376 and Q 58.

* * *

**Magnesium deficiency.** ANON. *Cane Growers' Quarterly Bull.*, 1966, **29**, 88.—Reasons are given why "orange freckle" of sugar cane in northern Queensland may be due to magnesium deficiency.

* * *

**Varieties for new land on the Far North.** C. D. JONES. *Cane Growers' Quarterly Bull.*, 1966, **29**, 93–95. Land newly assigned for cane in the north of Queensland is usually of a poorer nature than existing cane lands and care is necessary in choosing suitable varieties. Suggestions are made for soils liable to water-logging, soils with average soil moisture and soils liable to drying out.

* * *

**Disease resistance of approved varieties.** C. G. HUGHES. *Cane Growers' Quarterly Bull.*, 1966, **29**, 100–102. A table is given listing some 4 dozen varieties and their degree of susceptibility to 8 diseases that attack cane in Queensland, viz. chlorotic streak, Fiji, mosaic, ratoon stunting, red spot, yellow spot, leaf scald and top rot.

* * *

**Yields of foreign varieties in Asturias and Santos-Lopez.** I. J. HARESCO and R. C. PARGO. *Sugarland* (Philippines), 1965, **2**, (11), 14–17.—Two sets of variety tests were carried out. The performance of imported (foreign) varieties was poor compared with the variety POJ 3016, and they were considered unsuitable for local conditions.

**V-type ditches.** L. L. LAUDEN. *Sugar Bull.*, 1966, **44,** 180, 184.—It is pointed out that in Louisiana there has been a gradual trend towards V-type ditches in cane fields in recent years. The advantages of the V-type ditch are outlined under seven headings.

* * *

**Nutrient availability and uptake by sugar cane.** L. E. GOLDEN. *Sugar Bull.*, 1966, **44,** 182–183.—Soil samples, after 3 years of cane cropping, were taken from several selected sites and analysed (for N, P and K). Analysis showed a general tendency for available P and K to become progressively lower with several years of cropping. Leaf blade analysis was also carried out.

* * *

**Ratoon stunting disease not seed transmitted.** I. L. FORBES. *Sugar Bull.*, 1966, **44,** 194–196.—Four severely infected plants (variety CP 44-101) were selfed and the resulting seed sown. Results showed that the virus is not transmitted through true seed. Node symptoms in young plants were not always reliable, tending to disappear in summer months.

* * *

**Fertilizer trials in Réunion.** J. FRITZ. *Ann. Rpt. Inst. Recherches Agron. Tropic.*, 1964, 13–22.—An account is given of extensive N-P-K fertilizer trials. Unfortunately cyclones, drought and disease adversely affected the results. It was thought that the abnormally poor response to N may have been due to acute P deficiency in the soil.

* * *

**Sugar cane diseases in Réunion.** M. HOARAU. *Ann. Rpt. Inst. Recherches Agron. Tropic.*, 1964, 23–55. A list is given of seventeen cane diseases known to occur in Réunion. The more important of these are discussed, viz. gummosis, ratoon stunting disease, chlorotic streak, and leaf scald. The giant Asiatic grass "tiger grass" (*Thysanolaena maxima*) and the Royal palm (*Roystonia regia*) are quoted as secondary hosts of gummosis disease.

* * *

**Introduction of** ***Diatraeophaga striatalis*** **to Madagascar and Réunion.** J. BRÉNIÈRE. *Ann. Rpt. Inst. Recherches Agron. Tropic.*, 1964, 64–69.—An account is given of the introduction of this sugar cane borer parasite from Java. The journey (from Djatiroto to Tananarive *via* Djakarta and Paris) averages 5–7 days. Of the adult insects, 1700 or 12% arrived alive. How successful naturalization may be remains to be seen.

* * *

**Chemical fertilization of sugar cane.** J. T. VAZ. *Agronomia Angolana*, 1964, (19), 39–75.—A detailed account is given of fertilizer experiments with sugar cane carried out on cane fields belonging to Sociedade Agricola do Cassequel at Catumbela. Effects of N, P and K at various levels and in one or two doses on two types of soil were investigated. In general, application in two doses was more favourable than in one. P and K on their own had no significant effect on production. N (sulphate of ammonia) showed marked results in applications up to 750–800 kg/hectare.

**The reproductive system in** *Numicia viridis*. M. B. BAYER. *S. African J. Agric. Sci.*, 1965, **8,** 1009–1014. The article deals with the "green leaf sucker" or "numicia" sugar cane pest which has become serious in recent years in parts of Natal and Swaziland. Internal and external genitalia of the insect are illustrated and described, as are oviposition and the egg. The study is intended to serve as a basis for further investigations concerning mating behaviour, copulation, fertilization, etc.

* * *

**Sugar cane breeding centre.** ANON. *Kenya Farmer*, 1964, (98), 9; through *Plant Breeding Abs.*, 1966, **36,** 311.—A central sugar cane breeding unit for East Africa is being established at Kituza, Uganda, with a substation in the Nyanza part of Kenya.

* * *

**Developing sugar cane varieties for Florida.** L. P. HEBERT. *Proc. Soil Crop Sci. Soc. Fla.*, 1964, **24,** 427–429; through *Plant Breeding Abs.*, 1966, **39,** 311. Expansion of cane cultivation to colder areas has placed emphasis on early maturity. Some varieties bred for Louisiana are proving adaptable to Florida, e.g. CP 50-28, adapted to peaty muck soils and sandy soils in the colder areas, and CP 34-79 and CP 52-68. Breeding from these is in progress.

* * *

**Sugar cane varieties held at Muguga, Kenya.** ANON. *Pl. Introduct. Newsletter FAO*, 1965, (15), 17–19; through *Plant Breeding Abs.*, 1966, **36,** 311.—A list is given of varieties maintained at the Plant Quarantine Station of the East African Agriculture and Forestry Research Organization, Kikuyu, Kenya. The station can provide material in February and July-August.

* * *

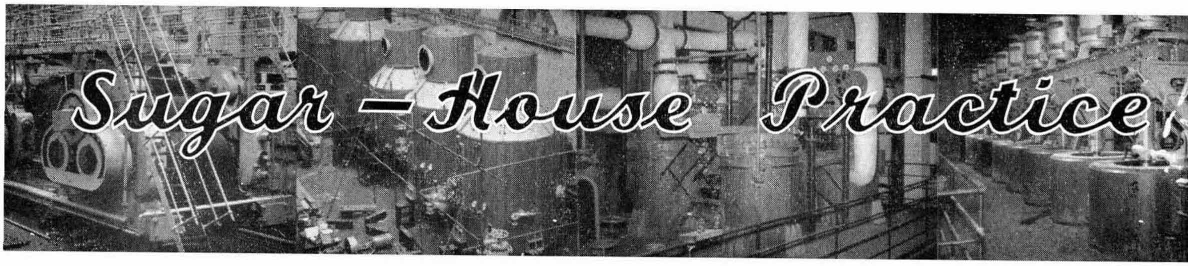
**Sugar cane flowering.** ANON. *Agric. Res. Wash.*, 1965, **13,** (10), 13; through *Plant Breeding Abs.*, 1966, **36,** 311.—Experimental removal of the leaf spindle (the central column of unfurled leaves) has shown that it plays an essential part in the initiation of floral components and also influences subsequent development for 2 to 3 weeks. Other leaves complement the spindle in flower initiation and influence floral development for a further 2 weeks after the spindle has become ineffective.

* * *

**A new method for determining drought resistance in sugar cane varieties.** K. K. PRASADA RAO and A. SANANDACHARY. *Andhra Agric. J.*, 1964, **11,** 200–204; through *Plant Breeding Abs.*, 1966, **36,** 313.—Laboratory tests, involving measurement of decreases in shoot moisture and in root and shoot weight, were carried out on 6 varieties to measure drought resistance. They were in agreement with field observations.

* * *

**Studies on sugar cane rust in India.** M. L. SAHNI and B. L. CHONA. *Indian Phytopath.*, 1965, **18,** 191–203; *Plant Breeding Abs.*, 1966, **36,** 313.—The rust was *Puccinia erianthi* and was tested on 22 varieties of sugar cane. Only 3 proved susceptible, viz. Co 513, CoS 186 and CoS 510.




**Determination of the (flow) rate at which fluidization starts in white sugar drying.** I. B. NOVITSKAYA. *Sakhar. Prom.*, 1966, **40**, (2), 14–16.—It was found that a fall in the sugar moisture content is accompanied by a reduction in the size of agglomerates, which in turn reduces the required flow rate at which fluidization commences ($v''_f$). Considerable increase in this flow rate at a high sugar moisture content leads to the formation of large sugar "flakes", which subsequently strike one another and are shattered into small particles. It was found that the value of $v''_f$ does not depend on the temperature of the fluidizing medium at constant sugar moisture and grist size. The angle of slope of the straight line expressing the relationship between $v''_f$ and sugar moisture content depends on sugar particle size. The value of $v''_f$ is calculated as $v'_f + a\ (W^c - 0{\cdot}03)$ m/sec, where $v'_f$ is the rate at which fluidization of dry sugar of identical size fraction commences, $\alpha$ is the angular coefficient and $W^c$ is the sugar moisture content % weight of dry material. Values of $\alpha$ may be found from a graph of $\alpha$ *vs.* equivalent diameters of sugar particles, while $v''_f$ can be calculated from the expression given earlier[1]. A worked example is given.

* * *

**Reducing sugar losses in raw sugar processing.** G. M. KHITUN. *Sakhar. Prom.*, 1966, **40**, (2), 41–43.—To reduce the sugar content of press mud, the latter is fed to a mixer where it is diluted with hot ammoniacal water and heated with steam to 80–85°C. The suspension is then recirculated continuously until the filter press has been cleaned, after which the mud is filtered by vacuum filters. The mud from these is washed into the drains with hot water, while the filtrate is used for melting raw sugar. By this means the sugar content of press mud has been reduced from 0·35–0·59% to 0·07% on weight of raw sugar at one factory and from 0·2–0·4% to 0·05–0·12% at another.

* * *

**Graining method for *C*-strikes.** C. G. GOKHALE. *Proc. 20th Ann. Conv. Deccan Sugar Tech. Assoc. (India)*, 1965, 5–9.—The technique used in preparing a seed slurry of powdered (6–10 μ) sugar in denatured alcohol, by means of a ball mill, is described, with details of its use for graining the *C*-strike and the advantages resulting.

* * *

**Processing juices from cane growing in alkaline heavy soils.** B. H. HOSING, N. G. PATEL, J. N. SHENOLIKAR and R. R. UNDE. *Proc. 20th Ann. Conv. Deccan Sugar Tech. Assoc. (India)*, 1965, 66–73.—Drainage in the soils referred to is poor and the cane juices contain a high inorganic non-sugars content. Scaling in the last evaporator effect is heavy and duplicate vessels have to be used alternatively. Some relief has been obtained by application of presulphitation and addition of 10–15 mg/litre of $P_2O_5$ to juice leaving the clarifier. The high non-sugar content in juice also leads to a greater load on the low-grade boiling house and high molasses loss. Increase in crushing rate has only been permitted by use of mechanical circulators in pans and additional crystallizer and centrifugal capacity.

