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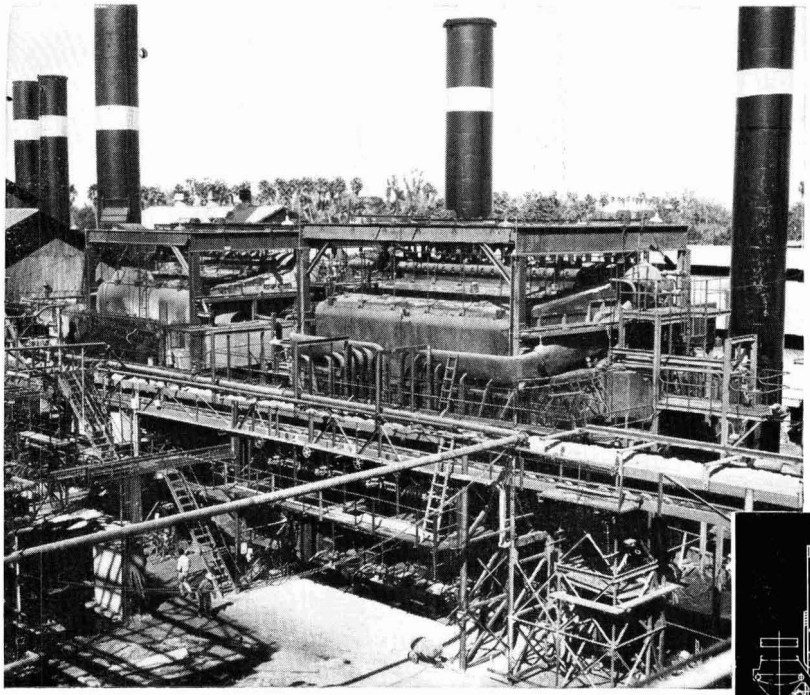
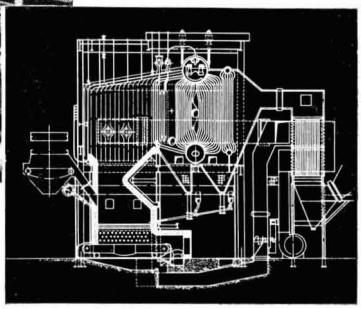


LOS MOCHIS

BABCOCK bagasse-fired boiler plant for the Los Mochis mill of Cia. Azucarera de Los Mochis S.A., Mexico (a total of 11 Babcock boilers) includes these two 125,000 lb./hr. Bi-drum units (left) and two further Bi-drum units each for 165,000 lb. steam/hr; supplied by Babcock & Wilcox Ltd. jointly with Babcock & Wilcox de Mexico S.A. de C.V., Mexico D.F.

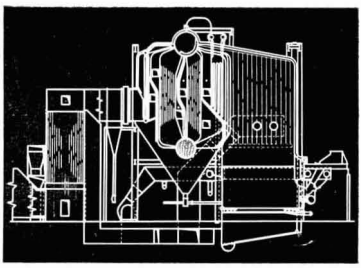


(Above) Arrangement of one of the 125,000 lb./hr. bagasse-fired boilers at Los Mochis. Steam conditions 250 lb./sq. in., 343 C.
Bagasse is fed through chutes into the Ward furnaces and spread by pulsating air-jets. Each Ward hearth is equipped with a chain grate to effect continuous removal of the ash. Auxiliary oil-firing is provided; also refiring of grits from the boiler hoppers.

MODERN **BOILER PLANT** for the SUGAR INDUSTRY

For over half a century sugar mills and refineries throughout the world have chosen BABCOCK boilers, fired with conventional fuels such as oil, gas, coal and wood, or with bagasse and other vegetable-refuse fuels, to meet their steam-raising requirements with the utmost reliability, economy and ease of maintenance.

This long and specialised experience is combined with modern design and construction in various types of Babcock boiler plant, with a wide choice of firing equipment to meet local requirements — the versatile Babcock-Detroit spreader stoker, burning bagasse and a variety of other fuels; the widely-used Babcock-Ward bagasse-furnace for efficient combustion and low maintenance and the established Horseshoe and Step-grate furnaces — with auxiliary oil or gas firing, if required.



Bi-drum boiler for bagasse firing with Babcock-Detroit spreader stoker, and with auxiliary oil-firing.

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THE
INTERNATIONAL SUGAR JOURNAL

VOL. LXVIII MARCH 1966 No. 807

NOTES AND COMMENTS

International Sugar Council.

The Twenty-first Session of the International Sugar Council was held at the seat of the Council in London on 27/28th January 1966. The Council unanimously elected Sir ROBERT KIRKWOOD (Jamaica) as its Chairman and Mr. J. CARNOCHAN (United Kingdom) as its Vice-Chairman for 1966.

The Council noted that 31 exporting countries and 13 importing countries were now members of the Agreement and that two more exporting countries were about to accede. The Council also noted that the Protocol extending the 1958 Agreement for a further period of 12 months has come into force.

The Council reviewed the market situation and the estimates of supply and demand for 1966. It adopted an estimate made by its Statistical Committee of the minimum net import requirements of the world market of 16 million metric tons. This represents an increase of 1·6 million metric tons over the first estimate made last October. (Details of the estimates appear elsewhere in this issue.)

The Council noted that while there would be ample supplies to meet requirements in 1966, over the year as a whole the balance between supply and demand was expected to be closer than in 1965.

The Council welcomed the report by the Exporters' Group that they had agreed on the principle of cooperative action by exporters to strengthen the free market price of sugar in the short term, and that a Sub-Group of exporters had been established to work out technical measures through which such action could be implemented and to submit an early report to the Exporters' Group.

The Council noted a report by its Executive Director on the preliminary consultations that had taken place in relation to the negotiation of a new International Sugar Agreement. The Council approved arrangements that had been made for convening meetings of working groups to carry out the preparatory work needed before the Secretary General of the United Nations Conference on Trade and Development could be advised to call a second session of the United Nations Sugar Conference.

British Sugar Corporation Ltd. 1965 report.

The Corporation's first year since the conclusion of its financial negotiations with the U.K. Government was an exceptionally favourable one in every way. An above-average rainfall to the end of June 1964 was followed by a long spell of warm sunny weather and easy harvesting conditions. This gave the second highest delivered crop of 6,218,925 tons of beet, equal to 14·54 tons per crop acre, with an average sugar content of 17·72% (the highest for nearly twenty years), high juice purity and a much higher than average pulp extraction. Manufacturing operations were completed in early February 1965 after a particularly smooth campaign at the factories. As a result record outputs were achieved of 928,484 tons in terms of white sugar and 548,128 tons of molassed dried pulp, including 147,049 tons in the form of nuts. The total amount of molasses produced was 304,159 tons. This most favourable combination of circumstances resulted in a profit, before taxation, of £3,716,291. Of this, £1,250,000 has been set aside as a future re-equipment reserve to provide for capital expenditure in excess of depreciation based on historical cost.

Although the 1965 crop may prove to be the second largest in the Corporation's history, it has comparatively low sugar and fibre contents and, notwithstanding improved technical efficiency, results in 1965/66 cannot be as good as they were in the year under review.

Recent progress towards reducing the amount of handwork needed for crop production and delivery was maintained in 1964/65. Sixty-five % of the crop was sown with precision drills, compared with 54% in 1963, and the acreage on which chemicals for weed control were applied at the time of drilling was increased from 15% to 23%.

Herbicides are now widely used on practically all agricultural crops and are of particular benefit in reducing the spring labour demand in sugar beet. Experience shows that at the present stage of development, very careful application in accordance with the manufacturers' instructions is necessary to obtain maximum crop yield and to achieve best results.

In conjunction with these techniques, field-scale trials using pelleted genetic monogerm seed gave most encouraging results. This type of seed provides the uniform stand of single plants necessary for complete mechanization of the spring work, and its availability will be substantially increased over the next few years.

Of the total crop 92% was harvested mechanically compared with 88% in 1963, and the use of cleaner-loaders to reduce dirt tare was increased from 30% to 37% of the total beet delivered. Whilst a further significant increase in mechanical harvesting is unlikely as the remaining growers have only small acreages, it is hoped that the use of cleaner-loaders, which is of mutual benefit to the grower and the Corporation in the reduction of dirt tare, will continue to expand.

New process plant installed in 1964 operated successfully and contributed to favourable results. Capital expenditure, to continue the programme of modernizing plant and increasing factory capacities, was at the same level as the previous year. In 1965 a large part of the available capital for replacements and capacity increase was used at Bardney, including better facilities for receiving and unloading beet, new extraction plant, pulp presses, lime kiln, centrifugals, boiler and power plant. Beet reception facilities were extended at Allscott, Ely, King's Lynn and Newark for quicker turn-round of vehicles, which is necessary with the general shortening of working hours.

The daily average of beet sliced by the factories was 52,100 tons, a new record which would have been exceeded had not the throughput been restricted by the abnormally high sugar content. The development of automatic recording of weights and sugar content of beet deliveries is being continued. Trial tests for feeding this information by telephone link direct to the computer at Peterborough, from tape produced at Bardney, have been successful. This will ultimately lead to results being more quickly available to the growers.

A new liquid sugar station has been erected at King's Lynn. Two new sugar silos at Spalding gave a total bulk capacity for the 1965 campaign of nearly 200,000 tons. Power requirements per ton of beet are steadily rising with modernization of process plant and the long-term programme of replacing boilers and turbo-generators is being continued.

New installations for the 1966 campaign include plant for capacity increase at Cantley, King's Lynn and Spalding, boiler and power plant at Felsted and King's Lynn, a complete plant for the production of kibbled pulp at Spalding, and sugar silos at Bardney and Felsted. A larger computer, ordered for installation in 1966, will enable the Technical and Operational Research Departments to extend the scope of their work.

U.S. sugar import authorizations[1].

On the 18th January the U.S. Department of Agriculture authorized the importation of 1,000,000 short tons, raw value, from nineteen foreign countries during April-June 1966. The Department approved applications giving first priority to bringing imports from each country in the first six months of this year up to the average for the years 1963–65. Second priority was given to bringing first half-year importations from countries up to 50% of their annual quota with first consideration to countries with the smallest quotas. Authorizations are as follows:

Argentina	28,550
Brazil	30,045
British West Indies	55,085
Colombia	11,286
Costa Rica	15,300
Dominican Republic	157,436
Ecuador	14,259
French West Indies	28,956
Guatemala	22,770
Haiti	8,925
India	47,953
Mexico	180,632
Nicaragua	13,665
Panama	5,024
Peru	62,709
Philippines	244,570
El Salvador	7,137
Taiwan	57,124
Venezuela	8,934
	1,000,000

* * *

International Sugar Council daily price formula.

The changes introduced as from 1st January 1966 in the basis for the quotations of the daily price by the United Kingdom Terminal Market Association (L.D.P.)[2]—these are now established with reference to sugar in bulk and do not include the cost of unloading in the United Kingdom—will not for the time being affect the terms in which the International Sugar Council's formula for the daily price is published, and this will continue to be expressed with reference to sugar in bags.

For this purpose, the formula used so far for the conversion of the L.D.P. from a c.i.f. U.K. to an f.a.s. Cuba will now omit the element of "unloading in the United Kingdom", but will include an element of "bag allowance" of 0·05 U.S. cents per lb (the New York ruling bag allowance).

[The adjustment of the London Daily Price to an f.a.s. Cuba basis will, therefore, now be made by (1) *deducting:* Freight from Cuba to the U.K., insurance, finance and loading and stowing at the port of embarkation (0·11 U.S. cents per lb); and (2) *adding* the bag allowance of 0·05 U.S. cents per lb.]

[1] *Lamborn*, 1966, **44**, 9–10.
[2] *I.S.J.*, 1965, **67**, 322.

SUGAR CANE RESEARCH IN TRINIDAD

Tate & Lyle Agricultural Research Station Annual Report, 1964.

THIS lengthy report from Trinidad (368 pp.) contains a great deal of information likely to interest research workers and others concerned with the cultivation and production of sugar cane. In his introduction the Director, Dr. A. J. VLITOS, points out that the year 1964 marked several advances in the research programme. Notable among these, from the economic point of view, was the demonstration that the sugar cane leafhopper (*Aeneolamia varia saccharina*), Trinidad's worst cane pest, is once again susceptible to the chlorinated hydrocarbons. This is regarded as a good example of how a fundamental study, begun in 1961, has "paid off." The discovery should result in substantial saving to the Trinidad sugar grower for several years to come, for it is again possible to control froghopper effectively with a number of inexpensive insecticides. If rotated with organophosphates ("Trithion" in particular) it should be possible to use them for some years before resistant strains of leafhopper reappear.

Other studies in the entomological field have included methods of rearing froghoppers in captivity, egg diapause and attempts to find oviposition and sex lures for froghoppers. A search has also been carried out in Uganda for predators and parasites of froghoppers. It is hoped this work may eventually lead to biological control of the pest.

With regard to oviposition with the froghopper, experiments so far indicate that crude acetone extracts of sugar cane roots are attractive to ovipositing froghoppers and that it is possible that an "oviposition lure" may be present in sugar cane roots. It is hoped that use of other solvents may lead eventually to the purification and identification of the "oviposition lure". Experiments have also indicated that a sex attractant may be produced by virgin female froghoppers. Production of the attractant may be confined to certain periods of the day and of the female's life. Observation has shown that mating of virgins most frequently occurs within 24 hours of emergence but some females do not mate until 3 or 4 days later. In captivity females will not mate more than once and there is evidence that more than one mating is needed for maximum fertility. An account is given of the British Honduras froghopper (*Aeneolaminia postica jugata*) and its habits, which resemble those of the Trinidad leafhopper in many respects.

In the sphere of agronomy many activities are recorded. The basis for the selection of new, higher-yielding varieties of sugar cane has been broadened. During the year 37 variety trials were reaped. In a comparison of mixed variety planting with pure stands using the three standard varieties (B 41227, B 49119, B 50112) there was no apparent advantage from mixed planting. Several new varieties, from Barbados and Puerto Rico, yielded well in the 1964 trials and obviously show adaptability to Trinidad conditions. Their names or numbers are given.

With regard to weed control during the year, research was largely concerned with the re-evaluation of chemicals which had shown promise in 1963, e.g. "Tordon 22K" and "Tordon 101" as pre-emergence herbicides. "Fenac" gave good results when applied as a pre-emergence spray in ratoons and its use is to be extended. A mixture of 2-methyl-4-chlorophenoxy-acetic acid and 2,3,6-trichlorobenzoic acid ("Pesco 1815") is considered to be one of the most effective and least expensive of the residual pre-emergence weedicides ever to be used with sugar cane. Some interesting preliminary results were obtained with chemical weedkillers designed to control weeds in the interval between ploughing and planting. Further trials are planned.

Fertilizer trials carried out on two different estates indicated that in general the fertilizer practices at present carried out are sound. Trials in which complete fertilizer formulations were compared with applications of individual fertilizers showed that there was no economic advantage in applying the complete fertilizer.

In the realm of fundamental research in plant physiology further work has yielded fresh evidence of the existence of gibberellins in sugar cane. There is also preliminary evidence for the existence of "bound" gibberellin-like substances, which may be released either by enzymatic or acid hydrolysis. The gibberellin-like substances released by acid hydrolysis differ from those which are released after hydrolysis with the enzyme. Progress has been made in purifying and identifying some of the important cellular components. Other fundamental studies, all aimed at expanding knowledge and at simplifying the eventual solution of practical problems, have included basic studies on the interaction between sugar cane roots and fungi and attempts to culture sugar cane tissues on defined media.

In the field of soil microbiology the detailed study of fungi in a very heavy clay soil was continued, this study having been in progress for the last 4 years. One of the major objectives has been to ascertain whether there are differences in the types of fungi that occur in an uncultivated plot as compared with one in which sugar cane is cultivated. Although the study is far from complete some interesting results have emerged. A surprising discovery was the lack of "qualitative" differences in the fungi isolated from fallow soil. In general the same genera of fungi were isolated from the fallow as from the cultivated plots. However 2½ months after the plant crop was reaped a sharp reduction was recorded in the number of fungal genera isolated. Almost 3 times as many fungal genera were isolated from fallow soil than from the soil of young first ratoons.

F.N.H.

ACTIVE CARBON AS AN ADSORBENT IN CLARIFICATION OF RAW SUGAR SOLUTIONS

By R. SAWYER

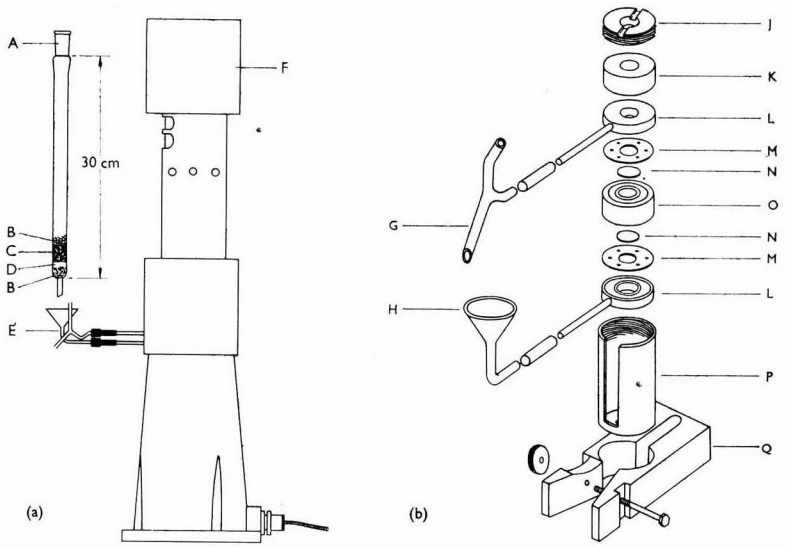
(Ministry of Technology, Laboratory of the Government Chemist, Cornwall House, Stamford St., London, S.E.1.)

Reprinted from The Analyst, 1965, **90**, 476–481.

THE commercial value of sugars and the duty to be charged on them is assessed by their "polarization," *i.e.*, the optical rotation of a standard solution (26·00% w/v) under defined conditions, the rotation being measured on the International Sugar Scale[1] with a visual polarimeter. A necessary stage in the preparation of solutions for visual polarimetry is the clarification by mineral-salt defecants, and this is essential even though solutions may be only slightly coloured.

Solutions of lead salts have been accepted, with reservations[2], as suitable for clarification purposes, although acknowledged side effects do occur in their use[3]. The magnitude of these side effects has long been the subject of controversy and of extensive research[4,5].

Filtration through bone char is a standard process for decolorizing sugar solutions during refining, and it was thought that a similar process might be adapted to the decolorizing of solutions for polarization. The adsorption of sugars on activated vegetable carbon has been studied in this Laboratory[6], and it has been shown that if a solution of mixed sugars is passed through a column of a suitable grade of carbon, the concentration of each sugar in the effluent builds up in turn until the composition of the mixture leaving the column is the same as that entering it. If the colouring matter of raw sugar were adsorbed more strongly than any of the sugars, then it should be possible to obtain a fraction of the effluent that contains all the sugars in the same relative proportions as they occur in the original solution but that contains none of the colouring matter.



A = B19 joint
B = Cotton-wool
C = Carbon-"Celite" mixture
D = "Celite"
E = Flow-cell
F = Photo-electric polarimeter
G = Sample outlet
H = Sample inlet
J = Retainer
K = Spacer
L = Manifolds
M = Sealing washers
N = Cover glasses
O = Cell spacer
P = Body
Q = Body clamp

Fig. 1. Diagram of photo-electric instrument: (*a*) set up for continuous flow; (*b*) exploded diagram of flow-cell.

