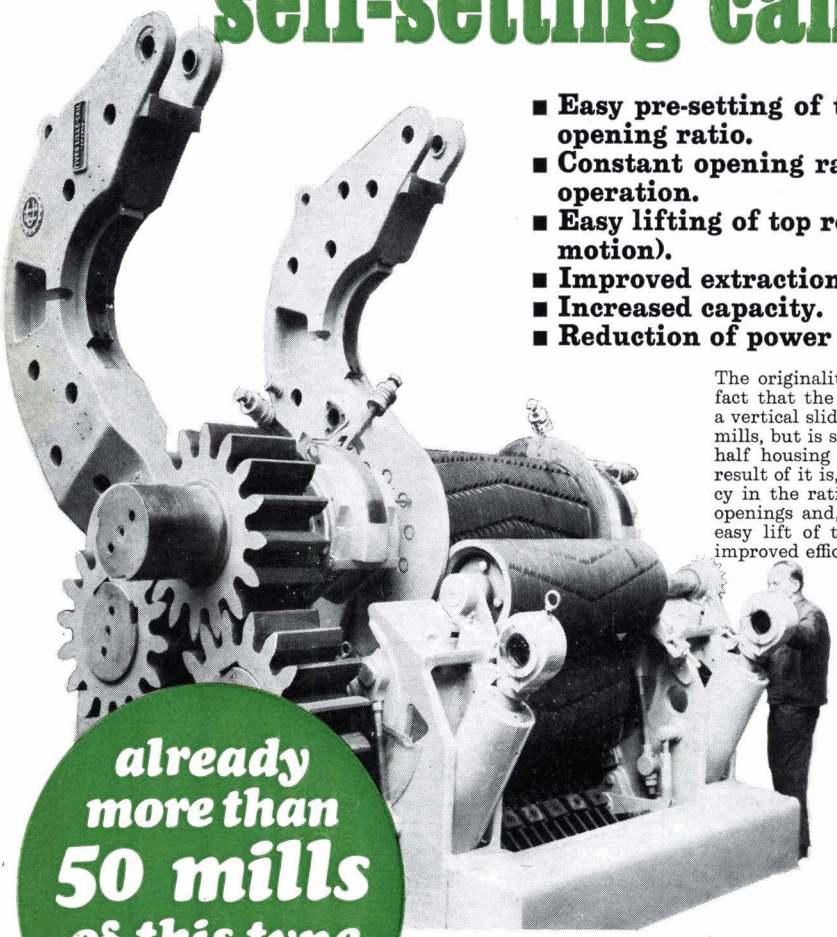
THE International Sugar Journal

OCTOBER 1972

with the Fives Lille - Cail self-setting cane mill

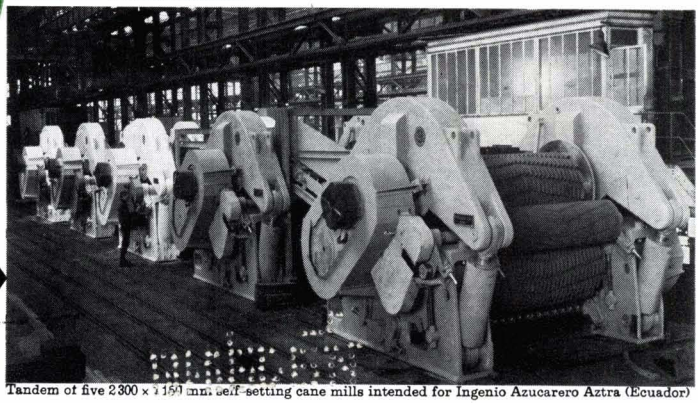


- **Easy pre-setting of the feed/discharge opening ratio.**
- **Constant opening ratio during operation.**
- **Easy lifting of top roller (rotating motion).**
- **Improved extraction.**
- **Increased capacity.**
- **Reduction of power peaks.**

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



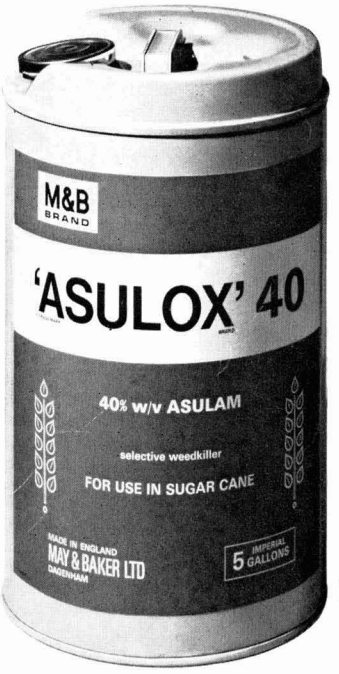
Tandem of five 2300 x 1150 mm. self-setting cane mills intended for Ingenio Azucarero Aztra (Ecuador)

FIVES LILLE - CAIL

7, rue Montalivet - PARIS 8e ☎ : 265-22.01 and 742-21.19

Cables : FIVCAIL-PARIS - Telex : FIVCAIL 65 328

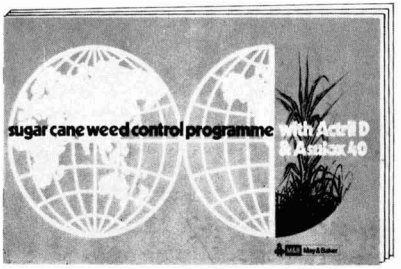
Now you can kill grasses without harming cane!



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

. . . and the perfect partner for 'Asulox' 40 to give a complete programme of weed control is 'Actril' D – which gives rapid knockdown of the toughest broadleaved weeds.

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 .....

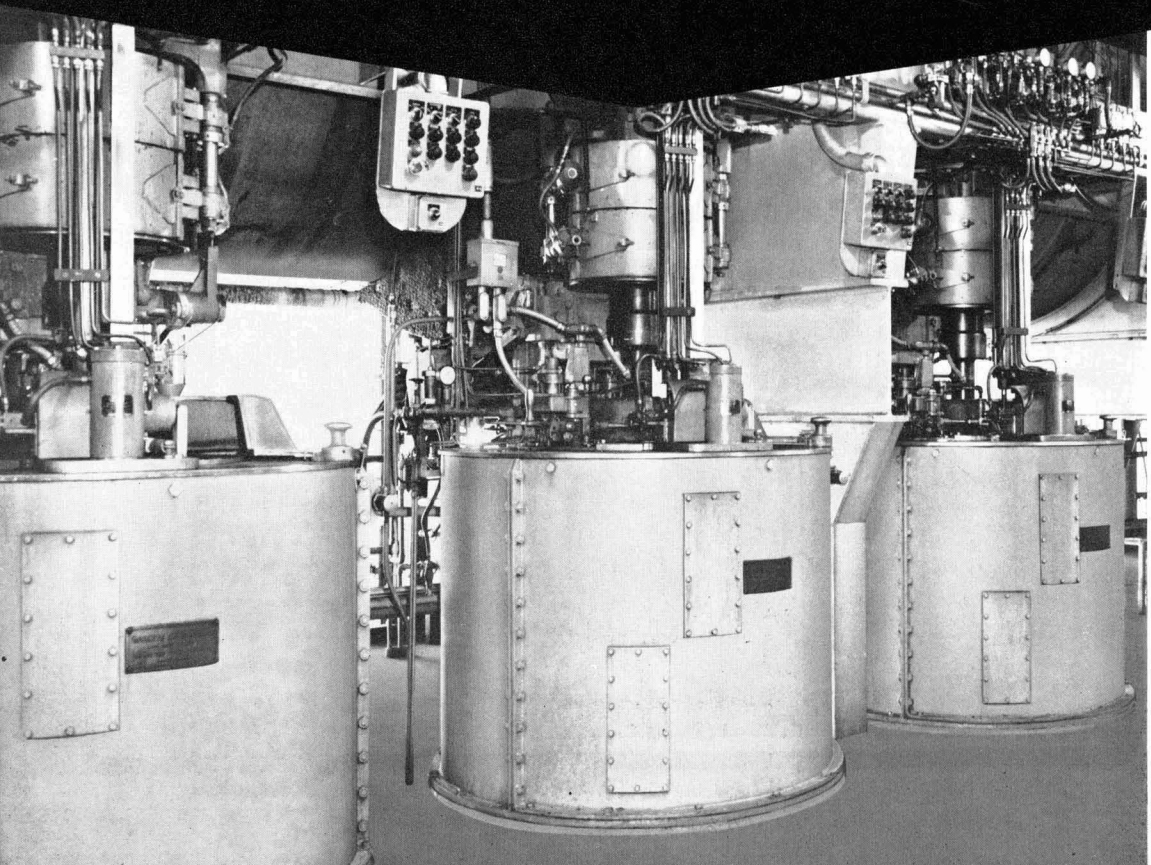
Address .....

