THE International Sugar Journal

MAY 1969

you will adopt the "F.L.C. compact" centrifugal

because it is:
- self-supporting therefore very stable
- fully automatic
- with integral electric braking
- economical to purchase and to erect

Fully automatic Compact 220 centrifugal battery, operating in a Marseilles refinery

you can select:

- **two sizes of basket :** ■ "Compact 220" : 1220 mm x 762 mm ; production capacity : 220 metric tons per day
  ■ "Compact 410" : 1370 mm x 1065 mm ; production capacity : 410 metric tons per day
- **two types of drive :** ■ a.c. motor
  ■ Ward Leonard set (static or rotating)
- **two applications :** ■ white and high raw massecuites
  ■ low raw massecuites

Fives Lille-Cail also manufactures continuous centrifugals.

S.A.G. PARIS 2940 - 4

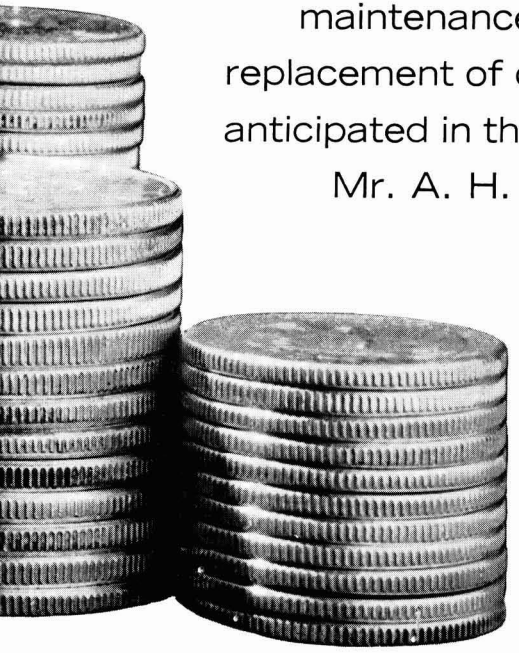
FIVES LILLE - CAIL

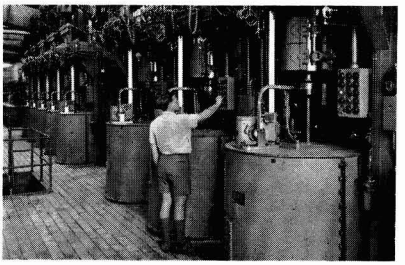
7, RUE MONTALIVET
PARIS 8e -
265.22-01, 32-40

there's American
into every Western

ngenuity built tates Centrifugal.

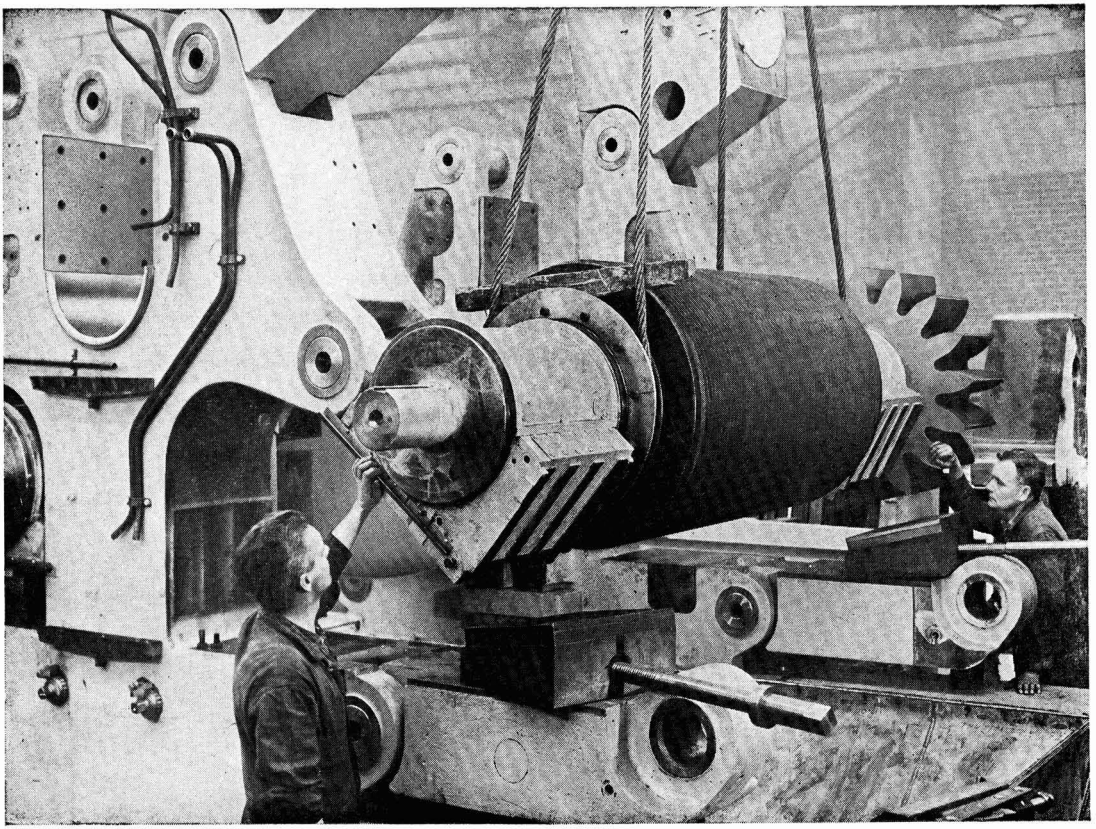
hat ingenuity is there for profit . . . profit you get as a return your investment in Western States Centrifugals. First, you it from a life expectancy that is unparalleled in the industry . . . according to our records, none of the G-8 centrifugals rchased in the last 20 years have been discarded. Secondly, profits are enhanced because centrifugation is performed as planned . . . without labor intervention. Thirdly, Western States centrifugals are built with maintenance procedures in mind. Ease of replacement of components subject to wear is anticipated in the design. Want more? Contact Mr. A. H. Stuhlreyer, Director of Sales.





THE WESTERN STATES
MACHINE COMPANY
Hamilton, Ohio 45012, U.S.A.

ROBERTS
STEVENS



Watchmakers' precision

Fabulous precision in engineering and manufacture is not just the virtue of the watchmaker. We claim the same standards in our own specialized field!

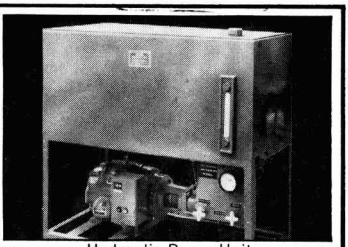
Milling stations installed by us the world over, in new plants and in existing ones, to increase efficiency, have proved us right, time and again. Designed to ensure high extraction, built to watchmakers' standards of engineering, they display clockwork operation under rugged milling conditions. Precision tools to provide man's brains and muscles with fresh energy through his most important staple-food: sugar. Sugar has kept us young and vital for more than a century, as long as we have been in business. Let us show you how!

Stork-Werkspoor Sugar nv

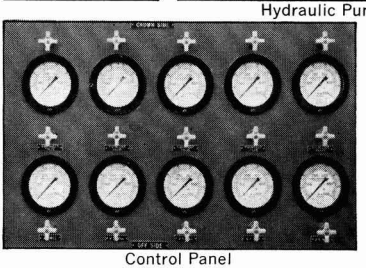
sugar industry engineers

Member of VMF/Stork-Werkspoor

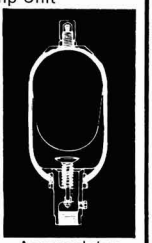
P.O. Box 147 Hengelo (O) - the Netherlands Cables: Stowesugar Telex: 44324 Tel: 05400-54321



Hydraulic Pump Unit

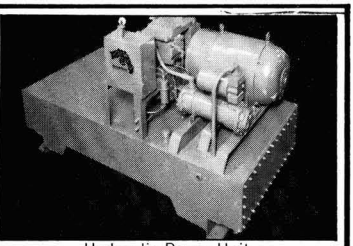


Control Panel

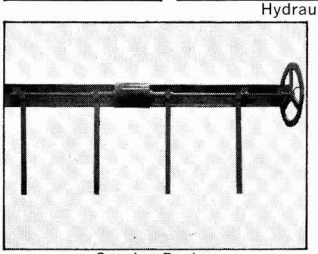


Accumulator

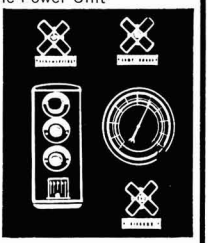
EDWARDS HYDRAULIC SYSTEMS—FOR MILL PRESSURE CONTROL. Separate pressure on each ram. No inertia. Long life. Frictionless. Quick installation. Maintenance free. Saves floor space.



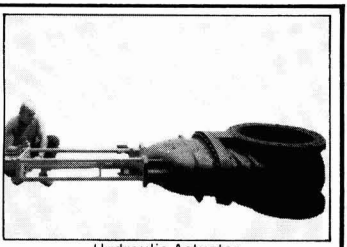
Hydraulic Power Unit



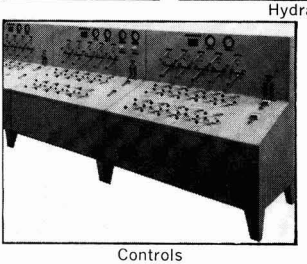
Sensing Device



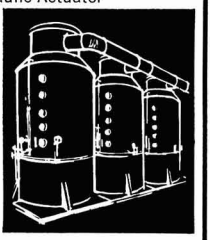
EDWARDS AUTOCANE SYSTEM—FOR AUTOMATIC CANE CARRIER DRIVE CONTROL. Fully automatic. Precise delivery rate. Increases grinding capacity. Eliminates chokes. Adaptable to existing drive units.



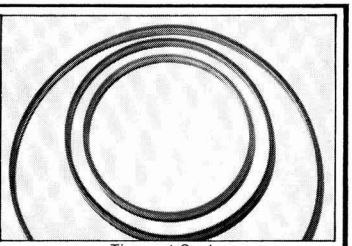
Hydraulic Actuator



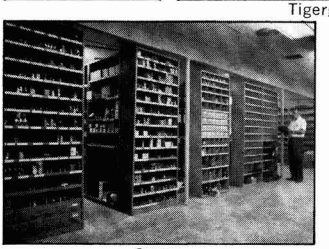
Controls



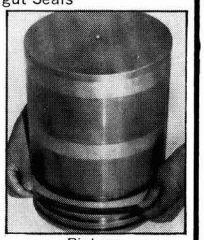
EDWARDS VALVE SYSTEM—FOR CONTROLLED HYDRAULIC VALVE OPERATION. Liquid or vapor service. Shock proof. Remote controlled. Positive motion. Quick operation. Any location.



Tigergut Seals



Stores



Pistons

EDWARDS PARTS AND SERVICE—A complete line of Accumulators, Pumps, Cylinders, Transmissions, Valves, Hoses, Fittings, Gauges and all types of hydraulic devices. Immediate shipment.

WORLDWIDE ACCEPTANCE— Wherever sugar cane is grown, you will find qualified Edwards Engineering Representatives ready to discuss your requirements at any time.

For Literature or information on Edwards Engineering Products or Service, contact your nearest representative or write to us direct.

FLUID POWER

EDWARDS
ENGINEERING CORPORATION
1170 Constance St. New Orleans 70130, U.S.A.

SAFE . . . STRONG . . . CONVENIENT

HODAG PH-2 ACID CLEANER

tells you by its color when its work is done

Hodag has developed a safe granular acid cleaner for removal of scale in evaporators, vacuum pans and heat exchangers. New PH-2 Acid Cleaner is a bright pink liquid in solution. After it has completed its work in removing scale it turns yellow.

PH-2 Acid Cleaner is a combination of acid cleaning and wetting agents that quickly penetrates and removes the toughest scale deposits. It rinses thoroughly leaving metal surfaces clean and bright to restore efficient heat transfer.

Hodag PH-2 Acid Cleaner is a dry granular product that is safely and easily handled. It eliminates the nuisance of carboys and the hazard of spilled acid. It measures easily and dissolves in cold water without objectionable fumes. In solution PH-2 Acid Cleaner is more powerful than hydrochloric, sulfuric and sulfamic acids. Unlike them, new PH-2 Acid Cleaner will not etch or corrode stainless steel, copper and brass at normal-use concentrations.

To try Hodag PH-2 Acid Cleaner, use the coupon below.

☐ Please send complete information on PH-2 Acid Cleaner.
☐ Please send sample.
☐ Send information on other Hodag products for the sugar industry.

Name _____ Title _____

Company _____

Address _____

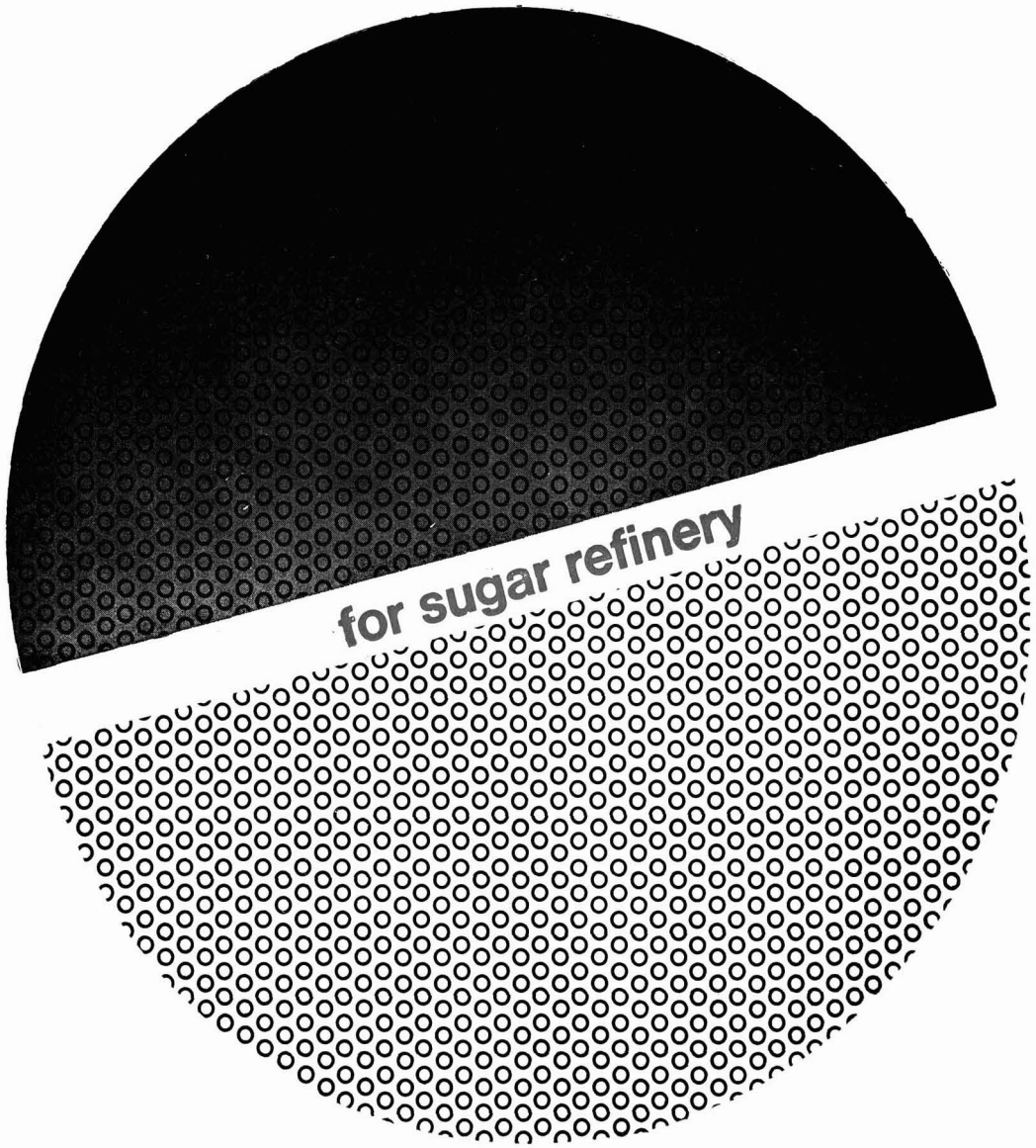
City _____ State _____

Country _____

HODAG CHEMICAL CORPORATION • HODAG INTERNATIONAL S A

SURFACE ACTIVE CHEMICALS

7247 North Central Park Ave., Skokie, Illinois 60076 U.S.A. • Cable Address: HODAG SKOKIEILL



International Sugar Journal

•

Editor and Manager:
D. LEIGHTON, B.Sc., F.R.I.C.

Assistant Editor:
M. G. COPE, M.I.L.

Agricultural Editor:
F. N. HOWES, D.Sc., I.S.O.

• • •

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

Annual Subscription: 50s 0d or $8.00 post free
Single Copies: 6s 0d or $1 post free

Contents

SOMMAIRES : ZUSAMMENFASSUNGEN : SUMARIOS

Le dextrane et l'élongation de cristaux: des nouveaux essais. D. N. SUTHERLAND et N. PATON. *p.* 131–135

Des essais ont montré que dextrane ajouté à des purs sirops sucrés est cause d'une élongation du *c*-axe dans les cristaux produits, le degré de cette élongation étant augmenté par une élévation de température et du poids moléculaire ou de la concentration du dextrane. Alors que l'effet avec des solutions pures est produit seulement à des concentrations de dextrane relativement hautes, dans le cas de sirops techniques même ½% de dextrane produit une élongation extrême, apparemment à cause d'une interaction entre le dextrane et des autres composants de la solution. La structure de dextrane est aussi d'importance.

* * *

Le besoin de binage de la betterave sucrière. E. MANOV. *p.* 135–137

On décrit des essais en Bulgarie, où, à l'aide de binages multiples (4 à 7 fois) à une profondeur progressivement croissante, on a obtenu une augmentation du rendement des betteraves.

* * *

L'effet de la qualité des cannes sur la perte aux moulins. R. R. FOLLET-SMITH. *p.* 138–140

On a dérivé des équations de regression pour calcul de la "perte aux moulins" en éliminant l'effet d'imbibition. Des corrections ont été calculées et essayées avec quelques valeurs de perte aux moulins et du rapport d'extraction à partir de rapports de sucreries. Par cette méthode la perte aux moulins est réduite à une base commune de 13,5% saccharose dans les cannes.

* * *

La diffusion de canne DDS dans l'Inde. K. H. PAREKH. *p.* 140–142

L'auteur compare les données de performance pour une installation de diffusion de canne DDS avec des moulins à Belapur Co. Ltd. avec des résultats obtenus avec des moulins seulement; il démontre les avantages de la diffusion, qui a donnée une extraction de sucre élévée mais une extraction des non-sucres plus basse que l'ont fait les moulins seulement.

Dextran und Kristallverlängerung: neue Versuche. D. N. SUTHERLAND und N. PATON. *S.* 131–135

Versuche haben gezeigt, dass zu reinen Zuckersirupen hinzugefügtes Dextran eine Verlängerung der *c*-Achse in den resultierenden Kristallen verursacht, wobei das Grad dieser Verlängerung mit Temperatursteigerung und mit Erhöhung des Molekulargewichts oder der Konzentration des Dextrans steigt. Obgleich im Falle von reinen Lösungen der Effekt nur in der Gegenwart von höheren Dextrankonzentrationen vorfallen wird, bei technischen Lösungen wird eben ½% Dextran beträchtliche Verlängerung verursachen, augenscheinlich wegen einer Reaktion zwischen dem Dextran und anderen Bestandteilen der Lösung. Die Dextranstruktur ist auch bedeutsam.

* * *

Die Notwendigkeit des Hackens bei Zuckerrüben. E. MANOV. *S.* 135–137

Der Verfasser beschreibt Versuche in Bulgarien, wo mehrfaches Hacken (4- bis 7-mal) bis zu einer allmählich zunehmenden Tiefe hat einen höheren Rübenertrag gebracht.

* * *

Die Einwirkung von Rohrqualität auf Verluste in den Mühlen. R. R. FOLLETT-SMITH. *S.* 138–140

Man hat Regressionsgleichungen für die Berechnung von Verlusten in den Mühlen entwickelt, wobei der Imbibitionseffekt eliminiert wird. Berichtigungen wurden berechnet und an Hand einiger in Zuckerfabrik-Berichten gegebenen Werte von Verlusten in den Mühlen und des Extraktionsverhältnis untersucht. Durch diese Methode wird der Verlust in den Mühlen zu einer Gemeinbase von 13,5% Saccharose in Rohr gebracht.

* * *

DDS Rohrdiffusion in Indien. K. H. PAREKH. *S.* 140–142

Leistungsdaten für eine DDS Rohrdiffusion-Mühlanlage in der Zuckerfabrik der Belapur Co. Ltd. werden mit Ergebnissen, die mit den Mühlen allein erhalten wurden, verglichen; dabei zeigt man die Vorteile des Diffusionsapparats, der eine höhere Zuckerextraktion auch eine nieder Nichtzuckerextraktion als die Mühlen gegeben hat.

Dextrana y alargamiento de cristales: experimentos adicionales. D. N. SUTHERLAND y N. PATON. *Pág.* 131–135

Experimentos demostraron que dextrana, añadida a siropes de azúcar puro, fomenta alargamiento del eje *c* en los cristales que se forman. El extensión de este alargamiento se encarece por aumento de temperatura y de peso molecular o concentración de la dextrana. Mientras concentraciones bastante altas se necesitan para producir el efecto con soluciones puras, en meladura técnica tan poco como ½% de dextrana produce alargamiento extremo, aparentemente á causa de interacción entre la dextrana y otras componentes de la solución. El estructura de la dextrana es importante, también.

* * *

La necesidad de binazón en remolacha de azucar. E. MANOV. *Pág.* 135–137

Se presentan detalles de experimentos en Bulgaria en donde binazón repetida (4–7 veces) a profundidades progresivamente más grande conduce a un aumento en rendimiento de remolacha.

* * *

El efecto de calidad de caña sobre pérdida de molienda. R. R. FOLLETT-SMITH. *Pág.* 138–140

El autor ha desarrollado ecuaciones de regresión para calcular la pérdida de molienda, que eliminan el efecto de imbibición. Ha calculado correcciones y las ha probado con pérdidas de molienda y valores de la relación de extracción tomado de informes de fábricas azucareras. Por este método, pérdida de molienda se reduzca a una base común de 13,5 pol % caña.

* * *

Difusión DDS de caña en la India. K. H. PAREKH. *Pág.* 140–142

Dados de cumplimiento de un unidad DDS de difusión-molida de caña á Belapur Co. Ltd. se comparen con resultas obtenida con molinos solamente. Demuestran las ventajas del difusor que provee extracción más alta de azúcar pero extracción más bajo de no-azúcar que proveen los molinos sólo.

THE
INTERNATIONAL SUGAR JOURNAL

VOL. LXXI MAY 1969 No. 845

Notes & Comments

World sugar production, 1968/69.