EXPERIMENTAL

Clarification efficiency

Various mixtures of activated carbon, "Hyflo Supercel" and "Celite 560" were examined for flow-rate and decolorizing power.

The most efficient decolorizing mixture consistent with a flow-rate of 3 to 4 ml per minute and an advantageous ratio of bed volume to cleared solution proved to be a mixture of activated carbon powder (British Drug Houses Ltd.) and "Celite 560" (Koch-Light Laboratories Ltd.) in the ratio of 1 to 3. The decolorizing capacity of a 16-mm internal diameter column containing 2·5 g of such a mixture was sufficient to reduce the optical density ($E^{26\%}_{1\,cm}$ at

[1] *I.S.J.* 1933, **35**, 17, 62.
[2] *Proc. 12th Session ICUMSA*, 1958, 82.
[3] GASKIN and MESLEY: *I.S.J.*, 1958, **60**, 65.
[4] GASKIN and HANDS: *Analyst*, 1953, **78**, 334; *I.S.J.*, 1954, **56**, 63-65.
[5] HORNE: *J. Amer. Chem. Soc.*, 1904, **26**, 186.
[6] WALKER and MORTON: *Analyst*, 1964, **89**, 512.

540 mμ) of 60 ml of a dark, raw sugar solution from 0·50 to less than 0·03. The optical density of a solution, clarified with lead acetate, of the same original sugar was 0·04. A progressive increase in the colour of the effluent solution became obvious visually, after approximately 60 ml of solution had passed through the column. The flow-rate was chosen to be comparable with the average filtration rate of raw sugar clarified with lead acetate.

Optical-rotation measurements

The optical rotation of effluent from a column can be measured continuously by the Bendix Ericsson ETL/NPL Automatic Polarimeter, Type 143A, coupled with a pen recorder that gives a full-scale deflection over any prescribed interval of 5° Sugar Scale, and fitted with a 1-cm flow-through cell (see Fig. 1). Such measurements (see Table I) showed that the rotation increased to a constant, maximum value after approximately 15 ml of solution had passed through the column, and also that the constant rotation was maintained for at least a further 25 ml of effluent. This is a sufficient amount for use with a standard polarimeter tube for visual reading. The final constant rotation observed was found to be independent of column flow-rates between 3 and 8 ml per minute.

Table I

Rotation and optical density of effluent from carbon-"Celite" mixture columns

	cane sugar		*beet sugar*	
Effluent, ml	*Rotation, °S*	*Optical density measured in a 1-cm cell*	*Rotation °S*	*Optical density measured in a 1-cm cell*
5	95·37	0·00	95·40	0·00
10	97·37	0·00	96·37	0·00
15	97·50	0·00	96·75	0·00
20	97·53	0·00	96·81	0·00
25	97·53	0·00	96·82	0·00
30	97·53	0·00	96·81	0·01
40	97·53	0·00	96·81	0·01
50	97·51	0·01	96·81	0·02
60	97·50	0·02	96·80	0·02
Original unclarified solution	97·30	0·35	96·37	0·19

In order to test whether other sugars found with sucrose were removed, artificial mixtures of sugars were made and passed through the charcoal column. Table II gives a summary of results obtained for the various mixtures, and shows that only insignificant changes in rotation are caused by the treatment.

Table II

Comparison of rotations of sugar solutions before and after treatment on carbon-"Celite" mixture columns at an approximate concentration of 26 g per 100 ml

Mixture composition		*Polarization, °S, found by photo-electric observation*		*Polarization, °S, found by visual observation*		*Theoretical effect of removing the non-sucrose sugars, °S*		
Sugar	*Percentage*	*before treatment*	*after treatment*	*before treatment*	*after treatment*	*Glucose*	*Fructose*	*Raffinose*
Sucrose	100	100·02	100·02	100·01	100·02	—	—	—
Sucrose	99·75	99·68	99·68	99·66	99·67	−0·10	+0·16	—
Glucose	0·12							
Fructose	0·12							
Sucrose	99·5	99·27	99·28	99·27	99·27	−0·20	+0·33	—
Glucose	0·25							
Fructose	0·25							
Sucrose	99·0	98·66	98·67	98·68	98·69	−0·40	+0·66	—
Glucose	0·5							
Fructose	0·5							
Sucrose	98·0	97·45	97·44	97·46	97·47	−0·79	+1·30	—
Glucose	1·0							
Fructose	1·0							
Sucrose	97·9	97·37	97·36	—	—	−0·79	+1·43	—
Glucose	1·0							
Fructose	1·1							
Sucrose	96·2	94·96	94·93	94·97	94·95	−1·51	+2·47	—
Glucose	1·9							
Fructose	1·9							
Sucrose	95·8	94·64	94·63	—	—	−1·67	+2·74	—
Glucose	2·1							
Fructose	2·1							
Sucrose	97·5	97·47	97·47	97·47	97·47	—	—	—
Sucrose	98·0	97·63	97·62	97·62	97·62	−0·79	+1·17	−0·16
Glucose	1·0							
Fructose	0·9							
Raffinose	0·1							
Sucrose	95·4	95·50	95·50	—	—	−1·67	+2·74	−0·64
Glucose	2·1							
Fructose	2·1							
Raffinose	0·4							

METHOD

Preparation of solution

Weigh 26·000 ± 0·002 g of raw sugar from the prepared sample into a nickel scoop, transfer it to a 100-ml calibrated flask with about 60 ml of boiled distilled water at 20° ± 0·1°C, and dissolve it by agitation without heating. Dilute the solution to the mark with boiled distilled water at 20° ± 0·1°C.

Preparation of the adsorbent column

Place a small cotton-wool plug in the lower end of a glass column, 30 cm long and 1·6 cm in internal diameter, with the lower end restricted to a short tip, 0·4 cm in diameter, and with a B19 socket at the top. Tamp the plug, and pour on a layer of "Celite 560" approximately $\frac{1}{16}$ inch thick. Tamp down again.

Weigh 2·5 g of carbon-"Celite" mixture (1 part of B.D.H. "Charcoal, decolorizing powder" to 3 parts of "Celite 560") and transfer it to the prepared column under a light suction from the bottom of the column. Tamp and seal the top of the column with a cotton-wool plug.

Clarification and measurement of rotation

Pour 40 to 50 ml of the raw sugar solution into the tube containing the prepared bed. Apply a positive pressure, equivalent to 1 to 2 inches of mercury, to the column by means of an air line and standard-joint adapter at the top of the column. Discard the first 15 ml of effluent. Collect the next 25 to 30 ml of effluent in a dry tube or beaker *taking precaution against evaporation* by covering the mouth of the receiving vessel.

For photo-electric measurement, transfer a portion of the collected effluent to the photo-electric polarimeter cell, and allow the solution to come to thermal equilibrium with the instrument. Allow the instrument to record the rotation of the solution for a further 60 second.

For visual measurement, transfer the collected effluent to a dry polarimeter tube. Place the tube in the visual polarimeter and allow the solution to come to thermal equilibrium with the instrument. Read the optical rotation of the solution.

Calibration of the photo-electric polarimeter

The method of calibrating this instrument has been described at the 13th Session of ICUMSA in 1962[7] and by MESLEY[8]. The instrument is standardized by observations on solution of pure sucrose whose rotations have previously been determined by using a visual instrument. The accuracy of calibration is, therefore, never better than that of visual observation of the standardizing solution. In all instances, the solutions were allowed to attain thermal equilibrium with the instrument before any observations were made. The rotation assigned to any one solution was the mean of ten individual observations in the steady state.

COMPARISON OF THE PROPOSED METHOD WITH THE ESTABLISHED ICUMSA STANDARD METHOD I

Groups of samples of raw cane and beet sugar drawn from lots with a common origin and with the same degree of polarization were collected together. Several bulk samples representing the various countries of origin and with a range of polarizations were then thoroughly mixed and sieved before use. Polarization determinations were made by the conventional ICUMSA lead-clarification technique[9] and the proposed carbon-column technique on solutions made from these bulk samples.

Comparative results

Reproducibility—Observations, made firstly on the basis of internal repeatability on any one solution and secondly on the basis of repeatability of results obtained by repetition of the two methods from a common bulk, showed that the two methods differed slightly in this respect. The standard deviation of ten individual observations on a solution prepared by the proposed method was in the range 0·01° to 0·02°S; all prepared solutions were colourless. The established technique showed a wider range of observations on any one solution; this was dependent on the original colour of the sugar and the efficiency of the lead clarification. Most light-coloured sugars gave solutions for which the standard deviation of ten observations varied from 0·01° to 0·02°S, but darker sugars (polarization generally 95° to 97°S), gave solutions on which the standard deviation of ten observations varied from 0·02° to 0·03°S.

Results obtained by ten replicate analyses from the same common bulk sample showed standard deviations of 0·04° to 0·06°S by both methods.

Comparison of results by ICUMSA Standard Method I and the proposed method—The comparative results for cane and beet sugars by the two methods are set out in Tables III and IV. The results so far obtained in the range 95° to 100°S show no apparent correlation between the polarization by standard method I and the difference between the results of the two methods (standard method I minus proposed method). The differences range from +0·33 to —0·16 for cane sugar, and +0·07 to —0·20 for beet sugar. Positive differences are expected owing to the fact that the proposed method eliminates the effects of lead precipitate volume; negative differences may be partially explained by the effects of lead salts on the rotation of certain amino-acid constituents[10].

The tabulated results are the means of three separate analyses by the two methods, except where indicated as means of ten independent replicates.

A statistical analysis of the pooled results of 168 determinations on 49 samples by both methods

[7] *Proc. 13th Session ICUMSA*, 1962, 84.
[8] *I.S.J.*, 1962, **64**, 37.
[9] *Proc. 12th Session ICUMSA*, 1958, 84.
[10] MESLEY: *I.S.J.*, 1962, **64**, 104.

Table III

Results for cane sugars

Source	rotation found by visual observation on lead-clarified solution (x)	rotation found by instrumental observation on carbon-clarified solution (y)	Difference, $x - y$
Antigua	97·58	97·53	+ 0·05
Australia (1)*	98·76	98·72	+ 0·04
(2)	98·80	98·85	— 0·05
(3)	98·64	98·67	— 0·03
(4)	98·85	98·88	— 0·03
Barbados (1)	97·23	96·90	+ 0·33
(2)	97·03	96·79	+ 0·24
British Guiana (1)	98·78	98·76	+ 0·02
(2)	98·88	98·77	+ 0·11
(3)	98·03	97·95	+ 0·08
(4)	97·03	96·91	+ 0·12
British Honduras (1)	97·94	97·81	+ 0·13
(2)	98·23	98·23	0·00
Cuba (1)	96·57	96·47	+ 0·10
(2)	98·11	98·03	+ 0·08
(3)	96·22	96·15	+ 0·07
Dominican Republic	97·77	97·72	+ 0·05
Fiji (1)	98·63	98·65	— 0·02
(2)	98·55	98·59	— 0·04
India	97·17	97·18	— 0·01
Jamaica (1)	97·60	97·54	+ 0·06
(2)	96·96	96·83	+ 0·13
Mauritius	99·01	99·04	— 0·03
Peru	97·35	97·34	+ 0·01
Rhodesia	97·56	97·51	+ 0·05
St. Kitts	97·24	97·18	+ 0·06
S. Africa (1)	98·72	98·88	— 0·16
(2)	98·97	98·99	— 0·02
Trinidad (1)*	96·94	96·82	+ 0·12
(2)	98·47	98·47	0·00
(3)*	96·56	96·49	+ 0·07
(4)	96·95	96·95	+ 0·03
(5)	97·04	97·13	— 0·09
(6)	98·26	98·33	— 0·07

* Values from 10 repeated observations.

Table IV

Results for beet sugars

Source	Rotation found by visual observation on lead-clarified solution (x)	Rotation found by instrumental observation on carbon-clarified solution (y)	Difference, $x - y$
Bury St. Edmunds	98·62	98·56	+ 0·06
Ely (1)	98·78	98·83	— 0·05
(2)	97·25	97·31	— 0·06
Peterborough	98·07	98·11	— 0·04
Wissington	98·05	97·98	+ 0·07
Belgium	97·56	97·55	+ 0·01
Czechoslovakia	99·96	99·98	— 0·02
France	98·04	98·09	— 0·05
Poland (1)	96·83	96·89	— 0·06
(2)	97·56	97·73	— 0·17
(3)	96·69	96·83	— 0·14
(4)	96·73	96·91	— 0·18
(5)	97·73	97·93	— 0·20
Rumania	99·86	99·89	— 0·03
U.S.S.R.	99·97	99·98	— 0·01

showed that the average standard deviation for each method was 0·05°S. The same average standard deviation was obtained for each of the sub-groups, cane and beet sugar, by each method. Variance-ratio tests showed no significant difference between standard deviations at the 1% probability level.

A summary of the numbers of replicate determinations necessary to establish differences between the two methods at various probability levels is given in Table V. From this it may be seen that for triplicate determinations, differences greater than 0·10°S are significant, and that for the ten-fold determinations, differences greater than 0·05°S are significant and these may be regarded as a measure of the net lead effect.

Table V

Results at varous probability levels

Number of replicate determinations	Difference between polarizations for significance, °S $P = 0·05$	$P = 0·02$	$P = 0·01$
1	0·14	0·17	0·18
2	0·10	0·12	0·13
3	0·08	0·10	0·11
4	0·07	0·08	0·09
6	0·06	0·07	0·08
9	0·05	0·06	0·06
10	0·04	0·05	0·06

Other Methods of Assessing Polarization

A proposal for determining polarization by direct observation of unclarified solutions in the photo-electric polarimeter has been reported[8]. This method requires an instrumental calibration for each individual sample, this calibration being required in order to correct the direct reading for light-absorption effects. The calibration involves three separate readings of the photo-electric polarimeter with (*i*) pure sucrose in the rotation cell, (*ii*) pure sucrose in the rotation cell with the sample in a 1-cm cell interposed in the non-polarized part of the light path and (*iii*) an unclarified solution in the rotation cell. Owing to varying optical densities of the raw sugar solutions, the photo-electric instrument shows a variable degree of electronic noise, and individual traces of the pen recorder under conditions (*ii*) and (*iii*) above show ranges of observation on a single solution covering 0·02° to 0·03°S with sugars in the 95° to 100°S range. With lower-grade sugars, variations in individual readings exceeded 0·20°S. The net effect is that the sum of variance for the various observations necessary to obtain a polarization from an unclarified sugar is such that the standard deviation for ten repeat observations on a single solution is greater than 0·03°S, and this is too large for the method to be useful for measuring small differences given by different techniques.

It was considered, therefore, that this technique was suitable only for examining lightly coloured solutions with optical densities ($E^{26\%}_{1\,cm}$ at 540 mμ) of not greater than 0·25.

Conclusions

The proposed technique of clarification has been demonstrated to be effective when used with raw sugar solutions, and the reproducibility of observation of the rotation of the prepared solution is at least as good as that of the equivalent solution prepared by the standard lead-clarification technique.

The method is therefore proposed as an alternative to the standard lead-clarification technique for use in obtaining the value of the optical rotation of the

sugars in a solution prepared from unrefined or partially refined sugar.

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SUMMARY

A new approach to the problem of clarifying raw sugar solutions is described.

A procedure is proposed for clarifying raw sugar solutions on the grounds that a decolorization of the sugar solution may be effected without altering the relative concentration of the component sugars. A departure from the use of traditional defecating agents with their precipitate volume and other rotation effects has been made, and a method that can be used with either visual or photo-electric polarimeters has been evolved.

NEMATODE-TRAPPING FUNGI IN SUGAR CANE SOILS

NEMATODES or eelworms cause vast damage to crops all over the world. In Britain alone the potato root eelworm is considered to be responsible for the destruction of about a quarter of a million tons of potatoes every year causing a total loss of some £2,000,000. The beet eelworm destroys considerable quantities of sugar beet as does the cereal eelworm in the case of cereals, especially oats. The stem eelworm attacks many economic plants, including clover, onions and hyacinth bulbs, while the root-knot eelworm destroys tomatoes. Nematodes or eelworms may attack tropical crops, notably pineapples, bananas and sugar cane.

Nematodes, like other forms of life, have their natural enemies. Among these are certain fungi which have the ability to trap nematodes with their sticky and looped strands of mycelium and to make use of the dead body of the nematode as food. The manner in which this takes place forms a fascinating story[1]. The possibility of making use of these fungi in controlling nematodes that attack important crops has been considered in many quarters in recent years.

In an article[2] in a Taiwan journal there is an account (in Chinese with an English summary) of work that has recently been carried out on the nematode-trapping fungi that are known to occur in the sugar cane soils of that island. Six species have been isolated, viz.: *Arthrobotrys cladodes* Drech., *A. conoides* Drech., *A. dactyloides* Drech., *A. oligosperma* Fres., *Dactylella ellipsospora* Grove and *Dactylella* sp. The most widely distributed species appears to be *Arthrobotrys oligosperma*, followed by *A. conoides*, whilst *Dactylella* is the least common.

Laboratory studies and experiments showed that the best development of mycelium of these fungi was in a cornmeal-agar culture medium, and the second best development by potato-agar. The best development of the six fungi was shown by *A. cladodes*, followed by *A. oligosperma*. With the last mentioned, normal growth of the mycelium took place within the temperature range 12°C–32°C with optimum growth at 27°C. With the temperature raised to 37°C or reduced to 3–8°C growth was markedly checked.

With *A. oligosperma* the strongest nematode-trapping action was at a temperature of 27°C, but good trapping action might still be secured at 22°C to 12°C. At a temperature higher than 32°C the trapping action was significantly checked and ceased at a temperature of 37°C.

In pot experiments with the root-knot nematode it was found *A. oligosperma* has a beneficial effect in trapping the nematode. When the "sick" soil in a pot was inoculated with this nematode-trapping fungus, damage by the root-knot nematode was markedly reduced. In comparative studies of the trapping action of *A. oligosperma*, *A. conoides* and *A. dactyloides* in pot experiments the first mentioned appeared to have the strongest trapping effect, with *A. conoides* the second strongest and *A. dactyloides* the weakest.

F.N.H.

BREVITIES

Sugar factory for El Salvador[3].—A new sugar factory with a production capacity of 500 metric tons of sugar per day has been put into operation at Izalco during the last campaign.

* * *

New sugar factory for Costa Rica[4].—A large sugar refinery, costing 3 million colones (£430,000), is to be set up in the Province of Grecia.

* * *

Polish sugar factory fire[5].—The sugar factory in Dobre has recently been destroyed by a fire which caused damage estimated at 5 million zlotys.

* * *

Paraguay sugar production, 1965[6].—Crushing for the 1965 season was completed in December with a total production of 35,040 tons of sugar, sufficient to cover domestic consumption.

[1] *I.S.J.*, 1958, **60**, 31–34.
[2] CHU and HSU: *Rpt. Taiwan Sugar Exp. Sta.*, 1965, (37), 81–88.
[3] *Foreign Agric. Circular*, July 1965.
[4] *Fortnightly Review* (Bank of London & S. America Ltd.), 1965, **30**, 1154.
[5] F. O. Licht, *International Sugar Rpt.*, 1966, **98**, (1), 12.
[6] *Fortnightly Review* (Bank of London & S. America Ltd.), 1966, **31**, 14.

CODEX ALIMENTARIUS

By CHARLES B. BROEG
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Talk given recently before The Sugar Club of New York, here somewhat abridged.