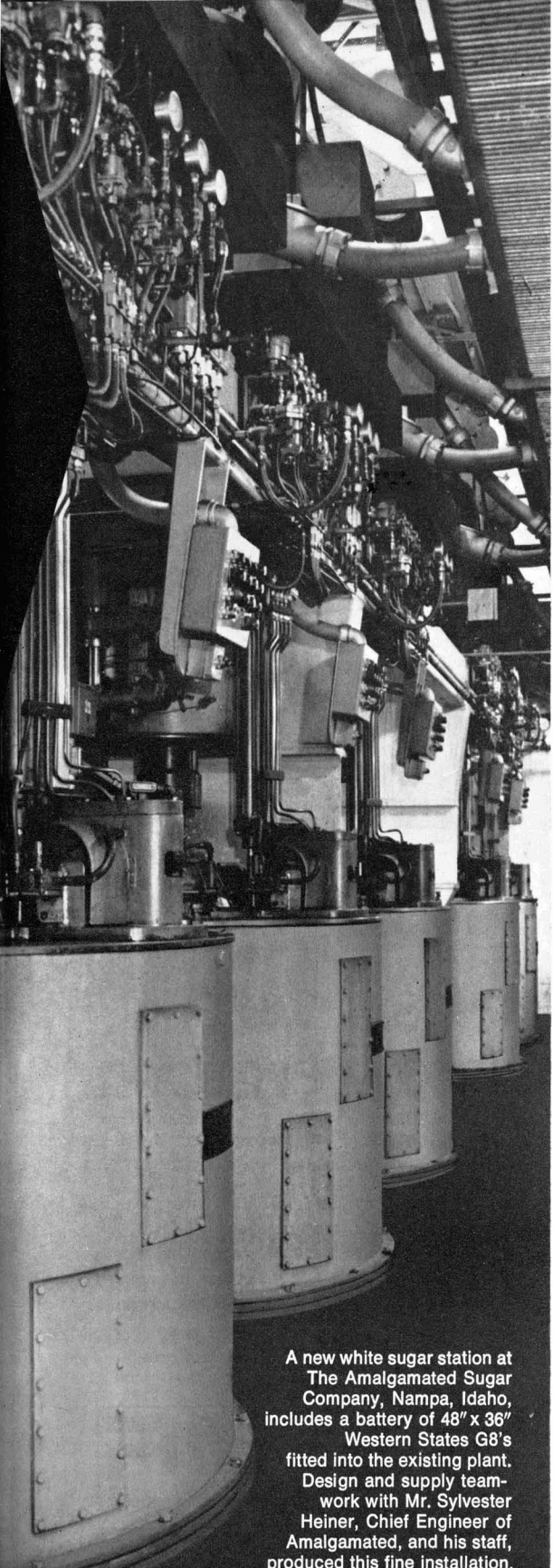
ISJ 10

M&B May & Baker

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

There are two important cycles for Western States centrifugals





A new white sugar station at The Amalgamated Sugar Company, Nampa, Idaho, includes a battery of 48″ x 36″ Western States G8's fitted into the existing plant. Design and supply teamwork with Mr. Sylvester Heiner, Chief Engineer of Amalgamated, and his staff, produced this fine installation.

You should know about both of them.

At Western States our interest in you starts long before your inquiry. We maintain that interest throughout the useful life of your machine . . . and that can be a long, long time. This interest in you is divided into two cycles . . . we've identified them as the responsibility cycle and the performance cycle.

The responsibility cycle

a. More than 50 years of specialization in the sugar industry goes into the design of your Western States centrifugal system.
b. Expert sugar technologists insure that your system will operate at top efficiency.
c. The utmost care (and resultant excellent quality) is the keynote during your machine's construction.
d. Western States engineering experts will supervise installation of your centrifugal station.
e. Improvements are developed so that the thousands of Western States centrifugals now in use can be retrofitted.

The performance cycle

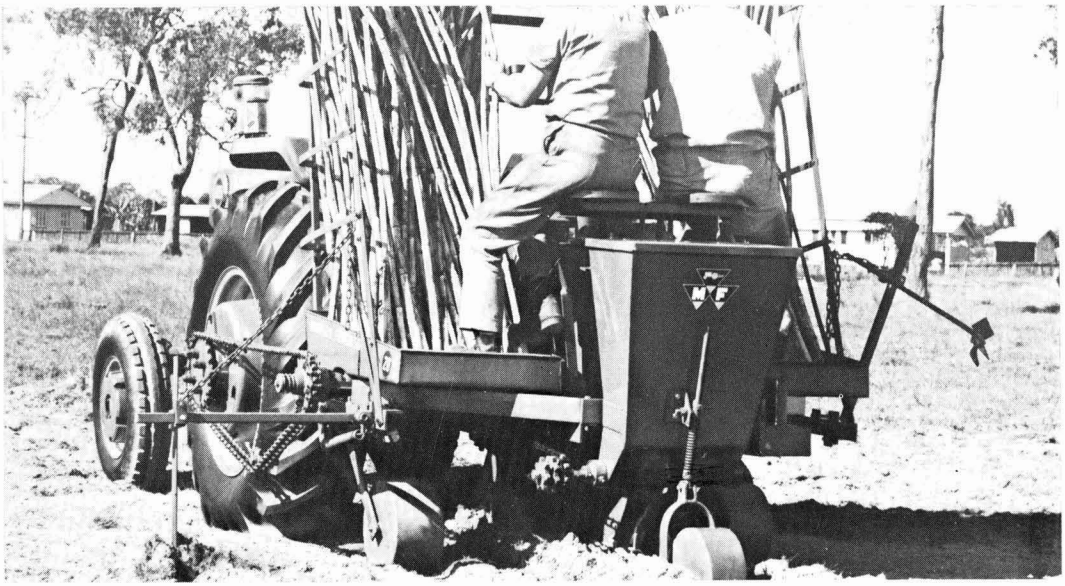
a. The Western States basket is the safest in the industry.
b. Safe, fixed, reverse-direction discharging.
c. Reliable two-speed squirrel-cage motor drive with straight forward industrial type controls.
d. Fastest braking from combination of regenerative to half-speed and mechanical to rest with the largest water cooled brake drum in the industry.
e. You get replacement parts when you need them . . . from an extensive stock handled by our spare parts specialists.
f. You get long life . . many Western States centrifugals are in fully productive operation after more than twenty years.

