THE International Sugar Journal

APRIL 1973

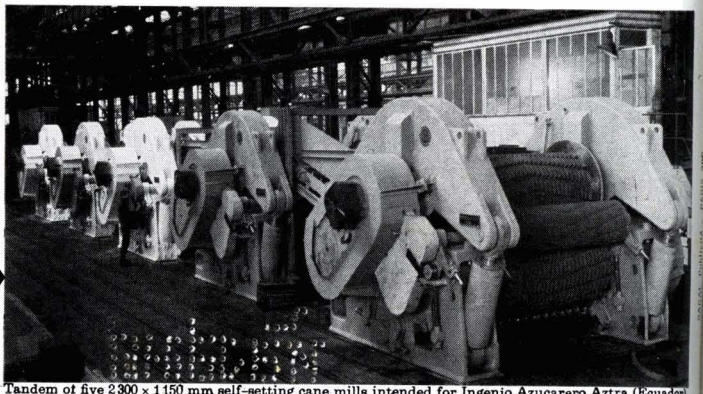
with the Fives Lille - Cail self-setting cane mill

- **Easy pre-setting of the feed/discharge opening ratio.**
- **Constant opening ratio during operation.**
- **Easy lifting of top roller (rotating motion).**
- **Improved extraction.**
- **Increased capacity.**
- **Reduction of power peaks.**

The originality of this system lies in the fact that the top roller does not move in a vertical slide, as in all the conventional mills, but is supported by a hinged upper half housing forming a lever arm. The result of it is, on the one hand, a constancy in the ratio of the feed and discharge openings and, on the other hand, a very easy lift of the top roller, involving an improved efficiency.

already more than 50 mills of this type in the world

THE BIGGEST IN THE WORLD

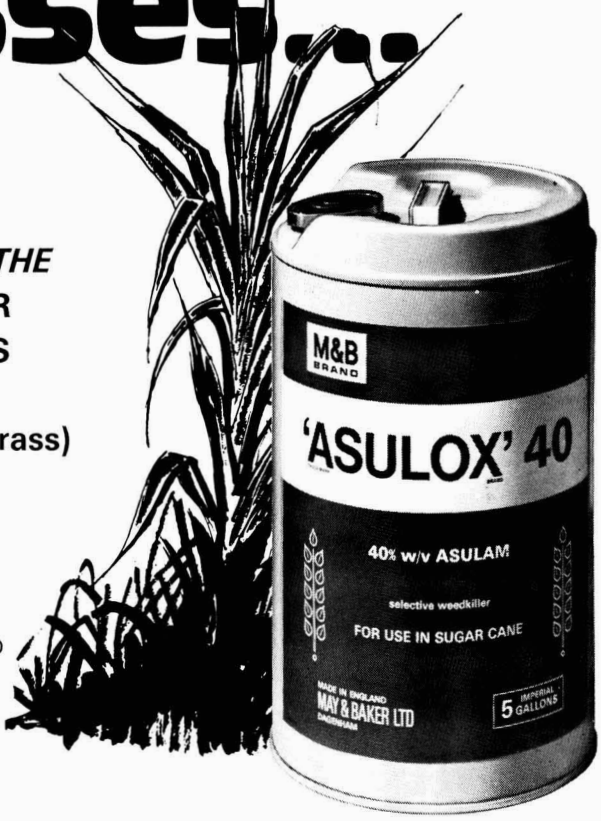


Tandem of five 2 300 x 1 150 mm self-setting cane mills intended for Ingenio Azucarero Aztra (Ecuador)

FIVES LILLE - CAIL

7, rue Montalivet - PARIS 8e ☎ : 265-22.01 and 742-21.19
Cables : FIVCAIL-PARIS - Telex : FIVCAIL 65 328

tough on grasses...



SO USE 'ASULOX' 40 *THE* HARD-HITTING KILLER FOR TOUGH GRASSES SUCH AS *SORGHUM HALEPENSE* (johnsongrass) AND *PANICUM PURPURASCENS.*

... and the perfect partner for 'ACTRIL' D in a complete weed-control programme for rapid knockdown of the toughest broad-leaved weeds.

...gentle on cane

SEND FOR FULL DETAILS OF THESE OUTSTANDING WEEDKILLERS NOW!

To May & Baker Ltd Dagenham Essex RM10 7XS England
PLEASE SEND INFORMATION ON 'ASULOX' 40 AND 'ACTRIL' D

Name .....

Position ..... Company/Estate .....

Address .....

.....

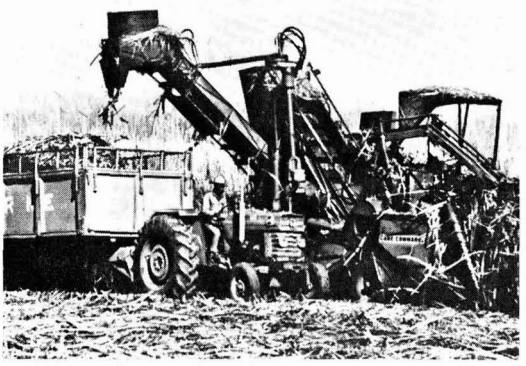
.....

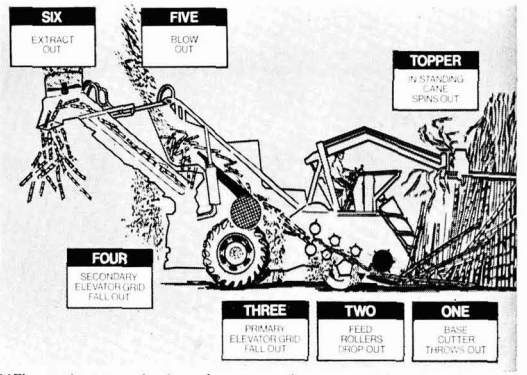
'Asulox' and 'Actril' are trade marks of May & Baker Ltd

HA 4676

M&B May & Baker

A member of the Rhône-Poulenc Group of Companies





MF's exclusive 6-stage cleaning cycle ensures maximum return of clean chopped cane

Great cane harvests start and finish with Massey-Ferguson

The MF sugar cane system provides you with methods and equipment to take you from land clearance and field preparation, through tillage and planting, to harvesting and transportation. The MF system, with the giant MF 201 cane harvester, gives improved productivity, beats labour shortages, and cuts down harvesting costs.

MF 20 cane planter—does six jobs at once. This machine opens the furrow, cuts the cane into lengths, dips them in protective fungicide, and then places them in the soil. At the same time, it sows fertiliser on both sides of the furrow, close enough to ensure healthy growth, but far enough to prevent the setts being scorched. Lastly, the MF 20 covers the setts with soil and presses it down. A single rotor MF 20 can plant up to 2 hectares per day; a two-man double rotor machine up to 4 hectares a day. (See top picture.)

MF 201—ton-a-minute cane harvester. This is the ultimate cane harvesting machine. Over 400 have been built in Australia and are now harvesting cane throughout the world, recording outputs up to 500 tons a day for as little as US $0.60 per ton.

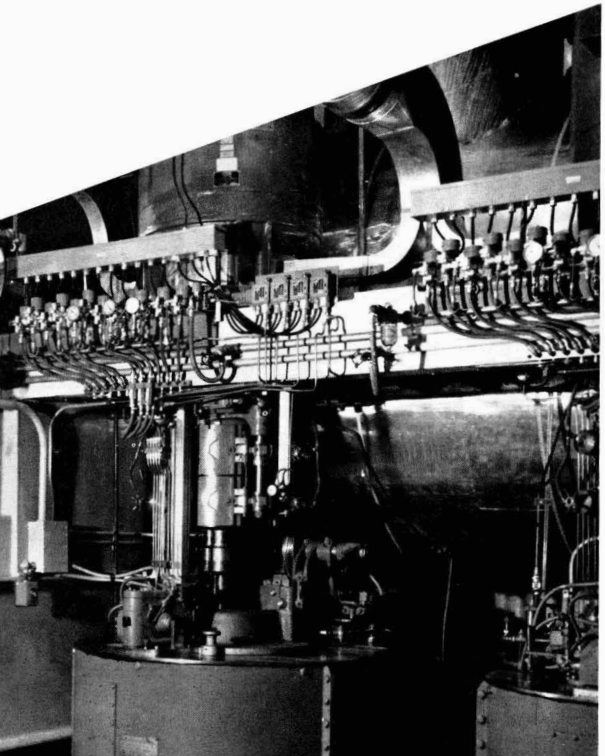
Write for more information now. *If you would like to know how the MF sugar cane system can help you increase productivity and overcome labour shortages, contact your nearest MF dealer or write to:* Marketing Development Department, Massey-Ferguson (Export) Ltd., P.O. Box 62B, Banner Lane, Coventry, CV4 9GF, England.

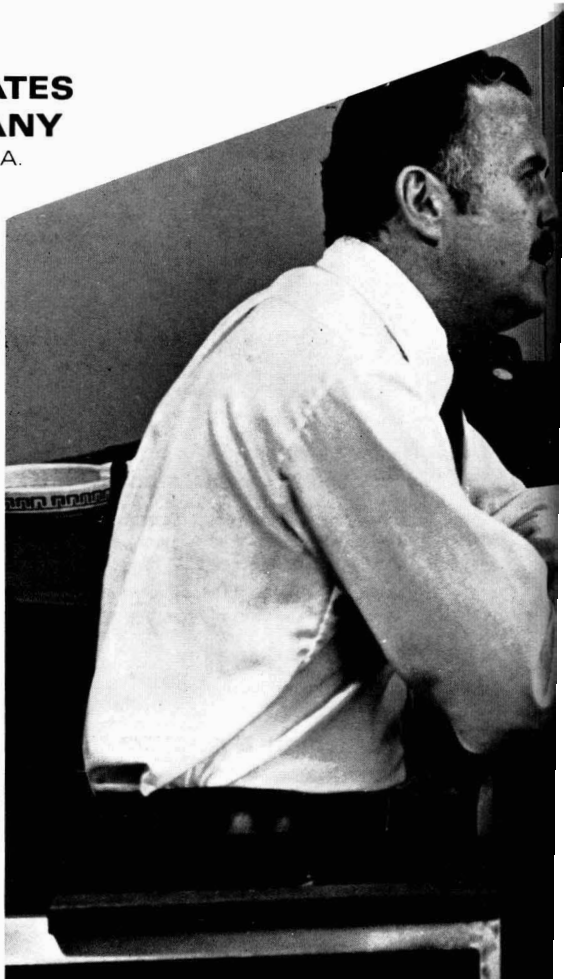
They will send you copies of the MF Systems Manual, literature on the MF 20 and MF 201, and the latest edition of Cane News.

MF
Massey Ferguson

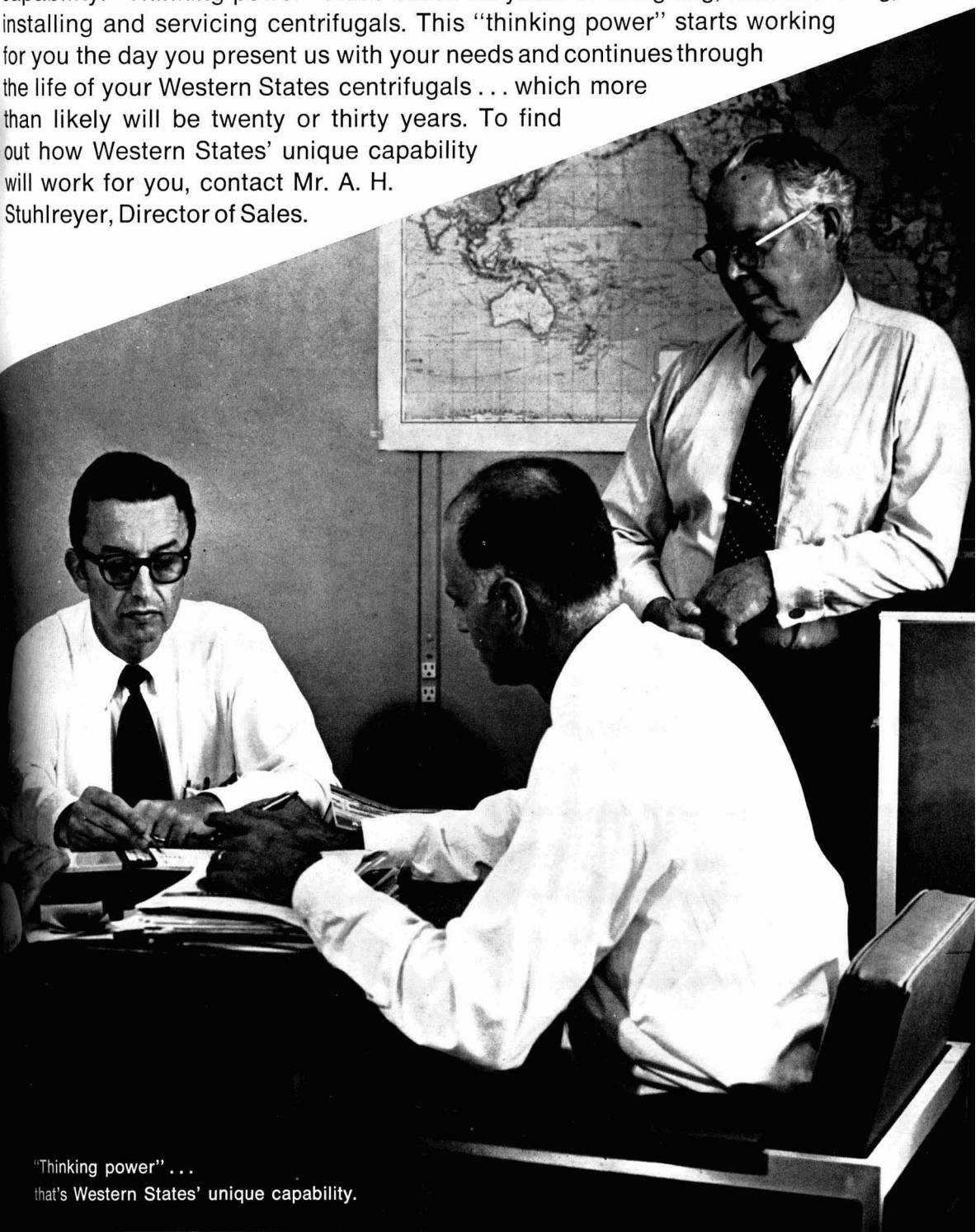
Western States has a unique capability to help you increase sugar processing efficiency

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





Getting the most out of a centrifugal installation is determined, to a large extent, by the initial "thinking power" that goes into it. That's Western States' unique capability. "Thinking power" that's based on years of designing, manufacturing, installing and servicing centrifugals. This "thinking power" starts working for you the day you present us with your needs and continues through the life of your Western States centrifugals . . . which more than likely will be twenty or thirty years. To find out how Western States' unique capability will work for you, contact Mr. A. H. Stuhlreyer, Director of Sales.



"Thinking power" . . .
that's Western States' unique capability.

In Sugar Processing . . . Hodag Helps

Hodag products for the Sugar Industry are designed to increase efficiency, reduce operating difficulties, and maintain a high level of production in sugar processing. Sugar factories and refineries throughout the world rely regularly on Hodag with utmost confidence.

Backed by years of technical expertise in the Sugar Industry, these Hodag products have become standards.

CB-6—An additive for use in the crystallization and processing of sugar to improve quality, increase exhaustion of final molasses, and overcome problems due to sticky, hard to handle massecuites.

VAP-99—An additive to inhibit scale formation and increase evaporator efficiency.

HCA-21—A powdered chelating and dispersing agent for use as scale inhibitor in alcohol stills, evaporators, and heat exchangers.

FLOCS 411, FLOCS 433—Polyacrylamide-type products for use as coagulants and flocculants in the clarification of sugar juice in refineries and raw sugar factories.

RAPISOL—A surface-active additive used to increase the penetration and cleaning power of caustic cleaning solutions.

PH-2 DESCALER—A non-corrosive granular descaler specifically compounded for cleaning evaporators, pans, and heat exchangers.

FLO-1—A molasses additive used to increase the fluidity and reduce stickiness and foaming. Benefits the blending, pumping, transporting, and storing of molasses. Improves clarification for fermentation.

SANITROL—A high-potency microbiocide used to reduce inversion losses, odors, and aid in overall mill sanitation.

ANTIFOAM BX-SERIES—A series of special antifoams for use in beet sugar processing. Formulations for direct use and dilution with water or mineral oil.

Write for technical data on any of Hodag's products for sugar processing. Or ask for a Hodag technical representative. He'll be glad to help you in the testing of our products or assist you in finding the best means of application in your process.

Why not send the inquiry coupon below? And let Hodag help you improve your operation and enjoy the benefits of these products.

Please send complete literature and case history data on the Hodag products checked below:

☐ CB-6 ☐ FLOCS 411, FLOCS 433 ☐ FLO-1
☐ VAP-99 ☐ RAPISOL ☐ SANITROL
☐ HCA-21 ☐ PH-2 DESCALER ☐ ANTIFOAM BX-SERIES
☐ Please have Hodag representative contact me.

HODAG CHEMICAL CORPORATION/HODAG INTERNATIONAL S. A.

7247 North Central Park Ave., Skokie, Illinois 60076 U. S. A.
Cable Address: HODAG SKOKIEILL Telex: 72-4417

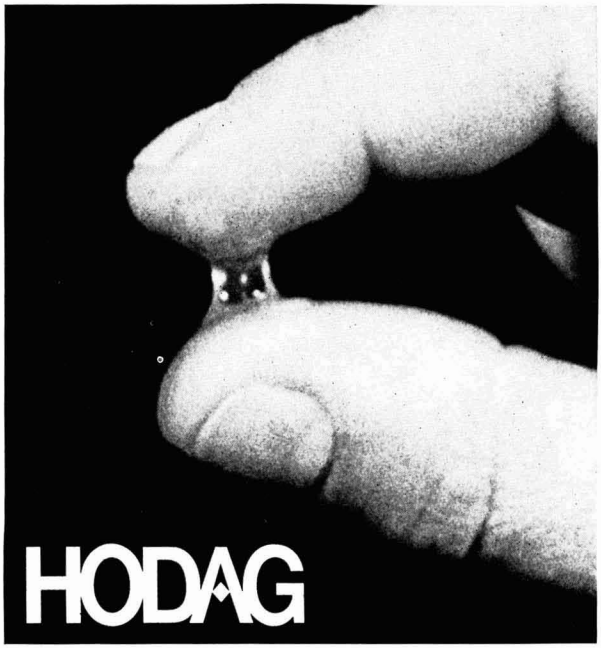
Name _____ Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Country _____



FS can help you...

Why should Fletcher and Stewart have earned contracts for no less than six complete sugar factories since 1968? And why, one might also ask, do they receive so many requests from other manufacturers to enter into licensing agreements?

The answer lies, of course, in the vast amount of know-how that Fletcher and Stewart have accumulated during more than 130 years of specialised service to the sugar industry, and the unique experience that they have acquired through their membership of a group of companies which owns and operates nine sugar factories and manages others.

THIRD — EXPERIENCE AND KNOW-HOW

In other words, Fletchers have a commodity to sell which is rare among the many people who claim to serve the sugar industry: Fletchers are technologists in sugar production and it shows in the equipment that they make and the factories that they build which are designed for efficiency, reliability and ease of operation.

Fletchers build factories to meet the needs of twentieth century sugar operators who demand the best.

It is not possible to stop people, who without even understanding their design, try to copy Fletcher and Stewart products, nor can they be stopped from marketing factories which lack the latest technology, but what discerning buyer would purchase such a substitute if he could afford the real thing.

When you think of sugar machinery—think of FS.

FS **FLETCHER AND STEWART LIMITED**

A member of the Booker Group

DERBY · ENGLAND · DE2 8AB

1966 1972
THE QUEEN'S AWARD TO INDUSTRY

Tel: Derby 40261 **Telex: 37514** **Cables: "Amarilla" Derby Telex**

Improved Filtration Efficiency

Whatever filtration system you are using—for all stages of juice clarification—we can improve its efficiency and reliability by supplying 'engineered' filter fabrics.

Every filtration system is different—each has its own problems. That's why we design every filter fabric individually, after careful research into each process. The result—fabrics 'engineered' to improve filtration efficiency in *your* plant.

We'll supply your filter fabric shaped, cut, eyeletted, hemmed—or as bags, sleeves, belts or blankets.

Give us a call—we'd like to help.

P. & S. TEXTILES LTD.

Broadway Mill, Haslingden,
Lancs, England, BB4 4EJ
Tel: Rossendale 3421
Telex: 63127

U.S.A.:	**P. & S. TEXTILES INC.,** Jordan Rd., Skaneateles Falls, New York., 13153.
CANADA:	**PORRITTS & SPENCER (CANADA) LTD.** P.O. Box 50, Station B, Hamilton, Ontario
AUSTRALIA:	**P. & S. TEXTILES Pty. Ltd.,** P.O. Box 82, Highett, Victoria 3190.
SOUTH AFRICA:	**P. & S. TEXTILES S.A. (Pty) Ltd.,** P.O. Box 9939, Johannesburg.
WEST GERMANY:	**P. & S. TEXTILES GmbH.,** 332 Salzgitter 51-Bad, Postfach 1570.
DENMARK:	**P. & S. TEXTILES LTD.,** Kirsebaer Alle 1, DK-2840 Holte.
SWEDEN:	**P. & S. TEXTILES LTD.,** Ostra Hamngatan 17, 411 10 Goteburg.

BEST NAME IN FILTER FABRICS

DE SMET is first in cane diffusion

read results !..

obtained in Venezuela with a DE SMET cane DIFFUSER during 1971/1972 season.

POL BALANCE % CANE

In Molasses	1.16
In Scums and Filter Wash	0.10
Undetermined	0.10
In Bagasse	0.47
Total losses % Cane	1.83

simar stevens brussels / m b

DE SMET

EXTRACTION DE SMET S.A.
B - 2520 EDEGEM
ANTWERP - BELGIUM

CABLES : EXTRAXSMET ANTWERP
TELEX : 31.824 DESMET B

EXTRACTION DE SMET S.A.
2520 EDEGEM - ANTWERP - BELGIUM

S 33

Send illustrated technical bulletin on
De Smet's cane sugar diffusion

NAME _____ TITLE _____

COMPANY _____

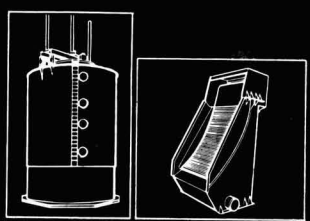
ADDRESS _____

CITY _____ STATE _____ ZIP _____

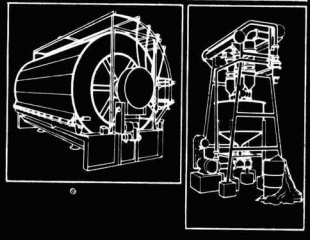
Machinery with "Machismo"

Dorr Oliver separates profit from cane.

RAPIDORR® 444 CANE JUICE CLARIFIER Requires no costly chemicals, gives greater throughput with less retention time. Four individual compartments each with separate feed, clear juice take-off, and mud withdrawal. Has an impressive list of design improvements to simplify operation and make it more efficient.



OLIVER-CAMPBELL® CANE MUD FILTER with Dorr-Oliver designed components, stainless steel and polypropylene construction to reduce maintenance, large-diameter piping and filtrate valve that give it greater hydraulic capacity.



DORR-OLIVER DSM® SCREENS combine high capacity with high efficiency, have no moving parts, require no operator, no special foundation and have a rugged self-cleaning stainless-steel or bronze screen element construction that makes them practically maintenance-free.

DORR-OLIVER DORRCLONE® DESANDING SYSTEM, two stage systems with automatically controlled discharge provide maximum sand removal with minimum sugar losses.

For more information about our machinery and systems with "machismo", call or write Dorr-Oliver Incorporated, 77 Havemeyer Lane, Stamford, Connecticut 06904

DORR OLIVER

SEPARATES THE GOOD FROM THE BAD

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

* * *

Annual Subscription: £3.00 or $10.00 post free

Single Copies: 40p or $1 post free

International Sugar Journal

April 1973

Contents

SOMMAIRES : ZUSAMMENFASSUNGEN : SUMARIOS

La théorie de l'extraction dans les diffuseurs. 2ème partie. G. V. GENIE. *p.* 99–103

On établit des équations basées sur la loi de FICK pour le calcul des paramètres de diffusion et on explique l'effet de la convection sur l'extraction du sucre. L'influence du temps de diffusion est discutée (on démontre que l'extraction du sucre est proportionelle à la racine carée du temps), ainsi que l'effet d'une concentration non-homogène et de la séparation incomplète du jus. Une méthode de mesure de θ, ϵ (rapport entre le volume et la surface du matériau extrait) et de D (coefficient de transfert du saccharose) est exposé.

* * *

Procédés pour déterminer et réduire la détérioration des résines décalcifiantes en service. 2ème partie. J. F. T. OLDFIELD, C. W. HARVEY et M. SHORE. *p.* 103–105

On discute des causes de salissement de la résine, englobant la contamination par du précipité de 2ème carbonatation et par de la matière azotée. Alors que le précipité de 2ème carbonatation est le précurseur du salissement de la résine, la cause principale est le matériau insoluble dans l'acide qui reste après l'élimination du précipité résiduaire par HCl. Un traitement avec de l'hypochlorite à 6% se révèle optimal pour un leger salissement, mais il faut 10% pour un salissement plus important, tandis que l'hypochlorite à 12% blanchit la résine et provoque une perte importante de la résistance de la résine.

* * *

Moulins à canne à deux rouleaux. A. T. DE BOER. *p.* 106–107

Pour des longueurs de rouleaux et des vitesses circonférencielles identiques, un moulin à deux rouleaux possède le même pouvoir d'entrainement et de compression de l'alimentation en canne qu'un moulin à trois rouleaux, pourvu que la canne soit dans la même condition dans les deux cas et étant donné que les rapports entre les diamètres des rouleaux soit dans les deux cas conforme à une équation dérivée de la relation entre les diamètres des rouleaux et les ouvertures de travail.