F. O. Licht K.G. recently published their second estimate of world sugar production for the crop year September 1968–August 1969[1]. Total production from cane and beet is now set at 67,970,416 metric tons, raw value, which compares with 66,843,734 tons in 1967/68 and with Licht's earlier estimate of 68,826,200 tons[2]. The downward revision of 855,000 tons compared with the earlier estimate is very largely the result of a drop of one million tons from the earlier Cuban forecast[3].

Beet sugar production is now expected to be 237,000 tons higher than thought earlier, largely owing to forecasts for Czechoslovakia and Turkey which are higher by 100,000 and 121,000 tons, respectively. Changes in the cane sugar sector total 1,100,000 tons but, apart from the Cuban figure, only minor variations from the former estimates have been made for individual countries.

* * *

Europe beet area, 1969[4].

First estimates of the areas to be sown to beet in Europe have been produced by F. O. Licht and appear elsewhere in this issue. Issued at the end of March, they are likely to require amendment since in many countries sowings had not started by that time and in some actual sowings may vary from the targets. The bad weather in a number of countries, particularly in Eastern Europe, is also likely to cause a number of variations in the estimated areas. But it is useful to have a preliminary guide to likely areas as well as the more definitive figures for the 1968 crop.

Most of the estimates for 1969 are the same or only slightly different from last year, the principal differences being increases of 34,000 ha in France, 19,000 ha in Yugoslavia, 11,000 ha in Spain, 8000 ha in Rumania and 6000 ha in Greece, while decreases of 5000 ha are forecast for Czechoslovakia and Hungary and one for 4000 ha for Poland. The increases in Spain and Greece are a consequence of efforts to cover consumption by domestic production, while Rumania has built several new sugar factories. The increase in Yugoslavia is less easy to understand in view of the reported surplus stocks. Decreases in East Europe may be a result of recent efforts to seek more sugar by improved yields rather than larger areas.

While delays in sowing as a result of bad weather are acknowledged, Licht notes that modern sowing methods are more rapid and the effect of the delays could well be eliminated. However, beet yields in 1968 were extremely high in most countries and it is not thought likely, therefore, that the 1969 crop will exceed that of last year or that European beet sugar will exert increased pressure on the market.

* * *

UK sugar imports and exports.

Statistics of UK sugar imports and exports are tabulated elsewhere in this issue. As a result of severe competition from Continental white sugar producers, and of new or expanded sugar production in countries which were former customers, exports have fallen considerably to a level which, at just over 200,000 tons, is the lowest figure since 1946. A temporary loss is that of cube sugar supplied to the specialty market by Tate & Lyle Ltd., whose cubing plant was damaged during the year[5] but is happily now back in full production.

Imports from Commonwealth suppliers remained at about the same level as the previous two years, but the fall in exports meant that less foreign raws were required and these imports were reduced accordingly, as were total imports in consequence.

C. Czarnikow Ltd.[6] note: "Imports of refined and white sugar for direct consumption rose slightly to 55,000 tons. This is not far different from the quantities imported during recent years, but presumably if the trend should continue upwards the system of open individual import licences in respect of sugar for direct consumption polarizing in excess of 98°, which has been in effect since March 1966, would be

[1] *International Sugar Rpt.*, 1969, **101**, (8), 1–5.
[2] *I.S.J.*, 1969, **71**, 63.
[3] *ibid.*, 97.
[4] F. O. Licht, *International Sugar Rpt.*, 1969, **101**, (9), 1–2.
[5] *I.S.J.*, 1968, **70**, 255.
[6] *Sugar Review*, 1969, (905), 27.

revoked in favour of the previous regulation which limited imports of this quality of sugar to a specific tonnage.

"Although certain clauses have been included in the International Sugar Agreement, which came into effect at the beginning of this year, specifically to safeguard the interests of in-transit refiners, it is still to be expected that 1969 will be a difficult one for British refiners, especially vis-à-vis non-member producers of whites. No doubt the situation will be watched carefully and if it can be shown that the operation of the Agreement is detrimental to the interests of members in this respect an early opportunity will be taken to relieve this disadvantageous position."

* * *

International Sugar Council.

The Statistical Committee of the International Sugar Council met in London on the 9th April to confer on administrative, economic and statistical rules and were expected to examine the latest supply and demand situation. Their findings were to be submitted to the Executive Committee for its meeting scheduled for the 19th April which was expected to last for a week. A full meeting of the Council is expected to take place around the end of May.

* * *

Temporary reprieve for Peru's US sugar quota.

In February, Peru's Foreign Minister announced that the Government would seek the support of all Latin American countries for counter-action if the USA were to withhold aid and to terminate the Peruvian import quota under the US Sugar Act, as required by the Hickenlooper amendment[1]. An immediate response and call for solidarity came from Bolivia, but other more powerful South American countries are at present much concerned with re-adjusting their own political and trading relations with the new US Administration.

President NIXON sent a special envoy to Lima to try to prevent a collision which would not only have a disastrous effect on the Peruvian economy but would also have a very bad effect on US influence in South America where there is already a love-hate relationship with "big brother in the North". Fortunately, the application of the Hickenlooper sanctions can be deferred if "meaningful discussions" on compensation for the nationalized properties have begun before the date set for their taking effect, and the Peruvian Government formally paid into the National Bank at Lima the sum of $71 million at which they assess the worth of the IPC properties. This sum has to be set against the $690 million claimed by Peru against the IPC for alleged illegal exploitation of the Talara oilfields. This claim is still to be decided by the courts but in the meantime the US Government has announced its decision to defer the economic sanctions which would otherwise have applied from 9th April.

West Indies Sugar Co. Ltd. 1967/68 report.

Although sugar production increased from 154,614 tons in 1967 to 172,363 tons in 1968 the loss on the year ended 30th September 1968 was even greater than the previous year. This is accounted for by the serious drought which continued in the Monymusk area where production was only 62,331 tons compared with 70,509 tons in 1967 and 80,216 tons in 1966. The effect on costs was disastrous and the loss at Monymusk was not completely offset by the profit at Frome where a record crop of 110,032 tons was made.

Other adverse factors were the continuation of the low world price during the period of the report, and the fact that the Jamaican Government had not yet implemented any of the recommendations of the Mordecai Commission Report, so that the local price of sugar is significantly below production cost, and Government policy also frustrates any attempt to make major improvements in productivity by mechanization. This situation casts its shadow on the 1969 prospects since a considerable time will elapse before modernization, when permitted, will have its effects felt on the estates and shown in Company results. Also labour trouble has caused a serious crop interruption at Frome, and the effects of the past year's drought at Monymusk are still apparent.

* * *

Tate & Lyle Ltd. 1968 report.

The wealth of interests of the Tate & Lyle Group is illustrated by the Chairman's statement for 1968 where, in the section on raw sugar production, brief mention is made of activities in Trinidad, Jamaica, British Honduras, and Zambia, and other sections deal with refining in the UK, Canada and Rhodesia. Activities of the United Molasses Group have expanded to include not only molasses sales but shipping, with tankers to be used for carrying chemicals, oil, etc., and alcohol distillation. Sugar Line is the Group's subsidiary concerned with the transport of sugar from the Caribbean to the UK, while other active members include A. & W. Smith & Co. Ltd. and The Mirrlees Watson Co. Ltd.

During the year, the new company Tate & Lyle Enterprises Ltd. was formed to offer the expertise of group members not only to the sugar industry but to other industries where their experience can ensure a competent job. It is also concerned with commercial uses of the sugar industry's by-products and has led to interest in materials for use in building. Progress in regard to the Continental activities of the Group in its European Sugars venture is reported.

The Group shows itself as an excellent example of the way in which diversification and comprehensive utilization of its resources—finance, plant and, especially, know-how—can permit an enterprise to thrive in spite of the difficulties which can affect a part of its activities.

[1] *I.S.J.*, 1969, **71**, 66.

Dextran and crystal elongation: Further experiments

By D. N. SUTHERLAND* and NANCY PATON

(Colonial Sugar Refining Co. Ltd., Research Laboratories, Roseville. N.S.W., Australia)

Introduction

WE have recently reported that the presence of dextran in sugar solutions promotes the formation of elongated crystals having the same habit (*c*-axis elongated) as those produced in factories receiving stale cane[1]. Further experiments are now described which deal with the effects of molecular weight, temperature, concentration, and chemical structure of the dextran on the resulting *c*-axis elongation.

Single Crystal Experiments: Dextran-Sucrose

Method

Selected "coffee crystals" (large grain crystals) were grown at constant temperatures in bottles rotated in a water bath. The crystals were photographed before and after crystallization and measurements of the photographs permitted calculation of a growth ratio defined as:—

$$\frac{\text{Apparent growth along } c\text{-axis}}{\text{Apparent growth along } b\text{-axis}}$$

A high value of this ratio denotes *c*-axis elongation.

Materials

The following materials were tested.

(i) Dextran 2000 "T_0 4386"†
$\overline{M}_w = 2 \times 10^6$, $(\eta) = 0{\cdot}70$

(ii) Dextran Grade A‡
Mol. Wt. 200,000–275,000
Shown in graphs as A

(iii) Dextran Grade C‡
Mol. Wt. 60,000–90,000

(iv) Dextran 10 "T_0 5400"+
$\overline{M}_w$ = 11,200, (η) = 0·098
Shown in graphs as 10.

Results

The results are shown in Figs. 1, 2 and 3. Each point represents the growth ratio averaged over 3 crystals, but despite this averaging the experiments were not very reproducible and a considerable scatter is apparent.

Fig. 1 shows the effect of increasing concentration of Dextran A on the *c*-axis elongation, and indicates a general trend of increasing *c*-axis elongation with increasing concentration. Some results at different temperatures are also shown in this plot and these

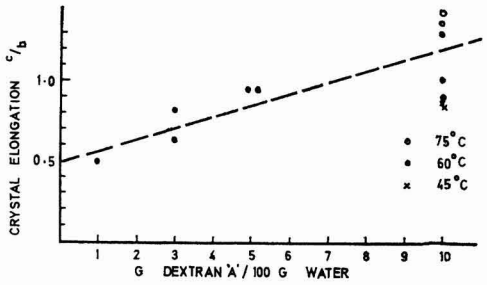


Fig. 1. Effect of concentration on crystal elongation

indicate an enhanced elongation at higher temperature.

Fig. 2 shows the effect of molecular weight change at a fixed concentration. A rise in elongation with rise in molecular weight is found, but the effect is not marked. When one considers that the range of molecular weights tested amounts to a 200-fold

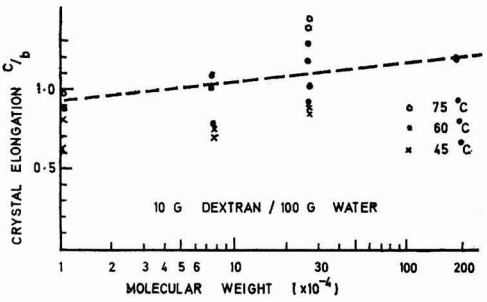


Fig. 2. Effect of molecular weight on crystal elongation

increase, the change in elongation is of secondary importance; to a first approximation all molecular weights have the same effect. Once again a change in temperature considerably alters the elongation.

Fig. 3 shows this temperature effect for Dextran A at a fixed impurity level based on water; the level on sugar will clearly change with saturation. A change is noted over a relatively small temperature interval of 35°C (63°F). Some low molecular weight results of

[1] Sutherland: *I.S.J.*, 1968, **70**, 355–358.

*Present address: Department of Chemical Engineering and Chemical Technology, Imperial College, London, S.W.7, England.

†Supplied by A.B. Pharmacia, Sweden.

‡Supplied by British Drug Houses Ltd., England.

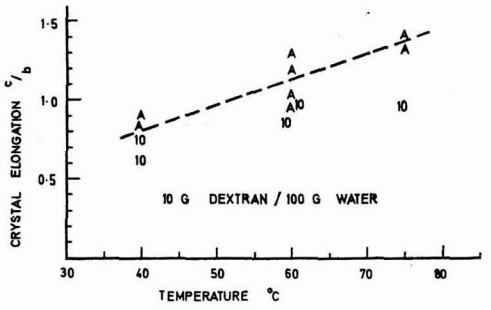


Fig. 3. Effect of temperature on crystal elongation

Dextran 10 are also shown and, as expected, these fall below the values for Dextran A.

Boiling Experiments: Dextran-Sucrose

A parallel series of trials was carried out in a small laboratory vacuum pan[1] using the same samples of purified dextrans added to pure sucrose syrups.

Method

The procedure followed was to seed the syrup containing 1·2 kg of sucrose with 50 g of —36/+52-mesh pure sugar crystals and to boil for 4 hours washing the pan (i.e. undersaturating the syrup by dilution with water) every 20 minutes. Repeated washing of the pan in this way is a useful laboratory technique for studying crystal shape effects since, owing to the lack of reversibility between the growth and dissolution processes, the resulting crystals show in exaggerated form the elongation tendency of the syrup. Dissolution is predominantly a diffusion controlled process and so roughly equal on all crystal faces; growth on the other hand is characteristic of the crystal habit.

The massecuite was finally centrifugalled and twenty crystals in the —16/+25 mesh fraction were measured by microscope. The results were expressed as an average crystal elongation defined as:—

$$\frac{\text{Crystal length along } c\text{-axis}}{\text{Crystal length along } b\text{-axis}}$$

The starting seed crystals exhibit *b*-axis elongation so that a reversal of this to give a *c*-axis elongated crystal is a positive result.

Boiling temperature could be varied between 45°C (113°F) and 90°C (194°F) by altering the vacuum. The low temperature experiments were rather difficult to carry out since rapid boiling with much splashing on the pan walls led to a loss of seed and a low yield of crystal resulted.

Results

The results are shown in Fig. 4, 5 and 6 and are seen to be considerably more reproducible than the single crystal values.

Fig. 4 gives the effect of increasing the molecular weight at a fixed concentration of 1½% dextran in sugar and at a fixed temperature of 65°C. This may be compared with the single crystal studies shown in Fig. 2. Once again we have the same general trend of a small increase in *c*-axis elongation with an increase in molecular weight.

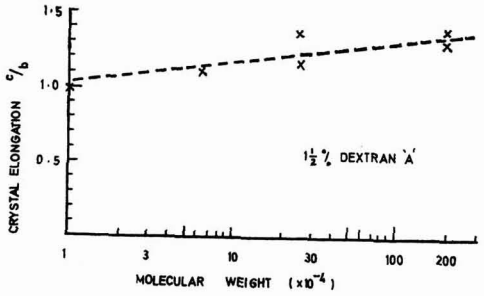


Fig. 4. Effect of molecular weight on crystal elongation

Fig. 5 shows the effect of increasing temperature on crystal elongation at a fixed level of 1% Dextran A. This may be compared with Fig. 3, the single crystal study for fixed impurity:water ratio. Again

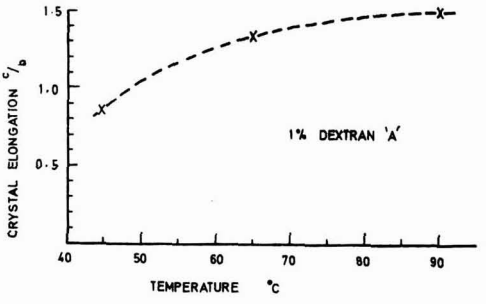


Fig. 5. Effect of temperature on crystal elongation

the same behaviour is found of an increase in elongation over a comparatively small temperature interval. The *c*-axis elongation is more pronounced at high temperatures.

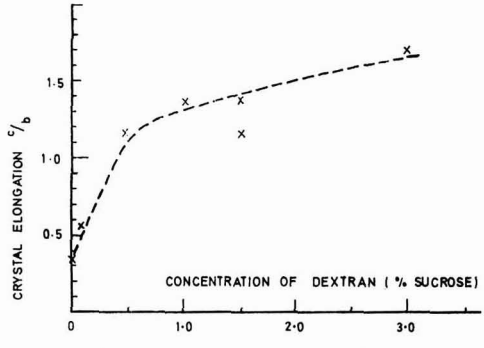


Fig. 6. Effect of concentration on crystal elongation

Fig. 6 gives the effect of increasing concentration of Dextran A on crystal elongation at 65°C. This may be compared with the single crystal results of Fig. 1. The form is somewhat different now and illustrates the ability of the cycling test procedure to magnify crystal elongation. The curve shows quite a steep rise with concentration and so provides a more sensitive measure of crystal elongation than the single crystal studies.

Boiling Experiments: Dextran-Factory Syrups

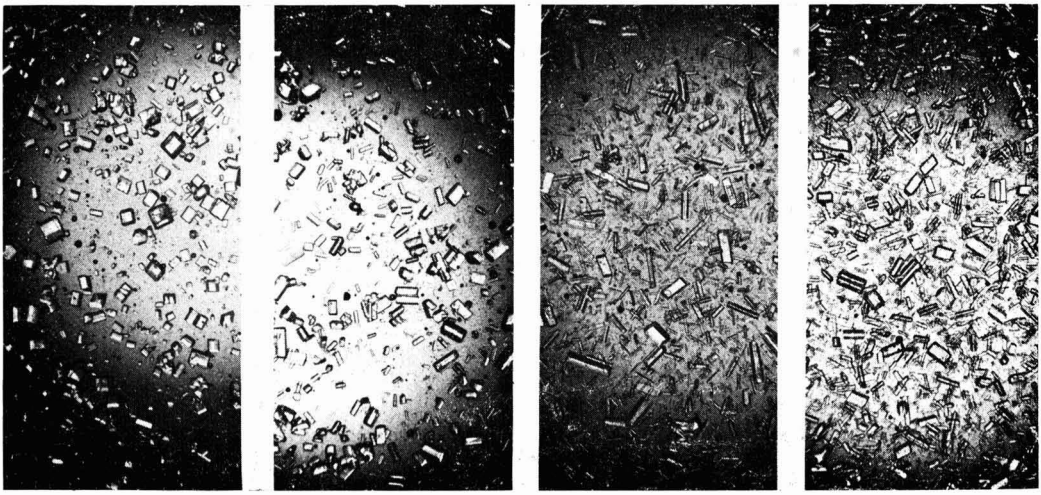
In order to achieve experimental conditions more representative of factory operation, boilings were made with a good syrup to which various levels of dextran were added.

Method

The syrups at a purity of about 72 were seeded with ball mill slurry and boiled with a minimum of washing for 2–2½ hours until the form of the crystal could be clearly established under a microscope.

Results

One series of results was given before for different levels of dextran added to a good quality mill syrup[1]. Fig. 7 shows another series. This time the same level (½%) of dextrans of different molecular weights was added to a low grade refinery syrup which initially grew reasonably well shaped crystals. With dextran added the elongation is seen to be extreme even at ½% level.



a b c d

Fig. 7. Effect of dextran added to refinery syrup: (a) no dextran added, (b) ½% Dextran 10, (c) ½% Dextran A, (d) ½%Dextran 2000

Two observations of interest may be made. First, there is a greater effect caused by change in molecular weight than was seen with pure syrups; the dextran of molecular weight 10,000 is clearly less effective than that of higher molecular weight. Second, there is a greatly increased potency for crystal elongation in factory syrups compared with pure solutions. As shown for dextran added to pure syrups, at least 1% is needed to give clear *c*-axis elongation, while in this refinery material only ½% gives grossly elongated crystals. There appears to be some interaction between the dextran added and other components already present in the syrup which results in an increased effectiveness in distorting the crystal shape.

Effect of Chemical Structure of Dextran

Dextran has been thought to be a linear polymer joined by α 1–6 glucosidic bonds. Jeanes *et al*[2]. in a comprehensive survey of dextrans produced by 96 different strains of bacteria found that marked differences occurred in the nature of the linkages along the polymer chain; 1–4 and 1–3 linkages also occur to varying degrees and give evidence of branching of the chains.

Nicholson and Lilienthal[3], and later Bruijn[4], isolated a polysaccharide which was formed within the stalk of stored cane and which had only about 30% of 1–6 linkages. Nicholson and Lilienthal found that this unusual dextran only formed within the stalk while the *Leuconostoc* associated with it yielded the common highly 1–6 linked polymer when grown in cane juice or synthetic media. Since deterioration of chopped cane is predominantly infection of juice at the cut ends, this mode of sucrose destruction always yields a dextran high in 1–6 linkages. Whole stalk deterioration, on the other hand, is less predictable and sometimes yields dextran with only 30% 1–6 linkages while sometimes yielding the normal material.

Experiments were carried out to see whether these materials behaved similarly when modifying crystal habit.

[2] *J. Amer. Chem. Soc.*, 1954, **76**, 5041.
[3] *Aust. J. Biol. Sci.*, 1959, **12**, 192.
[4] *I.S.J.*, 1966, **68**, 356.

Method

Polysaccharide was isolated and characterized from a number of sources. A mill and refinery syrup which were known to produce elongated crystals were used; deteriorated juice from sour chopped cane was taken and also cane stored in the open for at least four weeks was crushed and the juice used as a source of dextran. In each case starch and protein were removed and the polysaccharide precipitated by alcohol in the usual way.

The periodate oxidation analysis of NICHOLSON and LILIENTHAL[3] was used to determine the proportion of linkages in each sample and the materials were then tested for their effect on crystal shape.

Results

The results are shown in Table I and Fig. 8. The native dextrans having a high proportion of 1–6 links behaved in a similar way to the purified dextrans, but of particular interest was the polysaccharide formed from stored cane which was very low in 1–6 links. This material had very little effect on crystal elongation despite the fact that it produced an extremely viscous syrup. The refinery sample fell between these extremes which was in agreement with its intermediate structure.

Table I. Analysis and effect on crystallization of native dextrans

	Linkage analysis			*Effect on crystallization*	
Sample	%1–6	%1–4	%1–3	% *Added*	*Elongation c/b*
Refractory mill syrup	83	11	6	1·0	1·27
Refractory refinery syrup	60	22	18	0·6	0·64
Deteriorated juice	79	7	14	0·5 1·5	0·98 1·64
Stored cane I	32	66	2	0·75	0·57
Stored cane II	33	64	4	0·75	0·61

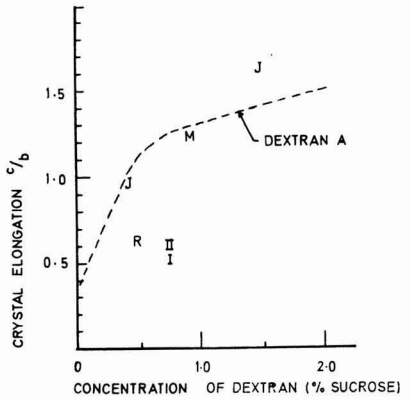


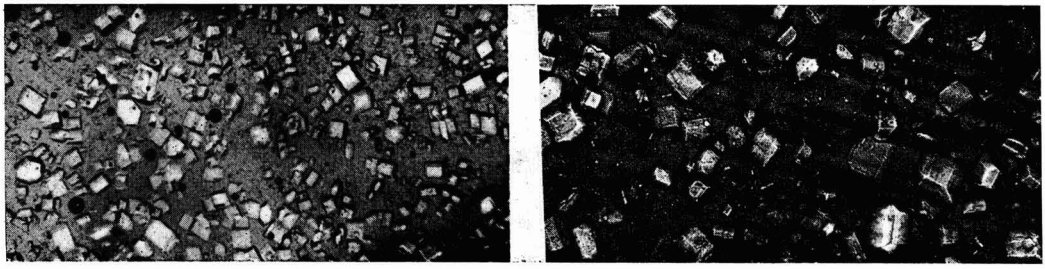
Fig. 8. Effect of native dextrans on crystal elongation; M refractory mill syrup, R refractory refinery syrup, J deteriorated cane juice, I stored cane (1st sample), II stored cane (2nd sample

on solids. The polysaccharide considerably reduced the apparent boiling rate owing to an increase in viscosity, but there is little effect on the shape of the crystals.

