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On applique l'équation présentée dans la première partie de cet article au calcul de l'efficacité de diffuseurs DDS employés pour le traitement de canne à sucre, sur la base des experiences avec deux des trois installations en opération. Des résultats sont donnés sous forme de graphiques. Pendent qu'on ne peut pas représenter la préparation de la canne par une description numérique, définie, l'emploi d'un facteur empirique donne des résultats qui indiquent les effets sur le broyage combiné avec la diffusion de canne de certains paramètres tels que le soutirage, la teneur en fibre, etc.

* * *

Un procédé pour computer et déterminer la teneur en matières sèches des sirops et boissons préparés de sucre inverti "moyen". I-ère partie. G. J. Marov. p. 134–136

Le sucre inverti "moyen" (un mélange de 50% sirop de saccharose et de 50% sirop de sucre inverti) est très employé par l'industrie de boissons nonalcooliques. Cependant, à cause des différentes propriétés physiques des sirops de sucre inverti la teneur en matières sèches, déterminée au moyen de l'aréomètre Brix ou avec réfractomètre gradué pour saccharose, ne concordent pas avec la teneur en matières sèches calculée. L'auteur présente sous forme de graphiques des corrections calculées pour les respectives valeurs obtenues avec aréomètre et réfractomètre.

* * *

Recherches sur l'opération de sucreries au Natal en 1965. p. 136–138

C'est une revue des recherches effectuées par l'Institute des Recherches de Fabrication de Sucre (Sugar Milling Research Institute) en 1965 et qui concernent des aspects variés de procédés dans la sucrière et des problèmes alliés.

* * *

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On donne une sommaire du rapport annuel (1965) de l'Institut des Recherches Sucrières de l'Ile Maurice. Le rapport traite de variétés de canne cultivées à Maurice, l'élevage et la sélection de canne, les maladies de canne, des insectes et animaux nuisibles, la nutrition et les sols de terrains de canne, et des autres sujets concernant la canne à sucre.

Berechnungen der Kombination von Mahlen und Diffusion von Zuckerrohr. Teil 2. H. Brüniche-Olsen. S. 131–134

Die im esteren Teil dieses Aufsatzes gegebene Gleichung wird zur Berechnung der Leistungsfähigkeit von DDS-Rohrdiffusionsapparaten auf der Base von Erfahrungen mit zwei von den drei jetzt in Betrieb sich findenden Anlagen angewendet. Die Ergebnisse werden graphisch dargestellt. Während man kann die Rohrbereitung durch eine bestimmte, numerische Beschreibung nicht repräsentieren, durch Anwendung eines empirischen Faktors kann man Ergebnisse erhalten, welche die Einwirkungen von solchen Parametern wie Saftabzug, Rohrfasergehalt, usw. auf die Zuckerextraktion durch Mahlen und Diffusion zeigen.

* * *

Eine Methode für Berechnung und Messung von Feststoffgehalt in Sirupen und Getränken, die aus sogenanntem Mittelinvertzucker bestehen. Teil I. G. J. Marov. S. 134–136

Der sogenannte Mittelinvertzucker (ein Gemisch von 50% Saccharose-Sirup und 50% Invertzucker-Sirup) wird für die Erzeugung von alkohol-freien Getränken viel angewandt. Jedoch, wegen der verschiedenen physikalischen Eigenschaften des Invertzucker-Sirups, stimmen die Feststoffgehalt, wie mit einem Brix-Aräometer oder mit einem für Saccharose kalibrierten Refraktometer bestimmt, nicht mit der berechneten Feststoffgehalt überein. Korrektionen, für die Aräometer- beziehungsweise Refraktometer-Werte berechnet, werden graphisch dargestellt.

* * *

Zuckerfabrik-Erforschungsarbeiten in Natal in 1965. S. 136–138

Diese Ubersicht von Erforschungsarbeiten, vom Institut für Zuckerfabrikationserforschung (Sugar Milling Research Institute) in 1965 durchgeführt, umfasst verschiedene Aspekte von Zuckerfabrikverfahren und verbündene Probleme.

* * *

Zuckerrohrlandwirtschaft in Mauritius. S. 138–139

Dies ist eine Abkürzung des Jahresberichts (1965) des Mauritius Sugar Industry Research Institute und umfasst die in Mauritius angebauten Zuckerrohrsorten, Rohr-Züchtung and -Auswahl, Rohrkrankheiten, Rohrschädlinge, die Nahrung and Erden des Rohrlandes, und andere verschiedene Arbeitsbereiche.

Cálculos de la molienda/difusión combinada de caña de azúcar. Parte II. H. Brüniche-Olsen. *Pág.* 131–134

El ecuación desarollado en Parte I de este artículo se usa para calcular la eficiencia de difusores marca DDS usado para tratar caña de azúcar, basando los cálculos sobre experiencias ganado con dos de las tres unidades en operación. Los resultados se presentan en forma gráfica. Aunque la preparación de caña no puede representarse como una descripción numérica precisa, el uso de un factor empírico da resultados que indican los efectos sobre la molienda/difusión de caña de tal parámetros como tiro, fibra % caña, etc.

* * *

Un procedimiento para computar y determinar sólidos en siropes y bebidas formulado con azúcar medio-invertido. Parte I. G. J. Marov. *Pág.* 134–136

Azúcar medio-invertido, una mezcla de siropes de sacarosa y de azúcar invertido, se usa anchamente en la industria de refrescos. No obstante, á causa de las diferentes propriedades físicas del sirope de azúcar invertido, el contenido de sólidos misurado con un areómetro Brix o un refractómetro, calibrado para sacarosa, no es en concordia con el contenido calculado. Correcciones que se han calculado para los valores hidrométricos y refractométricos se presentan en forma gráfica.

* * *

Investigaciones sobre operaciones de fábrica en Natal en 1965. *Pág.* 136–138

Es un examen de las investigaciones de Sugar Milling Research Institute durante el año 1965 que cubre varios aspectos de las operaciones de la fábrica de azúcar y problemas asociadas.

* * *

Agricultura de la caña de azúcar en Mauricio. *Pág.* 138–139

Un sumario se presenta de la Reporte Anual (1965) del Mauritius Sugar Industry Research Institute. El trata de las variedades de caña que se cultivan en Mauricio, la crianza y selección de caña, enfermidades y plagas de caña, nutrición y suelos de las tierras cañeras, y varias otras líneas de trabajo.

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Notes & Comments

International Sugar Council.

The 24th Session of the International Sugar Council was held at the seat of the Council in London on 2nd and 3rd March 1967 and was attended by representatives of forty-two countries as well as by governmental observers from Barbados, Honduras and Panama and by observers from the World Bank, F.A.O. and the E.E.C. The Council gave a special welcome to Mr. P. JUDD, the Director of the Commodity Division of UNCTAD, who was attending on behalf of the Secretary-General.

At this Session, which was opened by its retiring Chairman, Sir ROBERT KIRKWOOD (Jamaica), the Council elected as its Chairman for 1967 Mr. HIROSHI YOKOTA (Japan) and as its Vice-Chairman Dr. ZDENEK JUNG (Czechoslovakia).

The Council noted that the 1966 Protocol had been signed or acceded to by the Governments of thirty-six exporting countries and of thirteen importing countries and that it had entered into force on 1st January 1967. The new Protocol extends the 1958 International Sugar Agreement until 31st December 1968 unless a new International Sugar Agreement enters into force in the meantime.

The Council considered the report by its Statistical Committee on the estimated sugar supply and demand position in 1967. It adopted the Committee's second estimate of the minimum net import requirements of the sugar market for 1967 of 16·2 million metric tons, raw value (details of which appear elsewhere in this issue), and noted that this was nearly 500,000 tons higher than the first estimate. The Council noted that supplies in 1967, whilst being at a reduced level as compared with the position when the first estimate was made, would be more than sufficient to meet the estimated requirements.

The Council received an oral report on the activities of the Preparatory Working Group on Sugar established by the Secretary-General of UNCTAD in 1966. In this connexion, the Council noted a statement by the Cuban delegation as follows: "The Cuban delegation expresses its surprise at the inclusion in the Agenda for this Session of the Council of an item on the preparations and possibility of calling a new negotiating Conference when it is well known that these meetings can only be useful if the developed countries with market economies, which up to now have not agreed to respect the objectives and principles of UNCTAD, are ready to abide by such principles. Otherwise these meetings are pointless."

The Council was informed that the Secretary-General of UNCTAD had called a further meeting of his Consultative Committee on Sugar in Geneva starting on 16th March.

The Council resolved as follows:

"that the International Sugar Council recommends to the Secretary-General of UNCTAD that the consultations which, in accordance with the resolution adopted on the adjournment of the 1965 United Nations Sugar Conference, he is conducting with the assistance of the Executive Director of the International Sugar Council should have as a target the resumption of the Conference in the autumn of 1967 ;

that such a resumption should take place if the Secretary-General and the Executive Director are satisfied that conditions are such that the Conference has a reasonable chance of success."

The Council received a report from its Sugar Consumption Committee on the use of sugar in animal feeding stuffs and the possible utilization of sugar for non-food, non-feed purposes. Attention was drawn to the fact that in present conditions there exists a potential market in the world for the direct use of sugar in animal feeding to the extent of about one million tons a year and that a new trend towards the use of sugar for industrial purposes is also appearing.

* * *

UNCTAD sugar meeting.

The 22-nation UNCTAD Consultative Committee set up to review current prospects for negotiating an International Sugar Agreement this autumn held their meeting on 16th-18th March. In the press communiqué released afterwards the Committee is reported to have requested Dr. RAUL PREBISCH, the Secretary-General of UNCTAD, to continue his exploratory talks with governments and to establish a statistical committee for providing information on likely import requirements of sugar in coming years. It recommended that a fourth session of the Committee be reconvened during May to consider the results of Dr. PREBISCH's talks and the work of the statistical committee in order to assess whether favourable prospects exist for resuming the U.N. Sugar Conference, possibly in the autumn.

Dr. PREBISCH had a series of meetings with delegates of various countries at the Geneva meetings and has undertaken a formidable task in visiting the various capitals to seek a consensus favourable to reviving the Conference. This is still doubtfully regarded in many quarters because the divergence of views expressed by countries concerned is such as to make rather unlikely the reaching of agreement between them. C. Czarnikow Ltd., reporting on the Geneva meetings, reported that:

"There can be little purpose in disguising the fact that the UNCTAD Sugar Consultative Committee's discussions, which were held in Geneva, got off to an inauspicious start and the view expressed by the EEC, that GATT might be a better vehicle than UNCTAD for a new agreement, was not well received in some quarters. As the meeting continued, however, it was apparent that the atmosphere was improving and by the time delegates left they were generally more optimistic than they had been before the week-end. That is not to say that the way ahead is now open for the negotiation of a new agreement. Indeed, it must be plain to all that a great deal of groundwork is still needed before that stage can be reached. Nevertheless, there appears to be a degree of goodwill returning which has been noticeably absent for so long, while there also seems to be an increase in enthusiasm on the part of some important governments.

"It may be that 1967 will prove to be decisive for international sugar discussions. For several years there have been attempts to negotiate a new International Sugar Agreement but, although general lip-service has been paid to the idea, there has not been the necessary acceptance of the fact that some degree of sacrifice might be required from all participants. Consequently negotiations and discussions to date have been disappointing. The new mood among delegates brings fresh hope that with care and understanding on all sides an agreement could finally be reached. A great deal now depends upon Dr. PREBISCH."

* * *

World sugar production estimates, 1966/67.

F. O. Licht K.G. recently published their second estimate of world sugar production[1] which they set at 66,759,644 metric tons, raw value, an increase of 281,000 tons on their first estimate of the end of November[2]. This compared with their revised assessment of world output in the 1965/66 crop of 63,724,942 tons.

C. Czarnikow Ltd.[3] have paid tribute to the high esteem in which F. O. Licht's views are held by the sugar world, but find that their own estimates give a total of more than 1½ million tons below Licht's figure. Among the European estimates the most marked differences are in respect of the U.S.S.R., Czechoslovakia, Poland and Rumania. Official statistics which have been published in the Soviet Union indicate that production from domestic beet during the calendar year 1966 amounted to 8·3 million tons, white sugar value which, using the customary 92:100 formula, is equivalent to 9,020,000 tons, raw value. The area devoted to the crop was lower in 1966 than in 1965, while weather conditions also made it possible for roots to be lifted at an earlier date than during the previous year. Czarnikow therefore think it probable that output during the early months of 1966 will have been higher than during the corresponding period of 1967. Consequently they would not expect output during the 1966/67 crop to exceed the level of some nine million tons achieved in the calendar year 1966. Licht, on the other hand, have set their estimate at 9,500,000 tons, the same as the 1965/66 crop outturn.

The Czechoslovakian authorities have recently stated that production will amount to some 770,000 tons, white value, equivalent to about 840,000 tons in terms of raws. This is 176,000 tons below Licht's estimate. The campaign in Rumania will continue for about another three weeks, but Czarnikow's correspondents inform them that final output is likely to be in the region of 400,000 tons, white value, or 75,000 tons less than Licht's estimate. Their friends in Poland indicate that production will close at about 50,000 tons below the level mentioned.

Outside Europe it is the estimate for India which immediately catches one's attention. Originally it was forecast that production would be in the region of the 3·5 million tons produced in 1965/66, but a severe drought has caused widespread damage and led to acute shortages of cane. Licht have now reduced their estimate to three million tons, but Czarnikow have since heard that even this tonnage cannot be attained. The current estimate is that the calamity which has struck the country is of such proportions that the highest level which can be expected is 2·3 million tons, tel quel, equivalent to some 2·5 million tons, raw value.

Although the campaign commenced in November, estimates of production in Cuba still vary considerably. Licht have suggested an output of 6·5 million metric tons, which is, of course, the official figure, but daily statistics indicating a falling level of production leads Czarnikow to believe that the half-way mark was passed at the beginning of March. This, of course, indicates that 6·5 million tons might still be reached, but they feel this is unlikely, and would be surprised if final output exceeds 6·25 million tons.

[1] *International Sugar Rpt.*, 1967, **99**, (8), 1–5.
[2] *I.S.J.*, 1967, **69**, 63.
[3] *Sugar Review*, 1967, **(806)**, 59–60.

Calculations on the Combined Milling-Diffusion of Sugar Cane

By H. BRÜNICHE-OLSEN
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PART II

Experience gained with two of the three DDS-cane diffusers in operation so far is taken as the basis for the following calculations. Both diffusers are operating with a total amount of mixed juice, J, of 95 kg per 100 kg of cane. The fibre content of the cane is around 15%, corresponding to a C value of around 85. The fibre content of the bagasse is about 50% corresponding to a value for CQ of 70 and a value for $C(1 - Q)$ of 15. The retention time for the cane in the diffusers is 30 minutes. Values of Bp/Jp between 0·15 and 0·20 have been found for these two diffusers. Taking into consideration that the fibre content of the bagasse is 50%, this corresponds to values of $\frac{z_L}{y_0}$ between 0·30 and 0·40. The lowest value is obtained with younger (12 months old) finely-prepared cane while the higher values correspond to older cane (15–20 months), somewhat more coarsely prepared.

An E-value of 7·2 corresponds to the value of 0·30 for $\frac{z_L}{y_0}$, while the value of E for $\frac{z_L}{y_0} = 0{\cdot}40$ is 5·5. These values of E are taken as the basis for all the following calculations which are carried out by calculating first the value of $\frac{z_L}{y_0}$ by means of the formula above for the given circumstances and thereafter calculating Bp in a similar way as demonstrated in connexion with Fig. 1, due attention being paid to the fibre content of the final bagasse.

The first question which has been investigated is the influence of the intensity of the prepressing of the cane. The results of this investigation are shown in Fig. 3. It is assumed that the cane has a sugar content of 13% and a fibre content of 15%, while the fibre content of the bagasse is 50%. Furthermore the total juice production is assumed to be 95 kg per 100 kg of cane. According to the formula above, the value of $\frac{z_L}{y_0}$ is independent of the prepressing and the values of $\frac{Bp}{Jp}$ of 0·15 and 0·20 respectively indicated in the figure thus remain constant within the whole range of prepressing investigated, i.e. from 0% juice transferred to the diffuser corresponding to a theoretical complete expression of the juice and a 85% juice transfer corresponding to no prepressing at all prior to the diffusion. A fair degree of prepressing would probably correspond to a transfer to the diffuser of around 150% juice on fibre or 22% juice on cane, which for the two values of $\frac{Bp}{Jp}$ would give a bagasse pol of 1·4 and 1·75 respectively. It is interesting to note that an operation completely without prepressing would increase these values for the bagasse pol by only about 40%, an increase which could fairly easily be compensated for by an increase in the total amount of mixed juice produced or in the retention time of the cane in the diffuser, as will be illustrated by some of the following figures.

In Figs. 4a and 4b is illustrated the influence of variations in what is often called the draft, which means the total amount of combined diffusion juice and juice squeezed out of the cane prior to diffusion.

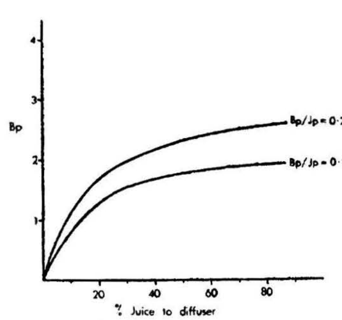

Fig. 3. Varying pre-pressing

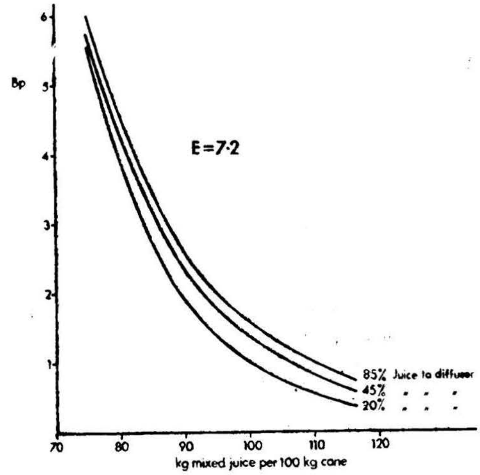

Fig. 4a. Varying draft for $E = 7{\cdot}2$

The same values of sugar and fibre content of cane and fibre in bagasse are assumed as mentioned in connexion with Fig. 3. Calculations are made for various degrees of prepressing and also for the case of no prepressing corresponding to 85% juice on cane being transferred to the diffusion. As can be seen from the figures, an omission of the prepressing can be compensated for by a 10–15% increase in the amount of mixed juice produced.