* * *

Epoque optimale pour la replantation de la canne à sucre. N. W. SIMMONDS. *p.* 107–108

A partir de données en provenance de la Jamaïque, l'auteur procède à une analyse algébrique du problème de la détermination du nombre économiquement optimum de récoltes de repousses et du moment ou il faut replanter la canne. Le problème est exposé en termes de rendements en récolte et en sucre ainsi qu'en termes monétaires.

Theorie der Extraktion in Saftgewinnungsanlagen. Teil II. G. V. GENIE. *S.* 99–103

Aus dem FICK'schen Gesetz leitet der Autor Gleichungen zur Berechnung der Parameter der Extraktion ab und erklärt den Einfluss der Konvektion auf die Zuckerextraktion. Es werden sowohl der Einfluss der Extraktionszeit—es wird aufgezeigt, dass die Zuckerextraktion proportional der Quadratwurzel aud der Zeit ist—als auch der der nicht-homogenen Konzentration und der unvollständigen Safttrennung diskutiert. Ferner wird eine Methode zur Messung von θ, ϵ (Verhältnis zwischen Volumen und Fläche des extrahierten Materials) und D (Zuckerübergangskoeffizient) beschrieben.

* * *

Methoden zur Ermittlung und Verringerung der Kapazitätsminderung von Enthärtungsharzen im Betrieb. Teil II. J. F. T. OLDFIELD, C. W. HARVEY und M. SHORE. *S.* 103–105

Die Autoren diskutieren die Ursachen des Faulens einschliesslich der Verunreinigung durch Niederschlag der 2.Carbonatation und durch stickstoffhaltige Substanzen. Während der Niederschlag der 2.Carbonatation das Faulen des Harzes einleitet, sind die Hauptursache die in Säure unlöslichen Stoffe, die nach der Entfernung des löslichen Niederschlags mit Salzsäure zurückbleiben. Bei geringem Faulen hat sich die Behandlung mit 6% Hypochlorit als optimal erwiesen. Bei stärkerem Faulen waren 10% erforderlich, während 12% Hypochlorit das Harz bleichten und einen merklichen Rückgang der Harzfestigkeit verursachten.

* * *

Zweiwalzen-Rohrmühlen. A. T. DE BOER. *S.* 106–107

Bei gleichen Walzenlängen und Umfangsgeschwindigkeiten zeigt eine Zweiwalzen-Mühle die gleiche Leistung hinsichtlich des Einziehens und des Pressens des zugeführten Rohres wie eine Dreiwalzen-Mühle. Dies gilt unter der Voraussetzung, dass der Zustand des Zuckerrohrs in beiden Fällen gleich ist und die Verhältnisse der Walzendurchmesser einer Gleichung entsprechen, die in Bezug auf Walzendurchmesser und Walzenabstand abgeleitet wurde.

* * *

Optimale Zeit für die Neuanlage von Zuckerrohrfeldern. N. W. SIMMONDS. *S.* 107–108

Unter Verwendung von auf Jamaika erhaltenen Werten führt der Autor eine algebraische Analyse des Problems der Bestimmung der wirtschaftlich optimalen Zahl von "Ratoon"-Ernten und des Zeitpunktes der Neuanlage von Zuckerrohrfeldern durch. Dieses Problem wird hinsichtlich der Rohr- und Zuckerausbeute und des finanziellen Aufwandes behandelt.

Teoría de extracción en difusores. Parte II. G. V. GENIE. *Pág.* 99–103

Ecuaciones basado en el lye de FICK se derivan para calcular paramétros de difusión, y el efecto de convección sobre extracción de azúcar se explica. La influencia del tiempo de difusión se discute (el extracción de azúcar se señale como proporcional al raíz cuadrado del tiempo) así como el efecto de concentración no-homogénea y separación no-completa de jugo. Un método de medición de θ, ϵ (relación entre volumen y area de materia sujeto a extracción) y D (coeficiente de transferencia de sacarose) se traza.

* * *

Procedimientos para asesar y reducir el deterioro en servicio de para descalcificación. Parte II. J. F. T. OLDFIELD, C. W. HARVEY y M. SHORE. *Pág.* 103–105

Las causas de ensuciamiento de resinas se discuten; incluyen su contaminación con material precipitado del jugo de 2° carbonatación y con materia nitrogenosa. Aunque el precipitado de 2° carbonatación es el precursor de ensuciamiento de la resina, la causa principal es la materia no-soluble en ácido que pe manece después del eliminación del precipitado residual con ácido hidroclórico. Tratamiento con hipocloruro de 6% se demostró como optimum con ensuciamiento ligero, pero 10% se requiere con ensuciamiento más severo. Hipocloruro de 12% blanquea la resina y causa una perdida considerable de la resistencia mecánica de la resina.

* * *

Molinos de caña de dos mazas. A. T. DE BOER. *Pág.* 106–107

Con idénticas longitudes de las mazas y idénticas velocidades circunferenciales, un molino de dos mazas tiene la misma habilidad como uno de tres mazas para arrastrar y comprimir la caña alimentado al molino, con tal que el estado de la caña as el mismo an ambos casos y que los diámetros de la mazas conforman con un ecuación que se derive que relata el diámetro de la maza al abertura de trabajo.

* * *

Tiempo optimal para replanteación de caña de azúcar. N. W. SIMMONDS. *Pág.* 107–108

Empleando dados obtenido en Jamaica, un análisis algebraico se hace de la problema de determinar el número económicamente óptimal de retoños de caña y cuande es aconsejable replantear. La problema se trata también en términos de producción de caña y de azúcar y en términos monetarios.

THE

INTERNATIONAL SUGAR JOURNAL

VOL. LXXV APRIL 1973 No. 892

Notes & Comments

The late F. N. Howes

We regretfully announce the recent sudden death of Dr. F. N. HOWES, Agricultural Editor of this Journal. Born in 1901 at Richmond, Natal, South Africa, he was educated at Durban Boys High School and Natal University College, University of South Africa, where he graduated M.Sc. in 1923. He was then engaged for eighteen months in botanical survey work in the Transvaal and Western Cape Province whilst attached to the Union Botanical Survey. Subsequently he held the post of Economic Botanist to the Agricultural Department of the Gold Coast, now Ghana, and joined the staff of the Royal Botanic Gardens, Kew, England, in 1926. Two years later he visited Malaya, Java, Siam, Burma, India and Ceylon in connexion with banana varieties and disease resistance. The degree of Doctor of Science was conferred on him in 1935 and in 1948 he was appointed Keeper of the Department of Economic Botany at Kew. On his retirement from the post in 1966 he was awarded the Imperial Service Order. He became Agricultural Editor in 1967.

He was the author of four books and numerous papers on economic botany and had experience of sugar cane and sugar beet as economic crops, the former from his boyhood. He was thus able to bring to his work for this Journal a great wealth of experience and fundamental botanical knowledge which has been manifest in the selection of agricultural articles from among those submitted to us as well as the editing of all agricultural matter published. We count ourselves fortunate to have had the privilege of working with Dr. HOWES.

* * *

Longer term sugar price prospects

F. O. Licht K.G. have been at pains to point out recently[1] that they are less sanguine about future prices in the long term. They calculate the increase of production between 1952/53 and 1962/63 to have been 50·88% of the earlier figure and the increase in the ten years to 1972/73 to be 48·20% of the 1962/63 production. They see no reason why a similar percentage increase should not apply for the decade to 1982/83 and this would give a production level then of some 115 million tons, enough to cover likely consumption.

Further, if the maximum crops attained in each country during the past twenty years were repeated, production would reach 87·7 million tons as compared with an expected 77·1 million tons in 1972/73. Thus Licht believes that there is scope for sufficient production in the near future to meet consumption requirements and that the problem for the world sugar economy will in the future be an excess of sugar not a shortage.

It should be remembered, however, that the variation of crops from their maximum is rarely a deliberate act and usually arises from natural causes such as droughts, floods, etc. There is little likelihood that such phenomena would not reduce crops in any part of the world during a single year, never mind a series of years. Further, the consumption levels mentioned by Licht are not typical; in 1963 consumption actually fell compared with 1962 as a result of high prices, while consumption increase has certainly been restricted in 1971 and 1972 as a result of higher prices so that a compensating extra large increase can be expected when prices fall again, as occurred in 1964/65. Thus we would be less confident that the 115 million tons would be sufficient to meet consumption requirements in 1982/83 or that production could be expanded by 10 million tons without installation of new capacity.

But we would agree with Licht's conclusion that a new, effective International Sugar Agreement is urgently necessary but in order to avoid the possibility rather than the likelihood of ruinous prices for producers supplying the world market.

* * *

UK Sugar Act 1956

As a consequence of the adoption on 1st February of the Common Agricultural Policy for sugar of the European Economic Community, certain provisions of the Sugar Act 1956 and of associated legislation, which will no longer be required, have been repealed.

[1] *International Sugar Rpt.*, 1972, **104**, (34), 6–9, (35), 4.

There are three main effects. First, the present distribution payments made by the Sugar Board on all sugar consumed in the United Kingdom will be retained in order to ensure the continuation of the sugar subsidy, which will cease on 30th June. However, they will no longer fluctuate in response to movements in the world price of sugar; instead they will be at fixed rates which will, at any given time, be exactly equal to the amount of the subsidy. The subsidy is to be phased out by 1st July 1973 and the distribution payment of £15 per ton which applied from 1st February was reduced to £10 per ton from 1st March. This is the maximum level which may apply during March and April, and is to be reduced to £5 per ton in May and June 1973.

Second, the statutory provision is repealed which allows the Minister of Agriculture, Fisheries and Food to make, or to approve, arrangements for ensuring a market in the United Kingdom for all sugar produced from home-grown sugar beet. In future the Intervention Board for Agricultural Produce will be responsible for purchasing sugar which is offered to it and which has been produced within the basic quantity allocated to the United Kingdom.

Third, the statutory provision which enables the Chancellor of the Exchequer to accept voluntary undertakings by sugar refiners to restrict their margins is repealed, and, in the absence of any such undertaking, the Minister of Agriculture, Fisheries and Food is empowered to impose a margin. The sugar refiners' margins will in future be governed by the price structure established by Community Regulation.

Existing guarantees to United Kingdom growers for sugar beet are not affected.

* * *

World sugar production estimates

F. O. Licht K.G. recently published their second estimates of world sugar production for the 1972/73 campaigns[1]. The overall total is now set some 300,000 tons lower at 76,872,311 metric tons, raw value, but this is the net result of a number of major changes. The European beet sugar estimate is reduced by nearly 600,000 tons, mainly as a result of a cut of 700,000 tons in the Soviet figure from 9·2 to 8·5 million tons. The figure for beet sugar outside Europe is also reduced by about 160,000 tons, almost all of this resulting from a cut in the US beet sugar estimate.

Among the cane countries, the USA is expected to produce a further 200,000 tons, Dominican Republic 70,000 tons, Argentina 78,000 tons, India 300,000 tons, Philippines 90,000 tons and Australia 43,000 tons, while reductions of 55,000 tons have been made in the figure for Hawaii, 72,000 in that for Mexico, 49,000 tons for Guyana, 30,000 tons for Ecuador, 25,000 tons for Uganda and 30,000 tons for the Malagasy Republic.

The overall figure nevertheless represents an increase of almost exactly 4,500,000 tons over the corresponding figure for 1971/72.

International Sugar Agreement

A working group of the International Sugar Organization's Executive Committee has been meeting but has failed to reach a decision on the question of the supply commitment price in the Agreement. Producer members are pressing for an immediate increase in the price to compensate them for losses incurred as a result of the devaluation of the US dollar, while importing members are strongly resisting this pressure. On the occasion of the previous devaluation of the dollar, the supply commitment price was raised from 6·50 cents to 6·95 cents/lb. Currently the ISA daily price is 8·82 cents/lb. The group was to resume its meetings on the 12th March.

* * *

UK sugar imports and exports, 1972

Statistics of UK sugar trade have been published and appear elsewhere in this issue. C. Czarnikow Ltd. point out[2] that in 1972 the actual quantity entering the country was, in fact, the largest since 1967, but the difference from one year to another is only marginal. Of the total quantity of 2,118,865 tons, about 1,860,000 tons originated from the Commonwealth. Once again Australia was the major supplier with more than 450,000 tons, followed by Mauritius with 415,000 tons. Foreign raws for refining rose from 125,000 tons in 1971 to 178,000 tons last year but, whereas in the previous three years the Soviet Union had been the major supplier within this category, that country was not represented at all last year and Cuba took over as the most important source with just over 40,000 tons. With the entry of Britain into the Common Market, changes will take place in the future and, although the full Negotiated Price Quota will continue to come into the country until the end of February 1975, the pattern of other supplies can be expected to show some alteration.

Despite the fact that regulations were introduced in January 1972 to limit imports of sugar from foreign countries for domestic consumption, they actually rose slightly during the year. It may be expected that in future these outlets will be filled entirely by EEC countries except in the case of speciality sugars.

During the past two years the once plentiful supplies of white sugar from East Europe have been less in evidence and, despite the reduction in refining capacity which has taken place recently, British refiners have been quick to take advantage of their increased opportunities. At just short of 300,000 tons, total exports last year reached the highest level since 1967. Norway and Switzerland were, as usual, the most important outlets for British sugar, but Tunisia, Algeria and Kenya also figure prominently. Some years ago it was customary for a considerable tonnage of British refined sugar to find outlets in the EEC. The operation of the common agricultural policy has lately reduced this to very small proportions and it will be interesting to see whether a two-way trade can now be revived.

[1] *International Sugar Rpt.*, 1973, **105**, (6), 1–5.
[2] *Sugar Review*, 1973, (1113), 23–24.

Theory of extraction in diffusers

Relation between time, convection, juice draft and sugar extraction in intermittent continuous diffusers

By G. V. GENIE, Dr. Sc.
(Consultant, Chaumont-Gistoux, Belgium)

PART II

Diffusion equations

As said above, while the computer can simulate any practical problem, the mathematical treatment of diffusion is restricted to elementary shapes and simple initial sugar distributions, usually flat or square cossettes with homogeneous concentration. The mathematical way should however not be neglected because it works with symbols and aids *understanding* of the diffusion process, while the computer, working on numerical data, shows what happens in a particular instance, but does not give a clear picture of the mutual action of the various parameters. Both are, of course, complementary. When the juice draft is supposed to be infinite and the thickness of the cossettes 2ε, the integration of FICK's law gives:

$$\varepsilon\Theta = \sqrt{\frac{Dt}{\pi}}\left(1 - \sqrt{\pi}\ \text{ierfc}\ \frac{\varepsilon}{\sqrt{Dt}}\right) \quad \ldots\ldots\ldots(1)$$

without convection and

$$\varepsilon\Theta = 2\sqrt{\frac{Dt}{\pi}}\left[1 + 2\sqrt{\pi}\sum_{n=1}^{\infty}(-1)^n\ \text{ierfc}\ \frac{n\varepsilon}{\sqrt{Dt}}\right] \quad (2)$$

when the convection is infinite. The physical meaning of these equations is as follows: the first term of the product assumes that the thickness of the cossette

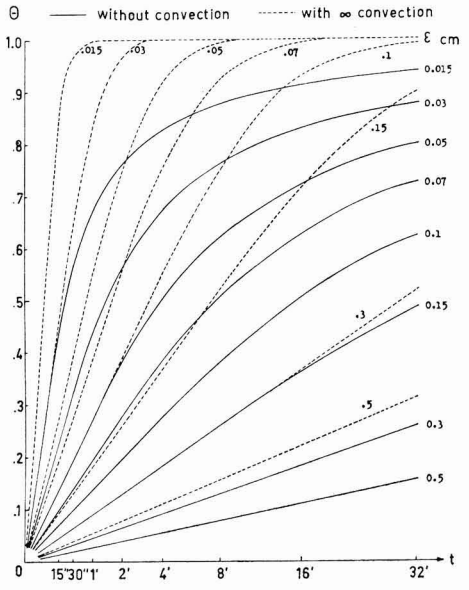


Fig. 1

is such that the gradient of concentration has not reached its centre at the time t while the term between brackets is a correcting factor decreasing from 1 to 0, which comes in action when the gradient of concentration has actually reached the centre at the time t. Fig. 1 shows the value of Θ *vs.* time and ε calculated according to the equations (1) and (2) when $D = 1 \times 10^{-5}$ cm²/sec. In these equations ierfc represents the integral of the complementary error function. We shall not attempt to define that function here; it is sufficient to know that it can be either found in tables or calculated with a computer when it is required, but that its value is usually negligible in intermittent diffusers. For short immersions, the terms between brackets drop out and, introducing a coefficient of convection k, the value of which lies between 1 and 2, we have simply:

$$\varepsilon\Theta = k\sqrt{\frac{Dt}{\pi}} \quad \ldots\ldots\ldots(3)$$

Equations similar to (1) and (2) can also be drawn from FICK's law when the draft S is not infinite. For instance when $S = 1$ (which corresponds to about 98 in practical weight units) they become respectively:

$$\varepsilon\Theta = \sqrt{\frac{Dt}{\pi}}\left[1 + 2\sqrt{\pi}\sum_{n=1}^{\infty}(-1)^n\ \text{ierfc}\ \frac{n\varepsilon}{\sqrt{Dt}}\right] \ldots(4)$$

without convection and

$$\varepsilon\Theta = \varepsilon\left[1 - exp\,\frac{Dt}{\varepsilon^2}\ \text{erfc}\ \frac{\sqrt{Dt}}{\varepsilon}\right] \quad \ldots\ldots\ldots(5)$$

with infinite convection*.

* This is an approximation. A rigorous solution is given by CARSLAW and JAEGER: *Cf.* CRANK J. "The mathematics of diffusion" (Oxford) 1956, 53–54.

To compare all these equations it is convenient to reduce them to the following one:

$$\varepsilon\Theta = k'\sqrt{\frac{Dt}{\pi}}\left[1 - \sqrt{\pi}\ \text{ierfc}\ \frac{\varepsilon}{\sqrt{Dt}}\right] \quad \ldots\ldots\ldots(6)$$

k' being an empirical coefficient depending on both convection and juice draft. If a diagram of k' *vs.* time is drawn, all curves have a reversed S-shape except the one corresponding to no convection and infinite draft which is completely flat by definition as in that instance $k' = 1$. To the right, all curves pertaining to the same draft tend for any convection to the same equilibrium value, which is the coefficient of expansion $S/(S+1)$. To the left, all curves pertaining to the same convection tend for any draft to the same value as $k' = k$. The useful part of the diagram is shown in Fig. 2 when $D = 1{\cdot}04 \times 10^{-5}$cm² sec^{-1} and $\varepsilon = 0{\cdot}06$ cm. As expected, a faster extraction corresponds to higher drafts but the influence of convection is very remarkable. Perfect stirring could theoretic-

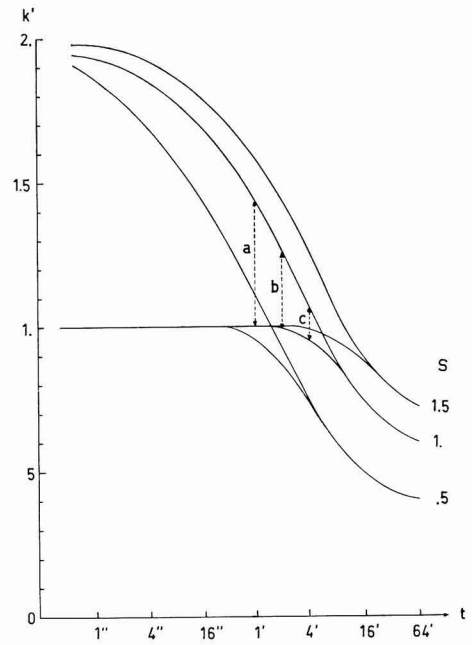


Fig. 2

ally improve the extraction of sugar by 40% after one minute (*a*), 25% after two (*b*), but only 10% after four (*c*). For longer extractions the influence of convection is negligible and this explains why stirring experiments were consistently less conclusive in diffusers than in boiling pans. The explanation is quite simple: two competitive effects tend to equalize sugar concentration in the juice, convection which has a quick action and diffusion which has a slow action. When the extraction starts, the flow of sugar out of the extracted material is large and convection is useful to reduce the concentration of the juice at the boundary, in order to keep a higher gradient of concentration in the extracted material. When the extraction comes nearer to equilibrium, the flow of sugar out of the extracted material is quite small and the homogeneity of the concentration in the juice is sufficiently secured by diffusion alone, so that the convection can no longer improve it.

Influence of time

This brings us to the influence of time on sugar extraction in intermittent diffusers. As shown by the equations (1) to (4), *the extraction of sugar is proportional to the square root of the time* until it is further decreased either by the exhaustion of the extracted material or by the increase of the juice concentration or both. This very important fact has never been emphasized, to our knowledge, as it should be. It means that, starting from a homogeneous concentration in the extracted material, 25% of the extractable sugar is in the juice after 5 seconds, 50% after 22 seconds, and that it takes about 15 minutes to get out the other 50%. The extraction of sugar is thus a very quickly decreasing process and the question arises of knowing when it should be interrupted to avoid any waste of time and to ensure the best efficiency of the equipment. To solve that problem we must calculate not the amount but the speed of the extraction; that means that the diffusion equations must be differentiated. The value of $d\Theta/dt$ *vs.* ε at the end of various durations of extraction is shown in Fig. 3 for $S = \infty$ without convection. As an infinite convection almost doubles its value, for clarity $1/2\ d\Theta/dt$ has been similarly plotted for that case. As expected $d\Theta/dt$ decreases when the extraction time increases but the appearance of the diagram is quite surprising at first sight for its shows that for any pre-set duration of extraction $d\Theta/dt$ goes through a maximum for a particular value of ε. This means that the choice of the duration—and consequently the number—of unit extractions in an intermittent diffuser is not arbitrary but should be determined by the characteristics of the extracted material and also, to a lesser extent, by the convection. Here too the explanation is quite simple: it should be remembered that Θ is the sugar extracted *per unit of volume* whereas extraction is a surface process which is relatively independent, at least at the beginning, of ε. If the same amount of sugar is extracted per unit of area, the lower ε is, the smaller the volume and the higher Θ. As a consequence, in spite of the fact that the extraction is just the same, $d\Theta/dt$ increases when ε decreases. But when ε is very small, the material is almost completely exhausted at the time t; Θ has reached its maximum value and

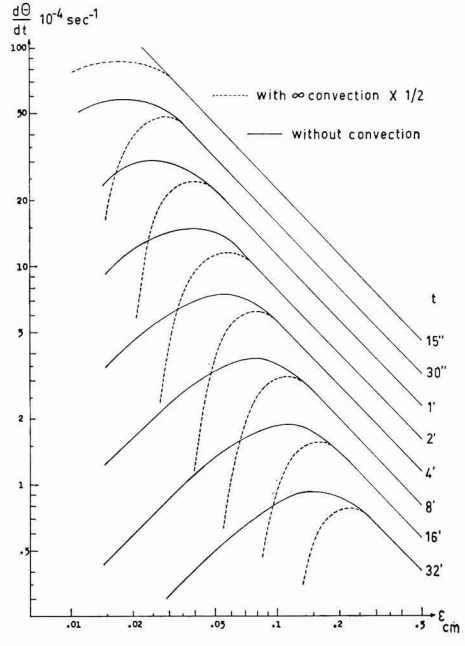


Fig. 3

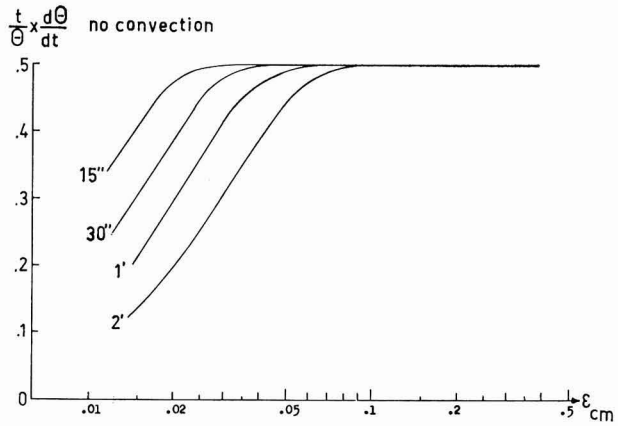


Fig. 4

cannot increase beyond, so that $d\Theta/dt$ returns to nil. Obviously there must be some intermediate value of ε for which $d\Theta/dt$ is maximum, although that maximum could be called an "economic" one as it does not correspond to any actual increase of the sugar transfer at some moment of the extraction. From the economic viewpoint it is indeed $d\Theta/dt$ that counts for we are interested in bringing Θ as high as possible but we cannot afford to wait unduly for a further small absolute increase of its value. We also could consider the relative increase of $d\Theta/dt$ which is given for any convection, with a close agreement over most of the useful range, by equation (7):

$$\frac{1}{\Theta}\frac{d\Theta}{dt} = \frac{1}{2t} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

The simplicity of that equation is not accidental but has a sound mathematical explanation. Fig. 4 shows the value of $\frac{t}{\Theta} \times \frac{d\Theta}{dt}$, which is dimensionless, *vs.* ε at the end of various durations of extraction without convection. For clarity, the lines for infinite convection have not been drawn; they correspond to those without convection for extraction of double the duration but fall off more steeply. The diagram shows clearly that for efficient results the falling sections should be avoided, which means that the unit extraction time should be kept as short as possible. Alas, if the unit extraction time is very small, a high rate of sugar transfer is secured but the number of steps must be large and the equipment can be bulky and expensive unless it has been specially designed for it. Moreover the time required to separate the juice and the extracted material between steps must be considered as a dead time. Yet, if the unit extraction time is very long—as it was in diffusion batteries—the overall rate of sugar transfer is low as is the number of steps and also the efficiency of the equipment. Fig. 3 shows that, from a theoretical viewpoint, the optimum doubtless lies on the high side, i.e. short extraction times with very fine cossettes, but there are of course practical limitations both in slicing machines and diffusers which will have to be overcome.