DISCUSSION

These further results confirm that dextran can promote *c*-axis elongation in sugar crystals. The experiments in pure solutions indicate the general pattern of behaviour which is an increase in elongation as the concentration, temperature, and molecular weight are raised. The effect is not particularly strong in pure solution, however, and unrealistically high levels of dextran are needed to show significant elongation.

In factory syrups the effect of dextran is much more pronounced. The addition of dextran at $\frac{1}{2}$% or less in some syrups can cause extreme elongation and



a b

Fig. 9. Effect of cane dextran (30% 1-6 linkages) on boiling of factory samples: (a) $\frac{1}{2}$% added to mill syrup, (b) $\frac{1}{2}$% added to refinery syrup

As reported previously, starch (predominantly 1–4 linkages) does not promote *c*-axis elongation[1]; thus, if we consider an increase in 1–4 linkages as an increase in the starch-like character of the polysaccharide, the crystallization behaviour is as expected.

In Fig. 9 is shown the effect of adding the dextran rom stored cane to factory materials at the $\frac{1}{2}$% level such levels are not unreasonable for very bad syrups. The factors which contribute to make dextran more potent in factory syrups are not yet fully understood, but it appears that some other materials are present in the juice which interact with dextran to exaggerate its effect as a habit modifier. These substances are apparently present to different extents in different

syrups, as shown for the mill and refinery samples, so it is not yet possible to predict the crystallization behaviour of a syrup simply from its dextran analysis. The effect of molecular weight is apparently also more marked in factory syrups than in pure sucrose and an increase in molecular weight from 10,000 to 2,000,000 gives a significant increase in crystal elongation.

The other finding of considerable interest is that related to the proportion of the 1–6 linkages present and their effect on crystal elongation. It suggests that perhaps only one component of what is doubtless a very complex mixture of polysaccharides causes crystal elongation when stale cane is processed. The conditions under which this material forms are not at all clear, but inoculation of juice or sucrose solutions by *Leuconostoc* appears always to produce the harmful product. Polysaccharide production within the stalk, however, is less predictable and may produce the starch-like dextran having less effect on crystal elongation. On other occasions infections in the stalk will produce the normal highly 1–6 linked polymer but the reason for these differences is not yet known[3].

Also, the finding emphasizes the danger of mechanical chopper harvesters. With the cane cut into small pieces the polysaccharide formation will be predominantly in the juice at the cut ends and not within the stalk. Such infection always yields the highly 1–6 linked dextran which is responsible for crystal elongation and explains why needle grain formation has become such a problem with deteriorated chopped cane. When whole-stalk cane deteriorates, the polysaccharide produced will sometimes result in needle crystals, while at other times it will merely lead to an increase in syrup viscosity. The syrup will be refractory and slow boiling but will not form *c*-axis needle crystals.

Conclusions

Experiments with dextran added to pure sugar syrups indicate that it promotes *c*-axis elongation in the crystals produced and that the extent of the elongation is enhanced by raising the temperature and the molecular weight or concentration of the dextran. Comparatively high concentrations are needed in pure solutions. In factory syrups the effect of dextran is much more pronounced and even ½% produces extreme elongation; there appears to be some interaction between the dextran and other components in the juice to give this amplification. The structure of dextran is also important and the most effective material is that joined mainly by α 1–6 glucosidic linkages.

Acknowledgements

Mrs. E. Farkas and Mr. H. Suzor are thanked for assisting with the experimental work, Mr. S. R. Harris and Mr. J. Keniry for providing samples, and the Colonial Sugar Refining Co. Ltd. for permission to publish this work.

The need for hoeing of sugar beet

By EMIL MANOV (Bulgarska Zahar, Gorna Oryachovitsa, Bulgaria)

ONE of the biological characteristics of the sugar beet is its sensitivity to the nutritive, moisture, thermal and atmospheric conditions of the environment. No less important is the structure of the soil, compaction of which plays a decisive rôle in the growth of the root lengthwise and particularly in weight.

This complex of interrelated factors can have an optimum effect on the growth of the plant in an easily workable soil, providing the best conditions for accumulation and conservation of water by destruction of the capillaries and improving the nutritive conditions and heat exchange. In a well-aerated soil, conditions do not exist for development of anaerobic micro-organisms which cause rotting of the young roots from their most tender age up to harvest.

It is for this reason that early spring hoeing is practised successfully in Bulgaria as a means of combating black leg and later the appearance and development of other diseases such as *Fusarium*, *Pythium debaryanum*, *Aphanomyces*, etc. The phytosanitary action of hoeing is incontestably proved and widely made use of in wet years and under irrigation conditions where mosses can appear as well as diseases; the acidity and salinity increase, and thus have an adverse effect on the beet.

According to Melnichuk[1], the optimum penetrability of air is situated between the following limits, % volume of soil:

	Semi-heavy soils	*Heavy soils*
before thinning	8–10	10–12
before covering of inter-rows	10–12	12–15
before harvesting	12–15	15–20

This biological need of the beet means in practice that we must not only maintain but also improve the workability of the soil during vegetation and up to the moment of harvesting. The layer of arable soil must be workable; its weaker resistance is necessary for normal growth of the beet root, which must push down into the soil and not branch.

As to development of the root system of the beet, surface hoeing of the soil in the inter-rows can hardly impair it, since

(i) the hoeing depth is small compared with the length of the main root;

[1] *Sakhar. Svekla*, 1957, (3), 29.

(ii) The secondary roots growing in the surface layer of soil soon perish after the first signs of drought and, in any case, we do not rely on their activity for growth of the plant. If this surface layer becomes wet, the rootlets torn up by the passage of the hoeing elements will re-establish themselves very rapidly on the basis of the principle of mutilated plants.

(iii) The root system of the beet is better able to spread deeply into well-worked soils. In compacted soils which have not been hoed, the roots develop in the surface layer of the soil and the main root remains "sluggish", branched and deformed. These "celery"-shaped roots always give only fair to poor yields.

Data accumulated from wide experience in Bulgaria and in Czechoslovakia emphasize the importance of multiple hoeing of beet. It is not by chance that the sugar beet has come to be regarded in agronomic circles as a "clean" crop. i.e. benefiting greatly from clean weeding.

The need for hoeing is not restricted to the necessity to maintain fields clean and free of weeds.

Fig. 1. *Right:* beets cultivated by 6–8 cm deep hoeing; *left:* beets cultivated by progressively deeper hoeings

In the present state of the chemical struggle against adventitious plants or weeds in agriculture, beet growers unfortunately still do not have at their disposal any reliable and effective means against weeds. The range of effectiveness of commercial herbicides is still very limited. Under irrigation conditions this is shown in a striking manner: seeds of weeds are disseminated over great distances by irrigation water and the floral population becomes extremely rich and varied both in autochthonous as well as allochthonous species. In beet fields under irrigation in the north of Bulgaria, in triennial comparative tests with 8 herbicides we have counted 50 different species of weeds, most of them allochthonous, having been carried by waters from the mountain plains of Rila. For destruction of all these weeds we would need to use every commercial herbicide. We have observed the same phenomenon in the fields of the institute at Sopronhorpacs in Hungary, where attempts are being made to combat this botanical diversity by using herbicide mixtures. On the other hand, localized treatment with "Pyramin" alone costs four times as much per ha as manual weeding.

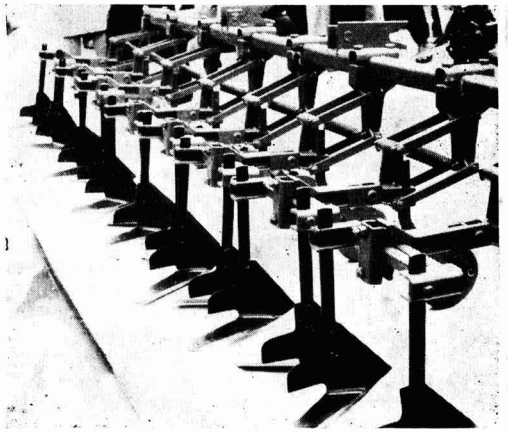


Fig. 2. Blades for the first hoeings

Because it is impossible to combat weeds with herbicides cheaply and effectively, in Bulgaria we successfully make use of agricultural engineering methods: digging up stubble, deep ploughing and autumn hoeing (twice in the case of weed invasion).

Fig. 3. Mounting of protective discs and hoe blades

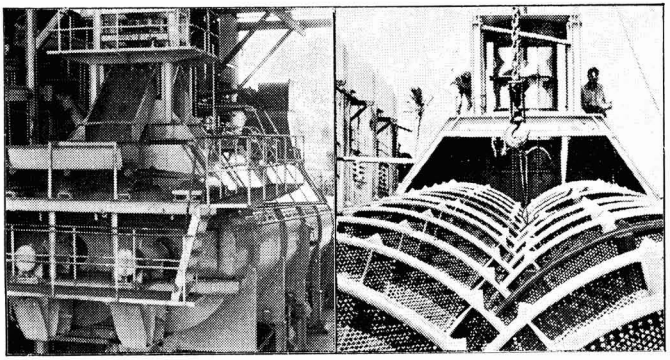
Contrary to the practice in the USSR and Central Europe, our efforts are directed towards transferring the work from spring to autumn, leaving only harrowing for the spring. Repeated passage of machines and agricultural implements in beet fields during spring, as recommended by GRAAF, SVETLICHNYI and others, has been shown to have an adverse effect on the harvesting and growth of the beet.

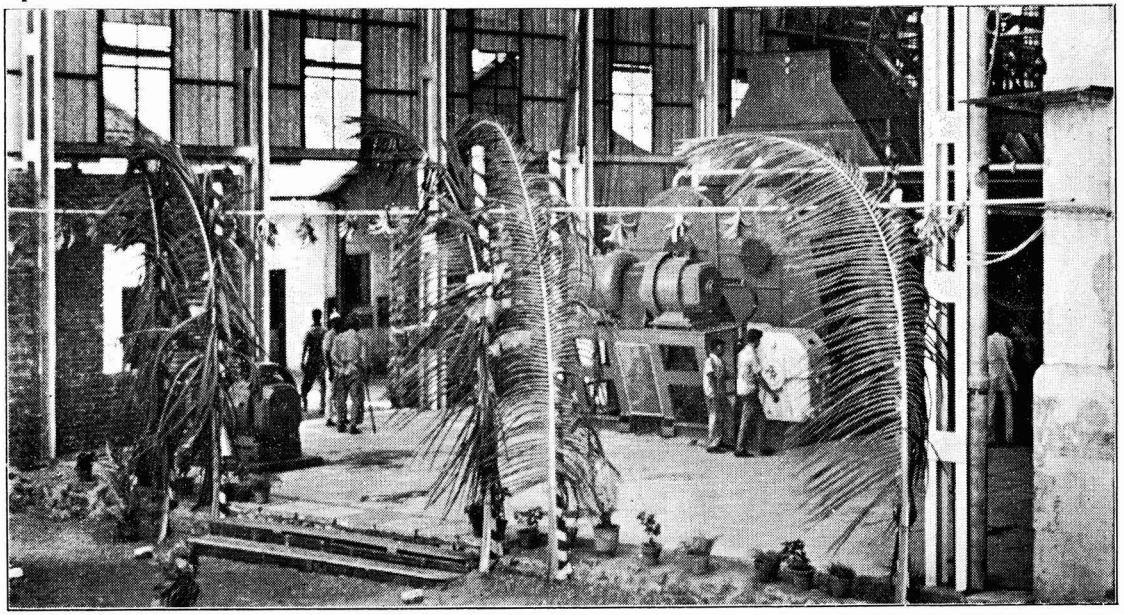
The essential ingredient in the new technique applied in Bulgaria is the maintenance of the beet field throughout the growth period in an easily workable state by means of repeated hoeing (4–7 times) to a progressively increasing depth: 4–6 cm for the first and 12–14 cm for the last hoeing. It appears that this new technique is not used in other European countries, where hoeing to a depth of 8 cm is considered "deep". Besides, it cannot be applied because the European (Canadian) hoes are light and provided

DDS

CANE DIFFUSERS IN ACTION...

DDS-CANE DIFFUSERS in sugar mills throughout the world have all improved extraction to more than 97 % with a corresponding increase in sugar yield. They are supplied through licensees and representatives on all continents.





DDS-CANE DIFFUSERS operate at diffusion periods of less than 30 minutes at temperatures below 70° C and are made of stainless steel to make the undesirable lime addition unnecessary. Capacities range from 30 to 400 tons per hour.

LEVERANDØR TIL DET KGL DANSKE HOF

AKTIESELSKABET DE DANSKE SUKKERFABRIKKER

D D S

A/S DE DANSKE SUKKERFABRIKKER

5, LANGEBROGADE - COPENHAGEN K - DENMARK

Sugar manufacturer since 1872 - daily production 4.500 tons of white sugar
Supplier of more than 300 DDS-Diffusers for sugar extraction all over the world

only with blades which cannot penetrate to a depth greater than 8 cm (Fig. 2).

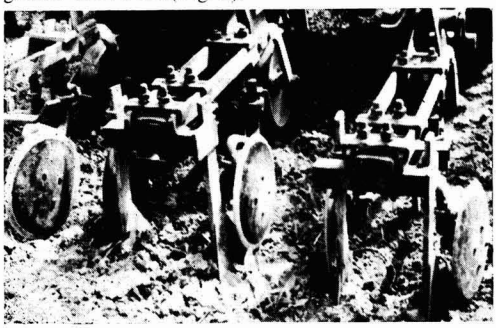


Fig. 4. Blades and protective discs for the first hoeings

Since 1955 we have been experimenting with the new technique; in 1964 it was applied to the whole of the beet area of 220 ha at Morava village and during the last 3 years to 7342 ha in the Veliko Tirnovo region. Since 1965 the method has been made general for almost all of Bulgaria. We have elaborated and put into operation supplementary elements for hoes and tractors: protective discs (Figs. 3, 4) for each row of hoe blades for the first two hoeings, and protective plates for the last. Official sanction has been given to commercial production of these parts. Use of the "goose-foot" type of element in beet fields has been discontinued, tines being widely used for the last hoeings (Fig. 5).

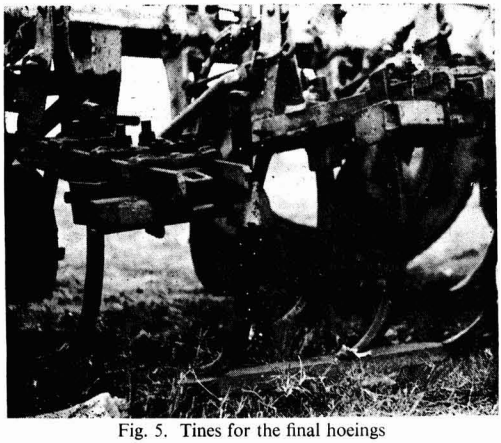


Fig. 5. Tines for the final hoeings

The improved state of the soil structure (Fig. 6) greatly facilitates the work of the beet harvesters. The fact alone that the dirt tare (loose and adhering soil) is only 5–10% for mechanically-harvested beet proves the efficiency of this method, while data from tests and wide practice outside Bulgaria indicate much higher dirt tares, necessitating the use of beet cleaning loaders.

The increase in beet yields through application of repeated, progressively deeper, hoeing is remarkable and gives rise to the statement that "each hoeing increases yield by 20% and is equivalent to one irrigation". This rule has been confirmed by tests and practical work. Data from the Ivanovskaya experiment station fields at Biisk and Ufim in the USSR (1960) show that the yields increase with each successive hoeing.

1 hoeing	2 hoeings	3 hoeings	4 hoeings
100%	126%	140%	148%

According to YAKUSHKIN & KUZNETSOV[2] the beet should be hoed 5–10 times. SMIRNOV[3] recommends 10 hoeings. PRYANISHNIKOV[4] shows that even late hoeings given an increase in yield of 800, 2500 and 3600 kg/ha.

Fig. 6. The soil is kept constantly workable

The increase in yield resulting from the greater number of hoeings has been confirmed by our own tests and by large-scale practice:

Number of hoeings	*Relative yields*	
	Tests	*Practice*
1	100	100
2	127	135
3	154	207
4	173	272

Application of the new technique to beet cultivation during the last 4 years has widely contributed to an increase in the yields on cooperative pilot farms in the Veliko Tirnovo region and throughout the country.

Table I. Average root yields (kg/ha and %). (*a* = old method, *b* = new technique.)

Locations	*Area* (*ha*)	*Yields* (*a*) 1960-63 (*kg/ha*)	*Yields* (*b*) 1964-67 (*kg/ha*)	*Yield increase* % (*a* = 100)
Alekovo	300	20,450	51,640	252
Alvanovo	100	18,670	40,680	218
Polykraishte	300	28,750	53,600	186
Ressen	400	33,850	59,130	177
D. Oryachovitsa	500	25,930	43,390	167
Kamen	300	26,580	40,770	158
Divdyadovo	200	34,100	52,830	155
G. Studena	220	27,580	40,840	148
Varbovka	220	31,140	43,140	139
Obedinenie	360	24,900	34,230	137
Morava	220	25,430	33,890	133
Veliko Tirnovo region	7,342	22,270	35,690	160
For the whole country	65,000	18,040	31,850	176

[2] "Tekhnicheskie kul'tury" (Moscow). 1955.
[3] "Rastenievodstvo". 1952, p. 428.
[4] *ibid.*, p. 575.

By extending the integral mechanization of beet cultivation practice, we have obtained a sharp reduction in manpower requirements per ha (reduced from 130 man-hours or more per ha to 40–50/ha) and per unit production (from 4 man-hours per ton of beet to 1·15/ton).

Moreover, agrotechnical methods can improve the beet sugar content by acting favourably on the plant-environment complex. This is one more factor in favour of repeated hoeing.

The effect of cane quality on milling loss

By R. R. FOLLETT-SMITH

THE milling loss, that is the percentage ratio of pol to fibre in bagasse, must have been one of the first measures used to estimate mill performance. It was incorporated in what was probably the first formula for pol extraction:

$$\frac{\frac{\text{Pol \% cane}}{\text{Fibre \% cane}} - \frac{\text{Pol \% bagasse}}{\text{Fibre \% bagasse}}}{\frac{\text{Pol \% cane}}{\text{Fibre \% cane}}} \times 100$$

or

$$100 - \left(\text{Milling loss} \times \frac{\text{Fibre \% cane}}{\text{Pol \% cane}}\right)$$

It continued to retain its interest since it splits the figure for sugar lost into two parts: one, the ratio of fibre to pol in the cane, over which the factory manager had no control and the other, the milling loss, which it was his duty to maintain at the most economical level.

However, it is reasonable to assume, all other things being equal, that a cane yielding sweeter juice will give a higher milling loss than a cane with inferior juice, but it has not been easy to measure this effect. HUGOT[1] suggested that "there was a question here worthy of worldwide study—to what extent, if any, does the initial content of Brix or pol in the cane or in the juice of the cane affect the milling loss".

The variation of milling loss with cane quality was brought to general attention by SIJLMANS[2]. His paper is mainly concerned with demonstrating the superiority of the term Undiluted Juice lost in Bagasse % fibre as a figure for international comparison. He states: "In Java it has been accepted as a fact for many years that pol in bagasse % fibre is not a good basis for mutual comparison because of its dependence on pol % cane."

In consequence his paper gives little indication of the magnitude of this effect.

He says of his Table I, reproduced in part below, "I have calculated the milling loss for all Java factories, equipped with crusher and four mills and arranged the figures in groups ascending by one pol % cane".

Table I. Milling loss and pol % cane

Number of factories	*Pol % cane*	*Milling loss*	*Fibre % cane*
10	11·8	5	12·2
34	13	5·66	12·5
33	13·9	5·74	12·5
15	14·8	6·01	12·3

The first figure for milling loss is incomplete and consideration of the other figures suggests that it approximates to 5·4.

Using the figures in the above table, with the amendment suggested, it is possible to calculate figures for the extraction ratio, the reduced extraction, the absolute juice lost % fibre (pol basis) and the whole reduced extraction suggested by MITTAL[3].

The extraction ratio is obtained by dividing 100 times the milling loss by the pol % cane.

The reduced extraction is obtained by subtracting one-eighth of the extraction ratio from 100, which is essentially similar to MITTAL's method.

The absolute juice lost % fibre (pol basis) is obtained by dividing 100 times the milling loss by the pol % absolute juice.

The whole reduced extraction is obtained by subtracting the milling loss from 100.

The figures so calculated are shown in Table II.

Table II

Pol % cane	*Extraction ratio*	*Reduced extraction*	*Absolute juice lost % fibre*	*Whole reduced extraction*
11·8	45·76	94·28	40·19	94·60
13	43·54	94·56	38·10	94·34
13·9	41·30	94·84	36·13	94·26
14·8	40·61	94·92	35·61	93·99
	−4·0%	+0·22%	−4·1%	−0·22%

The last line in the table shows the percentage variation caused by an increase of one unit in pol % cane. The figure for milling loss is +3·6%. It is evident that cane quality has a considerable effect on extraction ratio and on absolute juice lost % fibre.

BEHNE[4] pointed out that technical men prefer figures like reduced extraction or whole reduced extraction with targets of 100 rather than figures such as extraction ratio or absolute juice lost % fibre.

To obtain an estimate of the corrections necessary to bring reported figures to a basis of, say, 13·5% pol in cane, the records for 21 runs at Bybrook Factory, Jamaica[5] were examined. These records cover a wide range of imbibition rates and cane

[1] *Proc. 12th Congr. ISSCT*, 1965, 1706.
[2] *Proc. 3rd Congr. ISSCT*, 1929, 533.
[3] *Proc. 11th Congr. ISSCT*, 1962, 1046.
[4] *Proc. 11th Congr. Queensland Soc. Sugar Cane Tech.*, 1944, 24.
[5] INNES: *Proc. 1957 Meeting B.W.I. Sugar Tech.*, 234.

quality. The required corrections will vary directly with the milling loss, with the reciprocal of the pol % cane and with the difference between the reported pol % cane and the basis of 13·5% pol in cane.

In order to eliminate the effect of imbibition on the value of the milling loss, multiple regression equations were calculated with the two variables $-\log_{10}$ imbibition % fibre and K, where K is equal to:

$$K = \frac{\text{milling loss}}{Pc}\ (Pc - 13{\cdot}5)$$

and P_c = pol % cane.