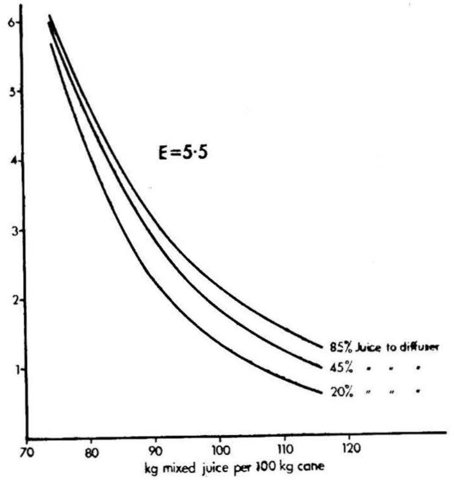

Fig. 4b. Varying draft for $E = 5{\cdot}5$

Figs. 5a and 5b show the influence of variations in the fibre content of the cane. It is still assumed that the sugar content of the cane is 13% and that a fibre content of 50% in the bagasse is maintained regardless of the varying fibre content of the cane. Furthermore, the total juice production is fixed at 95 kg per 100 kg of cane.

The calculations shown in Fig. 5a are carried out on the assumption that the prepressing and thereby the amount of juice supplied to the diffuser together with the prepared cane is independent of the fibre content of the cane. Contrary to this Fig. 5b is based upon the more realistic assumption that the quantity of juice transferred to the diffuser amounts to 150% on fibre.

Since, according to the above, the amount of bagasse is supposed to vary with the fibre content of the cane, the sugar losses in the bagasse cannot be compared solely on the basis of the bagasse pol. For this reason, the losses calculated on the basis of 50% fibre in bagasse are also indicated in the figures.

The two figures show that in all cases the pol of the bagasse decreases with increasing fibre content of the cane. If, as supposed in connexion with Fig. 5a, it is possible to carry out the prepressing in such a way that the amount of juice supplied to the diffuser does not increase with increasing fibre in cane, the losses will also slightly diminish with increasing fibre content.

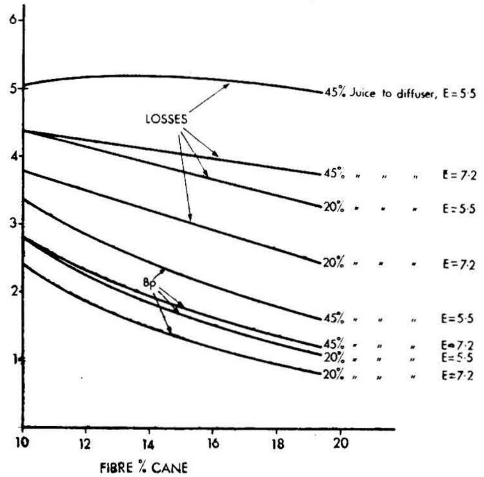

Fig. 5a. *Bp* and losses % sugar in cane for varying fibre content of the cane, 50% fibre in bagasse.

In contrast to this, Fig. 5b shows that if the amount of juice accompanying the prepared cane to the diffuser is proportional to the fibre content, the losses in final bagasse either remain almost constant or show a slight increase with increasing fibre content.

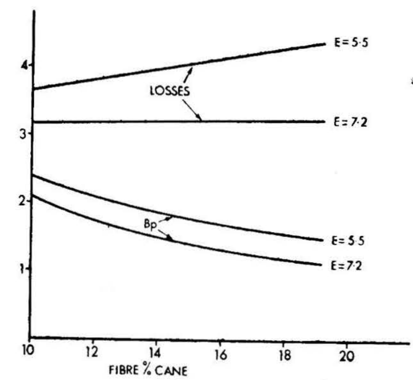

Fig. 5b. *Bp* and losses % sugar in cane for varying fibre content of the cane, juice to diffusion = 150% on fibre, 50% fibre in bagasse.

These calculations clearly indicate that no reason exists for the often expressed fear that a high fibre content of the cane should make the task of a cane diffuser substantially more difficult.

The influence of the intensity of the dewatering and thereby of the quantity of bagasse is shown in Fig. 6. As in the previous investigations it is assumed that the sugar content of the cane is 13% and the fibre content 15%, while the total amount of juice produced is supposed to be 95% on cane. The calculations are made for quantities of bagasse varying between 15 and 100% cane corresponding to a variation between a pressing to 100% fibre in bagasse and no pressing at all. The pol of bagasse as well as the corresponding sugar losses in the bagasse are indicated in the figure.

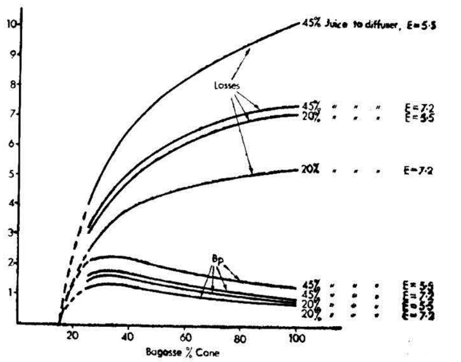

Fig. 6. *Bp* and losses % sugar in cane for varying quantity of bagasse.

As might be expected, the curves for the pol of bagasse show a maximum, the bagasse pol assuming low values after intensive pressing, owing to high fibre content, and also low values following a light pressing or no pressing at all owing to replacement of press water recycled to the diffuser by fresh water.

However, by less intensive pressing of the bagasse the amount of bagasse increases comparatively more than the pol value decreases, resulting in an evenly increasing loss of sugar in the bagasse with decreasing intensity of pressing. According to the figure, the losses are approximately twice as high if the bagasse is not pressed after diffusion as if the bagasse is pressed to a normal fibre content of about 50% corresponding to 30% bagasse on cane.

This is of specific interest to factories using the whole of their bagasse production for paper making, as it has sometimes been considered useless for such factories to dewater the bagasse after the diffusion. Fig. 6 shows, however, that such a procedure would most probably result in increased losses as it would be difficult to compensate for the calculated 100% increase in the losses by increasing the draft or the retention time for the cane in the diffuser.

Finally Fig. 7 shows the influence of the retention time upon the pol of the bagasse. As mentioned above, the value of E is proportional to the retention time and the E values of 5·5 and 7·2 used for all the preceding calculations are based upon a retention time of 30 minutes. When calculating the results shown in Fig. 7 for retention times other than 30 minutes the value of E used is increased or reduced corresponding to the proportion between the time in question and 30 minutes.

As might be predicted, the figure shows a marked decrease in pol of bagasse with increasing time. From a theoretical point of view it is interesting to note that at a retention time of 60 minutes all three curves representing diffusers operating with $E = 7{\cdot}2$ are situated below the curves representing $E = 5{\cdot}5$, whereas at 15 minutes retention time the curve representing 20% juice to diffusion and $E = 5{\cdot}5$ is situated below the two curves for $E = 7{\cdot}2$ and 45% and 85% juice to diffusion, respectively. This obviously means that if the efficiency of the diffuser is

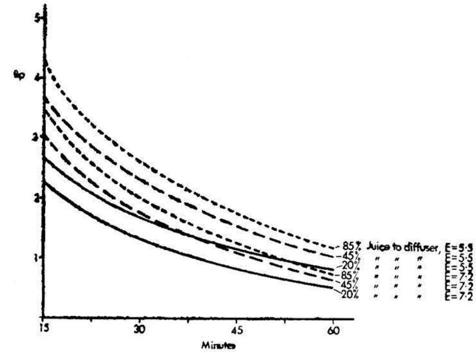

Fig. 7. Effect of retention time in the diffuser on bagasse pol

limited because of an inadequate retention time, the prepressing of the cane plays the most important part for the result of the combined milling-diffusion process, whereas the efficiency of the diffuser as expressed by the value of E is more important to the gross result if only the diffuser is allowed sufficient time.

Fig. 7 also illustrates the fact mentioned in connexion with Fig. 2 that an inefficient prepressing or no prepressing at all can be compensated for by an at most 60% increase in retention time for the cane in the diffuser.

All the preceding calculations have been based upon values of E which have been determined from practical experience with full-scale diffusers. No doubt a relation exists between the value of E and the preparation and character of the cane in the same way as the dimensions of the beet cossettes and the character of the beet tissue is decisive for the extraction of sugar from beets by diffusion as described in the book mentioned above. The beet cossettes are, however, comparatively uniform in shape and dimensions which facilitates the determination of the extraction properties. Contrary to this, cane prepared for diffusion by shredding or crushing is very non-homogeneous as to shape and dimensions of the various particles, and it is doubtful whether an adequate numerical description of the cane preparation is possible at all. For this reason it is unfortunately impossible to refer the above calculations to any specific, well defined preparation of the cane, but the results are to be regarded as indicative only regarding the influence of the important number of other parameters of the milling-diffusion of cane.

Summary

A system of formulae is deduced allowing a calculation of the influence on the results of the milling-diffusion process for cane of a number of various parameters. In the light of such calculations the importance of variations in intensity of prepressing, in total amount of juice produced (draft), in fibre content of the cane, in quantity of final bagasse, and in retention time of the cane in the diffuser, is illustrated and discussed.

A Procedure for Computing and Determining Solids in Syrups and Beverages Formulated with Medium Invert Sugar

By G. J. MAROV
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Paper presented at the 9th Ann. Conf., Canadian Inst. Food Tech., 1966.

PART I

BECAUSE of the advantages that it offers, medium invert sugar has come to be widely used in the soft drink industry. However, when this sugar is substituted for granulated or liquid sucrose, the solids, as determined by the Brix hydrometer or by the refractometer, do not agree with the calculated solids input. The purpose of this paper is to present reasons for these discrepancies and to indicate how they may be resolved.

The Pepsi-Cola Company has been using medium invert sugar for approximately 30 years and has therefore had to cope with the solids control problem that the use of this sugar entails. We believe that others, who are now using or are about to use this type of sugar, might find this discussion of interest. Although this paper specifically deals with syrup and beverage formulations, the facts discussed apply as well to other food products.

In beverage formulations with medium invert sugar, it is common practice to assume that at a given Brix the weight per gallon of this sugar is exactly the same as that of sucrose and that therefore data from sucrose tables may be used. Another assumption is that the Brix, as determined by the refractometer or by the hydrometer, is an exact indication of the percent solids in a formulation. Both of these assumptions are incorrect and may lead to errors and misunderstandings when accurate results are required. This happens particularly in the case of new formulations when it is found that the measured solids do not agree with the calculated solids input. These discrepancies are sometimes ascribed to a lack of accuracy in the instruments used or to unskilful technique; but in fact, it is the use of tables and instruments that apply to sucrose only that is as fault. The facts are as follows:—

(1) At the same % solids by weight or Brix the density, and therefore the solids per gallon, of medium invert sugar is *lower* than the corresponding value for sucrose.

(2) Both the hydrometer and the refractometer are calibrated in terms of sucrose and read correctly in pure sucrose solutions only. In solutions that contain invert sugar both instruments give low readings. It is necessary, therefore, to apply corrections in order to obtain the true solids.

The differences between the true Brix of medium invert sugar solutions and the results as obtained by measurement are greater for the refractometer than they are for the hydrometer, i.e., the hydrometer always gives results that are closer to the true solids. For this reason, it is necessary that we discuss hydrometer and refractometer corrections separately.

Hydrometer Brix corrections

Brix hydrometers are calibrated in terms of the densities of pure sucrose solutions. At 10% solids and below, the density of invert sugar[1] is the same as that of sucrose[2] of equal concentration. Therefore, in the 0° to 10° Brix range the hydrometer will read correctly in both sucrose and invert sugar solutions, or in mixtures of the two sugars. Above 10% solids,

Table I.—Computation of hydrometer correction for 55·00% solids medium invert sugar

	Pure invert sugar	*Sucrose*	*Medium invert sugar*
Density, 20°/4°	1·25412	1·25412	
Actual % solids	55·00	54·40	55·00
Hydrometer reading	54·40	54·40	54·70
Hydrometer correction	+0·60	0·00	+0·30

[1] SNYDER & HATTENBURG: *Nat. Bureau Standards Monograph*, 1963, (64).

[2] SNYDER & HAMMOND: *Nat. Bureau Standards Circ.*, 1946, (C 457).

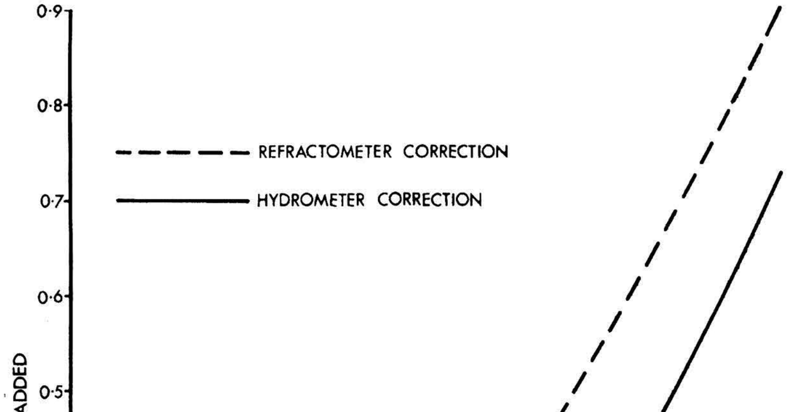

Fig. 1. Corrections to be added to hydrometer or refractometer Brix of medium invert sugar solutions to obtain true solids

however, at the same density, invert sugar has a higher solids content than sucrose. A correction, therefore, must be added to the hydrometer Brix readings to obtain the true solids. This correction may be calculated by determining exactly to what concentration of pure sucrose and also of pure invert sugar a given density corresponds. The calculation for 55·00% medium invert sugar is illustrated in Table I. As this example indicates, the true density (20°/4°) of 55·00% pure invert sugar is 1·25412[1]; however, sucrose tables[2] indicate that this same density corresponds to 54·40% solids. Therefore, if we use a Brix hydrometer to determine the solids in 55·00% invert sugar, the reading will be 55·00–54·40, or 0·60°Bx low. For 55·00% *medium* invert sugar, which is essentially an equal mixture of invert sugar and sucrose, the reading will be lower by 0·60 ÷ 2 or 0·30° Brix. Therefore, this is the correction that must be added to the hydrometer Brix reading to obtain the % true solids in this particular sugar solution.

If we repeat these calculations for medium invert sugar solutions of lower solids content, we find that the corrections decrease progressively until at 25°Brix they become negligible (less than 0·05° Brix). For more concentrated solutions the corrections increase.

Refractometer Brix corrections

Refractometer Brix scales are also calibrated in terms of sucrose, and at any given refractive index, invert sugar has a higher solids content than sucrose; therefore, in the case of the refractometer also, corrections must be applied to the refractometer reading to obtain the true solids. These corrections may be computed as was done for the hydrometer except that refractive index data are used instead of density. For example, as Table II indicates, a refractive index of 1·47583 corresponds to 76·00% pure invert sugar[1], and also to 74·36% sucrose[3] (found by interpolation). Therefore, if we use a refractometer to determine the solids in 76·00% pure invert sugar the reading will be 76·00–74·36 or 1·64° Brix low. For *medium* invert sugar, the reading would be low by 1·64 ÷ 2 or 0·82° Brix and, therefore, this is the refractometer correction for this sugar solution. This result agrees with the value calculated by means of the widely accepted de Whalley correction factor of 0·022 for each 1% invert sugar[4]; for example, since 76% medium invert sugar contains 38% invert sugar, the refractometer correction according to de Whalley would be 38 × 0·022 or 0·84° Brix.

Table II.—Computation of refractometer correction for 76·00% solids medium invert sugar

	Pure invert sugar	*Sucrose*	*Medium invert sugar*
Refractive Index, 20°C	1·47583	1·47583	
Actual % solids	76·00	74·36	76·00
Refractometer reading	74·36	74·36	75·18
Refractometer correction	+1·64	0·00	+0·82

[3] BATES *et al.*: *ibid.*, 1942, (C 440), Table 122.
[4] *I.S.J.*, 1935, 37, 353.

It should be pointed out that this refractometer correction applies only to 76% medium invert sugar. This is because calculations indicate that in the case of the refractometer also the corrections become smaller as the total solids decrease, as was pointed out by HOBBS[5] and ZERBAN[6].

Fig. 1 presents in graphical form the hydrometer and refractometer corrections for medium invert sugar solutions of 0 to 80% solids. These corrections were calculated at 10° Brix invervals according to the procedures outlined in Tables I and II. The solid line gives hydrometer corrections while the broken line indicates the corresponding data for the refractometer. The two graphs actually indicate the difference that may be expected between the refractometer and hydrometer readings of any medium invert sugar solution between 0 and 80° Brix. For example, since at 55° Brix, the hydrometer correction is 0·18° Brix smaller than the refractometer's, the hydrometer Brix *reading* would be 0·18° Brix higher. This would be an important factor to consider when standards for syrup formulations are established.

Fig. 1 also gives the following information:

(i) As the % solids increases, the differences between both the hydrometer or refractometer Brix and the true solids increase. In other words, more concentrated solutions require larger corrections.

(ii) Below 10% solids, the *hydrometer* Brix coincides with the true solids, i.e. there is no hydrometer correction. Between 10 and 25% solids, this correction is negligible, i.e. less than 0·05° Brix.

(iii) It is necessary to apply a slight refractometer correction even at the beverage level Brix. For example, this correction is + 0·05 Brix for a 10° Brix beverage.

(iv) The hydrometer correction is always smaller than the refractometer's. In other words, the hydrometer always gives readings that are nearer to the true solids content.

It should be pointed out that Fig. 1 gives corrections for solutions which contain 50% invert sugar and 50% sucrose, on a dry basis. For solutions in which these sugars are present in other proportions, the proper correction may be calculated from data that are obtained from Fig. 1. For example, the refractometer correction at 55·0° Brix is + 0·48°; for a solution that contains 80% invert sugar and 20% sucrose, on a dry basis, the correction would be $0{\cdot}48 \times \frac{80}{50}$ or + 0·77° Brix.

(*To be continued*)

[5] *I.S.J.*, 1950, **52**, 190.
[6] *J.A.O.A.C.*, 1943, **26**, 143.

Sugar Mill Research in Natal during 1965

Annual Report of the Sugar Milling Research Institute, Durban

A SCREW conveyor installed below the shredder at Tongaat for cane sampling did not withdraw a representative sample as regards the trash-cane ratio and was also liable to choking. A Rietz "Pre-Breaker" was to be installed instead, and the cane sample will fall through an automatically-controlled sampling hatch which has been designed for the purpose. The separation of consignments into various sample receivers is to be timed by a series of electronic revolution counters and time-delay relays in cascade.

The S.M.R.I. cold extractor has proved completely reliable. Reports covering only ten milling tandems were received in response to the Mutual Milling Control Project compared with 19 in the previous season. The data from the factories concerned have been analysed and are discussed. Analysis of bagasse throughout a mill tandem and purities of back-roller and residual juices indicate that the soluble non-sugars extracted by a "Varigrator" are considerably greater than those extracted by normal milling. The wide fluctuation in lost absolute juice % fibre within the range 50–70 indicates that a part of the residual non-sugars may vary with the type of cane rather than with the quality of milling. Direct analysis of residual Brix in final bagasse is possibly not a good guide to milling performance.