Effect of non-homogeneous concentration and incomplete juice separation

In all the preceding theory it has been assumed that the initial concentration is homogeneous in the extracted material. This can of course only be true for the first immersion and the question arises of knowing how long it takes to restore a homogeneous concentration between immersions and also what happens when such a condition is not completed or when the separation of the juice is not perfect. This problem is most conveniently solved with a computer. Fig. 5 shows the remaining fraction of the initial difference of concentration ΔC generated by an immersion of 30 seconds, assuming a complete separation from the juice, when $D = 1 \times 10^{-5}$ cm^2 sec^{-1} and $\varepsilon = 0{\cdot}05$ cm. It takes a little over one minute to decrease it by 90% and two minutes to decrease it by 96%. As a consequence the initial sucrose transfer rate would be reduced somewhere between 3% and 9%, which is insignificant compared to the high peak at the beginning of the next immersion. Most of the time lost between steps is consequently made up and it is in this way that, although their actual immersion time is only one third, intermittent continuous diffusers can compete with true continuous ones. In these the extracted material is exhausted by means of a low continuous gradient of concentration, while in intermittent diffusers successive high gradients are "despatched" which, on account of the time-lag mentioned above, continue to move sugar toward the surface after the juice which has generated them is removed. An analogy would be removers who continue to bring furniture down to the ground-floor after the van is away, so they can load it very quickly when it returns. These men would indeed be very

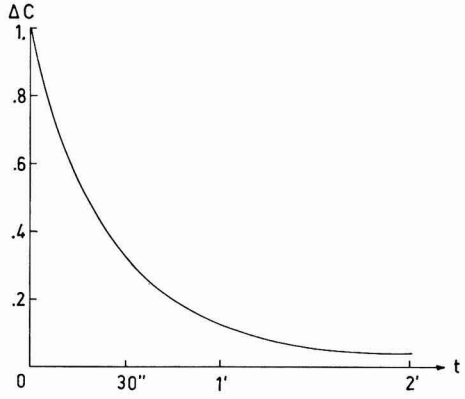


Fig. 5

efficient, provided of course that the van returns *empty*. The trouble is that in a diffuser the "van" does not return empty, because the juice is not completely separated between steps. Considering the static diffusion equations only, this is not very harmful as the extraction continues at a reduced rate and the concentration tends to equalize both in the extracted material and in the juice which has not been separated. But when that enriched juice mixes during the next immersion with the incoming one, of which it can represent one-third, it increases its sugar content notably and reduces in the same proportion the next gradient of concentration. This effect acts in the same way as a juice by-pass and the dynamic transfer equations show that the number of steps required for complete exhaustion is considerably increased. This is however another part of the problem which will possibly by dealt with at a later opportunity.

Measurement of Θ, ε *and* D

Finally, as it has not been published in English, we shall repeat briefly for convenience the practical method by which Θ, ε and D can be measured. The principle is to make a very short extraction under vigorous agitation, so that equation (3) can be applied and the coefficient of convection k assumed to be close to its maximum value which is 2. A representative sample of cossettes and several beets are taken simultaneously from the slicing machines. The cossettes are roughly cut in pieces about one inch long to reduce their apparent volume. Standard prismatic cossettes are cut from a piece of each beet by means of an instrument called "mandoline" by French cooks. It is a kind of tinplate cutter with a set of parallel vertical blades 2 mm apart and an adjustable horizontal knife on which potatoes or other vegetables are pushed by means of a sliding handle. When properly adjusted, this cutter delivers square cossettes 2×2 mm for which $\varepsilon = 0{\cdot}05$ cm and the length per hundred grams λ is 23·2 m. If λ is different, ε should be corrected by means of the formula:

$$\varepsilon = \frac{1}{0{\cdot}43\,\lambda + 10} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

Well-mixed 50 g samples of cossettes of both types are laid in 400 ml beakers and 200 ml hot water is poured on them under vigorous agitation with a thermometer. The temperature, which should lie between 68 and 72°C, is noted and after exactly 32 seconds the mixture is poured through a stainless steel gauze of about 20 mesh/inch, which is immediately removed, without allowing the cossettes to drain. A 100/110 ml flask is filled with the cooled solution, which is defecated, filtered and polarized in a 400 mm tube. The polarization P is corrected for the temperature by adding 1% for each half degree below 70°C or by substracting 1% for each half degree above 70°C. A higher reference temperature, for instance 75°C, could of course be chosen. Then, if R represents the original polarization /100 g of the cossettes, which is determined in the usual way on separate samples, we have:

(*a*) for both types of cossettes:

$$\Theta = 0{\cdot}57\frac{P}{R - 0{\cdot}06\,P} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

(*b*) for the standard cossettes:

$$D = 0{\cdot}025\,\varepsilon^2\Theta^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

(*c*) for the technical cossettes:

$$\varepsilon = \sqrt{D.10^5}\,(0{\cdot}035\,\frac{R}{P} - 0{\cdot}02) \quad \ldots\ldots\ldots\ldots\ldots\ldots (11)$$

A time saving procedure can be recommended: as the coefficient of sucrose transfer D changes very little, standard cossettes can be cut, say, once a week and only the technical cossettes subjected daily to the analysis to check the performance of the slicing machines. More details can be found in the original publications[5,9].

Summary

The mechanism of the extraction of sugar in continuous diffusers is explained and separated into two effects: (*a*) a kind of "pumping" of the sugar out of the extracted material under the influence of successive decaying gradients of concentration, and (*b*) a displacement of the extraction juice with the object of keeping these gradients as high as possible. In order to make the diffusion equations simpler, two new parameters are defined: Θ, which is the loss of sugar from the extracted material per unit of volume and per unit of initial difference of concentration, and ε, which is the ratio between the volume and the area of the extracted material. Equations and diagrams are presented for various juice drafts and ε-values with infinite convection and without convection. Convection can theoretically double the initial rate of sugar extraction but its influence decreases quickly and is quite small in practice.

Juice draft increases the extraction slightly but its major influence is on effect (*b*). Most important is the influence of the time. The sugar extraction is proportional to its square root and the usefulness of very short unit extractions in intermittent, such as rotary, continuous diffusers is stressed. A practical method for measuring Θ, ε and the sucrose transfer coefficient is outlined.

Nomenclature

D	sucrose transfer coefficient ($cm^2\ sec^{-1}$)
k	coefficient of convection (dimensionless)
k'	empirical coefficient depending on both convection and juice draft
n	parameter (= 1, 2, 3, etc.)
P	polarization
R	polarization /100g of cossettes
S	juice draft expressed as the ratio of the volumes of juice outside and inside of the extracted material (dimensionless)
t	time (seconds)
ΔC	difference of concentration between the surface and the centre of the cossette

[9] *idem*: *Ind. Alim. Agric.*, 1972, **89**, 1021–1025.

ε ratio between the volume and the area of the extracted material = half of the thickness when dealing with a thin slice or ribbon (cm)

λ length /100g of cossettes (m)

Θ loss of sugar of the extracted material per unit of volume related to the initial difference of concentration inside and outside of the extracted material (dimensionless)

ierfc integral of the complementary error function

Procedures to assess and reduce the deterioration of decalcification resins in service

By J. F. T. OLDFIELD, C. W. HARVEY and M. SHORE
(British Sugar Corporation Ltd., Research Laboratories, Colney, Norwich)

Paper presented to the 21st Technical Conference, British Sugar Corporation Ltd., 1972

PART II

Cause of Resin Fouling

Resin contamination with 2nd carbonatation precipitate

Some leakage of precipitate from the second carbonatation filters can occur at most factories at some period during the campaign. It is the normal practice to backwash between each cycle to remove insoluble material, but it is often impossible to remove such material completely.

New second carbonatation G.P. bag filters were installed at Peterborough in 1969 and their method of operation precluded the possibility of returning filtered, but cloudy, juice at the start of each cycle so that it was not possible to ensure the thin juice feed to the decalcification columns was free from suspended solids. The amount of suspended solids in the thin juice determined over a 45 minute period was 106 ppm which would give about 350 lb of precipitate per column per cycle.

A great deal of the contaminating precipitate was removed by backwashing after each cycle but sufficient generally remained to form a layer about 3 cm thick on top of the resin. Air blowing during back washing was effective in removing more of the precipitate but this method was stopped owing to the increased resin attrition and loss of the resulting fines.

When necessary the residual precipitate was removed by dissolving the calcium carbonate in dilute hydrochloric acid and washing the resultant solution and any excess acid through the column. The acid-insoluble material from the precipitate, such as protein and colour material, was left on the resin. It was considered that this acid-insoluble material was probably the main source of resin fouling at Peterborough factory.

During the 1970/71 campaign, changes were made to the second carbonatation filtration stage to reduce the contamination of the resin but occasional contamination still occurred and residual precipitate was again removed with acid and the capacity of the resin was reduced during the 1970/71 campaign by a further 36 to 58% as shown in Table I.

The excess acid remaining after the precipitate had been dissolved would convert resin at the top of the column into the acid form and on regeneration a band of acid would be developed down the column by the regenerant, finally being eluted as hydrochloric acid in the spent brine. During the two campaigns at Peterborough when the acid system was in use this mixture was responsible for corrosion of the unprotected parts of the stainless steel "Neva-clog" resin retaining screen fitted at the bottom of the column and there was some leakage of resin beads from the column. After fitting new screens more attention was paid to leakage of precipitate from the second carbonatation filters and it was no longer necessary to use acid on the columns.

As a result of the changes during the 1971/72 campaign only slight fouling of the cleaned resin occurred as shown by the results obtained for the capacity and $t_{\frac{1}{2}}$ in Table V.

Nitrogen content of fouled resin

The resin used at Peterborough was pale brown when new and darkened in service to a deep brown or black after one campaign. After three campaigns at Allscott the same type of resin was also black but there was a loss of capacity of only 7% and it is unlikely that the absorption of colour by the Peterborough resin accounted for much of the capacity loss.

New resin contains no nitrogen but the Peterborough mid-campaign sample (Dec. 1970) was found to contain 10·5 mg N/cm³ while the Allscott resin after 3 campaigns contained only 2·7 mg N/cm³.

When 10 cm³ of Peterborough resin (Dec. 1970) was soaked with excess of alkaline brine (10% sodium hydroxide and 10% sodium chloride) overnight at

room temperature the nitrogen content was reduced to 7·1 mg N/cm³; at the same time, the rate of exchange was increased and a value for $t_{\frac{1}{2}}$ of 4 minutes was obtained. The used alkaline brine was neutralized with hydrochloric acid and, after concentration in a rotary vacuum evaporator, a sample of the concentrate, acidified to 30% hydrochloric acid, was heated in a sealed tube at 110°C overnight. Examination of the neutralized hydrolysate in comparison with untreated material, by thin-layer chromatography, showed that several amino-acids had been produced. The material extracted from the resin was not coloured and it was considered that the amino-acids had been produced from protein or polypeptide material removed from the resin.

Nitrogen determinations were also carried out on the resin samples used in the experiment to show the effect of sodium hypochlorite on resin strength, the results of which are recorded in Table IV and the values obtained are recorded in Table VI.

Table VI. Effect of sodium hypochlorite on the nitrogen content of fouled resin

Sodium hypochlorite (%)	*Capacity* (% *new resin*)	$t_{\frac{1}{2}}$ (*minutes*)	*Nitrogen* (*mg N/cm³*)
0	73	18	10·5
2	83	4	8·4
6	92	4	7·2
12	96	4	5·2

At a concentration of 6% hypochlorite the nitrogen content has been reduced to 7·2 mg N/cm³ without apparent loss of colour from the resin which remained black. The further reduction of 2 mg N/cm³ in the nitrogen content with 12% hypochlorite was accompanied by a loss of colour from the resin.

Conclusions

1. The decrease in the rate of exchange of Peterborough resin was caused by protein, probably as a layer on the outside of the beads, which was easily removed by alkaline brine and hypochlorite.

2. The loss of capacity was probably caused by protein which had penetrated into the resin and this could be removed with hypochlorite.

3. It was considered that the gross contamination of the resin by second carbonatation precipitate was the precursor to the fouling of the resin.

4. The acid-insoluble material remaining after removal of residual second carbonatation precipitate with hydrochloric acid was the main cause of fouling.

5. Appreciable loss of resin strength occurred if the resin was treated with 12% hypochlorite and this treatment bleached the resin. A hypochlorite concentration of 6% proved optimum for mild fouling but for more severe fouling a concentration of 10% was required.

6. The resin clean-up procedure using 10% sodium hypochlorite was successful in removing the bulk of the fouling material without drastically reducing the strength of the resin.

Appendix

Determination of resin capacity

Virgin resin, in the sodium form, has a greater exchange capacity for calcium than regenerated used resin, owing to the residual calcium content of the latter, and measurements on new resin were made only after regeneration by the standard procedure following a preliminary exhaustion with calcium. The same procedure was also adopted with all the factory samples to ensure uniformity in the condition of the resin before regeneration.

The capacity was measured by determination of the total calcium uptake by resin in the sodium form when excess of a calcium chloride solution was applied.

To 10 cm³ of wet resin contained in a 125 × 15 mm diameter glass column was applied, at 3 cm³/minute, 1 litre of a calcium chloride solution (500 ppm calcium) ensuring complete exhaustion. After washing with 60 cm³ of deionized water the resin was regenerated with 100 cm³ of 10% w/v sodium chloride solution applied at 1·2 cm³/minute and then washed with 100 cm³ of deionized water.

The resin at this stage had undergone the standard regeneration procedure and to determine its capacity 1 litre of the calcium chloride solution (500 ppm calcium) was applied, at 3 cm³/minute, followed by washing with 100 cm³ of deionized water.

The effluent and washings were bulked and the calcium content of the mixture was determined by titration against N/50 EDTA using murexide as indicator and the calcium taken up by the resin was calculated by difference.

A typical value obtained with new resin was about 2 meq Ca/cm³ of wet resin.

Determination of the exchange rate of resin

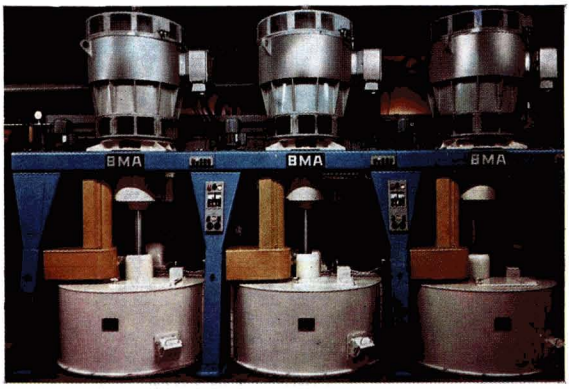
The exchange rate of resin was measured by determination of the time taken for the resin to exhaust to half its measured capacity when mixed, at room temperature, with calcium chloride solution.

10 cm³ of wet resin, regenerated according to the standard procedure, was added to 1 litre of calcium chloride solution (500 ppm calcium) and the mixture was stirred at a rate sufficient to keep the resin in suspension.

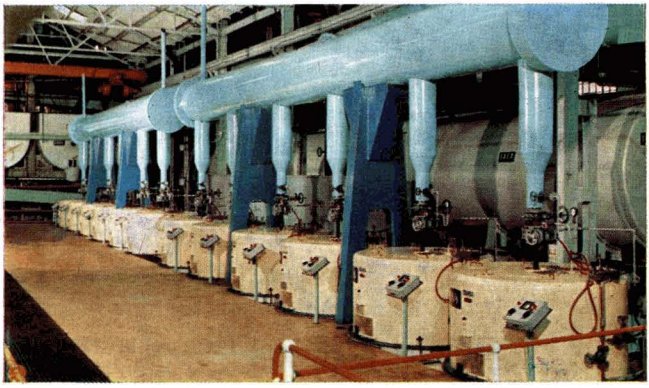
At one-minute intervals up to 10 minutes and thereafter at 5-minute intervals up to 30 minutes a 10 cm³ aliquot of the solution was withdrawn, using a pipette fitted with a small glass wool plug in the tip to avoid removal of resin, and its calcium content was determined by titration with EDTA.

The rate of removal of calcium from the solution by the resin was calculated from the calcium contents

BMA Centrifugals



fully automatic

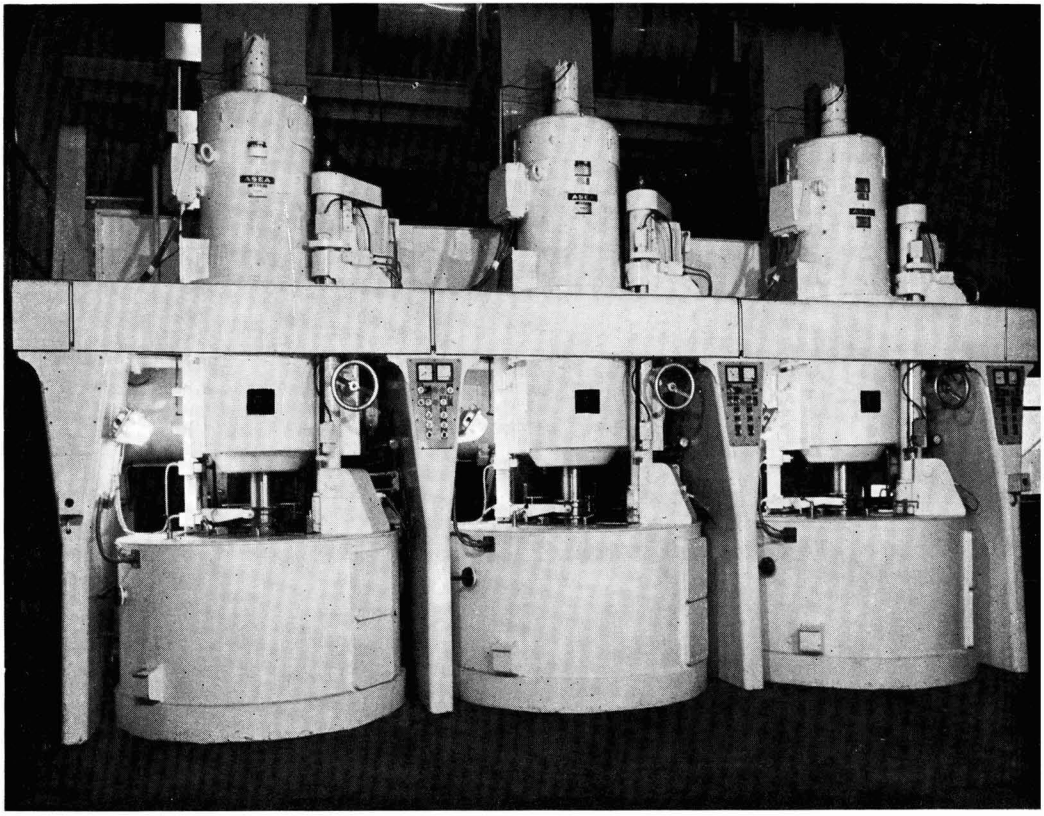


and continuous

are highlights of consequent development
high efficiency — robust — safe in operation — minimum servicing.

Braunschweigische Maschinenbauanstalt
Braunschweig, F R G Tel.: (05 31) 804-1 Telex: 9 52 456 a bema d

BMA



ASEA-WEIBULL

Fully automatic centrifugals with thyristor controlled DC motor drives fulfil the following requirements:

- **High capacity**
- **Flexibility**
- **Reliability**
- **Low operating costs**
- **Low maintenance costs**

Available in two sizes, 48″×42″and 48″×30″ for any centrifuging speed between 1000 and 1700 rpm.

If you want to know more – Ask us!

Chemical Industry Department, ASEA
S-721 83 VÄSTERÅS, Sweden

ASEA

Represented in more than 70 countries

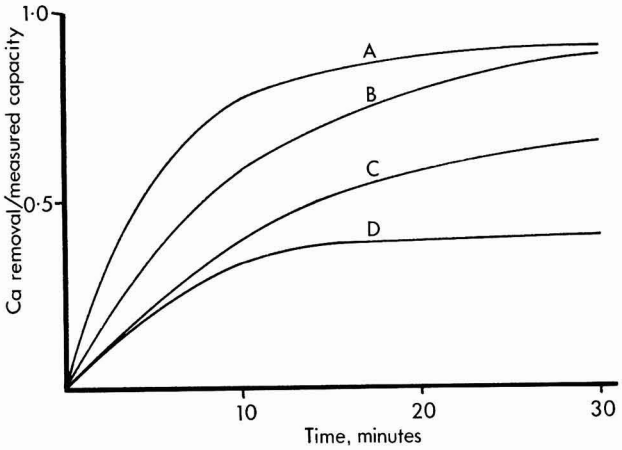


Fig. 1. Key: (A) New resin, (B) 1971/72—one campaign after treatment, (C) December 1970, (D) 1970/71—before treatment

of the samples after correcting for the calcium removed from the bulk solution in each 10 cm³ aliquot. The values obtained for the ratio of calcium removed:measured capacity were plotted against time on a graph and the value of time at a ratio of 0·5, i.e. $t_{\frac{1}{2}}$, the time to exchange half the measured capacity, was taken as a measure of the rate of exchange of the resin.

A value for $t_{\frac{1}{2}}$ of 4 minutes was always obtained with samples of new resin and typical curves for Peterborough resins are shown in Fig. 1.

Determination of the weight percentage of broken beads

The amount of broken beads present in a sample of resin was determined by separation of the dry beads on a flat plane inclined at about 10° from the horizontal. Unbroken beads rolled easily off the plane while broken beads remained on the plane as they settled on the flat part of the bead formed at the fracture.

The plane was made in the form of an equilateral triangle of side 22 cm with one vertex cut off parallel to the base at a height of 18 cm above it to form a lip as a run off for the resin beads. To enable the resin to be funnelled towards the lip the perimeter of the triangle, except for the lip, was edged with a strip of material 1 cm in height to form a tray.

About 4 cm³ of well drained wet resin, spread out on a clock glass, was air-dried at room temperature overnight and then distributed along the base of the, initially horizontal, separating tray. The resin beads were spread out by gentle shaking and then the base line end of the tray was lifted until the unbroken beads just rolled down the plane and off at the lip. Too steep an angle caused broken beads to roll off or be knocked off by unbroken beads. To avoid trapping any unbroken beads on the tray the resin remaining on the tray was returned to the base line by tilting and the separation procedure was repeated. After several cycles, when no more beads ran easily down the plane, the process was complete and the broken beads remaining on the tray were collected and weighed.

The weight was expressed as a percentage of the weight of the dry sample and the values obtained were typically 1 to 3% for new resins and 5 to 20% for factory resins.

Determination of resin strength

There is a reduction of about 50% in the volume of wet resin when it is air dried, with recovery to full volume upon re-wetting. The extreme volume changes undergone by the resin during one cycle of this treatment present a severe test of its durability[2] and strength and the severity is increased with rapid changes.

An estimate of the relative strengths of resin samples was obtained by a comparison of the percentage by weight of broken beads produced as a result of a rapid contraction and relatively more rapid expansion of the resin beads by alternatively drying and wetting the same several times.

A 2 cm³ sample of the wet resin under test was placed in an open 125 × 15 mm diameter glass column and rapidly air dried, at room temperature, by sucking air through the resin bed. The resin was considered to be dry after 1 hour when the volume had reduced by 50% and the resin beads no longer adhered to each other or the side walls of the column. At this stage the suction was removed and the resin was thoroughly re-wetted by the addition of 5 cm³ of deionized water. The drying cycle was then repeated as soon as the resin had recovered its original volume; this was typically 5 minutes with new resin and up to 15 minutes with fouled resin.

After a total of 10 cycles the percentages by weight of broken beads contained in samples of treated and untreated resin were determined using the inclined plane technique and the percentage by weight of broken beads produced as a result of the treatment were obtained by difference.

Typical values obtained with different types of competitive resins ranged from 1% to about 15%.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the contributions made by Mr. J. OSBORNE to the efficient operation of the clean-up procedure at Peterborough factory and to thank their colleague Mr. G. C. JONES for his assistance in the investigations reported in this paper.

[9] ROWE: *Power Eng.*, 1962, **66**, 68–69.

Two-roller cane mills

Would it be more difficult to feed a two-roller mill than a 3-roller mill?

By A. T. de BOER

(Consulting Engineer and former Head of the Research Dept. of Stork-Werkspoor Sugar N.V., Hengelo (O), Holland)

AFTER publication of a previous paper[1] entitled "Two-roller cane mills, a reappraisal in the light of value engineering of milling" several prominent scientists and experienced mill engineers approached the author questioning whether the feeding of a 2-roller mill would not raise more difficulties than with a 3-roller mill.

In trying to find and answer to the above question the following should be considered.

In Fig. 1, the two points M_1 represent the centres of the co-operating top and feed roller of a 3-roller mill, the diameters of both rollers being D_1.

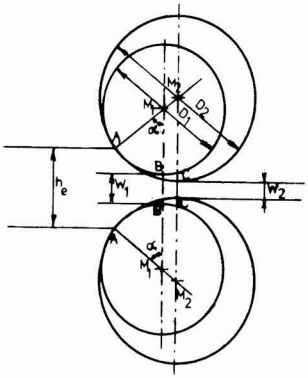


Fig. 1.

A mat of cane of thickness h_e enters between the rollers and is compressed to a thickness W_1 (work-opening at the feed side) at the axial plane of the rollers.

α is the angle of contact of the upper (and lower) surface of the blanket with the roller circumference at AA.

Suppose α is such that under the conditions under which the cane enters the mill it is entrained by the rollers without skidding.

The degree of compression C of the cane between a pair of rollers is defined as the ratio between the escribed volume per unit of time through the section AA and the same at the work-opening.

If v_e is the circumferential velocity of the mill roller, then the escribed volume at AA per unit of time and per unit of roll length will be $h_e v_e \cos \alpha$ and at the work-opening $W_1 v_e$

Hence:

$$C = \frac{h_e \cos \alpha}{W_1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

In Fig. 1, the two points M_2 represent the centres of a co-operating pair of rollers of a 2-roller mill, the diameters of each roller being D_2.

If A is a common point at the circumference of the rollers of both types of mills, while M_2 is situated on the radius A–M_1, then the conditions at the inlet side are exactly identical in both cases as concerns the angle of grip.

Under identical conditions at the inlet side and at the same circumferential velocity v_e, the compression ratio with the 2-roller mill will be identical to the total compression ratio of the two steps with the 3-roller mill if the work-opening CC at the axial plane of the rollers of the 2-roller mill is equal to the work-opening W_2 at the discharge side of the 3-roller mill.