THE basic idea of food standards undoubtedly germinated at the time individuals began exchanging food among themselves. Its growth has paralleled the growth of the food producing and processing industries and at present has evolved into a complex system in many different countries.

With local food regulations, standards of identity, trading exchange standards, product specifications, grading and quality standards, and food additive standards imposed upon the food industry, it may be wondered with considerable reason why another set of standards is needed. One important reason for standards results from international trade in foods and the need for common denominators better to define foods. The factor has led various organizations and technical groups to discuss "standards" for a variety of food products. Such activities, however, are generally limited in scope and application. Moreover, these unrelated efforts were beginning to produce an uncontrolled and wildly growing jungle of standards which at times created as many problems as they solved. The immensity of these efforts is indicated by the fact that in 1962 more than 135 inter-governmental and non-governmental organizations were investigating various aspects of foods and their standardization for trade purposes[1].

Dr. HANS FRENZEL, at the time he was a Minister in the Austrian Government, was perhaps the first individual to take public notice of the rapidly growing standards jungle. He saw a need for coordinating national food standards on a regional basis in order to facilitate and promote trade in food products. Dr. FRENZEL first advanced this principle at a meeting of the Research Group of the German Food Industry in 1953[2]. He and other representatives of the Austrian Government pursued this idea until their efforts resulted in the formation of the European Council of Codex Alimentarius in 1958. By this time, the efforts of Dr. FRENZEL and his associates had created sufficient world-wide interest to cause other governments to investigate this broad principle. The growing emphasis on international trade and the formation of regional trading groups (such as the common markets in Europe) led the Food and Agriculture Organization of the United Nations to issue the following statement[2] at its 1960 meeting in Rome:

> " . . . a valuable step forward would be achieved if the Director General of the F.A.O., in collaboration with the Director General of W.H.O. and after consultation with the international governmental and non-governmental organizations active in this field, could submit to the Eleventh Session of the Conference proposals for a joint F.A.O./W.H.O. programme on food standards and associated requirements, with particular reference in the first instance to the principal foodstuffs offered for sale on the European market . . . "

Subsequent discussions between the F.A.O. and the European Council of Codex Alimentarius led to an association of the council with the F.A.O. and the World Health Organization to develop a food standards programme. At its Eleventh Session in 1961, the F.A.O. together with the W.H.O. proposed the formation of a Codex Alimentarius Commission open to all member countries and associate members of the F.A.O. and W.H.O. which are interested in international food standards. A meeting attended by 44 countries and 24 international organizations was held in 1962 to consider the proposed Codex Alimentarius Commission and to set up guide lines for its work[1]. The first meeting of the Commission was held in 1963.

Objectives and Organization of the Commission

The basic purpose[2] of the Commission is to simplify and harmonize international food standards activities by:

(1) assigning priorities to the development of standards;
(2) coordinating and supplementing the work of other organizations in the field;
(3) finalizing draft standards for consideration at government level, and publication of adopted standards in a consolidated Codex Alimentarius; and
(4) amending published standards, after appropriate survey, in the light of developments.

These activities are expected to lead to further development of international food trade, primarily by the removal of conflicting national regulations and restrictions that tend to impede trade inadvertently or otherwise. The area in which greatest progress is likely to come is in the area of food additives.

National food additive regulations vary widely from country to country. Additives which are considered satisfactory in the United States are not acceptable in other countries, and vice-versa. National food consuming habits and customs also pose problems. Although it is hoped that the standards work of the Commission will eventually eliminate barriers of an artificial nature, this goal will be difficult to achieve on a broad scale within a short period of time. The Commission recognizes the magnitude of the problems and has started work initially on commodity-like products.

[1] *Rpt. Joint F.A.O./W.H.O. Conf. on Food Standards* (Geneva), 1962.
[2] KOENIG: "A New Vital Influence in International Food Standards." *Paper delivered at the 24th Ann. Meeting, Inst. Food Tech.* (Washington, D.C., U.S.A.), 1964.

In order to achieve the various objectives in an orderly fashion and within a reasonable period of time, the Commission is authorized to appoint committees and study groups to work on specific assignments. The following committees and study groups were appointed at the first meeting of the Commission[2].

	Subject	*Organization in Charge*
1.	Fish and Fishery Products	F.A.O. Fisheries Division
2.	Oils and Fats Committee	The United Kingdom
3.	Committee on Sugars	The United Kingdom
4.	Fruit Juice Standards	Switzerland
5.	Cocoa Products and Chocolate	Switzerland
6.	Food Additives Committee	The Netherlands
7.	Food Hygiene	The United States
8.	Processed Fruits & Vegetables	The United States
9.	Meat and Processed Meat Products	Republic of West Germany
10.	Pesticide Residues	The Netherlands
11.	Honey	Austria
12.	Methods of Analysis	Austria
13.	Sampling	International Standards Organization
14.	Food Labelling Laws	Codex Alimentarius Commission Staff
15.	Poultry Study Group	The United States
16.	Margarine	International Federation of Margarine Associations
17.	Eggs	Unorganized at present
18.	Soft Drink Study	The United Kingdom
19.	Sampling and Analysis of Wheat	International Standards Organization

The Chairman of each committee is authorized to convene international meetings for preparing draft standards for those food products falling within the jurisdiction of the committee. All countries which belong to the F.A.O. or W.H.O. may participate in committee meetings and other interested countries may send observers. A country may send an official delegate (usually a government official) and as many advisers as deemed necessary. The advisers may be selected from the industry affected by the standards. In some cases, a country may send only an observer who does not officially participate in the discussions of the committee. Some private organizations which have participated in standards activities also may send observers.

Types of Standards

Two types of standards, "minimum platform" and "trading", have been defined by the Codex Alimentarius Commission[3]. A committee may choose to work on the development of either or both types, as circumstances relating to a specific product dictate. The two standards are described as follows:

Minimum Platform Standards lay down basic requirements to protect the consumer from health hazards and misrepresentation. Their acceptance by a government solely implies that compliance with it is a necessary condition for their importation and sale within its jurisdiction, but that such products may well have to comply with more stringent national provisions.

Trading Standards build upon the minimum platform standard by including "higher" additional requirements. The acceptance of such standards by a government implies that, as far as food law provisions are concerned, compliance with them of the products is a necessary and sufficient condition for their importation and sale within its jurisdiction.

The minimum platform standard is expected to establish the basic levels of wholesomeness and quality for a product which make it acceptable for general distribution and consumption as a food. It is further expected that this standard would become the least common denominator for international trade for many countries. An additional objective of this type of standard is to upgrade the general level of wholesomeness and quality of food products in developing nations where few, if any, standards exist.

The term "trading standard" is unfortunately a misnomer. It suggests to many people that such a standard would establish product requirements for international trade. However, the major difference between a minimum and a trading standard is the degree of purity (hygienically and compositionally). Nonetheless, it is contemplated by the Commission that a trading standard could become the basis for trade among regional groups of nations in the sense that trade in products meeting trading standard requirements could not be restricted by national standards of purity. Adoption of such a standard by a country also implies that all products sold within a country must meet the requirements of the standard.

In part, the differences in the two types of standards reflects differences in the philosophy of the two organizations, F.A.O. and W.H.O., under which the Codex Alimentarius Commission functions. The World Health Organization is basically interested in seeing that only wholesome, unadulterated, nutritious foods, free of contamination and harmful substances enter into international trade as well as trade within each individual country. Once these basic objectives have been met, W.H.O. feels that its overall goals have been achieved. However, the Food and Agriculture Organization has adopted a policy of attempting to upgrade product quality, and it is for this purpose that the "trading standards" category has been established[4].

Codex Procedure for the Development of Standards

At its 1964 meeting, the Codex Commission adopted simple procedures for formulating and adopting food standards on a world-wide basis. Although the procedures may appear to be unwieldy and time-consuming, the need for such procedures is obvious when, in theory, the results may affect trade throughout the world. The basic procedures are as follows:

Step 1—The Commission assigns a product or group of products to a Committee or Study Group.

Step 2—The Committee draws up a *proposed draft provisional standard.*

[3] *Rpt. 2nd Session, Joint F.A.O./W.H.O. Codex Alimentarius Commission* (Geneva), 1964.

[4] Private discussion with Chairman, Codex Alimentarius Commission.

Step 3—The Committee refers the proposed draft provisional standard to all governments for comments.

Step 4—Comments are reviewed and changes, if any, are made in the proposed draft by the Committee.

Step 5—The proposals are submitted to the Codex Alimentarius Commission for adoption as "Draft Provisional Standards".

Step 6—The Commission refers the standards to all governments for comment.

Step 7—The comments are referred back to the Committee.

Step 8—After appropriate changes, the standards are referred to the Commission for adoption as "Provisional Standards".

Step 9—The Provisional Standards are referred to all governments for acceptance.

Step 10—When a sufficient number of governments has accepted the Provisional Standards, they are printed in a Codex Alimentarius as a Standard.

Step 11—When sufficient acceptances have been received, the Standard is printed in the Codex Alimentarius as a World-Wide Standard.

The Committee, under these procedures, is the most important group in formulating standards and is the only group that works directly with the problems associated with the formulation of standards. In reality, the Committee becomes the source of basic policy on standards and exerts a tremendous influence on all aspects of the standards.

A committee functions much as would be expected. The country or organization in charge of a committee prepares an agenda and a report or proposals for standards and distributes them to all member countries prior to a scheduled meeting. These reports and proposals are discussed at the meeting in an effort to reach agreement on a draft standard. In some cases, countries not participating in the meeting submit comments to the chairman of the committee for discussion.

The Codex Committee on Sugars has had two meetings. At its first meeting in 1964, the Committee worked on proposals for sugar, powdered sugar, soft and brown sugar, liquid sugar, invert sugar, refiners' syrup, molasses, treacle, golden syrup, glucose syrup, glucose syrup solids, hydrated dextrose, anhydrous dextrose, crude corn sugars and lactose. However, at the close of its three-day meeting the Committee had drafted standards for only extra white sugar, white sugar, powdered sugar, soft and brown sugars, glucose syrup, dried glucose syrup, dextrose monohydrate and dextrose anhydrous. Proposals for lactose and fructose were discussed but not acted upon.

After the proposed standards were reviewed by the participating countries, they were returned to the committee for reconsideration. At its second meeting, the Committee eliminated the standard for extra white sugar, modified other proposed standards, and worked on proposals for lactose and fructose. The Committee decided to defer action on liquid sugar, invert sugar, molasses and other sugar products to a later meeting.

As could be expected from the diversity of national interests involved and the importance of a particular product to individual countries, it is often difficult to reach agreement. In fact the Sugars Committee is the only committee which has yet prepared draft standards. In my opinion, the progress of the Sugars Committee is merely a reflection of the fact that international trade in sugars has been so well established for many years that many of the basic problems were already resolved. In view of the many other factors that presently control international trade in sugar, it is uncertain whether the activities of the Codex Alimentarius Commission will significantly simplify trade in sugars. On the contrary, its actions could complicate trade in sugars if considerable judgment is not exercised in the development and adoption of standards.

Effect of Codex Alimentarius on Sugar Industry

It is difficult to predict at this time what effect, if any, international standards will have on the United States sugar industry. The ultimate use of the standards is an area that has not been clearly defined and will probably remain cloudy for a considerable time. While the current attitude of the Commission indicates that the use of the standards is voluntary[5], actions taken by individual countries could add varying degrees of compulsiveness to their use.

For instance, there are at present no "national sugar standards" in the United States. Official adoption of a Codex sugar standard could, therefore, impose a standard for use within the United States as well as for the exportation of sugar in sugar-containing products.

Even though government policy with respect to the use of the standards is somewhat nebulous, opinions of invididuals suggest that the standards can affect the sugar industry very materially in an indirect way. A view frequently expressed contends that standards for sugar, corn syrup and other ingredient-type products would be incorporated by reference as a part of the standard for manufactured food products such as canned fruits, fruit juices, etc. Consequently, the sugar industry could become involved in this fashion.

A very direct way in which the sugar industry will be affected by Codex Alimentarius is the emergence of a government policy on the substitutability of dextrose, corn syrup, and other starch hydrolysate products, for sugar in any food product. This policy was first proclaimed internationally by the United States delegate to the meeting on 29th March 1965 of the Joint ECE/Codex Alimentarius Group of experts on fruit juices in Geneva. The policy statement is as follows[5]:

[5] KOENIG: "Development in International Food Standards." *Paper presented at the National Meeting, Amer. Chem. Soc.*, April, 1965.

"International food standards should not be tools of trade restriction and should permit the use of wholesome food ingredients, including suitable types of nutritional sweetener. International food standards must permit the use of any nutritive sweetener in quantities consistent with the physical and organoleptic characteristic desired for the food to which they are added."

Such a policy, of course, places greatest emphasis on economics and ingredient cost. The other aspects such as wholesomeness, nutritiousness, taste, and physical characteristics play a minor rôle in choice of sweetener under such a policy. In my opinion, this policy is not wholly consistent with the objectives of the Codex to "safeguard" and "adequately inform" the consumer.

Disparity among the specifications contained in the standards for different food products should also be of concern to the sugar industry. For example, there appears to be a tendency to make the requirements for sugar much more rigid than for other food products. This disparity is especially alarming in relation to other sweeteners which are in direct competition with sugar. Proposed draft provisional standards for some of the starch hydrolysate products are lower in quality than would be expected of considerable quantities of raw sugar produced in the world[6].

Despite the fact that the World Health Organization has as a primary objective the distribution of wholesome, nutritious food in international and national trade, non-nutritive sweeteners have been brought into the picture in a soft drinks report prepared by the government of the United Kingdom[7]. The report suggests that standards for soft drinks may not be needed because of limited international trade in them. It goes on to say, however, that many countries consider minimum standards necessary because of the high consumption of soft drinks by children. Ironically, the report also stated that growing interest in "low calorie" drinks would require careful examination of levels of sugar to be contained in a standard. It would appear that there is some confusion about objectives of the Codex as they apply to nutrition.

CORRESPONDENCE

To the Editor, *The International Sugar Journal*

Dear Sir,

Polarization Temperature Corrections

I have read with interest Mr. CLAYTON's penetrating and helpful comments[1] on the subject of "Polarization Temperature Corrections"[2], and I thank him for them.

Many details of derivation were omitted in my paper for the sake of brevity. For uniformity and convenience the academic form of equation was adopted:

$$P_{20} = P_T + P_{20}\, k\Delta t.$$

This is not always strictly accurate, as I will show later, but it is sufficient for most purposes. The equation can be solved for P_{20} by transposition, but it is more reasonable to invoke the approximation that the reciprocal of $1 - x$, when x is small, may be taken as $1 + x$, and express the equation in the form:

$$P_{20} = P_T\,(1 + k\Delta t),$$

when this is more convenient for practical purposes.

The error incurred by using the approximation is $P_{20}\,(k\Delta T)^2$. In the extreme case of a quartz wedge saccharimeter where $k = 0{\cdot}00060$, and for $\Delta T = 15°C$, $P_{20} = 100°S$, the error is $0{\cdot}008°S$ which is unimportant under such conditions.

It is reasonable to let NS equal P_T only when it is reasonable to let P_{20} equal P_T; the reason for letting NS equal P_{20} is quite different; $P_{20} = NS$ is an exact relationship for a pure sugar. For any other sugar $P_{20} = N(S - 0{\cdot}3R)$. . . . equation (19) of the paper.

Now use equation (19) to eliminate the term NS from equation (18), "Combined Equation for Specific Rotation of Sucrose and Reducing Sugars":

$$P_{20} = P_T + k_1\, NS(T_r - 20) + k_2\, NR\,(T_r - 20). \quad (18)$$

where $k_1 = 0{\cdot}000184 - 0{\cdot}0000063\,(T_r - 20)$, and $k_2 = -0{\cdot}004$.

We get:

$$P_{20} = P_T + k_1\, P_{20}(T_r - 20) + (0{\cdot}3\,k_1 + k_2)\, NR\,(T_r - 20).$$

Now $0{\cdot}3k_1$ is negligible compared with k_2, particularly in view of the approximate nature of the value of k_2. Therefore we can ignore the term $0{\cdot}3k_1$, and we get equation (20):

$$P_{20} = P_T + k_1\, P_{20}(T_r - 20) + k_2\, NR\,(T_r - 20) \ldots (20)$$

This has been done for the convenience of having a P_{20} term rather than an NS term. Ignoring $0{\cdot}3k_1$ is the same as putting P_{20} approximately equal to NS only in this particular case. The $0{\cdot}3\ NR$ term in the equation $P_{20} = NS - 0{\cdot}3NR$ is by no means insignificant. The next step, that of replacing P_{20} on the right hand side of equation (20) by P_T, is a quite different sort of approximation. There is another way of looking at the validity of the approximation $P_{20} = NS$ for a non-pure sugar: Ignoring the term $0{\cdot}3NR$ is justifiable for a raw sugar where R is small; for an

[6] *Rpt. Meeting of Codex Committee on Sugars* (London), 2nd–4th March 1965.

[7] "Soft Drinks". Rpt. prepared by Government of the United Kingdom for the 2nd Session Codex Alimentarius Commission (Geneva), 1964.

[1] *I.S.J.* 1966, **68**, 44.

[2] *I.S.J.*, 1965, **67**, 234-236, 265-268.

impure sugar where R is large, the R term in the correction equation (18) swamps in magnitude the S term, and so an accurate estimate of the S term becomes unnecessary.

Returning again to the question of P_{20} and P_T in the standard equation form, it is worth noting that

$$P_{20} = P_T(1 - k\Delta T)$$

is in fact the correct form of the equation for the temperature effect on polarization reading—solution concentration, on the specific rotation of a quartz wedge compensator, for scale expansion and for flask volume expansion, but none of the other effects mentioned in the paper. The derivations for these four cases are given in Appendix I for the more technically exacting readers; they are more than superficially interesting.

Referring now to the difference in sign of the coefficient of solution volume expansion between the two cases, solution reading and solution preparation, equations (6) and (16) are not contradictory; they are predicting different quantities. Each individual equation in the paper is predicting a correction to be added to an apparent pol to give a pol corrected for that one particular effect quite independent of other effects. In other words, the temperature for all effects except the one under study is being held at 20°C, and only the one under study is allowed to vary to T°C. Later, by combining the individual corrections, overall corrections for practical situations are obtained, assuming that the individual corrections are independent and additive.

To prove that both equations (6) and (16) are true, they are derived in detail in appendix II.

To put into words what is really happening, we can say:

(i) in the polarimeter cell, if the temperature increases the solution expands, its concentration and its pol fall and we therefore have to add a correction;

(ii) in the flask, if the temperature is above 20°C, for the given fixed volume to the mark, less mass of water is added; if the temperature is brought back to 20°C, the solution will shrink, its concentration and pol will increase and we therefore have to subtract a correction to give the true pol that would have been obtained had the solution been made up at 20°C.

Referring to the mode of applying solution expansion corrections, it is true that we are UNcorrecting over the range $T_m - 20$. However, I maintain that we are not just UNcorrecting, but REcorrecting or, better, FURTHER correcting. The two solution expansion corrections—polarization reading and solution preparation—are separate corrections for separate effects, and it would be undesirable to combine them just because the coefficients are the same, making combination appear mathematically tidy. However, this is largely a matter of opinion. Either way two corrections must be made.

However, by separating the two effects as I have suggested, corrections for the weight/weight method of preparation are easier to comprehend and apply; the relationship between the weight/weight and weight/volume methods is cemented closer, and some of the differences are revealed more clearly.