The following two equations were obtained:

Equation A

$$\text{Milling loss} = 17{\cdot}88 - 5{\cdot}89 \log_{10} \text{Imb. \% Fibre} + 0{\cdot}416K$$

Equation B

$$\text{Extr. ratio} = 133{\cdot}8 - 44{\cdot}2 \log_{10} \text{Imb. \% Fibre} - 4{\cdot}43K$$

The two equations account for 97·2% and 96·9% of the total variations. Both factors of K are highly significant ($P > 100{:}1$).

In order to bring reported results to a common basis of 13·5% pol in cane, the following two corrections are needed—

For milling loss

$$- \frac{0{\cdot}416 \times \text{milling loss}\ (P_c - 13{\cdot}5)}{P_c}$$

For extraction ratio

$$+ \frac{4{\cdot}43 \times \text{milling loss}\ (P_c - 13{\cdot}5)}{P_c}$$

When these corrections are applied to SIJLMANS' milling loss figures in Table I and to the derived figures for extraction ratio in Table II, the following results are obtained:

Table III

Corrected milling loss	*Corrected extraction ratio*
5·72	42·3
5·75	42·6
5·67	42·0
5·79	42·9

In order to test these corrections over a wider range six examples were chosen from factory reports. They are given in Table IV, together with the corrected values and appear in Fig. I.

Table IV

	Pol % cane	*M.L.*	*E.R.*	*Corrected M.L.*	*Corrected E.R.*
A	16·65	8·10	48·6	7·46	55·4
B	14·20	2·94	20·7	2·88	21·3
C	13·12	5·85	44·5	5·92	43·8
D	12·50	3·98	31·7	4·11	30·4
E	12·15	4·94	40·6	5·17	38·2
F	11·28	8·87	78·7	9·60	71·0

The ratio of the figures in the penultimate column to those in the final column is 0·135.

Calculation of further regression equations to investigate the effect of fibre % cane on the value of the milling loss failed to show that it had any significant effect. Similarly, it was not indicated that the ratio of pol to fibre in cane had any real effect on the milling loss.

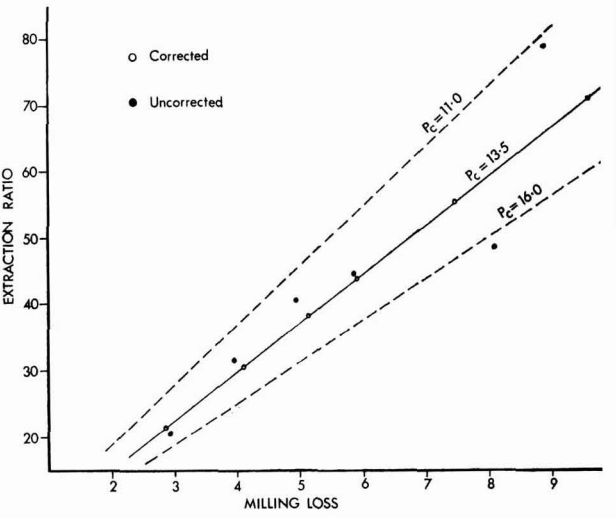


Fig. 1

Since the figures in Table II showed that the value for absolute juice lost % fibre (pol basis) decreases with increasing pol content of the cane, it was decided to examine the relationship between absolute juice lost % fibre (Brix basis) and the Brix of the first expressed juice. The result is shown in Equation C, which accounts for all but 3·5% of the total variation.

Equation C:

$$\text{Absolute juice lost \% fibre (Brix)} = 163 - 39{\cdot}1 \log_{10} \text{Imb. \% Fibre} - 2{\cdot}19 \times \text{Brix of first expressed juice.}$$

The effect of the Brix of the first expressed juice is highly significant ($P > 1000{:}1$) and indicates that a rise of one unit in the Brix of the first expressed juice reduces the figure for absolute juice lost by at least 5%.

This result is not surprising, for WILLIAMS[6] from 93 factory results obtained the following equation, D, with a correlation coefficient of + 0·9978.

Equation D:

$$AJL\%F\,(\text{Brix}) = 0{\cdot}999 \times AJL\%F\,(\text{Pol}) + 3{\cdot}21$$

Since the object of obtaining comparable mill performance figures is, presumably, to marry them to the output of mills of differing capacity in some such fashion as suggested by BIRKETT[7] it may be useful to record the operating data for Bybrook Factory for the crop year when the experiments were done[8].

[6] *Proc.* 1947 *Meeting B.W.I. Sugar Tech.*, 91.
[7] *I.S.J.*, 1936, **38**, 416.
[8] SHANNON: Private communication.

Milling Plant, 12 rollers, 24 in × 42 in	
Knives, 24 blades, 75 h.p.	
Long tons fibre per hour	6·34
Imbibition % fibre	152
Peripheral speed of rollers	30 f.p.m.
Pol % cane	13·26
Fibre % cane	13·80
Pol % bagasse	2·68
Fibre % bagasse	50·79
Milling loss	5·28
Pol extraction	94·51
Corrected milling loss	5·32
Corrected whole reduced extraction	94·68

Summary

It appears that all the recognised criteria for milling performance are affected by cane quality. A correction designed to reduce reported milling loss to a common basis of 13·5% pol in cane is suggested.

This corrected figure, subtracted from 100, would give a whole reduced extraction corrected to a common basis.

DDS cane diffusion in India

Comparative study at The Belapur Co. Ltd. before and after installation of a DDS diffuser

By K. H. PAREKH,

(Technical Adviser & General Manager, The Belapur Co. Ltd., P.O. Harigaon, Dist. Ahmednagar, Maharashtra State, India)

A DDS sugar cane diffuser was commissioned at The Belapur Co. Ltd. in the middle of the 1966/67 season. The results of the factory during this initial part-crop would not give a proper basis of comparison of factory operation and the data used for this study are therefore those of the 1967/68 season, when the diffuser was in full operation, and the 1965/66 season, when the factory was equipped only with mills.

During the 1965/66 season, experiments were made using higher imbibition % cane, but no benefit was found in mill extraction. There was a short break of 5½ days during the 1967/68 season when the diffuser was stopped and the factory worked only with four mills while, during the remainder of the season, a series of trials were carried out to study the effect of various factors on the working of the diffuser, irrespective of the final results; these trials affected the average results for the season which are, therefore, poorer than what is actually possible.

The mill at Belapur Co. Ltd. is a slow-speed tandem with a peripheral speed of the rollers of 22 f.p.m. At this speed, the designed capacity of the mill is 1000 tons/day of cane with a fibre content of 11–12%. A crushing rate of 1350 tons/day was maintained, with cane of 15·7% fibre content, during the 1967/68 season by maintaining more or less the same mill speed as in 1965/66 but increasing the mill openings, which reduced the mill extraction. In the case of a modern mill, it will be possible to increase the crushing rate by increasing the speed of the rollers and maintaining the same openings of the mills. In this way there will be no reduction in mill extraction and hence, while working with a diffuser, an extraction of 97% and more will be easily possible, even with a crushing rate increased to the maximum. Keeping the above in mind, we have to study the comparative results of the 1965/66 and 1967/68 seasons, average data for which appear in Table I.

Table I. Chemical control data from the two seasons*

	1965/66	1967/68†
Pol % cane	13·78	13·23
Fibre % cane	13·15	15·70
Recovery % cane	11·14	11·00
Molasses % cane	4·44	4·19
Gross mixed juice % cane	89·11	98·54
Nett mixed juice % cane	88·99	98·41
Mill extraction %	93·50	95·09
Reduced mill extraction %	93·87	96·23
Bagasse % cane	28·79	34·04
Imbibition % cane	17·90	32·58
Bagasse pol %	3·11	1·91
Bagasse moisture %	50·19	51·17
Mixed juice Brix	17·28	15·38
„ „ pol	14·47	12·78
„ „ purity	83·74	83·09
Primary juice Brix	20·41	19·31
„ „ pol	17·48	16·39
„ „ purity	85·64	84·88
Last expressed juice Brix	4·18	3·86
„ „ „ pol	3·15	2·72
„ „ „ purity	75·36	70·47
Final molasses Brix	95·66	97·19
„ „ pol	34·88	32·67
„ „ purity	36·46	33·61
Sugar (pol) balance		
Pol % cane	13·78	13·23
Pol in mixed juice % cane	12·88	12·58
Pol in bagasse % cane	0·90	0·65
Pol in filter cake % cane	0·03	0·04
Pol in final molasses % cane	1·55	1·37
Pol in sugars % cane	11·12	10·98
Undetermined losses % cane	0·18	0·19
Total losses % cane	2·66	2·25

Discussion

Comparing the quality of cane and its effects on the working of the factory, we find:

(i) The fibre % cane was higher in 1967/68 by 2·55 as compared with the 1965/66 season.

* The juice clarification processes, boiling house equipment and pan boiling schemes used in 1965/66 and 1967/68 were identical.

† All results inclusive of 5½ days when only the 4-mill tandem was in operation.

(ii) Primary juice purity was lower by 0·76 in 1967/68 as compared with 1965/66.

(iii) The drop in purity from primary juice to mixed juice was 0·11 less in the 1967/68 season than in the 1965/66 season.

From our experience of working only with mills, we estimate that if the same crushing rate had been maintained in 1965/66 but with the 15·7% fibre in cane experienced in 1967/68, the mill extraction would have fallen to 91%. However, owing to the addition of the diffuser, the mill extraction recorded was 95·09% on average and the reduced mill extraction 96·23% for the 1967/68 season. We would repeat that this average mill extraction would have been even higher if a number of trials for study of the effects of various factors on the working of the diffuser had not been conducted. In fact, during the last two months of the season, when practically no change was made in the working of the diffuser, we obtained a reduced mill extraction of 97% with a fibre content of nearly 16% on cane. We therefore conclude that:

(i) the DDS diffuser will give a reduced mill extraction of 97% under normal working conditions, and

(ii) the variation in fibre % cane has no effect on the reduced extraction and crushing capacity when working with the diffuser; it is well-known to all technologists that the fibre % cane has a great influence on both of these in the case of mills only.

From a study of the primary and mixed juice purity, we find that during the 1967/68 season, these purities are lower by 0·76 and 0·65 units, respectively. The effect of this lower purity would be expected to be a higher production of molasses, but we see from Table I that this did not occur; on the contrary, molasses production during the 1967/68 season was lower by 0·25% on cane by comparison with the 1965/66 season. Furthermore, in regard to molasses exhaustion, the final molasses purity was 36·46 in the 1965/66 season but came down to 33·61 during the 1967/68 season.

On the basis of the above results and observations we can draw the conclusion that the diffuser extracts less non-sugar in spite of increased extraction, which would explain the lower production and lower purity of final molasses in 1967/68 when the factory worked with the diffuser compared with 1965/66 when it worked with only the mills. Actually, non-sugar in mixed juice % cane during the 1967/68 season was higher than in the 1965/66 season. Final molasses production should therefore be higher, but has in fact proved lower. As claimed by the diffuser manufacturers, this proves that there is selective extraction and the lower production of final molasses can be attributed to working with the diffuser.

The higher non-sugar in mixed juice % cane during the 1967/68 season is due to the lower purity of primary and mixed juice, compared with the 1965/66 season, and, as may be seen from Table I, the fall in purity from primary juice to mixed juice was lower in 1967/68 than in 1965/66. We know from experience that, working with mills alone, if extraction during the 1965/66 season had been increased from 93·5 to 95·09%, the extraction of non-sugar would have increased considerably and that there would have been a larger drop in purity from primary juice to mixed juice. This is further evidence that the diffuser extracts less non-sugar in spite of higher extraction.

Comparison of the sugar balance shows that pol lost in bagasse in 1965/66 was 0·90% on cane when the fibre content was 13·15% on cane. With cane of 15·7% fibre, using mills alone, we would expect from experience that the extraction would fall to 91% and the loss in bagasse would have risen to 1·07%. As against this, we actually obtained a loss of 0·65% during the 1967/68 season when the factory worked with the diffuser. This reduction in pol loss in bagasse, plus the saving in pol loss in final molasses from 1·55 to 1·37% on cane, confirms the claim of the diffuser manufacturers of both improved mill extraction and reduced non-sugar extraction. The reduction of total losses from 2·66% on cane in the 1965/66 season to 2·25% in the 1967/68 season is due to the addition of the diffuser.

Finally we would like to point out that, before selecting this diffuser, we studied the specifications and technical working of various types of diffuser which were available on the market, and we selected the DDS diffuser because we were convinced that, in technical design, in maintenance cost and in actual working result, it is superior to other makes. Whereas most diffuser are of the percolating type, where a thick layer of finely cut cane is washed with juices of decreasing concentration and finally with water, without disturbing that layer, the design of the DDS diffuser is fundamentally different with the cut cane carried by a twin-scroll conveyor up along a trough against a counter flow of water which becomes enriched with sugar. Knowing well the harmful effect of liming on cut cane, the inventors of the DDS diffuser have designed their unit so that liming is excluded, and construct it in stainless steel so that no corrosion is caused by the unlimed juice, as can occur with mild steel construction.

In our opinion the above results have justified our selection in all respects.

Mauritius sugar statistics, 1968[1].—With an opening stock of 128,005 long tons and production of 587,155 tons[2], available supplies totalled 715,160 tons. Of this, 568,901 tons were exported, local sales were 28,864 tons and storage loss 479 tons, giving a final stock of 116,916 tons at the end of the year. The exported sugar included 414,301 tons to the UK, 139,200 tons to Canada, and the remaining 15,400 tons to the USA. A very severe drought has prevailed since the beginning of the 1969 campaign and most regions have been markedly affected[3]. At end-January, the 1969 crop estimate was about 625,000 metric tons (615,000 long tons).

* * *

Iran sugar research plans[4].—The Iran Sugar Mills Association, in collaboration with the Braunschweig Sugar Industry Research Centre, is to build a scientific research laboratory for sugar, the aim being to make Iran independent of sugar imports.

[1] *Mauritius Sugar News Bull.*, 1968, (12).
[2] *I.S.J.*, 1969, **71**, 64.
[3] *Mauritius Sugar News Bull.*, 1969, (1).
[4] *Consudel*, December 1968, (2); through *Sucr. Belge*, 1969, **88**, 120.

Sugar cane agriculture

New College of Agriculture cane varieties. ANON. *Mon. Bull. Univ. Philippines Coll. Agric.*, 1967, **33,** (1–2), 3; through *Plant Breeding Abs.*, 1968, **38,** 610. Two new sugar cane varieties, CAC 57-11 and CAC 57-60 are disease resistant, have good ratooning ability and give high cane yields with high sugar content. CAC 57-11, from the cross N:Co 330 × College 39, is early maturing and germinates well even under drought conditions.

* * *

Breeding methods in sugar cane. M. L. BRUZZO. *Rev. Indust. Agric. Tucumán*, 1967, **45,** 43–67; through *Plant Breeding Abs.*, 1968, **38,** 611.—The breeding plan and objectives in Tucumán and procedures for sowing seed, raising seedlings and evaluating them are described. The parents used are interspecific hybrids and have shown the best performance in progeny trials. Tucumán has become the most important producer of sugar cane seed in South America.

* * *

Long term experiments with fertilizers and manures on sugar cane in India. A. SINGH and R. P. ROY-SHARAMA. *Exp. Agric.*, 1968, **4,** (1), 65–75; through *Biol. Abs.*, 1968, **49,** 5255.—Yield and soil data are presented of 4 long-term experiments at 4 different centres. On soils where P and K were not limiting factors, application of ammonium sulphate over 14 years gave higher yields than application of farmyard manure and fertility status of the plots was in no way inferior.

* * *

Agricultural aspects of transplanting and spacing. L. G. NICKELL. *Rpts.* 1967 *Meeting, Hawaiian Sugar Tech*, 147–155.—The advantages to be gained from raising single-eye seed pieces or setts of sugar cane in a nursery—with plastic bags as containers—and transplanting these in the field at a regular 4 ft × 5 ft or 5 ft × 5 ft spacing are explained. An experimental mechanical transplanter is being developed.

* * *

Effect of gibberellin on sugar cane growth and sucrose production. T. TANIMOTO and L. G. NICKELL. *Rpts.* 1967 *Meeting, Hawaiian Sugar Tech.*, 137–146.—It is pointed out that only a year or so ago it was impossible even to consider gibberellic acid for field use because of its high cost. Now the position is very different, for the cost is much reduced because of the availability of the unrefined product, which has proved just as effective as a growth stimulator with sugar cane. Trials with this unrefined gibberellin are discussed.

Sugar cane ripening with chemicals. L. G. NICKELL and T. TANIMOTO. *Rpts.* 1967 *Meeting, Hawaiian Sugar Tech.*, 104–109.—The desirability of finding suitable and reliable chemical ripeners for the special conditions prevailing in Hawaii is explained. An account is given of experimental work with "Trysben" or TBA (2,3,6-trichlorobenzoic acid) and its advantages and disadvantages discussed. Six other chemicals which have now been advanced to the field-plot testing stage are referred to.

* * *

Development of a new sugar cane germplasm pool for Hawaii. D. J. HEINZ. *Rpts.* 1967 *Meeting, Hawaiian Sugar Tech.*, 79–82.—It is explained that with changes in breeding programmes with sugar cane the need for a wider range of germplasm, especially with *Saccharum spontaneum*, becomes more urgent.

* * *

Sulphur requirements of sugar cane. I. YONIMITSU. *Rpts.* 1967 *Meeting, Hawaiian Sugar Tech.*, 24–29. Reasons why sulphur deficiency may be developing in some of the sugar cane soils of Hawaii are given, changes in fertilizer practice being one of the causes. Results of extensive tests (for the Hutchinson Sugar Company) are discussed. On sulphur-deficient soils it was found that sulphur application increased nitrogen levels which allowed higher cropping.

* * *

The importance of controlling ratoon stunting disease in sugar cane. I. L. FORBES. *Sugar Bull.*, 1968, **46,** (11), 14.—The opinion is expressed that this disease (RSD) actually causes greater losses in Louisiana than does mosaic disease. The necessity for heat treatment of planting material and the need for clean seed plots is urged. The belief is now held that it may have been RSD that caused the failure or rapid decline of the noble varieties.

* * *

Intercropping sugar cane with legumes. ANON. *Victorias Milling Co. Expt. Sta. Bull.*, 1967, **14,** (11/12), 8–9.—The first harvest results of experiments in intercropping sugar cane in early stages of growth with three legumes or pulse crops are given. The pulses were peanut, soybean, and yellow mongo. Results are shown in a table. Plots with peanuts gave the highest sugar yield and soybean the second highest. Peanuts provided the best return in combining sugar yield with the relatively high gross income from the peanuts.

Heterodera sacchari, **a cyst-nematode pest of sugar cane new to Nigeria.** M. L. JERATH. *Plant Disease Reporter*, 1968, **52,** 237–239.—This nematode causes damage to sugar cane on a sugar estate in northern Nigeria, on light or sandy soils, causing cane to be stunted with leaves yellowing prematurely. Results of investigations on extent and type of damage and cyst population during 1966–67 are reported in this paper.

* * *

Controlling Johnson grass and Raoul grass on ditch-banks. ANON. *Sugar Bull.*, 1968, **46,** (12), 6.—To destroy these two weeds completely and so prevent them spreading into cane, the use of sodium chlorate (600 lb/acre for Johnson grass and 300 lb/acre for Raoul grass) and MSMA (monosodium methane arsonate), at 3·5 to 4 lb in 60 gal water/acre plus surfactant or wetter, is recommended.

* * *

Interrelationships of gibberellic acid and nitrate in sugar production and enzyme activity of sugar cane. A. G. ALEXANDER. *J. Agric.* (Univ. Puerto Rico), 1968, **52,** (1), 19–28.—It is pointed out that both nitrate stress and foliar treatment with gibberellic acid are known to alter the sugar-forming capacity of sugar cane. This paper summarizes greenhouse and laboratory studies aimed at clarifying nitrogen and gibberellic acid relationships in immature sugar cane. The most favourable treatment for growth and sugar production was a combination of low nitrate and medium gibberellic acid. This induced moderate growth plus major sucrose increases.

* * *

Effect of wetting agents upon uptake by sugar cane of foliar-applied phosphorus. J. ROLDAN R., L. H. MEYER and R. A. LUSE. *J. Agric.* (Univ. Puerto Rico), 1968, **52,** (1), 38–46.—Results are given of experiments carried out to measure the effect of various factors upon uptake by sugar cane of foliar-applied phosphate, utilizing the radioactive isotope of phosphorus, ^{32}P, as tracer. Factors considered were wetting agent or surfactant used, some half dozen being tried, pH of applied solution, its concentration, number and time of spray applications. The two most effective wetting agents were "Tergitol 7" and "Sterox AJ-100".

* * *

Maturity studies of new sugar cane varieties in Florida. L. P. HEBERT and E. R. RICE. *Sugar J.*, 1968, **31,** (2), 11–13.—It is pointed out that varieties are needed in Florida that produce a larger portion of the total sugar in the upper portion of the stalks early in the season. CP 50-28 has this favourable quality but it has negative properties of high fibre and profuse flowering early in the season. Other new or promising varieties are discussed.

Forty years' progress in cane disease research. R. W. MUNGOMERY. *Producers' Rev.*, 1968, **58,** (3), 33. This is a report of an address made by the Assistant Director of the Bureau of Sugar Experiment Stations in Queensland. In the mid-1920's, when work on cane diseases commenced, Queensland had the most formidable array of diseases that any sugar-producing country could have. The value of quarantine and constant vigilance to prevent new diseases becoming established is emphasized.

* * *

Leaf scald still a threat. ANON. *Producers' Rev.*, 1968, **58,** (3), 37.—This bacterial disease still "lurks round the corner" in Queensland in its ability to remain dormant and is a threat to such useful but susceptible varieties as Q 63 and Q 66. Resistant varieties are being developed as soon as possible. A close watch should be kept on infected fields.

* * *

Alarm at soldier fly spread. ANON. *Producers' Rev.*, 1968, **58,** (3), 45.—Reference is made to the recent appearance of the soldier fly in cane areas in Queensland where it had not previously been troublesome. It is pointed out top priority is now being given to work on this serious pest with a view to developing the best possible means of control.

* * *

War on Guinea grass. ANON. *Producers' Rev.*, 1968, **58,** (3), 47.—Reference is made to the fact that Guinea grass (*Panicum maximum*) has become a troublesome weed to cane growers in northern Queensland. Its vigour and fire tolerance assist in its competition with cane.

* * *

Safety frame for tractor operators. ANON. *Producers' Rev.*, 1968, **58,** (3), 107.—Tractor accident research at Queensland University has resulted in an Australian firm producing a tractor operator's protector frame of simple design and priced economically. This is described in detail with photographs.

* * *

Preliminary investigations of a simple technique for estimating fibre content in sugar cane. M. T. HENDERSON, B. L. LEGENDRE, P. D. VIATOR and J. A. MARIOTTI. *Sugar Bull.*, 1968, **46,** (13), 8–15.—The method of estimating fibre here described is claimed to be very much less time consuming than the standard method, as described by SPENCER and MEADE[1]. Its greatest potential value is considered to be in breeding programmes and selective work. It may prove useful in other phases of such cane research.