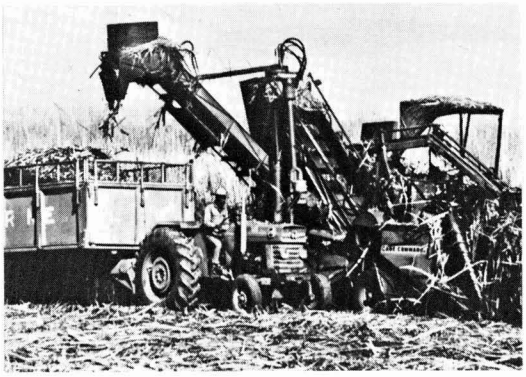
These two cycles are essential to your getting maximum return on your centrifugal investment . . . Mr. A. H. Stuhlreyer, Director of Sales, can give you all the details.

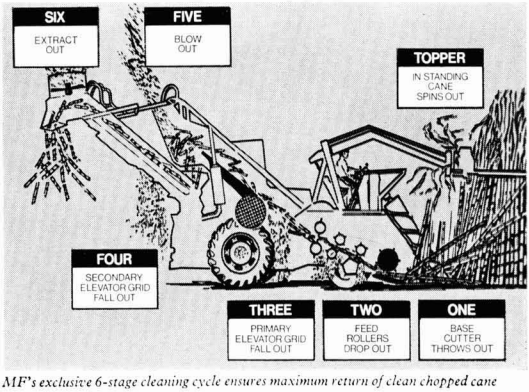
ROBERTS STEVENS

THE WESTERN STATES MACHINE COMPANY

Hamilton, Ohio 45012 U.S.A.







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.

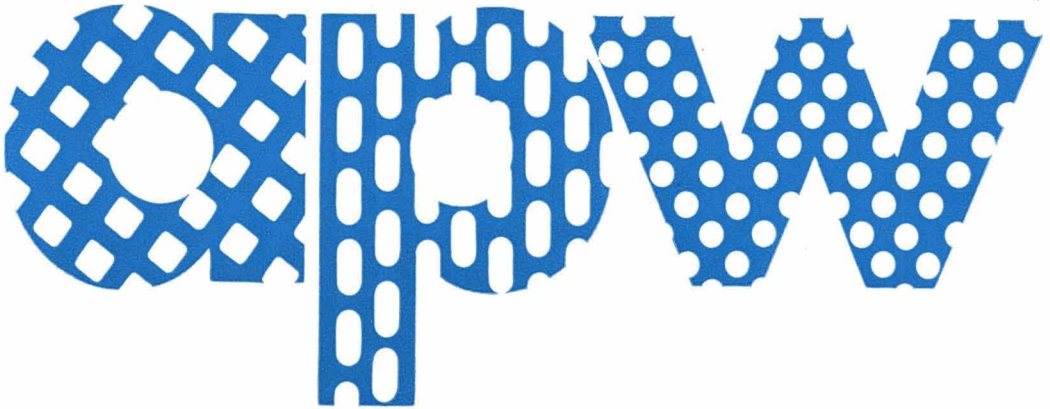
MF 20 cane planter—does six jobs at once. This machine opens the furrow, cuts the cane into lengths, dips them in protective fungicide, and then places them in the soil. At the same time, it sows fertiliser on both sides of the furrow, close enough to ensure healthy growth, but far enough to prevent 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



The only name you need to know in perforated metals

Associated Perforators & Weavers Limited are experts in their field. They produce every kind of perforation, from ·012″ to 1″ thick, (0·3mm to 25mm).

In a wide range of materials—mild steel, high tensile steel, stainless steel, tinplate and most non-ferrous metals. APW also perforate precious metals and many non-metallic materials such as hardboard, rubber and rubber laminates.

Perforating that can be purely functional or totally decorative. But it is always precisely made to meet your requirements.

Try them out for your company, discuss your particular need with them. You will find them friendly, helpful and expert no matter how big or small the job.

Write to:

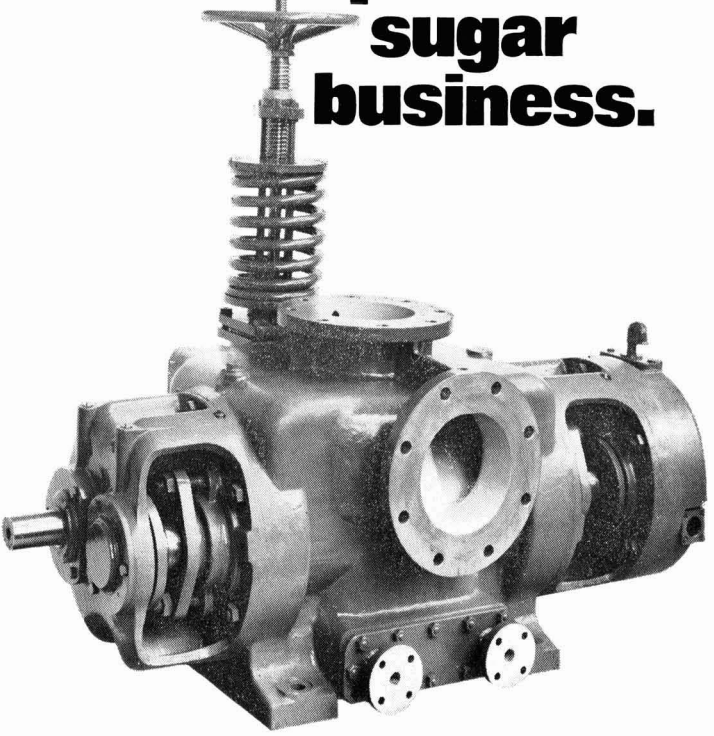
Associated Perforators & Weavers Ltd.,
Woolwich Road, London, SE7 7RS.
Telephone: 01-858 6401 Telex: 896648

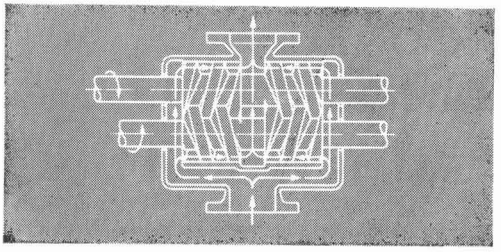
Northern Office and Works,
P.O. Box 161, Warrington WA1 2SU. Lancs.
Telephone: 0925 34119 Telex: 62508

apw

A JOINT HARVEY Locker ENTERPRISE

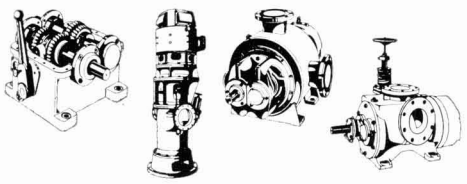
Houttuin screw pumps now also in operation in sugar business.