* * *

**Loss in molasses at Sakarwadi.** A. A. KHOT and M. A. GUNDECHA. *Proc. 20th Ann. Conv. Deccan Sugar Tech. Assoc. (India)*, 1965, 76–79.—The boiling process at Sakarwadi was changed in 1963/64 whereby all the *B*- and *C*-massecuites were grained on *A*-molasses, and all the *B*-massecuite was used as seed for the *A*-strike. The crystals produced were smaller, but final molasses purity was reduced from 37–38 to 34·64.

* * *

**Settling of treated cane juice.** D. P. KULKARNI. *Proc. 20th Ann. Conv. Deccan Sugar Tech. Assoc. (India)*, 1965, 92–102.—Difficulties in mud settling were eliminated in laboratory and factory-scale trials, by adding a solution of "Separan AP-30" to juice before settling. An amount of 2 p.p.m. proved efficacious, while other treatments including reduction of phosphate added, dilution to 16·5–17°Bx, addition of formaldehyde and of "Lytron X", presulphitation and pH changes had all proved ineffective.

* * *

**Studies in clarification.** D. P. KULKARNI and M. K. PATIL. *Proc. 20th Ann. Conv. Deccan Sugar Tech. Assoc. (India)*, 1965, 103–114.—Analyses of clear juices were made after lime defecation and after sulphitation during the periods when these procedures were in use for manufacture of raw sugar and white sugar, respectively. Sulphitation was found to increase the juice CaO content from 1222 to 1765 mg/litre on average, while phosphate fell from 66·5 to 27 mg/litre, the phosphate in clear juice being apparently unaffected by phosphate added during the process. The CaO content in clear juice was higher when immature cane was being crushed. A rise of 1 unit in both apparent and true purity occurred during defecation, the CaO content rose by 200 mg/litre, while the $P_2O_5$ content in clear juice was almost the same as with sulphitation.

[1] *I.S.J.*, 1965, **67**, 340.

**A résumé of evaporator performance.** TECHNICAL STAFF OF UGAR SUGAR WORKS LTD. *Proc. 20th Ann. Conv. Deccan Sugar Tech. Assoc. (India)*, 1965, 143–150.—Opinions expressed in the literature on adequate values of evaporation rate (lb/sq.ft. h.s./hr) are reviewed and it is pointed out how far the evaporators at 25 out of 26 local factories fall below these criteria. Factors which can improve performance are briefly surveyed, some of these having been applied at Ugar Sugar Works Ltd.

* * *

**Slip ring induction motor and its proper use in sugar factories.** B. K. CHATURVEDI and H. B. PATEL. *Proc. 20th Ann. Conv. Deccan Sugar Tech. Assoc. (India)*, 1965, 151–157.—A slip-ring motor at Godavari Sugar Mills Ltd. was not suitable for use as a cane carrier drive but became so on modification by additional resistances in each phase of the rotor circuit with push-button controls for cutting these resistances in and out. In this way the motor could be operated at speeds of 560, 900, 1270 and 1450 r.p.m., which provides adequate variation for the cane carrier. The possibility of arranging a suitable set of controls with a slip-ring motor for driving a centrifugal is discussed briefly.

* * *

**Reduction of sugar loss in molasses. Graining techniques.** S. C. GUPTA, M. SINGH and B. C. JAIN. *Proc. 20th Ann. Conv. Deccan Sugar Tech. Assoc. (India)*, 1965, 161–170.—The history of "true seeding" is reviewed and an account given of trials carried out by National Sugar Institute staff. A ball mill was designed and built for preparation of the slurry of 5$\mu$ crystals used in the tests. Results obtained at seven factories are tabulated; use of "true seeding" resulted in the desired grain size with less fluctuation and greater uniformity, molasses purity was improved and the recirculation of non-sugars reduced. Molasses exhaustion was improved markedly, giving better overall working.

* * *

**A plea for the use of superphosphate in clarified juice for manufacture of better quality sugar.** S. C. GUPTA and N. A. RAMAIAH. *Proc. 20th Ann. Conv. Deccan Sugar Tech. Assoc. (India)*, 1965, 171–178.—It has been observed that the presence of phosphate inhibits or reduces the extent of invert sugar destruction in hot alkaline solutions, with consequently lower colour production. It is suggested, therefore, that addition of phosphate to clarified juice would lead to a better quality sugar as well as reduction of evaporator scale and other benefits.

* * *

**New concept for the design of (a) vacuum pan.** B. B. PAUL. *Proc. 20th Ann. Conv. Deccan Sugar Tech. Assoc. (India)*, 1965, 179–186.—See *I.S.J.*, 1966, **68**, 118.

**Static and dynamic balancing of rotating bodies. Principles and corrections.** V. K. CHATURVEDI. *Proc. 20th Ann. Conv. Deccan Sugar Tech. Assoc. (India)*, 1965, 187–192.—The principles of static and dynamic balancing of rotating bodies are discussed and an account given of the balancing of ten centrifugal baskets made in the author's factory workshops.

* * *

**Evaluation of gul quality in relation to crushing of "millable cane" *vs.* "whole cane" (with trash and tops) in three important varieties.** D. G. DAKSHINDAS, R. A. KALE and S. U. CHINCHORKAR. *Proc. 20th Ann. Conv. Deccan Sugar Tech. Assoc. (India)*, 1965, 191–204.—Removal of trash and tops was found to give higher recoveries of gul from all three varieties—Co 419, Co 740 and Co 775, and the first two also gave better gul quality although Co 775 gave better quality gul if the trash was not removed. This variety gave the best gul quality of the three. Removal of trash and tops is recommended.

* * *

**Studies on the use of flocculating agents during sugar cane juice clarification. V. Trial of "Separan AP-30" in a sugar factory in Maharashtra.** S. BHOSE, K. C. GUPTA, S. MUKHERJEE and A. N. SHRIVASTAV. *Proc. 20th Ann. Conv. Deccan Sugar Tech. Assoc. (India)*, 1965, 210–214.—Addition of 2·5 p.p.m. of "Separan AP-30" to the juice line feeding the clarifier at the 1250 t.c.h. factory, in the form of a 0·05% solution, resulted in a marked decrease in mud volume, which eased the work of the filter station. Juice clarity was improved and the Oliver filtrate could be returned to the clarifier instead of going back to the mixed juice. It was further noted that wax and starch in white sugar were reduced by the use of "Separan".

* * *

**Sucrose loss suffered in accidentally-burned cane.** A. VELASCO P. *Bol. Azuc. Mex.*, 1965, (198), 30–32. Cane of three varieties—Co 290, Co 419 and H 37-1933—was examined by analysis of stalks and juice at 4-day intervals during a period of 24 days after an accidental burn. The original values were taken as those determined 15 days before the burn, and the falls in purity, yield and sucrose content and rise in reducing sugars during the period are recorded in graph form. The greatest resistance to loss was shown by Co 290 and the least by H 37-1933.

* * *

**Practical measures for reduction of sucrose loss in juice accumulated in decanters during shut-downs.** K. KLAN. *Brasil Açuc.*, 1966, **67**, (1), 62–64. Measures proposed to reduce sugar losses include: cooling or heating to a calculated temperature, depending on the probable duration of the shut-down, to bring the final temperature to no lower than 82°C; addition of two or three times the usual amount of trisodium phosphate before the shut-down to avoid a fall in pH; and careful addition of lime to the mixed juice to have the same effect.

# BEET FACTORY NOTES

**Problem of the purification of juice from partly decayed beets. III.** S. GAWRYCH, H. GRUSZECKA, I. OGLAZA and T. PIETRZYKOWSKI. *Prace Inst. Lab. Badawczych Przemyslu Spozywczego*, 1964, **14**, (4), 1–11; through *S.I.A.*, 1965, **27**, Abs. 869.—Semi-commercial-scale tests on the slicing of beets 1–10 days after thawing, and laboratory tests on the degradation of invert sugar during one-stage (pH 9·5) or two-stage (pH 9·5 and 10·8) defeco-saturation or 2nd carbonatation of juices from such beets are reported. The sucrose content of the beets and the quality of the cossettes deteriorated rapidly after thawing. It was impossible to obtain satisfactory cossettes after 8–10 days of storage at approx. 20°C. The two-stage defeco-saturation process gave a greater degradation of invert sugar than did the single-stage process, and gave a more highly coloured thin juice. The single-stage process gave a much shorter sedimentation time. The purities of the thin juices resulting from the two processes were about equal.

* * *

**Fermentation of sugar factory diffusion waste waters.** H. BIERWAGEN and S. KOLACZOWSKI. *Zeszyty Nauk. Inst. Gospod. Komun.*, 1962, (5), 3–76; through *Ref. Zhurn. Khim.*, 1964, 171234.—The application of the Nolte process (acid fermentation followed by alkaline fermentation) to diffusion waters was studied. Rapid acidification took place in the alkaline medium, and it is concluded that the alkali treatment is unnecessary. A maximum $BOD_5$ removal of 66% was obtained after 5–7 days of acid fermentation. Oxygen uptake fell by a maximum of 95% after 11–13 days.

* * *

**Deionization of sugar juices by electrolysis in ion exchange columns. I. Electrical conductivities of ion exchange columns.** J. BURIÁNEK and P. KADLEC. *Listy Cukr.*, 1965, **81**, 260–267.—Analysis of ion exchange resin conductivities showed that cations and anions can be arranged in a series, according to their decreasing conductivity, which is identical with the Hofmeister lyotropic series of decreasing affiinity of cations to a cation exchanger and anions to an anion exchanger. Hence, measured values of exchanger conductivity can be applied to a numerical expression of the affinities of individual ions to a resin. Resin conductivity is directly proportional to the mobility of the ions adsorbed by the resin. It is thus a function of the conductivity of the solution being treated and of the conductivity of the column itself, which is considered as a system composed of resin particles and solution. Graphs and tables are presented showing the conductivities of anion and cation exchanger columns together with corresponding values for various solutions, as well as conductivities and mobilities of the anions and cations at corresponding resin conductivities. It was found that the presence of ion exchange resin raised the conductivity of a sugar solution by approx. 300%, the greatest effect occurring at a solution Brix in the range 0–30%.

**Losses of beet stored in factory piles.** L. SCHMIDT, A. HAVRÁNEK, J. ZAHRADNIČEK and B. VORLIČKOVÁ. *Listy Cukr.*, 1965, **81**, 273–278.—Losses in stored beet during the period 1955–64 have been studied in relation to the weather conditions during the growth period, particularly the rainfall in the April-June and June-September periods. Although during this 10-year period the daily sugar losses in beet piled when dry were half those in wet beet, 3-year tests at one factory showed hardly any differences in sugar losses for both beet conditions, while the weight loss in the dry beet was lower than in the wet beet, in contrast to the results over the 10-year period when the weight loss in the wet beet was one-tenth that in the dry beet. (In the 3-year test the wet beet storage period was half that of the dry beet.)