Whereas:

$$h_e = D_1(1 - \cos \alpha) + W_1 = D_2(1 - \cos \alpha) + W_2$$

hence:

$$D_2 = D_1 + \frac{W_1 - W_2}{1 - \cos \alpha} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

From the above the following thesis may be derived:

Having the same roller length and working at the same circumferential velocity, a 2-roller mill has the same ability to entrain and to compress the cane fed into the mill as has a 3-roller mill, provided that the conditions of the cane at the entrance to the mills are identical and that the ratio of the roller diameters of both types of mills comply with equation (2).

In general the ratio of the two work-openings of a 3-roller mill could be put as:

$$\frac{W_1}{W_2} = 2 \text{ and: } W_2 = 0{\cdot}03\text{–}0{\cdot}04\ D \text{ (average } 0{\cdot}035\ D)$$

From equation (28) of the previous paper[1] the coefficient of friction at, e.g., $v_e = 10$ m/min could be calculated as:

$$\mu = 1{\cdot}87\ (0{\cdot}43 - 0{\cdot}0066 \times 10) = 0{\cdot}680 = \tan \alpha$$

from which

$$\cos \alpha = 0{\cdot}827$$

Hence, by substituting these figures in equation (2), it follows that:

$$D_2 = D_1\left(1 + \frac{0{\cdot}035}{1 - 0{\cdot}827}\right) = 1{\cdot}2\ D_1$$

[1] DE BOER: *I.S.J.*, 1972, **74**, 103–108, 136–140, 169–172.

The ratio of the total weight of the two rollers of a 2-roller mill to that of the three rollers of a 3-roller mill will then be about:

$$\frac{P_2}{P_3} = \frac{2 \times 1{\cdot}2^2}{3} = 0{\cdot}96 \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

where:

P_2 = total weight of the two rollers of a 2-roller mill

P_3 = total weight of the three rollers of a 3-roller mill.

The above calculated ratio of weights relates to the most unfavourable case with regard to the 2-roller mill which is when the lengths of the rollers of both types of mills are identical.

But if the lengths of the rollers are not identical and the length/diameter ratio in both cases is about 2, it may be proved in a similar way to the above that the weight ratio of the rollers would be even more favourable to the 2-roller mill.

The higher hydraulic force which could be exerted on the larger rollers to effect the compression is an additional feature in favour of the 2-roller mill.

Optimal replanting time for sugar cane

By N. W. SIMMONDS

(Scottish Plant Breeding Station, Pentlandfield, Roslin, Midlothian, Scotland)

Introduction

CHINLOY and SHAW have recently discussed the question of when to replant sugar cane[1]. They pointed out that the combination of high planting cost with declining ratoon yields implied that there must be an economically optimum number of ratoons and they showed, by numerical treatment of Jamaican figures, that this was three or four. In this note is presented a simple general algebraic analysis of the problem and the effect also considered of treating the question in terms of cash flow.

Analysis of Jamaican figures

The relationship between yield and time, as given by CHINLOY and SHAW, is nearly linear and it is assumed that, for the present purpose, this can be fairly approximated by

Generation	0	1	2	3	- - -	6
Yield, tons/acre (Y)	45·0	42·5	40·0	37·5	- - -	30·0

Where n is the number of ratoons, it follows that

$$Y = 45{\cdot}0 - 2{\cdot}5n \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Costs are given as 100 £/acre at planting and 100 £/acre annually, *plus* 2 £/ton harvesting. Omitting planting, annual costs are

$$C = 100 + 2\,(45{\cdot}0 - 2{\cdot}5n) \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

The value of the crop, V, at 6 £/ton of cane, is

$$V = 6Y = 6(45{\cdot}0 - 2{\cdot}5n) \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The profit in any one crop, £/acre, is

$$P = V - C = 80 - 10n \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

The average profit, $\bar{P}$, over plants plus a number (n) of ratoons, taking planting cost into account, follows from (4) and is

$$\bar{P} = \frac{-100 + 80(n+1) - 10\,(\Sigma 1 - - - n)}{n+1} \quad \ldots\ldots (5)$$

Since $(\Sigma 1 - - - n) = n(n+1)/2$, (5) reduces to

$$\bar{P} = 80 - \frac{100}{n+1} - 5n \quad \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

To maximize $\bar{P}$ with respect to n

$$\frac{d\bar{P}}{dn} = \frac{100}{(n+1)^2} - 5 = 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots (7)$$

from which

$$n^2 + 2n - 19 = 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots (8)$$

and $n = +3{\cdot}5, -5{\cdot}5$

of which the positive solution is the result CHINLOY and SHAW got numerically.

More general treatment

The same arguments as above, but using symbols throughout, yield the following expression for profit:

$$P = [Y_0(t-h) - m] - b\,(t-h)n \quad \ldots\ldots\ldots\ldots\ldots (9)$$

where Y_0 is the plant crop yield, t is the value of cane in £/ton, h is cost of harvest in £/ton, m is the annual cultivation cost in £/acre, b is the regression coefficient of yield decline, and P and n are as before. Writing E for establishment cost, in £/acre,

and $K = [Y_0(t-h) - m]$

also $L = b(t-h)$

the average profit, as before, is

$$\bar{P} = \frac{-E + K(n+1) - L\left(\frac{n(n+1)}{2}\right)}{n+1} \quad \ldots\ldots\ldots (10)$$

whence

$$\frac{d\bar{P}}{dn} = \frac{E}{(n+1)^2} - \frac{L}{2} = 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots (11)$$

which can be shown to be the same as (7) by substitution of the Jamaican figures: $E = 100$, $L = 10$.

If we substitute N for $(n+1)$ in (11)

$$N = \sqrt{\frac{2E}{L}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (12)$$

and this is a simple expression for optimal number of *total* crops (plants plus ratoons) in economic terms. Obviously, since $L = b(t-h)$ a high N will be favoured by high planting costs, low regression of yield on time, and low value of sugar relative to

[1] *Proc. 1969 Meeting WI Sugar Tech.*, 43-47.

cost of harvest. It may seem odd that the number of crops should be estimated by economic parameters but it will be noted that the right hand side of (12) is dimensionless because both numerator and denominator are in £/acre.

Since doing these calculations I noted with interest that the result (12) is formally identical to the solution of the standard economic batch quantity problem in operational research[2].

Time lost at replanting

CHINLOY and SHAW calculated on replanting directly after harvest so that there was a crop every year. If, for climatic or other seasons, replanting had to be delayed, a year would be added to each cycle; it would be, in effect, a pre-plant crop year in which planting costs were incurred but no income accrued. What effect would this have on optimum cycle?

The result is to increase by unity the denominator for the expression for average profit in (5), thus:

$$\bar{P} = \frac{-5n^2 + 75n - 20}{n + 2} \quad \ldots\ldots(13)$$

This no longer simplifies and must be differentiated as it stands

$$\frac{d\bar{P}}{dn} = \frac{-5n^2 - 20n - 170}{(n + 2)^2} \quad \ldots\ldots(14)$$

For the optimum, the numerator $= 0$, i.e.

$$n^2 + 4n - 34 = 0 \quad \ldots\ldots(15)$$

and $n = +4{\cdot}2, -8{\cdot}2$

Thus the optimum is four ratoons but a six-year cycle. Numerically it is evident that five ratoons is hardly inferior to four. The overall effect therefore is to lengthen the best cycle by one ratoon but by two years.

More generally, using the same symbols as above and differentiating (10) with the denominator changed to $(n + 2)$, we have

$$\frac{d\bar{P}}{dn} = \frac{-Ln^2/2 - 2Ln + (E + K - L)}{(n + 2)^2} \quad \ldots\ldots(16)$$

The optimum is given by numerator $= 0$, whence

$$n(n + 4) = \frac{2}{L}(E + K - L) \quad \ldots\ldots(17)$$

which, of course, reduces to (15) when $E = 100$, $K = 80$ and $L = 10$. It will be noted that, unlike (12), K remains in this expression.

The rate of yield decline

CHINLOY and SHAW chose as a typical rate of yield decline 2·5 tons per acre per year, as in equation (1) above. The optimum number of crops is fairly sensitive to the size of this regression coefficient. From (12), since $E = 100$ and $L = b(t - h) = 4b$,

$$N = n + 1 = \sqrt{\frac{50}{b}} \quad \ldots\ldots(18)$$

whence

$b =$	1	2	3	4
$N =$	7·1	5·0	4·1	3·5
$n =$	6·1	4·0	3·1	2·5

So a deviation of 0·5 from the chosen $b = 2{\cdot}5$ could swing the choice of optimum number of crops decisively to 3 or 4. More generally, it seems likely that estates, and even fields within estates, will differ sufficiently from a national average of b to affect the choice of optimum.

It will be noted that, as b tends to zero (i.e. no yield decline), N in (18) tends to infinity and replanting would be delayed indefinitely. The same is evident from putting $b = 0$ in (10) which reduces to

$$\bar{P} = K - \frac{E}{N} \quad \ldots\ldots(19)$$

where P tends to K as N rises.

The effect of discounting

Any plans for economic activity over a period of years must take the effect of time and the cost of finance into account. This is done by discounting. Since different cropping cycles in sugar cane are accompanied by different patterns of return, the point bears on the present problem.

Using the Jamaican data, equation (4) above, *plus* the information that planting cost is 100 £/acre, gives net profits per cycle as follows:

Years	0	1	2	3	4	5	6
Profits, £	−20	+70	+60	+50	+40	+30	+20

Consider a set of six régimes of plants plus 1 . . . 6 ratoons, endlessly repeated. Discounted profits are calculated for 25 years and summed. This procedure effectively asks the question: what is the present value of each of the six régimes? Results (A, below, in £/acre for $0 + 25 = 26$ years) are:—

	n	1	2	3	4	5	6
A.	5%	363	530	580	573	564	548
	10%	231	341	377	378	371	358
B.	5%	378	555	605	605	580	540
	10%	252	370	403	403	366	360

The effect of discounting is to reduce slightly the attractiveness of three or four ratoons revealed by the undiscounted figures: five ratoons would be nearly as good and, at 10%, the difference is marginal. This effect can, in a general way, be foreseen and it results from the delaying effect of the longer cycle on the loss-making plant-crop year.

This is, however, a somewhat unrealistic calculation. An estate, having adopted a particular régime, would, for practical reasons, have to have equal areas in each stage of the cycle at any one moment, rather than have all fields in phase, as just assumed. The average return in any one year, therefore, would simply be a constant arithmetical average of the component years of the chosen cycle and discounting would make no difference to the comparison of régimes (B in table above); three or four ratoons would still be the best choice. If, however, an estate had to regard a field, or a group of fields in phase, as a financially distinct enterprise, then the effect of discounting would be relevant to the choice of régime.

Acknowledgements

I am grateful to T. O. ELLIS (Guyana), T. CHINLOY (Jamaica) and R. F. LORD (Edinburgh) for helpful criticism.

[2] MAKOWER and WILLIAMSON: "Operational Research" (English Universities Press, London) 1970. Chapter 5.

SIEMENS

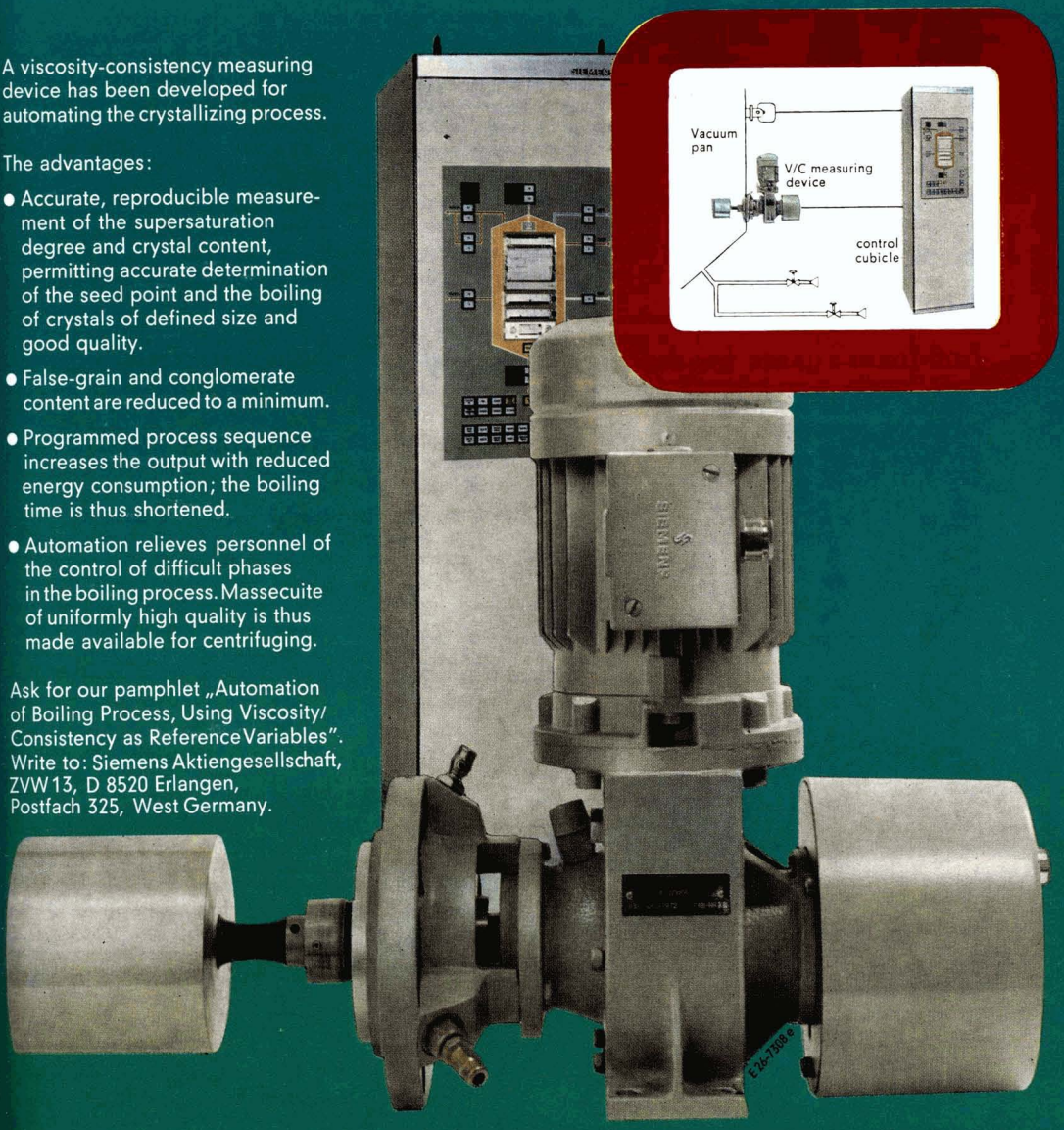
Improved Sugar Boiling Process Control

A viscosity-consistency measuring device has been developed for automating the crystallizing process.

The advantages:

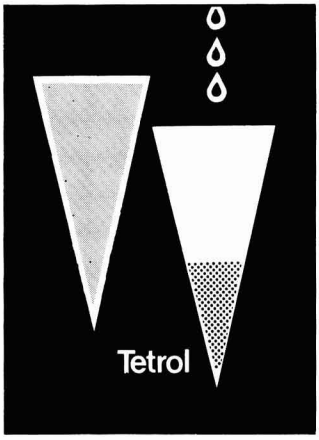
- Accurate, reproducible measurement of the supersaturation degree and crystal content, permitting accurate determination of the seed point and the boiling of crystals of defined size and good quality.
- False-grain and conglomerate content are reduced to a minimum.
- Programmed process sequence increases the output with reduced energy consumption; the boiling time is thus shortened.
- Automation relieves personnel of the control of difficult phases in the boiling process. Massecuite of uniformly high quality is thus made available for centrifuging.

Ask for our pamphlet „Automation of Boiling Process, Using Viscosity/ Consistency as Reference Variables". Write to: Siemens Aktiengesellschaft, ZVW 13, D 8520 Erlangen, Postfach 325, West Germany.



with automatic equipment from Siemens

Flocculating agent for the Sugar Industry: ®TETROL



for all clearing and settling systems known in the cane and beet sugar industry.

The use of TETROL for juice purification offers many advantages:

- highly accelerated sedimentation
- sharp separation between the clarified juice and the slurry
- thorough seizing of solids, and thus a brilliant clarified juice
- lower period of dwell in the settling tank, and thus better juice colours
- increase of decanter output
- better filtration capacity of the slurry and better desugarising, connected with an increase in rotary filter output

Considering the stringent waste water regulations and the frequent lack in fresh water, TETROL is also used as a sedimentation accelerator for flume and wash waters.

Anti-foam agents for the Sugar Industry: ®ANTISPUMIN

For decades ANTISPUMIN-products have become a catchword for quality in the Sugar Industry for an efficient and economical defoaming. ANTISPUMIN-types are used as

- anti-foam agents for outside work
- anti-foam agents for juice extraction and purification
- anti-foam agents for the evaporation station and the sugar end

The always unchanged high quality of ANTISPUMIN-types is the result of a stringent quality-control.

All over the world experienced STOCKHAUSEN-technicians are at your disposal for technical advice and service.

Wetting Agent for the Work in the Sugar End: ®INTRASOL FK

INTRASOL FK is used as a wetting agent for the processing of intermedium and after-product strikes in the sugar industry. Thus the following advantages are obtained:

- better results in centrifuging
- improvement of the B and C-discharge
- intensive foam removal effect and high de-aeration action
- increased output in raw sugar

Stockhausen

Please, fill in coupon and send to
Chemische Fabrik Stockhausen & Cie.,
D-415 Krefeld, Postfach 570

Coupon

Please, inform us on: .....

.....

.....

Our address: .....

.....

.....

Sugar cane agriculture

The national cane variety programme. W. CARNEIRO. *Brasil Açuc.*, 1971, **78,** 350–353.—The great expansion that has taken place in Brazil's sugar cane industry, especially in the State of São Paulo, is discussed, as is the need, in the future, to establish varieties that are well suited to the various sugar cane areas of the country with their differing climatic, edaphic and environmental conditions.

* * *

Treatment of setts to avoid the spread of sugar cane pests in Brazil. P. GUAGLIUMI and E. J. MARQUES. *Brasil Açuc.*, 1971, **78,** 393–419.—The sugar cane pests of Brazil are discussed at some length. Separate maps showing the distribution of each pest are included, the most serious pests being certain borers and froghoppers. Methods of preventing or minimizing their spread are described, notably the thermal and chemical treatment of seed pieces. The form this should take is described.

* * *

Growth of sugar cane plants in soils heated by solar radiation. T. T. YANG and C. H. CHANG. *Ann. Rpt. Taiwan Sugar Expt. Sta.*, 1969/70, 50–51.—The markedly improved rate of growth as a result of previously heating the soil by solar radiation (using soil in trays covered with two separate layers of transparent PVC sheet) is believed to be due to the destruction of harmful organisms in the soil caused by the high temperature.

* * *

Division of Pathology. C. G. HUGHES. 71*st Ann. Rpt. Bureau Sugar Expt. Sta.*, (Queensland) 1971, 48–55.—Three diseases were prominent during the year. In the wet north, yellow spot (*Cercospora koepkei*) was worse than for many years. Leaf scald (*Xanthomonas albilineans*) was not so particular as to environment and was present over a wide area. Fiji disease continued to be troublesome in some areas. These diseases and work done on them are discussed at some length, as are two Burdekin diseases —striate mosaic and Trojan mottle. The two diseases have much in common and are apparently viral in origin.

* * *

Individual and combined effects of *Pythium tardicrescens* and *Pythium graminicola* on sugar cane: a first report. H. KOIKE. *Plant Disease Reporter*, 1971, **55,** 766–770. Studies are reported on the root rots of sugar cane caused by *Pythium tardicrescens* and *P. graminicola*. In replicated greenhouse tests the pathogenicity of *P. tardicrescens* to sugar cane was demonstrated for the first time. Its symptoms on cane are described, as are those of *P. graminicola*. When the two fungi were present together *P. tardicrescens* produced an antagonistic effect on reduction of primary shoot height by *P. graminicola*. Cane yield reductions with the two fungi were the same as those caused by *P. graminicola* alone.

* * *

The incessant search for new and better varieties of sugar cane. R. P. HUMBERT. *La Ind. Azuc.*, 1971, **78,** 159–161.—Reference is made to the importance of New Guinea as a source of cane varieties in the past such as the noble canes and as a reservoir of sugar cane chromosome material and to the development, decline and replacement of varieties. The need for varieties better suited for mechanical harvesting is discussed.

* * *

Two-row harvester built by Messrs. Cannavan and Sons. ANON. *Australian Sugar J.*, 1971, **63,** 273–274.—An illustrated account is given of this harvester which was designed and built specially to deal with difficult standover cane in the Burdekin area of Queensland. It is said to be capable of successfully harvesting a "tangled mass of down cane without pause or hesitation", and is powered by two 100-hp diesel engines.

* * *

The leafhopper and Fiji disease. ANON. *Producers' Rev.*, 1971, **61,** (10), 9.—Only leafhoppers in the nymphal stage, but not adult leafhoppers, can transmit Fiji disease. Why this is so is explained. The disease cannot be transmitted by cane knives or mechanical harvesters, as can other cane virus diseases, but it can be spread by transfer of diseased cane between districts.

* * *

Inducing genetic changes in cane varieties. ANON. *Producers' Rev.*, 1971, **61,** (10), 11.—The potential value of irradiation in producing changes or new varieties in cane breeding is discussed. It is being carried out in Queensland on the variety N:Co 310 in the hope of inducing a non-arrowing variant of this cane and in New South Wales in the search for a frost-resistant variant.

* * *

"Raigros" is triumph for Proserpine grower-designer. ANON. *Producers' Rev.*, 1971, **61,** (10), 13–15.—A new mechanical chopper harvester which has proved

highly successful in full-scale trials in Queensland is described. Known as the "Raigros", it was designed and built by Mr. Frank Raiteri of Proserpine and has a minimum capacity of 1 ton of cane/min. Trash is removed from the stalk before chopping and separated from the cane billets in a rotary device in which both cane and trash are subjected to an air blast. The cane then passes via a rotary elevator to the accompanying bin.

* * *

Cane grower builds own fire unit. ANON. *Producers' Rev.*, 1971, **61**, (10), 63.—A tractor-mounted fire fighting unit for use in dealing with flares or breakaway fires is described and illustrated with a photograph. The unit is driven from the power take-off of the tractor and develops a pressure of approx. 120 psi. The tank carries 150 gallons of water.

* * *

Cicadas cause heavy damage to sugar cane. L. M. ARCEO. *Sugarland* (Philippines), 1971, **8**, (7), 6.—Considerable damage to sugar cane in Negros Occidental is reported, the pest having been introduced in 1965. It also causes damage in Taiwan, the Malagasy Republic and Australia. In the Philippines cicada damage is common in the ratoon crop only, the larval stage, during which the cicadas live on the root juices, being the most destructive stage. Control with chemicals (BHC, "Aldrin", "Heptachlor") has so far proved ineffective. Photographs of the insect in its larval stage are shown.

* * *

Survival of sugar cane seedlings raised from true seed. K. K. P. RAO and J. P. RAO. *Indian J. Agric. Sci.*, 1970, **40**, 733–736; through *Hort. Abs.*, 1971, **41**, 936. Studies are reported on the possibility of improving sugar cane survival without resorting to two transplantings in the first five months. The number of seedlings per unit area and their age at transplanting were the two important factors for survival. Sowing seed fluff at the rate of 10 $g.m^{-2}$ and planting in the field at 10 weeks gave the best results in tests involving seed rates of 1, 3, and 5 $g.m^{-2}$ and transplanting ages of 38–71 days.

* * *

Germination of stored sugar cane cuttings. D. M. BROADHEAD. *Agron. J.*, 1970, **62**, 831–832; through *Hort. Abs.*, 1971, **41**, 936.—Three-bud cuttings from three sugar cane varieties stored at 10 $\pm$ 2°C for 3, 6, 9 and 12 months showed a highly significant variety $\times$ storage interaction for bud germination. After 12 months 8% of the CP 52-48 buds were alive, but no buds of CP 67-500 were alive after 9 months.

* * *

Results of sugar cane variety trials at Kpong, Accra Plains. Y. TWENEBOAH. *Ghana Farmer*, 1970, **14**, 58–59; through *Hort. Abs.*, 1971, **41**, 936.—Several imported varieties now established have been classified as early, mid-season and late-maturing. In fertilizer trials responses to N, P and K have been obtained. Rates of 500 lb of ammonium sulphate, 220 lb of superphosphate and 167 lb/acre of potassium chloride are currently used.

* * *

Seedbed preparation, inter-tillage operations and chemical weed control for sugar cane growth and quality. J. P. AGRAWAL and N. K. JAIN. *Agron. J.*, 1971, **63**, 319–321; through *Hort. Abs.*, 1971, **41**, 937.—An account is given of studies carried out with variety CoS 510 to determine the optimum number of seed bed cultivations and to discover if any deficiency in initial cultivation could be made up by intensive post-planting measures which are described. The effect of post-planting treatments on growth, yield and juice quality was in proportion to their weed control effectiveness.

* * *

A note on relative performance of different intercrops in sugar cane. S. S. BAINS, S. DAYAN and K. N. SINGH. *Indian J. Agron.*, 1970, **15**, 86; through *Hort. Abs.*, 1971, **41**, 938.—Six short-duration intercrops were compared in a summer trial in spring-planted cane in N.W. India. The mung bean (*Phaseolus aureus*) crop, which takes 50 days, was the most profitable, followed by cowpeas for fodder.

* * *

Root inhibition of sugar cane seed pieces by *Ceratocystis paradoxa*. R. S. BYTHER and G. W. STEINER. *Phytopathology*, 1970, **60**, 1287; through *Hort. Abs.*, 1971, **41**, 939.—The nodal rooting of sugar cane setts incubated in plastic bags was inhibited by *C. paradoxa*. Ethylene was detected. It is suggested that a volatile compound produced by the pathogen stimulates the plant to produce ethylene, which then inhibits rooting.