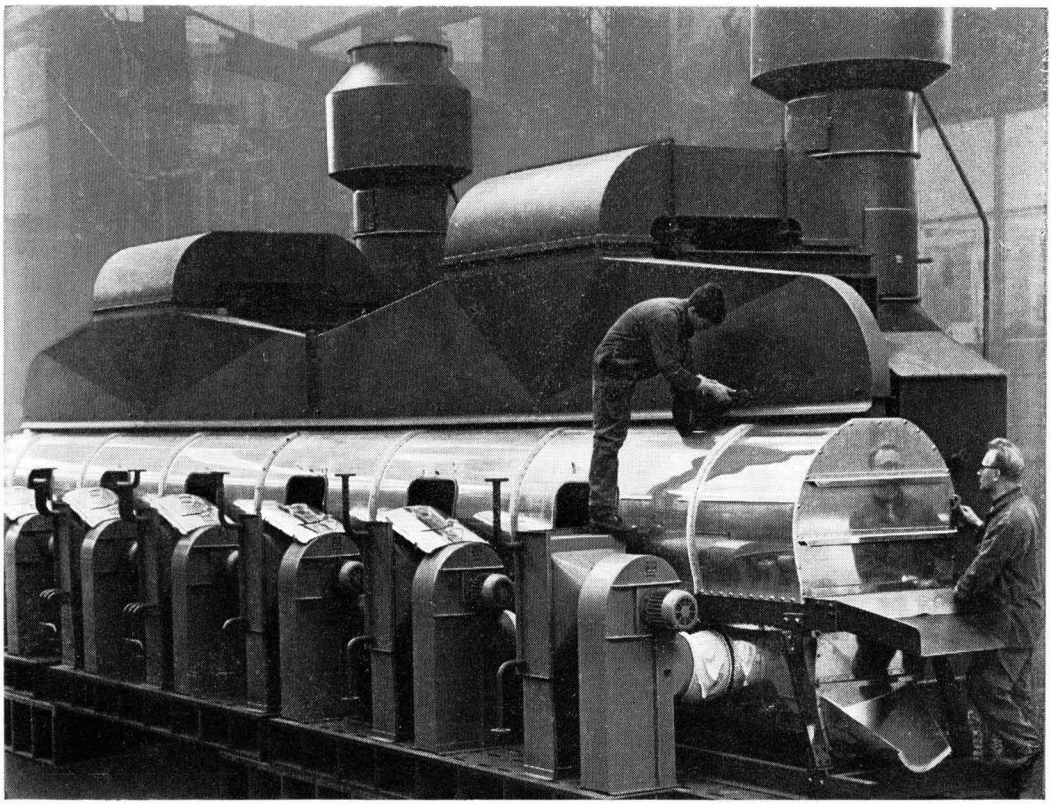
The two screws that provide the drive for Houttuin positive rotary displacement pumps, intermesh smoothly without metal to metal contact.

Features:
Selfpriming even under the most unfavourable conditions. Can handle all kind of liquids, including heavy juice, run offs, melts, molasses. Extremely suitable for pumping thin liquids to settling stations and filter presses because of the virtually pulseless flow. Versatile and suitable for all temperatures and capacities encountered in the sugar industry. All liquid contact points can be made from materials carefully selected to suit the liquid you want to pump. Wear resistant even on saturated juices (sulphitation, carbonatation, etc.).
Like to know more? Send for our comprehensive catalogue.



HM houttuin pompen

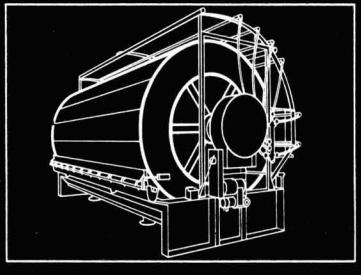
Sophialaan 4, Utrecht, The Netherlands, tel. 441644, telex 47280



How to pick a winner in the mud.

There's a rich payoff in being able to handle mud. We've got a sure thing for you in our Oliver-Campbell® Cane Mud Filter. It literally sucks up the sugar and leaves mud behind.

The Oliver-Campbell filter offers you new component design that gives you more efficient operation with minimal maintenance. Stainless steel construction of the filter drum, internal piping, filtrate valve and perforated screens over a polypropylene waffle grid decking assure long, trouble-free life.



You get greater hydraulic capacity because of the much larger internal piping (8′ drums have 1¼″ piping, 10′ drums 1½″), the larger capacity filtrate valve and the increased deck depth. You get better control with the new totally-enclosed Varispeed drive. And you get maximum utilization of the filter area with the new design of the scraper discharge unit.

The Oliver-Campbell filter provides great flexibility of operation. It can be used with or without chemical additives. It can be used as a Rapifloc™ type of filter with only minor modification. Or as a conventional filter with or without coagulating equipment and chemicals.

But Dorr-Oliver is not content simply to provide the filter hardware. We're sugar engineers with a lot of experience.

We have the skill and technology to design a complete, efficient and economical filtrator station for your mill. One that's perfectly suited to your local conditions.

We don't hedge our bet when it comes to service. We want to see you be a big winner. And pull more profits out of the mud.

For full details about our Oliver-Campbell Cane Mud Filter and our other systems for the sugar industry: write: Dorr-Oliver Inc., 77 Havemeyer Lane. Stamford. Connecticut 06904.

DORR OLIVER

Worth writing for

New 48-page brochure covers all the design, engineering and performance data that makes Farrel tandems the leading equipment for more efficient sugar production.

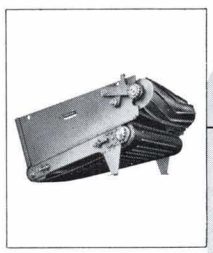
Fact-packed with specs, charts and illustrations, this new bulletin provides a valuable reference on Farrel's creative approach to engineering. Farrel techniques for increasing sucrose extraction from varying thicknesses of bagasse blankets, lower operating costs, easy maintenance and greater reliability of grinding equipment.

You'll learn faster steps to greater productivity through complete or progressive modernization programs. You'll see what goes into Farrel mills, understand why they perform better under heavy loads and adverse operating conditions. You'll discover how easily a regular program of parts replacement can reduce downtime and become your continuing program of modernization.

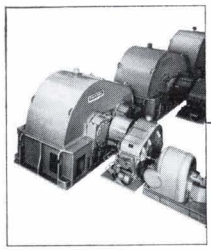
Other information includes engineering data, horsepower charts and application case histories. Learn why other producers rely on Farrel Sugar Cane Machinery. Send for bulletin 312-B. Write to Farrel Company, Division of USM Corporation, Ansonia, Connecticut, U.S.A. 06401.

Plants: Ansonia and Derby, Conn.; Rochester, N.Y.
Domestic Sales Offices: Ansonia, Akron, Atlanta, Chicago, Houston, Los Angeles
Foreign Sales Offices: Liege, Belgium; Rochdale, England; Paris, France; Frankfurt, Germany; Bunnik, Holland; Milano, Italy; Mexico, D.F., Mexico

New brochure gives you the full story on Farrel Sugar Cane Machinery

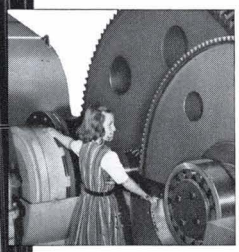


Durable rubber belt carriers feature many advantages.

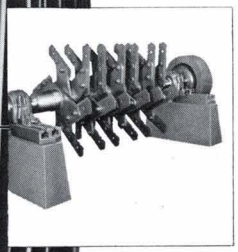


Modern gear design offers speed flexibility.

Patented side-cap construction permits fast vertical roll removal.



Air clutches between the two units of turbine drives provide slippage to prevent damage to mill or coupling.

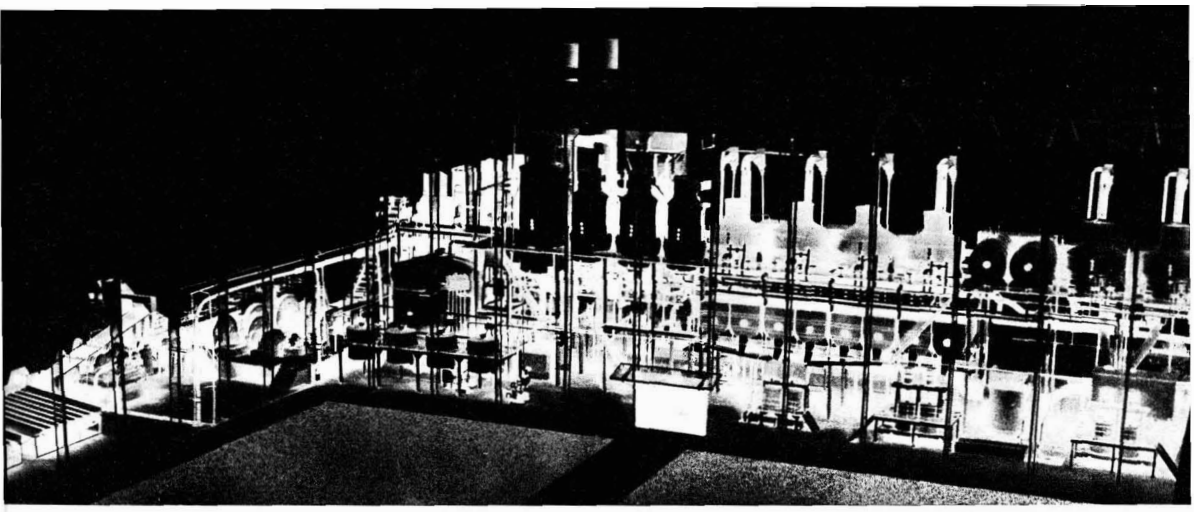


Type K-4 cane knife units improve sucrose extraction and increase grinding capacity.