Furthermore, the second order terms of the coefficients for sucrose specific rotation and solution expansion are almost equal and of opposite sign. If, then, my system of grouping correction terms is adopted, the mathematical expression of the basic, universal correction becomes very simple.

The second order term has to be considered only when a weight/volume method is used, and even then it is seldom of major importance and often can be ignored in routine work.

It is on grounds of unnecessary complexity of expression that I reject the otherwise mathematically accurate rearrangement of the corrections in the "$\alpha\beta\gamma$" form. The temperature difference factor for the second order, "β", term is especially subject to this criticism.

The statement on page 265 of the paper about the normality of juice polarized directly has suffered from an accidental omission of words. I think "total solids in," rather than "dissolved solids in" should be added before "100 ml." When 26 grams of a product are weighed out for a weight/volume polarization, the weight taken represents total solids. However, when there is little difference between total and dissolved solids, the normality N is given approximately by: $N = \text{Brix}/23{\cdot}7$.

Temperature corrections for cane juices are worth applying if the sucrose purity is 90 or above. Under these circumstances, errors are usually insignificant if normality is taken as pol reading divided by 100. It is better of course to divide by an estimate of the purity.

Yours sincerely,

ROBERT A. M. WILSON

Appendix I

(i) *Equation* (6): *Polarization Reading—Solution Concentration Effect*

The coefficient of volume expansion of a sucrose solution is:

$k = -[0{\cdot}00029 + 0{\cdot}0000066\,(T_r - 20)]$.

The volume expansion equation (of the solution in the polarimeter cell) is:

$V_T/V_{20} = 1 - k\,(T_r - 20)$.

But volume V is inversely proportional to the weight/volume concentration C, which is directly proportional to the normality N, and hence the polarization P. Therefore:

$V_T/V_{20} = P_{20}/P_T$,

$P_{20} = P_T - k\,P_T\,(T_r - 20)$,

or approximately, $P_{20} = P_T - k\,P_{20}(T_r - 20)$....(6)

(ii) *Specific Rotation of a Quartz Wedge Compensator*

The correction coefficient is the same as that for a quartz plate, namely—0·000143. Note that it is negative. The polarization correction equation for the wedges is:

$P_{20\ (quartz)} = P_{T\ (quartz)} - 0{\cdot}000143\,P_{20(quartz)}\,(T_r - 20)$.

The subscripts "quartz" are used advisedly. The compensation wedges are necessarily of opposite rotation to the solution being polarized.

Therefore:

$P_{20\ (quartz)}$ = — scale reading = $-P_T$,

the scale being calibrated at true, 20°C, rotation of the quartz, but the pol of the solution obviously being read at T°C.

$P_{T\ (quartz)}$ = — true sample polarization = $-P_{20}$,

the actual rotation of the wedges exactly balancing the actual sample rotation, which is P_{20} when we are considering the effect of temperature on the compensator only.

The correction equation then becomes:

$$-P_T = -P_{20} + 0{\cdot}000143\ P_T\ (T_p - 20),$$

or $P_{20} = P_T\ [1 + 0{\cdot}000143\ (T_p - 20]$.

(iii) *Scale Expansion*

The temperature coefficient of linear expansion of glass is—0·000008. Where V is the length of a glass scale, the linear expansion equation is:

$$L_T = L_{20}\ [1 + 0{\cdot}000008\ (T_p - 20)].$$

But the scale length is inversely proportional to the number of scale divisions per unit length, D, which is directly proportional to the pol reading P. Therefore L is inversely proportional to P, and:

$$P_{20} = P_T\ [1 + 0{\cdot}000008\ (T_p - 20)].$$

(iv) *Flask Volume Expansion*

The temperature coefficient of volume expansion of flasks normally used in sugar analysis is —0·000025. Where V is the volume of the flask, the volume expansion equation is:

$$V_{20} = V_T - 0{\cdot}000025\ V_{20}(T_m - 20),$$

or $V_T/V_{20} = 1 + 0{\cdot}000025\ (T_m - 20)$.

The volume V is inversely proportional to the weight/volume concentration C for a given weight of original sample. C is in turn directly proportional to normality N and polarization P.

Therefore V is inversely proportional to P, and:

$$P_{20}/P_T = 1 + 0{\cdot}000025\ (T_m - 20),$$
$$P_{20} = P_T\ [1 + 0{\cdot}000025\ (T_m - 20)].$$

APPENDIX II

(i) *Equation* (6)*: Polarization Reading—Solution Concentration Effect.*

See Appendix 1 (i)

(ii) *Equation* (16): *Solution Preparation—Solution Concentration Effect*

The coefficient of volume expansion of a sug. solution is the *same* as was stated in the previous appendix, and of the *same sign*.

It is $k = -[0{\cdot}00029 + 0{\cdot}0000066\ (T_m - 20)]$.

Now, ignoring flask expansion, when making to the mark at any temperature T_m°C, a fixed volume V_{20} is used. The volume V_T that this corresponds to at 20°C is given by:

$$V_T \text{ (at 20°C)} = V_{20} \text{ (at } T_m\text{°C)} + k\ V_T\ (T_m - 20),$$
$$V_{20}/V_T = 1 - k\ (T_m - 20).$$

As before, the volume V is inversely proportional to the weight/volume concentration C, the normality N and the polarization P.

Therefore: $P_T/P_{20} = 1 - k\ (T_m - 20)$,

$$P_{20} = P_T + k\ P_{20}\ (T_m - 20) \quad \ldots\ldots\ldots\ldots\ldots\ (16)$$

Note the different sign between this equation and equation (6).

CANE WINE OR "BETSA-BETSA" IN MADAGASCAR

IN Madagascar, or Malagasy, sugar cane is freely grown for the purpose of making what has been described as the national beverage (alcoholic) of the country and commonly known as "betsa-betsa". Considerable quantities of this wine or beverage are produced and consumed.

Recently*, at the instigation of the Malagasy Government, an attempt has been made to produce "betsa-betsa" with better keeping qualities than the wine usually made. The home-made preparation of "betsa-betsa" consists of three simple processes—extraction, aromatization and fermentation of the juice. The product normally produced does not keep well, owing to the development of yeasts, bacteria and secondary ferments. Lack of care in preparation and uncleanliness in the various operations is considered to be responsible.

The process now recommended is more complex than the primitive method. After extraction, the juice is filtered, acidified and treated with a sulphite to remove undesirable ferments. Selected yeasts are then added and when fermented the juice is again treated with sulphite. It is then possible to store the beverage. This wine differs from the traditional "betsa-betsa" produced on the east cost of Madagascar. The potential market for this improved product is considered to be mainly in the towns in the Highlands where it could compete with the hygienically prepared imported beverages.

F.N.H.

* Le vin de cannes à Madagascar (betsa-betsa). E. JOURDAN and G. RAMALANJAONA. *Agronomie Tropicale*, 1965, **20**, 854–862.

Cane for stock fodder. ANON. *Producers' Review*, 1965, **55**, (7), 97.—Reference is made to the despatch of cane to feed starving stock in western Queensland and northern New South Wales. Grown cattle can be expected to survive on sugar cane alone for a fairly long period, but there would be some loss in weight.

* * *

Further observations on the use of "Simazine" as a weedicide in sugar cane fields. P. S. MATHUR and R. P. SINGH. *Indian Sugarcane J.*, 1965, **9**, 143–146. Results are given of trials with "Simazine" at various rates in pre-emergence and post-emergence application. Rates lower than 4·48 kg per hectare were ineffective but higher rates gave good control except in the case of nut-grass (*Cyperus rotundus*). The present high price of "Simazine" is regarded as a drawback.

* * *

Attack of pink borer in Rajasthan. S. KUMAR and A. N. KALRA. *Indian Sugarcane J.*, 1965, **9**, 154–156. The pink borer (*Sesamia inferens*) normally attacks young cane as a shoot borer. An account is given of its attacking older cane (as a stem borer) in two zones of Rajasthan.

* * *

Response of sugar cane to fertilization in desert soils of Rajasthan under canal irrigation. C. J. JAISINGHANI, V. K. GUPTA and S. V. JAIN. *Indian Sugarcane J.*, 1965, **9**, 161–163.—Ammonium sulphate at levels of 50, 100 and 150 lb N/acre gave significant and increasing differences in yield. Similar rates of superphosphate did not result in notable differences in yield.

* * *

Studies on the relative merits of different inorganic fertilizers as suppliers of nitrogen to sugar cane in Andhra Pradesh. M. LAKSHMIKANTHAM, S. K. SASTRY, E. J. RAO, K. K. P. RAO, M. R. RAO and A. VENKATACHARY. *Indian Sugarcane J.*, 1965, **9**, 164–170.—Various nitrogenous fertilizers, including sodium nitrate, calcium ammonium nitrate, urea, ammonium chloride and "nitrophoska" (blue and green) were tested against ammonium sulphate. The differences in cane yield and juice quality were significant; all could be applied to sugar cane for supplying nitrogen.

* * *

Outstanding canes of Bihar. C. THAKUR, S. W. AKHTAR and S. A. AKHTAR. *Indian Sugarcane J.*, 1965, **9**, 171–180.—Two more varieties, Nos. VIII and IX in the series, are described, respectively, B.O.24, a mid-early variety suited to low-lying and flooded areas, and B.O.29, a high-tonnage late variety. Good coloured plates of each are included.

* * *

A new system of spacing sugar cane rows. G. N. MISRA. *Indian Sugarcane J.*, 1965, **9**, 193–195.—This "double row" system of planting (3 ft—1 ft—3 ft) in which two rows are spaced 1 ft apart and these 3 ft from the next double row was compared with a 3 ft—3 ft spacing with single rows (the normal). It was claimed to give a higher cane and gur yield per acre and presumably is intended for peasant cultivators.

* * *

Irrigating sugar cane. E. J. RAO. *Indian Sugarcane J.*, 1965, **9**, 201–205.—This is a résumé of work done in the more important cane growing states of India.

* * *

Labour-cost of machine harvesting. ANON. *British Sugar Beet Rev.*, 1965, **34**, (1), 15–16.—In Britain machine lifting of sugar beet has become more or less universal but there is wide variation in the amount of labour used. The smallest call on labour, in terms of man-hours per ton of beet lifted, was found to be the one-man system, using a tanker harvester with an elevator. This method is considered to be really suitable only where the distance from field to heap is short.

* * *

Use of herbicides in 1965. Effect of weather on light soils. ANON. *British Sugar Beet Rev.*, 1965, **34**, (1), 17–18, 48.—Damage to the sugar beet crop from herbicides was mainly due to abnormally hot weather associated with applications on light sandy soils. In some instances irregular damage might be attributed to uneven distribution from individual nozzles of the sprayer.

* * *

Breeding for resistance to sugar beet disease. A review of the current position. G. E. RUSSELL. *British Sugar Beet Rev.*, 1965, **34**, (1), 19–22.—The breeding programme for sugar beet disease resistance at the Plant Breeding Institute, Cambridge, is here described. The main part of the work is with virus yellows disease but resistance to downy mildew and powdery mildew is also being investigated. With virus yellows the possibility of breeding for resistance to aphids is also being studied.

* * *

Genetic monogerm seed. A review for sugar beet growers. S. ELLERTON. *British Sugar Beet Rev.*, 1965, **34**, (1), 41–42.—The nature of monogerm sugar beet seed and its advantages to the grower in reducing labour costs are explained as well as the need

for precision drills and selective herbicides to be used with it. Pelleted monogerm seed is also discussed.

* * *

Trends in sugar beet harvesting. H. SIMPER. *British Sugar Beet Rev.*, 1965, **34,** (1), 47–48.—The advantages of the tanker beet harvester and self-propulsion are stressed. It is in fact bracketed with the combine harvester.

* * *

Sugar cane germplasm. IV. Barbados varieties. ANON. *Sugar Cane Varieties Quarterly Newsletter* (Coimbatore), 1965, **2,** (2), 5–10.—The history of sugar cane breeding in the West Indies is summarized and the more important Barbados or "B" varieties described. Their behaviour in India has not been outstanding but they are included in breeding programmes on account of their high quality.

* * *

Facts about Co 1148. ANON. *Sugar Cane Varieties Quarterly Newsletter* (Coimbatore), 1965, **2,** (2), 11–13.—The high performance of this variety in Uttar Pradesh is outlined. It was bred at Coimbatore and approved for commercial cultivation in western Uttar Pradesh in 1962.

* * *

Sugar cane variety outfield experiments in Louisiana during 1964. T. J. STAFFORD, H. P. FANGUY and R. J. MATHERNE. *Sugar Bull.*, 1965, **43,** 284–292.—An account is given of the trials carried out on both light and heavy soils. Among commercial varieties CP 55-30 produced the highest average yields of cane and sugar per acre and was outstanding as a ratoon crop. CP 48-103 again outyielded other commercial varieties in sugar per ton of cane. The most promising unreleased varieties were: CP 60-16, L 60-14 and L 60-25.

* * *

Relation of sugar cane growth to "Chlordane" and "Endrin" treatments in the absence of insects. R. MATHES, L. J. CHARPENTIER and W. J. MCCORMICK. *Sugar Bull.*, 1965, **43,** 292–294.—Single eye setts were placed in 4-gallon cans of sterilized soil. It was concluded that increased yields, following application of these insecticides, was the result of reducing or eliminating pests (arthropods) and not of any direct stimulating effect that the chemicals might have on the sugar cane plant.

* * *

Mechanical cane planters in Louisiana. L. L. LAUDEN. *Sugar Bull.*, 1965, **43,** 301.—This is the first year that some acreage of sugar cane will be mechanically planted on a commercial scale in Louisiana. Three different types of mechanical planter are being offered for sale and at least three more are in the production stage, all being designed to plant full length stalks. It is expected that experience will lead to modifications or improvements in the machines.

1965 sugar cane variety recommendations for Louisiana. ANON. *Sugar Bull.*, 1965, **43,** 303–304.—Advantages and disadvantages of the major commercial varieties are discussed, viz. CP 52-68 (which holds first place in acreage), CP 44-101, CP 48-103, CP 55-30, N:Co 310, CP 36-13 and CP 47-193, the last two being resistant to mosaic. Recommendations by areas are given.

* * *

The growth of sugar beet in Belgium during 1964. L. VAN STEYVOORT. *Pub. Tech. Inst. Belge pour Amél. Betterave*, 1965, (1), 5–32.—This is a general account of how the sugar beet crop fared in Belgium in 1964, with special emphasis on pests and diseases and weather conditions.

* * *

Sugar beet yellows: trials carried out in Belgium in 1964 with systemic insecticides. L. VAN STEYVOORT. *Pub. Tech. Inst. Belge pour Amél. Betterave*, 1965, (1), 33–49.—In 1964 aphids (mainly *Myzus persicae*) appeared very late on beet and increased but little in June. Sugar beet yellows did not appear until very late, about mid-July. Under these circumstances spraying was not economical.

* * *

Problems in the selection of sugar beet. L. ERNOULD. *Pub. Tech. Inst. Belge pour Amél. Betterave*, 1965, (2), 51–66.—The early history of sugar beet and its selection are discussed as well as the modern methods employed in the production of new races with superior characters or greater disease resistance.

* * *

Results of variety trials carried out in Belgium in 1964 with commercial monogerm seed. N. ROUSSEL and R. VAN STALLEN. *Pub. Tech. Inst. Belge pour Amél. Betterave*, 1965, (2), 67–80.—Results are given of three germination trials carried out in 1964 with commercial seed, in which 18 varieties were represented. Results, which were very variable, are presented in 8 tables.

* * *

A study of sugar beet systems under various irrigation patterns with a view to determining the depth of the active soil layer. L. PAKOV. *Rast Nauki*, 1964, **1,** (9), 121–137; through *Field Crop Abs.*, 1965, **18,** 177. Irrigation influenced the number of fibrous roots, especially in the 60–80 cm layer. In a moderately humid year active roots were 20–30 cm deep, in a very dry year 40–50 cm deep. Where the root-spread was a maximum they were 50–80 cm deep. When soil moisture during growth was high they were 30–50 cm deep. Depth of active roots increased by 10–20 cm with close spacing. For high yields soil moisture in the horizon, where humus accumulates, should not drop below 70% field capacity.

Three new hybrid sugar beet varieties for early planting. J. S. McFARLANE and I. O. SKOYEN. *Calif. Agric.*, 1964, **18,** 2–4; through *Field Crop Abs.*, 1965, **18,** 177.—The multigerm variety US H6 and the monogerm varieties US H7 and US H8 were bred at Salinas, California. They outyielded the standard open-pollinated variety US 75 by 10–20% (sugar/acre). All showed reasonable to good resistance to bolting and curly top virus.

* * *

An evaluation of "Atrazine", "Simazine", "Monuron", and "Diuron" on ten Hawaiian sugar cane plantations. K. A. SUND. *Weeds*, 1964, **12,** 215–219; through *Weed Abs.*, 1965, **14,** 79.—Pre- and post-emergence application was made in the trials and numerous combinations were used. The best treatments (2 applications), in descending order, were: "Diuron"-"Diuron", "Atrazine"-"Diuron", "Simazine"-"Diuron", "Diuron"-"Atrazine", "Monuron"-"Atrazine", and "Atrazine"-"Atrazine". "Diuron" gave the best control of grasses and "Atrazine" the best control of *Commelina diffusa*. Results suggest that the alternate use of two herbicides will control a wide range of weeds without the risk of a build-up of residues in the soil.

* * *

Weed control practices in Jamaican sugar. T. CHINLOY and F. J. FLOYD. *Biokemia*, 1964, (4), 14–17; through *Weed Abs.*, 1965, **14,** 79.—Answers by Jamaican sugar estates to a questionnaire on weed control are summarized. Most estates control weed in cane by a combination of spraying with herbicides, hand-weeding and mechanical cultivation. With ratoon crops most estates maintain a trash blanket and weeds are controlled by spot-spraying and hand-weeding. Herbicides used include "Dalapon", and amine and high- and low-volatile ester formulations of 2,4-D and PCP, applied in most cases with knapsack sprayers.

* * *

Cytology of *Saccharum robustum* and related sympatric species and natural hybrids. S. PRICE. *U.S. Dept. Agric., Agric. Research Service, Tech. Bull.*, 1965, (1337), 47 pp.—An account is given of the cytological or cytogenetical examination of clones from the world sugar cane collection of the United States Department of Agriculture and the collections of the Hawaiian Sugar Planters' Association. An appendix (4 pages) gives chromosome numbers and origins of numerous *Saccharum robustum* clones and related species and hybrids, arranged in tabular form.

* * *

Responses of sugar cane to sunn green manuring in India. A. SINGH. *Experimental Agriculture*, 1965, **1,** 209–214.—A summary is supplied of experimental work on green manuring in India during the last 30 years. Results are given of field experiments from 1955 to 1963 to investigate the effects of sunn or sannhemp (*Crotalaria juncea*) manuring in the sugar cane rotation. Yield increase in cane was found to be proportional to the weight of green manure crop, irrespective of how this was disposed of, suggesting that it is the weight of sunn roots incorporated or left in the soil that is all-important.

* * *

The physiology of sugar cane. VIII. Diurnal fluctuations in the activity of soluble invertase in elongating internodes. C. R. SLACK. *Australian J. Biol. Sci.*, 1965, **18,** 781–788.—The activity of acid invertase in the storage compartment of elongating internode cells of sugar cane stems fluctuates several-fold during a single day, reaching a maximum early in the morning and falling to a minimum late in the afternoon. Diurnal fluctuations in invertase activity were observed both in the field-grown plants and plants in a controlled environment.