* * *

**Filter-thickeners.** H.-J. PRAUS. *Zucker*, 1966, **19**, 38–43.—The advantages of filter-thickeners over settlers are discussed and descriptions are given of various units operating in German sugar factories. These include the Gaudfrin filter[1] manufactured by Buckau R. Wolf, the Schumacher ceramic filter, the Grand Pont filter[2], the Walter Thron design, and the Putsch batch and continuous types.

* * *

**Operation of water separators at No. 2 Gorodokskii sugar factory.** I. I. BUSLOVICH. *Sakhar. Prom.*, 1965, **39**, 859–860.—Snags in the operation of disc-type water separators before and after the beet washers and modifications made to the discs are described.

* * *

**Capacity and maximum capacity of filters.** B. BRUKNER. *Zucker*, 1966, **19**, 43–45.—A formula is derived for calculating the capacity of a rotary filter. It assumes knowledge of the specific filtration resistance[3] and the mud content of the suspension, and takes the form: $S = O\sqrt{\frac{2Pn\beta}{\alpha W_s 60}}$ ml/sec, where $S$ = mud volume, $O$ = filter surface (sq.cm.), $P$ = pressure, $n$ = r.p.m., $\beta$ = ratio of filtering surface:total surface, $\alpha$ = ratio of "height" of filtrate (volume of filtrate/filter surface):cake thickness, and $W_s$ = specific filtration resistance of the mud suspension. The specific filtration resistance of the filter is assumed to be so small that it can be omitted. With batch filters the maximum throughput is attained with highly permeable cloths, when the filtration time will equal the interval between filtrations. Should the permeability of the cloths be below requirements, the filtration time should be greater than the interval between.

[1] *I.S.J.*, 1964, **66**, 130.
[2] *I.S.J.*, 1963, **65**, 77–80.
[3] *I.S.J.*, 1966, **68**, 247.

**Fluidization drying of carbonatation mud by boiler flue gases.** S. ZAGRODZKI and W. STANKIEWICZ. *Gaz. Cukr.*, 1965, **73**, 289–292.—In a small experimental counter-current drying column of 0·45–0·90 kg/hr throughput, mud from a press directly connected to the unit was dried to a granular product of 8·8–19·1% moisture content in a fluidized bed through which flue gas of 110–115°C was blown. The initial mud moisture content was 37–48%.

* * *

**Sediment (formed) in the concentration of beet syrup.** I. F. ZELIKMAN and V. A. KOLESNIKOV. *Izv. Vysshikh Ucheb. Zaved., Pishch. Tekhnol.*, 1965, (3), 47–50; through *S.I.A.*, 1965, **27**, Abs. 964.—The removal of suspended matter from thick juice by "intermediate" filtration of syrup between the 3rd and 4th effects of the evaporator was investigated at four factories in the Krasnodar region. This operation enabled the thick juice to be concentrated to 70–73°Bx in the 4th effect, by eliminating thick juice filtration. The juice from the 3rd effect, at 52–56°Bx, was filtered in Proksh mechanical filters at 90–94°C at the high mean rate of 5·2 litres/sq.m./min over an 8-hr cycle. The amount of suspended matter was determined by progressively concentrating the juice and filtering off the sediment formed at each stage. The largest amount of suspended matter appeared between 33° and 53°Bx. Filtration of the juice at 53°Bx removed 90–93% of the total suspended matter formed in concentrating thin juice to 65°Bx; only small amounts were added above 65°Bx. Over 50% of the sediment formed above 53°Bx was deposited in the 4th effect, mainly as calcium oxalate. The thick juice at 73°Bx, obtained after intermediate filtration, therefore contained only $\sim 2 \times 10^{-4}$ g of sediment/litre, or 0·0015% on weight of white sugar. Addition of yellow beet sugar melt to the syrup from the intermediate filtration increased the thick juice sediment by only approx. 25%.

* * *

**Influence of the principal non-sugars of molasses on its viscosity.** T. P. KHVALKOVSKII. *Izv. Vysshikh Ucheb. Zaved., Pishch. Tekhnol.*, 1965, (3), 51–53; through *S.I.A.*, 1965, **27**, Abs. 981.—Standards for comparing the melassigenic effects of various non-sugars are discussed from the viewpoint of their effects on viscosity. Measurements taken in an earlier study[1] are tabulated (for the first time) to show the effect of the added non-sugars on the standard Brix of the molasses and on its viscosity at 82°Brix. The latter values are in inverse relationship to their melassigenic coefficients (with some exceptions), i.e. the K- and Na-containing molasses had the lowest viscosities. It is argued that the true melassigenic effect of a non-sugar is measured by the amount of water in the molasses due to the non-sugar; this is calculated, by adding the amount of sugar "held" by the non-sugar, according to the formula $(1 + m)\ W/B$, where $m$ = melassigenic coefficient of the non-sugar, $W$ and $B$ = water and dry solids contents of standard molasses, respectively. Values of the amount of water/g of non-sugar are tabulated for 17 non-sugars, based on the standard Brix values of the studied molasses. These show that the melassigenic effect on sucrose solubility outweighs the influence of altered viscosity, so that the melassigenic effects correspond to the melassigenic coefficients of the non-sugars. It is emphasized that when $Ca^{++}$ or $Mg^{++}$ ions are substituted for $K^+$ or $Na^+$ ions to improve molasses exhaustion, the resulting massecuite must be cured at a relatively low Brix.

* * *

**Automation of the low-grade boiling process in sugar factories.** H. HEISRATH and A. JOSEPH. *Zeitsch. Zuckerind.*, 1966, **91**, 32–35.—An automatic boiling scheme based on conductivity control is described. When the calandria is immersed by incoming feed, the inlet valve is automatically opened and the syrup feed markedly reduced or stopped altogether. The conductivity falls with heating and evaporation at the constant massecuite level, which is maintained automatically. At the desired supersaturation, the limit indicator signals the "seed point" and the magnetic valve connected to the seeding device opens. When the required amount of seed is obtained, the limit indicator switches off the regulator, the valve closes and boiling re-commences. The conductivity continues to fall to a lower limit, at which the vapour valve is automatically closed. The end-position switch on this valve opens the vacuum valve, the end-position switch on which then opens the air feed valve. The impulse transmitted by the opening of the air feed valve opens the massecuite discharge valve, through a time relay, as soon as the partial vacuum in the pan has been adjusted to the atmospheric pressure. As soon as the pan is empty, steaming-out automatically commences and after a set time the air feed and massecuite discharge valves are closed simultaneously. The end-position switch on the massecuite discharge valve transmits a signal for opening of the vacuum valve, and as soon as the vacuum in the pan has reached the desired value, a signal is transmitted to the switchboard indicating that the pan is ready for the next strike.

* * *

**Methods of decolorization of sugar solutions with active carbon.** H. ZAORSKA. *Ind. Sacc. Ital.*, 1965, **58**, 324–347.—See *I.S.J.*, 1966, **68**, 85.

* * *

**Determination of the specific filtration resistance of carbonatation juice.** B. BRUKNER. *Zucker*, 1966, **19**, 62–63.—The specific filtration resistance $(W_s)$[2] can be easily determined using the Brieghel-Müller apparatus, given the mean lime content of the juice. A sample calculation is given, whereby the factor is obtained by which the filtration time is multiplied to give the required value of $W_s$.

[1] *I.S.J.*, 1965, **67**, 90.
[2] *See I.S.J.*, 1966, **68**, 247.

# NEW BOOKS AND BULLETINS

**F. O. Licht's Internationales Zuckerwirtschaftliches Jahr- und Adressbuch 1965/66 (International Sugar Economic Yearbook and Directory).** H. AHLFELD. 442 + 64 pp.; $8\frac{1}{2} \times 11\frac{1}{2}$ in. (F. O. Licht K.-G., P.O.B. 90, 2418 Ratzeburg, Germany.) 1966. Price: DM 42; £3 16s 0d.

The high standards of this annual publication are maintained in the latest edition which incorporates a number of changes in the countries included in the factory sections. As usual, the contents include sections on laws, agreements and contracts, German and other sugar organisations, sugar importers and exporters in Europe and other continents, details of German beet sugar factories and refineries, European and non-European beet factories and refineries. Three technical articles appear: one by Dr. VOLCK on the comparative economics of beet agriculture, a paper by R. SCHNEIDER on electronic data processing in the sugar industry, and a review of bagasse utilization by J. E. ATCHISON. (The first two are in German and English, the last in English only.) A survey of the German sugar machinery and factory construction industries (again in German and English) is followed by reports from German sugar machinery and factory manufacturers. The book concludes with a Buyers' Guide listed by products, an English-German vocabulary of sugar machinery, and some information on a number of sugar publications, with publishers' addresses. A 64-page supplement on world sugar statistics for 1965/66 is included as a separate booklet housed in a pocket at the back of the directory.

Generally, information on the sugar factories and refineries is given in German, French, English and Spanish, but in many cases only German and/or English are used, although it is easy to find the most useful information, such as factory capacity and location, by consulting a short list giving meanings of abbreviations used throughout the relevant sections. The beet factory section includes two new countries: Albania and Mainland China. The cane section has four new countries: China, Ghana, Malawi and Zambia, although, of course, information on the Zambian industry was formerly to be found under Northern Rhodesia. The information on the Mainland Chinese beet and cane industries is somewhat sketchy, but is nevertheless a very welcome start, and we must hope that Licht will be able to obtain further details for future editions. As regards the data on the Soviet industry, these have been improved to include year of erection of the factory or refinery as well as the daily capacity. All in all, the directory is a well-produced and highly commendable work.

* * *

**The Measurement and Automatic Control of pH.** W. N. GREER. 42 pp.; $8\frac{1}{2} \times 11$ in. (Leeds & Northrup Co., 4907 Stenton Ave., Philadelphia 44, Pa., U.S.A.) Price: $1.00; 7s 6d.

This is a monograph on measurement and automatic control of pH. It describes the theory of pH, the various electrode systems used, calibration and standardization of electrometric pH devices, laboratory measurement of samples, continuous process measurements, process dynamics (a knowledge of which is considered necessary for evaluation of a control system), and automatic control applications. The last section covers the use of automatic pH control in the sugar industry.

* * *

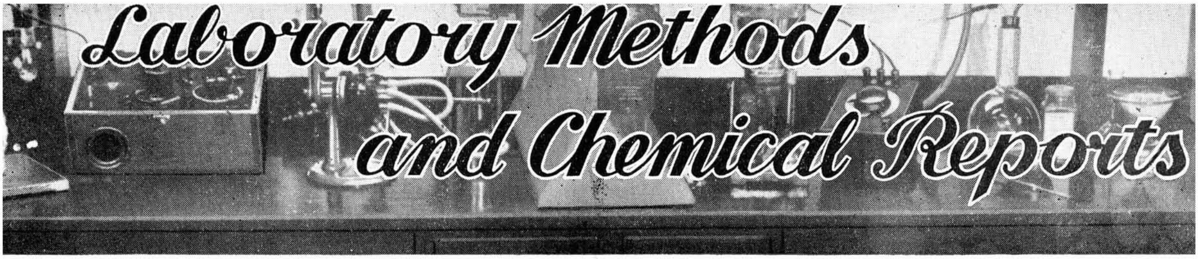
**Sugar Price Movements in World and U.S. Domestic Markets.** (C. Czarnikow Ltd., Plantation House, Mincing Lane, London E.C.3.) 1966.