Juices from various mills were analysed after clarification and concentration to a syrup. The average results showed that the first 60–65% of the sucrose was obtained at a purity of 86, while the last 2–3% was obtained at 76 purity, indicating that in first expressed juice 11% of the sucrose would not be crystallizable, while in last expressed juice 22% of the sucrose would not be crystallizable. However, the sulphated ash content also increases, so that the amount of crystallizable sucrose in the last fraction will be further reduced, the more so since the non-sugar composition also changes, becoming progressively unfavourable as extraction increases. Hence, the uncrystallizable sucrose fraction in last expressed juice increases to about 55%, assuming no rise in purity with clarification and a constant reducing sugar and ash % non-sugar content. It is conservatively estimated that the economical limit to extraction by milling is slightly above 97%.

A laboratory diffuser, consisting of a thermostatically-controlled jacketed column, has given only one complete set of experimental results which are inconclusive. No relationship was established between cane fibre and bagasse bulk density.

Investigations of the possible effect of cane characteristics on raw sugar quality showed that the weight of impurities extracted from the whole cane exceeded that extracted from clean stalks by 45%, an amount, by virtue of its melassigenic effect, more than sufficient to make the fraction of sucrose extracted from cane tops uncrystallizable, assuming a normal clarification effect. The investigations are continuing.

Gum isolated from stale cane and dextran produced by culturing *Lactobacillus mesenteroides* in a sucrose-containing medium were methylated and their methoxyl contents found to be approximately the same. However, while the gum contained no dimethyl compounds, the dextran contained 5·9% dimethyl derivatives, indicating that the gum is a straight-chain molecule, while dextran is a branched molecule. The dextran had no 1–4 linkages, whereas the gum had one unit linked in 1–6 position for every three linked in 1–4 position. The calculated M.W. of the gum, assuming no decomposition during methylation, is found to be 20,000, compared with values between 8,000 and 34,000 found by viscosity measurements. Gum from fresh cane was found to have a different composition from gum obtained from stale cane. Paper chromatography of an acid hydrolysate from the "fresh" gum revealed at least three monosaccharides, including what is presumed to be glucose. Extreme turbidity of aqueous solutions has prevented determination of the specific rotation of gum.

Infra-red spectra of a number of polysaccharides and their derivatives have been recorded at Natal University as a means of distinguishing between 1–6, 1–4, 1–2 and 1–3 linkages in a polysaccharide molecule. Results are, however, not very promising. A study of the effects of variation in Brix of gum-containing solutions and of variation in the relative amount of added precipitant on the standard precipitation method using acidified alcohol showed that in the range 7·5–12·5°Bx Brix variation had no effect at constant acidified alcohol quantities, but the amount of gums precipitated increased with increase in the amount of acidified alcohol added up to about 100 ml precipitant; after this the gum content remained constant until 150 ml alcohol, after which the gum content rose again. Comparative tests showed that the method of DUBOIS[1] for gum analysis gave results approximately 50% lower than those obtained with the standard S.M.R.I. procedure, while a short method in which the gums are precipitated from 10 g of a 10°Bx solution by adding 120 ml of acidified alcohol gave values in agreement with the S.M.R.I. figures.

Clarification difficulties at several factories were investigated. It was found that while the suspended matter removed from clarified juice consisted mainly of wax, phosphate and starch, the suspended matter removed from the affined sugar produced from the same juice, and constituting 99% of the total suspended matter, contained a considerable quantity of gum, a lesser quantity of starch and wax, and also phosphate and silicate. This suggests that the presence of suspended matter increases the degree of inclusion of these non-sugars in the crystal. Considerable improvement in clarification was effected by on-stream modifications, including the use of continuous flashing of boiling juice and partial flow stabilization.

An in-line turbidity meter designed and constructed at the S.M.R.I. consists of a short glass tube sealed in standard pipe fittings. Light is transmitted through the liquid cell to a light-dependent resistance mounted in a balanced resistance bridge. The out-of-balance voltage is a measure of the turbidity. The unit was to be tested at a number of factories.

Addition of 900 p.p.m. of phosphate to juice from N:Co 331 cane, which normally yields a juice containing less than 200 p.p.m. of phosphate, gave excellent clarification and up to 80% reduction in turbidity of poorly settling juices. Juices to which phosphate had been added before liming contained 65% less turbidity than those limed before phosphate addition. Wide variation was found in the amount of lime required to give a desired pH, the maximum demand being four times the minimum. Studies on the effect of mixing during juice liming showed that a well-agitated juice sample had 50% less turbidity than juices subjected to poorer mixing. For juices of high phosphate content the effect was less marked. An electro-magnetic agitator was found to be unsuitable for continuous operation requiring rapid dispersion as in clarification.

Vacuum pan circulation investigations confined to the boiling operation proper without any external control have given some information, but the data have yet to be fully evaluated. While laboratory tests showed that the colour of low polarizing sugars could be reduced by adding sulphitation molasses instead of defecation molasses, the method is not feasible on the factory scale. Decolorization of defecation molasses with a hydrosulphite preparation was not satisfactory. Reasonable correlation was found between filtrability of raw sugar and turbidity of its aqueous solution.

Direct esterification and trans-esterification of sucrose using various solvents and catalysts proved unsuccessful. Benzene sulphonyl sucrose was easily prepared by reacting sucrose with benzene sulphonyl chloride in dimethyl formamide in the presence of solid anhydrous sodium carbonate as HCl acceptor at 25–28°C, but the product has no surfactant properties.

Measurements over a 37-week period at one factory showed that the measured weight of bagasse was 7·3% lower than the calculated weight. The discrepancy is due, it is suggested, to drying out of the

[1] *Anal. Chem.*, 1956, **28**, 351.

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cane in the mill yard after weighing. Some results of investigations into high fuel consumption at one factory are discussed. Severe vibration in a 450 h.p. multi-stage turbine used at mill drive was caused by rotor imbalance and misalignment and by unsuitable clearance in the first reduction gear pinion bearing.

Sugar Cane Agriculture in Mauritius

Mauritius Sugar Industry Research Institute, Annual Report, 1965.

THE 1965 crop in Mauritius amounted to 5,984,489 tons of cane, the highest ever recorded for the island. Average sucrose content however was 12·69%, one of the lowest experienced in recent years, except 1960, 9 tons of cane being required to produce a ton of sugar as opposed to a normal ratio of 8·4. As a result the total sugar output of 664,000 metric tons was below normal expectations. This is considered to be due to a combination of climatic factors. Cane growth was adversely affected by lower than normal temperatures which prevailed almost continuously from November to June 1965 and which averaged 0·6° C below normal. "From July to November climatic conditions were most abnormal, the sum of monthly rainfall excesses reaching 14·12 inches, the highest observed from data available since 1875. To aggravate matters, minimum air temperatures were above normal, while the daily range of temperature was low throughout the harvest season. Ripening of the cane was therefore seriously affected . . ."

Cane variety position

A pressing problem which the Mauritius sugar industry has to face is the replacement of the much cultivated variety M 147/44 because of its susceptibility to gumming disease. The variety has proved outstanding in the drier districts, producing more sugar per unit area than any variety previously cultivated. The variety M442/51 has shown promise as a substitute but it is a medium-to-late maturer and should be complemented by another early maturing variety or varieties. Some 112 varieties are being studied at 6 sites in the dry coastal area in this connexion.

With regard to commercial varieties in cultivation in Mauritius it is pointed out that 65% of the area under cane in 1965 was occupied by varieties released since 1956 (This constitutes a very real tribute to the work of the Research Institute.—Ed.).

Among the varieties gaining in importance in Mauritius are M31/45, M202/46, M93/48, M99/48 and M442/51. With regard to the last-mentioned it is stated that "its pale yellow foliage together with susceptibility to rust and to attacks by thrips are not conducive to an attractive appearance, but in the end it is the sugar that counts and M442/51 has a high potential". Four varieties are listed as declining in importance, viz. M134/32, M147/44, B 3337 and B 34104, the last three on account of susceptibility to gummosis. Four commercial varieties regarded as being in a state of equilibrium at the present time are Ebène 1/37, Ebène 50/47, M253/48 and B 37172.

Cane breeding and selection

In spite of flowering being below normal in 1965 a total of 1250 crosses were made. This involved the use of 74 varieties as female parents. Emphasis was placed on research on the physiology of flowering. To that effect several experiments were laid down, involving various techniques, as a first step in an attempt towards a better understanding of the mechanism of flowering in sugar cane, knowledge which may lead to a more concise control of flowering for breeding purposes.

With the co-operation of local estates a proportion of seedlings at various stages of selection were planted and selected. "A breeding plot comprising 72 noble varieties, out of a total of 77 available, was established at Médine sugar estate, under conditions very favourable for growth, and a male plot (25 varieties) at Pailles, where it is hoped that the prevailing environment will enhance flowering and lead to better male fertility."

Among varieties approaching commercial status several appear to be outstandingly rich in sucrose content and none show a sucrose content below that of M 147/44. Unfortunately two promising varieties, which show susceptibility to gummosis, have been discarded, and another two are fairly susceptible.

Cane diseases

Investigations into the two strains of gummosis (*Xanthomonas vasculorum*) prevalent in Mauritius has led to the belief that the difference between the two strains of the bacterium is one of virulence rather than of varietal susceptibility. The disease was much less severe than in the previous season and the variety M147/44 showed a reduced incidence of systemic infection as indicated by leaf chlorosis. Nevertheless the characteristic leaf striping was observed all over the island indicating a widespread epidemic. Abundant oozing of gum also took place. Yellow spot disease (*Cercospora koepkei*?) caused reduction in yield with some commercial varieties such as B 3337, Ebène 50/47 and M99/48. Three varieties susceptible to rust disease (*Puccinia*) again showed infection during early stages of growth. Smut (*Ustilago*) was found in several varieties in observation and propagation plots. Leaf scald, also believed to be a new strain of the bacterium, has been spreading over the island on susceptible varieties. Some seedlings in variety trials also contracted the disease. The disease may be spread by infected knives at harvest or in infected cuttings. The value of efficient rogueing was again demonstrated. Chlorotic streak (a virus) was severe in areas liable to water-logging, accentuated by the wet winter.

Pests

A field survey to estimate damage by the stalk moth borer (*Proceras sacchariphagus*) was carried out, some 200 fields being sampled. The average percentage of stalks and internodes bored was 26% and 2·3%. This was less than in the previous year when the figures were 38% and 4·7%. The Tachinid parasite, *Diatraeophaga striatilis*, introduced from Java in 1961 and 1964, was not recovered in the field and does not seem to have established itself. About 90 flies received from IRAT, Réunion, were released in September and another attempt to establish the parasite is to be made. The scale insect (*Aulacaspis tegalensis*) continued to be troublesome in the Central Cane nursery. The sheltered position of the insect under the leaf-sheaths aggravates the problem of insecticide application. A simple device for injecting insecticide into the piped overhead irrigation water is to be tried. Live scales on planted setts may persist for months and eventually spread to the above ground parts of the developing plants.

A new form of rat bait, developed in Jamaica and consisting of "biscuits" made of paraffin wax, split maize, sugar and anticoagulant poison, promises to be most useful in cane fields. Attacks of army worm and locusts took place on a limited scale, the former in fields of young ratoons which had been burnt at harvest 4 to 5 weeks earlier. It is considered that both insects demand immediate suppression when detected in numbers.

Nutrition and Soils

The potash and phosphate status of cane lands in Mauritius are regarded as being generally adequate and nitrogen to be the king-pin of the fertilizer programme. During the last ten years there has been greatly increased consumption of phosphatic fertilizers by the sugar industry, imports having increased five-fold. With the kaolinitic soils of Mauritius potassium is easily taken up by the plant, even when present in low levels in the soil. No deficiency in potassium should therefore occur. The trace element status is also regarded as adequate in cane soils apart from a few minor areas. The results of several field trials and the third visible dewlap leaf analysis for zinc, copper and molybdenum are presented in the report.

With the present trend of low sugar prices and higher cost of fertilizers, studies on the efficiency of different forms of nitrogenous fertilizer have assumed special significance, especially as high levels of nitrogen are now being used by cane planters in Mauritius. Studies on nitrate movement through the soil profile received special attention. The final result of field and laboratory trials comparing urea and sulphate of ammonia are presented in the report. The general conclusions are that although burying or watering in urea improves its efficiency, sulphate of ammonia, at present prices and because it can be applied on the soil surface, is the best source of nitrogen for sugar cane in Mauritius. Data is presented in the report on the value of split applications of fertilizer and of the effect of nitrification inhibitors.

The question of soil acidity is receiving special attention, especially as the application of heavy dressings of sulphate of ammonia over many years has increased the acidity of the soil. Studies on the effect of soil acidity on cane composition and yields and the interaction of the various factors involved are being undertaken and some of the preliminary results obtained are presented in the report.

Other lines of work

A study of the economics of overhead and surface irrigation under Mauritius conditions was made during the year and the results given in the report. At the end of 1965 approximately 30,000 arpents of cane land were irrigated, 18,700 arpents being under surface irrigation and the remainder under overhead irrigation. During the last two years the area under overhead irrigation has increased by 8%.

Investigations were commenced during the year to determine the effect of varying soil moisture stresses on cane growth, these being carried out in a greenhouse with a drought-susceptible variety (Ebène 1/37) and a presumed drought-resistant variety (M442/51).

Results are given of trials with some of the newer herbicides on weeds in Mauritius cane fields. Control of the noxious leafy vine *Bignonia unguis-cati* was best obtained with "Tordon 101" at 2 lb a.i. per 60 gallons of water. "Tordon", at the same rate, successfully controlled *Paederia foetida*.

Spacing trials, a series of ten laid down in 1963 over the main climatic zones of the island, were continued. In these, spacings of 3, 4, and 6 feet were compared with the standard spacing of 5 feet, the best adapted varieties being planted in each zone, contrasting erect and lodging types of canes. Results to date indicate that in the six trials situated in the sub-humid and humid zones, yields were significantly higher at a spacing of 4 feet, irrespective of growth habit of the variety. The trials are planned to continue until the fifth ratoon.

Germination experiments (with setts) were carried out and are to be continued to ascertain if possible whether germination capacity is an inherent varietal characteristic. Variation in the percentage and rate of germination of different cane varieties has long been known, but the reasons for these differences have still to be explained.

F. N. H.

Sugar cane agriculture

Variety N:Co 310 in Jalisco, Mexico. A. L. FORS. *Sugar y Azúcar*, 1966, **61**, (7), 22–24.—The history of this well known variety, its introduction to Mexico and rapid rise in popularity there, are discussed.

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Sugar cane varieties in Tucumán. W. KENNING, R. F. DE ULLIVARRI and C. A. ARTAZA. *La. Ind. Azuc.*, 1966, **71**, 115–118.—The early development or growth of sugar cane cultivation in Tucumán, Argentina, took place during the period 1916–1942. Mosaic disease and sugar cane smut caused early varieties to be dropped in favour of more resistant varieties. Change has been continual. The variety Tuc 2645 which constituted 37% of all cane in 1957 had dropped to 33% in 1960–61 and 17% in 1963. It is recommended that, along with CP 34-120, it no longer be planted. Varieties recommended at present are NA 56/79, CP 48/103 and NA 56/30.

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Sugar cane chlorosis. ANON. *Sugarcane Varieties Quarterly Newsletter* (Coimbatore), 1966, **3**, (2), 14–15.—Reference is made to the various factors which may cause chlorosis in sugar cane such as nutritional deficiencies and certain diseases. In the case of iron deficiency the value of spraying the foliage with iron sulphate is pointed out. A type of chlorosis found in the Coimbatore area is described. It is believed to be due to a complex of biological factors. The fungus, *Pythium graminicolum*, is readily isolated from root lesions and considerable numbers of nematodes of various species occur.

* * *

Toft cane machines to be demonstrated. ANON. *S. African Sugar J.*, 1966, **50**, 553.—Reference is made to a visit to South African sugar cane areas by the managing director of the Australia-based company of Toft Bros. (Pty.) Ltd., which specializes in mechanical sugar cane harvesting and loading equipment. Demonstrations are being arranged during the 1966–1967 season for several types of loader and one harvester to be demonstrated under South African conditions. Robert Hudson & Sons (Pty.) Ltd. will be handling Toft equipment throughout the South African sugar belt and plans are being made for partial manufacture in South Africa.

* * *

More sugar from dry-cleaned cane. ANON. *S. African Sugar J.*, 1966, **50**, 559.—Reference is made to the experiments being carried out in Hawaii and the principles involved are explained, with the aid of a diagram. A set of performance figures is given, the average rate of cane through the cleaner being 55·9 tons/hr.

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Review of the varietal programme of sugar cane in Taiwan. K. C. LIU. *Taiwan Sugar*, 1966, **13**, (3), 11–17.—This paper is divided into three parts, the first dealing with varieties cultivated during the period 1945–1965, a diagram depicting vividly the phenomenal growth in popularity of the Natal variety N:Co 310 after its introduction in the early 1950's, the variety outyielding all others then grown and proving well suited to light sandy soils. Varieties cultivated during the period 1900–1945 are then discussed, the first production of centrifugal sugar having commenced in 1900. Some possible or hypothetical developments in Taiwan in the future are then considered having regard to excessive population growth and land shortage.

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Russet leaf disease of sugar cane. C. S. WANG. *Taiwan Sugar*, 1966, **13**, (3), 25–26.—What is thought to be a new disease, affecting variety N:Co 310, is described. It causes a rust colour to appear on the leaves from an early age. No causal organism has so far been isolated. It is thought a virus may be responsible but further work is needed.

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Agrobiological research in sugar cane and its application in Uttar Pradesh. K. KAR. *Indian Sugar*, 1966, **16**, 173–176.—The fact is stressed that the use of improved varieties must be accompanied by good agricultural practice for notable improvements in yield to be obtained. The estimated relative importance of different factors is shown by means of a chart with figures as follows: manuring 30%; irrigation 20%; improved varieties 9%; disease control 9%; pest control 9%; interculture 8%; timely planting 7%; rotation 5%; and germination 3%.

* * *

Observations on a beetle pest of sugar cane in Mysore. H. DAVID and A. N. KALRA. *Indian Sugar*, 1966, **16**, 195–198.—Studies on the biology and control of this little known beetle pest, *Holotrichia* (*Lachnosterna*) *serrata*, in India are recorded. It has caused increasing damage to cane in Mysore and elsewhere in India in recent years. The grubs attack the roots and rootlets of sugar cane below soil level and sometimes the bottom portion of the cane stalk. Alternative host plants are listed. Soil application of B.H.C. dust at 5 kg active ingredient per hectare gave satisfactory control.

The ultrastructure of sugar cane chloroplasts. W. M. LAETSCH, D. A. STETLER and A. J. VLITOS. *Zeitsch. Pflanzenphysiologie*, 1966, (5), 472–474.—Results are given of examination by electron microscope, and photographs are reproduced. Two kinds of chloroplast (chlorophyll granules in protoplasm) are present and these are described; one has starch grains, while the other has none or very few.