* * *

Malawi's Sucoma sugar estate. ANON. *Sugar y Azúcar*, 1968, **63,** (4), 15–18.—This sugar cane estate, the first in Malawi, is located in the valley of the Shire at an altitude of 200–300 feet, the river draining into the Zambesi. Developments that have taken place

[1] Cane Sugar Handbook, 9th Edn. (Wiley, New York). 1963, p. 540.

are discussed, the factory having commenced commercial operation in August, 1966, when 3000 acres were under cane. As a result of earlier trials varieties cultivated include POJ 2878, N:Co 310, Co 617, Co 622 and N:Co 376.

* * *

Field drainage for sugar cane. ANON. *Bull. Expt. Sta. S. African Sugar Assoc.*, 1968, (18), 19 pp.—The need for good drainage with sugar cane is discussed as is the need to avoid the development of hardpan or "brak" conditions. Photographs vividly depict the harmful effects of brak on cane in South Africa. The various methods of drainage that may be employed, their advantages or disadvantages, are fully discussed.

* * *

Nitrogen and related investigations. ANON. *Ann. Rpt. Research Dept. Sugar Manuf. Assoc. (Jamaica) Ltd.*, 1965, 10–22.—A study of interactions between varieties, irrigation and nitrogen showed that varieties B 51415, B 41227 and B 49119 responded best to irrigation in April-sown trials. B 51129, B 49119 and B 51415 responded well to nitrogen. Results showed that the response of cane quality to nitrogen may be a varietal characteristic. B 51129 was outstanding for cane yield and quality. Trials of numerous selections and varieties are reported.

* * *

"Baron" used in lieu of "Garlon" to destroy stubble pieces of mosaic stool rogued in early June. R. J. STEIB and S. J. P. CHILTON. *Sugar Bull.*, 1968, **46,** (14), 6.—"Garlon" (4 lb "Dowpon" and ½ lb "Silvex" per gallon), fortified with petroleum solvent at a rate of 1 gal of "Garlon" to 4 gal of diesel oil, has been recommended since 1960 for destroying sugar cane stools infected with mosaic. "Garlon" has been withdrawn from the market but another chemical "Baron" has been found to be just as effective (4 lb active ingredient per gal).

* * *

Leaf scald found in the world collection at Canal Point, Florida. R. E. COLEMAN. *Sugar Bull.*, 1968, **46,** (14), 7.—This disease, new to Florida, was found in part of the World Collection of varieties or germplasm, at Canal Point. Steps to prevent its spread were taken immediately.

* * *

Standardization of bulk cane trailers. G. R. TIMMONS. *Sugar Bull.*, 1968, **46,** (14), 8–9.—The need for standardization in bulk hauling equipment used in United States cane fields is discussed. Recommendations for this, after interviewing equipment manufacturers and builders of cane trailers, are put forward.

* * *

Borer infestation and loss in the 1967 Louisiana sugar cane crop. L. J. CHARPENTIER, R. MATHES and W. J. MCCORMICK. *Sugar Bull.*, 1968, **46,** (14), 10–12. Harvest time surveys to determine degree of infestation by the sugar cane borer, *Diatraea saccharalis*, and crop losses caused by the pest have been carried out annually in Louisiana since 1935. Results obtained in all the Louisiana mill areas from 1962 to 1967 are given in a table. The average for 1967 was 16%, as against 14% for 1966 and 18% in 1965.

* * *

Nitrogen fertilizer use for cane. R. A. WOOD. *S. African Sugar J.*, 1968, **52,** 331–339.—This is the second and last part of the article[1] and deals with time and methods of applying nitrogenous fertilizer. The vexed question of the desirability or otherwise of split applications of nitrogen for sugar cane is discussed. Much may depend upon local soil and climatic conditions. Under South African conditions evidence generally favours an early single application of nitrogen. This promotes a rapid canopy to smother weeds.

* * *

The effect of hot water treatment (50·5°C for 2 hours) on germination and number of stalks produced with different cane varieties. J. DA CRUZ FILHO. *Brasil Açuc.*, 1968, **71,** (4), 22–23.—Hot water treatment of setts, as used against ratoon stunting disease, was applied to 9 different sugar cane varieties and compared with untreated controls. Results, showing considerable variation among different varieties, are given in a table.

* * *

Two species of locust on sugar cane. P. GUAGLIUMI and H. D. SOUZA. *Brasil Açuc.*, 1968, **71,** (4), insert between pp. 40 and 41.—In January 1968, some sugar estates in the Sate of Rio de Janeiro were severely attacked by locusts (*Rhammatocerus pictus* and *Staurorhectus longicornus*). The pests and the nature of the damage are described and illustrated with colour photographs.

* * *

Biological control of the "cigarrinha" pest of sugar cane. ANON. *Brasil Açuc.*, 1968, **71,** (4), 41–44.—The possibilities of biological control of "cigarrinha" (*Mahanarva indicata*) in Brazil are discussed, this pest being very serious with sugar cane. Results of field and laboratory work and observations made on the pest are given.

* * *

Sugar cane during the colonial period (in Brazil). L. V. DE OLIVEIRA. *Brasil Açuc.*, 1968, **71,** (4), 45–52. This is the third part or instalment of the article and deals with sugar cane in early days in Brazil, with special reference to Bahia and Pernambuco.

* * *

Dry cane cleaning starts in Hawaii. ANON. *Sugar y Azúcar*, 1968, **63,** (5), 18.—Reference is made to commercial scale tests of a new dry cleaner in operation on a Hawaiian sugar estate, the Experiment Station of the Hawaiian Sugar Planters' Association doing the work. Advantages over traditional "wet cleaning" are discussed.

[1] *I.S.J.*, 1969, **71,** 47.

Let's talk

Here's some tasty news for the sugar industry

Centrifugals – Fully and semi-automatic and associated equipment are now being manufactured by Manloves and will incorporate the latest Watson Laidlaw designs with our technical expertise and engineering skill.

Spare Parts – May be obtained from us for all previous Watson Laidlaw centrifugals.

Sugar Dryers – With specially designed lifting fingers for efficient use of airflow are now available in drum sizes up to 10 feet diameter.

Filter Presses – A comprehensive range of plate and frame designs are available.

Manlove Alliott & Co Ltd. PO Box 81, Bloomsgrove Works. Nottingham NG7 3HQ
Tel: Nottm. 75127 (3 lines) Grams: Manloves Nottingham.

Manloves

A MEMBER OF THE MELBRAY GROUP

Sugar beet agriculture

Dry matter of the petiole as an index for the selection of sugar beet plants. P. BERGEN. *J. Amer. Soc. Sugar Beet Tech.*, 1967, **14,** 396–399.—Individual sugar beet plants were selected for high percentage dry matter of the petiole from each of three populations. The results showed that selective selection could be made for this character and that simultaneous changes could occur in root weight and percentage sucrose of the progeny. Selections for high percentage dry matter of the petiole produced progeny with improved sugar content and selections for low percentage dry matter of the petiole produced progeny with improved root weight.

* * *

Effects of previous light exposure on respiration rate and dry weight of sugar beet leaves. M. STOUT. *J. Amer. Soc. Sugar Beet Tech.*, 1967, **14,** 400–404. Fixation of carbon dioxide by sugar beet leaves previously kept in darkness for several hours occurred very rapidly when the leaves were exposed to sunlight. Respiration rate of the leaves increased rapidly after only a few minutes of exposure. Reduction in respiration rate and dry weight of half leaves shielded from light occurred more slowly. Respiration rate appears to be stimulated by an increase in the concentration of substrate in the leaves at the time of sampling, although the magnitude of the stimulation may not always be proportional to the concentration of substrate as measured by dry weight. It is evident that other factors also influence leaf respiration.

* * *

A contribution to the problem of choosing a suitable herbicide among the new weed-killers for sugar beet. G. WINNER and W. SCHÄUFELE. *Zucker*, 1968, **21,** 139–143.—Some new herbicides for sugar beet are discussed as a result of trials with them. These are "Betanal", a promising post-emergence contact herbicide for dicotyledonous weeds[1,2], "Gatnon" a soil herbicide applied before or after sowing, and "NaTA" (trichloracetic acid) for control of grass weeds.

* * *

Influence of weed competition on sugar beets. R. L. ZIMDAHL. *Weeds J.*, 1967, **15,** (4), 336–339; through *Biol. Abs.*, 1968, **49,** 3289.—The effects of 4 densities of annual broad leaf weeds and grass weeds and a combination of both, on sugar beet, were studied. The study included effect on roots and tops, percentage sucrose and total solids, average diameter of beet roots and total plot yield, over a period of 2 seasons. Broad-leaved weeds were more competitive than annual grass weeds and the effects of an equal combination were intermediate. The effects on yield of tops, average root diameter and total plot yield were similar to the effects on root yield.

* * *

Cultivars for irrigated beet sowing. V. F. CHEBOLDA. *Sakhar. Svekla*, 1967, **29,** (12), 24–26.—Methods used in beet breeding at the Kirgiz station are outlined and 5 of the 6 polycarpic cultivars produced are described; two of these are resistant to mildew. Details are given of other important selections. Summer sowing under irrigation enables seed to be produced the following season without transplanting the roots.

* * *

The results of field experiments to determine the proper rate of sugar beet seeds per hectare. Y. BILGIN and R. GÜRAY. *Seker*, 1967, **16,** (64), 1–10.—An account is given of trials made during 1952/53 and 1964/65 on variation of the rate of sowing of seed and row width; in terms of plant population the results were inconclusive, but in terms of beet yield in tons per hectare they showed that 25 kg of seed per hectare, using a row width of 40 cm, was best.

* * *

Weed control in green stands of sugar and fodder beets. K. SELLKE and K. KOTMANN. *Zucker*, 1968, **21,** 183–190.—A new product, "Betanal", to control dicotyledonous or broad-leaved weeds in sugar beet after emergence, is described[3]. Chemical constitution and toxicology of the active ingredient ("Phenmedipham") are also discussed.

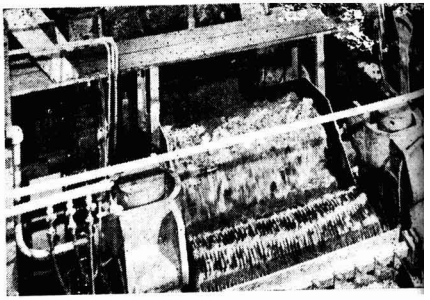
* * *

"Menazon" seed-treatment for aphid and virus control. G. D. HEATHCOTE. *British Sugar Beet Rev.*, 1968, **36,** 113–115.—Trials on sugar beet are discussed with this systemic insecticide (taken up by the roots and carried in the sap, making all parts poisonous to insects). It has proved valuable in protecting young sugar beet plants early in the season before regular spraying commences. Four ounces of "Menazon" ("Saphizon") is used to treat each 5-lb bag of sugar beet seed, the powder and seed being mixed in a revolving drum.

---

[1] *See I.S.J.*, 1968, **70,** 190.
[2] DETROUX *et al. : ibid.*,
[3] *See also I.S.J.*, 1968, **70,** 190, 370.

Cane sugar manufacture



The non-sucrose balance. C. M. MADRAZO *et al.* *Proc. 14th Conv. Philippines Sugar Tech.*, 1966, 24–28. See *I.S.J.*, 1968, **70**, 24.

* * *

High quality raw sugar production at Pasudeco. D. I. BALAGSO. *Proc. 14th Conv. Philippines Sugar Tech.*, 1966, 29–36.—Details are given of the clarification and 2-massecuite boiling schemes used at the cane sugar factory of Pampanga Sugar Development Co. Inc., where the raw sugar is of high refining quality as a result of the measures adopted.

* * *

Performance of the Silver continuous centrifugals at the Hawaiian-Philippine Company. J. E. EVANGELISTA. *Proc. 14th Conv. Philippines Sugar Tech.*, 1966, 37–45. The performances of Silver continuous centrifugals were compared with those of batch machines. In handling low-grade massecuite, the continuous centrifugals, operating at 2200 r.p.m., gave consistently higher final molasses purities than did the batch machines. Reducing the speed to 1800 r.p.m. not only did not improve the molasses purity, but also considerably reduced the capacity. Replacement of the screen having 0·005-inch diameter holes with one of 0·002–0·003-inch dia. perforations had some positive effect, but the molasses purity was still higher than with the batch centrifugals. Lump formation and a high percentage of fine grain in the handling of *A*- and *B*-sugars was overcome by reducing the speed from 1800 r.p.m. to 1450 r.p.m. and increasing the speed of the exhauster fan from 1740 to 2050 r.p.m. in order to produce drier, molasses-free sugar crystals. After these modifications, the appearance and grain size analysis of the sugar were comparable to those with the batch machines.

* * *

Hydraulic variable-speed drives in the sugar industry. C. M. RACELIS and L. B. FREEMAN. *Proc. 14th Conv. Philippines Sugar Tech.*, 1966, 46–49.—The advantages of hydraulic variable-speed drives are discussed and illustrated by the example of a cane carrier drive which is automatically controlled on the basis of the cane mat depth.

* * *

Sugar factory instrumentation. H. E. SAMONTE and D. YUMUL. *Proc. 14th Conv. Philippines Sugar Tech.*, 1966, 71–74.—An automatic system for controlling the maceration water:juice ratio in a mill tandem is described. The raw juice discharge line and the imbibition water line each have a weight totalizer and a flow rate recorder/transmitter; the transmitters send pneumatic signals to a recording ratio controller which automatically regulates a pneumatic throttling valve in the water line. Bubble-type level controllers on each of the collecting tanks or troughs ensure a steady, controlled flow of maceration water back through the tandem. A large-dial gauge installed near the cane feed operator station shows the raw juice flow rate and enables the operator to judge more accurately the rate at which to feed cane to the mill.

* * *

Bagasse burning in (a) multi-cell furnace. B. S. OCAMPO. *Proc. 14th Conv. Philippines Sugar Tech.*, 1966, 75–81.—Details are given of a Detrick-Dennis multi-cell furnace for the burning of bagasse and other cellulosic materials, which can be installed under any type of boiler and which has a number of advantages which are listed.

* * *

Pilot vacuum pan studies and experiments. C. M. MADRAZO and R. C. ALCANO. *Proc. 14th Conv. Philippines Sugar Tech.*, 1966, 98–102.—See *I.S.J.*, 1967, **69**, 341.

* * *

Hot process softener—ideal water treatment for a sugar mill. A. DAMIAN. *Proc. 14th Conv. Philippines Sugar Tech.*, 1966, 129–130.—The advantages of a hot lime-alum vaporizer for purification of raw water for use in a sugar factory are listed and other methods of purification briefly considered.

* * *

"Flintkote" applications in sugar centrals. C. A. LEONIN. *Proc. 14th Conv. Philippines Sugar Tech.*, 1966, 131–134.—The possible applications and advantages of Shell "Flintkote" asphalt emulsions as protective coatings in sugar factories are discussed.

* * *

Report of special committee on factory research & technology. E. R. DE LUZURIAGA. *Proc. 14th Conv. Philippines Sugar Tech.*, 1966, 135–142.—The report briefly discusses a number of subjects under the headings of engineering, boiling house, instrumentation and controls, bulk handling, and by-products. Details are given of new plant and processes introduced at Philippine sugar factories and references are made to Philippine sugar literature relevant to the subject discussed.

Performance of Edwards "Autocane" carrier drive at Bogo-Medellin. H. K. MIJARES and R. J. BANDOLON. *Proc. 14th Conv. Philippines Sugar Tech.*, 1966, 159–163.—See *I.S.J.*, 1969, **71**, 84.

* * *

Specialized lubrication system for the sugar industry. R. T. ANG. *Proc. 14th Conv. Philippines Sugar Tech.*, 1966, 164–166.—A procedure for scheduling and recording lubrication services in an industrial plant is described by a representative of Esso Standard Eastern Inc.

* * *

Factory expansion and modernization at Pasudeco. C. MENDIOLA and D. BALAGSO. *Proc. 14th Conv. Philippines Sugar Tech.*, 1966, 167–172.—See *I.S.J.*, 1969, **71**, 84.

* * *

A ball mill for making sugar slurry. C. M. MADRAZO and E. L. CABUGASON. *Proc. 14th Conv. Philippines Sugar Tech.*, 1966, 179–183.—See *I.S.J.*, 1967, **69**, 340.

* * *

A discussion of evaporator design. T. HAMILL. *Sugar J.*, 1968, **30**, (11), 22–26.—Statistical examination of juice flow in an evaporator indicates that with an average circulation of 2, over 28% of the juice will circulate more than average and 11·4% will circulate more than twice the average, i.e. more than 4 times. With an average recirculation rate of 3, some juice will circulate as many as nine times. Further, with juice recirculating and being concentrated less than the average, the over-circulated juice must also be over-concentrated to give the normal average, which conditions of over-circulation and over-concentration are liable to give excessive colour formation. To avoid this an evaporator should give once-through juice flow with the possibility of recirculation at near shut-down rates to avoid stagnation in the tubes. Two designs to permit this are illustrated; each embodies an external downtake for juice from a body in which the calandria spreads completely across the cross-section while the concentrated juice is withdrawn from the bottom of the downtake or from a surge tank at its upper end under the control of a valve which opens and closes in response to a signal from the next cell. Heat transfer in an evaporator and the hindrances to it are discussed, and it is proposed that the calandria and tube plates should be canted so that condensate on the steam side of the tubes should drain to one side, leaving the bulk of the tube area without the resistance of the water film.

* * *

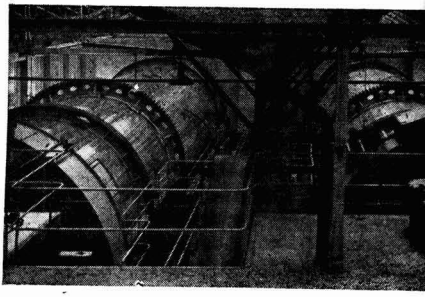
Boiler water treatment in Jamaican sugar factories. J. CASEY. *J.A.S.T.J.*, 1966, **27**, 44–47.—An account is given of a water treatment programme devised for Jamaican conditions, i.e. large-tube low-pressure boilers using substantial amounts of raw water and an absence of trained technicians to administer the treatments. The programme involves addition of NaOH or soda ash to maintain a pH of 9–10·5, phosphate to precipitate hardness as a soft sludge, colloids to suspend this sludge for removal by blow-down, sulphites to absorb dissolved oxygen, and anti-foams to reduce priming and foaming.

* * *

Sugar technology research in Hawaii. *Ann. Rpt. Hawaiian Sugar Planters' Assoc. Expt. Sta.*, 1967, 48–54.—Work reported includes preliminary work on the use of a computer to simulate factory processes[1] and collection of data from Waialua for use in evaluating the mathematical model of a sugar factory[2]. Studies of continuous centrifugal operation showed that rise in molasses purity averaged 1·2 and 2·5 units at two factories, and was greater in strikes with high contents of small grain. Optimum wash water rate was 0·05–0·14 g.p.m., less being inadequate and more raising molasses purity. When viscosity of molasses was reduced during purging, massecuite throughput increased and molasses purity decreased. Comparison of slurries produced showed that 4 hr grinding in a Sweco "Vibro-Energy" mill produced smaller and more uniform grain than 24 hr grinding in a conventional ball mill, while 4 hr grinding in a Ditmar slurry mill produced less uniform and larger grain. Batch crystallizers converted to continuous operation at two factories gave adequate molasses exhaustion when massecuite flow rate permitted proper cooling[3]. The importance of adequate reheating facilities was apparent. New boiling-down and crystallizing apparatus has shortened the time for determining molasses exhaustibility from 2 months to 14 days. Studies have been made of surface tension and viscosity of diluted molasses. A continuous analyser for refractometric Brix and pol was tested under factory conditions, and computing elements added for continuous recording of diffuser extraction found to work satisfactorily. A new method for determining insoluble solids in mixed juice was devised[4]. Initial tests were made on a surface scatter turbidimeter for continuous monitoring of diffuser-clarified juice. Sugars from 13 plantations were examined for visible and u.v. spectra before and after centrifuging to remove light-scattering particles. Infra-red spectra of five fractions separated from water-insoluble matter in sugar crystals indicated the presence of proteins, polysaccharides, humic acid, methoxyl-containing compounds, lipids and silicates. Initial experiments on tracing juice flow patterns in the Silver ring diffuser at Pioneer have used conductivity tracing after injection of brine in the juice stream at a given point. Ten new clarifying agents were evaluated against "Separan AP-30" as a standard; their performance was strongly affected by the juice being treated and results obtained are therefore not conclusive for general application.

[1] LUI: *I.S.J.*, 1969, **71**, 117.
[2] TAKAHASHI: *ibid.*, 117.
[3] MORITSUGU: *I.S.J.*, 1969, **71**, 116.
[4] RHODES: *ibid.*, 123.

Beet sugar manufacture



Liquid movement régimes in a bank of boiling tubes during evaporation. N. Yu. Tobilevich, I. I. Sagan' and Yu. G. Porzhezinskii. *Izv. Vuzov, Pishch. Tekhnol.*, 1968, (2), 147–152.—A study is made of conditions in an evaporator where, because of the large number of boiling tubes, e.g. 4000, the heat and hydrodynamic balance can be upset, thereby causing interruptions to normal circulation.

* * *

Modern electrical equipment for a beet sugar factory. E. Bläuenstein. *Zeitsch. Zuckerind.*, 1968, **93,** 237–245.—Details are given of the electrical equipment manufactured by Brown, Boveri & Co. for beet sugar factories, particularly for raw sugar production and D.C. drives for fully-automatic centrifugals. Brown-Boveri equipment at Aarberg sugar factory and refinery in Switzerland is described as an example.

* * *

Determination of the required heat gradient in a sugar factory power plant. H. Huber. *Zucker*, 1968, **21,** 305–307.—An equation is presented for calculating the theoretical heat gradient in a turbine, h_o; this factor is important in the combined generation of electricity and steam and governs the steam conditions to be selected for the boiler house. The equation takes account of irregularities in the flow of energy, and the desired steam conditions as a function of h_o and turbine back-pressure may be found in tables which are given. A diagram is also presented showing the various relationships.

* * *

Application of 2nd carbonatation at boiling temperature. III. Economic analysis. J. Dobrzycki. *Gaz. Cukr.*, 1968, **76,** 86–89.—Factory and laboratory tests showed that 2nd carbonatation at boiling temperature does not prevent over-saturation and does not permit better lime salts removal from the juice than does carbonatation at a lower temperature and optimum alkalinity. The method is also uneconomical because of the extra fuel required.

* * *

Decolorization-demineralization of sugar juices with macroreticular resins. G. Assalini. *Ind. Sacc. Ital.*, 1968, **61,** 69–78.—Characteristics of "Amberlite" macroreticular resins for decolorization and demineralization are described and tabulated, and some details given of their use in two Italian sugar factories in 1967/68. A new adsorbent resin, "Amberlite XAD-2", has a number of physical characteristics and affinities for adsorption of organic non-sugars which make it very suitable for pre-treatment of juices to be decolorized by the macroreticular resins.