Farrel Machinery Group
USM Corporation

FARREL

A-1-25



IT IS BEING ASSEMBLING IN VENEZUELA ONE OF THE MOST MODERN SUGAR CANE PLANT. WHO DID BUILD IT? M.DEDINI DID.

After an international bid for the construction of "Central Santa Maria C.A.", in Venezuela, M. Dedini built a complete Sugar Cane Plant, turn-key sistem.

Also in other countries, like Argentina, Bolivia, Paraguay and El Salvador there are in operation several Sugar Cane Plants equipped by M. Dedini.

These Dedini's achievements are becoming Brazil so known, that Dr. Emile Hugot, a famous sugar technician, due to his works on sugar technology, declared: "I have the great pleasure to certify that Brazil is also able furnish a complete Sugar Cane Plants, among the world competitors."

M. DEDINI S.A. METALÚRGICA

- an interprise of Mario Dedini Industrial Group
Av. Mario Dedini, 201 - Phone: PABX 2-3080
Piracicaba - SP - Brazil - São Paulo Office: Rua Tagipuru, 235 - 13th floor - Phones: 51-2034, 51-5649, 51-5316, 52-0582 e 52-7663 - Guanabara Office: Avenida Presidente Vargas, 542 22nd floor - Phone: 223-9949.

International agreements:

GHH (Gutehoffnungshütte Sterkrade Aktiengesellschaft), West Germany

BMA (Braunschwegische Maschinenbauanstalt),

ERIE CITY ENERGY DIVISION (Zurn Inc.), U.S.A.

ATELIERS DES CHARMILLES, Switzerland

ATELIERS BELGES RÉUNIS (ABR Engineering), Belgium

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

October 1972

Contents

SOMMAIRES : ZUSAMMENFASSUNGEN : SUMARIOS

Manchons d'accouplement carrés dans les transmissions de moulins à canne. Ie Partie. H. OKAMURA, H. TANAKA et M. TERAO. *p.* 291–294

Le manchon d'accouplement carré est un système très simple mais que l'on a peu étudié pour déterminer et pour, dans la mesure du possible, réduire les forces supplémentaires exercées au cours de la transmission du couple de torsion. On a construit un modèle à l'échelle du dixième qui fut utilisé pour mesurer et confirmer les calculs dérivés théoriquement de ces forces, couples de torsion, moments, etc. On donne quelques illustrations de l'équipement et on résume le grand nombre de variations des conditions de son emploi.

* * *

Expérience de la diffusion de canne au Queensland. IIe Partie. D. H. FOSTER et D. S. SHANN. *p.* 294–298

On discute les modifications qu'on a dû apporter à un certain nombre des principes de conduite d'une sucrerie à la Fairymead Sugar Co. Ltd. par suite de l'incorporation du diffuseur dans le système d'extraction. Ces modifications comprennent la variation des besoins en vapeur, le fonctionnement d'un décanteur pour le jus de pression afin d'obtenir une efficacité de percolation satisfaisante et la possibilité d'admettre dans le processus de fabrication une grande quantité de liquide provenant des réservoirs du diffuseur lors d'un arrêt éventuel. Il semble que la conduite de l'atelier de cristallisation n'ait pas été affectée. On se réfère à une méthode que l'on a trouvée être fort utile pour l'évaluation de la performance du diffuseur.

* * *

Prévention de l'entraînement dans la station d'évaporation de moulins à canne. R. FREW. *p.* 297–299

On décrit un séparateur d'entraînement développé par The Colonial Sugar Refining Co. Ltd. Il se compose de deux rangées de tôles inclinées les unes par rapport aux autres d'un angle d'environ 110° en travers du corps de l'appareil. Les gouttelettes de liquide sont récoltées sur les surfaces inclinées et forment des gouttes plus grosses lorsqu'elles s'écoulent vers le bas. De cette manière, elles ne sont pas réentraînées lorsqu'elles tombent des arêtes inférieures des tôles. La chute de pression est faible et les pertes en sucre sont trop faibles que pour être détectées dans l'eau du condenseur lorsque le séparateur est raccordé à un appareil à cuire sous vide.

Vierkantkupplungen für Rohrmühlenantriebe. Teil I. H. OKAMURA, H. TANAKA und M. TERAO. *S.* 291–294

Die Vierkantkupplung ist ein sehr einfaches Maschinenelement. Es sind allerdings noch wenig Untersuchungen durchgeführt worden, um die zusätzlichen Kräfte zu bestimmen und, wenn möglich, zu reduzieren, die während der Kraftübertragung auftreten. Es wurde ein Modell im Massstab 1:10 konstruiert, das zur Messung und Bestätigung der theoretisch abgeleiteten Berechnungsmethoden für diese zusätzlichen Kräfte, die Drehkräfte, die Momente usw. benutzt wurde. Die Beschreibung dieses Maschinenelements ist bebildert und enthält eine grosse Anzahl von Varianten für die Anwendungsbedingungen.

* * *

Erfahrungen mit der Rohrdiffusion in Queensland. Teil II. D. H. FOSTER und D. S. SHANN. *S.* 294–298

Eine Reihe von Gesichtspunkten bei der Fabrikarbeit der Fairymead Sugar Co. Ltd. musste als Ergebnis der Einbeziehung des Diffuseurs in das Extraktionssystem geändert werden. Unter anderem werden besprochen: der Dampfbedarf, die für die Sicherung einer ausreichenden Durchflussleistung erforderliche Arbeitsweise des Presssaftdekanteurs und die Abnahme einer grossen Menge Flüssigkeit aus den Diffusionssaftgefässen zur Weiterverarbeitung im Fall eines Stillstandes. Die Arbeit im Zuckerhaus scheint nicht beeinflusst worden zu sein. Es wird auf eine Methode eingegangen, die sich als brauchbar zur Ermittlung der Leistung des Diffuseurs erwiesen hat.

* * *

Vermeidung von Ueberreissern in der Verdampfstation einer Rohrzuckerfabrik. R. FREW. *S.* 297–299

Es wird eine Vorrichtung zur Vermeidung von Ueberreissern beschrieben, die von The Colonial Sugar Refining Co. Ltd. entwickelt wurde. Sie besteht aus zwei Schichten von jalousieartigen Einbauten in einer Verdampferstufe, die gegeneinander um etwa 110° geneigt sind. Die Flüssigkeitströpfchen sammeln sich auf den geneigten Flächen und bilden grössere Tropfen. Da sie als solche von den tiefer gelegenen Rändern der Platten herunterfallen und nach unten abgezogen werden, werden sie nicht mit den Brüden übergerissen. Der Druckabfall ist gering, und die Zuckerverluste sind so klein, dass sie nicht im Kondensat nachgewiesen werden können, wenn die Vorrichtung an einen Vakuumkochapparat angeschlossen wird.