* * *

The rôle of "Lindane" granules in the control of sugar cane shoot borer, *Chilo infuscatellus*. G. VARADHARAJAN *et al. Madras Agric. J.*, 1970, **57**, 25; through *Hort. Abs.*, 1971, **41**, 939.—"Lindane" granules at 1·2 kg a.i./ha, 35 days after planting, checked early shoot borer and also promoted tillering. A second application one month later did not improve control. Other less effective compounds tested included "Endrin", "Carbaryl", "Phosphamidon" and "Malathion".

* * *

Correlation studies in sugar cane. B. V. SINGH and A. S. SANGHA. *Madras Agric. J.*, 1970, **57**, 474–477; through *Hort. Abs.*, 1971, **41**, 940.—Partial and multiple correlation coefficients were calculated between the yield of the cane variety Co 312 and the following characters—number of canes per stool, average height, average girth, average number of internodes and juice percentage. Tabulated data include the relative contribution of each component towards cane yield; that of juice percentage was greatest, followed by girth.

Environmental modification of sex expression in sugar cane. R. NARASIMHAN and B. V. NATARAJAN. *Current Science*, 1970, **39,** 521; through *Hort. Abs.*, 1971, **41,** 940.—Environment-induced pistilloidy is reported in the cane variety P 1036/1. During the flowering season, a period of decreasing day length, the frequency of abnormal spikelets assessed weekly fell from over 90 to about 7%.

* * *

Loss in weight *vs.* quality in sugar cane. S. R. CHOWDAPPAN and Y. B. MORACHAN. *Madras Agric. J.*, 1970, **57,** 16; through *Hort. Abs.*, 1971, **41,** 941. Weight loss in the cane varieties Co 419 and Co 658, stored for up to 36 hours after harvest, was not accompanied by loss in quality.

* * *

A study of quality aspects in sugar cane after its scheduled maturity. R. S. CHOWDAPPAN and A. MARIAKULANDAI. *Madras Agric. J.*, 1970, **57,** 21; through *Hort. Abs.*, 1971, **41,** 941.—A comparative study was made of quality losses in the cane varieties Co 419 and Co 658 in the field during a period of 45 days after scheduled maturity and during a storage period of 48 hours after cutting. Differences were not significant but Co 658 was generally superior.

* * *

The bunch method of sugar cane breeding. R. O. CESNIK. *Rev. Agric. Piracicaba*, 1970, **45,** (1), 48–51; through *Plant Breeding Abs.*, 1971, **41,** 1055.—This method, which consists of growing bunches of 5–15 seedlings together in boxes, 30 bunches per box, is described. Selection is based on plant size, absence of disease and other defects and on pith in the cane. Selected plants are multiplied and selected on the same criteria and on Brix and polarization values; in later stages of selection trials are made of a number of different localities.

* * *

Morphologic, cytogenetic and enzymatic variation in *Saccharum* species hybrid clones derived from callous tissue. D. J. HEINZ and G. W. P. MEE. *Amer. J. Bot.*, 1971, **58,** 257–262; through *Plant Breeding Abs.*, 1971, **41,** 1055.—Two populations derived respectively from callous tissue of sugar cane clones H 37-1933 and H 50-7209 were studied for differences in morphology, chromosome number, and four enzyme systems. Variations observed in morphological characteristics were not directly correlated with differences in enzyme systems. Greater variation in both respects was observed in plants from H 50-7200 (a chromosomal mosaic) population than in plants from the H 37-1933 (chromosomally stable) population. Among 37 plants of H 50-7209 all but one had cell-to-cell variation in chromosome number.

* * *

Increased post-inductive photoperiods for delayed flowering in *Saccharum* sp. hybrids. P. H. MOORE and D. HEINZ. *Crop Sci.*, 1971, **11,** 118–121; through *Plant Breeding Abs.*, 1971, **41,** 1056.—Fifty-nine clones consisting of *Saccharum* species hybrids, *S. spontaneum*, *S. robustum* and closely related genera hybridized with *S. officinarum* were subjected to combinations of pre-inductive and post-inductive photoperiods to delay their flowering. The number of days delay in flowering varied among the clones tested and was correlated with the normal flowering date. Early flowering clones were delayed more than late flowing clones by post-inductive treatments.

* * *

Selection in two seedlings crops of four sugar cane progenies. N. I. JAMES and D. J. MILLER. *Crop Sci.*, 1971, **11,** 245–248; through *Plant Breeding Abs.*, 1971, **41,** 1056.—Phenotypic correlations were obtained between stalk number, stalk diameter and Brix, within and among the plant-seedling crop and first ratoon seedling crop, in progenies of four sugar cane crosses. The data obtained indicated that the most reliable selection criterion was stalk diameter. Stalk number was less reliable than either stalk diameter or Brix.

* * *

Billet quality in the central and southern district (of Queensland). L. G. VALLANCE. *Australian Sugar J.*, 1971, **63,** 329, 332.—A word of warning is given about unduly reducing the size of billets with chopper harvesters (often done in order to increase bin weight and simplify transport), as it may lead to excessive deterioration in the cane. Reference is made to recent analyses in Mackay where large quantities of dextran developed in 6-inch billets; four times as much as in 12-inch billets.

* * *

A planter for setts cut by chopper harvester. ANON. *Australian Sugar J.*, 1971, **63,** 332–333.—A two-row planter which is under construction and is designed to plant setts obtained with a chopper harvester is described and illustrated. It should reduce considerably the amount of labour normally used in planting. The machine carries its load of setts in a container at the rear. Below the setts spiral rollers and a conveyor belt move them longitudinally to the front of the machine into a storage bin. From this the setts are taken out one by one by means of a short conveyor elevator.

* * *

New release cane varieties. ANON. *Australian Sugar J.*, 1971, **63,** 339.—Descriptions are given of Q 94 and Q 95 cane varieties which have been approved by the Bureau of Sugar Experiment Stations for growing in given areas of Queensland.

* * *

Agronomic research at the Pongola field station. G. D. THOMPSON. *S. African Sugar J.*, 1971, **55,** 567–573. This field station was opened to serve the semi-arid areas typical of the northern irrigated parts of the South African cane area. Although its main purpose is variety selection, agronomic work has also been carried out. The latter is described under twelve headings and the conclusions reached are reported.

The effect of fluoride on sugar cane. R. A. WOOD. *S. African Sugar J.* 1971, **55**, 579.—The effects of fluoride on cane have been studied because of the proximity of a recently constructed aluminium smelting plant to cane fields in South Africa. Cane was found to be quite resistant to foliar injury by fluoride at the concentrations to be expected in the region of the smelter. Symptoms consist of chlorosis and associated colour changes. Fluoride accumulation in soil as a result of its presence in the atmosphere after release from the smelter would apparently be insignificant over a long period.

* * *

Factors affecting cane quality. ANON. *Ann. Rpt. Research Dept. Sugar Man. Assoc. (Jamaica) Ltd.*, 1970, 4–9.—The data from 5 large estates in Jamaica with reliable meteorological records are utilized in an attempt to correlate various factors, notably temperature and rainfall at or near harvesting, with yield. Other factors considered that may affect yield are variety of cane, extraneous matter, cane staleness and length of harvest period. It is thought that the chances of quality being adversely affected by high maximum temperatures in the near future are small. The low cane sucrose contents in the 1969 and 1970 crops were due to the relatively high minimum winter temperature and late rains before and during harvesting. Steps to prevent recurrence of the poor results in 1970, when the cane quality was the worst for 38 years, are recommended.

* * *

Land forming. ANON. *Ann. Rpt. Research Dept. Sugar Man. Assoc. (Jamaica) Ltd.*, 1970, 10–12.—Details are given of land forming operations carried out by two commercial operators on a large scale in irrigated areas. Figures were kept of soil removed for the first 25 fields. It is considered that the evidence proved that land forming is economically feasible and desirable but requires a fairly high investment. Land forming for drainage in humid areas is also discussed.

* * *

Herbicide trials. ANON. *Ann. Rpt. Research Dept. Sugar Man. Assoc. (Jamaica) Ltd.*, 1970, 12–20. Details are given of pre- and post-emergence trials, mainly summarized in tables, with a number of new herbicides not yet in commercial use on cane in Jamaica. Some of the trials were specifically designed to find a means of controlling the very troublesome corn grass (*Rottboellia exaltata*), which is known as Raoul grass in Louisiana. Some success was achieved with "Karmex", "Gesaprim", "Karmex" + "Gesaprim" and "Lasso" + "Sinbar". The effects of herbicides on different cane varieties were also studied.

* * *

Irrigation, variety and nitrogen trials. ANON. *Ann. Rpt. Research Dept. Sugar Man. Assoc. (Jamaica) Ltd.*, 1970, 20–26.—The main object of irrigation experiments was to train personnel in irrigation and the correct use of water. There is a serious shortage of trained or trainable personnel of this kind capable of applying the advanced irrigation practices now recommended. The estimated demand for irrigation technicians is of the order of one per 1500–2000 acres. Yield responses to nitrogen were somewhat obscured by weather and salinity factors.

* * *

Fertilizer experiments. ANON. *Ann. Rpt. Research Dept. Sugar Man. Assoc. (Jamaica) Ltd.*, 1970, 31–33. Results are not expected to be fully apparent until possibly the second ratoon crop. This is because materials such as rock phosphate and marl require some time to exert beneficial effects. Filter mud at 10 tons per acre produced the greatest response. The basic application of 3 cwt ammonium sulphate and $1\frac{1}{2}$ cwt muriate of potash per acre gave good yields.

* * *

Trace element survey. ANON. *Ann. Rpt. Research Dept. Sugar Man. Assoc. (Jamaica) Ltd.*, 1971, 33–34. The elements studied were magnesium, copper, manganese, iron, zinc and molybdenum. The soil samples were from selected fields of a large estate. Only 3 of the 29 fields had low magnesium, only 2 were low in manganese and 4 had a deficiency of molybdenum. All were adequately supplied with copper, iron and zinc.

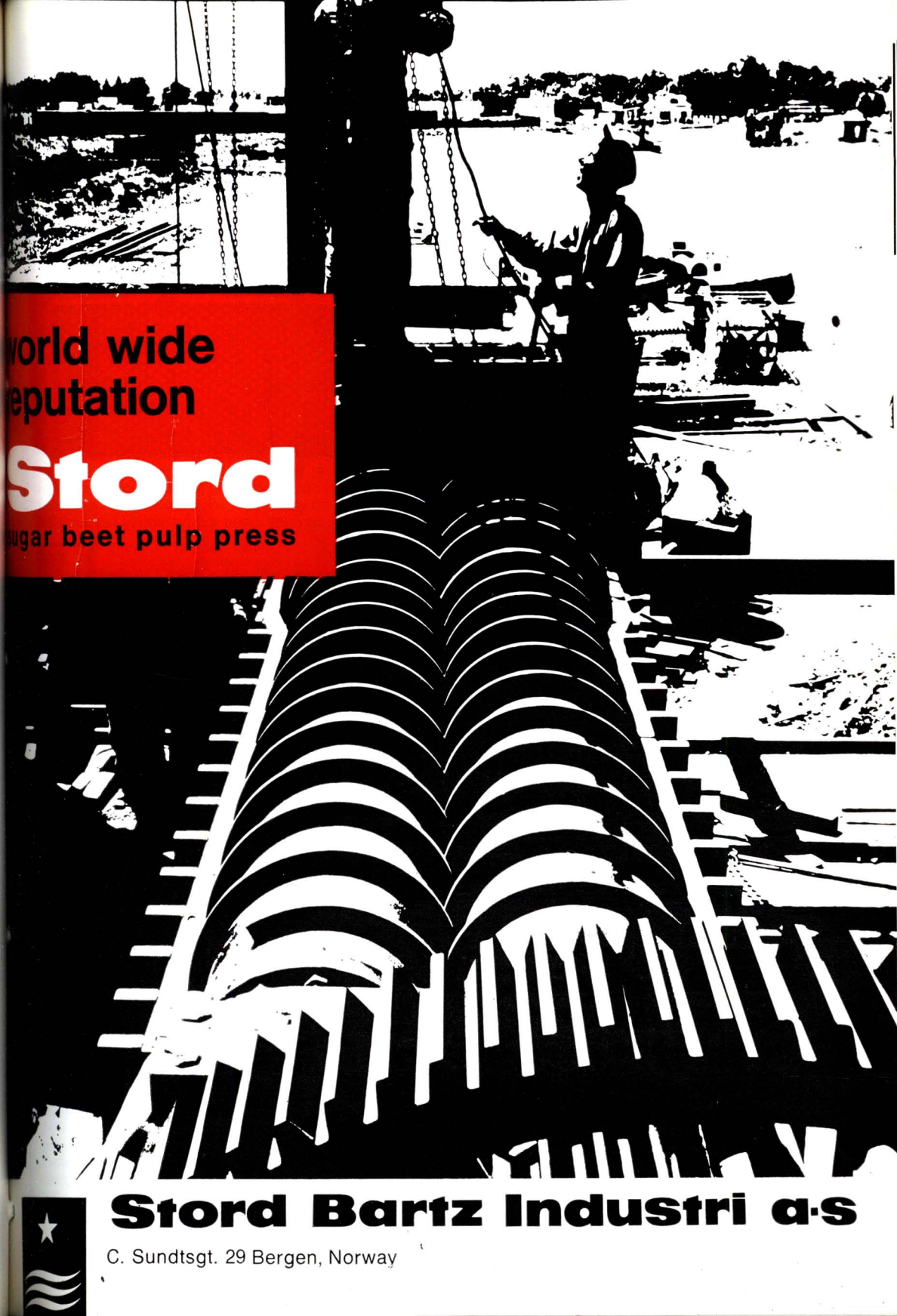
* * *

Mechanical harvesting. ANON. *Ann. Rpt. Research Dept. Sugar Man. Assoc. (Jamaica) Ltd.*, 1970, 35–47. Full details are given of trials with two cane harvesters, the Massey-Ferguson "M-F 201" and the Cameco "Cost Cutter"[1]. Brief mention is also made of the Australian Don "Mizzi" side-mounted harvester which is of advantage on steep slopes.

* * *

Sugar cane varieties. ANON. *Ann. Rpt. Research Dept. Sugar Man. Assoc. (Jamaica) Ltd.*, 1970, 47–73. Extensive cane varietal trials carried out in Jamaica are fully reported. A good bird's-eye view of the relative importance of the main varieties is given in the form of a diagram depicting percentage acreages under different varieties. In recent years the two important commercial varieties, B 41227 and B 4362, have been steadily losing ground to newer varieties. Varieties that have recently gained increasing commercial importance are HJ 5741, UCW 54/65 and B 51129. These accounted for 56% of the acreage reaped as plant cane in 1970, an increase of 31% on the previous year. BJ 5924 has won wide acceptance after final trials and has been recommended for preliminary field-scale extension. Other BJ varieties have not proved so acceptable. These and a number of others are discussed. Characteristics in cane desirable for mechanical harvesting are outlined and reference made to selection work carried out with these properties in mind. Bunch planting experiments with bunches containing 2, 4 and 8 plants are reported.

[1] *I.S.J.*, 1973, **75**, 6–10.



Stord Bartz Industri a·s

C. Sundtsgt. 29 Bergen, Norway

Burning × organic matter × nitrogen experiment. ANON. *Ann. Rpt. Research Dept. Sugar Man. Assoc. (Jamaica)* 1970, *Ltd.*, 73.—In experiments to examine the effects of cane burning, sulphate of ammonia application (at 3 and 6 cwt/acre) and use of molasses or bagasse on cane and sugar yields, burnt cane yield was slightly higher than that of unburnt cane and gave an average of 0·18 tons of sugar/acre more than did unburnt cane. The greater quantity of sulphate of ammonia gave higher yields than did the smaller amount and molasses was better than bagasse, the best yield from burnt cane being obtained with 4 tons of molasses/acre. Plant and ratoon cane was involved.

* * *

Variety × fungicide experiment. ANON. *Ann. Rpt. Research Dept. Sugar Man. Assoc. (Jamaica) Ltd.*, 1970, 73–75.—Experiments on eye spot disease control by spraying with muriate of potash showed that cane and sugar yields were increased slightly by the treatment compared with the untreated controls. Some difficulties were encountered in spraying the tall cane (34-week old plants) with a boom sprayer.

* * *

Soil microbiology. ANON. *Ann. Rpt. Research Dept. Sugar Man. Assoc. (Jamaica) Ltd.*, 1970, 75.—Reference is made to descriptions of the new genus *Echinopodospora* containing the two new species *E. jamaicensis* and *E. sacchari* which have been published. The former was isolated from Worthy Park soils and the latter from Innswood Estates. In investigations of soil fungi, the number of fungi isolated from fallow soil and soil soon after cane planting was somewhat higher than from soil sampled in subsequent isolations, indicating that the fungal population was reduced by cane roots in the soil near the roots and remained fairly constant throughout the plant and ratoon crops. Cane roots appear to have no rhizosphere effect, at least in heavy clay soils.

* * *

The effect of herbicides on different varieties. ANON. *Ann. Rpt. Research Dept. Sugar Man. Assoc. (Jamaica) Ltd.*, 1970, 76–77.—Results of tests to determine the effects of herbicides on cane showed that "Dalapon" severely reduced germination and growth, causing leaves to be crenellated and shoots to be twisted and deformed before premature death; "Terbacil" ("Sinbar") depressed growth and caused chlorosis, while "Asulam" ("Asulox") caused chlorosis but only slightly affected growth and germination. The effects differed with variety, except in the case of "Dalapon".

* * *

Moth borer survey of 1970 crop. ANON. *Ann. Rpt. Research Dept. Sugar Man. Assoc. (Jamaica) Ltd.*, 1970, 77–79.—A survey of the damage to cane by moth borer (*Diatraea saccharalis*) has not been carried out in Jamaica since 1964. The constantly changing proportions of cane varieties, together with the increased extent of pre-harvest burning, made a further survey desirable. Details of the survey and the conclusions reached are given. The southern estates showed the highest borer damage and the eastern estates the lowest. Figures for damage bore an inverse relationship to figures for rainfall, i.e. the higher the rainfall the lower the borer incidence.

* * *

West Indian cane fly. ANON. *Ann. Rpt. Research Dept. Sugar Man. Assoc. (Jamaica) Ltd.*, 1970, 79. Sugar cane acreage infested by this pest (*Saccharosydne saccharivora*) appears to have declined steadily since 1967, so that a decreased acreage has had to be sprayed since that year. There is no evidence to suggest that the decline is due to better chemical control or to any long-term improved control by parasites.

* * *

Trials of rat poison at Frome. ANON. *Ann. Rpt. Research Dept. Sugar Man. Assoc. (Jamaica) Ltd.*, 1970, 79–85.—Experiments conducted with two brands of rat poison, "Rattex" and "Ratilan", both hydroxy coumarin compounds, showed that at the same poison concentration per unit area "Rattex" was more effective in reducing the percentage of damaged canes and loss in yield (0·28% and 0·12%, respectively, compared with corresponding values of 1·53% and 0·60% in the untreated controls). However, the monetary returns were considered low since the level of infestation was about half that at which use of rat bait is regarded as commercially viable and for other reasons which are given.

* * *

Some observations on the causes leading to the severe multiplication of sugar cane leaf hopper, *Pyrilla perpusilla*, and suggestions for its control. R. L. GUPTA, H. NATH, B. N. PANDEY, S. L. VISHWAKARMA and R. DAYAL. *Indian Sugar*, 1971, **21**, 327–332. This leaf hopper is a serious pest of sugar cane in India in some seasons. A study was made of factors likely to be responsible for the pest reaching epidemic proportions. It was found that there may be heavy breeding of the pest in dense crops of cane with heavy foliage and with a higher than usual nitrogen content. Such conditions provide greater food value and adequate shelter from which the pest spreads to other cane. The two parasites *Tetrastichus pyrillae* and *Epipyrops melenoleuca* may increase with increasing host population but contribute little to the actual control of the pest in epidemic years.

* * *

New sugar cane cleaner under development. ANON. *Sugar Bull.*, **49**, 332–333.—Three photographs are shown, with captions, of a new experimental cane cleaner being built by Cary Iron Works in Opelousas and developed by the American Sugar Cane League, the US Dept. of Agriculture and Louisiana State University. Many types of cane cleaner have been developed but none have proved completely satisfactory for the Louisiana sugar industry.

Sugar beet agriculture

Effects of nitrogen fertilizer, plant population and irrigation on sugar beet. II. Nutrient concentration and uptake. A. P. DRAYCOTT and M. J. DURRANT. *J. Agric. Sci.* (Cambridge), 1971, **76,** 269–275; through *Soils and Fertilizers*, 1971, **34,** 718.—A 4-year experiment is reported, under irrigated and non-irrigated conditions, using 4 rates of N (0–1·8 cwt/acre) and 4 plant populations (8,800–54,000/acre). N and irrigation increased N uptake by the crop but increasing the plant population had little effect on uptake and decreased the N concentration. P concentration was affected little by all the treatments but K, Na, Ca and Mg were greatly affected.

* * *

Effects of nitrogen fertilizer, plant population and irrigation on sugar beet. III. Water consumption. A. P. DRAYCOTT and M. J. DURRANT. *J. Agric. Sci.* (Cambridge), 1971, **76,** 277–282; through *Soils and Fertilizers*, 1971, **34,** 717.—Results are given of a 3-year experiment in which a neutron moderation meter was used to measure soil moisture 0–4 feet deep in plots with populations of 8,800 and 54,000 plants/acre, with and without irrigation. Measured soil deficits were very similar to potential deficits calculated from meteorological measurements. Decreased plant population and irrigation decreased the amount of water used from depth in the profile every year. The total amount of water consumed by evapo-transpiration from soil reserves and rainfall averaged 12·2 inches by the small population and 13·4 inches by the large one. Under irrigation, consumption increased to 14·2 and 15·4 inches respectively.

* * *

The effects of soil fumigation and nitrogen fertilizers on nematodes and sugar beet on sandy soils. D. A. COOKE and A. P. DRAYCOTT. *Ann. Appl. Biol.*, 1971, **71,** 253–264.—The sugar beet malady known as Docking disease has now been shown to be due to damage of seedling roots by nematodes. Results of 15 experiments on soil fumigation and nitrogen fertilizing are here given. Fumigating soil the previous winter with D-D increased average yield of sugar beet roots from 25 to 36 tons/ha. This was more than that obtained with various N fertilizers in amounts up to 250 kg N/ha. Application of 85 kg N/ha increased yields on fumigated plots by 7 tons/ha and there was little benefit from giving more. Fumigation killed 65% of the *Pratylenchus* spp., 80% of the *Trichodorus* spp. and 90% of the *Tylenchorhynchus* spp. in the top 5 cm of the soil and at 15–20 cm 90, 93 and 95% of these genera. Fumigation not only improved the health of the beets, enabling them to use N more efficiently, but also increased the amount of available N in the soil.

* * *

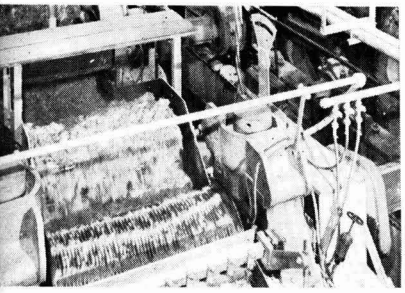
Studies on the relation between density of *Longidorus elongatus* and growth of sugar beet, with supplementary observations on *Trichodorus* spp. E. B. BROWN and G. B. SYKES. *Ann. Appl. Biol.*, 1971, **71,** 291–298. *Longidorus elongatus* attacks sugar beet on light, sandy soils in the West Midlands of England, killing plants or causing fanged roots. Results are given of 5 experiments or sets of investigations. Estimated loss of yield varied between 0·8 and 7·3 tons per acre. Large numbers of *Trichidorus* occurred in two trial sites and there is some evidence of competition between the two genera.

* * *

Pathogenicity of curly top virus isolates from Utah and Idaho on several hosts. C. L. SCHNEIDER. *J. Amer. Soc. Sugar Beet Tech.*, 1971, **16,** 275–278.—This paper reports on the inoculation of several plant species with over 30 curly top virus isolates collected by the author in northern Utah and southern Idaho in 1962 and 1963. The objectives of the study were to determine the extent of pathogenic variation among the isolates on the test hosts, to identify the strain or strains that the isolates comprised and to determine whether the relative degree of virulence of the isolate on one sugar beet variety is indicative of its relative degree of virulence on other sugar beet varieties. No isolate in this study showed relatively low virulence on one variety and relatively high virulence on another. Should isolates ever be found that show such selective virulence on sugar beet varieties designated as curly top-resistant they would have to be taken into account in curly top resistance breeding programmes.

* * *

Bolting in early-sown beet. L. A. WILLEY. *British Sugar Beet Rev.*, 1971, **40,** 69–70.—The average percentage of bolters from 8 varieties are given for the years 1969, 1970 and 1971. Sharpe's Klein E had the fewest bolters at both counts in 1971 and showed the greatest resistance to bolting over the 3 years. Bolters were most numerous in Sharpe's Klein Monobeet and in Hilleshog Monotri. These two varieties and possibly Sharpe's Klein Megapoly appear to be unsuitable for early sowing. When sown before mid-March the 3 varieties gave over 10% of bolters.



Cane sugar manufacture

Swaziland. ANON. *Sucr. Franç.*, 1972, **113**, 183–189. The geography, history and economy of Swaziland are surveyed and its sugar industry examined.

* * *

Sugar in India. H. HIRSCHMÜLLER and H. J. DELAVIER. *Zeitsch. Zuckerind.*, 1972, **97**, 198–203.—The Indian cane sugar industry is surveyed and a map showing the locations of sugar factories is reproduced.

* * *

"Dearborn-694" as boiler sludge conditioner—a preliminary trial. S. BOSE, P. N. GANGULY, K. C. GUPTA and S. MUKHERJEE. *Sharkara*, 1970, **12**, 99–103.—Preliminary tests on boiler feedwater treatment with "Dearborn-694", a synthetic sodium polyacrylate copolymer manufactured by Dearborn Chemical Division, W. R. Grace & Co., Chicago, Ill., USA, showed that 10–15 ppm was the optimum concentration at which scale formation from a hard raw water onto an electric heating element was minimum. However, for greatest reduction in total hardness (from 325 to 42 ppm) a concentration of 40 ppm was required. Factory-scale tests are to be carried out.