* * *

The cane borer: new labels for "Azodrin" and "Guthion". L. L. LAUDEN. *Sugar Bull.* (La.), 1966, **44,** 275.—Louisiana growers now have five chemicals to use against the cane borer; these include a new one, which is not yet in full supply. Details of it are given.

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Sugar cane breeding programme at Canal Point, Florida, 1965-66 season. N. I. JAMES. *Sugar Bull.* (La.), 1966, **44,** 277, 280–282.—Details are given of the methods and technique employed. Characteristics of importance for Louisiana are high sucrose, purity of juice, early maturity, resistance to mosaic, cold tolerance, vigour, erectness and fibre content. For Florida large barrel size, relatively low fibre and a well developed root system are important.

* * *

L 60-25; A new release for Louisiana. L. L. LAUDEN. *Sugar Bull.* (La.), 1966, **44,** 288.—About 1000 tons of seed cane of this promising new variety were to be made available to Louisiana growers in the autumn of 1966. It is a cross between CP 52-68 and CP 48-103. Its advantages are high sugar, early maturity, high yield, adaptation to both light and heavy soils and good ratooning ability. One big disadvantage is that it is susceptible to mosaic disease. It is tolerant to ratoon stunting disease and resistant to red rot.

* * *

Factors affecting the sugar content or purity of cane juice. W. E. CROSS. *La Ind. Azuc.*, 1966, **72,** 149–153. The various factors that may have a bearing on the sucrose content of sugar cane juice are discussed in turn, including soil, climate, rainfall, cultivation, manuring, time of harvesting and irrigation.

* * *

Burning cane for harvest. ANON. *Producers' Review*, 1966, **56,** (6), iv.—In Queensland virtually all sugar cane is burned before harvesting to destroy loose trash and facilitate harvesting, whether by hand or mechanically. The various precautions that should be observed are outlined.

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Soldier fly is not a new problem. ANON. *Producers' Review*, 1966, **56,** (6), 2.—Remarks by the Director of the Bureau of Sugar Experiment Stations (N. J. KING) at the annual field day of the Mackay Experiment Station are reported. It is pointed out how the increase in damage by soldier fly (*Altermetoponia rubriceps*) in recent years may be explained by the changes in cultivation practice. Eggs are hatched in the surface soil in the autumn months and need moist undisturbed conditions. Previously the practice was to scarify the soil continually during the autumn months, but with modern more vigorous canes this is no longer done.

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Studies with chlorotic streak disease of sugar cane. XIV. Infection and incubation periods of the pathogen. B. T. EGAN. *Tech. Comm. Bureau Sugar Exp. Sta.*, 1966, (1), 9 pp.—This work involved gravel culture experiments. The minimum infection period for chlorotic streak disease was shown to be less than one hour, while the minimum incubation period obtained was 12 days.

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Census of sugar cane varieties (at Ingenio Nuñorco, Tucumán, Argentina). V. G. MARTEAU. *Publ. Depto. Agrotecn. Ingenio Nunorco* (Monteros, Tucumán), 1966, (3), 9 pp.—Information is given on the varieties cultivated and their relative prevalence, over 40 varieties being listed. Pride of place in terms of acreage goes to CP 34/120 with 33%, followed by Tuc 2645 (13%), N:Co 310 (7·6%) and CP 48/103 (7·3%).

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Economic selection in sugar cane. L. A. R. PINTO. *Bol. Inf. Copereste* (São Paulo), 1966, **5,** (5), 1–3.—A formula is put forward for estimating the overall value of any particular variety based primarily on yield of millable cane in tons per unit area and % sugar. It is pointed out that where two similar varieties are compared, one with a high figure in tons cane, and the other with lower yield but with richer juice, the latter may be preferable having regard to transport costs.

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Nitrogenous fertilizers for cane. V. ZUNCKELLER. *Bol. Inf. Copereste* (São Paulo), 1966, **5,** (5), 4–5. The relative merits of inorganic nitrogenous fertilizers (ammonium sulphate) compared with organic nitrogen fertilizer in the form of oil-seed cake are discussed. A combination of the two is recommended.

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Soil preparation. Ploughing and harrowing. F. O. BRIEGER. *Bol. Inf. Copereste* (São Paulo), 1966, **5,** (6), 1–2.—Notes are given on the preparation of virgin land and land already cultivated for sugar cane cultivation.

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Payment for cane on the basis of sugar content. L. A. R. PINTO. *Bol. Inf. Copereste* (São Paulo), 1966, extra number, 9 pp.—In this booklet the advantages of payment for cane on a sugar content basis, which is becoming more general in Brazil instead of weight of cane only, are discussed.

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Mechanized harvesting—a materials handling problem. R. O. PETERSON. *Sugar y Azúcar*, 1966, **61**, (8), 30–31. The writer explains that the present urgent need to increase field mechanization with sugar cane, in order to reduce production costs, is not so very different from what other important crops have had to face, such as cereals, potatoes and cotton. The bulkiness of cane makes imperative the use of efficient methods of transport from field to factory and in handling. The grower must arrange his field lay-out, methods of cultivation, and the variety he grows to suit the mechanical harvester. Field mechanization with sugar cane is now a "must" for purely economic reasons.

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New lowveld cane area geared to mechanization. ANON. *Sugar y Azúcar*, 1966, **61**, (8), 36–37.—Reference is made to the new cane planting project at Malelane in the eastern Transvaal where full scale mechanized field operations are planned and automatic factory processing at a new factory. Initially cane will be grown on 28,000 acres but ultimate potential is much higher as water for irrigation will be available from three main rivers. The Louisiana system of growing, harvesting and transplanting cane, with possible modifications for local conditions, will be used. An equipment pool, to assist growers, is envisaged.

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USDA's sugar research programs. T. THEIS. *Sugar y Azúcar*, 1966, **61**, (8), 38–41.—The research programmes of the United States Department of Agriculture in regard to sugar beet, sugar cane and sweet sorghum are described, the activities of each individual research station being outlined. Investigations are directed, in the main, to the most pressing production problems. Research achievements have been instrumental in eliminating hazards and increasing efficiency. Yields of sugar per acre have increased over the years.

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Pests of sugar cane in South Africa. ANON. *S. African Sugar Assoc. Expt. Sta. Bull.*, 1966, (8), 10 pp.—This bulletin replaces an earlier bulletin published in 1958. Brief popular descriptions, with photographs and notes on control, are given of some 17 insect pests (and eelworms). These are trashworms or ratoon worms (*Cirphis loreyi* and *C. leucosticha*), army worm (*Laphygma exempta*), red locust (*Nomadacris septemfasciata*), stalk borers (*Sesamia calamistis*) and *Eldana saccharina*), dynastid beetles (*Heteronychus licas*, *H. tristis* and *Temnorrhynchus clypeatus*), March beetles (*Nitidulidae*), termites, green leaf sucker (*Numicia viridis*), leaf hoppers (*Perkinsiella insignis* and *Cicadulina mbila*), sugar cane aphid (*Longuinguis sacchari*), maize leaf aphid (*Rhopalosiphum maidis*), sugar cane mealybug (*Saccharicoccus sacchari*), and nematodes.

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Advice to sugar cane growers in the Zacatepec region. ANON. *Bol. Azuc. Mex.*, 1966, (202), 18–20.—General recommendations in regard to cultivation, fertilizers and pest control are made. The application of iron sulphate is advised in areas where the cane shows signs of chlorosis or yellowing.

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Size of sugar cane farms, a factor in the decline of Puerto Rican sugar production. R. J. MARTÍNEZ GIRALT. *Sugar J.* (La.), 1966, **29**, (2), 16–17.—It is explained that the small sugar cane farm in Puerto Rico (also in other countries) operates at a disadvantage compared with the larger units, mainly because of inadequate mechanization and the lower quality of managerial supervision. During the 1963/64 season sugar cane farms of 25 acres or less averaged 2·57 tons of sugar per acre. Farms of over 1000 acres averaged 4·13 tons, or 60% more sugar. Other advantages possessed by the larger holdings are discussed. On many small farms sugar cane production has been relinquished.

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Sugar cane fertilizer research at the agricultural experiment station, University of Puerto Rico, 1955-1965. G. SAMUELS. *Sugar J.* (La.), 1966, **29**, (2), 24–29.—A summary of the past ten years of fertilizer research is given. The most outstanding development may have been the use of foliar diagnosis to determine sugar cane fertilizer needs. After much experiment it has become a working reality for a large percentage of the sugar cane acreage. The Station's experimental work with nitrogenous, phosphatic and potash fertilizers is described.

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Research on insect problems at Aguirre, Puerto Rico. R. TOYOFUKU. *Sugar J.* (La.), 1966, **29**, (2), 34–36. Insect control must be, in the main, by chemical means, as about 85% of cane is burned and pest parasites or predators stand little chance of survival. An important problem is the control of soil grubs, notably the curculionid *Elasmospalpus* ("vaquita"). It bores into the stool, much like termites, where it is well protected from insecticides. The harrowing-in of 2 lb "Aldrin" per acre at planting was effective with white grub but not with this pest. Experiments with other insecticides are described, also work on other pests such as yellow aphids and borers.

Perennial *Urochloa*. J. H. Buzacott. *Cane Growers' Quarterly Bull.*, 1966, **30**, (1), 7–8.—An alien grass, *Urochloa mosambicense*, naturalized in parts of northern and central Queensland and regarded as a good pasture grass, has increased considerably in the last two years. So far with cane it has been confined to the headlands and only an odd stool has been seen in the rows, but it needs to be watched. Photographs are presented.

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Wireworm damage in ratoon cane. O. W. D. Myatt. *Cane Growers' Quarterly Bull.*, 1966, **30**, (1), 9–10. Two sites of severe damage to first ratoon cane by the wireworm *Lacon variabilis* are recorded. Bad drainage and exceptionally rainy conditions are considered responsible.

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Selecting an insecticide for cane grub control. G. Wilson. *Cane Growers' Quarterly Bull.*, 1966, **30**, (1), 12–13.—Reference is made to the various cane grubs that may occur in Queensland, such as frenchi, mungomeryi and consobrina grubs and *Lepidiota rugosipennis*. The need to make sure the right treatment is given for any particular grub is emphasized. Otherwise predators may be killed and not the pest, making matters worse the following season.

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Prolific nutgrass growth. L. S. Chapman. *Cane Growers' Quarterly Bull.*, 1966, **30**, (1), 16.—An experiment is described in which a single "nut" planted in a pot in a glasshouse had increased to 91 "nuts" after 2 months. Nut grass (*Cyperus rotundus*) has the potential to develop some 20 tons per acre of plant material in 8 weeks and may compete severely with cane for moisture.

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Moth borer damage. J. Anderson. *Cane Growers' Quarterly Bull.*, 1966, **30**, (1), 21–22.—In most years moth borers are a pest of little importance with cane in Queensland, but in 1965 damage was more severe. Likely reasons are suggested, i.e. weather conditions and grass-infested cane fields.

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Land crabs are cane pests. Anon. *Cane Growers' Quarterly Bull.*, 1966, **30**, (1), 22.—In the Caribbean region land crabs can be a serious pest with sugar cane in low coastal areas, devouring the young ratoon cane shoots for some distance around their burrows.

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Habitat and food preferences of cane rats. J. A. Woods. *Cane Growers' Quarterly Bull.*, 1966, **30**, (1), 25.—Rat trapping in three mill areas and stomach analysis of captured rats have given a better understanding of their food eating and other habits. Comparisons are made between the field rat (*Rattus conatus*) and the smaller khaki rat (*Melomys littoralis*).

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More about Q 80. I. T. Freshwater. *Cane Growers' Quarterly Bull.*, 1966, **30**, (1), 28–29.—Present indications are that this will prove a very popular variety in the Lower Burdekin area of Queensland. Figures are given showing its superiority over the standard variety "Pindar" in yield and sugar content, but it may lodge more. Care with nitrogen fertilizing is advised.

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Unusual germination failures caused by rind disease. B. T. Egan. *Cane Growers' Quarterly Bull.*, 1966, **30**, (1), 30–31.—Rind disease (*Pleocyta sacchari*) is of minor importance in Queensland but infected cane should not be used for planting. Reasons are given.

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Assessing the extent of frost damage. A. A. Matthews. *Cane Growers' Quarterly Bull.*, 1966, **30**, (1), 32–33. Directions are given for estimating the degree of frost damage. These are intended to help growers not familiar with frost damage. With planting cane, examination for eye damage by splitting a cane is explained. With cane for harvesting, possible damage is explained under four headings: foliage, growing point, eyes, and internal stalk damage.

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Post-emergence control of Guinea grass. O. W. D. Myatt, L. G. W. Tilley and A. W. Ford. *Cane Growers' Quarterly Bull.*, 1966, **30**, (1), 34–36.—The seriousness of Guinea grass (*Panicum maximum*) as a weed of sugar cane is stressed. Not only does it compete with cane in soil moisture and nutrients, thereby reducing yields, but it leads to poor burns resulting in dirty cane penalties and can impair efficiency of mechanical harvesters. Results of field trials are given showing the efficiency of "Diuron" (marketed as "Karmex") as a pre-emergence herbicide with this grass weed. With the addition of a non-ionic surfactant (one third of a gallon plus 4 lb "Karmex" per acre) it can promote excellent post-emergence activity for eradication of Guinea grass stools in the cane row. Precautions necessary to avoid cane damage are explained.

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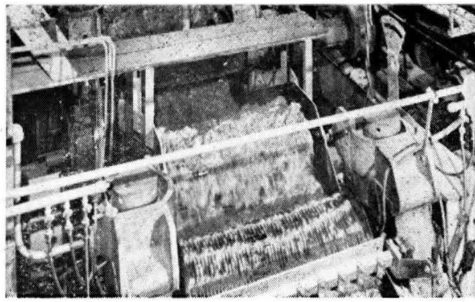
A minor grasshopper pest with unusual behaviour. A. E. Johnson. *Cane Growers' Quarterly Bull.*, 1966, **30**, (1), 36.—This insect (*Bermiella acuta*) sometimes strips the lower cane leaves to their midribs in areas near water. It ranges over the water, normally feeding on grass growing in the water or at the water's edge. It has been observed that it may dive under the water as readily as a frog and may remain submerged for up to 2½ minutes.

Cane sugar manufacture



Central Izalco—new 3000-ton raw sugar factory for Central America. J. M. SANTIAGO. *Sugar J.* (La.), 1966, **29**, (1), 11–15.—Situated near Sonsonata (El Salvador), this factory started operations in January 1965. All the processing equipment from cane mills to the sugar end is located in a building 300 ft long by 54 ft wide, so that material flow from cane to sugar is practically in a straight line. The equipment includes a 12-roller 30×54 in Farrel milling tandem, each mill being powered by a Worthington steam turbine; a quadruple-effect evaporator; three low-head pans; Broadbent 1200 r.p.m. fully-automatic 48 × 30 in centrifugals for *A*-sugar and three BMA K 1200 continuous centrifugals for *C*-sugar. The bulk warehouse has a storage capacity of 20,000 tons of raw sugar.

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Filtration of raw and limed cane juice. J. M. KINABREW. *Sugar J.* (La.), 1966, **29**, (1), 23–25.—Initial laboratory-scale tests in Louisiana on the application of the Hayward pre-coat pressure filter to clarifier mud and evaporator syrup demonstrated great difficulties, and further tests were restricted to juices. By limiting initial input pressure, limed and unlimed raw juice could be filtered to give a clear filtrate without too short a cycle time. Pilot plant tests were carried out and gave clear filtrates with limed and unlimed raw juice and clarified juice; in the last case, massecuites boiled from the filtrate were of high purity and low ash content. Filtrate from a rotary vacuum filter contained much suspended solids and plugged the Hayward filter at once. Further tests in Florida gave poorer results, attributed to differences in cane, soil, harvesting methods and different test conditions and filter aid. The cold mixed juice filtrate clarity was not good and a precipitate was deposited on evaporating to syrup. Limed juice, however, gave good clarity, and rotary vacuum filtrate after filtration through the Hayward filter could be sent to the evaporator.

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Manufacture of white sugar by (the) defeco-sulphitation process. M. SINGH and K. S. SHAH. *Indian Sugar*, 1966, **16**, 251–253.—In the process described mixed juice was treated with bentonite solution (80 g/ton of cane), heated to 70–75°C, and 5° Bé milk-of-lime added in 3–4 doses to raise the juice pH to 7·1 before settling and filtration. After evaporation of this clear juice to syrup, it was sulphited (0·016% sulphur on cane) and three strikes boiled (an A2 massecuite is boiled, when necessary, on a footing cut from the *A*-massecuite). Since the quantity of syrup to be sulphited exceeds the capacity of the sulphitation tanks, untreated syrup is stored in overhead tanks between the evaporators and the sulphitation tanks, thus minimizing inversion losses occurring with retention of sulphited syrup at the pan station. The advantages claimed for the process include a 41·2% saving in lime, a 76·6% saving in sulphur, a higher purity rise from mixed to clear juice, a higher clarification efficiency and less lime in the clear juice (800 mg CaO/litre compared with 1200 mg/litre in sulphitation clear juice).

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Ring diffusion at Pioneer Mill. H. IDEHARA. *Sugar y Azúcar*, 1966, **61**, (9), 46–47.—Further information is given on the Silver ring diffuser at Pioneer Mill Co. Ltd. in Hawaii[1,2].

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Process control in Hawaiian raw sugar factories. J. H. PAYNE and G. E. SLOANE. *Sugar y Azúcar*, 1966, **61**, (9), 49–53.—A survey is presented of the control systems used in Hawaii for cane cleaners, cane feed, bagasse weighing, the Silver ring diffuser at Pioneer, clarification, evaporation, pan boiling, centrifugals, and steam power generation. Future developments discussed include continuous analysis of process streams and the use of computers for process optimization and direct digital control.

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Microbiology in sugar production. F. WYNN HAYES. *Process Biochem.*, 1966, **1**, 285–289.—This is a general survey of microbial activity in raw and refined sugar production. The need for strict bacteriological control is emphasized, and in this connexion cleaning of surfaces and material is the first step before sterilization. While steam sterilization is almost universally used in a raw sugar factory, routine control tests are still necessary to show if and when this treatment will be effective. Although appreciable contamination occurs at the juice end of a factory, the mesophiles involved are easily dealt with, whereas the worst infection, caused by thermophiles, occurs at the sugar end. Even the high viscosity of molasses does not inhibit all microbial activity, several yeasts existing which can operate at very high viscosities; these yeasts also cause difficulties in jam manufacture and possibly in molasses industrial fermentations. These same micro-organisms cause losses through inversion of sugar stored in bulk. While it is difficult to make bacteriological analyses of raw sugar consignments

1 *I.S.J.*, 1965, **67**, 169.
2 *ibid.*, 1966, **68**, 229–231.

at a refinery with the aim of penalizing for high contamination, it is considered possible to make systematic studies of raw sugar bacteria from particular mills or localities, and separate those sugars that are "serious offenders" from the other consignments, possibly for early processing. Recycling of liquors during refining leads to increase in the number and types of bacteria. Airborne infection in the pan house of a refinery is often overlooked, but it is pointed out that thermophiles are such prolific spore-formers that where any spillage occurs and the infected material allowed to dry out, wide distribution of the organisms will occur when dusty conditions prevail. The water from the scrubbing tower used to separate the sugar dust during drying is an important source of infection. Refinery effluents offer little trouble, but sulphate-reducing bacteria in, for instance, boiler blow-down water, can increase corrosion of piping, etc. Reference is made to the rigid standards laid down by canners and soft drink manufacturers for refined sugar contamination.