Acoplamientos de ejes con collares cuadrados en el accionamiento de molinos de caña. Parte I. H. OKAMURA, H. TANAKA y M. TERAO. *Pág.* 291–294

El acoplamiento de eje con collar cuadrado es un equipo muy sencillo, pero ha recibido poco estudio para determinar y, si posible, reducir las fuerzas adicionales aplicado mientras la trasmisión de pares. Un modelo de escala 1:10 fué construido y se usaba para medir y confirmar las calculaciones, derivado teoricamente, de estas fuerzas, pares, momentos, etc. Se presenta ilustraciones del equipo y se resumen las numerosas variaciones en las condiciones de su uso.

* * *

Experiencias con difusión de caña en Queensland. Parte II. D. H. FOSTER y D. S. SHANN. *Pág.* 294–298

Se demandaban cambios en algunos aspectos de operación de la azucarera de Fairymead Sugar Co. Ltd. como resulta de la inclusión del difusor en la sistema de extracción, y estos cambios se discuten. Incluyen la variación en demanda para vapor, operación de un decantador para jugo de la prensa para asegurar un eficiencia adecuada de percolación, y aceptación de una grande cantidad de líquido de los tanques del difusor en el proceso de fabricación en caso de un cierre. Operación de la casa de cocción parece no ser afectado. Se refiere a un método que estaba útil para asesar el cumplimiento del difusor.

* * *

Prevención de arrastre en la planta de evaporación de un azucarera. R. FREW. *Pág.* 297–299

Se describe un separador de arrastre desarrollado por The Colonial Sugar Refining Co. Ltd. Consta de dos capas de rejillas inclinado entre sí a un ángulo de ca. 110° y situado al través del cuerpo. Gotitas de líquido se acumulan sobre las superficies inclinadas y forman gotas más grande cuando escurren al fondo que no se re-arrastran cuando caen de los bordes inferiores de las placas. La caída de presión es baja y pérdidas de azúcar están demasiado pequeño de percibirse en el agua del condensador cuando el separador se encaja en un tacho.

THE

INTERNATIONAL SUGAR JOURNAL

VOL. LXXIV OCTOBER 1972 No. 886

Notes & Comments

South African sugar prospects

In his address to the Annual General Meeting of the South African Sugar Millers' Association, the Association's Chairman, Mr. J. MORTON TAYLOR, sounded a note of warning on the possibility of a serious labour shortage in the South African cane sugar industry. He is reported[1] as saying that it was only now that members of the South African sugar industry were taking note of the grave situation which could develop, particularly in cane harvesting. With the changing socio-economic pattern whereby local labour was calling for higher wages and becoming more reluctant to work as cane cutters, unless there was a rapid move to overcome the problem of diminishing labour supply, "the end result will be an inevitable slowing down and contraction" of the South African industry. Hence, there is great need to establish mechanical harvesting, and a special Mechanization Sub-Committee of the South African Sugar Association Experiment Station has been formed to start investigations on the subject and make recommendations on the most economical methods of introducing mechanical harvesting. It was suggested by Mr. TAYLOR that up to R5 million should be set aside during the 1972/73 season as a fund for such investigations.

Reference to the scarcity and high cost of manual labour and to its costly replacement with mechanical harvesters was also made by the Vice-Chairman of the South African Cane Growers' Association, while the Chairman of the same Association is reported as saying that he believes a possible solution lies in improving wages and living conditions of the labour force.

* * *

Sugar production prospects

Increases in the distribution payment made by the UK Sugar Board indicated the upward trend in the world sugar price experienced during the period up to the first week of September. On 15th August the Minister of Agriculture, Fisheries and Food made Orders increasing the distribution payment by £2 to £6 per ton; this was followed by an increase on 25th August to £14 per ton, on 31st August (when the London Daily Price stood at £76 per ton) to £22 per ton and on 7th September to £26 per ton. However, since then there has been a rather sharp fall in the world price and at the time of writing a decrease in the distribution payments is to be expected.

E. D. & F. Man warned at the end of August that the recent high sugar prices were not yet justified, and this has indeed been borne out by the sharp downturn, one cause of which will have been the first estimate of the European beet sugar crop for 1972/73 published by F. O. Licht K.G.[2] As C. Czarnikow Ltd. indicate[3], "The poor beet test results in most West European countries and reports of severe damage to the Russian crop as a result of the hot and dry weather which has been experienced had led most people to expect a lower output of sugar from Europe this season than in 1971/72". Hence, it was somewhat of a surprise to learn that in their first estimate Licht forecast a production of 26,348,000 tons of sugar, i.e. an increase of some 300,000 tons on the 1971/72 result, which, if achieved, would constitute a record for European sugar. The figures published by Licht are shown elsewhere in this issue.

As will be seen, the major increase is in the USSR figure. The West European estimates still show a drop of some 1 million tons (as C. Czarnikow Ltd. had forecast in their *Sugar Review* of 31st August), but this is well balanced by the East European figure.

It should also be pointed out that with an increase of only 300,000 tons in the European crop—representing a third of world production—the increase required in the cane sector is correspondingly raised if a further fall in stocks and cut-back in consumption are to be avoided[4].

---

[1] *S. African Sugar J.*, 1972, **56**, 287.
[2] *International Sugar Rpt.*, 1971, **104**, (25), 1.
[3] *Sugar Review*, 1972, (1091), 155.
[4] *See also I.S.J.*, 1972, **74**, 257.

St. Kitts move to avert sugar crisis

It is reported[1] that the St. Kitts House of Assembly has passed the Sugar Industry (Rehabilitation) Loan Act under which the Government of this West Indian island can borrow EC$ 3·6 million from local banks at an interest of 8%, maturing about the end of 1977, in an effort to restore the sugar industry, which is the mainstay of the island's economy. For the last three years, St. Kitts has suffered from low sugar production, involving the island's only sugar factory in increasing losses, and in August 1971 a firm of accountants in the UK was called in to carry out a feasibility study and report on the re-organization of the sugar industry. Their report recommended that the entire sugar industry should be owned and operated by a single company, having a nominal value of £3·5 million, with a Government interest of 20%. The Government should take the initiative in organizing and negotiating for the formation of the company, which should aim at a cane area of 13,000 acres of which 12,000 acres would be harvested annually to produce cane for production of 40,000 tons of sugar, while the cultivable portion of the remaining 1,000 acres should be put to livestock and food crop production. The rescue operation will be under the overall direction of the Minister of Agriculture, Labour and Housing, and a pool of agricultural machinery, costing several hundred thousands of pounds, will be made available. The UK is to provide advisors on the proper use of this machinery.

* * *

Verenigde HVA-Maatschappijen N.V. 1971 report

"As a result of various developments the large surpluses of sugar which have been overhanging the world market during the past few years were considerably reduced. There is no doubt that the sharp increase from year to year in the world consumption of sugar is of major importance. This development leads to the impression that surpluses as occurred in the past are unlikely to recur in the near future. The improved statistical position will result in an accelerated reconstruction and expansion of existing units of production as well as the erection of new sugar factories. This will certainly be the case in developing countries where, hand in hand with the increase in national income per caput, the consumption of sugar generally shows a clearly upward tendency."

Ethiopia—In the 1970/71 crop year a new record was set in the production of sugar in Ethiopia as a result of sufficient supply of cane for a normal milling season at the Metahara sugar factory. Production reached a total of 109,432 metric tons, of which Wonji and Shoa produced 68,246 tons (67,428 tons in 1969/70) and Metahara 41,186 tons (29,665 tons in 1969/70). Local sales were 97,547 tons, an increase of 8·4% which was a welcome surprise in view of an increase in the selling price. The surplus was exported to Red Sea countries.