* * *

Control of weedkillers. ANON. *Mauritius Chamber of Agriculture, President's Report* 1964–65, 16–18.—The recommendation to control by licence the use of chemical weedkillers in order to encourage the employment of more labour in the sugar industry is adversely criticized and reasons for the criticism given.

* * *

Physiological growth attributes of *Saccharum* clones and their progenies. E. F. GEORGE. *Occ. Paper, Mauritius Sugar Ind. Res. Inst.*, 1965, (19), 12 pp. This investigation was conducted to determine the variation existing within seedling families for physiological characters and to examine their potentialities as aids to selection. Seven sugar cane clones and their seedling progenies were studied. Significant differences in progeny means for relative growth rate and net assimilation rate were mainly accounted for by differences in average leaf-area index. Some evidence was obtained to suggest that leaf area ratio is a character which could be used in selecting small plots for weight.

* * *

Monogerm sugar beet seed production. J. NIEDERER. *Sugar Beet J.*, 1965, **29,** (1), 6–7.—A brief popular account is given of the present methods employed in the large scale production of commercial monogerm seed in Oregon.

* * *

Many mechanical cane planters in 1965. L. L. LAUDEN. *Sugar Bull.*, 1965, **43,** 317–318.—Brief descriptions are given, with photographs, of five different kinds of mechanical cane planter in use or on trial in Louisiana.

* * *

The cost of hauling cane to the factory: field wagons *versus* trailers. J. N. FAIRBANKS. *Sugar Bull.*, 1965, **44,** 10–12.—Data from a recent survey indicated that cane could be transplanted up to 5 miles from the factory in conventional 2-wagon units cheaper than it could be transferred and hauled to the factory in conventional trailers. With a third wagon added, making a 3-wagon train, the cost per ton is lower than the cost of the trailer-hauled cane at distances up to 9 miles from the factory.

Effect of height of topping on quality of mill cane in Louisiana. L. G. DAVIDSON. *Sugar Bull.*, 1965, **44,** 14–17.—Data from three experiments, with several different commercial varieties, are given. Higher topping increased yields but brought into force the penalties for normal juice below 11%.

* * *

Leaf scald in Rhodesia. ANON. *Commonwealth Phytopathological News*, 1965, **6,** (6), 1.—The presence of leaf scald (*Xanthomonas albilineans*) has been confirmed on sugar cane variety B 34-104 in Hippo Valley, Rhodesia. This is the first report of the disease from the African continent, although it has previously been known in Madagascar and neighbouring inslands. Precautions are being taken to prevent its spread.

* * *

Geographical distribution of *Pythium* in sugar cane fields in the State of São Paulo. P. DE CARVALHO *et al. Bras. Açuc.*, 1964, **63,** (3–4), 80–82; through *Rev. Appl. Mycology*, 1965, **44,** 477.—It is pointed out that root rot (*Pythium arrhenomanes*) was isolated from sugar cane and other *Gramineae* for the first time in 1962. In this survey species of *Pythium* were obtained from 37 of 119 root samples.

* * *

Mutation in the causal organism of red rot of sugar cane. B. S. BAJAS *et al. Indian Phytopathology*, 1964, **17,** 296–303; through *Rev. Appl. Mycol.*, 1965, **44,** 525.—Biochemical mutants induced by ^{32}P irradiation of *Glomerella tucumanensis* showed various vitamin deficiencies which were, however, unrelated to morphological characters.

* * *

Sugar cane diseases in Tucumán. S. ZABALA and N. E. V. DE RAMALLO. *Rev. Ind. Agric. Tucumán*, 1964, **42,** (2–3), 1–21; through *Rev. Appl. Mycol.*, 1965, **44,** 525.—Diseases, mainly fungal, are covered in 4 sections, symptoms and control being described. A new fungus involved in the rotting of setts is referred to. "Spring chlorosis" is shown not to be of virus origin and a soil deficiency may be involved.

* * *

Some physiological studies on sugar cane smut. P. APPALANARASAYYA. *Indian Phytopathology*, 1964, **17,** 284–286; through *Rev. Appl. Mycol.*, 1965, **44,** 525.—Spores (*Ustilago scitaminea*) germinated best at 25°C. Germination was increased by sucrose, dextrin and mannose at 0·5–1·5%, but not by lactose or mannite, while it was depressed by 1·5% fructose.

* * *

The effects of nitrogen, potassium and sodium fertilizers on sugar beet. P. B. H. TINKER. *J. Agric. Sci.*, 1965, **65,** 207–212.—A report is given on a series of factorial field trials carried out during 1959–62. It is concluded that Na and K are closely related in beet nutrition. Na decreased yield in only two trials and was nearly always profitable. K was justified in 28 trials in absence of salt but in only 13 where Na was applied; K then caused a decrease in yield as often as an increase. The mean annual responses to N and K varied considerably, but for sodium much less so. No relationship could be found between percentages of Na and K in the beet juice and the responses to fertilizer.

* * *

Factors affecting red rot of sugar cane. M. S. MANOCHA and R. S. VASUDIVA. *Indian J. Agric. Sci.*, 1964, **34,** 264–272; through *Rev. Appl. Mycol.*, 1965, **44,** 525.—The disease (*Glomerella tucumanensis*), represented by two strains (a light and a dark coloured isolate), was increased in virulence when the inoculum was supplemented with an organic or inorganic N source (except nitrate).

* * *

Contributions to a biochemical study of sugar cane. K. PARTHASARATHI. *Proc. Indian Acad. Sci., Sect. B*, 1965, **61,** 81–89; through *Hort. Abs.*, 1965, **35,** 71. This part (11) deals with the chlorophyll-iron balance in cane leaves, and its use in the early characterization of late and early ripening cane varieties.

* * *

Spraying liquid fertilizer from the air in sugar cane in Colombia. M. L. CHESP. *Fertilité*, 1964-1965, (23), 30–41; through *Hort. Abs.*, 1965, **35,** 722.—An account is given of experiments using foliar applications of urea, ammonium sulphate, potassium chloride and potassium phosphate, ammonium and potassium phosphates and N-P-K. Urea at 60 kg/acre gave an increase of 12 tons of cane (1 ton of sugar). On plant cane, but not ratoons, P plus K had a beneficial balancing effect on nutrition. The N-P-K spray increased sugar production by 400 kg/acre.

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Foliar diagnosis in sugar cane, with special reference to potassium. E. MALAVOLTA. *Potash Rev.*, 1963, Subj. 27, Suite 40, 23 pp.; through *Hort. Abs.*, 1965, **35,** 722.—In several different cane areas of São Paulo, Brazil, 40 N-P-K factorial experiments were carried out. When a given element succeeded in raising the yield this was accompanied by an increase in the leaf concentration of the element. It was possible to predict a large response whenever the level of the element in the soil was low. K caused a significant increase in yield in 15 out of 40 experiments.

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Effects of number of buds and size of sett on the germination, growth and production of sugar cane. C. C. WANG. *Mem. Coll. Agric. Nat. Taiwan Univ.*, 1964, **8,** (1), 1–11; through *Hort. Abs.*, 1965, **35,** 719. Setts with 1, 2, 3 or 4 buds were used. The terminal bud germinated earlier as the number of buds per sett increased. Number of stalks and weight of millable cane were lowest with single bud setts. Stalk number and yield were also best with half an extra internode at either end of the sett. It is recommended that in the rainy season or with irrigation 2 or 3-bud setts should be used but under drier conditions 3 or 4-bud setts. Half an internode should be left at either end of the sett.

Nitrogen fertilizing with ammonium sulphate as top dressing: preliminary results. F. F. DE TOLEDO *et al. Rev. Agric. Piracicaba*, 1964, **39,** 157–158; through *Hort. Abs.*, 1965, **35,** 722.—In these Brazilian experiments, data for the first ratoon crop of the variety Co 413 showed that top dressing the plant cane with N had no residual effect on the ratoon crop, whether the application was single or split.

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The aluminium cap method for testing sugar cane varieties against leaf scald disease. H. KOIKE. *Phytopathology*, 1965, **55,** 317–319; through *Hort. Abs.*, 1965, **35,** 723.—This method consists in cutting the growing shoot, spraying the bacterial cell suspension (*Xanthomonas albilineans*) on the cut surface and covering with aluminium foil. In less than two weeks after this inoculation symptoms may appear on the leaves. Cane plants in all stages of growth could be inoculated in Hawaii.

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Mechanization of beet growing. II. Thinning and weed control. N. Y. TURNER. *Farm Mechaniz.*, 1965, **17,** (188), 22–24; through *Weed Abs.*, 1965, **14,** 183. Progress in drilling and thinning techniques and in the use of herbicides in sugar beet is briefly reviewed.

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Weed control in sugar beet. *Proc. 7th British Weed Control Conf.*, 1964; through *Weed Abs.*, 1965, **14,** 185.—Several papers on control of weeds in beet were given, viz.: The use of "Pyrazon" for pre-emergence weed control in sugar beet, F. R. STOVELL and M. B. S. TULLOH (pp. 660–670); Trials on mixing "Pyrazon" into the soil for sugar beet crops, L. A. DURGEAT, J. LHOSTE and F. VERNIE, (647–650); Further experiments with the use of "Pyrazon" in sugar beet, G. W. CUSSANS, (643–646); Further experiences with "Pyrazon" for the control of annual weeds in sugar beet, G. B. LUSH and A. J. MAYES, (651–659); Some factors involved in the selectivity of "Pyrazon" on sugar beets, H. BEINHAUER, A. FISCHER, M. HANF and J. JUNG, (635–642); Some experiments with 3-cyclohexyl-5,6-trimethylene uracil in sugar beet, G. W. CUSSANS, (671–678); and Flame-cultivation trials, E. J. CREEK, (925–932).

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Use of "Dalapon" for post-emergence grass control in sugar cane. J. R. ORSENIGO. *Res. Rep. Univ. Fla. Agric. Exp. Sta.*, 1965, **10,** (2), 14–15; through *Weed Abs.*, 1965, **14,** 203.—Recommendations are given for the use of "Dalapon" for the control of annual weed grasses in cane in Florida, spraying being directed to the stalk bases, 2 or 3 times, using a shielded sprayer. Spray programmes should start early in the season when weed grasses are young. Rates of "Dalapon" (as 85% Na salt) should be 3–3·5 lb per acre per application in about 50 gal water per acre. Two or not more than three applications should be made with 7–21 days between spraying.

Contributions to the cytology of the genus *Saccharum*. VII. *Saccharum spontaneum* from Sikkim and Manila. A. MORIYA. *Cytologia*, 1965, **30,** (1), 10–13.—These forms of *Saccharum spontaneum* have not previously been described. The chromosome count of the form from Sikkim was 2n-56, the same as the Dehra Dun form; that of the Manila form was 2n-80. The ligule pattern of the latter was the same as Japanese forms. The ligules are illustrated.

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Evolution of sugar cane borer damage in Colombia. N. N. HINCAPIÉ. *Agronomia* (Manizales), 1965, **2,** (1), 1–56.—Investigations to determine sugar losses caused by the borer *Diatraea saccharalis* in the Cauca River Valley of Colombia are reported, work being carried out at six different centres with three commercial varieties—POJ 2878, POJ 2961 and Co 419. Total losses to the Cauca Valley sugar industry are estimated at over 53 million Colombian pesos.

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New approach to Fiji disease control. ANON. *Producers' Rev.*, 1965, **55,** (8), 5.—Large numbers of the leafhopper (*Perkinsiella saccharicida*) which spreads this sugar cane disease are to be bred and subjected to a low dosage of irradiation, from radioactive cobalt, to bring about sterilization, and then released in the field. It is hoped the overall population of leaf hoppers will be reduced in this way, as has been done with the screwworm pest in parts of America. It is not likely to be a cheap method and the economics have yet to be worked out.

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The Pindar problem. ANON. *Producers' Rev.*, 1965, **55,** (8), 5.—The recent degeneration of this much grown variety in Queensland is described. This includes greater susceptibility to yellow spot (*Cercospora koepkei*) in some areas, failure to mature early, and development of internal discoloration or breakdown of the stalk, not understood as yet but believed to be physiological.

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Drought busting with irrigation. ANON. *Producers' Rev.*, 1965, **55,** (8), 6–8.—It is pointed out that the lower Burdekin delta area is today, with irrigation, Australia's most productive sugar area. The 1964-65 drought has drawn attention to the inadequacy of both underground water supplies and surface irrigation in many areas, and the urgent need to increase water supplies for irrigation.

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Rainmaking in Australia. A. J. HIGGS. *Producers' Rev.*, 1965, **55,** (8), 29–35.—The history is given of rainmaking experiments in Australia, by "seeding" of suitable clouds with silver iodide particles released from aircraft. These have not been very encouraging so far. Ground-based generators, as used in the United States, are unsuitable for Australian conditions. The coastal districts (where cane is grown) were not regarded as suitable areas.

The effect of soil strength on sugar cane root growth. N. H. MONTEITH and C. L. BANATH. *Trop. Agric.*, 1965, **42**, 293–296.—Laboratory experiments (in Australia) with rooted cane cuttings (variety Triton) in three cane soils showed that "root growth was more closely correlated with penetrometer measurements of soil strength than with determinations of either soil bulk density or air porosity. Air porosity was the least well correlated with root growth. The critical values of bulk densities for root growth varied according to soil."

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Destruction of weeds in sugar beet with chemical weedkillers. G. PEETERS. *Pop. Pub. Inst. Belge pour Amél. Betterave*, 1965, (2), 4 pp.—The excessive rains in Belgium during April-June, 1965, and the consequent difficulty in weeding sugar beet are referred to. Successful use of the contact herbicide "Paraquat" for inter-row weeds and the screened method of application (by tractor), covering 6 rows at a time, are explained.

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Radioactive labelling of sucrose in sugar beet. W. RATHJE. *Zeitsch. Zuckerind.*, 1965, **90**, 505–506. Radio-glucose solution was sprayed onto the leaves of two growing beets which were harvested 63 days later. The leaves and a section from the roots were comminuted with water in a mixer and the macerates heated to boiling and filtered. The filter residues were again heated to boiling with water, filtered and the combined filtrates evaporated, each to 10 ml. The radioactivity of a 1-ml sample was determined by counting the light impulses produced in a solution containing 2,2-*p*-phenylene-bis (5-phenyloxazine), 2,5-diphenyloxazine and naphthalene (250:10:100 w/w/w) mixed in 1 litre of dioxane. Almost all the radioactivity measured (85% of the light pulses were counted) was in the roots, while two-thirds of the radioactivity had been lost through respiration.

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A preliminary report on water availability in some Natal sugar belt soils. J. N. S. HILL and M. E. SUMNER. *Proc. 38th Congr. S. African Sugar Tech. Assoc.*, 1964, 114–118.—Cane plants were grown in 5-gal drums containing 6 different soil series. Water transmitting properties of the soil were shown to play a major rôle in transpiration. The experiments emphasized the importance of the soil factor on moisture use by sugar cane. It is hoped future work on these lines may lead to improving irrigation efficiency and control.

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The estimation of runoff from high pressure spray irrigation in sugar cane fields on the coast of Natal. J. N. S. HILL and M. E. SUMNER. *Proc. 38th Congr. S. African Sugar Tech. Assoc.*, 1964, 119–120. Results are given of runoff estimations calculated by means of portable runoff lysimeters at Tongaat. The experiments gave a good indication of the extent of runoff and the significance of soil comparison.

The infiltration capacities and percolation rates for some Natal sugar belt soils. J. N. S. HILL and M. E. SUMNER. *Proc. 38th Congr. S. African Sugar Tech. Assoc.*, 1964, 121–125.—The urgent need for knowledge of the rates at which certain soils will accept overhead irrigation water is stressed. Studies on 10 different soils at Tongaat are recorded. It was concluded that results with a double ring infiltrometer served only as a rough guide to irrigation potential for a given soil series. Variations in soil temperature did not seem to influence results to any significant extent.

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Stalk sodium: a useful guide in investigating problems of plant nutrition. R. T. BISHOP. *Proc. 38th Congr. S. African Sugar Tech. Assoc.*, 1964, 126–133.—In Natal the active growing period of sugar cane takes place about one week after an effective rainfall and lasts about 3 weeks. The presence of Na in the stalk was shown to be significantly correlated with adequate soil moisture and stalk elongation, provided no other limiting growth factors are present. The presence of Na was also shown to be related to optimum N, P and K content of the stalk and its value as a guide to determining, reliably, different levels of soil fertility was considered.

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Preliminary report on the root spread in sugar cane as revealed by radioisotopes. G. H. WOOD. *Proc. 38th Congr. S. African Sugar Tech. Assoc.*, 1964, 134–143.—Preliminary work with radioisotopes (^{32}P) undertaken at the S.A.S.A. Experiment Station, Mount Edgecombe, Natal, is described. The purpose of this investigation was to determine the spread and activity of the root system of sugar cane at different distances from the cane row and at different depths, and to obtain some idea of the variation in P uptake with age and season. Feeding roots were found to be concentrated mainly beneath the stool. P uptake was strictly in proportion to growth.

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A symposium on soil compaction. T. G. CLEASBY. *Proc. 38th Congr. S. African Sugar Tech. Assoc.*, 1964, 144–153.—Various speakers took part in this symposium. With the increase in the use of tractors and trailers in Natal cane fields it was considered the time was ripe for a full discussion on soil compaction and its bearing on sugar cane production. Suggestions for reducing compaction included the use of better road systems, with more exits in cane fields, and the use of dual wheels or multiple axles to reduce ground pressure from vehicles.

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The results of herbicide trials. J. M. GOSNELL and G. D. THOMPSON. *Proc. 38th Congr. S. African Sugar Tech. Assoc.*, 1964, 166–175.—Results of herbicide trials for 1963–64 are discussed. These included more extensive experiments in the control of water grass (*Cyperus* spp.) with "Paraquat", which proved superior to "Diquat". Among pre-emergence herbicides DCMU was the best. In a dry land trial no pre-emergence treatment was successful.

SUGAR HOUSE PRACTICE

Methods of sugar solution decolorization with active carbon. H. ZAORSKA. *Zucker*, 1965, **18,** 512–520. The techniques used to decolorize liquor with active carbon or bone char at refineries in various countries are briefly described with 37 references to the literature. Laboratory tests in which a remelt liquor was treated with active carbon showed that almost all the colouring matter adsorbed by a carbon can be recovered by elution with an azeotropic pyridine-water mixture. After such regeneration, the decolorizing capacity of the carbon is only very slightly reduced. Using 0·25, 1·0 and 2·0% active carbon on Brix, it was found that prolonging the contact time between liquor and carbon beyond the optimum (found to be 15 min) could lead to such a reduction in efficiency that the colour content of the liquor could increase on heating to 80°C. The amount of colouring matter adsorbed was found to depend to a large extent on the ratio of carbon quantity to Brix of the solution to be treated, so that 5% carbon would decolorize to a significantly greater degree than would 0·25% carbon, although calculation based on 1 g of carbon showed that there was a four-fold decrease in reduction of the liquor's extinction compared with 0·25% carbon. With the mixer method, active carbon did not lose all of its decolorizing capacity after a number of cycles, so that carbon used three times at 5% has only slightly less decolorizing power than carbon used once at 0·5%. Comparison between the mixer method and the column method showed the latter to be the better, although the former is considered sufficiently good if a colouring matter extraction of between 50% and 80% is required. The mixer method is economical only with very small amounts of carbon (below 0·25% on Brix). Even at 0·25% the carbon in the mixer method adsorbs only half the colouring matter adsorbed in the top layer of carbon in a column. A study of the decolorizing power of carbon in a column divided into 8 layers showed that the top one had the greatest power, while only the bottom layers adsorbed little colouring matter. Three-quarters of the carbon in the column was utilized. The results are given in table and graph form.