This is a record, in graph form, of the world price of sugar (covering the London Daily Price and New York No. 4 and No. 8 Contract spot prices), the U.S. Domestic Market Price (including the New York No. 6 and No. 7 Contract spot prices) and the Commonwealth Negotiated Price. The chart covers the period January 1958–December 1965 and notes, at the appropriate places, those factors having important bearing on the prices at particular periods. The ordinates are cents per lb and £ per ton. An inset panel gives a graph of the average world values during the years from 1927 to 1965. Prepared by one of the world's leading sugar brokers, the chart, which measures approx. 22 × 30 inches, is a clear record of the movement in sugar prices.

* * *

**FAO Commodity Review, 1966.** 226 pp.; $8\frac{1}{2} \times 11$ in. (Food & Agriculture Organization of the United Nations, Rome, Italy.) 1966. Price: 15s 0d.

This is one of a regular series of annual commodity reviews prepared by the Commodities Division of FAO's Department of Economic and Social Affairs. It contains 73 tables of data and 21 graphs for all the major agricultural commodities. Part I is a general review summarizing developments in international commodity markets during 1965 and that part of 1966 up to 15th March. Sections on regional economic integration arrangements and consultations are also included. Part II consists of chapters analysing the current situation and outlook for each commodity, The section on sugar (pp. 99–108) mentions the very low average price on the free world market of 2 cents/lb in 1965, the lowest for any year since 1941 and far below the average production costs in any country. The 1964/65 production was much higher than expected, and although world trade increased in 1965 and consumption began to resume its upward trend, large volumes of sugar still remained unsold in exporting countries. However, the consumption in 1966 is expected to increase sufficiently to diminish the stocks, helped also by the approximate 6% drop in production in 1965/66. Nevertheless, world market prices in the near future are likely to remain relatively low unless unfavourable weather affects the cane harvests or beet for crops in 1966/67 are reduced.




**Effect of non-sugars on the refractive index of sugar solutions.** R. BRETSCHNEIDER, P. KADLEC and J. BOHAČ. *Listy Cukr.*, 1965, **81**, 281–295.—Tables and graphs are presented showing the effect of added non-sugars on the R.D.S. (refractometric dry solids content) of 15–20% and 40–45% sugar solutions. Except in certain isolated cases, when non-sugars were present the R.D.S. was lower than the calculated dry solids content and in all cases was higher than the calculated sucrose content. This latter difference, which increased with the quantity of non-sugars present (the relationship between it and the non-sugars quantity was linear for individual non-sugars), was smaller the higher was the concentration of the solution.

* * *

**A mobile laboratory to visit sugar factories.** R. PIECK. *Sucr. Belge*, 1966, **85**, 185–190.—An illustrated description is given of a mobile laboratory belonging to Raffinerie Tirlemontoise S.A., which is used to visit the various sugar factories of the group and is able to carry out micro-factory experiments, analyses, etc. with the object of aiding the factory staff to overcome processing difficulties.

* * *

**Conductimetric measurement of ash in white sugars.** G. PIDOUX. *Ind. Alim. Agric.*, 1965, **82**, 1257–1260. Conductivity measurements were made on solutions of refined sugar from French and other sources, derived from beet and cane, dissolved in deionized distilled water, and using a Bruel and Kjaer conductivity meter previously standardized with a fresh N/5000 solution of KCl at 20°C. The results were recorded for solutions at 5 g/ml concentration and at 27·5°Bx. The ratio of the two measurements lay between 2·207 and 3·246 (arithmetical mean 2·902) except for one sample, found to contain 3% of starch, which was ignored. The statistical mean of the ratios was 2·895 and confidence limits $\pm$ 0·079. The relationship between ash content and conductivity is discussed and the effect of the variable nature of the non-sugars from different origins is emphasized. To eliminate the water effect, it is necessary to make two or more determinations in water of different conductivities and plot the results as a graph which by extension to the ordinate gives a value of solution conductivity at zero solvent conductivity.

* * *

**Paper chromatography for the determination and dosage of sucrose added to musts and wines.** P. ARMANDOLA. *Ind. Alim.*, 1965, **4**, (20), 54–56.—Methods previously proposed are reviewed, and a new technique described, with an account of factors influencing choice of solvent, developing agent, etc. For a wine or must containing less than 150 g of reducing sugars per litre, a 50-ml sample is shaken with 200 mg of decolorizing carbon and filtered, the filtrate being used directly for chromatography. With more than 150 g/litre, a 20-ml sample of the wine or must is treated with 2 ml of 10% KOH and held at 100°C for 10 min, cooled, and treated with 3–4 ml of "Dowex" resin. After shaking for a few minutes, the liquid is filtered and 50 µl of the filtrate used for chromatography. An ascending technique with "Arches 302" paper is used, with 6:3:2 ethyl acetate: acetic acid:water as solvent, the time of development depending on the sucrose: total sugars ratio, and after drying the paper is sprayed with an anthrone reagent (900 mg anthrone in 10 ml acetic acid plus 3 ml phosphoric acid and 20 ml ethanol) and the spots are developed by heating for 5 min in an oven at 105°C. The amount of sucrose is estimated by comparison with spots obtained using known quantities.

* * *

**Current activities of (the) Cane Sugar Refining Project.** F. G. CARPENTER. *Sugar J.* (La.), 1966, **28**, (8), 7–9. See *I.S.J.*, 1966, **68**, 184.

* * *

**Interpretation of factory operating reports.** A. G. KELLER. *Sugar J.* (La.), 1966, **28**, (8), 23–27.—Criteria for sugar factory operation in Louisiana are presented and discussed.

* * *

**Determination of dielectric properties and moisture content of bagasse beyond hygroscopic range.** A. PANDE and S. P. AGARWAL. *Instrument Practice*, 1965, **19**, 915–922; through *S.I.A.*, 1965, **27**, Abs. 1076.—The dielectric constant of bagasse under varying conditions was measured to find whether it could be used to determine the moisture content. An electrode system was designed, consisting of two parallel aluminium plates (a variable distance apart) between which the bagasse was placed; an insulating plate was fixed to the upper plate to minimize conduction effects. The capacitance was measured by placing the electrode system in parallel with a known variable capacitance and keeping the total capacitance in the circuit at the constant value which produced resonance. Results are given in tables and graphs. The dielectric constant of the bagasse increased with moisture content and with packing density, and decreased with increasing particle size. Higher frequencies gave a lower dielectric constant, lower losses, and a greater change in capacity with moisture content than lower frequencies. Moisture determinations by the electronic method showed satisfactory agreement with oven drying methods for composite bagasse, but not for sieved bagasse of single particle size.

* * *

**Polarographic determination of fructose.** H. KAWAKAMI, T. FUKUDA and K. ITO. *Japan Anal.*, 1965, **14**, 643–645; through *S.I.A.*, 1965, **27**, Abs. 1091.—The procedure is described. Since the polarographic wave height increases with pH and is constant at pH 11–12, the determination is carried out at pH 12 in 0·0125M $CaCl_2$ with added $Ca(OH)_2$ and 0·01% gelatin. The method is sensitive to 36 p.p.m. of fructose.

* * *

**Application of modern techniques to special problems in sugar analysis.** D. GROSS. *Proc. Soc. Anal. Chem.*, 1965, **2**, 149–150; through *S.I.A.*, 1965, **27**, Abs. 1093. Applications to sugar industry products of techniques such as paper chromatography, paper electrophoresis and enzymic methods are reviewed. Some recent qualitative separations of colouring matter by gel filtration combined with high-voltage electrophoresis are presented.

* * *

**Methods of determining noxious nitrogen in sugar beet.** M. KOZHUKHAROV and M. LAZAROV. *Rastenievadni Nauki*, 1964, **1**, (12), 143–148; through *S.I.A.*, 1965, **27**, Abs. 1094.—Noxious N was determined in beet brei by the colorimetric method of STANĚK & PAVLAS after either hot or cold digestion. Using a Lange colorimeter with white illumination, the noxious N value measured after cold digestion was ~ 20% greater than after hot digestion. Using a Soviet FEK-M photocolorimeter with a red filter, similar noxious N values were measured with hot or cold digestion; however, these values were higher than those obtained with the Lange colorimeter, and the readings were less sensitive. The cold digestion method using the FEK-M photocolorimeter is proposed for routine analysis, and the analytical procedure is described.

* * *

**Kinetics of crystallization of sucrose from supersaturated solutions.** A. V. ZUBCHENKO, I. G. SAMOTIN and A. YA. OLEINIKOVA. *Khlebopekar. Konditer. Prom.*, 1965, (6), 12–14; through *S.I.A.*, 1965, **27**, Abs. 1100.—The influence of temperature on the latent period and crystallization rate was investigated in a stirred vessel, containing 80·9% sucrose solution at 40–70°C; the corresponding supersaturation coefficients decreased from 1·82 to 1·30 with increasing temperature. The latent period at 70°C was approx. half and the crystallization rate approx. double the values at 40°C. This is explained by the fact that the rate constant $K_1$ of nucleation is much smaller than the rate constant $K_2$ of crystal growth, so that the quantity of crystallized sucrose is $\sim S\,(1 - e^{-K_1 t})$, where $S$ = initial concentration and $t$ = time; the value of $K_1$ was $1{\cdot}95 \times 10^{-2}$ min$^{-1}$ at 40°C and $3{\cdot}7 \times 10^{-2}$ at 70°C. However, the crystallization rates decreased sharply as the saturation concentration was approached. An increase in the stirring rate from 400 to 800 r.p.m. at 40–70°C led to an increase of 2–3 times in the crystallization rate, and to a corresponding decrease in the latent period; the influence of stirring is thus similar to that of temperature. The conditions studied were comparable to those of fondant manufacture. (See also *I.S.J.*, 1965, **67**, 310; 1966, **68**, 153.)

* * *

**Influence of neutral salts on the hydrolysis of saccharides by dilute acids. Action of chlorides other than those of alkali metals on the hydrolysis of sucrose by hydrochloric acid.** A. DE GRANDCHAMP-CHAUDUN. *Compt. Rend.*, 1965, **260**, 6723–6725; through *S.I.A.*, 1965, **27**, Abs. 1101.—The rates of hydrolysis of sucrose solutions (5 g/100 ml) by 0·1N HCl were compared in the presence of 1N solutions of various chlorides at ~20°C. The hydrolysis rate was increased by the chlorides by a maximum of ~50% over the value in their absence. The order of the cations was as follows: K > Mn > Mg > Ba > Ca >> Al, the first 5 being of similar order. It is suggested that the results may be determined by the activity of the $Cl^-$ ions.

* * *

**Determination of total sucrose in cane and its distribution among individual suppliers by the Java ratio method.** J. R. LOUDON. *S. African Sugar J.*, 1966, **50**, 53–61.—An account is given of the method of allocating sucrose supplied to the factory by determining the total sucrose entering (weight of mixed juice × sucrose % mixed juice × 100) and the individual tonnages in crusher juice (weight in individual cane consignment × sucrose % crusher juice from each consignment). The relationship involved is shown to be the Java ratio, and an example of the calculations necessary is worked out.