Tanzania—In the 1971 season the Kilombero estate produced 37,400 metric tons, about 5% higher than in 1970. Factory extension has been completed and, weather permitting, 42,000 tons are expected in 1972. A feasibility study is being made for a new sugar factory in the north-west of Tanzania at the Government's request, in view of increasing demand for sugar and the desirability of a further extension of cane cultivation.

Ghana—After completion of a survey into the possibility of reconstructing two sugar factories in Ghana in 1970, a management contract was initiated towards the end of 1971; implementation has been postponed, however, for the time being, owing to the change of Government.

* * *

Sugar factory construction interest

We have commented on the large expansion of sugar production necessary to avoid the curtailment of consumption by reason of non-availability and excessively high prices. Hindrances to expansion include the very large capital investment needed in a modern sugar factory, and the formation of a finance company by Fletcher and Stewart Ltd.[2], the British sugar machinery manufacturers, is an interesting development in this connexion, as is the proposal by C. Czarnikow Ltd., the sugar brokers, that this is a sphere in which the World Bank might find an opportunity to step into the breach[3].

A second hindrance is the memory of the disastrous effects of uncontrolled expansion in 1963 when, in the absence of an International Sugar Agreement, an increase of production by 12 million tons in two years led to four years of ruinously low prices in a slump which would have led to the destruction of several sugar industries without Government assistance. Producers are understandably cautious about committing themselves to further capital investment which they fear might lead to a repetition of the bad years of 1964–68. The situation is different, of course, since production in 1971/72 has been nearly 4 million tons *under* consumption (which has been restricted by high prices) and there is scope for considerably higher offtake, while the ISA exists to ensure orderly marketing to prevent the losses of the past.

The readiness of sugar machinery suppliers to meet an increasing demand is illustrated by the results of the bid for the $25,000,000 fifth Greek sugar factory to be built at Orestias for the Hellenic Sugar Industry[4]. Twelve bids were received; 2 British, 2 French, 2 Italian, 2 Spanish and 1 each from Belgium, Czechoslovakia, Poland and the USA. The bids will be under consideration until December when the choice will be made; however, the number of bids and the terms were considered satisfactory. No doubt the unsuccessful tenderers will find plenty of business in other countries if the world's sweet tooth is to be satisfied.

---

[1] *W. Indies Chron.*, 1972, **87**, 328.
[2] *I.S.J.*, 1972, **74**, 158.
[3] *Sugar Review*, 1971, (1055), 232.
[4] F. O. Licht, *International Sugar Rpt.*, 1972, **104**, (25), 9.

Square box couplings in cane mill drives

By H. OKAMURA, H. TANAKA and M. TERAO
(Hitachi Shipbuilding & Engineering Co., Ltd., Osaka, Japan.)

PART I

Introduction

SQUARE box couplings have been commonly used in cane mill drive, since they are very simple compared with other types of universal couplings. But the square box coupling generates undesirable forces when it transmits the torque to the mill, and the thus-generated forces have various effects on the gear box and mill.

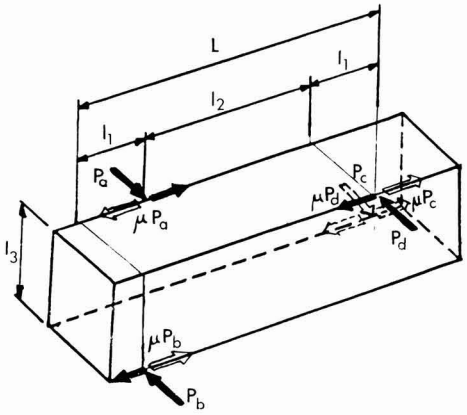


Fig. 1. Free body diagram

Careful consideration should be paid to the gear box and mill design, especially to the gear bed and bearings. The writers have witnessed and experienced many times the effect of the forces on the mill and gear box, and have tried to estimate them.

But it is difficult to estimate the forces by only theoretical analysis, because the mechanism of torque transmission by a box coupling is very complicated. Experimental proof was required of the results of theoretical investigation.

In 1969 and 1970, such a study was made at the Technical Research Laboratory of Hitachi Shipbuilding and Engineering Co. Ltd. using a tenth-scale model of a real coupling.

In this paper a brief explanation of the experiment, method of calculation of the extra forces and some suggestions to reduce them are described.

Extra forces generated at the square box coupling

The extra forces generated at a square box coupling comprise extra bending moment, extra radial force and extra axial force. It is next to impossible for a square box coupling to transmit the torque without generating any extra force at the coupling. These extra forces are considerably larger than has been thought hitherto, and therefore it is strongly required that they be estimated and taken into consideration in gear box and mill design.

The following are thought to be the causes of the extra forces: In most cases in cane mill drive, the position of the drive shaft (master gear shaft) and driven shaft (mill roller shaft) differ owing to top roller floating, so the square box coupling is used to connect the two shafts flexibly. But the square box coupling is not completely flexible and extra radial force, axial force and bending moment are generated owing to the stiffness of the coupling. These extra forces are generated by the frictional force at the contacting points and the difference between the contacting points of the square shaft and the coupling box in the axial direction.

From the free body diagram shown in Fig. 1 it may be seen how these factors cause the extra forces. According to geometrical analysis, the number of contacting points varies between two and four during operation.

Free body diagram

The square coupling transmits the torque in a very complicated way, changing the conditions during a complete revolution. Designers have to find the maximum magnitude of the extra forces in gear box and mill design. Fig. 1 shows typical conditions where the torque is transmitted by two contacting points, which is the most likely case. Under these conditions, the largest extra forces are generated at the coupling.

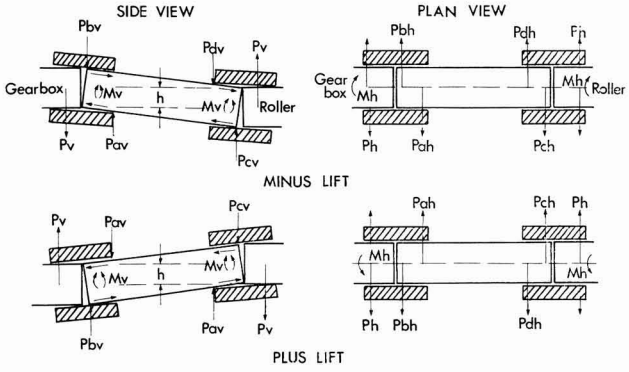


Fig. 2. Torque transmitting conditions

Pav, *Pbv*, *Pcv*, *Pdv*—vertical component; *Pv*—extra vertical force; *Pah*, *Pbh*, *Pch*, *Pdh*—horizontal component; *Ph*—extra horizontal force; *Mh*—horizontal bending moment; *Mv*—vertical bending moment.

The equilibrium equations for the free body diagram are as follows:

P_a, P_b, P_c, P_d: Force on each pad, kg.
μ: Frictional coefficient.
l_1: Axial distance between two contacting points, cm.
l_2: Axial distance between the two inner contacting points, cm.
l_3 Pad width, cm.
L: Effective length of the square shaft, cm.
T: Transmitting torque, kg.cm.
Fr: Extra radial force on the coupling, kg.
Th: Extra axial force (thrust) on the coupling, kg.
Mc Extra bending moment on coupling, kg.cm.