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The biggest sugar factory in the world. ANON. *Bol. Azuc. Mex.*, 1966, (203), 28–31.—A brief illustrated history of Ingenio San Cristóbal, in Mexico, is presented with an account of its present equipment. In 1965 it produced 191,493 tons of sugar, crushing 2,560,133 tons of cane to do so.

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A system for detecting sugar entrainment in boiler feedwater. N. J. SCHEXNAYDER. *Sugar J.* (La.), 1966, **29**, (3), 9–12.—The system at St. James Sugar Cooperative is described. It comprises a conductivity measuring cell mounted on the sampling line from the 3rd evaporator effect condensate pump discharge, a temperature compensator which automatically corrects the measurement for changes in the condensate sample temperature, a solid state electronic conductivity monitor and an alarm meter relay working in conjunction with the monitor and which actuates an alarm horn. In future it is planned to monitor the condensate purity in all condensate drains from the evaporator and preheaters.

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Vacuum pan boiling and automation. J. J. QUINTERO. *Sugar J.* (La.), 1966, **29**, (3), 13–17.—A suggested approach to pan boiling control involves manual control of three preliminary operations necessary before the automatic system will operate: emptying of the pan, closing of the discharge valve and filling of the seed slurry chamber. Condenser water flow is then started automatically, the vacuum breaker valves closed and massecuite feed commenced. When the massecuite reaches the top of the calandria, the steam valve opens to heat the massecuite and the circulator (or tightness sensing element where the pan is not provided with a circulator) is actuated. Seeding takes place once the "proper" massecuite temperature is reached, after which supervision of the massecuite feed control is transferred from the level controller to the temperature controller. Should the massecuite become too tight during seeding, the tightness controller will override the temperature controller and correct the condition. At a pre-set time after seeding, the steam pressure controller is slowly returned to its high set point, and when the level of the massecuite is some 2 ft above the calandria, massecuite feed control is transferred to supervision by the tightness controller, the set point for which is continuously adjusted from the level transmitter so that massecuite feeding proceeds at a desired rate. After the pan is full and a final desired tightness obtained, a contact in the tightness recorder closes and causes a red light to flash and actuates an audible alarm. Pressing an acknowledgement button will silence the alarm, while the light will become continuous, and the steam valve and condenser water feed valve will close and the vacuum breaker valve open. Once the vacuum is lost and a green light indicates "pan open to atmosphere" the massecuite may be dropped and steaming-out started. After a pre-set time, the steam-out valve closes and the circulator stops. The circulator will not operate during a second steaming-out.

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Mill capacity. O. A. ESPINOSA. *Bol. Ofic. Asoc. Técn. Azuc. Cuba*, 1966, **21**, 3–6.—The HUGOT formula for mill capacity[1] is reproduced with a divisor of 53·76 f instead of 65 f; this gives the capacity in terms of arrobas of cane per day instead of t.c.h. The factor *c* in the formula refers to the initial preparation and values of 1·10–1·20 are given by HUGOT for various conditions as to knives and shredders used. A new set of factors ranging up to 1·44 is presented for a wider range of preparation equipment, some of the factors not agreeing with the original values of *c*, and reasons for proposing them are discussed.

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Data on condensers. O. A. ESPINOSA. *Bol. Ofic. Asoc. Técn. Azuc. Cuba*, 1966, **21**, 28–33.—The views of NOËL DEERR, HAUSBRAND and HUGOT, with regard to condenser height, cross-section area, water injection tube area, etc., are quoted and tabulated.

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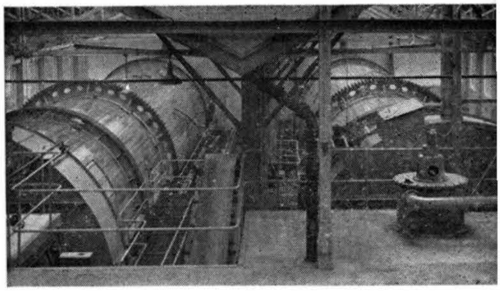
Hydraulic pressure in mills. O. A. ESPINOSA. *Bol. Ofic. Asoc. Técn. Azuc. Cuba.* 1966, **21**, 34–59.—A table is presented in which the force exerted on a hydraulic piston is calculated for pressures of 1000–7000 p.s.i. and diameters of 7–16¾ in. A formula is also presented for calculating the maximum load which can be borne by a mill journal or crusher journal. From these and roller dimensions it is possible to calculate the maximum hydraulic pressure which can be exerted on the cane being milled, and it can be judged whether this is sufficient for good extraction or whether the mill is of inadequate design.

[1] Handbook of Cane Sugar Engineering (Elsevier, Amsterdam), 1960, p. 154.

Beet sugar manufacture



Recirculation of pulp press waters. I. E. SLAVIČEK. *Listy Cukr.*, 1966, **82,** 169–175.—Basic equations for calculation of the quantities involved in the return of press water to battery diffusion are derived, for three different schemes, from the differential model described previously[1]. In the first scheme, which is the simplest, the quantity of fresh water fed to the diffuser is greater or smaller than the amount drawn off, while in the other two schemes the amount of feed water exceeds the draw-off, the difference between the two schemes lying in the method used to balance this discrepancy. The equations cover the course of the complete process from the start of recirculation as well as limiting, steady state conditions. Calculations show that known sugar losses may be increased or decreased by press water recycling, depending on the recirculation scheme used and its parameters.

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Comparison of the performance of different diffuser systems. P. M. SILIN. *Sakhar. Prom.*, 1966, **40,** (8), 20–24.—The Einstein formula relating the diffusion coefficient (D) to temperature has been found to be inaccurate, the coefficient increasing to a greater extent with temperature than indicated by the formula. This is attributed to a reduction in hydration of the sucrose molecule at higher temperatures, while the coefficient also falls considerably with increase in concentration, especially at 60–65%. A new nomogram has been constructed in which D is expressed as sq.cm./sec $\times 10^5$ instead of sq.cm./sec $\times 10^6$. From this and data obtained from various other sources, values of the diffusion constant A have been calculated and are compared for different types of diffusers. An approximate value of $5{\cdot}0 \times 10^{-5}$ is given for continuous rotary, tower and DDS diffusers. Recycling of press water is recommended as one means of reducing diffusion losses.

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Automatic control of massecuite boiling in a continuous multi-compartment vacuum pan. L. Z. AMLINSKII, M. L. VAISMAN and V. N. GOROKH. *Sakhar. Prom.*, 1966, **40,** (8), 29–36.—Full details are given with the aid of a diagram of the controls and control parameters used to regulate continuous boiling of a 1st massecuite in a 10-stage horizontal vacuum pan. The overall control was based on temperature depression. Comparison of a true temperature depression curve with a required curve over a period of 2 hr showed that the maximum deviation (±1°C) occurred in the first sections and in those sections containing "young" crystals, whereas in the end sections the maximum deviation was ± 0·5°C. Curves of Brix change in massecuite and intercrystalline molasses, of intercrystalline molasses purity and of crystal weight in massecuite per section over a period of 60 hr showed that the continuous process followed the same course as the batch process, the degree of non-homogeneity of the sugar crystals being the same as in batch boiling.

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Beet ventilation during storage. N. A. NECHIPORENKO and V. I. DUKHNOVA. *Sakhar. Prom.*, 1966, **40,** (8), 56–59.—Beets harvested during the period 5th–15th October were stored for varying periods up to 90 days in different piles, one of which (a) was unventilated. The ventilated piles contained beets (b) that had been manually cleaned, and (c) that had not been cleaned. The average daily losses of sugar were 0·024%, 0·013% and 0·015% in (a), (b) and (c) respectively. The quantity of rotten beet in all cases was small, that in pile (c) being only 0·64% greater than in pile (b). Weight loss was 3·4%, 3·28% and 3·8% in (a), (b) and (c) respectively. Forced ventilation is not recommended when the ambient temperature and the temperature within the pile are identical.

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Determination of the activity of NLT starch flocculants produced at Wronki (Poland). M. DUSIŃSKI. *Gaz. Cukr.*, 1966, **74,** 164–167.—When added as a 1% solution to 1st carbonatation juice (0·0012–0·0025% dry flocculant on juice), NLT starch-based flocculant had a considerable positive effect on settling rate, volume of mud and on the filtration coefficient. The results were not so good when the solution was made up cold (22°C) in contrast to those obtained with the solution made up hot (93°C). In all cases the supernatant juice was clear. Of various solvents tested for preparation of the flocculant, condensate proved the most suitable.

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The significance of mould in beet sugar technology. Taxonomic studies on some moulds isolated from stored beet. H. KLAUSHOFER and F. HOLLAUS. *Zeitsch. Zuckerind.*, 1966, **91,** 452–457.—The causes of mould formation on stored beet and its significance are discussed and investigations of mould isolated from stored beet are described. References are given to the work of others on isolation and identification of fungi found on beet. In the present work the fungi

[1] *I.S.J.*, 1965, **67,** 150.

identified included five hitherto not reported as found on beet: *Penicillium roqueforti* Thom, *P. levitum* Raper et Fennell, *Fusarium poae* (Peck) Wollenweber, *F. solani* (Martius) Appel et Wollenweber, and *Oospora variabilis* (Lindner) Lindau.

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Determination of cossette loading in a DDS continuous diffuser. S. GAWRYCH. *Gaz. Cukr.*, 1966, **74**, 162–163.—Cossette samples were stained with methyl blue so that their flow rate and retention time in a DDS diffuser in which the transporting scrolls were rotating at 0·7 r.p.m. could be determined. It was found that the flow rate was lowest at the entry, after which it rose to a maximum at about 4 metres from the entry, subsequently falling gradually for the next 13–14 metres. In some cases the peak flow rate occurred 7 m from the entry. A difference of 40 min occurred between discharge of the first and the last of the stained cossettes. The ratio between the two flow rates is the coefficient of slip, which is found to depend on the percentage of mush in the cossettes: the higher the mush content, the greater will be the slip. This particularly applies towards the end of a campaign. The cossette loading is determined from the retention time by a simple formula.

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The separation of crystal-syrup mixtures by centrifugals. H. EICHHORN. *Zeitsch. Zuckerind.*, 1966, **91**, 463–468.—The fundamentals of centrifugation theory are explained and a survey is presented of studies and experiments concerning certain factors which influence massecuite spinning. The parameters discussed include crystal size, mother liquor viscosity and use of wash water. The significance of the separation factor z (acceleration/acceleration due to gravity), which characterizes the performance of a centrifugal, and its relationship to the massecuite and its composition are discussed and the difficulty of expressing the separation process, particularly the individual parameters with different massecuites, in mathematical terms is considered. Although a value of 1100 for z is considered sufficient for white sugar massecuite which has large, uniform crystals, a value of 1400 is recommended for complete separation of syrup from massecuite which has small and irregular crystals, so as to reduce the wash water requirement. Centrifugals with a z factor of 1400–1500 should be used for middle-product massecuite, the sugar from which will be redissolved, while low-grade massecuite requires a z factor greater than 1400. The higher the value of z, the better will be the molasses exhaustion. In practice z values up to 3000 are applied.

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A new process for raw juice purification. P. SMIT. *Zeitsch. Zuckerind.*, 1966, **91**, 469–473.—Details are given of a patented process in which the raw juice is sulphited, passed through a cation exchanger in H^+ form, limed and carbonatated. The exchange resin replaces the cations in the juice (particularly K^+ ions) with H^+ ions which are in turn replaced by Ca^{++} ions in the subsequent liming. Many colloids are precipitated during juice flow through the resin bed, and these are washed off during resin regeneration. Since no scale was found in the pilot-plant evaporator used in tests, it is supposed that the high lime content of the carbonatated juice would offer no difficulties. However, this is to be studied further. It is pointed out that while deliming of the juice would prevent deposition of lime salts during evaporation, it would also adversely affect the exchange of Ca^{++} ions for K^+ ions. "Imac C 16 P", a polystyrene-based, strongly acid exchanger has been found preferable to "Imac C 12". The hourly throughput of the ion exchange column is 4–5 volumes of juice per volume of resin. The thick juice obtained in the pilot plant was analysed at the laboratory of the Groupement Technique de Sucreries, in Paris, and then processed to sugar and molasses. Crystallization offered no difficulties and the massecuites seemed better than those obtained by conventional processing. The low-grade massecuite was so easily crystallizable that a lower molasses sugar content resulted. An extra sugar recovery of 1·5% on beet is claimed to be possible.

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Production difficulties in the 1965/66 campaign at Goslawice sugar factory with particular regard to juice filtration. J. MIJAKOWSKI. *Gaz. Cukr.*, 1966, **74**, 139–141.—Pre-liming was modified in order to overcome difficulties associated with sub-standard beet, particularly in settling and filtration. The changes involved reducing the amount of 1st and 2nd carbonatation mud returned to compartments I and II of the 8-compartment pre-liming vessel, reducing the amount (to nil where necessary) of 1st carbonatation juice returned to compartment III, abolishing liming of raw juice with limed juice in compartments I, II, III, IV and V, and reducing the temperature of main defecation and shortening the liming period. Recycling juice to compartment IV and liming raw juice with defecation juice in compartment VI were retained. As a result of the modifications, the pH and alkalinity of the pre-limed juice in each compartment were lower than previously, while the settling rate, mud volume and 1st carbonatation juice clarity were considerably better. Difficulties in evaporation and at the sugar end generally are mentioned and the question of applying pre-defecation or simultaneous liming and gassing is discussed.

* * *

Effect of frost on beet—their storage and technological value. J. ANTKOWIAK. *Gaz. Cukr.*, 1966, **74**, 141–147. Experience from the 1965/66 campaign has shown that harvested beet left in the field and exposed to a sharp frost (—8°C to —10°C) can be stacked in factory piles for up to 3–4 days, even with piling as high as possible to avoid the adverse effect of external factors on the beet, which should not be ventilated. Diffusion at a slightly lower temperature (72–75°C) will limit the rate of solution and amount dissolved of pectins, which occur in greater quantities in frozen beet. Tabulated data show the purity and pH of juice from frozen and unfrozen beet, as well as the sucrose, ash, noxious N, invert and soluble pectin contents. While the values for frozen beet are only slightly different from those for unfrozen beet, the differences increase considerably when the frozen beet are thawed. Other data show the various factors mentioned above in the case of healthy beet and in beet of varying proportions of putrefaction. It is suggested that rotten beet should be processed separately.

* * *

Some aspects of the 1965/66 campaign (in Western Germany). F. SCHNEIDER. *Zucker*, 1966, **19**, 449–457. Information is provided on a number of aspects, including the abnormal weather conditions and their effect on the beet, the non-sugar composition of molasses, the processing of beet exposed to frost, the dependence of juice pH on temperature and the extent of infection period, bacterial counts in healthy and frozen beet, heating of cold raw juice, pulp presses, developments of the Braunschweig carbonatation system, invert destruction in sugar juices, the use of filter-thickeners, massecuite alkalinity, bacteriological investigations on circulation water from wet dedusting, and waste water treatment in a Lübeck tank, which is a development based on the activated sludge process.

* * *

Recent advances in molasses exhaustion. K. W. R. SCHOENROCK and J. R. JOHNSON. *J. Amer. Soc. Sugar Beet Tech.*, 1966, **13**, 662–680.—The solubility of sucrose in molasses samples from Amalgamated Sugar Co. factories was determined by the method of WAGNEROWSKI *et al.*[1,2]. The values obtained differed from the solubilities found by GRUT and BROWN & NEES, which were too low at a given non-sugar:water ratio. Differences between the solubilities for low purity liquors from different areas were smaller than indicated by solubility tables. In all cases a linear relationship was established between saturation coefficient and non-sugar:water ratio. A supersaturation of 1·25, rather than 1·5, was found to be maximum for smooth crystallizer operation. Nomograms and alignment charts are presented relating the variables occurring in pan boiling and crystallization. These are proposed for use in establishing a complete programme for low raw massecuite curing under optimum conditions. The thirteen basic steps in the procedure are detailed. Thirty-four references are given to the literature.

* * *

Problems in raw juice extraction from sugar beet brei. R. WASMUND. *Zeitsch. Zuckerind.*, 1966, **91**, 507–512.—The fundamentals of raw juice extraction from beet are explained and disadvantages of the conventional diffusion process indicated. The theory of juice extraction from beet brei[3,4] is described and guidance offered for efficient extraction by this means. Optimum conditions include as rapid an extraction and a juice withdrawal as are possible. The extraction rate is considerably influenced by the size of the beet particles in the brei; the smaller they are the shorter will be the material transfer distances and the better will the extraction liquor mix with the beet cells. Thirty-nine references are given to the literature.

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Steam consumption in a white sugar factory. W. VON PROSKOWETZ. *Zeitsch. Zuckerind.*, 1966, **91**, 519–522. A study was made of the quantitative effect of three factors on steam consumption, using the data from the 36 European sugar factories previously published[5]. Tabulated results show that the three factors (thin juice quantity, daily beet slice and white sugar yield) are insufficient for steam consumption determination, since there are many other factors which mask their effect.

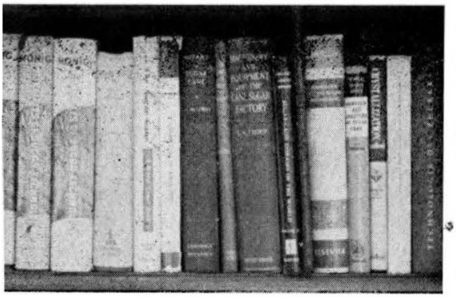
* * *

Recirculation of 1st carbonatation mud to continuous progressive pre-liming. H. GRUSZECKA and S. GAWRYCH. *Gaz. Cukr.*, 1966, **74**, 181–184.—Tests showed that while recycling 40% of the 1st carbonatation mud from the clarifiers to preliming gave about the same results as did recycling 40% unfiltered 1st carbonatation juice as regards 1st carbonatation juice alkalinity, pH, Brix, settling rate, and mud thickening, it gave a much greater filtration rate (35·3 ml/sq.cm./min compared with 21·2 ml/sq.cm./min with 1st carbonatation juice recycling). However, while it gave slightly lower thin juice colour, it also gave a somewhat greater lime salts content than did juice recycling (90·3 mg CaO/100°Bx compared with 78·5 mg CaO/100°Bx, respectively). The advantages of recycling mud are particularly significant when sub-standard beet are being processed.