* * *

**Exhaustion of final molasses from certain factories of the Piracicaba sugar region (Brazil).** E. R. DE OLIVEIRA. *Thesis presented as a requirement for the degree of Docente of the Sugar and Alcohol Dept., Agricultural High School, University of São Paulo*, 1964. The literature on theories of molasses formation is surveyed and the views of numerous authors on mechanical, physico-chemical, physical and chemical aspects are quoted, with notes on the reducing sugars: ash ratio and massecuite concentration as factors affecting exhaustion of the molasses. The various criteria proposed in the literature for judging molasses exhaustion are surveyed and one based on that of WEBRE[1], viz. $y$ (minimum possible purity) $= 0{\cdot}7x^2 - 6{\cdot}84x + 42{\cdot}06$, where $x$ = reducing sugars:ash ratio, is adapted for examination of molasses samples from ten Brazilian sugar factories, collected over 15 days during the 1961 and 1962 seasons. The analyses and their statistical examination showed that solids, reducing sugars, total sugars and purity were high in all cases and exhaustion low, the loss of sucrose amounting to between 2·58 and 4·35 kg/ton of cane.

[1] *Mem. XXVI Conf. Asoc. Técn. Azuc. Cuba*, 1952, 163–165.

# BY-PRODUCTS

**Continuous pulping systems.** S. C. BHARGAVA. *Chem. Age of India*, 1964, **15**, 961–966; through *S.I.A.*, 1965, **27**, Abs. 988.—The application of the Pandia continuous digester to bagasse or bamboo at an Indian paper factory is described. The bagasse is first thoroughly depithed with Hörkel depithers. The preliminary depithing is carried out on moist bagasse at the sugar factory, where 20% of the pith is removed and used as fuel. The bagasse is then baled, transported to the paper factory and depithed in the dry state. Ideally, this should be followed by wet depithing. The depithed bagasse is pre-digested in a horizontal mixer-impregnator with steam or chemicals, and is then compressed in a screw feeder and fed to the continuous digester. The latter is a horizontal pipe divided for convenience into two pipes connected by a short vertical pipe at one end. Steam and alkali are injected into the pipe under pressure and the mixture is forced continuously through the pipe without agitation. A liquor ratio of only 3–4:1 is used, giving economy of chemicals. The retention time for bagasse is 10–15 min.

* * *

**Hemicellulose from bagasse.** S. R. D. GUHA and P. C. PANT. *Indian Pulp & Paper*, 1964, **19**, 327, 329; through *S.I.A.*, 1965, **27**, Abs. 991.—Bagasse holocellulose was prepared by four successive chlorite treatments. Analyses of this (73·9% on oven-dry bagasse) and of whole bagasse are tabulated. Two hemicellulose fractions, "A" and "B", were prepared from the holocellulose by successive extraction with 16·7% and 10% KOH respectively. They amounted to 34·0 and 2·7% on oven-dry holocellulose respectively. The α-cellulose remaining after extracting the residue with $K_2O,B_2O_3$ amounted to 51·2% on oven-dry holocellulose, and alcohol-soluble hemicellulose to 12·1%. The large "A" fraction suggests that bagasse contains a large amount of hemicellulose with a low degree of polymerization, which would dissolve during alkaline pulping, yielding a pulp with a low hemicellulose content. Paper chromatography of hydrolysates showed that the "A" fraction yielded mainly xylose, with some arabinose, glucose and uronic acid, the "B" fraction mainly xylose with some arabinose, and the α-cellulose mainly glucose with traces of xylose.

* * *

**Production of pure absolute alcohol by pasteurization.** CHEMICAL STAFF OF THE KOLHAPUR SUGAR MILLS LTD. DISTILLERY. *Proc. 33rd Conv. Sugar Tech. Assoc. India*, 1965, 74–75.—Impurities in rectified spirit passed with benzene to the dehydration column resulted in sudden colour and impurity fractions in the pure absolute alcohol which was drawn off at the bottom of the column. By drawing off pasteurized spirit from the first or 2nd plate of the column, and occasionally draining concentrated impurities from the bottom, the difficulties were avoided.

**Uses for sugar beet pulp.** R. M. MCCREADY and A. E. GOODBAN. *J. Amer. Soc. Sugar Beet Tech.*, 1965, **13**, 467–468.—The constituents of beet pulp and its behaviour on lime treatment are discussed, and possible new uses suggested; these include preparation of a water-soluble gum, incorporation in pressed board, and conversion by alkali into an industrial thickening agent.

* * *

**Bacterial contamination in Indian distilleries using waste molasses as raw material.** J. P. SHUKLA and A. K. NIGAM. *Proc. 33rd Conv. Sugar Tech. Assoc. India*, 1965, 77–79.—Although yeast is developed under aseptic conditions in most Indian distilleries, the fermenters are charged with unsterilized diluted molasses. The effect of bacterial contamination thus introduced was examined and found to reduce yields of alcohol appreciably.

* * *

**Some aspects of treatment of distillery effluents.** J. P. SHUKLA and K. A. PRABHU. *Proc. 33rd Conv. Sugar Tech. Assoc. India*, 1965, i–viii.—Methods of distillery effluent treatment are described, including lagooning, ponding, Torula yeast cultivation using the sludge as raw material (the yeast is suitable as cattle fodder), potash recovery, biological filtration, and anaerobic digestion. The last of these methods gives a combustible gas of 80% utilization efficiency, but its disadvantage, as with the yeast cultivation and potash recovery, lies in the heavy investments needed.

* * *

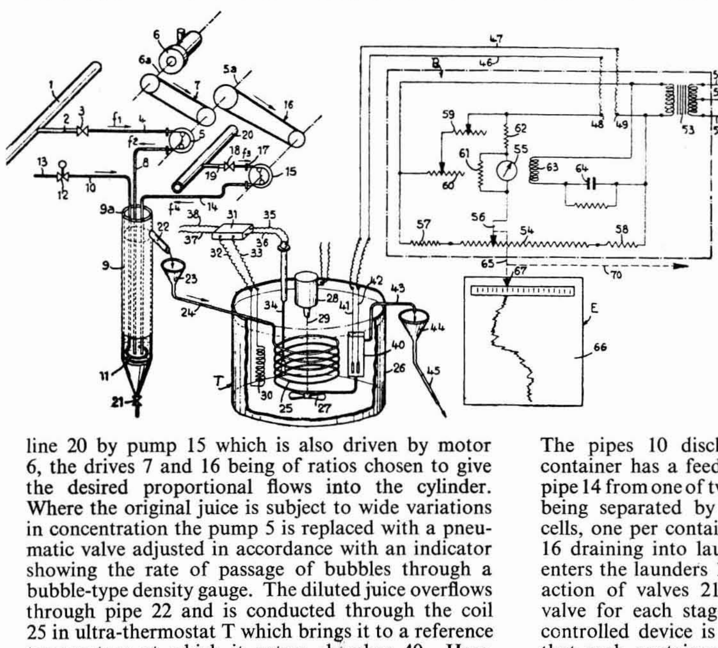
**The treatment of distillery effluent by anaerobic digestion.** S. D. GUPTA. *Proc. 33rd Conv. Sugar Tech. Assoc. India*, 1965, lxix–lxxii.—A pilot plant at the Hindusthan Sugar Mills distillery consists of a masonry digester tank, heat exchanger, gas holder and a small compressor for aerating the activated sludge. The plant can treat about 1000 gal of wash per day. Some of the effluent is by-passed to a small activated sludge tank for further BOD reduction. A cow dung slurry is fed into the digester before the wash, which is fed slowly, and the liquid maintained at 36–38°C. The BOD is reduced by 93–95% in the digester, and by a total of 96–97% after the activated sludge tank. Dilution of the treated effluent with condenser water reduces the BOD further. Laboratory tests show that 10–12 days' digestion gives about 12 cu.ft. of gas (methane and $CO_2$) per lb of BOD load.

* * *

**Capacity of a particular distillation unit varies with alcohol percent wash.** B. B. PAUL. *Proc. 33rd Conv. Sugar Tech. Assoc. India*, 1965, lxxvii–lxxx.—Statistical analysis of experimental results obtained with an ethyl alcohol distillation plant showed that the production capacity of a particular distillation column can be increased by increasing the alcohol % wash.


## UNITED KINGDOM

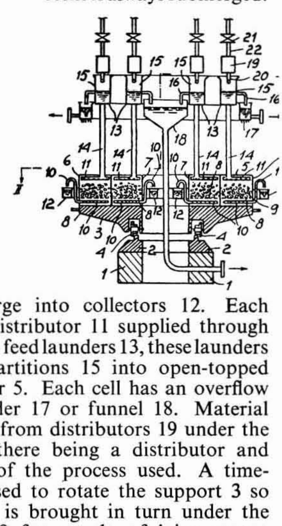
**Method, means and plant for continuous measurement and adjustment of sugar solution purity.** J. C. A. J. PONANT, of Us (S. et O.), France. **1,019,356.** 3rd January 1963; 2nd February 1966.—Sugar juice flowing through line 1 is shunted through pipe 2, cock 3 and pipe 4 to pump 5, driven by motor 6, which delivers it to cylinder 9 by way of pipe 8. The juice in the cylinder is stirred by bubbling through it a non-reactive gas supplied by way of pipe 10 and ring 11 (or by use of a propeller-type stirrer). Also into the cylinder 9 is introduced a liquid (distilled water or ash-free condensate) brought from



line 20 by pump 15 which is also driven by motor 6, the drives 7 and 16 being of ratios chosen to give the desired proportional flows into the cylinder. Where the original juice is subject to wide variations in concentration the pump 5 is replaced with a pneumatic valve adjusted in accordance with an indicator showing the rate of passage of bubbles through a bubble-type density gauge. The diluted juice overflows through pipe 22 and is conducted through the coil 25 in ultra-thermostat T which brings it to a reference temperature at which it enters chamber 40. Here, electrodes 42 measure the conductivity of the solution before it is discharged through pipe 43. The self-balancing measuring bridge B of the Kohlrausch type derives a trace on chart 66 corresponding to this conductivity which has been found to be related to the purity. For controlling purity the original line 1 feeds to a tank through one valve while a purity-adjusting supply is added through another valve which is adjusted by the purity-measuring circuit so that the two supplies when mixed give a juice of the required purity.

* * *

**Ion exchange treatment of sugar juices and molasses.** G. ASSALINI and G. BRANDOLI, of Genoa, Italy. **1,019,037.** 1st October 1963; 2nd February 1966. A circular rail 2 on base 1 carries a support 3 fitted with wheels 4 riding on the rail. The support carries two concentric series 6, 7 of closed containers 5, each provided with a support 8 for the purifying resin 9 and a discharge pipe 10 formed as a siphon of such a height and shape that the resin is always submerged.