* * *

Settling of beet piles. D. I. Kapelyushnyi. *Kharchova Prom.*, 1966, **30,** (6), 27–28; through *S.I.A.*, 1968, **30,** Abs. 68–118.—A 6 m-high beet pile was built around a metric scale in October 1961 and observed during 129 days' storage, after which it was only 5·43 m high; the height is graphed against time. The slip (as % of original height) is correlated to the % mass load for the 6 superposed 100 cm layers, marked by wooden planks tied to the scale. The slip is due mainly to drying out of beets and subsequent re-orientation owing to shrinkage. Small beets or trash decrease the slip by blocking spaces between larger beets.

* * *

Effectiveness of modernizing the (twin) scrolls of the DDS and S-17 diffuser systems. N. N. Pushanko, V. M. Lysyanskii and O. M. Buzykin. *Kharchova Prom.*, 1966, **29,** (5), 16–21; through *S.I.A.*, 1968, **30,** Abs. 68–121.—From an analysis of observed mass transfer coefficients (β) under various technical schemes, conditions for optimum mass transfer were established: draft = 105–111%, specific cossette loading $\geqslant$ 585 g/litre. Sugar losses were 0·3–0·4% on beet. β substantially increased after decrease of the cross-section of the scrolls, especially in the head section. The best transfer and agitation of cossettes occurs when screw flights with (fixed) counter-flights are used. The mass transfer coefficient increased rapidly as the equivalent diameter of the cossette increased from 1·6 to 2·0 mm.

* * *

Welding techniques cut repair and maintenance costs. P. Luescher. *Sugar y Azúcar*, 1968, **63,** (6), 24–26. See *I.S.J.*, 1968, **70,** 374.

* * *

Amalgamated Sugar Company combats water pollution. F. S. Nielsen. *Sugar y Azúcar*, 1968, **63,** (6), 28–29, 31.—The problems faced by the US beet sugar industry in controlling water pollution are briefly referred to and measures taken by Amalgamated Sugar Co. described and illustrated. At the MiniCassia and Nyssa plants a closed beet fluming re-utilization system has been adopted, in which the flume water is limed to pH 10–11 to increase settling of solids, while the pond storage conditions are made

such as to inhibit multiplication of the undesirable anaerobic bacteria and thus reduce unpleasant smell. At Nampa a conventional plant has been built in cooperation with the local authorities which successfully treats both town and factory wastes.

* * *

Waste water treatment in an activated sludge plant. F. W. MEYER. *Zucker*, 1968, **21**, 338–341.—At Ameln sugar factory the total effluent from a campaign is pretreated in settling tanks and then subjected to activated sludge treatment in a Lurgi plant. Over a long period (up to August) the BOD_5 is reduced from about 2000 mg/litre to 100 mg/litre, even with a 77% increase in water throughput (from 18 to 32 cu.m./hr) and using only 0·1% mud volume, the plant having a rated maximum capacity of 2500 mg BOD_5. Servicing and operational costs are about one-quarter of the original costs before the plant was installed.

* * *

Circumstances under which excessive sugar juice coloration occurs. W. STANKIEWICZ. *Gaz. Cukr.*, 1968, **76**, 111–113.—Causes of excessive increase in juice coloration, particularly after evaporation, were investigated. It was found that when sub-standard beet were processed, greater quantities of invert were introduced into process and remained undecomposed even after liming at 80°C. At this high temperature colour compounds form, particularly melanoidins. The soundness of juice sulphitation is indicated.

* * *

Pilot plant trials on beet sugar in India. S. C. GUPTA, N. C. VARMA, T. P. SAKSENA and J. S. MEHTA. *Indian Sugar*, 1968, **17**, 799–803.—An account is given of trials during the 1965/66 season on a 25 tons/day scale at Saraswati Sugar Mills, Yamunanagar, where locally grown beets were processed to clear juice. Extraction of sugar was higher than that guaranteed by the makers of the DDS diffuser, and juice Brix could be kept as high as 16·92° to yield an expected 12·09% sugar on beet. Beets washed in the field deteriorated faster than if left to be washed at the factory. If left in the fields, beets could be processed at 92–95°F without any significant fall in sucrose content, but extraction was slower. Foaming in the juice tanks and weighers caused physical losses, but foaming in the 1st carbonatation tanks was eliminated by adoption of De Haan carbonatation. Diffusion juice was of 84–87 purity and contained 1·3–1·4% reducing sugars on Brix. Filtration rate, apparent purity rise and juice clarity from 1st carbonatation were good, and lime consumption was about 2% on beet. Sugar beet processing in colder regions of India is considered possible without difficulty and at a profit.

* * *

Increasing beet processing by prolonging the campaign. S. VAJNA. *Zeitsch. Zuckerind.*, 1968, **93**, 281–289.—A beet storage system is proposed in which the beets are stored in piles measuring 230·5 m long × 62 m wide × 10 m high and covered with tarpaulins sewn together to form a large tent. The temperature of the stored beet should be reduced to +1°C by artificial ventilation. On the basis of 67,500 tons of beet stored in each of 4 such piles and 105,000 tons stored in a conventional pile, and assuming daily mean sugar losses of 70 g/ton of beet, the author works out the running costs and capital costs for concrete, air ducts, fans, tarpaulins, etc. and shows that the total is far less than the cost of a new factory or expansion of an existing one to process the extra quantity of beet per day required to enable the campaign to end in December, compared with a campaign ending in March with the "cold pile" system..

* * *

Use of carbonatation gas for treatment of feed water entering a diffuser. D. V. GORBAN'. *Sakhar. Prom.*, 1968, **42**, (6), 11–13.—The microbiological advantages of treating raw water with CO_2 to reduce the pH from 7·8–8·4 to 6·0–7·0 before it enters the battery diffuser at Oktyabr' sugar factory are noted. The raw juice is of lighter colour and circulates faster than without CO_2 treatment.

* * *

Calculation of (the parameters of) hydrocyclones for water purification. A. M. FOMINYKH. *Sakhar. Prom.*, 1968, **42**, (6), 14–16.—Formulae are given for calculating the water throughput and basic dimensions of hydrocyclones for given conditions.

* * *

Application of semi-conductor elements for automation of lime kiln charging. V. N. KATULKIN, V. M. KUNDIN and A. B. GUSAKOV. *Sakhar. Prom.*, 1968, **42**, (6), 19–24.—The potentials of ET semi-conductor functional and logical elements in automatic control schemes are illustrated by an arrangement for automatic control of lime kiln charging.

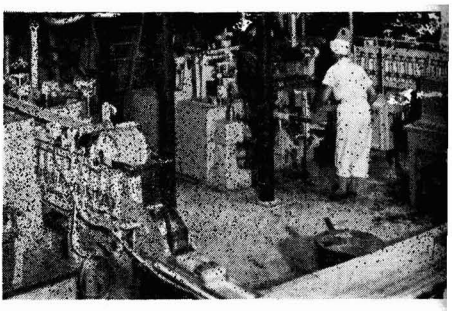
* * *

Increasing the lime activity and CO_2 content in carbonatation gas. A. S. KRENDEL'. *Sakhar. Prom.*, 1968, **42**, (6), 25–27.—The low free CaO content in lime from an anthracite-fired kiln is discussed and means of remedying the situation are considered.

* * *

Water in the sugar industry. II. P. DEVILLERS. *Sucr. Franç.*, 1968, (5), 147–150.—A water balance shows the need to store waste water for disposal during the whole year and not just during the campaign. Disposal and purification methods for polluted water are discussed; these include use for irrigation of a wide area of cultivated land or a small area of specially chosen land, injection to a great depth in the soil, concentration (especially of vinasse or ion exchanger effluents) and spray drying to a solid which can be used as fertilizer, biological purification by lagooning or use of a Pasveer ditch or aeration, and the use of microbiological filters or active sludge. Certain of the costs of water treatment have been calculated for a 3000 tons/day sugar factory and are presented.

Sugar refining



Experience in the operation of Odessa refinery during the final production period. A. D. PROKHLATOV. *Sakhar. Prom.*, 1967, **41**, (6), 26–27.—Modifications to the scheme used for cane raws at Odessa are described. These permitted a 1½-day reduction in the time taken to close production and a 79-ton decrease in the amount of intermediate products, the quality of which was also raised.

* * *

Programme boiling in pan control. S. HONDA and Y. AIZAWA. *Proc. Research Soc. Japan Sugar Refineries Tech.*, 1967, **18**, 1–9.—A white sugar pan having a heating element consisting of six concentric annular surfaces and an outside jacket was provided with a boiling control system developed by the authors in collaboration with Yamatake-Honeywell Co. Ltd. Details are given of the various controls, which are also shown schematically, which have permitted a considerable reduction in total boiling time and in steam consumption, while allowing crystal quality to be improved. No dilution water is necessary for supersaturation control, and supervision of the boiling is minimal.

* * *

Intensive decolorization of white sugar solutions. I. F. ZELIKMAN and D. M. LEIBOVICH. *Izv. Vuzov, Pishchev. Tekhnol.*, 1967, (4), 54–55.—Decolorization of 60°Bx white sugar solutions having a colour content in the range 1·2–2·3°St was greater when treatment with "Carboraffin" preceded treatment with AV-16G anion exchanger then when the anion exchanger was used alone. For the same degree of decolorization the syrup throughput of the resin could be at least trebled.

* * *

Defeco-saturation purification of syrup and remelt liquor. G. T. DEMIDENKO. *Sakhar. Prom.*, 1967, **41**, (8), 33.—Simultaneous liming and gassing of evaporator syrup and remelt liquor from raw and 2nd product sugar has been shown in various tests to have favourable effects on colour, lime salts and colloid contents, on molasses sugar loss and on purity of the treated product.

* * *

Modern sugar manufacturing plant. Y. SAITO. *Look Japan*, 1966, **11**, (122), 2–6; through *S.I.A.*, 1967, **29**, Abs. 561.—The process and plant used in modern cane sugar factories are described with diagrams. A special account is given of a refining process suitable for production of refined sugar for local consumption. Local refining of raw sugar is recommended, with or without carbonatation, as more efficient than white sugar manufacture by sulphitation or carbonatation. Decolorization columns of granular active carbon are used after filtration, and are operated by the pulsed bed ("slugging") system. Other factors improving the efficiency of a sugar factory are: production of cane containing more sucrose than fibre; use of diffusers instead of intermediate mills; electric mill drive by A.C. commutator motor; and extensive automation, including fully-automatic batch centrifugals based on motors of the multi-speed, secondary high resistance cage type. Diagrams are given of automatic control systems for lime mixing and defecation, and for quadruple-effect evaporators with B.P.E. control in the 4th effect. Manufacturers of the equipment in Japan are indicated.

* * *

The explosive property of sugar dust. K. Čtž. *Listy Cukr.*, 1967, **83**, 210–214.—The various factors involved in sugar dust explosions at refineries are discussed, particularly the relationship between explosive pressure and dust concentration. The lower limit at which an explosion could occur has been found to be about 12 g/cu.m. for particles measuring less than 70 nm.

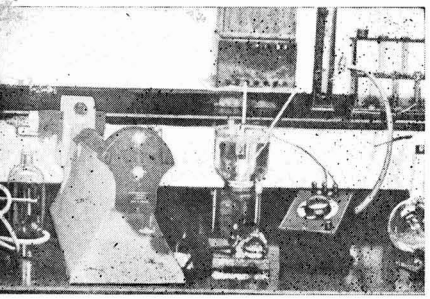
* * *

Specific resistance of refinery process carbonatation filter cake (mud). C. M. YOUNG. *Proc. 41st Congr. S. African Sugar Tech. Assoc.*, 1967, 87–93.—An equation of CARMAN[1] is used to derive a relationship between the square of the reciprocal of instantaneous flow rate of a filtrate and time, from which values of the specific resistance of the carbonate filter cake to carbonatation liquor flow can be easily determined. Tabulated data from a number of tests at constant pressure confirm the linearity of the relationship.

* * *

Korea's sugar success story. ANON. *Sugar y Azúcar* 1967, **62**, (12), 26–27.—Illustrations and information are given concerning the Cheil Sugar Co. Ltd. refinery established in 1953 at Pusan. The first sugar refinery in Korea, it has been expanded from 50 tons/day production to 375 tons/day. A flour mill and glucose syrup plant have been established adjacent to the refinery. The parent Samsung Group owns other plants, which are briefly mentioned.

[1] *Trans. Inst. Chem. Eng.* (London), 1938, **16**, 168–188.



Laboratory methods & Chemical reports

International sugar scale. R. BÜNNAGEL. *PTB Mitt.*, 1966, **76,** 412–415; through *S.I.A.*, 1968, **30,** Abs. 68–56.—The development of new photoelectric saccharimeters without quartz wedge compensation may restore uniformity to sugar measurement. The saccharimeter is easily calibrated with a 100°S quartz plate at a known wavelength λ; the proportional division of the 0 — 100°S space has been verified experimentally. The ratio of the angles of rotation $\alpha\lambda/\alpha_{(Hg\ green)}$ at 20°C (both wavelength referred to vacuum) is given by the formula $a + b\lambda^{-2} + c\lambda^{-4} + d\lambda^{-8}$, where $a = -1{\cdot}7982 \times 10^{-3}$, $b = 0{\cdot}2765318$, $c = 6{\cdot}55737 \times 10^{-3}$, $d = 10{\cdot}3825 \times 10^{-6}$. For a 200-mm thickness of 26 % (w/v) sucrose solution at 20°C, $\alpha = 40{\cdot}7643 \pm 0{\cdot}0009°$ for the green Hg line at 0·5462271μ. The new and old methods are compared.

* * *

Nomograms for checking reported factory data. J. F. WILLIAMS. *Proc.* 1966 *Meeting B.W.I. Sugar Tech.*, 377–381.—Nomograms have been prepared, based on the DEERR *s-j-m* formula[1], and their use described for checking: (1) molasses output data from mixed juice and molasses purity, for 98·1 and 98·5 purity sugars, (2) pol recovery, and (3) boiling house efficiency.

* * *

The assessment of cane quality in Barbados. I. Pilot scheme, 1966. R. R. TROTT and J. C. HUDSON. *Proc.* 1966 *Meeting B.W.I. Sugar Tech.*, 382—387. **II. Flow-through method for sampling and analysis of first expressed juice.** D. H. WEST. *ibid.*, 390–395. **III. The analysis of data obtained during the experiment.** J. C. HUDSON and M. KIRTON. *ibid.*, 388–389.

I. Sampling and analysis for cane payment on sucrose content would be very difficult and expensive in Barbados which has many small factories, and it is considered better to introduce a premium/penalty system for extra good/bad cane. For quality assessment a 50-lb cane sample is taken from the middle of a load and dumped into a 100-gal tank of water. On stirring, the leaves and stem trash separates by floating and is recovered, drained on mesh trays and weighed; the wet weight is easily correlated with the dry weight and hence trash content of the cane. The crusher juice is analysed for Brix and pol, and a cane sample, prepared by a Jeffco cutter-grinder, is analysed for fibre.

II. The juice sample is obtained through a screen section in the crusher juice chute and passes from the collecting trough to a sample receiver having an overflow and connected to a chamber with a Brix hydrometer. From this the juice enters a 500-ml container provided with a stirrer, mixing baffles and a feeder device for delivering 10-g amounts of lead subacetate. The mixture is stirred for 1½ min and delivered to a filter which provides a clear filtrate which is examined in the saccharimeter. The system of valves and conduits and the timing of the operator's work is such that the apparatus can handle a sample every 5 min.

III. Analysis of trash showed this to be due to poor work by a relatively small number of loading gangs and control over these appeared possible. Fibre in cane was not clearly related to varieties, rainfall and crops, but a correction for fibre % cane was made for each variety in each of the three rainfall divisions. The effect of a number of factors on sugar per acre could be determined. The cane suppliers' interest was stimulated by displaying the analysis results, creating pressure on suppliers of poor cane. It is considered that, by optimizing quality, the same tonnage of cane could yield nearly 10,000 tons more sugar per year.

* * *

Standardization of Peruvian raw sugar. P. HONIG and J. C. P. CHEN. *Anal. VII Conv. Asoc. Peruana Técn. Azuc.*, 1963, 257–265.—See *I.S.J.*, 1964, **66,** 198.

* * *

Study of the ash and potassium (K_2O) content in juice from five varieties of sugar cane. C. SICHRA J. and L. CONDEMARÍN A. *Anal. VII Conv. Asoc. Peruana Técn. Azuc.*, 1963, 266–282.—Ash and potassium analyses were made of the five varieties at different ages and at various times of the year and the data examined for correlations which are discussed.

* * *

The HSPA solids-liquids subsampler and the determination of insoluble solids by centrifuging. L. J. RHODES. *Rpts.* 1967 *Meeting Hawaiian Sugar Tech.*, 172–176. Mixed juice comprises insoluble solids, soluble solids and water; a sample is centrifuged (for 15 minutes at 16,000 r.p.m. in a "Superspeed" machine having a 8½-in dia. rotor) and the supernatant decanted from the residue. The latter is dried and the weight of insoluble solids calculated from the dry residue weight and the weight of soluble solids therein, obtained from the weight of water lost in drying and the ratio of soluble solids to water in the decanted supernatant. The method is practical, convenient and less tedious than conventional methods using filtration; it gives excellent reproducibility and satisfactory accuracy, within the 0·10% weight tolerance for mixed juice.

[1] "Cane Sugar" (Norman Rodger, London) 1921, 558.

Buffering of sugar factory juices in relation to the formation of (decomposition) products and pH change. F. NEUBRUNN. *Zucker*, 1968, **21**, 174–183, 211–221, 246–255.—Potentiometric titration tests were conducted on juices, syrups and model solutions and curves of pH *vs.* log (H/OH) plotted for weak acids of various dissociation constants. From these, conclusions are drawn as to the chemical reactions taking place during processing, and particularly during evaporation. A greater tendency to a fall in pH in the range pH 7–9 was caused by two main groups of substances occurring simultaneously and having dissociation constants of 10^{-4} and 10^{-10} respectively. This was reflected in a discontinuity in the buffering curves. Buffering also resulted from elimination of CO_2 from the acid-base equilibrium, while, in addition, the concentration of the buffering substances rose during evaporation. It is suggested on the basis of theory and empirical results that a fall in pH during evaporation is caused in the first place by peptides and not by amides. Determination of buffering capacities is considered useful for detecting corrosion in an evaporator effect.

* * *

Preserving sugar beet brei by a freezing process for analytical purposes. E. JUNGHANS. *Die Lebensmittelind.*, 1968, **15**, 144–145.—To prevent changes in beet brei which is not presented for immediate analysis, a method has been developed in which a 100-g sample is placed in a small polyethylene bag to which a metal tag is attached for identification. The bag is then heat-sealed and the contents frozen in a small refrigerator at between −20° and −22°C. After a 10-hr journey from Mecklenburg to Kleinwanzleben, such samples are removed from the portable freezers and stored overnight at + 4°C in a refrigeration room or for 3 hr at + 20°C in the laboratory. The brei must be mixed thoroughly before analysis.

* * *

Rapid determination of some non-sucrose components of beet juices. W. A. HARRIS, R. L. NAYLOR and R. L. NELSON. *J. Amer. Soc. Sugar Beet Tech.*, 1967, **14**, 511–517.—Techniques are described for rapid analysis of iron, nitrite, invert sugar and amino-acids in a Sachs-Le Docte filtrate and in press juice. The first involves concentration of the iron on a cation-exchange resin, previously washed iron-free with HCl, and elution into a test tube containing a buffer, reducing agent and phenanthroline which gives a red colour measured at 505 nm. Nitrite is determined by adding α-naphthylamine and sulphanilamide in acetic acid to the juice; the latter is diazotized by the nitrous acid liberated and couples to the former to produce a red colour which is developed over 10 minutes and measured at 520 nm. Nitrite may also be determined by applying drops of samples and known standard solutions to filter paper impregnated with the reagents above and comparing the coloured spots produced. A similar technique is used for invert determination, the paper being impregnated with 2,3,5-triphenyltetrazolium and 2-ethanolamine (as a base) in *iso*-propanol. In the case of amino-acids, the Sachs-Le Docte filtrate must first be de-leaded with oxalate solution before estimating against known glutamic and aspartic acid standards on ninhydrin-impregnated paper. In the case of press juice samples, the reaction requires controlled inhibition with $CuCl_2$ in *iso*-propanol and the standards must be dilutions of a juice of known high amino-acid content.

* * *

Polarization and moisture determinations on export sugar. ANON. *Ann. Rpt. Research Dept., Sugar Manuf. Assoc. (Jamaica) Ltd.*, 1965, 76–77.—Comparative analyses for pol and moisture were made on sugar at the four factories of origin and at the Ocho Rios store. Except for Gray's Inn polarization figures, the differences were not very appreciable. Safety factor and dilution indicators showed that, except for Richmond/Llandovery factory sugar, keeping quality of the exported sugar was satisfactory.

* * *

Molasses studies. R. BRETSCHNEIDER and I. HORÁLEK. *Listy Cukr.*, 1968, **84**, 80–91.—Details are given of analyses of molasses samples from sugar factories and refineries representing the various regions of Czechoslovakia. The total betaine and amine nitrogen contents varied according to region and to the climatic conditions within them. The source of a sample could not be determined from its composition, however. Generally, raw sugar factory molasses contains more total N, betaine and amino-N and is lighter in colour than refinery molasses, which contains more reducing matter and colloids.

* * *

Thermophiles in sugar. M. P. SCARR. *J. Applied Bacteriol.*, 1968, **31**, (1), 66–74.—Sugar refining and related processes take place in an environment where thermophilic bacteria are the only micro-organisms which can flourish, the very high temperatures and saturated solutions used excluding everything but thermophilic spore-formers. The extraction of sugar from beet is probably the only case where measurable sugar loss can take place; elsewhere, growth by thermophilic bacteria can be a hindrance to factory operations and may be the cause of sugar not conforming to customer's requirements.

* * *

Determination of the pH of beet raw sugar solutions. W. SCHIEBEL. *Zucker*, 1968, **21**, 278–281.—Tests with beet raw sugar solutions showed that the pH fell with increase in the sucrose content, although increase in the non-sugars content had a reverse, partially or completely compensating, effect. As regards the time taken for a stable pH to be attained, the author found that for electrometric pH determination a sample containing 20 g raw sugar in 100 ml water was better than 10 g raw sugar in 100 ml, the differences in the measured values being only slight.

Patents

UNITED STATES

Beet thinner. H. GUGENHAN and A. GEGO. **3,361,217.** 15th January 1965; 2nd January 1968.

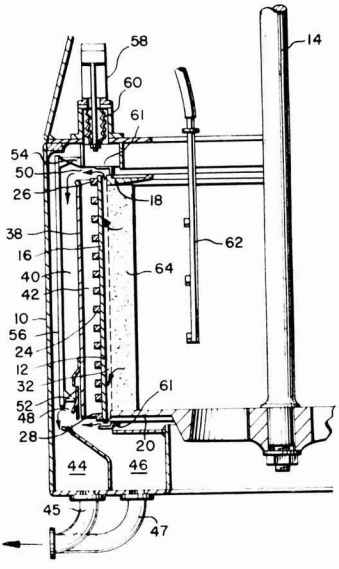
* * *

Beet leaf remover. E. BALLIGNAND, of Jemeppe-sur-Sambre, Belgium, *assr.* S. A. SOCIETER. **3,365,868.** 2nd November 1964; 30th January 1968.