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Taiwan sugar—its relation with the refining industry. H. S. WU. *Taiwan Sugar Quarterly*, 1965, **12,** (2), 20–22.—The process used in Taiwan factories for the production of plantation white sugar (of 99·6–99·9 pol) is described. Difficulties in the refining of Taiwan raw sugar were investigated; it was found that it was the form and not the quantity of non-sugars that affected the filtration rate. Efficient clarification and filtration improved filtrability and colour. Juice samples were carbonatated, filtered and analysed for starch, wax, silica, etc. While the quantity of non-sugars before and after filtration differed only slightly, the difference in turbidity was marked. The greater the turbidity, the poorer was the filtrability, so that as long as a non-sugar did not form a colloidal suspension in the carbonatated liquor, it did not affect filtrability. Filtrability determination based on carbonatated liquor instead of raw sugar melt is recommended, while turbidity measurement is considered more useful than filtration rate determination. Ion exchange treatment of 45°Bx sugar melt showed that carbonatation increased the demineralization and decolorization capacity of the resins ("Amberlite IRA-411" in OH^- form and IRC-50 in H^+ form).

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Modification to the 1st affination scheme at Hrušovany nad Jevišovkou sugar factory. F. GERŽA. *Listy Cukr.*, 1965, **81,** 207–209.—By adding dissolved crystal of 90°C instead of affination syrup to the raw sugar remelt to give a magma of 65–68°C, the 1st and 2nd melt liquor colour was reduced by 70% compared with the colour obtained in a previous process, while the consumption of "Carboraffin" and filtering medium was halved. In affination the magma is sprayed with hot water at 15°C. The 1st melt liquor temperature is maintained at 99°C.

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Good characteristics of the new Italian synthetic decolorizing resin for decolorization of sugar solutions. S. IWASHINA. *Ind. Sacc. Ital.*, 1965, **58,** 199–218. Detailed comparisons are reported of physical and chemical properties, surface structure, physical and chemical stability and decolorizing characteristics which have been made. On the basis of these the Italian resin Kastel A-501D has been chosen to be used industrially by Japanese refiners.

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Expansion of St. James Cooperative. F. A. GRAUGNARD and F. C. SCHAFFER. *Sugar J.* (La.), 1964, **27,** (6), 24–27.—Information is given on the various expansion programmes that have raised the crushing capacity of the St. James Sugar Cooperative raw sugar factory from 1600 tons to over 3000 tons of cane per day. Details are given of the changes involved in the 1964 project which was intended to raise the daily capacity to 4200 tons of cane. The programme convered installation of a special pilot-scale bulk handling system for incoming cane, both long and short, with some modifications to cane yard equipment, replacement of the milling tandem with a new Dibert, Bancroft & Ross 15-roller 39 × 84 inch tandem and new 84-inch cane knives, new and enlarged boiling house equipment, and a Riley bagasse furnace. Warehouse modifications bring the total storage capacity to 16,000 tons and molasses storage has been expanded.

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Cajun Sugar Cooperative begins operation. L. A. SUAREZ. *Sugar J.* (La.), 1964, **27,** (6), 36.—A list is given of the equipment in the Cajun Sugar Cooperative Inc. raw sugar factory, Louisiana, which has a grinding capacity of over 4000 t.c.d.

Louisiana's new sugar factory. ANON. *Sugar J.* (La.), 1964, **27,** (6), 37–39.—Details are given of the milling tandem and ancillary equipment at Cajun Sugar Cooperative. The train comprises four 36 × 72 inch Fulton inclined mills preceded by a 39 × 72 inch crusher. Drive of the mills and crusher is through individual steam turbines. Preparation is carried out by two sets of knives, one mounted above the auxiliary carrier and the other over the main carrier. The tandem and juice strainer are set 8 ft above the floor level. The juice is collected in a stainless-steel juice pan extending the length of the tandem, whence it is fed to a drag-type strainer having stainless-steel screens. The mixed juice from the crusher and first two mills is limed and clarified, while that from the last two mills is pumped to maceration troughs placed before the 2nd and 3rd mills, hot maceration water being applied before the last mill.

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Cajun and St. James install duplicate boiler units. E. C. MILLER. *Sugar J.* (La.), 1964, **27,** (6), 40–41. Information is given on the Riley bagasse furnaces at the two factories. The two units at Cajun have a total rated steam capacity of 110,000 lb/hr, while the one unit at St. James has a capacity of 100,000 lb/hr.

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Turbines at Cajun represent latest in sugar mill drives. ANON. *Sugar J.* (La.), 1964, **27,** (6), 43–45.—Data are given on the Elliott single-stage steam turbines installed at Cajun as drives for the turbo-generators, knives, crushers, mills, evaporators, boiler feed pumps and fans.

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Tinguaro II sugar factory dedicated at Reserve. ANON. *Sugar J.* (La.), 1964, **27,** (6), 54.—Some information is given on the factory which was built by Reserve Sugar Co. Inc. to crush 2400 tons of cane per day with an eventual extension to 4000 t.c.d. The sugar is bought by Godchaux Co. for refining at the Reserve refinery.

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Bryant sugar house—the first two years of operation. H. T. VAUGHN. *Sugar J.* (La.), 1964, **27,** (7), 41–43. While the factory has a rated crushing capacity of 5000 tons of cane per day, in 1963/64 it crushed an average of 6441 tons per day during 148 days, producing 94,868 tons of sugar of approximately 98 pol. The 1964/65 crop was expected to be much greater and details are given of additional equipment installed to handle the extra 25% cane.

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1964 expansion programme of the Moore Haven sugar house. G. A. ROBINSON. *Sugar J.* (La.), 1964, **27,** (7), 61–63.—Information is given on the 1964 expansion programme intended to raise the daily crushing rate of the factory to 4000 tons of cane, with a possible maximum of 4400 tons. Additional equipment included two 38 × 78 inch Dibert, Bancroft & Ross mills added as 5th and 6th mills to follow the existing four 30 × 54 inch Farrel mills. St. Mary Iron Works equipment installed in the sugar house included a pan, two crystallizers and a clarified juice heater. A Western States centrifugal for *A*- and *B*-massecuites was also installed. In the refinery section, apart from a centrifugal, the only major piece of extra equipment was a Nadler double-effect evaporator intended to raise liquor Brix and accelerate pan boiling.

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Statistics on Atlantic Sugar Association mill. ANON. *Sugar J.* (La.), 1964, **27,** (7), 68.—A list is given of equipment planned for installation in this new factory which was designed to crush 4500 t.c.d.

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Turbine drives at new Atlantic Sugar Association Florida mill. M. A. SARRIS. *Sugar J.* (La.), 1964, **27,** (7), 71–72. Details are given of the Elliott single stage steam turbine drives installed in this mill.

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More about equipment at new Belle Glade plant. ANON. *Sugar J.* (La.), 1964, **27,** (7), 73.—Among the equipment installed at the Atlantic Sugar Association factory are Western States fully-automatic centrifugals for *A*- and *B*-massecuites and Allis-Chalmers centrifugals for *C*-massecuite.

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Diffusion in (the) sugar cane industry. V. E. BAIKOW. *Sugar J.* (La.), 1964, **27,** (7), 75–76.—The advantages of cane diffusion over milling are discussed and the combination of milling and diffusion considered as a first step towards higher sugar extraction. While diffusion will involve greater volumes of juice to be evaporated, the 15–20% increase in evaporator capacity required will, it is suggested, be offset by the extra sugar extracted.

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Bagasse burning. A. D. SMITH. *Sugar J.* (La.), 1965, **27,** (9), 31–38.—The physical and chemical properties of bagasse are described and the basic designs of various types of bagasse furnaces are surveyed, with a discussion of their applications and advantages. Factors governing the choice of equipment are briefly listed. The various types of grates available are described. Factors affecting efficiency of a furnace are also discussed, including selection and application of ancillary equipment such as dust collectors and induced draught fans.

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Influence of surface-active additives (alpha-methyl glucoside esters) as applied to factory operations. T. H. KRITCHEVSKY. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965.—The various effects produced by surface-active materials are described and their possible use in sugar production surveyed with reference to published literature. α-Methyl glucoside diester, a non-ionic surface-active material, has been

developed by the Hodag Chemical Corporation for use in evaporators and vacuum pans. In the former, contact between vapour and tube surface during bubble growth is reduced so that liquid-tube surface is correspondingly increased and heat transfer improved. Scale formation is reduced and the scale is softer. In addition to improving heat transfer in vacuum pans, the ester also increases massecuite fluidity, lowers agglomerate formation, and results in shorter pan cycles, improved filtration rates and greater crystal uniformity, purity and colour. Case studies in Florida and Hawaiian cane sugar factories are quoted where these effects have been demonstrated as well as a beet sugar factory in California. The benefits are illustrated by photographs of crystal samples, of massecuites and of evaporator calandrias, as well as by tabulated analytical data, etc.

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Loss of sugar by entrainment in (an) evaporator and the effects of automation. G. R. SERBÍA and J. BALSA. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965. Entrainment trapped by centrifugal-type catch-alls in each effect of the Aguirre quadruple evaporator drains back into the vessel through piping provided with a sight glass. The amount returning in the 4th effect was large and it was thought that there might be sugar loss in vapour to the condenser. A sampler was fitted and the loss confirmed, the quantity amounting to 4–5000 lb sugar per day. Installation of a Webre internal separator[1] reduced loss from 240 to 60 lb sugar per hour while a vacuum control reduced this further to 20 lb/hr, and installation of a level control brought the loss down to 10 lb/hr.

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Further investigation of the centrifugation of *B*-molasses. J. C. P. CHEN and F. PROSKOWETZ. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965.—*B*-molasses, diluted to 65–70°Bx, was treated in two centrifuges: the Titan "Superjector" Type CNS-71, with batch sludge discharge, and the Westfalia SAMN 15037 with automatic partial or total discharge. Variations were made in the feed rate and cycle time, and the analyses of purified molasses are tabulated. It is concluded that the optimum rate and cycle time depend on the individual molasses quality. Boiling tests on the untreated and treated *B*-molasses showed that the *C*-massecuite purity was increased but its ash content was reduced as was that of the *C*-sugar, which was of higher purity. An additional recovery of 3·3% could be expected from the *C*-strike, and the net gain is calculated as 2·0 tons of pol per day for a factory crushing 6000 tons of cane per day.

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Automatic dilution of third sugar magma at Central Coloso. J. R. RAMOS. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965.—A simple event sequence controller has been used at Central Coloso for diluting the sugar from the 3rd product centrifugals with water to give a 93°Bx magma. This is then dissolved separately to give a 65°Bx syrup. Water enters the dilution tank and is stopped by a level control. A controlled amount of sugar is added with simultaneous stirring, and after dilution the mixture is pumped to the syrup storage tanks. The cycle takes 18 min to complete.

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Cleaning boilers in sugar factories operated by Bookers Sugar Estates in British Guiana. A. P. T. VAN HAMEL. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965.—Factories in British Guiana close at week-ends for boiler cleaning, and reduction of the time for this would therefore increase production capacity. The breaking of hard clinker takes up about one-third of the cleaning time and if this could be eliminated total cleaning time would be cut. Experiments were therefore made; addition of sand decreased the K_2O:SiO_2 ratio and reduced the tendency towards hard clinker, as did reduction of furnace temperature and also time of exposure of ash to combustion chamber temperatures. For the last a re-designed combustion chamber was installed with a series of V-troughs for water flushing of settling fly-ash mixed with partly burnt bagasse. These tests were found to be successful.

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Ring diffuser at Pioneer Mill Co. B. T. TOWNSLEY and S. G. CHEATHAM. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965.—See *I.S.J.*, 1965, **67**, 169–172.

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The Egyptian sugar cane diffusion process. M. H. TANTAWI. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965.—Disadvantages of extraction of sugar from cane in a mill are briefly surveyed and practical difficulties in use of a true diffusion system are discussed. Preparation of cane for a lixiviation-diffusion system has been found to be adequate with the use of a leveller, a heavy-duty knife set and a single three-roller mill. A description is given of the Egyptian system; the diffuser is a horizontal slat conveyor drawn by four endless chains over a stationary screen at a rate adjustable between 0·7 and 1·5 metres/min. Beneath the screen and above the return chains is a series of tanks from which the drained juice is pumped to a distribution unit above the 1—2 m thick layer of bagasse nearer the head of the unit. A heater is interposed near the head of the diffuser to bring the bagasse temperature to about 70°C so as to kill bacteria and unopened cells. The bagasse leaving the unit is dewatered in two mills and the sweet water returned to the unit after liming to pH 8·5 and heating to 75°C. Juice from the head end is mixed with the first expressed juice. Power consumption is slightly lower than 1 h.p. per t.c.h. (*vs.* 7 h.p./t.c.h. for a milling station), capital cost and maintenance are less than with milling, losses in bagasse are reduced and bacterial loss eliminated, and the juice has a higher purity, giving low molasses loss.

[1] *Sugar y Azúcar*, 1964, **59**, (4), 58–60, 72.

New natural flocculation aid in the sugar industry. R. OSVALD and H. VLCKOVÁ. *Listy Cukr.*, 1965, **81**, 192–199.—Addition of 20 p.p.m. of BSB starch flocculant to raw juice raised the settling rate by 88–181% and reduced the mud in the supernatant juice by 69–84%. At this rate it was as efficient as "Akrynax 2" synthetic copolymer in reducing juice mud content, but the "Akrynax" was 15% more efficient in increasing the settling rate. Increasing the amount of BSB to 50 p.p.m. raised the settling efficiency to that obtained with the copolymer. The two disadvantages of BSB (prolonged preparation of its solution and degeneration of the latter) can be overcome, it is thought.

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Certain features of the kinetics of the diffusion process in Olier diffusers. N. N. PUSHANKO, V. M. LYSYANSKII and N. A. BUZYKIN. *Sakhar. Prom.*, 1965, **39**, 571–574.—Investigations revealed fluctuations in the diffusion rate and temperature; these were prevented by spraying steam through radial nozzles in the 1st column onto the cossettes from a specially installed accumulator. Increased losses and reduced throughput were attributed to irregularities in the hydrodynamic pressure during cossette transfer from one column to the next. These fluctuations were caused by a number of factors. Peaks and troughs occurred in the pressure-specific load curves. A linear relationship was found between increase in losses and (1) increase in specific load (filling of inter-screen space) and (2) column area cross-section. The throughput was raised while maintaining optimal hydrodynamic conditions by changing the column section from circular (1450 mm dia.) to elliptical (1450 × 1800 mm) and by bubbling steam to various parts to reduce squeezing of the cossettes in the transfer columns. Most of the steam is discharged to the steam jackets, so that the juice is not unduly diluted.

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The life of (sugar factory) equipment. M. I. RYBALKIN. *Sakhar. Prom.*, 1965, **39**, 579–583.—Expressions are given for calculating the permissible annual wear of sugar factory machinery and components, and from the calculated results the life in hours and years (between capital repairs) is obtained for each piece of equipment.

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Results of tests of BUM-U4M1 and Kompleks-5-TsINS unloading and piling machines in 1964. V. A. NOVIKOV and N. M. KICHIGIN. *Sakhar. Prom.*, 1965, **39**, 587–591.—The results are discussed in detail and criticisms and recommendations are given. The machines are also compared with other current types and types that they have superceded.

Operating conditions in gas-fired shaft lime kilns. V. E. FIL'SHIN. *Sakhar. Prom.*, 1965, **39**, 592–596. Tests with an experimental kiln showed that inadequate heat insulation and relatively small dimensions of the kiln led to high heat losses and hence excessive fuel consumption. While the CO_2 concentration in the waste gas was 26·4–31·0%, it is considered possible to raise this to 31–32% by improving the insulation. The waste gas did not contain oxygen or methane. Almost complete burning of the fuel gas with low air intake indicated good mixing of the air and gas.

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Relationship between the calcium oxide content in milk-of-lime and its specific gravity. S. V. TSVETSINSKII. *Sakhar. Prom.*, 1965, **39**, 597–598.—Since changes in the CaO content are not proportional to changes in its density, it is necessary to apply a correction for CaO content as well as density for dosing devices. A formula derived from a graph of CaO convent *vs.* density assumes approximate linearity and gives the CaO content at 20°C within an error of less than 1%. Other formulae are developed for calculating the weight of CaO in unit volume of milk-of-lime and the amount of milk-of-lime required for defecation at a given lime usage (on weight of beet). For the latter calculation, the formulae omit the lime content in the milk.

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New standard design for a sugar factory with a daily slicing capacity of 3000 metric tons of beet. E. KH. BERKOVICH. *Sakhar. Prom.*, 1965, **39**, 600–610. Details are given of a standard design developed by the Soviet sugar industry design institute. The central building houses all the usual processing section including pulp briquetting, drying and sugar packaging plant, and is sandwiched between the warehouse for bagged sugar awaiting despatch at one end and the heating and power plant at the other. The main building can be single- or double-spanned and the arrangement of equipment for both variants is considered.

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Application of the Pavlyuk-Sokolov stone and sand catchers for separation of beet tails. I. B. BAL'TSER, E. K. KOPYTKO and A. A. MIKHAL'CHUK. *Sakhar. Prom.*, 1965, **39**, 620–621.—Details are given of modifications to a Pavlyuk-Sokolov rotary drum stone catcher to trap beet tails and transfer them to a screw conveyor.

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Recirculation of 1st carbonatation mud to pre-liming. H. GRUSZECKA and S. GAWRYCH. *Gaz. Cukr.*, 1965, **73**, 184–185.—The advantages of recycling 1st carbonatation unfiltered juice or mud to pre-liming

(higher settling rate and greater mud separation) are discussed on the basis of tests carried out during two campaigns. The optimal amount to recycle is considered to be 40%.

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Extraction of the sugar from radioactive beet cossettes by liquid exchange. W. RATHJE. *Zeitsch. Zuckerind.*, 1965, **90,** 506–507.—Beets labelled with radio-sucrose[1] were sliced and the cossettes treated with water or press juice heated to 78°C. Extraction of the labelled sugar was considerably quicker with water than with press juice. After 45 min, extraction of the sugar from the water-treated cossettes was extensive and the distribution of radioactivity in the cossettes and water remained almost constant. With press juice the radioactivity of the solution increased rapidly during the first 45 min and thereafter increased only very slowly as a result of diffusion. After 24 hr most of the radioactivity still remained in the cossettes. These results are a further indication that sugar extraction from cossettes is only very slightly the result of diffusion and that it is principally brought about by a process resulting from differences between the sugar concentration in the beet cells and in the surrounding solution, e.g. liquid exchange.

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Critical consideration of raw juice extraction using the Steckel process. R. WASMUND. *Zeitsch. Zuckerind.*, 1965, **90,** 507–509.—Details are given of tests carried out with the Steckel process[2], patented in 1949 but still not used on an industrial scale. On the basis of the results, various flaws in the process are indicated and possible remedies discussed.

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Demand presses Turkey's sugar industry. T. M. OZIL. *Sugar y Azúcar*, 1965, **60,** (10), 36–39.—A survey of the Turkish beet sugar industry, which comprises 12 state-owned and 5 private white sugar factories, is presented.