* * *

Some practical suggestions for recording mill stoppages using discarded instruments. R. C. SHARMA. *Sharkara*, 1970, **12**, 105–109.—The author advocates using modified pressure and vacuum gauges, recorders, vapour pressure thermometers, etc., which have become damaged and discarded, as recorders for cane mill stoppages. Diagrams and recorder charts are presented.

* * *

Improving filtrability of raw sugar at Kaohsiung sugar factory. J. H. CHEN. *Sugar News* (Philippines), 1972, **48**, 12–13.—Clarification difficulties at Kaohsiung were overcome by treating cloudy filtrate from the Oliver mud filters in settlers with the addition of "Zuclar" coagulant instead of recycling it to the clarifiers as was done previously. Other modifications to the system include installation of an "EimcoBelt" filter to handle some of the clarifier muds, filtrate from which is sent direct to evaporation.

* * *

Reclamation of screens of continuous centrifugals. J. P. MUKHERJEE and G. K. CHETTY. *Sugar News* (India), 1971, **3**, (8), 5–6.—The authors describe how to repair the fine nickel screens used in continuous centrifugal baskets by replacing any damaged section with a section from an old screen and soldering with ordinary lead-tin or silver solder onto a brass shim.

Sugar cane shredders. M. ANAND. *Sugar News* (India), 1971, **3**, (8), 8–11, 14.—The swing-hammer type of shredder and its operation are described with mention of its advantages and suitable location. The question of incomplete burning of bagasse from finely disintegrated cane is also considered.

* * *

Sugar cane juice clarification. ANON. *Sugar News* (India), 1971, **3**, (8), 12–14.—Clarification research in Cuba is discussed with particular attention to the use of magnesium oxide, and difficulties caused by mechanical cane harvesting, cane burning and stale cane are examined. Brief mention is also made of juice deterioration during shut-downs.

* * *

Steam ejectors for evacuating pans and evaporators. F. CABALLERO. *Bol. Azuc. Mex.*, 1971, (263), 9–15. The advantages of steam jet ejectors for producing vacuum for pans and evaporators are listed and a two-stage unit with an intermediate contact condenser is recommended for sugar factory use. The steam pressure must be adequate without being excessive, and 5–10° superheat is recommended to ensure that the steam is dry. The sources of incondensable gases from evaporating juices are discussed, and the ejector must be chosen of a size to extract these gases as well as handle the water vapour produced. Sample calculations are presented on the air capacity and water and steam consumption for given conditions.

* * *

Cane conveyor drives. ANON. *Brasil Açuc.*, 1972, **79**, 143–145.—A brief report is given of a visit to a number of sugar factories in São Paulo state to inspect the operation of "Positorq" electronic drive control units for cane carriers installed by Positron Equipamentos Electro-Mecánicos S.A.

* * *

Studies on the use of flocculating agents as settling aids for muddy juices obtained on clarification by the sulphitation process—laboratory assessment of indigenously produced "Flocal LT 26/25" "Flocal LT 26/50" and "Separan AP 273". S. K. D. AGARWAL, K. K. MATHUR and B. K. GUPTA. *Sugar News* (India), 1972, **3**, (9), 9–16. Graphs and tabulated data are presented to show that "Flocal LT 26/25" and "Flocal 26/50" were very similar to "Separan AP-273" in their effects as settling aids. The quantities required for optimum results varied from 1 to 5 ppm according to the nature of the juice.

Cane sampling at Inkerman mill. ANON. *Producers' Rev.*, 1972, **62**, (2), 9–10.—The cane sampling and punched card data system for cane payment at Inkerman in Queensland is briefly described.

* * *

The characteristics of sugar factory effluents. D. R. PARASHAR. *Sugar News* (India), 1972, **3**, (10), 13–14, 17.—The nature and behaviour of cane sugar factory effluent are discussed and the question of establishing reasonable permissible levels of BOD at which no harm is done to crops and aquatic life is examined.

* * *

Critical study about electrification of sugar industry in India. R. C. SHARMA. *Indian Sugar*, 1972, **21**, 673–676.—The pros and cons of cane sugar factory plant operation on steam or electricity are discussed and the question of whether to produce all the electricity in the factory or buy it from the national grid is examined. A list of recommendations is given.

* * *

The Honiron "Hi-Extractor" installation and performance at Honokaa Sugar Company 1970. L. J. RHODES and J. W. BERSCH. *Hawaiian Planters' Record*, 1971, **58**, 127–146.—See *I.S.J.*, 1972, **74**, 179, 310.

* * *

Tower Hill raw sugar factory, British Honduras. J. H. MILLINER. *J.A.S.T.J.*, 1969, **30**, 7–10.—See *I.S.J.*, 1972, **74**, 278.

* * *

Multiple-effect evaporators in the sugar industry. E. B. ELLIOT. *J.A.S.T.J.*, 1969, **30**, 21–38.—See *I.S.J.*, 1972, **74**, 278.

* * *

Introducing mechanization and controls in a sugar factory. M. PEARSE. *J.A.S.T.J.*, 1969, **30**, 58–63.—See *I.S.J.*, 1972, **74**, 278.

* * *

The ecology of *Leuconostoc mesenteroides* and control of post-harvest biodeterioration of sugar cane in Jamaica. R. TILBURY. *J.A.S.T.J.*, 1969, **30**, 93–104. See *I.S.J.*, 1972, **74**, 278.

* * *

Why is cane tonnage higher? F. A. GRAUGNARD. *Sugar J.*, 1972, **34**, (10), 19–22.—The president-manager of St. James Sugar Cooperative Inc. discusses factors that possibly contributed to good results achieved at the 4000 t.c.d. factory at St. James, Louisiana, in the 1971/72 season.

* * *

Cane juice acidity *vs.* sugar recovery. J. C. P. CHEN and R. W. PICOU. *Sugar J.*, 1972, **34**, (10), 25–27. Cane juice acidity, used as a cane quality criterion in Louisiana, has been found to depend on soil structure and is highest on heavy soils. Application of 10 tons of bagasse per acre of heavy soil reduced the acidity, but it has yet to be decided whether the cost benefits of increased cane yield, reduced lime consumption in the factory and lower molasses sugar (because of reduced lime salts) outweigh the costs of bagasse application.

* * *

Questions frequently asked about sugar cane diffusion. J. C. P. CHEN. *Zeitsch. Zuckerind.*, 1972, **97**, 261–265. The advantages of and problems involved in cane diffusion are discussed, including: cane preparation and the percentage of cells to be ruptured; clarification within the diffuser (shown to give juice of lower turbidity and colour than conventional milling and clarification); juice retention time in the diffuser; bagasse dewatering and pol; purity of diffusion juice compared with that of mixed juice from conventional milling; the greater quantity of press water to be handled when diffusion is used; and the comparative recoveries of sugar in milling and diffusion.

* * *

Why should the three-roller crusher be substituted for two-roller units in future sugar factory installations. A. DEL MONTE N. *ATAC*, 1971, (4), 35–43.—Installation of crushers is necessary in order to ensure achievement of the full capacity of the mills. The three-roller crusher has important advantages over a two-roller unit and the cost, relative to the work it can perform, is lower. In absolute terms, the difference in cost of investment, operation and maintenance is compensated by the savings in civil construction, reduction of carrier length and especially by the gain in installed capacity. The three-roller unit is more economical than a double two-roller installation both in operation and maintenance costs and in power consumption. It is concluded that, subject to guarantees of their performance efficiency, three-roller units should be substituted for two-roller crushers in future installations.

* * *

Modelling of the drying of bagasse with views to its economy. F. GROBART and Y. TERENTIEV. *Sobre los derivados de la caña de azúcar*, 1971, **5**, (3), 25–38. Drying of bagasse raises its calorific value and reduces the amount of bagasse needed as fuel for the sugar factory, so liberating a greater quantity for conversion into by-products. The economies possible have been calculated for various degrees of drying by means of a computer.

* * *

Thick juice storage applied in sugar cane syrups. E. M. HINE. *Sugar y Azúcar*, 1972, **67**, (4), 20–21.—After a mention of the pioneering work done on beet thick juice storage at Carlton in the USA[1], the author reports on the cane syrup storage scheme being practised at Venezuelan sugar factories and based on the system first tested at El Palmar after a visit made by Dr. F. CORDOVEZ to the Carlton plant in 1963. La Pastora is a new factory operating as a syrup mill and supplying the product to factories at Motatán, Yaritagua and El Palmar.

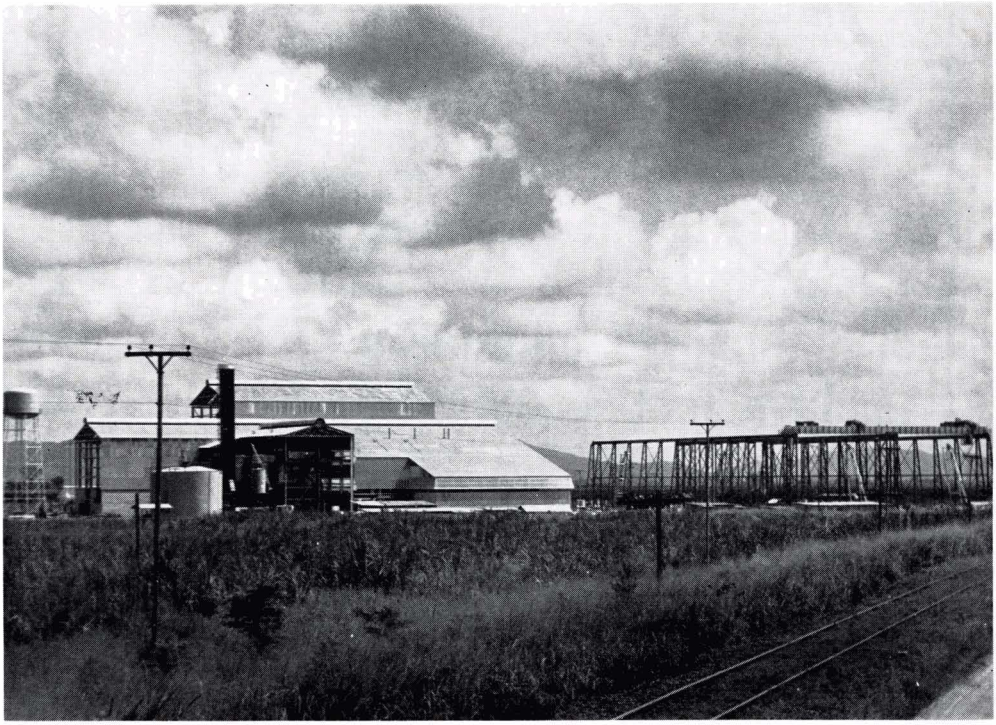
[1] *I.S.J.*, 1961, **63**, 371–373.

SMITH Mirrlees'

CENTRAL RIO YARACUY

ANOTHER " TURNKEY " FACTORY NEARS COMPLETION

TRIALS COMMENCED 18 MONTHS FROM EFFECTIVE DATE OF CONTRACT



A & W Smith & Co Ltd

Cable Address: Sugrengine Bromley Kent

The Mirrlees Watson Co Ltd

Cable Address: Mirwat Bromley Kent

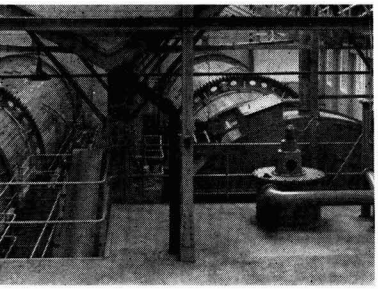
1966 1969

Sugar factory & refinery engineers
No. 1 Cosmos House
Bromley Common Bromley
BR2 9NA Great Britain

Telex Number: 2-2404

Works: Cook St Glasgow G5 8JW

Companies in the Tate & Lyle Group



Beet sugar manufacture

Reducing the lime consumption in juice purification. A. M. GREBENYUK. *Sakhar. Prom.*, 1972, **46,** (1), 21. At the author's sugar factory lime consumption in carbonatation was reduced by 0·4–0·5% on weight of beet by recycling 25–30% of the thickened 1st and 2nd carbonatation muds from the filters to preliming instead of recycling 1st carbonatation juice.

* * *

Electrical equipment of the APN-1250 automatic centrifugal. M. V. BAKSHT and A. G. PODOL'SKII. *Sakhar. Prom.*, 1972, **46,** (1), 21–27.—Details are given of the electrical components and controls of the Soviet APN-1250 automatic centrifugal which has a massecuite capacity of 650 kg.

* * *

Pneumatic conveying for bulk handling of white sugar. V. I. BEREZNYAK. *Sakhar. Prom.*, 1972, **46,** (1), 29–33. Details are given of the system used at a confectionery plant for pneumatic discharge of white sugar from a road tanker, and data are tabulated showing the slight increase in moisture, colour and reducing matter after pneumatic conveying as well as the change in crystal size distribution.

* * *

Control and registration of the weight of beet cossettes. A. B. GUSAKOV and S. P. GOTSKII. *Sakhar. Prom.*, 1972, **46,** (1), 34–35.—Modifications to the indicating system of a beet cossette belt weigher before the diffuser at the second author's factory are described.

* * *

Regulating the level of suspension in a vacuum filter. V. I. ABRAMCHUK. *Sakhar. Prom.*, 1972, **46,** (1), 49–50.—A simple system for regulating the level of suspension fed to a vacuum filter is described.

* * *

Factors affecting the choice of site for a beet sugar factory. S. OZEL. *Seker*, 1972, **22,** (82), 40–43. Social, economic and technical factors to be considered in the choice of beet sugar factory location are discussed.

* * *

Line for the preparation of granulated sugar for storage in silos. J. MLYNÁŘ. *Czech. Heavy Ind.*, 1972, (2), 15–20.—Descriptions plus diagrams and illustrations are given of a Škoda fluid-bed dryer/cooler and wet dust separator for white sugar.

* * *

Filtration of carbonatated sugar juices. V. MAURANDI. *Ind. Sacc. Ital.*, 1971, **64,** 188–196.—Filtration of juices is considered theoretically and a number of equations derived to relate the various factors with each other. These have been tested by application to factory practice, with the aim of optimizing operation and capacity.

* * *

Application of Fick's law to cossette extraction. III. G. V. GENIE. *Zucker*, 1972, **25,** 117–122.—Formulae derived previously by integration of Fick's second law are explained in physical terms, whereby sugar extracted from cossettes is assumed to be the product of two factors: (1) a function of the square root of the time, which assumes an infinite cossette thickness, and (2) a coefficient having a value between 1 and 0, which is dependent on time and cossette thickness and applies a correction to factor (1). It is shown that deviations from Fick's law found by BRÜNICHE-OLSEN for thin cossettes are probably a result of insufficient convection. The validity of Fick's law is discussed and a simple method proposed for simultaneous determination of the sugar transfer coefficient and equivalent factory cossette thickness. An example is given demonstrating application of the dimensionless parameter θ for calculation of a batch counter-current diffuser.

* * *

The new juice purification and filtration station at Platy sugar factory. P. CHRISTODOULOU. *Sucr. Belge*, 1972, **91,** 61–68.—The equipment, processes and performances of the new carbonatation and filter stations at Platy beet sugar factory in Greece are described.

* * *

Sugar loss caused by hyperthermophilic micro-organisms in beet sugar factory diffusion plants. I. Correlation between sugar decomposition and acid formation. H. KLAUSHOFER and G. POLLACH. *Zucker*, 1972, **25,** 157–165.—Correlations were found experimentally between sugar loss and acid formed by bacterial action, viz. (1) 0·8 meq of acid per 100 mg of sugar where hyperthermophilic H_2S-forming bacteria are involved (in the middle zone of a diffusion tower) and (2) 1·1 meq of acid where hyperthermophilic bacilli are active in the zones of higher juice concentration. It was found that a pH drop of 0·5 units corresponded to 1·2 meq of acid per litre of juice in the case of (1) and to 2·5 meq/litre in (2), allowance having been made for the raw juice buffering capacity. The buffering capacity of beet pulp was examined with the aim of evaluating the quantities of acid discharged with the pulp and thus representing an extra loss.

Analytical evaluation of frost-damaged beets. R. BERGKVIST. *Socker Handl.*, 1971, **25**, (1), 1–3.—Multigerm beet showed greater losses than monogerm beet when frozen and then stored at 10–12°C. Provided the beet are completely frozen, the actual freezing temperature is not of decisive importance as regards losses. Measurement of the sucrose content by polarization was found to be unreliable in the case of seriously frost-damaged beet because of the presence of dextran.

* * *

Decolorization of beet syrup with AV-17-2 anion exchange resin. N. M. KODENKO and D. M. LEIBOVICH. *Izv. Vuzov, Pishch. Tekh.*, 1971, (6), 89–91. Comparative tests are reported in which AV-17-2 and AV-16G granular carbons were used to decolorize syrup. The advantages of the former carbon over the latter include longer retention of adsorptive properties, which are almost identical for both carbons, and greater wear resistance.

* * *

The normal pressure on cossettes in a trough diffuser. I. M. FEDOTKIN, V. A. SEMENOVSKII and V. M. PRIIMAK. *Izv. Vuzov, Pishch. Tekh.*, 1971, (6), 131–134. It is found that in a DDS-type twin-scroll diffuser the pressure exerted by the left- and right-hand scroll segments on the beet cossettes during movement in the upper half of the trough cross-section is greater than that on the cossettes in the bottom half of the cross-section for reasons which are given. The result, as shown mathematically, is a greater packing of the cossettes in the upper half of the trough cross-section with consequent adverse effect on juice extraction.

* * *

Effect of the method of boiling house operation on the heat economy in a sugar factory. V. SÁZAVSKÝ. *Listy Cukr.*, 1972, **88**, 39–44.—In a discussion of reasons for excessive steam consumption in boiling, particular attention is drawn to the use of dilution water, an excess of which is a prime factor in increased steam usage. Other causes of high steam consumption are also considered, and it is recommended, where low-purity syrup is used as footing, to dissolve the resultant sugar and carbonatate it together with raw juice so as to reduce the quantity of low-grade massecuite.

* * *

Experiences in processing trashy beet. G. MALATINSZKY. *Cukoripar*, 1972, **25**, 32–33.—The removal of extraneous matter, including weeds, from beet as carried out at Sarkad sugar factory is described.

* * *

The fundamentals of limestone calcining. S. ZAGRODZKI. *Gaz. Cukr.*, 1972, **80**, 36–39.—The physicochemical bases of limestone calcination and optimum conditions to give the best lime are discussed. The process is described and examples of the results of inefficient kiln operation are given. The use of coke and liquid fuels is considered as well as fluidized bed operation. The effect of type of process used on the lime quality is discussed.

Sugar house operation in the light of new trends in technology. I. The significance of the non-sugar quantity for the loading of the sugar house. K. WAGNEROWSKI. *Gaz. Cukr.*, 1972, **80**, 40–46.—With the aid of mathematical expressions, the author discusses the rôles played by a number of factors grouped under the main headings of beet quality, diffusion, juice purification and thick juice non-sugar content on boiling house performance. Relationships between the various parameters are illustrated by graphs.

* * *

A forced-circulation vacuum pan of 60 tons massecuite capacity. E. KACZMARSKI. *Gaz. Cukr.*, 1972, **80**, 46–49.—Details are given of a vacuum pan of Polish construction which is equipped with a 60 rpm, 6-bladed rotor for massecuite circulation. In comparative tests, a prototype of the pan yielded white sugar of better crystal size distribution and of lower moisture, ash and colour contents (0·031%, 0·008% and 0·55°St, respectively) than did the same pan without use of the agitator and a conventional pan.

* * *

Determination of massecuite sugar rendement. J. DOBRZYCKI. *Gaz. Cukr.*, 1972, **80**, 49–50.—A nomogram is reproduced linking massecuite Brix, pol and white sugar yield for ease of calculating rendement. The nomogram has been drawn on the basis of the expression $Rd = Ck - Nc \frac{Cz_m}{100 - Cz_m}$ where Rd = rendement (per 100 parts by weight), Ck = massecuite pol, Nc = massecuite non-sugar content, and Cz_m = predicted molasses purity.

* * *

A modern factory: the Vierzy juice station. A. LEMAITRE. *Sucr. Franç.*, 1972, **113**, 151–155.—Details are given of equipment and processes at Vierzy, where the sugar factory was converted to a juice station which stores the thick juice end-product and sends it for after-campaign processing to a sugar factory owned by the same company 14 km away. Throughput in 1971/72 averaged 3,050 tons of beet a day.

* * *

Raising the accuracy of the method of calculating evaporator parameters in the sugar industry. N. YU. TOBILEVICH. *Sakhar. Prom.*, 1972, **46**, (2), 20–24. Mathematical expressions are given for calculating various parameters involved in evaporation with the chief aim of finding optimum conditions under which the interval between stoppages for boiling-out is maximum. Graphs and nomograms relating a number of parameters are reproduced.

* * *

The effect of thermal and hydrodynamic conditions on pH change during evaporation of sugar solutions with natural and forced circulation. M. A. GEISHTOVT, V. V. MAIOROV and V. V. GONCHAR. *Sakhar. Prom.*, 1972, **46**, (2), 24–28.—Investigations showed that juice pH fell with temperature rise and, additionally, with evaporation time. The type of circulation

(forced or natural) did not affect the pH change, which also remained unaffected by circulation velocity within the range 1–3 m/sec. An equation for calculating juice pH drop in evaporation has proved sufficiently accurate (to within ±0·5% of experimental data) for temperatures in the range 105–125°C, circulation rates of 1–3 m/sec, Brix of 10–50° and initial pH of 6·5–7·5.

* * *

Control of Category I waste waters. K. P. GONCHAROVA, Z. D. ZHURAVLEVA and V. N. KRASNIKOVA. *Sakhar. Prom.*, 1972, **46**, (2), 31–35.—Methods of determining COD, oil products and ammonia in Category I effluent (water used to cool massecuite, sulphur burners and pumps plus condenser water and ammoniacal condensate as well as residual cold water) are described.

* * *

Standard scheme for automation of beet sugar factory processes. B. A. EREMENKO, A. A. VIL'SHANSKII, V. M. ERLIKH and M. YA. AZRILEVICH. *Sakhar. Prom.*, 1972, **46**, (2), 37–40.—Possible application of the PSA-67 central control system, which incorporates a visual mnemonic memory scheme, to beet sugar factory operation is explained.

* * *

Some problems in installing and adjusting controls and measuring instruments in DDS diffusers. A. V. TERNOVOI. *Sakhar. Prom.*, 1972, **46**, (2), 40–44. Various aspects of the title subject with respect to Polish-built DDS diffusers are discussed.

* * *

The use of magnetic amplifiers for regulating the rotary speed of beet slicers and diffusers. K. E. REZNIK and ZH. L. ZIMAN. *Sakhar. Prom.*, 1972, **46**, (2), 48–50.—The use of a magnetic cascade amplifier as a generator exciter for control of the speed of rotation of a beet slicer and diffuser motor is described.

* * *

The application of plastics to increase the operational reliability of sugar factory equipment. B. S. PETROVSKII, B. N. RESHETILOV and S. G. ROZHUK. *Sakhar. Prom.*, 1972, **46**, (2), 51–53.—The use of plastics in place of metals for specific components in sugar factory equipment is discussed.

* * *

The use of polyamide sleeve bearings. YU. I. KRASNOV *et al. Sakhar. Prom.*, 1972, **46**, (2), 54–55.—The subject is discussed with reference to experiences at a Soviet sugar factory.

* * *

Removal of non-sugars after preliming and pre-carbonatation of raw juice. S. ZAGRODZKI and K. SZWAJCOWSKA. *Zucker*, 1972, **25**, 195–198.—See *I.S.J.*, 1972, **74**, 117.

* * *

Some physical characteristics of sugar crystals affecting dust formation. S. A. FARAG, C. L. SCHMALZ and L. W. NORMAN. *J. Amer. Soc. Sugar Beet Tech.*, 1971, **16**, 448–456.—Details are given of methods developed to measure the amount of dust formed from sugar crystals as a result of compression and impact. Results of tests showed that sugars from different factories varied in their dusting characteristics, that compressive strength was markedly affected by crystal size (it was inversely proportional to the square root of the surface area) but little influenced by heating, while impact strength was independent of crystal size but was significantly affected by heating. Both strengths were considerably improved by reducing the relative humidity (to below 20%).

* * *

Application of ion-selective electrodes in the beet sugar industry. T. HENSCHEID, K. SCHOENROCK and P. BERGER. *J. Amer. Soc. Sugar Beet Tech.*, 1971, **16**, 482–495.—The use of ion-selective electrodes to determine specific ions in beet sugar factory products is discussed and laboratory methods described for determination of chlorides, sulphate, calcium, magnesium, potassium and nitrate. Among factory applications of ion-selective electrodes for process control mentioned are the monitoring of ion exchange effluent in the Quentin process and determination of lime salts in 2nd carbonatation juice.

* * *

Elimination of non-sugars during processing by means of ion exchange resins. G. ASSALINI and G. BRANDOLI. *Sucr. Belge*, 1972, **91**, 99–106.—See *I.S.J.*, 1972, **74**, 85.

* * *

Second carbonatation juice treatment by means of ion exchangers applied to "Aconex" and "Preconex" continuous equipment. G. ASSALINI and G. BRANDOLI. *Sucr. Belge*, 1972, **91**, 107–111.—Details are given of the "Aconex" continuous system for ion exchange treatment of carbonatation juice[1]. Results obtained at an Italian sugar factory indicate an average thin juice demineralization of 84%. The "Preconex" semi-continuous system, similar to the "Aconex", is also described. Campaign results indicate 88% demineralization and 87% decolorization.