* * *

Centrifugal. A. MERCIER, of La Madeleine, France, *assr.* SOC. FIVES LILLE-CAIL. **3,366,245.** 11th March 1966; 30th January 1968.

The basket 12 of the centrifugal comprises a solid wall 16 spaced apart from upper flanges 18 and bottom 20 by pegs such that there is an annular opening at the top and bottom of the wall, interrupted at regular intervals by the pegs. The wall is supported by reinforcing rings 24, and contains the separating screen, supporting screen and a spacer element which is in the form of a corrugated sheet having axial rows



of short circumferential slits so that it is in the form of rigid axially elongated tubes providing transverse openings to receive molasses separating from the massecuite which then flows up and down the axial channels to the annular openings.

Outside the basket is a cylindrical partition 38 with openings at the top and bottom while another partition below divides the collecting trough into two parts 44, 46, each having a separate outlet pipe 45, 47. Sheet metal rings 52, 54, attached to rods 56, may be moved up and down by motor 58. When the massecuite is fed into the basket the rings are in the raised position shown so that molasses separating passes through the annular openings and then through openings 48, 50 to the compartment 44 which it leaves through pipe 45. When the sugar wall is thick enough and wash water is applied, the rings are lowered, blocking openings 48, 50 and deflecting the wash into compartment 46 which it leaves through pipe 47.

* * *

Polyethers co-initiated by sucrose and sorbitol and urethane resins therefrom. R. E. BOOTH, of Syracuse, N.Y., U.S.A., *assr.* ALLIED CHEMICAL CORPORATION. **3,369,014.** 13th September 1966; 13th February 1968.—Propylene oxide is introduced into a [0·5–2:1 (0·75–1·4:1) molar proportion] mixture of sucrose and sorbitol at 100–120°C (100–110°C) and this introduction continued while maintaining at 80–120°C (90–110°C) to effect reaction of the propylene oxide with the mixture to give a polyether composition of high functionality. This is continued until the hydroxyl number of the composition is in the range 350–600 (450–500).

* * *

Purifying esters of polyhydric alcohols. C. O'BOYLE, of Gramercy, La., USA, *assr.* NORTH AMERICAN SUGAR INDUSTRIES INC. (A-C) **3,378,542-4.** 13th July 1964; 16th April 1968.—(A) Esters of polyhydric alcohols, produced by a transesterification reaction (sucrose stearate, cocoate or esters of hydrogenated tallow oil or olive oil fatty acids, etc.) containing up to 50% of a polar organic solvent as a fluxing agent [aliphatic diols, triols, dicarboxylic acids or their esters (methyl or ethyl aconitate, tartrate or citrate esters, or esters of lactic, acetoacetic or levulinic acid, propylene glycol, glycerol triacetate, glycerine, butyl lactate, monoethyl fumarate, diethyl maleate, trimethyl citrate, ethyl levulinate)] are dispersed in 1-8 times by weight of a wash solvent (methanol, ethanol, propanol, *sec*-butanol, acetone, methyl ethyl ketone, diethyl ketone, or methyl *iso*-propyl ketone, giving a washed mass which is separated (at a temperature $\nearrow$30°C) into solvent-rich and ester-rich fractions and the latter recovered.

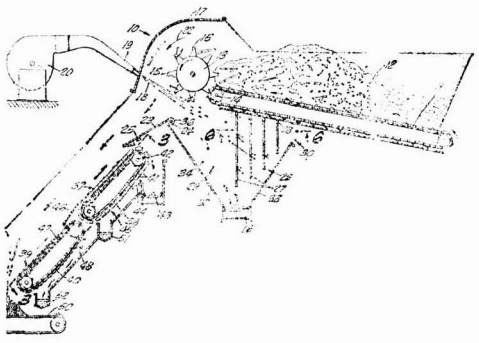
(B) Similar esters, containing up to 50% of a fluxing agent (propylene glycol or a monoester, glycerol or a mono- or di-ester, or esters of succinic, citric or levulinic acid) are mixed with 1–10 times (1·5–4 times) by weight of a wash solvent (essentially water) and separated (at >20°C) into solvent-rich and ester-rich fractions, the latter being recovered.

(C) The esters, containing up to 50% of an oxygenated polar solvent as fluxing agent [aliphatic diols or triols (glycerine) or partial esters with acetic, propionic or butyric acid, partial esters of aliphatic dicarboxylic acids (malic acid) (dimethyl malate, methyl or ethyl partial esters of tartaric, citric or aconitic acid, propyl lactate or esters of lactic acid, acetoacetic acid or levulinic acid with aliphatic diols having a free OH)] is mixed at 30°C with a wash solvent [a neutral aqueous (2–25%) solution of a Na, K, Ca or Mg salt of HCl, HBr, H_2SO_4, HNO_3, H_3PO_4 or $H_2P_2O_7$ (NaCl, Na_2SO_4)] and separated into solvent-rich and ester-rich fractions, and the latter recovered.

* * *

Dry-cleaning sugar cane. E. R. BOLLES, *assr.* HAWAIIAN DEVELOPMENT CO. LTD., of Honolulu, Hawaii, USA. **3,384,233.** 8th October 1965; 21st May 1968.

The gross cane, preferably cut into 20–40 inch long billets and containing no rocks bigger than 5 inches in diameter, is dumped onto the feeder conveyor 11 which carries it to the revolving drum 13 with notched fingers 15 at a minimum clearance from the conveyor head shaft 14. The cane is propelled against the cowling 17, the impact loosening adhering soil and gravel. Moist trash is impaled on the fingers 15 which hold it until it reaches the underside of drum 13. A jet of air 18 from nozzle 19 and blower 20 passes through the free-falling stream of cane, blowing the leafy trash from among the cane and off the fingers 15 against the loosely supported maze of bars 27 which collect the trash and vibrate so that it falls off onto the disposal conveyor 16. The rods absorb the kinetic energy of the airstream which leaves through opening 30.



The cane which falls through the airstream still contains trash and falls onto apron 23 and downwards over the upper surfaces 37, 39 of conveyors 38 and 40. These are inclined and move counter to the flow of the cane, and the upper conveyor is provided with bucket-type pockets 41 into which small rocks and soil fall and are carried up and over shaft 42, emptying onto conveyor 43, the buckets then being washed by sprays 44. The surface of conveyor 40 is studded with hooks or barbs 47 facing the direction of movement which do not offer resistance to the cane stalks but catch leafy trash which is impaled and carried upwards under dead plate 46 and removed from the hooks by gravity, assisted by a jet 48 of air or water. The cleaned cane is then delivered to conveyor 50 leading to the cane mill.

* * *

Method for the accurate and specific analytical determination of glucose. L. F. MARTIN, of New Orleans, La., USA, *assr.* US Secretary of Agriculture. **3,384,554.** 22nd September 1965; 21st May 1968. The true glucose content of solutions containing it, e.g. molasses, cane sugar, beet sugar, etc., is measured by oxidizing the glucose stoichiometrically to gluconic acid, by reacting with oxygen in the presence of a carbohydrate-free glucoseoxidase (notatin) and measuring the change in optical rotation resulting from the reaction by means of a polarimeter (with a sensitivity of 0·0002°). Substances such as sucrose or raffinose, etc., which yield a fixed amount of glucose on hydrolysis may, in the absence of other members of the group, be measured by hydrolysis [using a specific enzyme (invertase, invertase-melibiase) when other carbohydrates are present] to obtain the glucose moiety and then oxidizing this.

* * *

Cane harvester. R. A. ROBICHAUX, of Thibodaux, La., USA. **3,387,441.** 19th August 1965; 11th June 1968.

* * *

Cane planter. D. A. THIBODEAUX, M. P. RICHARD and W. J. MONSON, of Napoleonville, La., USA. **3,387,745.** 27th December 1966; 11th June 1968.

* * *

Continuous centrifugal basket with trash trapping means. W. GRIESELHUBER, of Hamilton, Ohio, USA, *assr.* WESTERN STATES MACHINE CO. **3,390,777.** 19th November 1964; 2nd July 1968.—See UK Patent 1,103,794[1].

* * *

Cane harvester. A. L. ROBERTS, of West Monroe, La., USA, *assr.* SUGARLAND IMPLEMENTS INC. **3,394,535.** 25th February 1965; 30th July 1968.

* * *

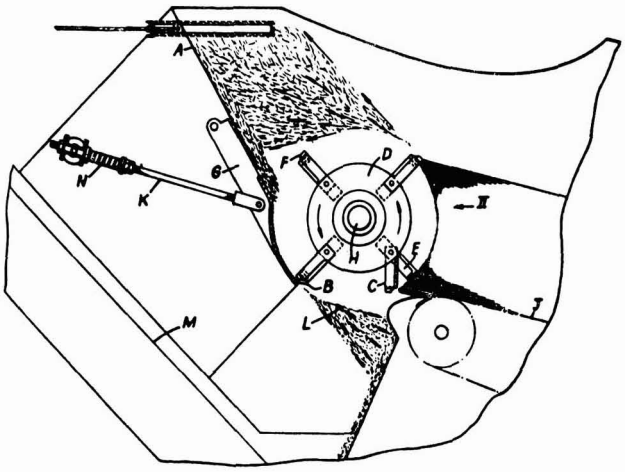
Chemical control of weeds in sugar beet fields. R. B. NEIGHBORS, of Olathe, Kansas, USA, *assr.* GULF RESEARCH & DEVELOPMENT CO. **3,396,009.** 20th April 1966; 6th August 1968.—Weeds in beet fields, especially *Kochia* species, are controlled by application of benzamidooxyacetic acid at the rate of ½–6 lb/acre.

[1] *I.S.J.*, 1968, **70**, 349.

UNITED KINGDOM

Cane disintegrator. J. C. V. DUCASSE, of Papaaloa, Hawaii, USA. **1,138,081.** 18th July 1967; 27th December 1968.

Rotor D comprises a series of plate steel discs, conveniently spaced about 1¼ inches apart, mounted on a shaft H and arranged across the head end of cane carrier J. On the periphery of the rotor D, between the rotor discs, are pivotally attached sets



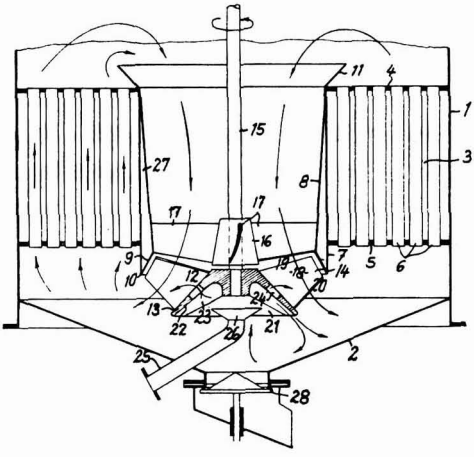
of U-shaped blades C, the legs of each of which are so spaced as to provide four intermediate spaces formed between adjacent rotor discs. The blades C, preferably four, spaced at 90°, have cutting edges formed by the two legs and the bridge of the U, and each bridge carries six small triangular hammers F. Fixed straight knives E are located in the intermediate spaces between the legs of blades C; on one side two will be located in the middle two of the four intermediate spaces while, diametrically opposite, the straight blades E will be in the outermost two intermediate spaces of the four. When the pivoting blades C encounter the cane on the carrier they are thrown backwards in relation to the cane, exposing the fixed blades E; the latter cut the cane longitudinally while the blades C cut it transversely, and the cut cane is flung up against the chute A down which it slides to an adjustable hinged curved gate G.

This carries on its inner face an indented lining B the serrations of which are located at a small clearance from hammers F so that the cut cane falling from chute A is subjected to a shredding action and disintegrated before falling through outlet L to conveyor M. Tramp iron entering the mill would, under the action of hammers F, force back the gate G, thereby preventing serious damage to the machine which may be mounted, e.g. over the feed chute to the first mill of a tandem.

Vacuum pan. MASCHINENFABRIK BUCKAU R. WOLF A.G., of Grevenbroich, Germany. **1,135,635.** 11th March 1966; 4th December 1968.

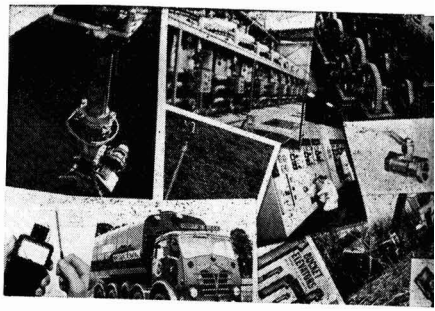
The centre downtake 7 of the calandria pan is provided with a frustroconical insert 8 connected at the upper and lower ends to two other frustroconical sections 11, 9, the upper edge of 8 and lower edge of 9 being fastened in an airtight manner to downtake 7 and providing an air-filled chamber 27 which acts as an insulator from the calandria. Within the insert 8 is located a forced-circulation impeller in the form of a shaft 15 supported in a bearing 16 and carrying a boss 13 on which are mounted blades 14. The supporting arms 17 for bearing 16 are so formed and pitched that they impart a rotational movement to the circulating massecuite opposite to that imparted by blades 14.

The latter and hub 13 are so shaped that the annular cross-sectional area at the top 19 and bottom 20 of the passage is the same; this prevents formation of vortices within the annular channel 18. The underside of the boss is dished as shown at 21, and the conical section is supported by radial ribs 23 offset from blades 14, enabling openings 24 to improve secondary



circulation. This is so that the massecuite will be drawn from below the hub and radially through the openings, so preventing accumulation of settled crystals in the centre of the pan bottom below the impeller. Feed to the pan enters through pipe 25 and is distributed through the funnel-shaped end 26.

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.

Beet piler. C. F. & I. Engineers Inc., 3309 Blake St., Denver, Colo., 80205 USA.

The new "36-inch Super Piler", which is the first of a new series of Silver beet pilers, has a drive-over platform and a number of new features, including a 90-in 16-roll grab-roll screen providing 45% more screening area than previous Silver models, a larger dirt hopper and dirt conveyor providing 75% more storage capacity, and a longer and wider stacker conveyor which permits an 80% increase in the weight of beets piled per foot of pile. The dirt conveyor discharge has been raised by 2 ft. Individual drives are provided for each conveyor and crawler and for the screen. The piler can be supplied with side-dump, end-dump drive-over or cross-over platforms.

* * *

"Atplus 401" adjuvant for Johnson grass treatment. Atlas Chemical Industries Inc., Wilmington, Delaware, 19899 USA.

"Atplus 401" is an adjuvant—a product which increases the weedkilling power of a herbicide—which is recommended for use with MSMA (monosodium acid methane arsonate) to kill Johnson grass. Used at the rate of 1·75 lb of "Atplus 401" per gal in 4 lb of MSMA/gal, the adjuvant can make MSMA three times as lethal as when used alone. Bulletin LI-34 gives information on the new surfactant.

* * *

Synthetic flocculants. Hodag Chemical Corp., 7247 Central Park, Skokie, Ill., 60076 USA.

"Flocs 411" and "Flocs 433" are two new high-molecular weight polymers for use as coagulants and flocculants, the former being intended for refinery liquor clarification and the latter for the clarification and filtration of beet and cane juices. Data on their properties and applications, preparation of solutions, and mixing instructions are contained in information sheets available from the manufacturers.

* * *

Vacuum pumping sets. George Waller & Son Ltd., Stroud, Glos., England.

These packaged units consist of a Waller-type double-impeller, positive-displacement air exhauster coupled to a water ring pump, and are supplied as prefabricated units on a steel frame baseplate, so that overall installation costs in a factory are very low. They are available at capacities of up to 10,000 c.f.m. at a maximum vacuum of 29 in Hg. Both exhauster and pump are electrically driven through V-belts. Water injection equipment which completes the set includes 4 stainless steel nozzles supplied from a stainless steel water tank of 20–30 gal capacity. A number of these 2-stage sets have recently been supplied to the sugar industry and show considerable saving over the conventional reciprocating units used up to now. The sets are complementary to the CO_2 pumps supplied by Wallers to sugar refineries for a number of years, and their design is based on the experience gained in this field.

* * *

Pocket sugar refractometers. Atago Optical Works Co. Ltd., 11-16-2 chome Ushima, Bunkyo-ku, Tokyo, Japan.

Details are announced of a new range of hand sugar refractometers which have an accuracy of $\pm$ 0·1–0·2% and are available for the following ranges: 0–16% (Type 50), 0–32% (Type 100), 28–62% (Type 200), 58–90% (Type 300) and 0–90% (Type 500). The last has three separate scales selected by movement of a dial. Graduation is 0·1% for the Type 50 and 0·2% for the others. The refractometers incorporate an Amici prism which corrects for colour and gives a very sharp boundary line on the sugar scale. The instruments are of high quality and are relatively inexpensive. Full details are given in Catalogue No. 320–325.

* * *

Ceramic permanent magnets. Rapid Magnetic Ltd. Lombard St., Birmingham 12, England.

Rapid Magnetic Ltd. announce an entirely new range of ceramic permanent magnets for the extraction of tramp iron from e.g. feeds on conveyor belts. Made of ceramic ferrite materials, the magnets can be used for duties previously requiring electromagnets, or where the latter type cannot be used. Operating heights of up to 15 in are possible with the available size range, and "overband" as well as the basic suspension types are obtainable. The magnets will operate indefinitely in adverse conditions of vibration, moisture, heat and corrosion, and are intrinsically flameproof.

PUBLICATIONS RECEIVED

ELECTROMAGNETIC FLOWMETER. Brooks Instrument N.V., Veenendaal, Holland.

Bulletin DSE 7100–7200 gives information on the Series 7100–7200 "Brooks-Mag" electromagnetic interchangeable flowmeter heads for volumetric flowrate measurement in conjunction with almost any read-out equipment.

* * *

PROCESS INDICATORS. Jacoby-Tarbox Corp., 808 Nepperhan Ave., Yonkers, N.Y., 10703 U.S.A.

Condensed catalogue 67B gives details of sight flow indicators, sight glasses, level controls, turbidity alarms, turbidity indicator/controllers, moisture indicators and illuminators.

* * *

ALUMINA CEMENT. Lafarge Aluminous Cement Co. Ltd., 73 Brook St., London W.1, England.

A new, up-to-date set of data sheets on high alumina cement is available from the compilers, Lafarge Aluminous Cement Co. Ltd.

* * *

FILTERS. Davey, Paxman & Co. Ltd., P.O. Box 8, Colchester, Essex, England.

Publication No. 7019 Food carries information on filters manufactured by Davey, Paxman for the food and sugar industries: one of the illustrations shows two of an installation of four 300-sq.ft. Paxman filters handling carbonatation mud. Rotary brushes are fitted to clean the cloth periodically.

* * *

FLUORO-MICROPHOTOMETERS. American Instrument Co. Inc., 8030 George Ave., Silver Spring, Md., 20910 U.S.A.; V. A. Howe & Co. Ltd., 46 Pembridge Rd., London W.11, England.

The Aminco fluoro-microphotometer is a versatile instrument readily adapted for a number of uses, including turbidimetry, for which it is suitable in the case of liquid sugars. Details are given in Bulletin 2390-C.

* * *

OLIVER-CAMPBELL CANE MUD FILTER. Dorr-Oliver Inc., Stamford, Conn., USA.

A new 4-page brochure, Bulletin No. 4093, describes up-to-date variations in construction materials and the design of the Oliver-Campbell cane mud filter, and also explains and illustrates ancillary equipment, such as cyclone separators, pumps, etc. A stainless steel-polypropylene construction now available eliminates plugging of the drainage deck.

* * *

CUBE SUGAR COMBINE. Goka N.V. Machinefabriek, P.O. Box 3530, Amsterdam, Holland.

A leaflet is now available showing the layout of the Goka sugar cube line which is designed for small outputs up to 500 kg/hr, the cubes being packed in 500-, 1000- or 2000-g cartons. The plant is available for natural gas, butane gas or oil firing as well as electrical operation.

* * *

THE USE OF MAGNESIUM OXIDE TO PREVENT EVAPORATOR SCALING IN SUGAR FACTORIES. Basic Chemicals, 845 Hanna Building, Cleveland, Ohio, 44115 USA.

This is the title of a 24-page booklet on the use of MgO to prevent evaporator scaling in cane sugar factories. It contains detailed information on scale analysis and the chemistry of scale formation and removal, as well as case histories where the use of "Magox" MgO helped to solve the scaling problem in sugar factories in various parts of the world.

* * *

ION EXCHANGE SURVEY. The Permutit Co. Ltd., Pemberton House, 632/652 London Rd., Isleworth, Middx., England.

"Ion Exchange Survey" is a quarterly publication which over the past 10 years has established itself internationally as an authoritative reference to published works on ion exchange. Because of expanding readership and a great increase in the total number of references in each issue, production costs have risen, so that to maintain the high standards and allow for more copies, an annual subscription of £5 has been introduced. A free specimen copy is obtainable from The Permutit Co. Ltd.

* * *

"MODEL 50" SOLID STATE DIFFERENTIAL REFRACTOMETER. Anacon Inc., 62 Union St., Ashland, Mass., 01721 USA.

The "Model 50" differential refractometer, described in a new brochure, is a solid state unit designed for continuous measurement of changes in the refractive index of various process streams at temperatures in the range 0–150°C. Temperature compensation and control are incorporated in the unit as part of the standard assembly.

* * *

"SUGAR BULLETIN". A. & W. Smith & Co. Ltd., 1 Cosmos House, Bromley Common, Bromley BR2 9NA, England; The Mirrlees Watson Co. Ltd., 1 Cosmos House, Bromley Common, Bromley BR2 9NA, England.

Issue No. 5 (February 1969) of "Sugar Bulletin" gives information on the equipment for the 4000 t.c.d. Passi (Iloilo) Sugar Central in the Philippines, for which Mirrlees Watson received the order[1]. Details are also given of the Bach/Mirrlees "Polycell" clarifier, in which the large number of separate settling units, or "cone tree" assemblies, are each made up of a mild steel central support pipe to which is welded, at optimum intervals, steeply inclined steel plate cones. On the underside of each cone is an aperture in the support pipe to allow the clarified juice to be displaced to a collecting gutter via the bore of the support pipe. The "cone trees" are arranged in equally spaced concentric circles in the top part of the main tanks, while the clear juice collecting gutters are also arranged concentrically so that one gutter can serve as many cells as is practicable. The clear juice flows from the gutter under gravity to a weirbox and then to process. The settling time is about half that in a conventional tray clarifier, so that the volume requirements for juice in process are cut.

* * *

"SKATOSKALO" BOILER SCALING AND TUBE CLEANING EQUIPMENT. Flexible Drives (Gilmans) Ltd., "Skatoskalo" Works, Miller Rd., Warwick, England.

A new, re-designed catalogue, S68/3, gives details of the "Skatoskalo" flexible drive equipment for boiler scaling and tube cleaning, including toolheads and rotary brushes and general information on flexible drives.

* * *

ROTARY DRYERS AND COOLERS AND DUST CONTROL EQUIPMENT. Newell Dunford Engineering Ltd., 143 Maple Rd., Surbiton, Surrey, England.