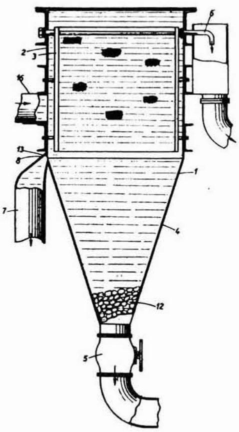
The pipes 10 discharge into collectors 12. Each container has a feed distributor 11 supplied through pipe 14 from one of two feed launders 13, these launders being separated by partitions 15 into open-topped cells, one per container 5. Each cell has an overflow 16 draining into launder 17 or funnel 18. Material enters the launders 13 from distributors 19 under the action of valves 21, there being a distributor and valve for each stage of the process used. A time-controlled device is used to rotate the support 3 so that each container 5 is brought in turn under the required distributor 19 for supply of juice, water, regenerant, etc.

* * *

**Tank filter.** RAFFINERIE & SUCRERIES DU GRAND-PONT S.A., of Hoegaarden, Belgium. **1,019,618.** 3rd December 1962; 9th February 1966.—Tank 1 is

Copies of Specifications of United Kingdom Patents can be obtained on application to The Patent Office, Sale Branch, Block C, Station Square House, St. Mary Cray, Orpington, Kent (price 4s 6d. each). United States patent specifications are obtainable from: The Commissioner of Patents, Washington, D.C. 20231 U.S.A. (price 50 cents each).

provided with a partial drainage pipe 7 the inlet 8 of which is located just below the lower level of filter element 3. Pipe 7 is provided with a valve and, when the elements 3 are clogged, this valve is opened,



whereby the liquid above inlet 8 is drained quickly through pipe 7 and air is introduced from outlet 6, dislodging sludge 12 which falls into the funnel 4. More liquid can be supplied through pipe 16 and several partial drainages carried out until funnel 4 is filled with sludge, when a complete drainage through valve 5 must be made.

* * *

**Cyanoethyl ethers of sucrose.** Eastman Kodak Company, of Rochester, N.Y., U.S.A. **1,019,635.** 10th December 1962; 9th February 1966.—A cyanoethyl ether of sucrose, useful as a plasticizer and containing at least five (6·8–7·25) cyanoethyl groups per sucrose molecule, is prepared by reacting (an excess of) acrylonitrile with sucrose in a mole ratio of at least 5:1 [in water or an inert organic solvent (dimethyl formamide)] (at 30°–70°C) in the presence of a strong base (KOH) as a catalyst (in the molar ratio of 1:10 – 6:10 on sucrose). The alkali is neutralized, volatile substances removed and the ether purified by dissolving in an inert solvent, filtering and evaporating the solvent.

* * *

**Producing L-glutamic acid by fermentation.** Asahi Kasei Kogyo K.K., of Osaka, Japan. **1,020,283.** 19th October 1962; 16th February 1966.—Biotin-requiring L-glutamic acid-producing bacteria (*Microbacterium ammoniaphilum* ATCC No. 15354, *Bacillus giganteus* or *M. flavum* var. *glutamicum* ATCC No. 13693) are cultured on a medium containing 1–2% w/v of carbohydrate (glucose, fructose, sucrose, molasses, etc.) and biotin sufficient to give maximum growth within this range of carbohydrate concentration. After maximum growth is reached the carbohydrate (and a nitrogen source) is added gradually and aerobic cultivation continued, to form a substantial amount of glutamic acid.

## UNITED STATES

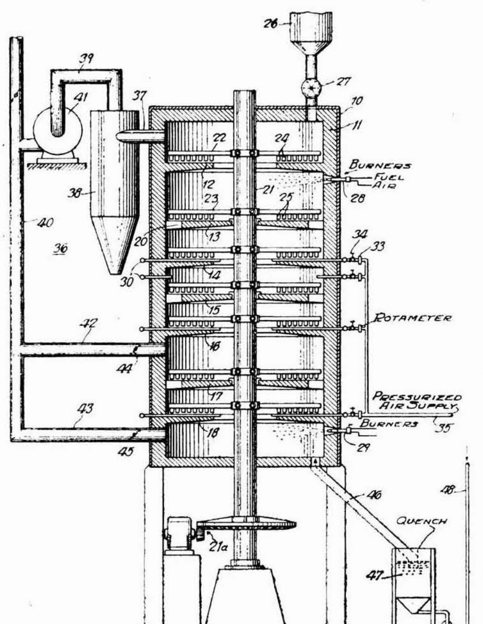
**Cane harvester topping device.** J. K. Gaunt, J. Wood and J. E. Douglas, *assrs.* Massey-Ferguson (Australia) Ltd., of Victoria, Australia. **3,144,743.** 27th March 1961; 18th August 1964.

* * *

**Beet topper.** C. V. Everett and E. M. Clark, *assrs.* International Harvester Co., of Chicago, Ill., U.S.A. **3,151,433.** 2nd January 1962; 6th October 1964.

* * *

**Regeneration of granular activated carbon.** C. F. von Dreusche, *assr.* Nichols Engineering & Research Corp., of New York, N.Y., U.S.A. **3,153,633.** 5th June 1961; 20th October 1964.—The kiln is designed to provide the necessary conditions of rate of heat addition, addition of supplemental air, dissipation of heat and carbon/atmosphere contact, whereby carbonaceous adsorbed material is removed without coking (and thereby reducing the activity of the adsorbent) while the carbon adsorbent is not materially removed or its pore size enlarged. This is achieved with a higher burn rate so that a smaller kiln is necessary to regenerate a given throughput of spent carbon.




The shell 10 is lined with refractory material 11 and includes a series of hearths 12–18, alternate hearths having central and peripheral openings. The central shaft 21 is rotated by motor and gear drive 21a and carries rabble arms 22,23 with rakes 24,25 to feed the carbon towards the opening to the hearth below. Spent carbon is fed into the kiln from hopper 26 through feeder 27. Heat is supplied by burners 28,29 while air is also supplied from a pressurized source through rotameters 33 and air valves 34. Furnace gases, withdrawn from the top hearth through pipe 37 and cyclone 38 are partly recycled by way of pipes 40,42,43. Regenerated carbon leaves the bottom hearth through line 46 to quench tank 47 and thence to process as a slurry.

* * *

**Glutamic acid production.** G. J M. MIESCHER, *assr.* COMMERCIAL SOLVENTS CORP., of New York, N.Y., U.S.A. **3,156,627.** 4th August 1961; 10th November 1964.—A glugamic acid-producing strain of *Brevibacterium divaricatum* is grown on an aqueous medium containing a pure sugar (sucrose, glucose or fructose), a nitrogen source, a mineral source and a growth-promoting material (biotin, oleic acid, linoleic acid or linolenic acid) in the presence of small amounts of caramelized glucose sufficient to start growth of the *B. divaricatum.*

* * *

**Production of itaconic acid.** M. A. BATTI, *assr.* MILES LABORATORIES INC., of Elkhart, Ind., U.S.A. **3,162,582.** 31st December 1962; 22nd December 1964.—A carbohydrate, e.g. 15% sucrose, fermentation medium is inoculated with an itaconic acid-producing organism (*Aspergillus terreus*), allowed to ferment until the itaconic acid content reaches 4·6–5%, and a neutralizing agent [$NH_4OH$, $CaCO_3$, $Ca(OH)_2$ or KOH] added to adjust the pH to about 3–5, after which the fermentation is continued until the desired production of itaconic acid had been achieved. In this way the acid produced is not contaminated with other acids produced during the fermentation.

* * *

**Method of controlling Johnson grass in sugar cane.** E. D. WEIL and J. P. STANFORD, *assrs.* HOOKER CHEMICAL CORP., of Niagara Falls, N.Y., U.S.A. **3,163,516.** 7th December 1959; 29th December 1964. The control is achieved by spraying the cane with ½–20 lb/acre of 2,3,6-trichlorophenylacetic acid, its Na salt, amide or butoxyethyl ester.

* * *

**Soil conditioning composition from bagasse.** H. M. MAY and H. A. NADLER. **3,163,517.** 14th January 1963; 20th December 1964.—Bagasse is saturated with water and, with 60–90% moisture content, is weathered by outdoor storage in piles (100 ft long × 200 ft wide × 20 ft deep) for at least 70 days (until the pH exceeds about 6·3 and the C:N ratio does not exceed 100:1). The weathered bagasse is then compressed until its moisture content is less than 65% and passed through a heated zone in which the entry temperature is about 1880°F and the exit temperature is about 200°F; this reduces the moisture content to between 10 and 40%, and also destroys all plant and animal life in the bagasse. The dried bagasse is classified and a fraction separated which will pass a Tyler No. 4 sieve and be retained on a No. 35 sieve. This fraction is then treated with inorganic compounds so that the final product contains about 98% of organic matter on dry weight, 0·6–1·5% fo N by weight, 0·3–1·0% of P and 0·45–1·0% of K.

* * *

**Substituted heteropolysaccharide.** G. P. LINDBLOM and J. T. PATTON, of Tulsa, Okla., U.S.A., *assrs.* JERSEY PRODUCTION RESEARCH CO. **3,163,602.** 30th December 1960; 29th December 1964.—The substituted polysaccharide is a gum which, dissolved in brine, alters its viscosity and flow properties so making it more useful in flooding oilfield reservoirs for displacement of oil. A polysaccharide is prepared by the action of *Xanthomonas* bacteria (*X. campestris* or *X. begoniae*) on a carbohydrate, e.g. pure sucrose, glucose, fructose, raw sugar, molasses, beet juice, etc., and reacted in aqueous solution with a quaternary ammonium compound having $C_1$–$C_{24}$ substituent groups (1–3 methyl and 1 long chain groups), to give a product insoluble in the solution but soluble in brine.

* * *

**Sugar cane cart wheel.** A. M. DIAZ, *assr.* INTER-AMERICAN TRANSPORT EQUIPMENT CO., of Miami, Fla., U.S.A. **3,164,194.** 28th June 1963; 5th January 1965.

* * *

**Treatment of cane mud containing a suspension of impurities.** H. V. MILES, *assr.* DORR-OLIVER INC., of Stamford, Conn., U.S.A. **3,166,443.** 30th January 1961; 19th January 1965.—The cane mud is subjected to flocculation by addition of [10–60 p.p.m. in proportion to the mud concentration (normally 5–20%)] a coagulating agent in the form of (a 0·05% solution of) a water-soluble (anionic) polymer (partially hydrolysed polyacrylamide). The coagulant is added under conditions of instantaneous dispersion by introducing it at a number of points in a shallow stream formed between a stationary outer cylindrical shell and an inner cylindrical shell which is rotating about the common axis. Addition is carried out in the presence of a substantially inert finely-divided auxiliary material (a lime suspension at a dosage of 150–750 p.p.m. on mud) adsorbed by the polyelectrolyte remaining in solution, whereby the mud solids from flocs include substantially all the fines present in the original mud.

The flocculated mud is filtered continuously through a fabric-type filter medium in the presence of a fibrous filter aid material (bagacillo provided at a rate of 30–50% on mud solids) whereby a highly permeable filter cake is formed and giving a filtrate sufficiently clear to send direct to the evaporator.