* * *

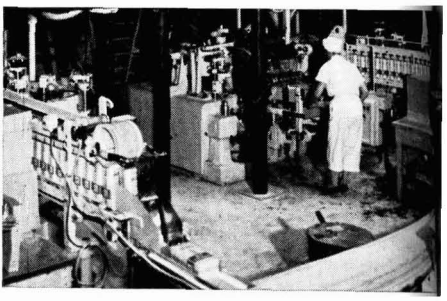
Thick juice storage after the sugar beet processing campaign. F. DOMSA *et al. Ind. Alimentara*, 1971, **22**, 199–206; through *Abs. Rom. Sci. Tech. Lit.*, 1972, **8**, 171.—Thick juice storage was carried out on pilot- and semi-industrial scales at two Rumanian sugar factories during the 1969/70 campaign. Determination of the physico-chemical characteristics of the juice made during more than 200 days in four tanks and of the sugar produced from the juice showed that they remained almost unchanged, while no bacterial degradation occurred. Maintenance of juice quality depended on beet quality, strict disinfection and juice concentration, temperature and pH. Protection was afforded by a layer of mineral oil on the juice surface.

* * *

100 years of DDS. H. B. OSTENFELD. *Zeitsch. Zuckerind.*, 1972, **97**, 137–140.—See *I.S.J.*, 1972, **74**, 99–102.

[1] *I.S.J.*, 1968, **70**, 86.

Sugar refining



Experience in operation of flat-bottomed FTsKhu 1000 × 1300 B/3 centrifugals for refined sugar massecuite curing. E. M. KARNASEVICH and I. A. DEONEGA. *Sakhar. Prom.*, 1971, **45**, (10), 35–37. Information is given on the operation of these East German Sangerhausen fully-automatic centrifugals at Berdichevskii refinery. Some modifications are noted.

* * *

Counter-current adsorption plant for sugar solution purification. YA. O. KRAVETS *et al. Sakhar. Prom.*, 1971, **45**, (11), 10–14.—Details are given of a continuous counter-current adsorption unit in which syrup rises against a bed of granular active carbon, which is removed from the conical bottom of the tower and fed to a wash chamber where the sugar content is reduced to 0·3%; the carbon is then steam treated for 15–20 min before regeneration with further water and steam in the feed bunker above the adsorption tower, into which it is fed as a syrup-carbon slurry. Tabulated data show the greater decolorizing efficiency of the process compared with a batch process using the same grade of carbon. Even better results were obtained by polish filtration after adsorption, so that a 1st refined sugar syrup colour content of 3·17°St was reduced to 1·55°St and then to 1·38°St, and that of a syrup from white sugar remelt from 1·61°St to 0·75°St and 0·66°St (compared with final colours of 2·04° and 0·93°St, respectively, with batch treatment).

* * *

Reducing the consumption of "Carboraffin" for refinery syrup decolorization. S. A. BRENMAN and I. L. ZDANOVICH. *Sakhar. Prom.*, 1971, **45**, (11), 17–20. Tests are reported which were aimed at reducing the amount of "Carboraffin" by replacement with a Soviet powdered carbon which, although having a decolorizing capacity half that of "Carboraffin", was found to be applicable where double the quantity was still cheaper than "Carboraffin" or where it could be mixed with "Carboraffin" in requisite proportions. The amount of "Carboraffin" could be reduced without replacement only with high purity sugar, or where treatment with the Soviet product was followed by hyposulphite treatment. On the other hand, secondary treatment with kieselguhr would not be economically advantageous.

* * *

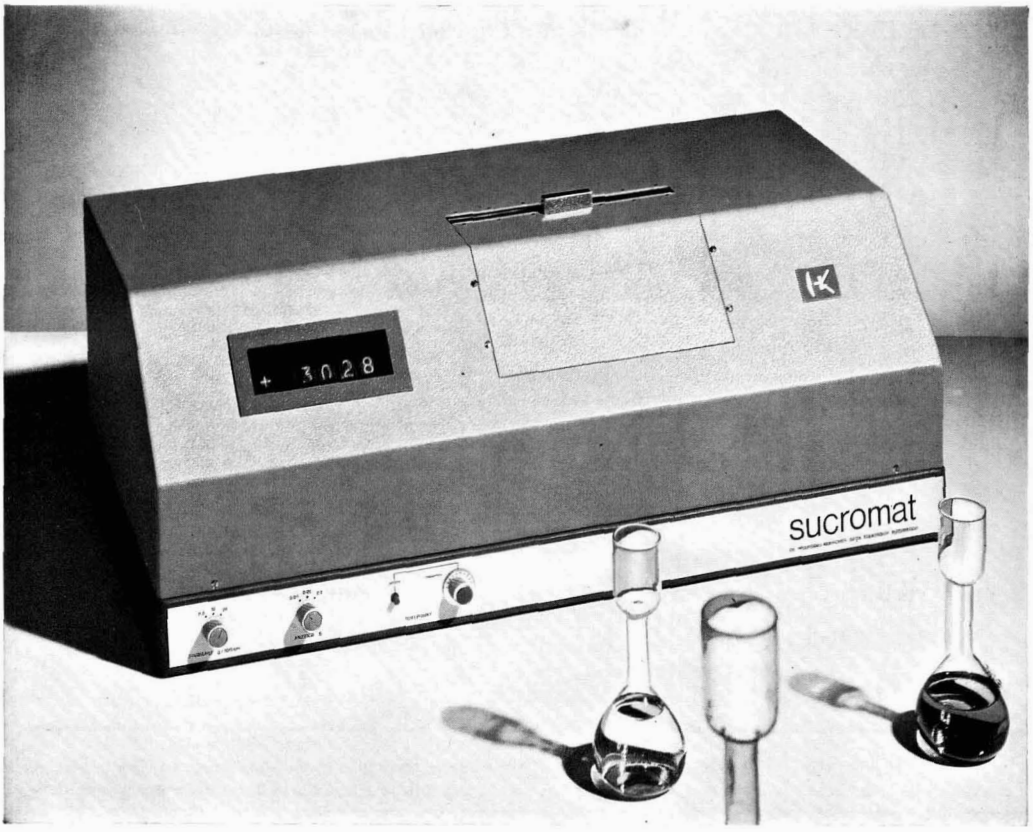
Setting a norm for molasses sugar content in raw sugar processing. E. YA. GOISMAN. *Sakhar. Prom.*, 1971, **45**, (11), 24–25.—That the boiling house scheme used has a significant effect on factory performance in the processing of raws is demonstrated by comparison of results from three Soviet sugar factories, two of which used a 4-product scheme with raw sugar affination and had molasses sugar contents of 2·54% and 2·52% (on weight of raws) compared with values of 1·70% and 1·58%, respectively, predicted on the basis of remelt non-sugars and the melassigenic coefficients. The third factory used a modified 3-product scheme without affination and had a molasses sugar content of 2·68% compared with a predicted value of 2·00%. Alteration of the processing scheme to suit the raw sugar quality is advocated.

* * *

Elimination of colour from sugar solutions by adsorbent resins. ANON. *Bol. Azuc. Mex.*, 1971, (260), 20–27. Advantages and disadvantages of resinous adsorbents by comparison with carbon and bone char are discussed, as are the requirements for a good adsorbent resin, and the differences between adsorbent resins and ion exchange resins. Types of adsorbent resins are discussed and characteristics of four "Duolite" resins are tabulated. Use of such resins is described and the effects of the different types indicated. Laboratory experiments on syrup decolorization are described which illustrate the benefit of using a weak base adsorbent as well as a strong base resin for decolorization of a bone char-treated refinery syrup. A two-stage resin treatment is recommended, based on the nature—which is discussed—of the colour impurities to be removed from cane syrups.

* * *

Kinetics of removal of natural cane sugar colorant with ion exchange resin. D. F. BAGSTER. *Ind. Eng. Chem., Proc. Res. Dev.*, 1972, **11**, 108–114.—The performance of ion exchanger columns in cane sugar liquor decolorization is examined in terms of the SCHUMANN and the ROSEN mass transfer models (the former assuming that the fluid passes over a packed bed in plug flow and the latter describing the case where a film resistance exists and there is also a significant internal diffusion rate). The ability to scale-up results from columns of small length to predict industrial-scale columns is explained in terms of the ROSEN model, showing that it is possible with small columns to make close reproductions of factory-scale performance even when diffusion within the resin beads limits the decolorizing rate at low residence times, provided these times are sufficiently long. (See also *I.S.J.*, 1970, **72**, 134–138, 200–203; 1972, **74**, 355–359.)



The automatic sugar polarimeter **sucromat** *has built-in reliability*

When we developed the **sucromat** some years ago, we had the choice of three different optical systems to realize automatic balance:

1. Servo-rotated analyser.
2. Servo-driven quartz wedge compensator.
3. Feedback controlled Faraday compensator.

Our experience led us to system number one which combines accuracy with reliability.

The servo-rotated analyser principle has the advantage of a scale which is nearly independent of temperature. As power consumption of the **sucromat** is only 72 watts due to its modern electronics containing extensively reliable integrated circuits, there is no need for ventilators and air filters which cause maintenance problems. Equipped with a dust- and splash-proof case, the compactly designed **sucromat** withstands all climates and tough ambient conditions.

The optical system chosen for the **sucromat** offers a wide measuring range of ± 120° S for versatility of applications in the beet and cane sugar industries. Sample tubes of reasonable length (200 mm) are used to produce an optical signal which is sufficiently large to resolve 0.01° S without noise and zero point drift problems. In addition, the **sucromat** can easily be checked with quartz control plates of certified accuracy.

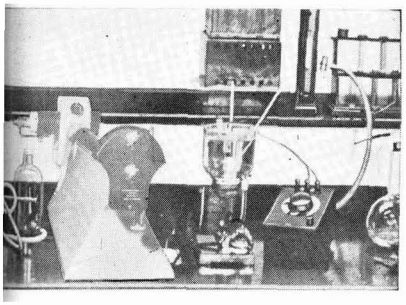
Digitizing of rotated analyser position is performed by a shaft encoder. Results are continuously displayed by an electronic up-and-down counter which is completely free of the zero point drift and calibration errors common to digital voltmeters.

Both the opto-mechanical and the electronic systems of the **sucromat** are manufactured by us. This guarantees unlimited availability of competent service.

International success of the **sucromat** proves that our conception is right.

For more information and references write to:

DR. WOLFGANG KERNCHEN
OPTIK-ELEKTRONIK-AUTOMATION
D-3011 LETTER-HANNOVER
WEST-GERMANY



Laboratory methods & Chemical reports

A new technique for determination of the biochemical oxygen demand of waste waters. G. CATROUX and J. N. MORFAUX. *Ind. Alim. Agric.*, 1971, **88**, 1699–1704.—Details are given of a method in which the BOD of waste water is determined as the difference between the COD (chemical oxygen demand) before and after 5 days' incubation with micro-organisms contained in carbonatation mud filtrate. Comparison of values obtained for beet factory flume and wash water and and vinasse shows reasonably close agreement between the dilution method and the proposed method which is unaffected by the organic matter concentration.

* * *

Relationships between sugar beet technological parameters. II. L. SCHMIDT and J. ZAHRADNÍČEK. *Listy Cukr.*, 1971, **87**, 268–271.—Empirical relationships have been established for a number of beet processing parameters from weekly samples obtained during the 1966–1970 period at Modrany sugar factory. The expressions given relate beet sugar content to brei dry solids, marc, pulp production and juice purity; beet weight is related to conductimetric ash, and a modification of the ŠANDERA formula for calculation of rendement and molasses yield in terms of beet digestion, ash and overall losses is proposed.

* * *

The use of gel column chromatography in a study of the interaction between sucrose and certain salts. N. P. SILINA and K. ČÍŽ. *Listy Cukr.*, 1971, **87**, 275–277.—Gel filtration on a column of "Sephadex G-25" was used to study the relationship between binary compounds formed between sucrose and salts and molasses formation. The flow rates through the column were the same for sucrose and its compounds which had almost the same molecular weight as sucrose. Potassium chloride and acetate were found not to form complexes with sucrose, and since both potassium compounds are highly melassigenic, it is concluded that the formation of sucrose-non-sugar complexes is not the only factor in molasses formation.

* * *

Density measurement by a pneumometric method. V. VALTER, A. HAVLÍN and J. HORNÍKOVÁ. *Listy Cukr.*, 1971, **87**, 277–283.—Pneumatic measurement of juice and syrup Brix, i.e. determination of pressure head on a column of the liquid, is explained and guidance given on air tube diameters and air flow rates. Accuracies of between $\pm 1{\cdot}5°$ and $\pm 2{\cdot}0°$Bx are claimed for the method.

Micro-wave absorption by impure sugar solutions. V. VALTER, A. HAVLÍN and K. ANTOV. *Listy Cukr.*, 1971, **87**, 283–287.—At constant ash:organic non-sugars ratio and temperature, micro-wave attenuation can be used as a measure of molasses (or mother liquor) moisture or supersaturation coefficient. Linearity in the moisture-attenuation relationship was established at temperatures in the range 20–45°C.

* * *

Formation and behaviour of steam volatile substances during sugar storage and processing. G. STEINLE. *Zucker*, 1972, **25**, 81–88.—See *I.S.J.*, 1972, **74**, 120.

* * *

Sucrose solubility. IV. Solubility of anhydrous sucrose and theoretical approximation of the solubility of sucrose hemipentahydrate in water. J. VAŠÁTKO, A. SMELÍK, A. DANDÁR and J. MATEJOVÁ. *Zucker*, 1962, **25**, 89–96.—Equations are presented for calculation of the solubility of sucrose as a function of temperature from —13°C to +145°C. Evaluation of experimental results has permitted an approximate value of the solubility of sucrose hemipentahydrate to be found below 45·7°C. Differences between the calculated values and those determined by HIRSCHMÜLLER, VAVRINECZ, CHARLES and KAGANOV are tabulated, showing a standard deviation of up to 0·19%.

* * *

Circuit analyses. J. BUREŠ and M. FRIML. *Listy Cukr.*, 1972, **88**, 5–18.—Details are given of raw sugar and molasses analyses (pol, sucrose content, ash, reducing matter and sugar crystal composition) for which a large number of laboratories were used to carry out replicate tests. Statistical methods were used to determine maximum errors, scatter and reproducibility with the aim of expanding instructions on analytical procedure.

* * *

Application of ion exclusion in the sugar industry. II. Treatment of eluates during regeneration of decolorizing ion exchange resins. K. ČÍŽ, V. ČEJKOVÁ and V. HOBÍKOVÁ. *Listy Cukr.*, 1972, **88**, 18–21.—Ion exclusion, using a macroporous cation exchanger in Na^+ form, was applied to colorant separation from ion exchange column eluates. The nitrogen content in the eluates was a governing factor, the separation efficiency falling with increase in the N colorant content. Hence, it is concluded that ion exclusion would be practical only where the eluate colour content was already rather low.

Microbial infection of some beet sugar products. V. Z. NAKHODKINA. *Sakhar. Prom.*, 1972, **46**, (1), 27–29.—The numbers of mesophiles, thermophiles, slime-forming mesophiles and moulds in beet cossettes, raw juice, condenser water, 2nd carbonatation juice and *A*-massecuite at three Soviet sugar factories are recorded in a table and briefly discussed.

* * *

Extraction-complexonometric determination of calcium in darkly coloured beet sugar products. E. A. GRIVTSEVA, R. I. SUKHOMLIN and E. N. ZUBENKO. *Sakhar. Prom.*, 1972, **46**, (1), 41–43.—A description is given of a method for extracting calcium from molasses, syrup or massecuite with ammonium thiocyanate in solution followed by its determination by titration with "Versene" (EDTA) using murexide indicator. The relative error in tests with addition of known quantities of CaO was 2·5% and the method is recommended in place of the permanganate method.

* * *

RTS-2 beet crusher. A. YA. ZAGORUL'KO, S. A. BOGDANOV and N. S. KOCHUBEI. *Sakhar. Prom.*, 1972, **46**, (1), 43–44.—A motor-driven apparatus provided with a rotary knife for beet brei preparation is described.

* * *

The New York Sugar Trade Laboratory. Progress in the years 1907-1971. W. W. BINKLEY. *Sugar y Azúcar*, 1971, **66**, (12), 20–22.—A brief history and description of The New York Sugar Trade Laboratory Inc., formed by raw sugar sellers and buyers to provide an unbiased measure of polarization, is given with illustrations.

* * *

Test on simplification and verification of a method for determining sugar and conductimetric ash in the evaluation of sugar beet varieties. K. KANIEWSKI and T. HRYCAK. *Gaz. Cukr.*, 1972, **82**, 17–20.—A method is described in which samples for sugar and conductimetric ash determination are taken from the same brei after clarification with basic lead subacetate. Tests on a number of beet varieties showed that the new method gave higher sugar contents than did the official method, while ash values were about the same. The new method is recommended since it is quicker and simpler while still giving results of the same order of accuracy as the official method.

* * *

Quantitative measurement of sugars by gas-liquid chromatography. V. S. VELASCO, M. HEISLER and J. F. DOWLING. *Proc.* 1970 *Tech. Session Cane Sugar Refining Research*, 61–81.—Gas-liquid chromatography of prepared mixtures of dextrose, levulose and sucrose, using hexamethyldisilazane as the major silylating agent and trifluoroacetic acid as catalyst, gave quantitative determination of the hexoses to within 0·5% of the true quantity, while the measured value for sucrose was consistently 2% below the true value (reasons for this are suggested). Means of measuring peak areas should be established to minimize the errors. Excellent separation of trimethylsilyl derivatives of ferulic, caffeic, sinapic and chlorogenic acids (found earlier to be major colorants in raw sugar[1,2]) was achieved and it is concluded that GLC can be used to measure colorants, provided they are first concentrated (since they are present in very small quantities) and separated from the mass quantity of sugar.

* * *

Properties of sugar colorants removable by ion exchange resins. D. COOKSON, K. J. PARKER and J. C. WILLIAMS. *Proc.* 1970 *Tech. Session Cane Sugar Refining Research*, 103–113.—Absorption spectra, the distribution of ionizable groups, anionic charge density, molecular size and weight, and net charge of raw sugar colorants were examined in relation to the molecular structures and behaviour of the colorants towards adsorbents. While colorant retention by resins is thought to take place by one of two mechanisms, viz. ion exchange or adsorption onto the resin matrix, giving up to 95% colour removal from washed raw sugar, Zwitterionic colorants have no net charge and cannot be retained by any known resins, so that they present a problem in refinery liquor decolorization. Possible ways of removing them are suggested.

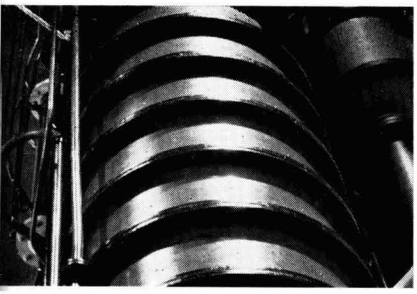
* * *

Fluorescence of sugars. J. H. WALL and F. G. CARPENTER. *Proc.* 1970 *Tech. Session Cane Sugar Refining Research*, 157–178.—The fluorescence peaks and colours of various liquors, raw sugars, molasses and other refinery products are compared to show good correlation, from which it is deduced that measurement of fluorescence could be used instead of colour measurement. Among the advantages of fluorescence as a measure is its greater sensitivity than colour in the lower range of values and the fact that it provides peaks which can be more informative than colour measurements. On the other hand, measurement of fluorescence is more complicated, requiring two wavelengths and a reference standard.

* * *

Determination of the optimum sample size in sugar beet as a prerequisite for the representative determination of yield and quality. M. BURBA and W. HAUSE. *Zeitsch. Zuckerind.*, 1972, **97**, 75–80.—From a uniform plant population, 250 samples each of 20 beets were collected at random and their weights noted; 8 constituents which determine quality were also established, and calculations gave 11 different quantities which can be used as qualitative criteria, thus giving a total of 20 parameters. Statistical analysis was carried out to determine the optimum sample size which would give a representative determination of these parameters. The relative standard deviations are tabulated for all 20 parameters and plotted on graphs for samples containing between 4 and 200 beets, from which the optimum can be read.

[1] FARBER & CARPENTER: *I.S.J.*, 1970, **72**, 99.
[2] FARBER *et al.*: *ibid.*, 170.



By-products

Solid molasses (powder). A. P. PELLEGRINI. *Brasil Açuc.*, 1971, (Special Edn.), 53–57.—Hindrances to the utilization of molasses as animal fodder are mainly difficulties in transportation, storage and keeping. These are eliminated by dehydration to a solid which, in combination with phosphates, yields a valuable and acceptable feed for pigs and cattle, as has been shown by trials which are reported.

* * *

The uses of bagasse. D. B. BATSTONE. *Cane Growers' Quarterly Bull.*, 1971, **35,** (1), 25–26.—The applications of bagasse as a raw material are reviewed; they include the manufacture of furfural, paper pulp, and particle board, as well as use for anaerobic fermentation to produce methane gas and compost, incorporation in animal fodder and as a substrate for yeast production.

* * *

A complementary study on the quality and feeding value of beet leaves harvested with a defoliator-collector. A. DEVUYST, R. ARNOULD, M. HAMELRYCK, M. MARTENS and P. H. VERSTRAETE. *Publ. Trimest. Inst. Belg. Amél. Betterave*, 1971, (2), 39–55.—In a previous study the authors examined the quality of silage prepared from beet leaves harvested with a defoliator-collector machine[1]. The present study shows the relationship between silage quality and adjustment of the defoliator-collector. Results showed that silage made from the leaves harvested by defoliating in normal conditions has less insoluble ash than conventional silage made from leaves and tops. The opinion of stock owners (dairy and beef cattle) using the silage was sought.

* * *

Annular press for pulp briquetting. G. S. STEPANOV *et al. Sakhar. Prom.*, 1971, **45,** (10), 33–35.—Details are given of a briquetting press which consists of a pair of eccentric annular sections, placed side by side, in each of which a disc is held to the inside wall under hydraulic pressure. The pulp is fed via a hopper to one of two screw conveyors which carry it into the annular sections at the point where the gap between the disc and annulus is greatest. As the annuli rotate in opposite directions, the available space between each disc and the annulus decreases, with the result that the pulp is subjected to pressure. A continuous length of pulp some 80 mm wide and 10–16 mm thick is "extruded" and is cut into sections 100–120 mm long. Tests with pulp of 13% moisture content and 250 kg/m³ bulk weight at 1°C demonstrated the efficiency of the press, which has a nominal throughput of 2·5–3 tons/hr.

* * *

Present situation regarding pulp drying and mixed fodder production. F. LOSS. *Cukoripar*, 1971, **24,** 167–173.—Beet pulp drying is discussed in terms of what are considered to be the two most important parameters: degree of pressing and heat efficiency. Sealing the dryer drum against introduction of excess air is dealt with[2] and the production of mixed fodder such as "Dorma"[3,4] described.

* * *

Utilization of by-products of the alcohol industry. K. A. PRABHU. *Sugar News* (India), 1971, **3,** (4), 15–17. The by-products from molasses alcohol distilleries mentioned include CO_2, fusel oil, *iso*-amyl alcohol, sludge yeast, spent wash, distillers' solubles and potash. Treatment of effluent to produce a nitrogenous fertilizer is also mentioned.

* * *

Pilot plant scale studies of extraction, modification and purification of cane wax; design of glass-lined vessel. K. K. NIGAM and A. C. RAHA. *Proc. 37th Conv. Sugar Tech. Assoc. India*, 1970, 315–322.—The design of a steam-jacketed, glass-lined stirred reaction vessel for cane wax de-ashing is described and the design parameters calculated. Stages in a wax separation and purification scheme are explained.

* * *

Prospects and economics of utilization of bagasse as raw material for pulp and paper industries in India. B. B. PAUL. *Proc. 37th Conv. Sugar Tech. Assoc. India*, 1970, 351–358.—The advantage of bagasse utilization for pulp, paper and particle board manufacture is discussed against an Indian background, with most of the article being devoted to board manufacture. The economics are examined, with special mention of the costs of alternative fuels and depithing methods.

* * *

Production of "amido" pulp. S. V. NOVIKOV. *Sakhar. Prom.*, 1971, **45,** (11), 23.—Reference is made to a plant at a sugar factory for production of briquetted molasses-pulp-urea mixture which contains 10–11% sugar, about 10% moisture, 4–6% total nitrogen and 22–40% crude protein.

---

[1] *I.S.J.*, 1972, **74,** 49.
[2] *See also* HUBER: *ibid.*, 1965, **67,** 278.
[3] *ibid.*, 1968, **70,** 189.
[4] *ibid.*, 1970, **72,** 121.

Patents

UNITED STATES

Animal feed. S. MATSUOKA, of Kagoshima-ken, Japan. **3,597,218.** 4th September 1968; 3rd August 1971.—An aqueous culture medium of wheat and rice bran (mixed with water at about 37°C) is inoculated with *Irpex consorus*, a *Nitrobacter* sp., *Aspergillus niger* and *Penicillium* sp. and the micro-organisms cultured for about 12 hours at 30–45°C. Bagasse (10 parts) is mixed with raw spirits lees (7 parts) and the composite inoculum added to the mixture which is cultured at about 37°C for 24 hours to promote the growth of the *I. consorus* and thus decompose the bagasse cellulose and lignin, rendering the feed digestible.

* * *

Animal feed. W. W. WORDEN, of Ewa, Hawaii, USA. **3,600,190.** 12th May 1967; 17th August 1971.—Cane stalks after burning and removal from the field are stripped to recover the leaves, tops and short pieces of stalk as waste material. This is washed to remove dirt and ash to lower the ash content to about 7%. It is chopped to reduce it to pieces about 3 inches long and dried to 10% moisture by passing it through a drum heated to 1200–1800°F. The product is again chopped to give pieces about ½—1½ inches and these compressed into pellets which are cooled and allowed to "sweat" before storage.

* * *

Edible sugar product. P. L. VELTMAN, J. C. J. VERDONK and L. O. THOMSEN, *assrs.* W. R. GRACE & CO., of New York, N.Y., USA. **3,600,222.** 25th November 1969; 17th August 1971.

In a stream of heated air are dispersed separate feeds of sugar solution (decolorized and deionized cane syrup, dissolved raw sugar, a decolorized and deionized sucrose syrup containing a notable proportion of invert sugar) and of fine sucrose particles (which may be recycled from a subsequent step) [in a ratio of 1:4 (2:3) solid sucrose:dissolved sucrose]. The water is evaporated from the sugar solution coated on the particles, the latter recovered from the air stream and the outlet air temperature maintained at 45–105°C (55–75°C).