* * *

Return of pulp press water to a continuous diffuser. P. M. SILIN. *Sakhar. Prom.*, 1966, **40**, (9), 22–24. Higher losses in continuous diffusers than in battery diffusers in the Soviet Union are attributed to the fact that the sugar factories do not return press water to diffusion. It is shown mathematically that by mixing press water with fresh water, it is possible to reduce diffusion losses considerably (by 30·8% in the example shown). The aim of the article is to offer a simple method of calculating the effect of press water recirculation once certain variables are known, such as beet solids content, juice draft, and weight and dry solids of pressed pulp. Formulae are given for calculation of the sugar content in pressed pulp and the degree of dilution of press water when mixed with fresh water.

1 *I.S.J.*, 1961, **63**, 249.
2 *ibid.*, 1962, **64**, 115.
3 WASMUND: *I.S.J.*, 1966, **68**, 89.
4 MÜLLER: *ibid.*, 1961, **63**, 282.
5 *I.S.J.*, 1964, **66**, 88.



New books

The mechanics of crushing sugar cane. C. R. Murry and J. E. Holt. 143 pp.; 5½ × 8½ in. (Elsevier Publishing Co. Ltd., 22 Rippleside Commercial Estate, Ripple Rd., Barking, Essex, England.) 1966. Price: 85s 0d.

Written by two experts very well known in connexion with research work on cane milling in Queensland, this book aims "to present, in a reasonably concise form, the theory of crushing developed to date." A set of notes prepared by the research team of the Dept. of Mechanical Engineering at the University of Queensland for a seminar on sugar mill mechanics at the University in 1963 forms the basis of the book. It is divided into five chapters: "The extraction performance of the crushing train", "Pressure on the roll surface", "Roll load and roll torque", "The capacity and feeding of crushing units", and "The effects of roll diameter". Two appendixes deal, respectively, with measurement of fineness of prepared cane and bagasse, and juice flow in a compression test, and a third appendix gives a glossary of current milling terms. The book includes 26 figures and 14 tables. The typography and presentation are excellent, and the work will be invaluable to all concerned with cane milling. Let it be hoped that the somewhat high price will not deter readers from obtaining it.

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Zuckerwirtschaftliches Taschenbuch 1966. (Sugar economic pocket book.) 191 pp.; 4 × 5¾ in. (Verlag Dr. Albert Bartens, Berlin-Nikolassee, Lückhoffstr. 16, Germany.) Price: DM 14.40; 26s 0d.

The 13th edition of this pocket book contains 74 tables and 14 graphs apart from a number of maps and a wealth of data covering both beet and cane countries. The statistics in the first section include beet and cane areas and yields per ha in Europe and North America and sugar production in all countries of the world. Other factors dealt with include sugar consumption, sugar imports and exports, and sugar balances and prices. Data are given for EFTA and EEC countries as well as the U.S.A. and the Soviet Union, followed by details of sugar and molasses production, sugar consumption, trade, balances, prices, freight and taxes in West Germany and somewhat fewer details of the East German industry. The second section contains data on trade regulations, while the third section contains details of international and German sugar organizations and sugar factories in West and East Germany and Western Europe. The data apply to 1964/65 with estimates given for 1965/66. The captions and headings to the tables in Section I are in English, French and German. The book is very clearly printed and neatly arranged. Its small format and thickness (less than ½ inch) added to the valuable contents make it a very worthwhile acquisition.

* * *

The Gilmore West Indies sugar manual, 1966. Ed. C. O. Dupuy and B. J. Smith. 96 pp.; 8 × 10½ in. (Hauser-American, 441 Gravier St., New Orleans, La., 70130 U.S.A.) 1966. Price: $10.00.

This is the first edition of a publication to be issued every other year. It contains information on Antigua, Barbados, British Honduras, Grenada, Jamaica, St. Kitts and Trinidad, including cane and sugar production figures, maps showing factory locations, details of sugar producers' associations, and a directory of sugar company personnel. The new volume is set out in the same way as the other Gilmore manuals, by far the most important feature being the reports on the individual sugar factories, which occupy most of the pages and give details of chief personnel, equipment, processes, and manufacturing results achieved in 1965. There are some typographical errors, however, and, surprisingly, no mention is made of the fact that the Antiguan industry has suspended operations.

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The Gilmore Hawaii sugar manual, 1966. Ed. C. O. Dupuy and B. J. Smith. 120 pp.; 8 × 10½ in. (Hauser-American, 441 Gravier St., New Orleans, La., 70130 U.S.A.) 1966. Price: $10.00.

This edition of the Hawaiian Manual is the first to be published since 1957. Intended to be issued biennially, it is a valuable guide to the Hawaiian sugar industry, giving details of cane and sugar production from 1934 to 1965, sugar production in 1963–1965 by individual firms, arranged by islands, and information on Hawaiian sugar companies, on the Hawaiian Sugar Planters' Association and on the refining of Hawaiian raw sugar. A directory of personnel is followed by maps showing factory locations, while the bulk of the work is taken up with details of each factory. Nowhere else is such a wealth of information assembled on the Hawaiian sugar industry.

The Gilmore Puerto Rico-Dominican Republic sugar manual, 1966. Ed. C. O. DUPUY and B. J. SMITH. 168 pp.; 8 × 10½ in. (Hauser-American, 441 Gravier St., New Orleans, La., 70130 U.S.A.) 1966. Price: $10.00.

This is the 19th edition of a biennial publication which gives information on the sugar industry in Puerto Rico, Dominican Republic and Haiti. It takes the same form as the other Gilmore manuals, giving information on sugar associations, yield and production figures, and extensive details of each factory's equipment, processes and results in 1965 and 1966. Maps show the locations of the factories. The book provides an unparalleled source of information not available in any other convenient form and must be the first choice for anyone seeking knowledge of the areas.

* * *

Beet sugar in the West. L. J. ARRINGTON. 234 pp.; 6¼ × 9½ in. (University of Washington Press, London, England.) 1966. Price: 56s 0d.

This history of the Utah-Idaho Sugar Co. has been written by L. J. ARRINGTON, Professor of Economics at Utah State University, to mark the 75th aniversary of the company, which traces its origin to the establishment of the fourth beet sugar factory in the U.S., at Lehi, Utah, in 1891. This was the first beet factory to be built in the Mountain West and the first to use American-built equipment. The company formed, The Utah Sugar Co., was merged with The Idaho Sugar Co. and the Western Idaho Sugar Co. in 1907 to form the present Utah-Idaho Sugar Co. which now operates five factories [West Jordan and Garland in Utah, Idaho Falls in Idaho, and Toppenish and Columbia Basin (Moses Lake) in Washington]. In 1965 these sliced a total of 2,368,371 tons of beet out of which 6,463,484 bags of sugar were produced. Details of each of these factories as well as past factories are given in an Appendix. (During its life the Company has constructed and operated factories in five states, including the three mentioned above plus Montana and South Dakota.) The book is obviously concerned primarily with the economics and industrial history of beet sugar manufacture in the Western U.S., but is also concerned with the subject of beet mechanization and such problems as the fight against curly top disease, which is stated to have caused greater losses to the Utah-Idaho Sugar Co. than to any other U.S. sugar company. The Company's close connexion with the Mormon Church (the pioneer beet sugar enterprises of Utah and Idaho were church-promoted) is also touched on. Details of the Company's officers and directors and statistical tables and charts covering sugar production in 1891–1965 are given in Appendixes. While possibly of restricted interest to readers outside the U.S., the book is well written and provides an interesting history of one of the major companies in the U.S. sugar industry as well as giving information on the U.S. national sugar situation during the same period.

Sweet malefactor. W. R. AYKROYD. 160 pp.; 5¾ × 8¾ in. (William Heinemann Ltd., 15–16 Queen St., London W.1, England.) 1967. Price: 30s 0d.

The aim of this book, which is sub-titled "Sugar, Slavery and Human Society", is to recount "the story of sugar from the time the sugar cane was first cultivated 2,500 years ago up to the present day, when sugar production is a great world industry. In doing this it has been necessary to turn from century to century and from continent to continent, from Christopher Columbus to King Henry Christophe of Haiti, from slavery to bad teeth, from rum to current sugar production statistics. Unification, in so far as this has been achieved, depends on the presence of sugar in the foreground or background throughout, as the hero or villain—more often the villain." It is a very interesting history, written by a nutritionist (the author became Director of the Nutrition Division of F.A.O. in 1946 and since 1960 has worked in the Dept. of Human Nutrition at the London School of Hygiene and Tropical Medicine) in an easy style without any obvious bias. Although not concerned with technical aspects of sugar production, the book is to be recommended to all in the sugar field, if only to give a clear idea of the importance of their industry in the modern world. While a large number of publications have been consulted in writing his book, the author makes special mention of the major source (NOËL DEERR'S "The History of Sugar") and devotes half a page to details of DEERR'S life.

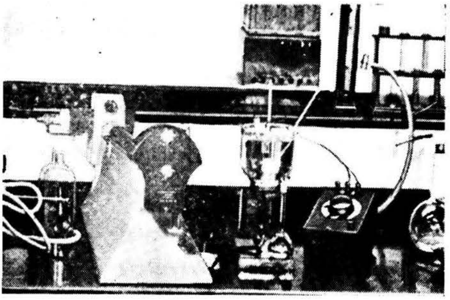
* * *

The storage and recovery of particulate solids. Ed. J. C. RICHARDS. 182 pp.; 6¾ × 10 in. (The Institution of Chemical Engineers, 16 Belgrave Square, London S.W.1.) 1967. Price: 35s 0d.

The Institution of Chemical Engineers has publised this new book as an attempt to highlight the present state of knowledge (or ignorance) in the field of solids handling. As stated in the foreword, when designing bulk solids handling plant, engineers are faced with a largely unknown state of matter, and it is hoped that this work will stimulate investigation and research.

The book stems from a suggestion by Mr. P. L. BALDWIN, a member of the Institution, that the lack of knowledge of bulk materials properties and the consequent lack of reliable equipment design methods was threatening to create a bottleneck in the progress of chemical engineering. In view of this opinion, the Institution set up a working party under the chairmanship of Mr. BALDWIN and this valuable report is one of the results of their deliberations.

Individual chapters review the feed control of bulk solids, the examination and description of particulate materials, the effects of external conditions on bulk solids in a static bed, bulk solids in motion, and bunker design. The compilation of this information should be of considerable value to all engineers and scientists who have to deal with the problems of solids handling.



Laboratory methods & Chemical reports

Formation and composition of beet molasses. V. Application of the saturation function to binary non-sucrose mixtures. G. Vavrinecz. *Zeitsch. Zuckerind.*, 1966, **91**, 447–452.—A mathematical procedure for calculation of the resultant melassigenic coefficient when several non-sucrose substances are present is described. Derived from the law of mixtures, the method is applicable where data for higher concentrations of the non-sucrose are lacking, and is based on the use of cubic parabolas. Typical curves of saturation coefficient *vs.* non-sucrose:water ratio are presented showing the additive effects of various non-sucrose mixtures, while curves are also given for the individual compounds. The mixtures were 1:1 combinations of two highly melassigenic salts (NaCl and KCl), a highly positive melassigenic salt (K acetate) and a highly negative melassigenic salt (Ca acetate), and a moderately melassigenic salt (K pyrrolidone carbonate) with a weakly melassigenic compound (betaine). In a mixture of K acetate and invert sugar the latter seemed to affect the melassigenic properties of the acetate. It is suggested that associates are formed between the two substances and that a certain quantity of salt is removed from the associates together with the sucrose. Suitable equations are presented for each combination and the results are tabulated except for the invert sugar-K acetate mixture.

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The effect of nitrogenous substances on thin juice colour. V. Prey, F. Stressler and R. Goller. *Zeitsch. Zuckerind.*, 1966, **91**, 457–462.—Spectrophotometric studies on thin juices obtained by carbonatating model raw juices are described, and some U.V. spectrograms presented. In an investigation of the effect of N compounds in the model juices on thin juice colour, it was found that most amino acids had only slight effect, cystine alone causing any measurable colour formation. Peptides too had insignificant effect on juice colour. All peptide fractions caused considerable colour formation, the maximum coloration occurring under the effect of alkaline albumin hydrolysate. While high molecular albumin can be separated by carbonatation, reaction between the peptides formed by albumin decomposition and reducing sugars (indicated by maximum absorption at 320/340 mμ in the U.V. spectrum) causes considerable colour formation or results in the formation of melanoidin precursors, which subsequently cause juice coloration through condensation reactions. These melanoidin precursors (found by analysis to be predominantly peptide-pectin complexes) are present in press juice and hence are responsible for considerable colour formation. However, they can be removed by active carbon or decolorizing resin.

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Importance and control of sugar crystal formation. Anon. *Nuestra Ind. Rev. Tecnol.*, 1962, **1**, (4), 20–23; through *S.I.A.*, 1966, **28**, Abs. 464.—The disadvantages of conglomerates, fines and twinned crystals in sugar crystallization are summarized. Reasons for their formation are given. A photomicrographic method of estimation of sugar quality is described: the sugar is washed with alcohol and dried, and a small sample is spread out on a glass plate, enlarged and photographed. The crystals are counted, and the percentages of conglomerates, fines and twins in the total are multiplied by 3, 2 and 1 respectively, and added together to give a total number of "bad points" (0–300).

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Nomogram for calculating reduced boiling house recovery (Gundu Rao). K. G. B. Doss. *Indian Sugar*, 1966, **16**, 255.—The nomogram is used to determine reduced boiling house recovery as defined by the Gundo Rao formula

$$E\,(\text{Rao}) = e + \left[K\left(\frac{17 - 20\,J}{17\,J}\right) - \frac{m}{(1 - m)}\right]$$

where E (Rao) = reduced boiling house recovery, e = recorded boiling house recovery, J = mixed juice purity, m = final molasses purity, and K = clarification factor. Two worked examples are given.

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Colorimetric micro-determination of calcium in sugar-house products. G. V. Heyndrickx. *J. Amer. Soc. Sugar Beet Tech.*, 1966, **13**, 681–686.—A solution is made up by heating 250 mg of naphthalhydroxamic acid in 100 ml of water containing 5 ml of ethanolamine and 2 g of tartaric acid. After this is cooled, an aqueous NaCl solution, containing 9 g of NaCl, is added and the reagent made up to 1 litre with water. 5 ml of reagent is mixed with 0·5 ml of sugar solution, raw or clarified juice and after 30 min is centrifuged for 5 min. The supernatant is poured off, and the tube placed inverted in a rack to drain on filter paper. After a few min, the mouth of the tube is wiped dry and 1 ml of an alkaline solution, made up by dissolving 2 g of EDTA (disodium salt) in 1 litre of 0·1N NaOH, added. The tube is sealed and heated on a boiling water bath, with occasional shaking to ensure that the precipitate dissolves completely. After 10 min the tube is cooled and 3 ml of a colour solution, made up by dissolving 60 g of ferric nitrate nonahydrate in 1 litre of water containing 15 ml of nitric acid, is added. After mixing, the optical density of the solution is measured at 450 mμ against a blank prepared by the same procedure but with the sugar solution omitted. The calcium content is read from a calibration graph obtained with standard calcium solutions containing 4 to 40 μg of Ca per 0·5 ml. Syrup and molasses samples are diluted to a concentration of approx. 20 μg of calcium/0·5 ml. The results are not significantly different from those given by the oxalate method, while the hydroxamate method takes less time, is claimed to be much more sensitive and can be applied without preliminary clarification of the test sample.

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Odour in refined sugar. R. R. West and R. S. Gaddie. *J. Amer. Soc. Sugar Beet Tech.*, 1966, **13**, 716–720. A modification of the method used to determine the threshold number[1] (representing the extent to which an odour-bearing sample must be diluted with odour-free water to make its odour barely perceptible) is described, in which 200 g of the test sugar is dissolved in 200 ml of odour-free water at room temperature and reducing quantities of this diluted with odour-free water to 200 ml and 5 ml of 10% citric acid solution added. The odour is then compared with that of odourless water + citric acid, both control and samples being heated to 60°C. Only one positive correlation has been found between odour and operating conditions, i.e. a proportional increase in odour with progress in campaign and increase in beet storage periods.

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Sucrose solubility in impure sugar solutions. L. Bozhkov. *Hranit. Prom.*, 1964, **13**, (10), 21–23; through *Ref. Zhurn. Khim.*, 1965, 13R350.—Sucrose solubilities were determined in beet molasses from the six white sugar factories in Bulgaria for each year in the period 1961–63 inclusive, the molasses being concentrated to non-sugar:water ratios of 1·4–2·8 and crystallized for 4 weeks at 40°C. The mean solubilities, expressed as sucrose:water ratios, at Dolna Mitropoliya were 2·49, 2·71 and 3·01 at 40°C and corresponding nonsugar:water ratios of 1·5, 2·0 and 2·5 in 1961, 1962 and 1963, respectively; at 55°C (the solubilities at this factory are tabulated over the range 40–55°C at 1° intervals) the solubilities were 2·89, 3·15 and 3·50 at corresponding nonsugar-water ratios of 1·5, 2·0 and 2·5 in 1961, 1962 and 1963, respectively. At constant nonsugar:water ratios the solubilities varied only slightly from one year to another and between factories.

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Determination of the length of peptide chains. F. Neubrunn. *Zucker*, 1966, **19**, 427–434, 479–486.—A method is described for determining the length of peptide chains in beets and beet factory products, in which amino compounds are isolated by mercuric acetate and acetone and the amino acids separated from the peptides on the basis of their ability to form complexes with copper which are unstable at boiling point and react differently with ninhydrin in the subsequent stage of the process. The free amino N in the peptides is determined from the copper remaining in solution, the Kjeldahl N is determined after separating the amino acids from the ninhydrin by separation on carbon, and the mean chain length is then calculated from the ratio between amino N and the total (Kjeldahl) N. However, very long chains found in unripe beets cannot be determined by the copper and ninhydrin, but are represented by a rise in the total N content. Tabulated data from the last three weeks of the 1965/66 campaign indicate an increase in the length of the peptide chains, showing that towards the end of a campaign an increasing quantity of high molecular albumin decomposition fractions pass through carbonatation and form longer-chain decomposition products in subsequent processes. A general picture is given of the progress of amino and total N and of the change in peptide chain length from press juice to low-grade boiling and press water.