# TRADE NOTICES

*Statements published under this heading are based on information supplied by the firm or individual concerned. Literature can generally be obtained on request from the address given.*

**"Fabcon I-12".** Fabcon Inc., 314 Public Square Bldg., Cleveland, Ohio, 44101 U.S.A.

"Fabcon I-12" is a chemical formulation developed specifically to reduce evaporator incrustation in cane and beet sugar factories. By chelating lime and other insoluble salts in the juice, it reduces the amount of scale forming in the evaporator tubes. Extended factory use shows 100% longer cycles between cleaning, and scale that does form is unusually soft and easily removed. Interestingly, exhaustion of sucrose from molasses has been significantly improved. The purity drop from massecuite to molasses has been increased by approx. 1½ units on *A*-, *B*- and *C*-strikes, resulting in 2% lower final molasses purity to date, while molasses weight per ton cane has not changed.

A 5% solution is metered to the evaporator, half being added to the first effect and half to the last effect. Amounts of "Fabcon I-12" required will vary from 5 to 15 p.p.m. in proportion to the calcium content of the clarified juice; in general, 1000 p.p.m. calcium on total juice weight requires 9 p.p.m. "Fabcon I-12".

An independent appraisal, prepared by Rumsu Technical Services Ltd., of Kingston, Jamaica, reports that the results obtained in the use of "Fabcon I-12" for evaporators have been impressive and encouraging. A factory with a production capacity of 40,000 tons of sugar has ordered sufficient "I-12" for the full crop's requirement. Reducing to a minimum the loss of efficiency of evaporating equipment towards the end of the operating period due to scaling of heating surfaces has been the subject of much research and development, and the favourable results obtained with "Fabcon I-12" in the factory mentioned and two other factories indicate a possible break-through.

When cleaning only fortnightly, against the initial cost and installation of equipment, and the cost of the "Fabcon I-12", savings accrue in the 50% lower cost of cleaning and in helping the evaporating equipment to maintain practically full efficiency to the end of the fortnight.

When cleaning weekly, against the initial cost and installation of equipment and cost of the chemical, cleaning will be easier owing to thinner deposit and more pliable scale, while, with the use of "Fabcon I-12", a factory with a full rated capacity of 100 t.c.h. could grind the full amount in the last 2½ days of a 6½-day week operating period, the gain in terms of cane ground being an extra 300 tons, assuming that the normal expected drop in grinding capacity for 2½ days due to dirty evaporating equipment is of the order of 5%. This is equivalent to a 3 hours' saving, the operating cost of a typical Jamaican factory grinding 100 t.c.h. being £30 per hr.

**Heat sealer.** The Thames Packaging Equipment Co., 28 City Rd., London E.C.1.

Capable of sealing all types of plastic bags, irrespective of size and gauge thickness, the T.P.E. heat sealer has a totally-enclosed built-in induction motor. The sealer is available as a mobile normal- or a static heavy-duty model and gives a seal strength greater than the strength of the plastic. One standard sealing head can seal sacks from ½ lb to 1 cwt faster than the operator can fill and is interchangeable between normal- and heavy-duty models. All working parts are easily accessible, maintenance costs are negligible and the operator requires no previous experience. In the case of the heavy-duty model, different lengths of conveyor can be made to customers' specifications.

* * *

### PUBLICATIONS RECEIVED

**AUTOMATIC ALARM UNITS.** Mimic Diagrams & Electronics Ltd., Maxim Road, Crayford, Kent.

The Model MD 320/321 single- or multi-way "Transalarm" integral units have a wide range of alarm and control applications as described in literature supplied by the manufacturers. The MD 320 is an alarm window unit which flashes, while the MD 321 both flashes and operates an audible signal. The MD 323/ETA emergency trip alarm system provides for monitoring of normally open or normally closed contacts on a process plant. When an alarm occurs, a signal causes the solenoid controlling the valve in question to become de-energized, this condition being altered only when the alarm and trip have been reset.

* * *

**LEVEL INDICATOR.** Dukes & Briggs Engineering Co. Ltd., Approach Road, Urmston, Manchester; Endress & Hauser G.m.b.H. & Co., 7867 Maulburg, Germany.

The "Silometer S7" is a continuous level measuring instrument suitable for hoppers, silos and tanks. It can be used with different types of electrodes at working pressures up to 300 atm and temperatures up to 600°C. The output can be transmitted to an indicator or to remote instruments, or signals can be transmitted for switching purposes at predetermined levels. Reproducibility is to within 2%. Leaflet E2.09.1.1 gives full details.

* * *

**TEMPERATURE CONTROL.** NIEAF, Jutfaseweg 205, Utrecht, Holland.

Details are given of the phototransistorized moving coil temperature controller manufactured for temperature ranges according to the type of thermocouple used or the measuring range of a resistance thermometer. The horizontal scale is 130 mm long. The instrument may be used to control other parameters such as level, pressure, flow, etc.

* * *

**LEVEL CONTROL.** Flowsheet Instruments Ltd., Oaklands House, Oaklands Drive, Sale, Cheshire; Ekkehard & Georg Exner Mess- und Regeltechnik/Apparatebau, Neuss/Rh., Quienheimerstr. 56–58, Germany.

The principle on which the "Nivex" level controls operate is that in which the column of air in a closed container is compressed as the liquid rises, this actuating a diaphragm switch. The "Nivex" S1, S3 and S4 are designed to control the liquid level in pump shafts, open containers and basins, while the S2 is applicable to a mixing tank such as for milk-of-lime preparation.

# INTERNATIONAL SOCIETY OF SUGAR CANE TECHNOLOGISTS

## XIII Congress 1968, Taiwan

**Rules for preparing papers to be presented before the XIII Congress, I.S.S.C.T.**

The deadline for submission by authors to the Programme Committee has been set at 30th June, 1967.

Papers submitted for the I.S.S.C.T. Congress must be of high scientific calibre. Those primarily concerned with establishing the merits of or promoting a particular machine or product will be considered commercial in nature and will be rejected. Authors should consult a previous *Proceedings* as a guide when preparing a manuscript. The following rules for preparing a manuscript must be observed:

Manuscrips MUST:

(*a*) be written in English,

(*b*) be typewritten on one side of the page only, double-spaced, and with a one-inch margin on all four borders,

(*c*) be clearly divided into separate paragraphs headed by titles such as: INTRODUCTION, METHODS, MATERIALS, EXPERIMENTAL RESULTS, DISCUSSION, ACKNOWLEDGEMENTS, REFERENCES, etc.,

(*d*) have pages numbered throughout on the right-hand upper corner,

(*e*) include a summary of about 250 words,

(*f*) be sent in triplicate (original and two carbons), to Dr. CHEN WEI, the Programme Committee Chairman, for approval. All photographs must also be sent in triplicate, but charts and drawings may consist of an original and only two photostat copies.

Illustrations, charts and tables MUST:

(*a*) be non-coloured (i.e. black and white) and unfolded,

(*b*) be not larger than 9 × 12 inches,

(*c*) be supplied separately from the text, and neither stuck nor pasted to the manuscript,

(*d*) have a number and, if necessary, a legend in which symbols occurring in the figure or table are clearly explained. The legend must be typewritten, double-spaced on a separate sheet of paper, and properly identified with the same number as the illustration.

Original photographs must be submitted in the form of sharp, non-folded, glossy prints. Line drawings must have an identification number, and the text of the explanation and all units and scales should be typewritten in a separate sheet bearing the same identification number.

Literature references should be listed at the end of the paper. In this list (supplied on a separate sheet) references should be arranged in alphabetical order in accordance with authors' surnames. Each reference should bear a number and this number should appear in the text at the place where the reference is made. Every reference in the text must appear in the list and *vice versa.*

Each reference to an article published in a periodical must contain the author's name, followed by the title of the article, the title of the periodical (abbreviated according to the system used in *Chemical Abstracts*), the volume number, year of publication (in brackets) and the pager number.

Each reference to a book must contain the author's or editor's name or names followed by the title of the book, the publisher's name, the publisher's city, the year of publication and the page number.

The Executive Committee reserves the right of not publishing papers of excessive length for which the authors do not desire to share extra printing expenses.

Authors are requested to obtain the usual permission from the authors and the publishers to quote or copy parts from other copyrighted publications. Authors will protect the publishers of the *Proceedings* against any claim by a third party in connexion with infringement of copyright caused by the publication of these *Proceedings.*

**Processing procedures for technical papers**

The following sequence of steps occurs:

(1) Regional Vice-Chairmen, individual members or potential writers are approached for technical papers suitable for presentation before the Congress.

(2) The contribution in triplicate is sent directly to Dr. CHEN WEI, the Programme Committee Chairman, whose address is:

Dr. CHEN WEI,
Taiwan Sugar Experiment Station,
1 Shen Chan Rd.,
Tainan, Taiwan, Republic of China.

Dr. CHEN acknowledges the receipt of the paper with a standard slip No. 1.

(3) Dr. CHEN sends the original manuscript plus one copy to the pertinent Section Vice-Chairman in Taiwan for preliminary screening.

(4) The Section Vice-Chairman sends the original manuscript plus one copy to the Section Chairman or persons appointed by Section Chairman for reviewing or approval.

(5) The original manuscript is returned to the author for correction or amendment, if needed, by the Section Chairman.

(6) The manuscript is sent back to the Section Chairman by the author after complying with the Chairman's request for final approval.

(7) The approved manuscript is sent back to Dr. CHEN WEI by the Section Chairman for preparation of presentation.

(8) The original author is notified of the approval by Dr. CHEN (using standard slip No. 2) and one copy of the manuscripts and the summary of the approved paper handed to the Publication Committee.

(9) The summary of the approved paper is printed or stencilled by the Publication Committee and distributed by the Programme Committee to the delegates before the section meeting convenes, provided the paper is submitted before the scheduled deadline.

(10) The author will have to schedule and advise Dr. CHEN if the presentation of the paper is to be by the author in person, an appointed representative or by the Chairman in charge.

The author may prepare 16-mm slides, sketches on tracing paper in letter size or smaller to assist him in presentation; a 16-mm projector and viewgraph will be made available during the section meeting.

(11) Discussions at the section meeting will be recorded and posted in front of the meeting hall for correction.

(12) The manuscript of the paper along with the discussion are transferred to the Publication Committee for final editing and publication of the Proceedings.

## Brazil Sugar Exports[1]

| | 1965 | 1964 | 1963 |
|---|---|---|---|
| | *metric tons, tel quel* | | |
| Bolivia | — | 77 | 443 |
| Canada | 8,627 | — | — |
| Ceylon | — | — | 20,877 |
| Chile | 88,551 | — | 8,449 |
| Finland | — | 10,590 | — |
| France | 31,561 | 5,250 | 4,204 |
| Germany, West | 999 | — | — |
| Hong Kong | 20,739 | — | — |
| Iraq | 41,567 | — | — |
| Italy | 9,707 | 10,005 | — |
| Japan | 23,185 | — | — |
| Kenya | 7,907 | — | — |
| Korea, South | 10,482 | — | — |
| Lebanon | 45,474 | — | — |
| Morocco | 6,500 | — | — |
| Portugal | 10,296 | 10,513 | — |
| South Africa | 31,542 | — | — |
| Spain | — | — | 8,947 |
| Sweden | 10,704 | — | — |
| Syria | 10,578 | — | — |
| Tunisia | 47,464 | 20,736 | — |
| United Kingdom | 54,910 | 20,804 | 15,141 |
| United States | 322,934 | 161,994 | 417,684 |
| Uruguay | 34,761 | 25,590 | 10,925 |
| | 818,488 | 265,559 | 486,670 |

**Sugar mills for India**[2].—The Madhya Pradesh Government proposes to set up nine cooperative sugar mills to ensure a fair price for sugar cane growers and to increase sugar production. The State Government has sought licences from the Centre for the mills and a letter of intent has been issued to the Morena Mandal Cooperative Sugar Factory to set up a sugar mill in Kelaras in Morena district.