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The use of formalin in beet diffusion. P. BIDAN, J. GENOTELLE, M. BLANCHET and M. NAMORY. *Ind. Alim. Agric.*, 1965, **82,** 699–708.—Laboratory and factory experiments showed that up to 100 g of 30% formalin solution per ton of beet will inhibit bacterial development for 3–5 hr. Formalin added to the 23rd compartment of an RT diffuser was found to have a partition ratio of 45:55% between the juice and the cossettes. This compartment (two-thirds along the diffuser from its head) is the usual point for formalin addition because the juice is displaced twice as fast as the pulp, and the formalin is able to be distributed throughout the diffuser. However, the total quantity of formalin discharged in the juice is greater than that in the cossettes. In continuous diffusers formalin is preferably added as a liquid and not as a gas, and addition in separate massive doses is considered preferable to continuous dosing. Where the juice leaves the diffuser colu, however, and in preheaters and other ancillary equipment, continuous treatment is thought to be more effective, particularly where the infection is permanent. Factors affecting the time which must elapse between two doses, the rate of elimination of the formalin and its concentration at any one point in the diffuser have been studied, as well as the effect of bacterial counts, formalin content and temperature on the latent period of the micro-organisms.

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Treatment of filtered 1st carbonatation juices as a function of their natural composition. P. DEVILLERS and A. LEMAITRE. *Ind. Alim. Agric.*, 1965, **82,** 713–718.—The ionic content of juice from diffusion up to and including evaporation is discussed in respect of the lime salts. The influence of additives, including reducing sugars, diffusion water, soil, formalin, SO_2, sodium carbonate and glutamate, on the ion balance has been studied and means of eliminating lime salts and avoiding loss of alkalinity investigated. The balancing of the non-precipitable anions and the K and Na cations to give a required thick juice pH is regarded as the main task. Two methods of determining the quantity of sodium carbonate to add before 2nd carbonatation are described.

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Evolution of the technical characteristics of Grand-Pont filters. P. DUPONT. *Ind. Alim. Agric.*, 1965, **82,** 721–726.—Details are given of the Grand-Pont 2nd carbonatation filtered design and operating characteristics[3]. A scheme is described for a battery of three filters. The 1st filter treats all the carbonatation juices, while the 2nd filter treats the mud from the 1st filter after dilution with filtrate from the 3rd filter, which treats the mud from the 2nd filter after dilution with sweetening-off water. A pilot plant has been planned for operation during the current campaign. The scheme is completely automatic.

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Recent progress in the use of ion exchangers in the sugar factory. J. BOUCHARD. *Ind. Alim. Agric.*, 1965, **82,** 729–737.—A survey is presented of progress in some fields of ion exchange technology. The so-called "pulse counter-current" regeneration technique described involves the use of an upward current of regenerant introduced periodically into the resin columns in pulses of short duration at a rate comparable to the normal service rate. The Japanese Asahi process described is a fixed bed continuous four-column technique used for demineralization of raw water, but it is also considered suitable for 2nd carbonatation juice softening. Basic factors in ion exchange decolorization of sugar liquors are discussed.

[1] *See* RATHJE: *I.S.J.*, 1966, **68,** 84.
[2] MULLER: *I.S.J.*, 1961, **63,** 282.
[3] *See I.S.J.*, 1963, **65,** 77-80

NEW BOOKS AND BULLETINS

The Gilmore Louisiana-Florida Sugar Manual, 1965. F. I. MEYERS, B. J. SMITH and C. O. DUPUY. 272 pp.; 8 × 10½ in. (Hauser-American, 441 Gravier St., New Orleans, La., 70130 U.S.A.) 1965. Price: $10.00.

The layout of the latest edition of this biennial directory, first published in 1911, is the same as that of the 1963 edition, with information on addresses and officers and members of the various organizations in the field of cane growing, sugar production and marketing, the departments and members of the Louisiana State University staff engaged in cane research, sugar company group ownership, etc. A directory of sugar company personnel is followed by crop statistics and manufacturing reports for the 1963 and 1964 crops and covering the period 1934–1964. A map of the Louisiana sugar area is given as well as one, on a much smaller scale, of the Florida area, with factories and refineries clearly indicated. The production figures of sugar and blackstrap molasses for each Florida factory in 1964 are tabulated as well as other information on Florida factories.

The bulk of the manual consists of detailed descriptions of all the factories and refineries in the two areas. Under each company is given information on executive and staff personnel, on the operating company, details of agricultural processes and factory information, including details of the equipment and summaries of the manufacturing results in 1964 and in most cases, 1963 and 1964.

For those concerned with the Louisiana and/or Florida industries this manual, with its considerable wealth of information, is a valuable and necessary acquisition.

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Dictionary of Nutrition and Food Technology. A. E. BENDER. 221 pp.; 5¾ × 8¾ in. (Butterworth & Co. (Publishers) Ltd., 88 Kingsway, London W.C.2.) 1965. Price: 47s 6d.

This is the second edition of a book first published only five years ago and containing terms used in nutrition, food manufacture and food handling. It is designed for those whose work touches on the fringes of the field of food and nutrition, offers brief descriptions of equipment and apparatus commonly used, legal definitions, analyses of common foods and covers bacteriological, pharmacological and biochemical aspects. The list of terms has been greatly increased, as can be seen from the increase of 78 in the number of pages. However, the reviewer cannot agree with the claim that the entire text has been revised, since an error noted in the review of the first edition[1] remains uncorrected. This concerns the definition of molasses, which, because of the accidental splitting of one sentence into two is defined as "Syrup produced by washing raw sugar". As regards the sugar industry, this is quite well represented, but there are numerous omissions. Bone charcoal is defined, but active carbon is left out. Brix is not only used to refer to the concentration of sugar syrups used in canned fruits, as any sugar technologist knows. However, the compiler of any dictionary finds it difficult to decide what should be included and excluded, since obviously a line must be drawn somewhere, and the author of this dictionary would seem to have made a reasonably good job.

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Zuckerwirtshaftliches Taschenbuch 1964. (Economic Sugar Pocket Book.) Ed. P. MEIMBERG. 192 pp.; 4 × 5¾ in. (Verlag Dr. Albert Bartens, Berlin-Nikolassee, Lückhoffstr. 16, Germany.) Price: DM 13.20; 24s 0d.

This is the 12th edition of a book originally edited by A. BARTENS and H. MOSOLFF and includes a vast amount of information assembled by A. BEER, K. GUMPERT, W. SCHUBERT and G. BRUHNS in the form of a single thin and small volume. It is split into three sections, the first containing statistics and graphs covering international, European, West and East German beet, cane, molasses and sugar production, sugar consumption, sugar and molasses imports and exports, sugar balances and prices, etc. The data apply up to 1963/64 with estimates for 1964/65. Section II (in German) deals with the International Sugar Agreement, world sugar prices and West German regulations applying to sugar and molasses sales and delivery. Section III contains the addresses of international and West German sugar organizations and sugar factory addresses, and a new feature in the form of West European sugar factory addresses. The tables and graphs (there are 75 of the former and 14 of the latter) have English and French sub-titles and the complete work is a very handy book, clearly printed and attractively bound in a blue plastic material.

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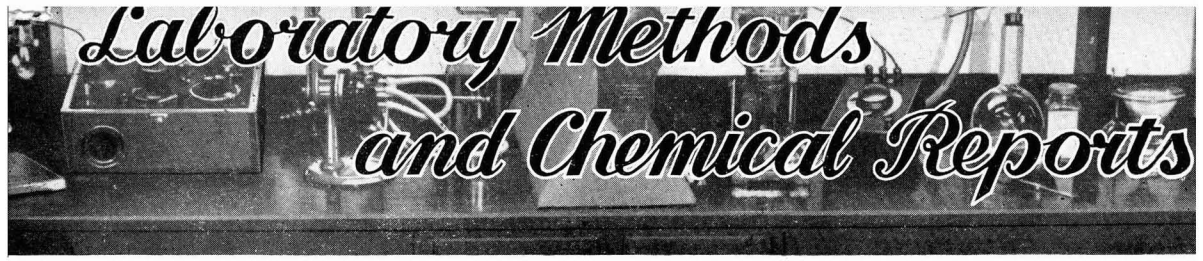
Our Achievements in a Decade. 14 pp.; 7½ × 10½ in. (Taiwan Sugarcane Growers' Association, Chichow, Changhwa, Taiwan.) 1965.

This is an illustrated booklet in Chinese and English published to mark the tenth anniversary of the Taiwan Sugarcane Growers' Association. This Association was formed with the aim of helping growers to derive economic benefits in cane agriculture, acting as liaison between the sugar factories of the Taiwan Sugar Corporation and the large number of growers (it is stated that two-thirds of the cane requirement is obtained from some 200,000 plantations), consolidating the Taiwan sugar industry for future development and safeguarding the rôle of the sugar industry in the economic growth of Taiwan. Details are given of the services offered, the membership, and the achievements in raising cane productivity, payment for scholarships of members' children, insurance schemes, loans, etc., and in improvement of communication media (sugar publications, audio-visual services for growers' education, and broadcasting of agricultural programmes).

[1] *I.S.J.*, 1960, **62**, 259.



Formation and composition of beet molasses. IV. Saturation function of various non-sucrose substances. G. VAVRINECZ. *Zeitsch. Zuckerind.*, 1965, **90,** 449–456. Data from the literature (22 references) are examined in a study of the effect of various compounds and mixtures on sucrose solubility. The saturation functions of these have been determined and the results confirmed by the saturation function of molasses containing only one cation. Sodium was found to be more melassigenic than potassium. The salting-out effect at higher purities was found to increase in proportion to the hydration of the cations. Alkali salts of carboxylic and hydroxycarboxylic acids (including carbonic acid) were found to be the most melassigenic, while nitrogenous compounds in molasses and potassium salts of amino acids proved to be only slightly melassigenic. Magnesium chloride and calcium acetate are non-melassigenic.

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Conductimetric ash determination in white sugars. G. PIDOUX. *Zucker*, 1965, **18,** 455–458.—Conductimetric ash in 29 sugar samples was determined (1) using 5 g/100 ml solutions, and (2) using 31 g/100 ml (27·5°Bx) solutions. The results are discussed statistically. A 27·5°Bx solution is recommended for thick juices and sugar and high-purity massecuites. In the case of refinery massecuites, the effect of water used in the determination is reduced. Where the purity is at least 90, the 5 g/100 ml solution is recommended since it is suitable for sugar juices and is widely used for routine purposes. A conversion factor of 2·9 has been found for comparison of the two conductivities. For sugar with a purity of 98·5 and above, a factor of 1260 will give the ratio between conductivity with either solution and the corrected sulphate ash value. There is apparently no constant correction factor for the water required in the determination. The conductivity of a sugar sample can be determined by means of a graph of solution conductivity *vs.* solvent water conductivity. The method is described briefly.

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Determination of glucose in corn syrup and sugars. A. G. ROHWER, E. R. HENSCHEL and C. E. ENGEL. *J.A.O.A.C.*, 1965, **48,** 844–846.—The glucose content of a number of syrups was determined by means of a specially prepared glucoseoxidase-peroxidase reagent* and spectrophotometry at 396 mμ. The method compared well with paper chromatographic determination for accuracy, although measuring the transmittance rather than absorbance increases the accuracy.

SV-1 electric juice extractor for pressing pulp in the determination of its sugar. A. T. SNISAR' and YA. V. MESIONKO. *Sakhar. Prom.*, 1965, **39,** 598–599. Illustrations are given of the device, in which the pulp is pressed onto a special disc and the juice extracted by centrifuge. Some analytical data obtained with it are tabulated.

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Surface tension of aqueous sucrose solutions. H. SCHOENECK and W. WANNINGER. *Zucker*, 1965, **18,** 477–480.—Measurements of the surface tension of high purity sucrose solutions at 20–50°C are reported. The results are given in graph form and can be expressed by a quadratic equation within an error of ± 0·2%. Because of extreme scattering, no differential coefficient could be obtained as an exact temperature coefficient, although a linear reduction in surface tension with temperature was established. Measurement of the surface tension of consumption sugars treated by various types of active carbon and bone char gave results which were independent of the type of sugar and type of active carbon, although the two bone chars gave lower values. The results can be expressed by a quadratic equation with a maximum deviation of 0·3% for active carbon and 1·1% for bone char. Since hydrometer readings can differ for liquids of the same density but different surface tension, it is considered essential for the sake of accurate determinations to know the surface tension of the liquid to within at least 5%.

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Possibilities of rationalizing beet analysis by automation in a central laboratory. H. REGGELIN. *Zeitsch. Zuckerind.*, 1965, **90,** 514–518.—An illustrated survey is presented of automatic equipment for use in the tare house and central laboratory, including dosing devices, polarimeters, flame photometers, etc.

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Experience with the membrane-type filtration tests in a Louisiana sugar refinery—1963. E. E. COLL, J. J. FRILOUX, S. J. CANGEMI and N. A. CASHEN. *Sugar J.* (La.), 1964, **27,** (5), 17–19.—Investigations of raw sugar, affined raw sugar and clarified liquor filtrability through "Millipore" membrane filters are reported. The samples from various origins were prepared by dissolving a weighed portion in distilled water and diluting to 15% R.D.S. at ambient temperature (approx. 26°C). Type RA filter discs of 47 mm dia. and 1·20μ pore size were used. The raw sugar samples were also filtered through a type RA membrane with a micro-fibre glass fibre pre-filter. Most of the results were within ±15% of the mean values. Average filtrabilities of the clarified liquors were fairly closely correlated with commercial filter data

* Worthington Biochemical Corp., Freehold, N.J., U.S.A.

for cycle times and filter-aid requirements. A method described previously[1] for total insoluble solids determination, with a 1·2μ membrane and 5% R.D.S. samples showed that 31% of the insolubles in Australian raws were removed by affination, and 73% by clarification, with a total separation of 81%. Corresponding figures for Philippine raws, containing treble the quantity of insolubles, were 50, 24 and 62%. Philippine clarified liquor contained more insolubles than did the affined raw sugar on 3 of the 8 days of operation. The insolubles content can be rapidly calculated at 0·01–0·05% R.D.S. by determining the filtrability and reading the corresponding insolubles content from a reference curve. Hence the total quantity of insolubles entering the refinery and the amount removed by affination can be quickly estimated.

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Molecular association during the pre-crystallization period of supersaturated aqueous sucrose solutions. N. TIKHOMIROFF. *Ind. Alim. Agric.*, 1965, **82**, 755–772. See *I.S.J.*, 1965, **67**, 379.

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Electrical conductivity of sugar juices and syrups. M. FRIML. *Listy Cukr.*, 1965, **81**, 204–207.—The electrical conductivity of juices, syrups, molasses and model solutions was measured and the results used to calculate temperature correction factors and to construct nomograms for conductivity determination of juices and syrups under varying conditions of Brix, ash content and temperature.

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Determination of white consumption sugar quality. ANON. *Sucr. Franç.*, 1965, **106**, 219–222.—Details are given of the three-test Braunschweig points system for white sugar evaluation. The system is based on the four-test system that has been applied for a number of years, but colour determination on heating is omitted.

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Do you believe your sucrose balance? G. ALEMAN. *Sugar J.* (La.), 1964, **27**, (7), 57–58.—The author points out the dangers of accepting pol as the equivalent of true sucrose content and recounts some examples of discrepancies in factory balances due to this error.

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Analysis of Puerto Rican rums by gas chomatography. M. GARCIA M., C. AGUILERA and C. TORRES-NOYA. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965. Details are given of a gas chromatographic technique which has been applied to rum analysis, together with results obtained. The technique uses only a small amount of rum but permits the determination of acetaldehyde, methyl, ethyl and *iso*-amyl acetates, *n*-propanol, *n*-butanol, *iso*-butanol and *iso*-amyl alcohol.

Assaying cane deliveries by core sampling and direct analysis. J. H. PAYNE and L. J. RHODES. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965.—As the proportion of trash in cane delivered rises, the assessment of cane quality becomes increasingly difficult and the reliability of the conventional stripping tests reaches the point of diminishing return. Net cane weights incur errors which may be as high as 50%. A new approach to this problem involves core sampling of the gross cane as it arrives and mechanical subsampling of the 30-lb sample, which is passed through a Rietz pre-breaker before again sub-sampling and analysing for pol and fibre content. From the pol and weight of cane the pol available in the truck load is known, and payment can be made for this after applying a factor derived from the sugar recovery in the factory. The sampling and sub-sampling are completely mechanical and free from personal bias. Data are given from the application of the procedure at one factory.

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Quantitative aspects of gas formation in final molasses during boiling of *C*-strikes and during storage; effect of composition and age of molasses and temperature. P. HONIG. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965.—Measurements were made of the rate of gas formation in blackstrap molasses. The rate depended on the age of the molasses, i.e. time since its initial production, and to a high degree on the temperature of storage, e.g. the rate of 40°C is three times that at 30°C. The gas is CO_2 formed by exothermic reactions between amino acids and reducing sugars. The progress of gas production is therefore associated with loss of fermentable sugars. At a temperature of 60°C the heat is liberated by the reaction at such a rate that it cannot be dissipated, which leads to even higher temperatures and molasses decomposition.

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Precipitation of non-sugars in the manufacture of raw cane sugar. P. HONIG. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965.—Some non-sugars in cane juice become insoluble during evaporation and boiling not only as a result of their concentration but also because of chemical reaction and because of changes occurring with maintenance at high temperatures for considerable periods of time. Molasses, when diluted with water, deposits insoluble non-sugars, and sediment is also found to settle in the pan station storage tanks. The practical significance of this only arises in the distillery, however, where dilution of molasses and subsequent storage permits removal of insolubles which would otherwise be deposited as scale on the columns. Precipitation of insoluble non-sugars during boiling has a harmful effect on sugar filtrability and sometimes on clarification in the refinery.

[1] *Proc. 12th Session ICUMSA*, 1958, 35.

BY-PRODUCTS

Elimination of free formaldehyde in resin for board making. K. S. TSAI. *Taiwan Sugar Quarterly*, 1965, **12**, 9–14.—Tests are reported in which attempts were made to eliminate the unreacted formaldehyde in the preparation of urea and melamine resin, since exposure to even small concentrations of formaldehyde gas can cause discomfort and body disorders. It was found that free formaldehyde can be completely removed from the resin by adding an ammonium salt (chloride or sulphate) which produces hexamine and liberates a strong acid; the latter is neutralized with zinc, magnesium or calcium oxide (or NaOH at a suitably reduced level). The metal salt resulting from neutralization remains in the resin and reduces its normal and wet bonding strength if the quantity of metal salt exceeds that which is in equilibrium with 4% free formaldehyde in the resin; hence the ammonium salt and alkaline earth added should be no more than is required for equilibrium with 3% free formaldehyde. The solubility of the metal salt will determine the degree of reduction in wet strength. Free formaldehyde can be avoided by strict control of resin condensation conditions, including the pH of the reaction mixture before and during condensation. Gelling occurs when the pH is high and resin formation is favoured at lower pH values, while free formaldehyde increases as resin formation velocity increases. The molar ratio of formaldehyde to urea or melamine and the impurities in the raw materials will determine the appropriate initial and reaction pH of the mixture. The free formaldehyde concentrations resulting from various mole ratios are tabulated.

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Process improvement for alcohol manufacture. L. J. KEO. *Taiwan Sugar Quarterly*, 1965, **12**, (2), 15–19. Details are given of the procedures used by the author to culture a yeast adapted to a 32°Bx wort containing 22% sugar. An alcohol concentration of 11·2% was obtained at the end of fermentation, with a 12°Bx spent wash concentration, compared with 8% alcohol concentration and 7°Bx spent wash concentration using a 22°Bx wort. Distillation can be improved by eliminating aldehyde, and details are given of a de-aldehyder designed by the author. Impurities such as iso-propyl alcohol, ethyl acetate and methyl ethyl ketone can be removed from the alcohol effluent by adding ferric sulphate and NaOH solution to oxidize the impurities to sodium acetate which is then removed on re-distillation.