* * *

Cane harvester. R. A. DUNCAN, of Lafourche, La., USA, *assr.* THOMSON MACHINERY CO. INC. **3,601,957.** 18th April 1968; 31st August 1971.

Beet harvester. W. J. WHITSED, of Peterborough, England, *assr.* ROOT HARVESTERS LTD. **3,603,404.** 15th May 1970; 7th September 1971.

* * *

Production of fortified sugar. J. F. CARTER, of Northridge, Calif., USA. **3,607,310.** 29th July 1966; 21st September 1971.—Fortified beet or cane sugar for human consumption is prepared by mixing unfortified sugar with (10 μg — 7g/100 g) selected nutrients (in 30-mesh form), coated where required and masking if necessary to negate colour or odour, with minimum mechanical work to give minimum breakage and produce a sugar fortified with (0·001–5% of) nutrients but identical in appearance with unfortified sugar.

* * *

Cane press. J. SHANN and D. V. BESSANT, *assrs.* ROSE, DOWNS & THOMPSON LTD., of Kingston-upon-Hull, England. **3,607,391.** 13th March 1969; 21st September 1971.—Instead of relieving pressure on pressed cane for absorption of water, e.g. in a multi-press sequence or in a multi-stage press having special expansion chambers between the press stages, it has been found preferable to wash the cane by injection of water under pressure through suitable injector bars located among the lining bars forming the cage of the press. During the subsequent stage of pressing, this water, with the sucrose it has extracted, is discharged through the perforations in the press cage. The water injected in a later stage can be replaced by sugar-containing press water from an earlier section of the press.

* * *

Treatment of sugar solutions. P. HIDI, I. G. R. BURGESS and R. H. HOLDGATE, *assrs.* COLONIAL SUGAR REFINING CO. LTD., of Sydney, N.S.W., Australia. **3,607,647.** 19th April 1967; 21st September 1971.—The starch content of a starch-containing sucrose solution derived from sugar cane (or juice from the 3rd or 4th evaporator effect of a mill) is reduced by treatment with at least one thermostable bacterial amylase (having α-activity and derived from *Bacillus subtilis*) at a temperature above 160°F (above 175°F) but below the deactivation temperature of the amylase (and at neutrality to slight alkalinity).

Copies of Specifications of United Kingdom Patents can be obtained on application to The Patent Office, Sale Branch, Block C, Station Square House, St. Mary Cray, Orpington, Kent, England (price 25p each). United States patent specifications are obtainable from: The Commissioner of Patents, Washington, D.C. 20231 USA (price 50 cents each).

reader inquiry service

If you wish to receive further information on the products and services mentioned in the advertisements please fill in the inquiry section of this card and post it to us.

reader inquiry service

Please arrange for me to receive without obligation further details of the products referred to below which are advertised in your ..... 19..... issue.

Advertiser	Product	Page

Signature .....

Block Letters

NAME ..... Date .....

Position .....

Firm .....

Address .....

photocopy service

We are able to supply one photocopy, for research or private study purposes, of most of the original papers abstrated in this journal. It should be noted that these are not translations but are in the original language of publication, which may not be English. Please ask us to quote you the cost of your requirements, indicating whether surface or air mail delivery is to be provided.

photocopy service

Please submit your pro-forma invoice for the supply of one photocopy of each of the following original papers, abstracts of which appeared in your ..... 19..... issue.

Page	Author(s)	Title

Air Mail/Sea Mail *Signature* .....

Block Letters

NAME ..... Date .....

Position .....

Firm .....

Address .....

additional subscriptions

To receive additional copies of *The International Sugar Journal* all you need do is to complete the card with details of the subscription required, and return it with your remittance of £3.00 or U.S. $10.00 for supply by surface mail.

additional subscription order

Please send a further copy of your journal each month to the address below, starting with the issue ..... 19.....

Block Letters

.....

.....

.....

.....

.....

Signature .....

Date .....

I enclose cheque/draft/M.O./P.O. for £3.00/$10.00.

Reader Inquiry Service,
The International Sugar Journal Ltd.,
23a Easton Street,
High Wycombe, Bucks.
England.

Photocopies Dept.,
The International Sugar Journal Ltd.,
23a Easton Street,
High Wycombe, Bucks,
England.

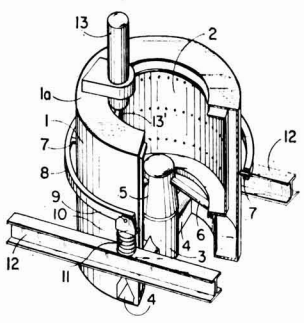
Subscriptions Dept.,
The International Sugar Journal Ltd.,
23a Easton Street,
High Wycombe, Bucks.,
England.

Cane harvester. H. R. HILL, of Bundaberg, Queensland, Australia, *assr.* INTERNATIONAL HARVESTER CO. **3,608,597.** 3rd March 1970; 28th September 1971.

* * *

Centrifugal. W. STEPRATH, of Gohr, Neuss, Germany, *assr.* BRAUNSCHWEIGISCHE MASCHINENBAUANSTALT. **3,608,732.** 5th November 1969; 28th September 1971.

The protective jacket 1 supports the centrifugal drum 2 while the hydraulic motor 3 is supported within the drum's lower end by radial hollow arms 4 which carry the oil under pressure for the motor and conduct leaking oil away. The motor 3 supports



a hub 5 carrying spokes 6 which support the drum 2. The protective jacket 1 is mounted above the centrifugal's centre of gravity in a gimbal mounting which includes a ring 8 having diametrically opposed pivot pins 7 to support the jacket. The ring is itself supported by pins 9 on brackets 10 mounted on spring elements 11 which are supported by beams 12. The top 1a of the jacket carries the discharger mechanism 13, 13'. Alternatively the drum may be driven from above by an electric motor supported from a fixed overhead frame and having a shaft with universal joints.

* * *

Free-flowing brown sugar. J. M. MICKEVICZ, of Chicago, Ill., USA, *assr.* PRO-COL CORP. **3,615,699.** 13th October 1965; 26th October 1971.—Free-flowing brown sugar which retains it normal moisture content is prepared by (i) spreading both (a) a tacky brown sugar and (b) finely divided wood cellulose, microcrystalline cellulose or sugar cane cellulose over a wide area and (2) mingling these materials intimately in their spread-out state without compacting and in the absence of any substantial pressure or shear, and, if required, incorporating flavouring fats or oils.

* * *

Increasing the sugar content of crops. B. QUEBEDEAUX, of Wilmington, Del., USA, *assr.* E. I. DU PONT DE NEMOURS & CO. **3,619,166.** 1st April 1969; 9th November 1971.—The sugar content of cane, beet or sorghum is increased by applying to it, 2–8 weeks before harvest, an effective amount of a compound of formula $\begin{matrix} R_1O \\ MO \end{matrix}\!\!>\!P\ (O) - CONH_2$ where R_1 is a C_1–C_4 alkyl group or a C_3–C_4 alkenyl group and M is Na, Li, K or NH_4 (ammonium allyl or ethyl or *iso*-propyl carbamoyl phosphonate).

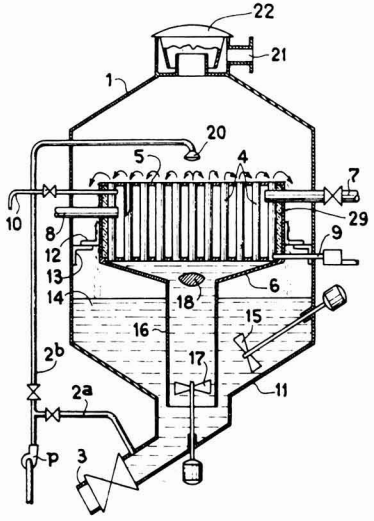
* * *

Increasing the recoverable sugar from beets. W. H. ZICK, of Pittsburgh, Pa., USA, *assr.* VELSICOL CHEMICAL CORP. **3,619,169.** 23rd April 1969; 9th November 1971.—The beet plants are treated with at least 0·1 oz/acre (0·5–20 oz/acre) of an (C_1–C_{10}) alkyl (methyl decyl) ester of 2-methoxy-3,6-dichlorobenzoic acid, 2–10 weeks before harvest.

* * *

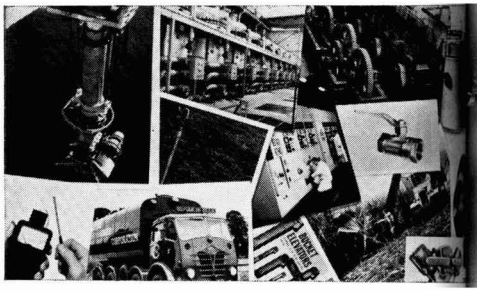
Vacuum pan. A. R. GRANDADAM, of Saint-Maur, France, *assr.* S.I.C.E.R. Société Industrielle & Commerciale d'Etudes et de Réalisations. **3,622,387.** 26th June 1969; 23rd November 1971.

In order to avoid the harmful effects of varying hydrostatic head during boiling, the calandria is mounted near the top of pan 1 by support rings 12. Beneath it is a funnel 6 connected with tube 16 inside which is a stirrer 17 or pump. Syrup is fed by pump p through pipe 2a into the bottom of the pan and is directed up tube 16, past distributor 18 and into tubes 4. These are heated by steam admitted through pipe 7 and leaving through pipe 8, condensate being discharged through pipe 9. The syrup loses vapour which is withdrawn through port 21 and the concentrate overflows into the lower part 14 of the pan.



Homogeneity of the massecuite is aided by circulator 15, and when the level reaches the top of the calandria, syrup is fed through pipe 2b to sprinkler 20 above the upper tube plate. When the strike is complete it is discharged through port 3.

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.

BMA equipment for the sugar industry. Braunschweigische Maschinenbauanstalt, 33 Braunschweig, Am Alten Bahnhof 5, Postf. 3225, Germany.

Among the latest equipment produced by BMA for the sugar industry is a waste water treatment plant in which the anaerobic basin, provided with two agitators, is used for both fermentation and putrefaction. (Closed tanks in which the agitators are replaced by circulation pumps can be used instead of open basins.) This stage handles treated water from a Brukner sedimentation tank, where the BOD_5 is reduced by 35–45% by liming with 0·15 kg CaO/m^3 of water, and is followed by an activation stage, oxygen for which is supplied by surface blowers, and secondary clarification in which the activated sludge is continuously removed. COD is reduced by 60% after $2\frac{1}{2}$ days and more than 99% organic matter can be removed, with average water samples containing less than 30 mg BOD_5/litre. The basins occupy little space and the process is rapid. Details are available in issue No. 11 of "BMA Information", which also features BMA heavy-duty cyclones developed to meet the stringent requirements regarding dust emission from sugar factories.

Also described in the new issue is the new "Variant" fully-automatic centrifugal[1], the range of which has been extended to include 1500 kg and 1800 kg basket capacities. The problem of incrustation on the side walls of the sugar discharge chute has been overcome by means of a rubber apron acting as a flexible wall against which the sugar is thrown but does not cling as the apron is constantly moving under the force of the sugar. The start of water/steam washing, actuation of the syrup separating device and control of curing and charging speeds are adjustable, to give optimum results at all times regardless of variation in massecuite quality, from the control panel on the vertical steel frame member to the side of the centrifugal. The time relays in the switch cabinet are remotely controlled from the panel, so that there is no need to open the switch cabinet and expose the components to the warm, damp air of a sugar factory. Full details of the curing cycle are clearly shown.

A new massecuite feeding device for BMA K850 S and K1000 continuous centrifugals is divided into two components: the feed pipe and the distributor. The former directs the massecuite into the accelerator and moistens it with water, fed through an annular pipeline located on the feed funnel, and with steam which is fed into the annular chamber of the double-walled pipe through perforations in the inner pipe. The feed pipe inside diameter is such that the massecuite flowing down into the centrifugal does not normally touch the pipe. The distributor consists of a cylindrical cup with several vertical distributing pegs and an acceleration bell. The massecuite, water and steam flowing into the distributing cup are caught by the pegs and thoroughly mixed. Tabulated test results demonstrate the advantages of the new feed device for low-grade work.

Briefer mention is made in the booklet of tower diffuser modifications, an arcuate screen for press water depulping and the BMA continuous filter-thickener which has operated highly satisfactorily in trials at Gross-Lafferde sugar factory on 1st and 2nd carbonatation juice.

* * *

Tramp metal detector. ASEA (Great Britain) Ltd., 41 Strand, London WC2 5JX, England.

A new transistorized unit for detection of tramp metal consists of one or two search soils, a connexion box and a control unit containing an oscillator, amplifier and supply circuits. The detector operates on the basis of variation in the electrical charge of a tuned circuit when a metal object enters the magnetic field of the inductance—in this case, the search coil. Search coils within strong glass fibre formers are available in five different sizes suitable for encircling a conveyor belt or for mounting above or below the conveyor for maximum sensitivity. Full information is given in catalogue YL 33-1E.

* * *

Company name change.—Turner Bros. Asbestos Co. Ltd., which has six divisions making a large number of products including conveyor belting, packings, gaskets and thermal insulation, has changed its name to TBA Industrial Products Ltd. The decision was made primarily because many of the company's products do not contain asbestos.

* * *

New materials handling division.—Newman Fabrications Ltd., of Feeder Rd., Bristol, England, announce the formation of a new Materials Handling Division which will be able to offer a complete design, manufacturing and commissioning service in the field of bulk handling, including both mechanical and pneumatic systems.

[1] *I.S.J.*, 1972, **74**, 125.

United Kingdom sugar imports and exports, 1972[1]

IMPORTS	1972	1971	1970
Refined and Direct Consumption Sugar	(*long tons, tel quel*)		
W. Indies and Guyana	8,906	4,872	—
Other Commonwealth..	32	7	—
Belgium	512	385	973
Czechoslovakia	27,213	34,563	15,265
Denmark	3,923	—	—
Finland	17,410	—	—
France	3,170	2,039	—
Germany, East	148	—	3,131
Germany, West	40	—	—
Irish Republic	9,953	8,825	12,072
Netherlands	14,835	31,009	41,542
Norway	4	30	—
Poland	492	1,888	—
Sweden	2,489	—	34
USA	402	25	26
Other Foreign	13	11	—
	89,542	83,654	73,043
Raw Sugar and Sugar for Further Refining			
Australia	452,605	598,089	341,618
Barbados	98,818	114,868	118,481
British Honduras	25,417	20,452	20,491
Fiji	141,040	129,659	136,916
Guyana	209,168	192,357	172,172
India	24,947	30,358	19,282
Jamaica	231,848	227,497	238,079
Leeward Is.	15,602	27,962	30,801
Mauritius	414,972	313,455	405,692
Swaziland	87,305	84,928	95,835
Trinidad & Tobago	149,773	134,828	145,874
Other Commonwealth..	3	2	149
Commonwealth Raws	1,851,498	1,874,455	1,725,390
Belgium	10,848	—	5,762
Brazil	18,362	—	—
Cuba	40,474	35,921	31,228
Czechoslovakia	—	490	—
Dominican Republic	29,840	—	—
El Salvador	11,520	—	—
France	—	1,004	42,790
Germany, West	—	—	28,856
Guatemala	10,892	—	—
Irish Republic	226	445	—
Mozambique	12,696	—	—
Netherlands	—	14	—
Poland	—	—	13,533
Rumania	—	—	4,460
South Africa	18,203	—	31,826
Spain	—	—	2,192
Switzerland	—	2	1,053
USSR	—	87,163	93,694
Venezuela	24,764	—	—
Other Foreign	—	3	25
Foreign Raws	177,825	125,042	255,419
Total Raws	2,029,323	1,999,497	1,980,809
TOTAL SUGAR	2,118,865	2,083,151	2,053,852

EXPORTS

	1972	1971	1970
	(*long tons, refined value*)		
Bahamas/Turks & Caicos Is.	1,160	1,289	935
Bahrein	59	163	126
Barbados	208	1,240	1,537
Bermuda	807	540	779
British Honduras	685	1,217	1,574
Canada	162	158	578
Ceylon	8	72	4,085
Cyprus	6,522	6,936	6,962
Gambia	121	230	107
Ghana	499	2,066	2,398
Gibraltar	963	1,211	1,156
Guyana	—	21	232
Indian Ocean Islands	223	45	34
Jamaica	4,350	586	12,692
Kenya	31,505	410	1,073
Leeward Is.	2,518	1,304	2,241
Malaysia	20	96	102
Malta	1,268	345	380
Nigeria	16,340	18,607	16,884
St. Helena	152	157	169
Sierra Leone	2,499	2,466	2,574
Trinidad & Tobado	421	859	154
Trucial State	—	193	141
Windward Is.	3,073	2,715	2,040
Zambia	10	161	809
Other Commonwealth..	154	262	70
Total Commonwealth	73,727	43,349	59,832
Abu Dhabi	108	19	19
Algeria	35,484	12,265	—
Belgium	57	9	287
Burma	94	205	373
Dubai	136	74	74
French Pacific	275	486	433
French W. Indies	146	—	—
Germany, West	2,106	2,498	1,160
Greece	82	436	82
Honduras	150	—	—
Iceland	4,684	3,769	2,617
Iran	369	346	304
Irish Republic	5,240	1,070	686
Israel	10,080	3,324	104
Kuwait	150	81	158
Lebanon	654	647	276
Liberia	291	400	346
Libya	20	5	205
Madeira	935	4,650	—
Malagasy Republic	—	—	506
Mozambique	6	—	1,049
Muscat & Oman	89	117	48
Netherlands	6,675	4,371	3,992
Netherlands Antilles	140	2	2
Norway	56,164	47,412	38,462
Saudi Arabia	1,126	1,164	357
Spain	2,393	13,461	969
Sudan	9,350	4	4
Sweden	320	300	370
Switzerland	38,830	49,031	37,115
Tunisia	34,075	34,354	32,454
USA	14,157	10,992	3,629
Other Foreign	400	263	475
Total Foreign	224,786	191,755	126,556
TOTAL EXPORTS	298,513	235,104	186,388

Effluent treatment course.—A residential course on advanced aspects of the microbiology of effluent treatment is to be run in the Department of Microbiology, University College, Cardiff, Wales, from the 10th to 14th September 1973. The cost of the course, including accommodation, will be £95. Full details are available from Dr. C. F. Forster, at the Dept. of Microbiology.

[1] C. Czarnikow Ltd., *Sugar Review*, 1973, (1113), 31.

Brevities

New Indian sugar institute plans[1].—It has been decided to set up a sugar research institute at Poona to cater to the technological needs of the sugar industry in Maharashtra, Gujerat and the southern States in connexion with sugar cane, sugar and its by-products and allied industries. The total capital expenditure for the proposed facilities, to be known as the Deccan Sugar Institute, is estimated at Rs.10,000,000 of which one-fifth will be contributed by cooperative sugar factories in Maharashtra. Financial assistance will also be provided by the Union Government, the Maharashtra Government and the Council of Scientific and Industrial Research.

* * *

Iran sugar beet project[2].—A new company, International Agrobusiness Corporation of Iran, has been set up and will be concerned with growing of sugar beets as well as cotton and farming of livestock. The total capital investment will be $19,000,000, of which 40% will be provided by Iranian interests including the Ahwaz Beet Sugar Factory and Refinery Co. Ltd. Equal shares of the remaining investment will be provided by four non-Iranian parties including Hawaiian Agronomics Co. (International) and Mitsui & Co. Ltd. Hawaiian Agronomics will provide design engineering and technical assistance during the development and construction phase of the project and will manage it after operations begin. The project is located near to the Haft Tappeh cane sugar project, also managed by Hawaiian Agronomics.

* * *

Beet seed production in India[3].—Beet seed has been produced in India for the first time in commercial quantities. The necessary cold and dry climate was found in Kashmir and in the Kalpa Valley in Himachal Pradesh, near the border with Tibet, where 3000 acres was devoted to the project. India is now in a position to launch a programme for large-scale commercial production of the seed.

* * *

Ivory Coast sugar project[4].—Lang Engineering Corporation, of Coral Gables, Florida, USA, has been awarded a $63,000,000 contract from the government of the Ivory Coast for a sugar production complex to be located at Ferkéssédougou and to be under the authority of Sodesucre, the government-owned sugar corporation. Under the terms of the turn-key contract, Lang will design and construct a 5000 t.c.d. sugar factory with a refinery section, cubing plant and storage facilities, as well as providing management, procurement and supervisory services. Finance will be provided by the Export-Import Bank and a US commercial bank utilizing the export financing guarantee of the Export-Import Bank. A 6000-hectare irrigated cane plantation is to be developed with construction of several irrigation dams, rail links, roads, housing, etc. The complex is expected to be in operation in 1973 and completed by 1974.

* * *

Argentina sugar production quotas[5].—Sugar production quotas for the period 1974–78 have been fixed as follows: 1974, 1,390,000 tons; 1975, 1,440,000 tons; 1976, 1,490,000 tons; 1977, 1,540,000 tons; and 1978, 1,590,000 tons. Export quotas for the period 1973–78 have been established by the Ministry of Commerce as follows: 1973, 362,000 tons; 1974, 400,000 tons; 1975, 420,000 tons; 1976, 440,000 tons; 1977, 460,000 tons; and 1978, 480,000 tons. Last November the 25% duty on exports of raw, refined and semi-refined sugar was abolished, and from January 1973 subsidies are to be given for exports to the world market[6].

Zambia sugar production 1972[7].—The Nakambala factory of the Zambia Sugar Co. Ltd. closed on 12th November 1972 after crushing a record crop of 397,363 metric tons of cane from the estate and surrounding farms. Raw sugar production from this crop was 51,118 metric tons and exceeded the company's original estimate by over 5500 metric tons. Compared with 1971 production, however, it is a rise of nearly 10,000 metric tons.

* * *

Indian sugar production, 1972[8].—Total sugar production during the 11 months of the 1971/72 season amounted to 3,084,000 metric tons, 636,000 tons less than production in 1970/71.

* * *

Philippines 1972 sugar production[9].—Sugar production in the past crop year, ended 31st August, declined by 11·7% to 2,000,270 short tons from the previous season's 2,267,420 tons.

* * *

British Sugar Corporation Ltd. factory closure postponed. It was announced near the end of December that the Selby sugar factory of the British Sugar Corporation is to remain operational for a further year, to assist with the additional beet acreage to be grown following the United Kingdom's entry into the EEC and pending the coming on-stream of the reconstructed factory at York at full capacity in 1975. As part of the B.S.C.'s rationalization plan, Selby, the smallest of the Corporation's factories, had been due to close after the 1973/74 campaign and its beet supplies handled by the York plant which was to be given a higher capacity than the present combined slices.

* * *

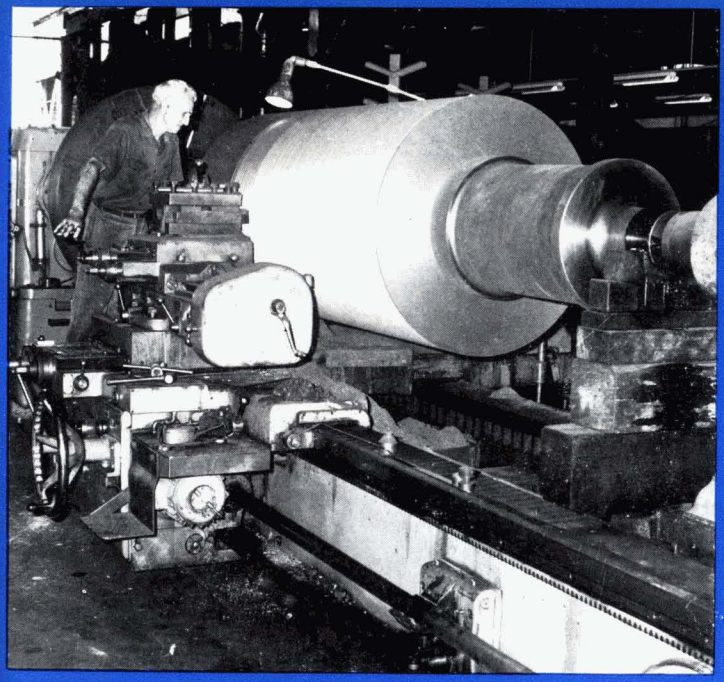
French sugar industry concentration[10].—Fusion of five sugar companies is to take place in 1973, according to a communiqué issued by Générale Sucrière. It is to be in three stages: Lebaudy-Sommier is to merge with Raffinerie de Sucre de St.-Louis, and Union Sucrière de l'Aisne is to merge with Sucreries et Raffineries Bouchon et Pajot. Subsequently both of these merged groups are to be taken over by Générale Sucrière.

* * *

Alcohol distillery for Nigeria[11].—The Federal Government of Nigeria, in partnership with a Dutch distilling company, is to establish an alcohol plant at Bacita with an initial capacity of 500,000 Imperial gallons per year. The distillery will use as raw material the molasses produced at the nearby factory of the Nigerian Sugar Co.

---

[1] *Indian Sugar*, 1972, **22**, 552.
[2] *Sugar y Azúcar*, 1972, **67**, (10), 34–35.
[3] *Indian Sugar*, 1972, **22**, 552.
[4] *Sugar y Azúcar*, 1972, **67**, (11), 35.
[5] *BOLSA Review*, 1973, **7**, 11.
[6] F. O. Licht, *International Sugar Rpt.*, 1973, **105**, (1), 8.
[7] *Standard Bank Review*, January 1973, 19.
[8] *Sugar News* (India), 1972, **4**, (6), 27.
[9] *Public Ledger*, 13th January 1973.
[10] F. O. Licht, *International Sugar Rpt.*, 1972, **104**, (35), 6.
[11] *Barclays International Review*, December 1972, 19.



MILL ROLLERS

ANY SIZE.
TO ANY METALLURGICAL COMPOSITION, ALTHOUGH WE RECOMMEND OUR OWN PROVEN ROLLER IRON.

FULLY MACHINED COMPLETE WITH SHAFT,

OR

AS PARTIALLY MACHINED SHELLS

ALL EQUIPMENT YOU WANT FOR A SUGAR FACTORY
WALKERS CAN SUPPLY

WALKERS LIMITED

CONSULTANTS
DESIGNERS
ENGINEERS

MARYBOROUGH QUEENSLAND AUSTRALIA

Index to Advertisers

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

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.