* * *

**Sugar factory proposal for Dutch Guiana**[3].—According to the Dutch journal *Economische Voorlichting*, the Venezuelan association Distribuidora Venezolana de Azucares plans the construction of a sugar factory of 10,000 tons annual production capacity in Dutch Guiana. The production would serve partly to cover internal requirements and also would have access to the E.E.C.

* * *

**Sudan—U.S.S.R. trade agreement**[4].—Under the terms of a trade agreement between the U.S.S.R. and Sudan, the former was to supply the latter with 30,000 tons of sugar in 1965, rising to 45,000 tons in 1966 and 50,000 tons in 1967.

## Brevities

**Cane diffusion in India**[5].—Experiments have been carried out at the Shriram Cooperative sugar factory for the extraction of sugar from cane by a diffusion process. Results yielded are reported to be promising and the factory is expected to switch from milling to diffusion next season. The cane is prepared by means of a shredder and, after the sugar has been extracted with water, the wet bagasse is pressed in a mill so that it may be used as fuel.

* * *

**Sugar factory for Chile**[6].—Plans to build a beet sugar factory with an annual capacity of 48,000 tons of refined sugar were recently announced by local industry sources. The new factory will be located at San Carlos, 350 km south of Santiago[7]. Sugar production currently runs at about 120,000 metric tons and consumption at around 275,000 tons, so the additional production facilities should enable Chile to reduce her imports of sugar substantially.

* * *

**Indonesia sugar crop reduction**[8].—Sugar production in Indonesia in 1966 is estimated at some 600,000 metric tons, according to the head of the Indonesian State Sugar Company. This is a reduction of about 175,000 tons compared with production in 1965.

* * *

**South Korean sugar production**[9].—Production of refined sugar in South Korea in 1965 totalled 45,269 metric tons, as against 17,087 tons in 1964 and 39,750 tons in 1963. Imports of raw sugar in 1965 amounted to 39,857 tons, compared with 20,830 tons in 1964 and 41,700 tons in 1963.

* * *

**Antigua sugar production to cease**[10].—Antigua's 1966 sugar crop is unlikely to exceed 8000 tons because of the continued severe drought, the Antigua Sugar Factory Ltd. board announced on the 22nd July. It also said that the drought makes it impossible to continue sugar operations beyond the end of the present crop. The 8000 tons compare with a recent estimate of 7500 tons and an earlier forecast of 10,500 tons. Sugar production has fallen off in recent years; 21,074 tons was produced in 1964 and 14,040 tons last year.

[1] C. Czarnikow Ltd., *Sugar Review*, 1966, (760), 79.
[2] *Indian Sugar*, 1966, **16**, 107.
[3] Through *Sucr. Belge*, 1966, **85**, 397.
[4] *Board of Trade Journal*, 15th July 1966.
[5] *Indian Sugar*, 1966, **16**, 107–108.
[6] *Merrill Lynch*, 8th July 1966.
[7] F. O. Licht, *International Sugar Rpt.*, 1966, **98**, (21), 17.
[8] *Public Ledger*, 6th August 1966.
[9] C. Czarnikow Ltd., *Sugar Review*, 1966, (770), 126.
[10] *Public Ledger*, 23rd July 1966.

# BREVITIES

**Mali sugar industry**[1].—A new sugar factory has recently started production in the Segou area of Eastern Mali, according to press agency reports. Sugar cane is being cultivated on a plantation of 500 hectares near the River Niger and 400 tons of cane per day are being processed by the new factory which was erected with Chinese assistance. Imports of refined sugar during 1965 totalled 28,644 metric tons, white value, compared with 13,974 tons in 1964. The imports included 5173 tons from Belgium/Luxembourg (600 tons in 1964), 9300 tons from China (3200 tons), 780 tons from France (2500 tons) and 13,391 tons from the U.S.S.R. (6571 tons). The balance of the 1964 imports was 1103 tons from Czechoslovakia.

* * *

**U.S. views of Cuban sugar production**[2].—Reviewing the current season's production in Cuba, the U.S. Department of Agriculture estimates the outturn at 4,500,000 tons or 1,500,000 tons below the good crop of 1965 and 2,000,000 tons below the Cuban target. "Long-continued drought, a big drop in fertilizer use, poor cutting methods, bad management and deteriorating mechanical plant have all contributed to cutting output", the Department declares. The Department considers that prior sales and domestic consumption would use up most of the crop unless the Soviet Union releases Cuba from this year's commitment to supply 3,000,000 tons. The Cuban target for 1967 was 7,500,000 tons and recent rains which had ended a drought there could bring a sharp increase in output next year. But according to the Department "the greatest problem is an adequate supply of proper seed cane for new plantings, and neither 'volunteer' urban workers nor experimental mechanical harvesters have proved successful".

# Stock Exchange Quotations

## CLOSING MIDDLE

| **London Stocks** (*at 17th August*, 1966) | s d |
|---|---|
| Anglo-Ceylon (5s) | 5/1½ |
| Antigua Sugar Factory (£1) | 8/9 |
| Booker Bros. (10s) | 18/3 |
| British Sugar Corp. Ltd. (£1) | 20/7½ |
| Caroni Ord. (2s) | 1/10½ |
| Caroni 6% Cum. Pref. (£1) | 16/6 |
| Demerara Co. (Holdings) Ltd. | 3/3 |
| Distillers Co. Ltd. (10s units) | 19/9 (x.d.) |
| Gledhow Chaka's Kraal (R1) | 15/– |
| Hulett & Sons (R1) | 15/– |
| Jamaica Sugar Estates Ltd. (5s units) | 4/– |
| Leach's Argentine (10s units) | 12/– (x.d.) |
| Manbré & Garton Ltd. (10s) | 29/4½ |
| Reynolds Bros. (R1) | 16/3 |
| St. Kitts (London) Ltd. (£1) | 15/– |
| Sena Sugar Estates Ltd. (5s) | 10/– |
| Tate & Lyle Ltd. (£1) | 25/3 |
| Trinidad Sugar (5s stock units) | 1/9 |
| West Indies Sugar Co. Ltd. (£1) | 7/6 |

## CLOSING MIDDLE

| **New York Stocks** (*at 16th August*, 1966) | $ |
|---|---|
| American Crystal ($5) | 16 |
| Amer. Sugar Ref. Co. ($12.50) | 26¼ |
| Central Aguirre ($5) | 30⅜ |
| Great Western Sugar Co. | 37¼ |
| North American Sugar ($10) | 12⅛ |
| South P.R. Sugar Co. | 21⅝ |
| United Fruit Co. | 33⅝ |

# SWISS SUGAR IMPORTS[3]

| *Metric tons, tel quel* | 1965 | 1964 |
|---|---|---|
| Belgium/Luxembourg | 830 | 978 |
| British East Africa | — | 50 |
| Cuba | 9,876 | 31,799 |
| Czechoslovakia | 27,979 | 12,802 |
| Denmark | 15,326 | 21,079 |
| Dominican Republic | — | 420 |
| France | 134,495 | 85,605 |
| Germany, East | — | 1,002 |
| Germany, West | 7,663 | 2,808 |
| Holland | 20 | — |
| Hungary | 4,413 | 1,657 |
| Jamaica | — | 20 |
| Peru | 1,405 | 1,048 |
| Poland | 20 | 15 |
| Surinam | — | 425 |
| United Kingdom | 41,879 | 37,065 |
| U.S.A. | — | 6 |
| | 243,906 | 196.779 |

**Japanese sugar production estimates.**—Details of sugar production plans for the next two campaigns in the Ryukyu Islands have been published by C. Czarnikow Ltd.[4]: centrifugal sugar production from the 1966/67 and 1967/68 cane crops is expected to reach 245,000 metric tons and 280,000 metric tons, respectively. This compares with an actual production figure of 210,560 tons from the 1965/66 campaign. In Hokkaido, 54,721 hectares are to be sown to beet for the 1966/67 crop, as compared with 53,784 ha for the 1965/66 crop, while the Aomori beet area will be reduced to 3950 ha compared with 4299 ha in 1965/66. Sugar production in Hokkaido is now expected to reach 226,560 metric tons from an estimated 1,618,300 tons of beet[5]. Final production figures for the 1965/66 and 1964/65 campaigns were 246,796 tons and 161,436 tons, respectively.

* * *

**New sugar factory for the U.S.**—The Holly Sugar Corporation plans to build the largest beet sugar factory in the United States. The factory, which will be located at Tracy, California, will have a daily processing capacity of 8000 tons of sugar beets and is expected to be completed in time to process beets early in 1970. The cost of the project amounts to some $30,000,000.

* * *

**French sugar industry contraction**[7].—According to a report in the French journal *Le Sucre et ses Dérivés*, 109 sugar factories were working during the 1955/56 campaign; by 1960/61 there were only 103 and in 1964/65 85 factories. During the 1966/67 campaign it is probable that only 81 sugar factories will be in operation.

* * *

**Australian sugar exports**[8].—Exports of sugar from Australia totalled 1,142,130 metric tons, tel quel, in 1965, compared with 1,236,329 tons in 1964. The total included 121,355 tons for Canada (122,506 tons in 1964), 2134 tons for Hong Kong (1924 tons), 358,961 tons for Japan (405,204 tons), 43,178 tons for Malaysia (26,345 tons), 45,675 tons for New Zealand (47,750 tons), 393,631 tons for the U.K. (440,370 tons) and 177,169 tons for the U.S. (188,166 tons). The balance of 1964 exports comprised 4064 tons for South Korea.

* * *

**Kenya sugar expansion possibilities**[9].—Sugar trials and feasibility surveys, which might lead to a white sugar factory being built at Mumias in Kakamega District, are under way, according to the Agricultural Research Officer for the Western Province.

1 C. Czarnikow Ltd., *Sugar Review*, 1966, (773), 141.
2 *Public Ledger*, 23rd July 1966.
3 C. Czarnikow Ltd., *Sugar Review*, 1966, (751), 42
4 *Sugar Review*, 1966, (773), 139.
5 F. O. Licht, *International Sugar Rpt.*, 1966, **98**, (20), 18.
6 *Willett & Gray*, 1966, **90**, 306.
7 Through F. O. Licht, *International Sugar Rpt.*, 1966, **98**, (19), 8.
8 *Lamborn*, 1966, **44**, 121.
9 *Overseas Review* (Barclays D.C.O.), August 1966, p. 44.