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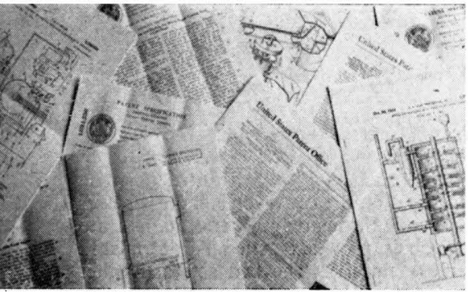
Determination of the "reactive nitrogen" in beet and sugar factory juices. V. Prey, F. Stressler and R. Goller. *Zeitsch. Zuckerind.*, 1966, **91**, 513–519. The nitrogen determined is labelled "reactive" because it reacts with the carbonyl groups in reducing sugars, particularly during juice purification and subsequent factory processes. Its determination is based on the formation of melanoidin precursors when free α-amino N present in peptides reacts with methyl glyoxal. The absorption band formed by the melanoidin precursors, with a maximum at 320/340 mμ in the U.V. spectrum, has been found to be proportional to the α-amino N concentration in peptides. Stock solution is made up by heating 50 ml of lead-clarified press juice to boiling with 7·68 ml of M/10 methyl glyoxal and 0·5 ml of 10N NaOH for about 9 min and removing the basic lead acetate with 1 ml of 5N acetic acid. The extinction of the spectral band is measured and compared with the standard curve obtained with diglycine. The free α-amino N in peptides can be determined by a modification of the Pope & Stevens method[2] based on the ability of α-amino N to dissolve copper from a copper phosphate suspension, the copper in the filtrate then being determined iodometrically. Any copper not passing into solution can be determined by adding dilute H_2SO_4 to the precipitate, washing with water, neutralizing the free acid with 10N NaOH and, after adding KI, titrating the excess iodine with N/20 sodium thiosulphate, whereby 1 ml of N/20 iodine solution ≡ 1·4 mg of α-amino N.

[1] *Biochem. J.*, 1939, **33**, 1070.
[2] *I.S.J.*, 1962, **64**, 116.

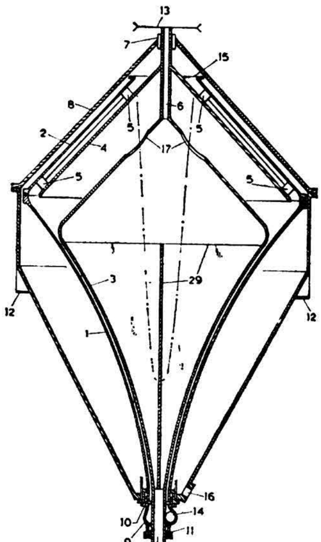


Patents

UNITED KINGDOM

Clarifying centrifuge. WERKSPOOR N.V., of Amsterdam, Holland. **1,046,290.** 5th October 1965; 19th October 1966.

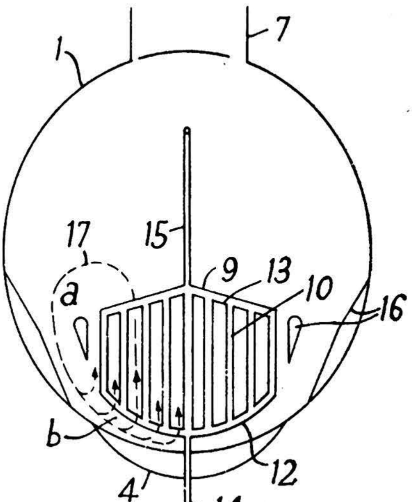
The rotor of the centrifuge has a funnel-shaped part 1 at the wide end of which is fastened a conical part 2. Inside the rotor is a hollow inner body 3 forming a narrow flow space inside the inner surface of part 1. A conical partition 4 extends into rotor part 2 and by means of blades 5 or other turbulence-generating elements is connected to the inner body 3. The shaft 6 is journalled at its upper end 7 in a casing 8. At the other end of the casing is a stationary bowl 9 supporting the rotor at 10 and the inner body 3 at 11. The casing 8 has supporting feet 12 and a driving pulley 13 is fastened to the end of shaft 6.



Juice to be clarified is introduced tangentially into the bowl 9 at port 14 and enters the space between the rotor wall 1 and inner body 3. The heavier mud moves outwards and as a thickened muddy juice enters the space between the part 2 and partition 4, where it is subjected to turbulence created by blades 5 before overflowing into casing 8 and thence through outlet 16. The clear juice passes through ports 17 into the inner body 3 and so out of the axis end *a*.

Juice heater. SOC. FIVES LILLE-CAIL, of Paris 8e, France. **1,046,474.** 14th June 1963; 26th October 1966.

The juice heater 1, here shown with circular cross section, is provided with an assembly of vertical longitudinal hollow plates 10 to which steam is admitted through the end wall of the vessel. Condensate produced drains to the bottom of the plates and is directed by collectors 12 to a discharge pipe 14. Incondensable gases rise to the top of the plates and are directed by collector 13 to pipe 15 which takes them out of the end wall of the vessel and re-injects them into the vessel itself, in the neighbourhood of the juice inlets so as to stimulate mixing.



The juice is introduced at various points below the plates and circulates as indicated by the arrows, being aided by baffles 16. The bottom of the vessel is provided with downward-sloping portions 4 leading to ports from which the heated juice is withdrawn.

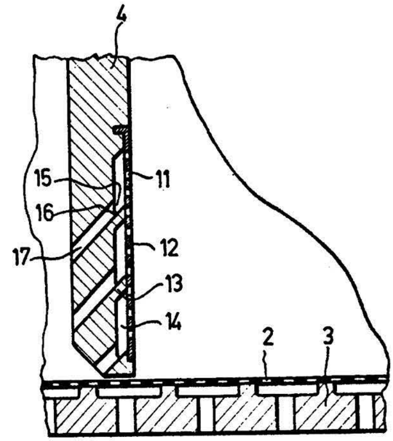
* * *

Push-type continuous centrifugals. ESCHER WYSS A.G., of Zurich, Switzerland. **1,047,434.** 31st May 1963; 2nd November 1966.

While the drier layers of sugar in the drum of a push-type centrifugal move easily the molasses in the newly added massecuite must have time to separate

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

from the crystals and this governs the overall capacity of the machine. Improvement of the discharge of



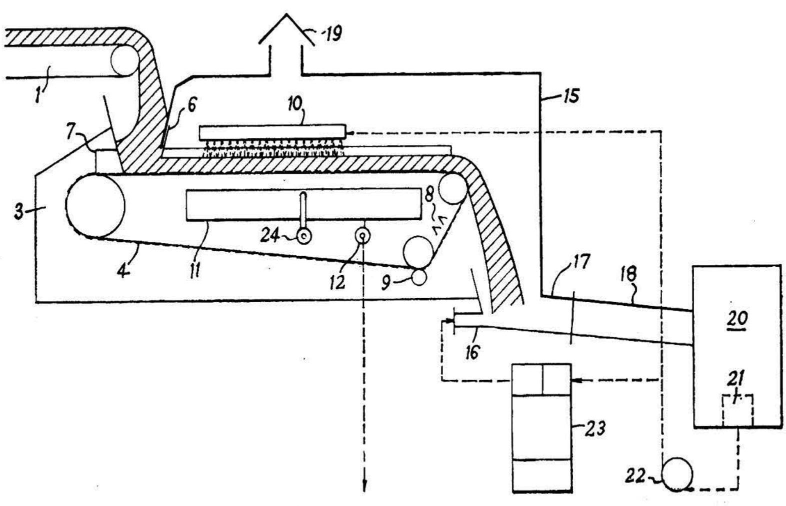
molasses at this point is achieved by providing the push plate 4 at its periphery with a screen surface 11 through which molasses can pass to liquid collectors 14 and ducts 17. The surface 11 is supported on webs 13, and variations in the angle of the surface 11 and molasses ducting may be incorporated for greater efficiency of separation.

* * *

Pre-scalder for beet and cane. Soc. Fives Lille-Cail, of Paris 8e, France. **1,048,326.** 6th March 1961; 16th November 1966.

The conveyor 3 comprises essentiallly a perforated endless belt 4 running over three drums and supplied from a hopper 2 with prepared beet or cane, the level being maintained uniform by a regulator 6 and held within side baffles 7. After discharge of the layer the belt is cleaned by jets of pressurized air or other fluid supplied through nozzles 8, or by a contrarotating bush 9.

The discharge material then falls into the chute 18 through which it passes to the diffuser 20. Juice is withdrawn from the diffuser through a screen 21 and is sent by pump 22 in two streams. One of these passes via a heat exchanger 23 to the port 16 where it aids the transport of the sugar-containing material into the diffuser; its temperature and the length of the chute 18 are sufficient to ensure that the material entering the diffuser is aseptic. The other stream of juice is sent to sprinklers 10 which distribute it on the bed of material on the conveyor belt 4. It passes through this and through the perforations into trough 11 which is provided with an exit pipe 12 and an overflow pipe 24. The bed acts as a filter surface so that the juice withdrawn through pipe 12 is both cooled and contains no material in suspension.

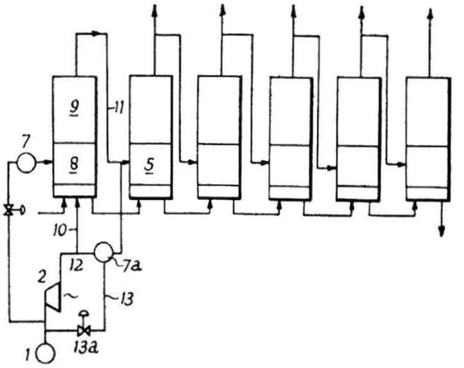


* * *

Evaporator. Soc. Fives Lille-Cail, of Paris 8e, France. **1,048,388.** 13th August 1963; 16th November 1966.

Boiler 1 produces high pressure steam some of which is sent to a power generating unit 2 which provides exhaust steam in a superheated form. Some of the high-pressure steam from boiler 1 is sent to static pressure reducer 6 which produces steam at higher pressure than the exhaust steam from unit 2. This steam may be desuperheated by means of desuperheater 7 and is condensed on the exchange surfaces 8 of the concentrator vessel 9, the heat extracted being used to concentrate the solution to be evaporated afterwards in the multiple effect evaporator (here shown as a quintuple effect unit with a first body having an exchange surface 5). The juice to be evaporated is introduced into the concentrator vessel 9 by way of a chamber in the base where it is mixed with superheated exhaust steam from unit 2 supplied through conduit 10. The pressure reducer 6 is so regulated as to maintain a substantially constant concentration of the final product from the concentrator.

This passes into the first body of the evaporator, while the heat exchange surface 5 is provided with steam from the top of the concentrator 9, by way of



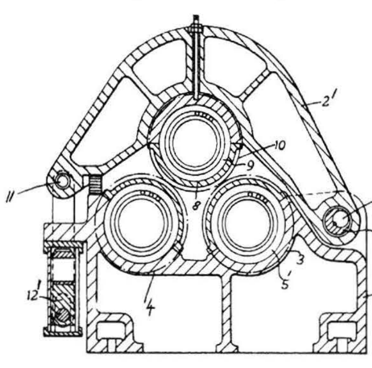
conduit 11, and with the remainder of the exhaust steam from unit 2 supplied through conduit 12 by way of desuperheater 7a. More steam can be supplied to desuperheater 7a if required from the high-pressure boiler by way of static pressure reducer 13a and conduit 13.

Because the juice entering concentrator 9 is in the form of an emulsion with the exhaust steam it has been found that the heat exchange can be carried out at higher temperature—280°–284°F—and requires only a short time. Since the exhaust steam in the emulsion is superheated, there is no substantial dilution of the juice feed to the concentrator.

* * *

Cane mill. Soc. Fives Lille-Cail, of Paris 8e, France. **1,048,563.** 10th July 1963; 16th November 1966.

The mill comprises two heavy lateral frames 1′ with a bracket cover 2′ on each, one end of which has an opening in which a hollow bearing pin 6 is able to rotate. The pin is keyed to an eccentric shaft 18 which rotates in the frame. Lower rollers 3 and 4 are journalled in sleeve bearings 5 on the frame 1′ for rotation about fixed parallel axes extending horizontally between the frames. Stub shafts at the two ends of the top roller 10 are journalled in split



bearing blocks 8 mounted in the middle portion of each bracket 2′. The other end of each bracket is attached by a pivot pin 11 to the piston of a hydraulic jack 12′ the cylinder of which is secured to the stationary frame 1. Alternatively the cylinder of the jack can be connected to the bracket and the piston to the frame. Since the two brackets are independently mounted, the top roller may take up an angle to the horizontal, and the bearing blocks 8 are connected to the brackets 2′ by way of a universal joint assembly to permit this.

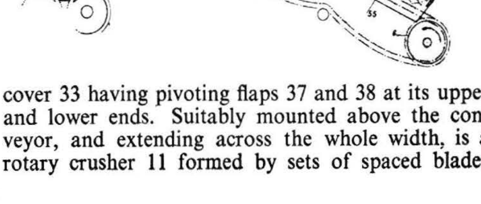
The rollers may be driven in any appropriate manner, when cane fed between rollers 4 and 10 has part of the juice content squeezed out before passing between rollers 3 and 10 where more juice is squeezed out, because of the smaller clearance. The initial and second clearances are maintained in a constant ratio (2:1) regardless of the thickness of the cane blanket and the movement of the top roller about pivot pin 6, this ratio being governed by the dimensions of the bracket and location of the bottom rollers and pivot pin. With wear of the rollers, however, the ratio between the clearances may vary but can easily be adjusted by rotation of the shaft 18 (which is provided with a suitable arm) in which the pin is eccentrically mounted.

UNITED STATES

Increasing the sugar content of sugar cane. A. E. Carlson, of Wilmington, Del., U.S.A., assr. E. I. Du Pont de Nemours & Co. **3,224,865.** 20th November 1962; 21st December 1965.—The maturing cane is treated, ½–3 months before harvesting, with a tri-substituted benzoic acid in which the 2 and 6 and one other position are substituted, with either chloride or methyl groups, at least one methyl group being present, the rate of treatment being 0·1–10 lb of the acid per acre of cane. A surface-active agent may be used in admixture with the acid, the ratio of acid to agent being 1:16–30:1.

* * *

Crushing machine for sugar cane stalks. M. Hayot, of Basse-Pointe, Martinique. **3,225,803.** 15th November 1963; 28th December 1965.—Cane delivered to the hopper 43 formed at the bottom of the apron conveyor 3 is carried upwards and deposited into the feeder chute 9 supplying the mill 1. On either side of the conveyor is a wall and above is a steel



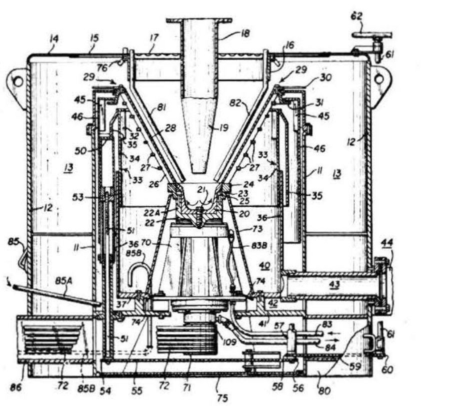
cover 33 having pivoting flaps 37 and 38 at its upper and lower ends. Suitably mounted above the conveyor, and extending across the whole width, is a rotary crusher 11 formed by sets of spaced blades

13a, 13b, 13c, mounted around the shaft 12 at angular intervals of 60°. The blades are provided with hardened steel corner caps 21 with flat front faces, and are driven by motor 51 through belt drive 52 at a speed of approx. 900–1000 r.p.m., striking the cane violently enough to disintegrate it and forming two fractions: a layer of pulp 56a which remains on the conveyor and a stream 56b which is directed upwards and then falls down as a stream 56c to mix with the pulp layer 56a and form a compacted mass 57 under the action of the pressure plate 38.

* * *

Continuous centrifugal. C. R. STEELE and F. B. PRICE, assrs. AMERICAN FACTORS ASSOCIATES LTD., of Honolulu, Hawaii, U.S.A. **3,226,257.** 9th October 1961; 28th December 1965.

The continuous centrifugal includes an inner housing 11 and an outer housing 12 defining a collection chamber 13 for separated sugar crystals. The flange 14 from the upper edge of housing 12 carries a removable annular cover 15 to which is secured a sleeve 16 across which extends a grate assembly 17 with a central hole for the feed conduit 18. Massecuite enters through conduit 18 and is discharged from its tapered end 19 into the accelerator bowl 20 attached to the stub shaft 22. Also attached is the flanged annulus 24 containing the support ring 23 for the



screen of the basket 28. This is formed with a number of upwardly diverging bars 26 supported by rings 27 and reaching to an upper flange assembly 29 between the flanges 30, 31 of which extend the flanges of a sleeve 46 and housing 11 to form a substantially sealed chamber to prevent the upward flow of moisture or vapour. A partition assembly 33 is adjustable vertically so as to provide separate collection chambers 40 and 42 for molasses and wash water. A steam spray 81 and a water spray 82 are provided inside and near the surface of the basket 28 for washing and drying the sugar.

* * *

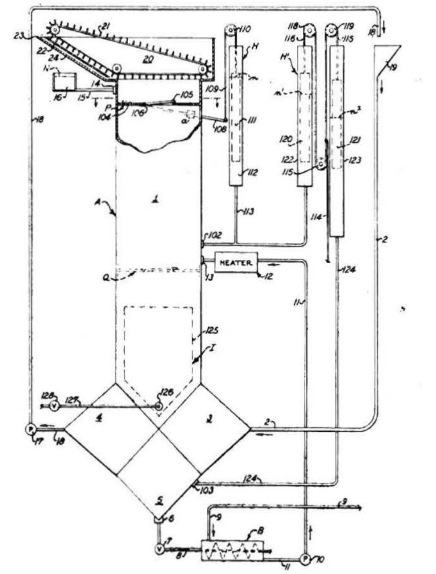
Beet harvester flail. E. W. PARRISH and A. G. BAROWS, assrs. INTERNATIONAL HARVESTER CO., of Chicago, Ill., U.S.A., **3,227,223.** 2nd December 1963; 4th January 1966.

Cane diffuser. W. LIEBIG, assr. BRAUNSCHWEIGISCHE MASCHINENBAUANSTALT, of Braunschweig, Germany. **3,227,582.** 23rd October 1963; 4th January 1966. See U.K.P. 1,000,599.[1]

* * *

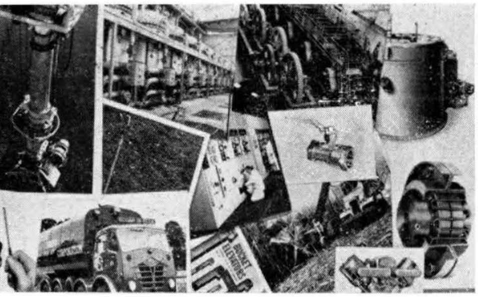
Bagasse diffusion. P. NEUVILLE, of Rabastens, Tarn, France. **3,231,423.** 31st July 1963; 25th January 1966.