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Evaluation of the furfural distillation process. K. S. TSAI. *Taiwan Sugar Quarterly*, 1965, **12**, (2), 23–27. In a process using a rotary digester in which the bagasse was treated with steam periodically and the vapour flashed to a condenser, the furfural yield was only 9·45% on bagasse, compared with 13% obtained in laboratory experiments. Flash distillation of the vapour condensate was repeated until the furfural and water were separated as two layers. The water layer was then re-distilled. The furfural yields in the first 300 g of distillate out of an original 1000 g ranged from 88 to 95%, after which the yield fell markedly. The heat costs of each of the five condensates in distillation are calculated.

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Isolation and analysis of wax from Philippine sugar cane filter press cake. A. M. ESCARRILLA and I. S. SALCEDO. *Sugar J.* (La.), 1965, **28**, (3), 48–52.—Wax was extracted from the filter-cake of five Philippine centrals using different solvents. Maximum recovery was 13·56% (from Pasudeco filter-cake) with toluene, while refined alcohol gave 12·31% crude wax from Victorias filter-cake. The other filter-cake samples gave such low yields that their analysis was discontinued. Pure wax was separable from the fatty oil fraction by fractional crystallization at temperatures in the range 72–0°C. Most of the wax was crystallizable at 30°C. Hard, brittle wax was obtained at 45–20°C and below 20°C it was granular or powdered. Refining with acetone removed most of the colour without bleaching and gave a creamy colour. The Pasudeco wax thus obtained contained 27·27% fatty matter. The cane waxes had properties similar to those of carnauba and other commercial hard waxes.

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Manufacture of paper from sugar cane bagasse. ANON. *Bol. Azuc. Mex.*, 1965, (193), 18–23.—An illustrated account is given of the bagasse paper plant at San Cristóbal Ecatepec, near Mexico City, which has been in commercial operation since 1953 after a year of pilot plant tests. Bagasse is brought to the plant by rail and by road trailers from six sugar factories, nearly 150,000 tons being used in 1965. The parenchyma cells are separated by a wet process and the fibre is then impregnated with pulping chemicals and treated in continuous "cookers" to give pulp in two fractions derived from fibre needing only one and two treatments, respectively. Some of the pulp is sold to other paper-making plants and the remainder is converted to paper of various types.

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The use of protein in sugar cane as an animal feed. D. H. PARISH. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965.—Further trials have been made on the feeding of dried cane tops, muds and molasses to sheep, and the results confirm the low digestible protein level of the first. Cane juice coagulate, fed to young chicks, was found to have a supplementary protein value of one half that of fish meal. Analysis of the coagulate showed that methionine is low and supplementation with this essential amino acid may be needed.

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Process improvement for alcohol manufacture. L. J. KEO. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965.—See above.

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.

Automatic industrial weighers. Herbert & Sons Ltd., Angel Road Works, Edmonton, London N.18.

The new type WD.1025 weigh feeder unit can be used as a batch constant weight feeder, in which form it is adjusted to the speed of the belt conveyor. It has two controllers set to give "higher" and "lower" flows so that material is transferred from the hopper to the belt conveyor at the higher setting until flow along the belt exceeds a required amount. Photo-electric cells switch the vibratory feeder to the lower setting, so averaging out the flow to a constant rate. As a batch weigher it again operates with high and low feeds. When the material being transferred at the high setting approaches correct weight, the photo-cells switch to low setting and the material is "dribble" fed until the correct weight is reached when the feeder stops. The conveyor continues to run and when the weight has fallen below a certain level the vibrator resumes feeding while the first batch is still being unloaded. Twenty weighings per minute are possible, according to material flow.

The WD.1024 continuous weigher totals the weight of material as it flows on the conveyor belt from either of two storage hoppers. It is provided with two printing units, one for the continuous total and the other giving individual batch weights. As a batch weigher the unit is so adjustable that material flow automatically stops when a pre-determined value is reached.

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Temperature controllers. Sifam Electrical Instrument Co. Ltd., Woodland Road, Torquay, Devon.

Previously available only as on/off or proportional controllers, "Pyromaxim" phototransistorized instruments are now obtainable in seven basic forms, covering most temperature control applications. All individual circuit components are plug-in units, so that any number of controllers can be serviced from one set of replacement units, servicing requiring the use of a screwdriver only. The controllers are moving-coil measuring instruments in which movement of the pointer is also arranged to "trigger" a control circuit at pre-determined readings in the ranges of 0-200°C and 0–1600°C (or Fahrenheit equivalents). The instrument is used in conjunction with a thermo-couple or resistance thermometer, but may also be calibrated in other parameters and used for purposes other than temperature control provided a variable electrical input signal is available.

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"Bibbicote" thermal insulation. J. Bibby & Sons Ltd., Oleochemical Dept., King Edward St., Liverpool 3.

"Bibbicote" is a new polyurethane foam system which can be applied as a spray to almost any clean dry surface. It has a low thermal conductivity (0·16 B.Th.U./sq.ft./in/°F at 50°F), nearly twice as good as conventional insulating materials, and virtually eliminates condensation. It has a hard surface which can be brushed, washed with detergents or pressure hosed, and it is self-extinguishing as far as fire is concerned. Its density is approx. 3 lb/cu.ft., and it may be used for thermal insulation of farm and other buildings. It is designed for internal use only; for external use a weatherproof protection coating is required.

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PUBLICATIONS RECEIVED

"TRANSDATA MINICARD" CONTROLLERS. George Kent Ltd., Luton, Beds.

Publication P153-3 gives information on the 153A "Transdata" analogue-output 3-term controller which is a recent addition to the "Transdata Minicard" range of standard modular units. This general-purpose controller accepts a high-level measured value signal from a suitable converter or amplifier and produces a control signal of 0 to 10 mA or 0 to 5 V, the desired value being set manually or by another electrical signal. Publication P153-4 gives details of the 153AF fast integral action 2-term analogue-output controller which has an integral action time of 0–25 sec, making it particularly suitable for flow applications.

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DUST CONTROL. Dust Control Equipment Ltd., Thurmaston, Leicester.

A well-prepared 25-page booklet (Catalogue 141) contains illustrated information on dust hazards and the various pieces of equipment manufactured by DCE for dust control in a wide range of industries.

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COMPACT. Soc. Fives Lille-Cail, 7 rue Montalivet, Paris 8e, France.

An 11-page booklet gives details of the "Compact" 220 and 410 automatic centrifugals for white sugar and high-purity raw sugar massecuites, as well as low-purity massecuites. Full mechanical and operational data are given together with illustrations of various parts of the machines highlighting their advantages. The booklet is printed in French, English and Spanish.

* * *

Cane diffuser for Ryukyu Islands.—Hokubu Sugar Co., located at Naha, Okinawa, has purchased a Silver cane sugar diffusion-clarification-filtration system, of the same type installed at Pioneer Mill Co. in Hawaii[1], and plans to install a second unit next year. The sale was made by Mitsubishi Heavy Industries, Ltd. of Japan, licensees for Silver Engineering Works Inc. of Denver Colo., U.S.A. The Hokubu unit will have a capacity of 3600 tons of cane per day and a French Oil Machinery Co. screw press will be used for dewatering bagasse.

* * *

Suchar merger.—Suchar Sales Corp. and its associate, Fas-Flo Filter Corp., have been merged with Bartlett-Snow-Pacific Inc. to become the Suchar Division of B-S-P. Bartlett-Snow-Pacific Inc., a wholly-owned subsidiary of Bangor-Punta-Alegre Sugar Corp., specializes in systems engineering and heat processing equipment, including regeneration furnaces for active carbon and bone char.

[1] *I.S.J.*, 1965, **67**, 169–172.

WORLD NET SUGAR IMPORT REQUIREMENTS, 1966

INTERNATIONAL SUGAR COUNCIL SECOND ESTIMATE

(*metric tons, raw value*)

FREE MARKET *Country or Area*	*1st estimate for 1966 at U.N. Conference*	*2nd estimate for 1966*	*Change against previous estimate*
EUROPE			
Albania	15,000	15,000	0
Bulgaria	85,000	270,000	+185,000
Cyprus	14,000	14,000	0
Finland	140,000	137,000	—3,000
Germany, West:			
for human consumption	94,000	94,000	0
for animal feeding	—	188,000	+188,000
Gibraltar	2,000	2,000	0
Greece	70,000	40,000	—30,000
Iceland	11,000	11,000	0
Ireland	21,000	50,000	+29,000
Italy	17,500	50,000	+32,500
Malta	13,000	12,500	—500
Netherlands	150,000	150,000	0
Norway	150,000	150,000	0
Portugal (incl. terr.)	35,000	20,000	—15,000
Spain (incl. terr.)	125,000	225,000	+100,000
Sweden	70,000	109,000	+39,000
Switzerland	225,000	210,000	—15,000
United Kingdom	1,970,000	2,000,000	+30,000
U.S.S.R.	1,600,000	2,400,000	+800,000
Yugoslavia	80,000	100,000	+20,000
TOTAL	4,887,500	6,247,500	+1,360,000
NORTH AMERICA			
Canada	780,000	790,000	+10,000
TOTAL	780,000	790,000	+10,000
CENTRAL AMERICA			
Bahamas and Bermuda	7,000	7,000	0
Honduras	2,000	2,000	0
Panama Canal Zone	2,000	2,000	0
Virgin Islands (U.K.)	400	400	0
TOTAL	11,400	11,400	0
SOUTH AMERICA			
Chile	170,000	150,000	—20,000
Uruguay	55,000	50,000	—5,000
TOTAL	225,000	200,000	—25,000
ASIA			
Afghanistan	48,000	48,000	0
Arabian Peninsula:			
Fed. of South Arabia	30,000	49,000	+19,000
Kuwait	22,000	0	—22,000
Saudi Arabia	55,000	55,000	0
Yemen	24,000	24,000	0
Others	33,000	33,000	0
Brunei	4,000	4,000	0
Burma	30,000	30,000	0
Cambodia	19,000	0	+19,000
Ceylon	225,000	240,000	+15,000
China, Mainland	500,000	400,000	—100,000
Hong Kong	102,000	102,000	0
Iran	250,000	315,000	+65,000
Iraq	210,000	210,000	0
Israel	74,000	60,000	—14,000
Japan	1,300.000	1,300,000	0
Jordan	50,000	50,000	0
Korea, North	20,000	30,000	+10,000
Korea, South	50,000	50,000	0
Laos	4,000	4,000	0
Lebanon	35,000	35,000	0

(*metric tons, raw value*)

FREE MARKET *Country or Area*	*1st estimate for 1966 at U.N. Conference*	*2nd estimate for 1966*	*Change against previous estimate*
Malaysia:			
Malaya	200,000	220,000	+20,000
Sabah	14,000	18,000	+4,000
Sarawak	19,000	19,000	0
Mongolia	15,000	15,000	0
Nepal	3,000	6,000	+3,000
Pakistan	66,000	70,000	+4,000
Singapore	70,000	75,000	+5,000
Syria	75,000	90,000	+15,000
Vietnam, North	20,000	20,000	0
Vietnam, South	50,000	70,000	+20,000
TOTAL	3,617,000	3,642,000	+25,000
AFRICA			
Algeria	220,000	220,000	0
Burundi	8,000	8,000	0
Cameroon	10,000	10,000	0
Central African Republic	3,000	3,000	0
Chad	18,000	18,000	0
Dahomey	8,000	8,000	0
Gabon	1,000	1,500	+500
Gambia	5,000	5,000	0
Ghana	39,000	39,000	0
Guinea	12,000	12,000	0
Ivory Coast	32,000	29,000	—3,000
Kenya	70,000	120,000	+50,000
Liberia	4,000	4,000	0
Libya	33,000	33,000	0
Malawi	15,000	19,000	+4,000
Mali	28,000	28,000	0
Mauritania	20,000	21,500	+1,500
Morocco	400,000	350,000	—50,000
Niger Republic	8,000	8,000	0
Nigeria	43,000	55,000	+12,000
Rwanda	8,000	8,000	0
Senegal	70,000	75,000	+5,000
Sierra Leone	17,000	17,000	0
Sudan	120,000	130,000	+10,000
Tanzania	10,000	4,000	—6,000
Togo	6,000	6,000	0
Tunisia	80,000	80,000	0
U.A.R.	80,000	100,000	+20,000
Upper Volta	10,000	10,000	0
Zambia	25,000	27,000	+2,000
TOTAL	1,403,000	1,449,000	+46,000
OCEANIA			
New Zealand	133,000	133,000	0
U.K. Admin. Oceania	3,000	3,000	0
U.S. Admin. Oceania	4,000	4,000	0
Western Samoa	4,000	4,000	0
TOTAL	144,000	144,000	0
TOTAL FREE MARKET	11,067,900	12,533,900	+1,416,000
U.S. MARKET			
U.S.A. net import requirements from foreign countries	3,300,000	3,500,000	+200,000
GRAND TOTAL	14,367,900	15,983,900	+1,616,000
GRAND TOTAL ROUNDED	14,368,000	15,984,000	+1,616,000

BREVITIES

Reduction in U.K. sugar surcharge.—The Sugar Board surcharge of 3¾d per lb (35s 0d per cwt) was reduced to 3½d per lb (32s 8d per cwt) from 21st January 1966, and to 3¼d per lb (30s 4d per cwt) from 1st February 1966, the Minister of Agriculture, Fisheries and Food, on the advice of the Sugar Board, having made the necessary orders under the Sugar Act, 1956. The changes in surcharge, which resulted in a total reduction of about 4s 8d per cwt in the ex-refinery price, were made to bring the Sugar Board's trading position more into line with the current level of world prices.

* * *

New sugar beet research journal.—A new journal, The Journal of the International Institute for Sugar Beet Research, has now appeared with its first 65-page number. The International Institute for Sugar Beet Research (General Secretary: O. J. KINT, 150 Beauduinstraat, Tirlemont, Belgium) was started in Brussels in 1931 with 10 members representing 25 sugar beet growing countries. Today it has some 275 members representing 25 sugar beet growing countries in 4 continents. The journal will replace the Report of the Winter Congress which previously had been published annually. It is expected the journal will make known the results of sugar beet research much more quickly and will facilitate or strengthen collaboration between members. It will cater for growers, seed producers, sugar manufacturers and in particular scientists and research institutes who deal with the many problems that arise, right from the breeding of sugar beet to its processing in the factory. We wish the new journal every success.

Stock Exchange Quotations

London Stocks (*at 17th February*, 1966)	CLOSING MIDDLE s d
Anglo-Ceylon (5s)	5/8¼
Antigua Sugar Factory (£1)	10/–
Booker Bros. (10s)	21/9
British Sugar Corp. Ltd. (£1)	23/3
Caroni Ord. (2s)	2/4½
Caroni 6% Cum. Pref. (£1)	16/6
Demerara Co. (Holdings) Ltd.	3/4½
Distillers Co. Ltd. (10s units)	21/3
Gledhow Chaka's Kraal (R1)	15/6
Hulett & Sons (R1)	18/–
Jamaica Sugar Estates Ltd. (5s units)	3/4½
Leach's Argentine (10s units)	11/6
Manbré & Garton Ltd. (10s)	35/3
Reynolds Bros. (R1)	20/–
St. Kitts (London) Ltd. (£1)	15/6
Sena Sugar Estates Ltd. (5s)	8/10½
Tate & Lyle Ltd. (£1)	34/3
Trinidad Sugar (5s stock units)	2/8¼
West Indies Sugar Co. Ltd. (£1)	10/3

New York Stocks (*at 16th February*, 1966)	CLOSING MIDDLE $
American Crystal ($5)	20½
Amer. Sugar Ref. Co. ($12.50)	34⅜
Central Aguirre ($5)	35
Great Western Sugar Co.	41⅛
North American Ind. ($10)	15⅝
South P.R. Sugar Co.	26¼
United Fruit Co.	31⅞

U.K. post graduate course in food science.—From October 1966 a one-year M.Sc. course in Food Science will be available in the University of Leeds. The course is designed to provide an adequate knowledge of food science for entry into the food industry or food research, designed for chemistry, biochemistry and chemical engineering graduates. The course is also suitable for graduates in biological subjects, or those with combined degrees, provided their courses have had a substantial chemistry content. The twelve month period is divided into nine months of formal teaching, followed by a research project for the remaining three months. Options exist for specialization on the chemical or microbiological side depending on the previous experience of the students. There will be a maximum, at present, of eight places each year, some of which will be filled with students graduating the previous June but others may be taken by graduates with some industrial experience. The course will be given by specialists in the department, with assistance from other departments and lecturers from industry and the research institutes.

* * *

New U.S.S.R. sugar factories[1].—A new sugar factory with a daily capacity of 3000 tons of beet has been completed at Slutsk in Byelorussia. In this connexion it is reported that at present 30 sugar factories are under construction in the U.S.S.R.

* * *

Furfural production in the U.S.[2].—Agreement has been reached between Sugar Cane Growers' Cooperative of Florida and Quaker Oats Company which calls for the erection and operation of a plant to manufacture furfural from bagasse. The new plant will be built adjacent to the mill of the Glades Sugar House from which supplies of bagasse will be drawn.

* * *

Cuba-Syria trade agreement[3].—Cuba will supply all Syria's sugar needs for the next three years, under a trade agreement signed between the two countries. This amounts to some 70,000–75,000 metric tons per year.

* * *

Italian sugar project[4].—Sicily is planning to start producing sugar again after a lapse of many years. An area of about 12,000 acres is being opened in a project to plant the land to sugar beet. Plans also call for the reopening of a sugar factory at Catalina. Sicily used to produce cane sugar years ago but the industry was abandoned because of low profits.

* * *

Bagasse paper and board in Trinidad[5].—Pulp, paper, boards and packaging materials are to be manufactured in Trinidad shortly. Pioneer status has been granted to General Paper Products (Caribbean) Ltd., an American firm which is to build a factory on the Manuel Congo Road off the Churchill Roosevelt Highway. Bagasse is to be used as raw material for the first time in Trinidad.

* * *

Italian beet sugar campaign, 1965[6].—The results of the 1965 sugar campaign in Italy surpassed the most optimistic expectations. Sugar production reached 1,043,928 metric tons, white value, or 100,000 tons more than the previous forecast. The 78 factories which participated in the campaign sliced 8,876,937 tons of beets and the campaign lasted for 53 days, compared with 45 days in 1964. The sucrose in beet reached 15%.

* * *

Polish sugar factories for Czechoslovakia[7].—For the first time Poland will export sugar factories to Czechoslovakia, according to *die Wirtschaft des Ostblocks*. Under the provisions of a long-term trade agreement covering the period up to 1970 it is anticipated that among other items four fully equipped sugar factories will be supplied by Poland.

[1] F. O. Licht, *International Sugar Rpt.*, 1966, **98**, (1), 14.
[2] *Sugar y Azúcar*, 1966, **61**, (1), 48.
[3] *Public Ledger*, 15th January, 1966.
[4] *Sugar y Azúcar*, 1966, **61**, (1), 49.
[5] *Chron. W. India Comm.*, 1966, **81**, 39.
[6] *Sucr. Belge*, 1966, **85**, 213.
[7] C. Czarnikow Ltd., *Sugar Review*, 1966, (748), 29.