A new brochure has been published explaining the background and activities of Newell Dunford Engineering Ltd., which has been formed by merger between Dunford & Elliott Process Engineering Ltd., makers of the "Rotary Louvre" dryers which are widely used in the sugar industry, and Ernest Newell & Co. Ltd., makers of rotary dryers for a number of industries. Also incorporated in the company is Thermix Industries Ltd., manufacturers of dust control equipment, who were acquired by Dunford & Elliott in 1957.

* * *

AUTOMATIC CENTRIFUGALS. Thomas Broadbent & Sons Ltd., Central Ironworks, Huddersfield, Yorks., England.

A brochure has recently been published which gives details of the Broadbent fully-automatic centrifugals for sugar. Driven by pole-change forced-ventilation induction motors operating at 5 speeds, the centrifugals are available for operation on 50 and 60 cycles/sec. A.C. In the 50 cycles/sec series, there are two 1000 r.p.m. machines for (i) white sugar and *A* raw sugar and (ii) refined and white sugar and *A* raw sugar, and two 1500 r.p.m. centrifugals for (i) refined and white sugar and *A* and *B* raw sugars, and (ii) *C* sugar and 2nd and 3rd recovery sugar. The machines operating on 60 cycles/sec include a 1200 r.p.m. centrifugal to handle refined sugar and *A* and *B* raw sugar, and two 1800 r.p.m. centrifugals, both for *C* sugar and 2nd and 3rd recovery sugars, but one having a 42 × 30-in basket while

[1] *I.S.J.*, 1968, **70**, 318.

all the other centrifugals have 48 × 30-in baskets. Brief mention is also made of the Broadbent semi-automatic centrifugals.

* * *

INDUSTRIAL ELECTRICAL EQUIPMENT. Harland & Wolff Ltd., Queen's Island, Belfast BT3 9DU, Northern Ireland.

Catalogue 691 gives information on alternators, motors, switchboards and control gear available from the Electrical Division of Harland & Wolff Ltd.

* * *

"MIEDEMA TRANSPORT EQUIPMENT FOR AGRICULTURE AND INDUSTRY". L. S. Miedema Landbouwwerktuigenfabriek N.V., Winsum (Fr.), Netherlands.

This is the title of a brochure illustrating the various types of trailers, tippers, conveyors and elevators for numerous applications including beet and cane. A detailed price list is also available.

* * *

GRAND-PONT AUTOMATIC FILTER. Soc. Sucrière d'Etudes et de Conseils, Aandorenstraat 1, Tienen (Tirlemont), Belgium.

A newly produced brochure gives illustrations and details of the Grand-Pont pressure leaf filter[1], showing schemes for 1st and 2nd carbonatation juice treatment and mud sweetening-off and also gives details of G.P. filters supplied to sugar factories in various countries.

* * *

"TECHNIK". Maschinenfabrik Buckau R. Wolf A.G., D 4048 Grevenbroich, Germany.

Issue No. 3 of "Technik" is a bilingual (English and German) publication giving information on the Buckau-Wolf tower beet diffuser which is designed to handle large throughputs (that at Kopingebro sugar factory in Sweden handles 6000 tons/day and is the largest tower diffuser in the world); the work of Buckau-Wolf New India Engineering Works Ltd.; and information connected with other industries.

* * *

SERIES 6400 CLASSIFIER/CONTROLLER. Hunting Engineering Ltd., Electrocontrols Division, Dallas Rd., Bedford, England.

Bulletin 6400 gives details of the Series 6400 classifier/controller which has all the necessary input and output functions on a single chassis. It will accept inputs in the range 0–6V at a frequency response from D.C. to 20 kHz, and for read-out purposes provides 0–6V D.C. at 2 mA, which is suitable for use with a wide range of indicators, recorders and data processing instruments. The unit is designed on a plug-in concept and affords great flexibility through use of an open terminal plug at the front of the chassis.

* * *

"HEATHKIT" ELECTRONIC KITS. Daystrom Ltd., Gloucester, England.

"Heathkit" easy-to-build kits (a construction manual is supplied with each model) cover a wide range of electronic equipment, including test instruments and scientific and general equipment and are designed to provide high-quality instruments at low cost. Full details are provided in the latest catalogue available from the manufacturers.

* * *

CHAIN TRANSMISSION. Renold Limited, Renold House, Wythenshawe, Manchester M22 5WL, England.

Amongst new publications from Renold Ltd. is booklet CT 681, which gives details of Renold chains, pinions and wheels for power transmission plus essential technical data on chain drive selection and applications.

* * *

COMMUTATOR MOTORS. A. Reyrolle & Co. Ltd., Hebburn, Co. Durham, England.

Pamphlet No. 1394 published by Reyrolle gives information on their "CH" adjustable-speed A.C. commutator motors. These are available as 4-pole, with a rated top speed of 2160 r.p.m. and maximum power of 30 h.p., and as 6-pole models, with a rated top speed of 1440 r.p.m., suitable for 3-phase, 50 cycles/sec supply. An output and dimension sheet is also available with the pamphlet.

* * *

"PLANT AND SERVICES FOR THE CHEMICAL PROCESSING INDUSTRIES". The A.P.V. Co. Ltd., Manor Royal, Crawley, Sussex, England.

This 30-page illustrated booklet gives details of the products made by the APV Group for various industries, covering distillation, evaporation, heat transfer, process heating, fermentation, filtration, crystallization, drying, homogenization, mixing and fluids handling.

* * *

STAINLESS STEEL PLANT. Stainless Steel Plant Ltd., Marton, Blackpool, Lancs., England.

An illustrated 19-page booklet gives information on the various applications and industries for which this firm makes stainless steel plant, including distillation columns and trays.

* * *

Generating plant for UK sugar factories.—W. H. Allen Sons & Co. Ltd., of Bedford, a member company of Amalgamated Power Engineering Ltd., have received an order for a 615-kW diesel alternator set and a 3500-kW turbo-alternator set to operate in parallel with an existing 3500-kW Allen unit at the Ipswich sugar factory of the British Sugar Corporation Ltd., and an order for a diesel set to provide off-season power at the Corporation's York sugar factory.

* * *

Boiler water treatment.—Paterson Candy International Ltd. have received an order from Tate & Lyle Enterprises Ltd. for the supply of a boiler feed chemical plant and make-up water treatment plant to be installed at the Monymusk sugar factory of West Indies Sugar Co. Ltd. in Jamaica.

* * *

Bulk carriers for UK shipping line.—Sugar Line Ltd., owned by the Tate & Lyle Group, has placed an order with the Scott Lithgow Group, on the Lower Clyde, for two specialized bulk carriers.

* * *

BMA tower diffusers.—BMA have recently received orders for the supply of beet tower diffusers to sugar factories in Austria, France and Italy. The largest will be delivered to Enns sugar factory in Austria and will have a daily capacity of 4000 tons of beet.

* * *

Bookers Agricultural and Technical Services.—This Bookers company is being expanded to cater for the consultancy and management services required by the world sugar industry. Recently it has undertaken three new assignments: management of the Chemelil Sugar Co. in Kenya (the estate and factory started operations last year, and total sugar production is planned to reach 40–50,000 tons per annum); a report on the operations and assets of the Orange Grove sugar factory and estate in Trinidad (wholly owned by the Trinidad Government) with a view to establishing the economically optimum method of operating the company; and a report on behalf of the Government of Tanzania on the future development and expansion of the Tanzania sugar industry over the next 10 years.

* * *

New UK computer services company.—Tate & Lyle Ltd., in association with computer consultants R. TOMLIN and R. G. FERGUSON, are setting up a new company, Corporate Computer Services Ltd., which will initially look after all aspects of design, planning and construction of computer rooms and associated facilities and later probably advise on computer acquisition, application and use, and offer programming and other related services.

[1] I.S.J., 1966, **68**, 323-326, 358-361.

United Kingdom Sugar Imports and Exports[1]

IMPORTS	1968	1967	1966	1965
		Long tons, tel quel		
Refined and White Sugar				
Canada	2	163	2	2
W. Indies & Guyana	3,071	1,129	3,306	1,794
Other Commonw'th	30	11	21	8
Belgium	916	1,452	87	46
Czecholovakia	15,849	26,528	32,022	24,266
Denmark	14,619	—	—	1
France	2,227	882	858	5,151
Germany, East	4,522	5,136	1,427	1,894
Germany, West	906	104	503	1
Ireland	10,127	10,725	12,530	8,339
Netherlands	12	25	—	—
Poland	2,336	2,187	3,721	1,409
USSR	—	—	1,421	1,624
Other Foreign	32	52	91	280
TOTAL	54,649	48,394	55,989	44,815
Raws—Cane and Beet				
Australia	358,353	433,162	412,653	401,758
Barbados	130,310	114,088	135,549	128,835
British Honduras	22,810	15,786	17,123	24,063
Fiji	130,112	143,809	131,433	166,622
Guyana	141,718	140,666	58,971	119,051
India	24,791	76,902	96,948	74,120
Jamaica	213,653	198,541	211,198	257,606
Leeward Is.	29,660	34,416	35,739	36,744
Mauritius	484,257	370,241	436,808	404,691
Rhodesia	—	—	20,163	34,439
Swaziland	84,466	87,539	81,985	86,240
Trinidad & Tobago	129,587	142,914	122,943	139,567
Other Commonw'th	299	818	—	—
Commonwealth Raws	1,750,016	1,758,882	1,761,513	1,873,736
Argentina	—	—	500	—
Belgium	—	4,055	—	—
Bulgaria	—	3,995	—	—
Brazil	11,898	17,826	162,090	52,558
Colombia	9,812	11,706	30,040	—
Cuba	19,494	79,923	65,341	90,569
Czechoslovakia	—	—	—	183
Dominican Republic	—	9,949	—	10,328
Ecuador	—	—	—	—
France	28,372	—	824	24,204
Germany, West	5,915	—	—	—
Haiti	—	—	9,470	—
Malagasy	—	—	12,612	—
Mexico	—	—	12,605	—
Netherlands	42,832	26,013	—	—
Poland	44,314	31,792	5,882	16,172
Réunion	9,451	—	—	—
South Africa	42,548	158,539	58,360	19,938
Yugoslavia	—	1,008	250	—
Other Foreign	—	2	3	2
Foreign Raws	214,636	344,808	357,977	213,954
TOTAL RAWS	1,964,652	2,103,690	2,119,490	2,087,690

[1] C. Czarnikow Ltd., *Sugar Review*, 1969, (905), 30.

EXPORTS	1968	1967	1966	1965
		Long tons tel quel		
Bahamas/Turks & Caicos Is.	1,242	1,101	954	981
Bahrein	1,755	102	270	6,341
Barbados	447	259	496	369
Bermuda	949	583	684	539
British Honduras	873	716	1,072	580
Canada	3,036	2,032	1,289	538
Ceylon	3,314	665	907	1,944
Cyprus	9,025	11,541	9,163	10,359
Gambia	548	775	807	458
Ghana	11,335	19,301	19,171	556
Gibraltar	1,217	1,184	994	1,443
Guyana	117	90	70	104
Hong Kong	8	2	303	3
Indian Ocean Islands	46	246	281	590
Kenya	3,183	3,580	3,237	2,123
Leeward Is.	2,235	1,367	1,000	727
Malaysia	498	523	22,691	18,831
Malta	551	935	857	1,002
Nigeria	8,544	24,469	24,918	25,016
Sierra Leone	4,450	8,281	10,181	10,228
Singapore	999	5,535	9,072	*
South Arabia	†	216	473	966
Trinidad & Tobago	91	26	1,294	155
Trucial States	589	100	816	9,499
Windward Is.	2,005	2,298	1,231	596
Zambia	1	2,017	—	—
Other Commonw'th	548	603	364	477
Total Commonwealth	57,606	88,547	112,595	94,425
Belgium	18	968	438	27
Bulgaria	—	—	—	9,340
Burma	335	—	286	149
Cameroons	45	6	8	358
Chile	1,498	1,287	437	5,861
French Pacific	2,276	2,353	3,730	3,443
Germany, East	10	5,000	—	—
Germany, West	827	583	593	1,491
Greece	311	34,168	10,997	5,119
Iceland	2,864	3,354	3,809	1,428
Iran	1,453	1,723	1,357	975
Ireland	562	590	6,061	6,178
Israel	354	426	773	276
Italy	8	26	105	30
Korea, South	3	—	1	492
Kuwait	2,180	249	254	24,104
Lebanon	1,574	1,627	693	2,417
Liberia	523	555	735	906
Libya	203	294	446	784
Muscat & Oman	705	89	53	42
Netherlands	17,431	45,329	25,044	10,958
Norway	38,481	43,473	40,613	53,844
Saudi Arabia	9,043	486	514	4,894
South Yemen Rep.	1,968	†	†	†
Spain	104	252	1,349	4
Spanish Possessions Overseas	261	168	166	316
Sweden	89	9,859	2,382	1,965
Switzerland	45,240	56,566	55,219	42,005
Togo	429	246	404	284
Tunisia	15,781	12,817	24,782	20,564
USA	314	7	3,657	4,326
Vietnam, South	—	9,550	—	—
Other Foreign	168	943	275	532
Total Foreign	145,058	232,994	185,181	203,112
TOTAL EXPORTS	202,664	321,541	297,776	297,537

* Export figures for 1965 are included in shipment to Malaysia.
† The Federation of South Arabia left the Commonwealth on 30th November, 1967 and is now the People's Republic of South Yemen.

ICUMSA 15th Session

The 15th Session of the International Commission for Uniform Methods of Sugar Analysis will be held in London from the 10th to the 15th May 1970.

Registration of delegates will take place during the afternoon of Sunday 10th May. A programme, giving details of all of the business and social events of the Session, will be forwarded to Chairman of National Committees at a later date.

Brevities

El Salvador sugar production targets[1].—The sugar quota for internal consumption in 1969 has been fixed at 1,350,000 quintals and for industrial processing at 150,000 quintals; total production is expected to reach 2,900,000 quintals. (One quintal = 46 kg.)

* * *

Swaziland distillery plans[2].—Plans have been announced to establish a distillery and erect a blending and bottling plant at Matsapa Industrial Township near Manzini, Swaziland. The distillery will use molasses from the sugar factories to produce pure alcohol. Plant is being supplied by the associated company in South Africa and gin, vodka, cane spirit and brandy will be produced.

* * *

Honduras sugar crop forecast[3].—Sugar production for 1969 is estimated at 1,420,000 quintals, an increase of 30% over the 1968 figure (1 quintal = 46 kg). A total of 950,000 quintals will be consumed locally; the export quota for the world market is 250,000 quintals, and for the US market 160,000 quintals.

* * *

Guyana 1968 sugar production[4].—Grinding continued on most estates right up to the end of the year in an effort to meet the overall 1968 target of 335,000 tons. Some 316,848 tons of sugar were produced compared with 343,922 tons in 1967. The 1968 production included 18,823 tons of sugar made from farmers' cane.

* * *

Moroccan sugar plans.—Further information on the planned expansion of the Moroccan sugar industry for the period up to 1980 has been published[5,6]. The total number of sugar factories is to be raised to 17, to be provided with beet from an area of 124,400 hectares. Four factories are currently in production; a fifth, Tadla II, is expected to go into operation this year and will produce 36,000 tons of raw sugar per year. Sidi-Bennour factory, to operate in 1970, is to produce 25,000 tons/year and Berkane, to operate in 1973, will produce 30,000 tons/year as sugar loaves. Zelovan and Zagora-Dra factories, to operate in the same year, will produce 26,000 and 24,000 tons/year, respectively, while Erfoud-Tafilet will produce 13,000 tons/year, starting in 1974. Kella-des-Srarhna, Tetouan and Ksar-el-Kebir, to start in 1975, 1976 and 1977, will produce 32,000, 14,000, and 48,000 tons/year respectively, while Ait-Melloul and Jemaa-Haouafate, to start in 1978, will produce 24,000 and 40,000 tons, respectively. Ajdir and Khemis-Zemamra, scheduled for 1979 and 1980, will produce 14,000 tons and 25,000 tons/year. The existing Souk-es-Sebt, Mechra-Bel-Ksiri and Si Allal-Tazi factories are to be expanded from 15,000 to 50,000, 40,000 to 80,000 and 40,000 to 80,000 tons/year, respectively.

* * *

Mexico sugar situation[7].—During the calendar year 1968, total sugar production in Mexico amounted to 2,336,203 tons, raw value, compared with 2,411,547 tons in 1967. Domestic consumption was 1,766,342 tons and 676,189 tons exported, reducing stocks from an initial 586,655 tons to 480,327 tons. Production in 1969 is expected to reach 2,393,000 tons.

Europe sugar beet area estimates, 1969[8]

Western Europe	1969 (hectares)	1968 (hectares)
Belgium-Luxembourg	89,000	89,499
France	400,000	365,747
Germany, West	305,000	302,050
Holland	103,000	103,550
Italy	300,000	300,000
Total EEC	*1,197,000*	*1,160,846*
Austria	46,000	43,971
Denmark	50,000	50,715
Finland	14,000	14,558
Greece	23,000	16,750
Ireland	24,750	25,767
Spain	180,000	169,000
Sweden	40,000	40,960
Switzerland	9,000	8,983
Turkey	125,000	124,698
UK	179,000	179,200
Yugoslavia	92,000	72,643
Total Western Europe	*1,979,750*	*1,908,091*
Eastern Europe		
Albania	6,000	6,000
Bulgaria	65,000	65,000
Czechoslovakia	180,000	185,133
Germany, East	210,000	210,000
Hungary	99,000	104,500
Poland	410,000	414,100
Rumania	198,000	190,000
USSR	3,600,000	3,600,000
Total Eastern Europe	*4,768,000*	*4,774,733*
TOTAL EUROPE	6,747,750	6,682,824

* * *

UK sugar beet prices, 1969.—In the annual Farm Prices Review it was announced that the guaranteed price to be paid to British farmers for sugar beet for the 1969/70 crop would be the same as for the 1968/69 crop, i.e. 136s 6d per ton, basis 16% sugar content, while the same differential of 10s 0d for each 1% above or below the 16% standard would also be continued. The guaranteed price will apply to the same area as last campaign, i.e. 443,000 acres.

* * *

U.K. sugar surcharge.—The surcharge made by the UK Sugar Board was reduced from 2¼d per lb (21s 0d per cwt) to 2d per lb (18s 8d. per cwt) from the 19th March 1969, as a result of the continuing rise in the world price of raw sugar on the London market.

* * *

Sugar beet yield in the USSR[9].—The yield of sugar beet per hectare in the Soviet Union has been rising over the last few years, from an average of 16·5 metric tons in 1961–65 to 26·3 tons in 1968. The yield in the Ukraine was much higher at 32·8 tons/hectare.

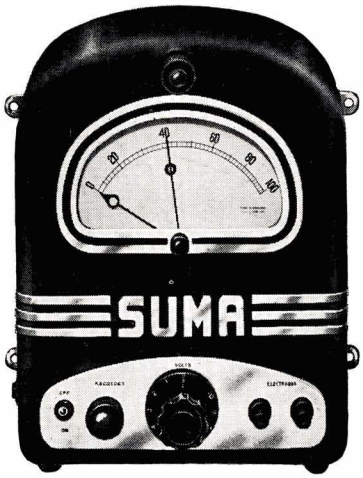
---

[1] *Bank of London & S. America Review*, 1969, **3**, 101.
[2] *Barclays Overseas Review*, February 1969, 24.
[3] *Bank of London & S. America Review*, 1969, **3**, 102.
[4] *Barclays Overseas Review*, February 1969, 72.
[5] *L'Usine Nouvelle*, 1968, (52), 153; through *Sucr. Belge.*, 1969, **88**, 121.
[6] See also *I.S.J.*, 1969, **71**, 127.
[7] F. O. Licht, *International Sugar Rpt.*, 1969, **101**, (5), 6.
[8] F. O. Licht, *International Sugar Rpt.*, 1969, **101**, (9), 1.
[9] *Ekon. Gaz.*, 1969, (5), 8.

Index to Advertisers

FOR BUYERS' GUIDE SEE JANUARY ISSUE pp. xxvii-xliv

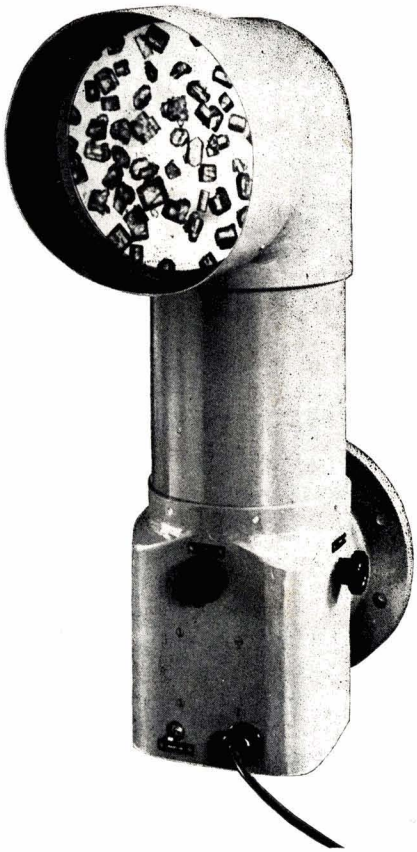
VACUUM PAN CONTROL



The **CUITOMETER**, designed for use in pan boiling and crystallizer work, indicates the conductivity of the mother liquor and so enables the progress of the strike to be judged. A Recorder with clockwork or synchronous motor chart drive can be supplied having 2 speeds with a 6:1 ratio. A change of speed is obtained by a lever movement. These models are either projection or flush mounting type.

Emile Hugot, in his "Handbook of Cane Sugar Engineering" writes: "The Cuitometer is particularly useful for pans working on low grade massecuites, especially with C massecuites; but it is very useful with any massecuite, and it may be stated that today it is an indispensable instrument for the sugar boiler. Thanks to it, novice sugar boilers can boil as safely as a master boiler, and maintain the massecuite at the optimum point of supersaturation, without risk of false grain. **Each pan should have its Cuitometer. The relatively insignificant cost of this instrument permits of this.**"

[Extracted by kind permission from "Handbook of Cane Sugar Engineering" (p. 517) by E. Hugot, translated by G. H. Jenkins (Elsevier, Amsterdam). 1960.]



The graining point can be watched on the 8⅛ in. diameter viewing screen of our **CRYSTALOSCOPE** pan projection microscope. The overall magnification of x 30 allows the Pansman to check false grain easily and without eyestrain.

The instrument has a fitting diameter and flat facing requirement exactly the same as that for the PANOSCOPE which it is designed to replace, with minimum disturbance to existing arrangements.

Write now for details of our complete range of factory and laboratory equipment.

The Sugar Manufacturers' Supply C[illegible]

196-204 BERMONDSEY STREET, LONDON, S.E.1, EN[illegible]

Telephone: HOP 5422 *Cables:* "Sumasuco, Lo[illegible]

Printed by JOHN ROBERTS & SONS, Salford, Manchester; and published by the Proprietors, THE INTERNATIONAL SUGAR JOURNAL LTD., at 23a Easton Street, High Wycombe, Bucks. Entered at the New York Post Office as Second-Class Matter.
PRINTED IN GREAT BRITAIN