Cane is passed through one or two mills to produce a juice and bagasse, the latter containing sugar. It is fed through hopper 19 and washed down pipe 2 with juice from the bottom of the tower 1 withdrawn by way of pipe 18. It enters the expanded portion 3 of the tower base and is carried upwardly where it is held in the zone beneath the grate Q. This is a device to maintain a required bagasse-juice consistency and embodies an opening which is opened and closed in



relation to the density of the mixture by an automatic mechanism H′ which operates on the counterweight of the lever which governs the position of the opening. Bagasse rises into the zone below grate P, similarly controlled, by device H, and then passes through opening 105 into the wider section 20 at the top of the tower from which it is removed by scraper conveyor 21, water draining through screen 22 and back into the tower. Juice is withdrawn through pipe 126 from partitioned chamber 125 and goes to process. Heavy solids separating from the bagasse are withdrawn through pipe 6 and mixed in mixer 8 with clarifier muds introduced through pipe 9. The mixture is sent by pump 10 along pipe 11 to the heater 12 and so into the tower through port 13.

[1] *I.S.J.*, 1966, **68**, 221.

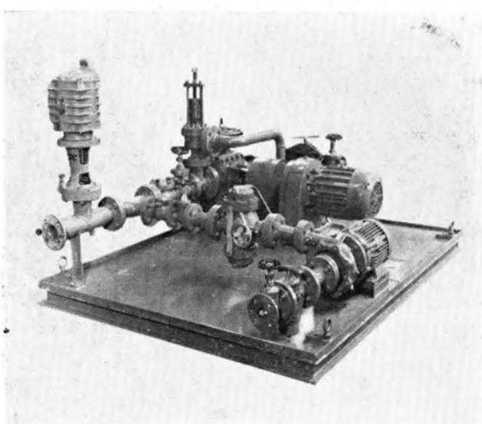


Trade notices

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.

Molasses-water mixing unit. Plenty & Son Ltd., Newbury, Berks., England.

The illustration shows a molasses-water blending set supplied by the manufacturers to the Booker Group for use in one of their rum distilleries. The first of these packaged units is in operation at Inns-

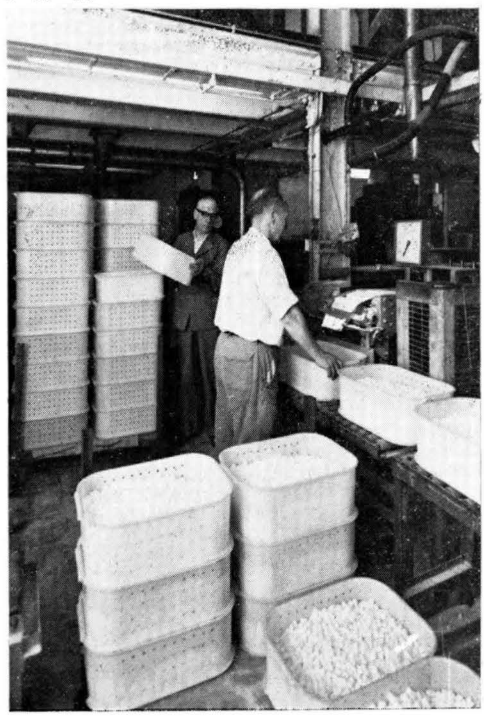


wood Estate Ltd., in Jamaica, and a number are being manufactured for use in Guyana. The units include a Plenty "Universal" variable-output, positive-displacement pump specially designed to handle highly viscous fluids; a centrifugal water pump; an in-line mixer with an "Impelator" mixing head; and a "Simplex" filter in the suction line to each pump, the filter in the line to the molasses pump having a mild steel perforated basket, while the water pump filter has a stainless steel basket. The filters have a patented quick-release basket cover which facilitates access for cleaning without the need for special tools. The unit incorporates all necessary control valves and interconnecting pipework, and the complete assembly is mounted on a mild steel bedplate. The unit is claimed to give accurate mixing to a pre-determined Brix, and controlled, continuous flow to fermentation and distillation processes, while it obviates the need for intermediate holding tanks, is completely clean in operation, and requires the minimum of supervision, since once it has been set to a required mix it will operate continuously on its own.

* * *

Plastic stacking boxes for the food industry. WCB Containers Ltd., Stamford Works, Bayley St., Stalybridge, Cheshire, England.

The illustration shows newly pressed cubes being fed into TP 141 plastic containers at the Liverpool refinery of Tate & Lyle Refineries Ltd. The containers replace cardboard boxes which suffered from moisture migration from the cubes, with resultant wastage of boxes and sugar. The TP 141 boxes weigh only 2¼ lb, but up to nine may be stacked one on top of the other on pallets, giving a total load on the bottom box of 225 lb. Perforation of the boxes with small holes encourages free air circulation, allowing moisture which has collected in the cubes during production to evaporate. The boxes are available in polyethylene or a sterilizing grade of polypropylene.



Nylon bearings in a refinery. Polypenco Ltd., Gate House, Welwyn Garden City, Herts., England.

Monocast nylon has found a number of applications in the Liverpool refinery of Tate & Lyle Ltd. The sugar granulators were supported by four cast iron rollers running on a cast iron path fitted on each drum. The metal-to-metal contact resulted in wear and also excessive noise. The rollers have been modified and 18-in diameter nylon tyres shrunk-fit on them; the life of the rollers and path have been considerably increased. A similar application has been in fitting tyres to the rollers which supported the 18-ft diameter circular table from which sugar is distributed into the 10,000-ton silo. Here again, metal-to-metal wear was causing wear which might result in contamination of the refined sugar in the silo.

A third application for nylon is in the provision of hanger bushes supporting the scroll shaft used in the screw conveyors delivering hot granulated sugar to and from the silos. Previous bearings had failed quickly because of abrasion but the nylon bearings are provided with a feed of low-pressure air which excludes the sugar and this has permitted them to be in service for three years without excessive wear.

* * *

PUBLICATIONS RECEIVED

ULTRASONIC SWITCH. Airmec Ltd., High Wycombe, Bucks.

Leaflet 384 describes the Type N384 ultrasonic switch which maintains an ultrasonic beam between two probes up to 50 ft apart. When the beam is interrupted for 2 milliseconds or more, relay contacts in the control unit provide a switching action which can be used for control and/or counting. Even optically transparent objects are sensed, and the switch has innumerable applications.

* * *

KDG/SOPAC EQUIPMENT. K.D.G. Instruments Ltd., Manor Royal, Crawley, Sussex.

Details of thermostats, pressure switches, temperature and pressure recorders and thermometers are given in the latest catalogue issued by this firm.

* * *

NORTHROP SIX-CYLINDER TRACTOR. Northrop Tractors Ltd., Church St., Ware, Herts.

Details are contained in a new brochure describing the Northrop 5004/6 six-cylinder version of the Ford-based 5004 model[1].

* * *

BEARINGS FOR BEET WASHERS. Svenska Kullagerfabriken, Göteborg, Sweden; The Skefko Ball Bearing Co. Ltd. Luton, Beds., England.

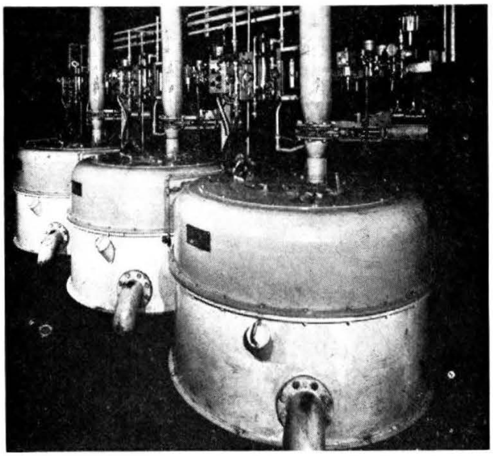
Leaflet No. SKF TSP 576 illustrates the application of SKF spherical roller and ball bearings in a beet washer constructed by Maschinenfabrik Buckau R.Wolf A.G. The bearings support the shafts carrying agitator arms, are fitted to the reduction gear unit between the driving motor and the shafts, and support the delivery and knife roller shafts. The washer is installed in one of the sugar factories of the Swedish Sugar Corporation and more SKF bearings are provided on the worm conveyor which carries the washed beet to the slicers. These rolling bearings, which are lubricated with high quality grease, give great reliability, trouble-free operation and require very little maintenance.

"ASMIT 261". Industrieele Mij. Activit N.V., Postbox 240-C, Amsterdam, Holland.

This resin, described in a new booklet, has been developed for decolorization of sugar solutions and is an improvement on previous "Asmit" resins in that it is regenerated with a 12% brine, instead of caustic soda, and by occasional treatment with cold 1–2% sodium hypochlorite solution. It is a highly porous polystyrene-type resin and is preferably used within the pH range 3–9 and at a maximum temperature of 90°C. Life of the resin varies with the product treated but is normally 300–500 cycles.

* * *

Western States centrifugals in Africa.—The illustration shows a battery of three Western States continuous conical-basket centrifugals installed in 1966 at Gledhow Sugar Co. Ltd. in Natal for purging reheated *C*-sugar. Other Natal sugar companies using Western States machines include the Umzimkulu Sugar Co. Ltd., which used one continuous machine for *C*-massecuite in 1966 and is installing another for the 1967 season, and the Umfolozi Cooperative Sugar Planters of Natal, which is to install a battery of four 48 × 30 in high-speed



centrifugals for *C*-massecuite this year. The largest single installation of Western States centrifugals in Africa is under construction at the new Malelane sugar factory in Eastern Transvaal. This comprises nine 54 × 40 in fully-automatic recycling machines for refined and *A*-massecuites, and twelve continuous centrifugals for reheated *B*- and *C*-massecuites. In 1966 the new Sucoma factory near Nchalo in Malawi installed three Western States continuous machines for *B*- and *C*-massecuites.

* * *

Venezuelan sugar factory contract.—A contract has been signed in Caracas by the Mirrlees Watson Co. Ltd. for the supply and erection of a sugar factory and refinery worth £4,600,000. There has been intense international competition over a considerable period for this contract. A contributing factor in securing the contract has been the whole-hearted coperation of U.K. sub-contractors who have stood by their quotations based on 1965 prices. The factory, to be erected at Acarigua in Portuguesa province, will have a crushing capacity of 3000 tons of cane per day, accounting for 300,000 tons in an average 100-day campaign. Output will be 300 tons/day refined sugar. Mirrlees have contracted with Central Azucerero Portuguesa C.A., a sugar company, and Corporacion Venezolana de Fomento, the Government industrial development agency, jointly. The latter will retain a 50% interest. Plant from the Glasgow workships of A. & W. Smith and the Mirrlees Company and over forty other U.K. contractors will account for £3,400,000 of the contract. Erection is to be completed in twenty-two months.

[1] *I.S.J.*, 1966, **68**, 382.

International Society of Sugar Cane Technologists

13th CONGRESS, 1968

THE General Secretary & Treasurer of the I.S.S.C.T., Dr. H. S. Wu, has asked the Regional Vice-Chairmen to provide lists of probable members of the next Congress in Taiwan. According to Article II of the I.S.S.C.T. Constitution, persons who have contributed or are contributing to the progress of the cane sugar industry are eligible for membership and this may be obtained by application, accompanied by the necessary dues—U.S. $20.00 for the 13th Congress—to be sent to any Regional Vice-Chairman.

In the case of the U.K., the Regional Vice-Chairman, Mr. R. R. Follet-Smith, has requested that the dues should be sent in the form of a draft payable to Dr. H. S. Wu together with the following information: (i) name, (ii) postal address, (iii) position and employer's name (or company name), and (iv) contributions to or connexions with the cane sugar industry. They should be sent to Mr. R. H. Faulkner, Booker Bros. McConnell & Co. Ltd., Bucklersbury House, 83 Cannon Street, London E.C.4.

In other regions the dues and the same information should be sent to the Regional Vice-Chairman whose address appears below; intending members from countries which have no Regional Vice-Chairman should send their applications to a neighbouring or other convenient Regional Vice-Chairman.

Australia:	N.S.W. and Fiji	Mr. J. L. Chalmers, Colonial Sugar Refining Co. Ltd., 1-3 O'Connell St., Sydney, N.S.W.
	Queensland	Mr. J. L. Clayton, Central Sugar Cane Prices Board, P.O. Box 62, North Quay, Brisbane.
Bolivia		Sr. Juan E. Maclean, Comisión Nacional de Estudio de la Caña y del Azúcar, Av. Camacho 1488, 3er piso, La Paz.
Brazil		Sr. Gilberto Miller Azzi, Sociedade dos Tecnicos Açucareiros de Brasil, Caixa Postal 88, Piracicaba, Est. São Paulo.
British West Indies		Mr. T. Chinloy, Jamaican Association of Sugar Technologists, Sugar Manufacturers Association Sugar Research Dept., Mandeville P.O., Jamaica.
Colombia		Sr. Julio César Márquez, c/o Ingenio Oriente Ltda., Palmira, Valle.
Cuba		Sr. Edgardo González Alonso, 3a Avenida 805, Apto. 1, Miramar Marianao, Habana.
France		M. H. Barat, 45-bis, Avenue de la Belle Gabrielle, 94 Nogent-sur-Marne.
French West Indies		M. Ernest Bonnet, c/o Syndicat de Producteurs et Exporteurs de Sucre et Rhum, 11 rue Schoelcher, Pointe-à-Pitre, Guadeloupe.
India		Regional Vice Chairman, c/o Shri G. L. Kapoor, Assistant Secretary, P.O. National Sugar Institute, Kalyanpur, Kanpur, U.P.
Mauritius		Dr. P. O. Wiehe, Mauritius Sugar Industry Research Institute, Réduit.
Mexico		Sr. Alfonso González Gallardo, I.M.P.A., Balderas 44, Despacho 601, Mexico 1, D.F.
Mozambique		Sr. Pereira E. Santos, c/o Companhia do Buzi S.A.R.L., Caixa Postal 68, Beira.
Nicaragua		Sr. P. Alfredo Pellas, Nicaragua Sugar Estates Ltd., Edificio Pellas, Managua.
Peru		Sr. Augusto de la Piedra Lora, Hacienda Pomalca, Chiclayo.
Philippines		Mr. Carlos Bell Raymond, Asst. to the Resident Gen. Manager, Central Azucarera de Tarlac, San Miguel, Tarlac.
Puerto Rico		Sr. Rubén A. Bonilla, P.O. Box 2847, Río Pedras.
Réunion		M. Emile Hugot, B.P. 49, St.-Denis.
South Africa		Mr. L. F. Chiazzari, c/o Gledhow Sugar Estates Ltd., P.O. Stanger, Natal.
Uganda & Kenya		Mr. Mahendra M. Madhvani, P.O. Box 54, Jinja, Uganda.
United States:	Hawaii	Mr. R. E. Coleman, Experiment Station, H.S.P.A., Honolulu, Hawaii 96822.
	Mainland	Mr. Denver T. Loupe, Knapp Hall, Room 247, Louisiana State University, Baton Rouge, La. 70803.
Venezuela		St. José Ignacio Arnal, Hacienda Santa Teresa, Avenida Vollmer No. 1, San Bernardino, Caracas.

World Net Sugar Import Requirements, 1967

INTERNATIONAL SUGAR COUNCIL, SECOND ESTIMATE

A. FREE MARKET

Country or Area	*Metric tons, raw value,*
EUROPE	
Albania	17,000
Bulgaria	175,000
Cyprus	14,000
Finland	140,000
Germany, West, for human consumption	90,000
„ „ for animal feeding	220,000
Gibraltar	1,000
Greece	20,000
Iceland	11,000
Ireland	18,000
Italy	80,000
Malta	17,000
Netherlands (including territories)	168,000
Norway, for human consumption	165,000
„ for animal feeding	5,000
Portugal (including territories)	16,000
Spain (including territories)	236,000
Sweden	110,000
Switzerland	250,000
United Kingdom	1,990,000*
U.S.S.R.	2,400,000
Yugoslavia	45,000
TOTAL	6,271,000
NORTH AMERICA	
Canada	840,000
TOTAL	840,000
CENTRAL AMERICA	
Bahamas	5,000
Bermuda	2,000
Panama Canal Zone	2,000
TOTAL	9,000
SOUTH AMERICA	
Chile	170,000
Uruguay	60,000
TOTAL	230,000
†ASIA	
Afghanistan	50,000
Brunei	4,000
Burma	50,000
Cambodia	20,000
Ceylon	250,000
Hong Kong	110,000
Iran	330,000
Iraq	240,000
Israel	80,000
Japan	1,400,000
Jordan	46,000
Korea, North	26,000
Korea, South	58,000
Kuwait	14,000
Laos	5,000
Lebanon	33,000
Malaysia:	
West Malaysia	215,000
Sabah	15,000
Sarawak	20,000
Mongolia	19,000
Persian Gulf	5,000
Saudi Arabia	64,000
Singapore	77,000
South Arabian Federation	47,000
Syria	81,000
Vietnam, North	9,000
Vietnam, South	130,000
Yemen	20,000
TOTAL	3,418,000

* of which a small quantity for animal feeding.

AFRICA	
Algeria	275,000
Botswana	11,000
Burundi	3,000
Cameroon	10,000
Central African Republic	3,000
Chad	19,000
Congo (Kinshasa)	10,000
Dahomey	8,000
Gabon	1,000
Gambia	6,000
Ghana	45,000
Guinea	14,000
Ivory Coast	33,000
Kenya	40,000
Liberia	2,000
Lesotho	10,000
Libya	50,000
Malawi	12,000
Mali	28,000
Mauritania	23,000
Morocco	330,000
Niger	7,000
Nigeria	70,000
Rwanda	1,000
Senegal	71,000
Sierra Leone	19,000
Seychelles	—2,000
Sudan	145,000
Togo	8,000
Tunisia	80,000
U.A.R.	135,000
Upper Volta	11,000
Zambia	29,000
TOTAL	1,511,000
OCEANIA	
British Oceania	4,000
New Zealand	142,000
Western Samoa	3,000
TOTAL	149,000
TOTAL FREE MARKET	12,428,000
B. U.S. MARKET	
U.S. net import requirements from foreign countries	3,800,000‡
C. GRAND TOTAL (A + B)	16,228,000
D. GRAND TOTAL ROUNDED	16,200,000

† In the absence of any valid information the Council refrained from including any figures for China (Mainland) in the estimate.

‡ of which 100,000 metric tons for non-human consumption (this is a conservative estimate based on present knowledge; it may reach a higher figure by the end of the year)

U.S. sugar supply quota, 1967[1].—On the 16th March the U.S. Dept of Agriculture announced its allocations of its increases of 100,000 tons and 50,000 tons in the second-quarter permitted imports of raw sugar. The new individual entitlements are: Philippines, 293,035 short tons, raw value, Mexico 179,444 tons, Dominican Republic 170,339 tons, Brazil 106,451 tons, Peru 79,968 tons, B.W.I. 51,217 tons, Ecuador 15,887 tons, Argentina 19,585 tons, French West Indies 29,806 tons, Costa Rica 18,129 tons, Nicaragua 14,453 tons, Colombia 13,027 tons, Guatemala 19,856 tons, Panama 10,812 tons, El Salvador 8594 tons, Haiti 9806 tons, Venezuela 6284 tons, British Honduras 5582 tons, Taiwan 48,419 tons and India 49,576 tons, giving a total of 1,150,000 tons.

[1] *Willett & Gray*, 1967, **91**, 119.