(*a*) Equilibrium for force

$$P_a + P_c = P_b + P_d \quad \ldots(1)$$

$$\mu P_a + \mu P_c = \mu P_b + \mu P_d \quad (2)$$

(*b*) Equilibrium for moment

$$\mu P_a l_3/2 + \mu P_b l_3/2 = \mu P_c l_3/2 + \mu P_d l_3/2 \ldots \quad (3)$$

$$P_b L/2 + P_c L/2 = P_a l_2/2 + P_d l_2/2 \pm \mu(P_b + P_c)\, l_3/2 \pm \mu(P_a + P_d)\, l_3/2 \ldots . (4)$$

$$P_a l_3/2 + P_b l_3/2 = P_c l_3/2 + P_d l_3/2 \ldots \ldots (5)$$

(*c*) Transmitting torque: T

$$T = l_3(P_a + P_b)/2 \ldots \ldots (6)$$

From the above equations,

Extra radial force on coupling: Fr

$$Fr = P_a - P_b = \frac{4}{l_3}\left(\frac{l_1 \pm \mu l_3}{L + l_2}\right) T \ldots . (7)$$

Extra axial force (thrust) on coupling: Th

$$Th = \mu(P_a - P_b) = \frac{4}{l_3}\,\mu\left(\frac{l_1 \pm \mu l_3}{L + l_2}\right) T \ldots (8)$$

Extra bending moment: Mc

$$Mc^2 = \left\{\frac{l_1}{2}(P_a + P_b) + \frac{l_3}{2}\,\mu(P_a + P_b)\right\}^2 + \left\{\frac{l_3}{2}\,\mu(P_a + P_b)\right\}^2$$

$$Mc = \frac{T}{l_3}\sqrt{(l_1 + \mu l_3)^2 + (\mu l_3)^2} \quad \ldots\ldots\ldots\ldots (9)$$

These three kinds of extra force, i.e., radial force Fr.

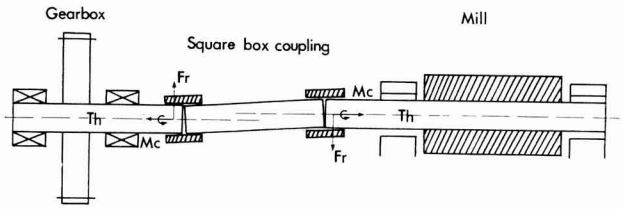


Fig. 3. Torque transmitting conditions. *Fr*—extra radial force; *Th*—extra axial force; *Mc*—extra bending moment.

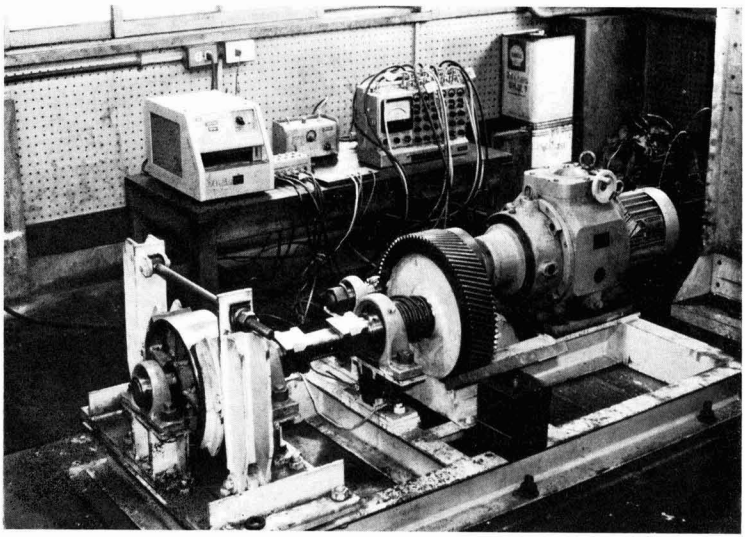


Fig. 4. Experimental equipment

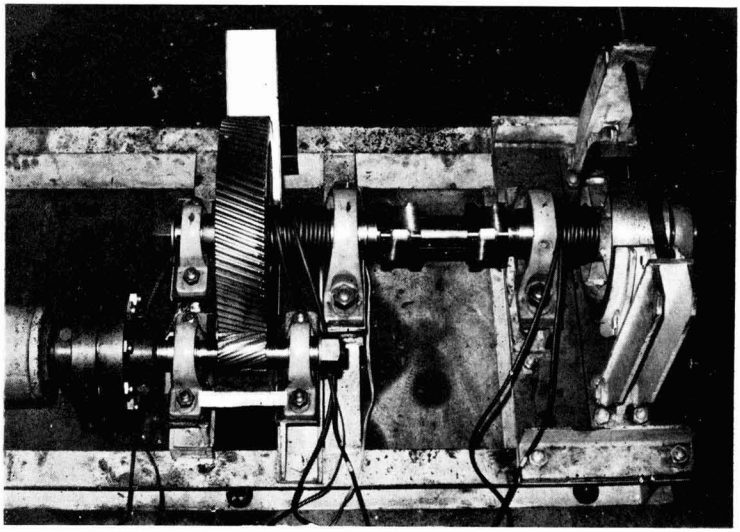


Fig. 5. Experimental equipment

axial force (thrust) *Th* and bending moment *Mc*, are exerted on both the master gear shaft of the gear box and the mill top roller shaft.

Next, the direction of the extra forces should be made clear. The contacting points of the coupling box and square shaft are likely to move only at the upper and lower positions as shown in Fig. 2. When the difference between the drive and driven shaft centres is large, this tendency becomes obvious.

From Fig. 2 it is seen that the lower shaft will be subjected to an upward force and the upper shaft to a downward force. On the other hand the horizontal component is seen to have no clear tendency because there is usually little difference in horizontal direction between the two shafts. Thus the direction of the resultant, i.e. the direction of the extra radial force, is almost vertical, being affected only to a small degree by the above horizontal component. The extra bending moment is the resultant of the consequent vertical and horizontal bending moment.

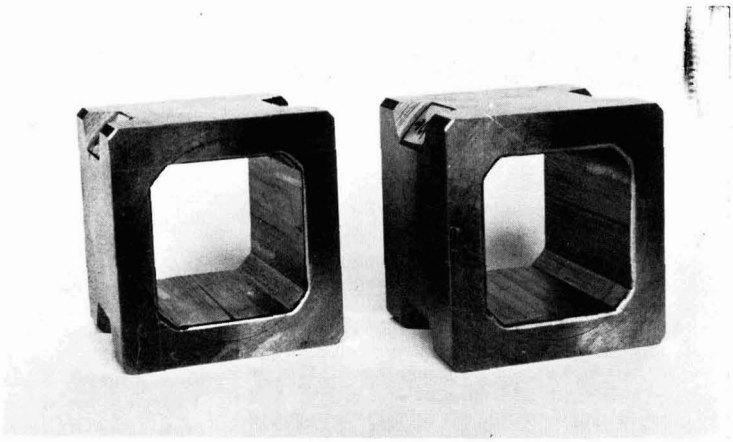


Fig. 6. Coupling box

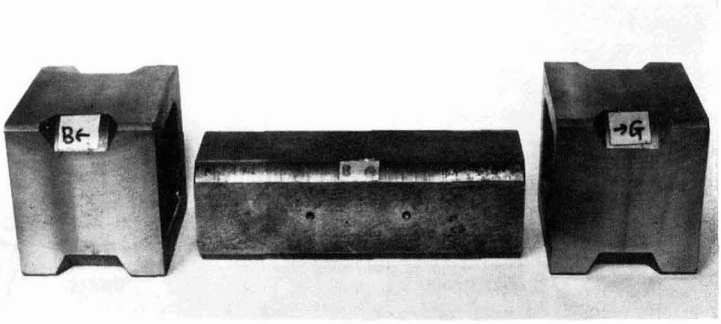


Fig. 7. Square shaft and coupling box

The direction of the extra vertical bending moment is determined by the direction of slip at the contacting points, but it changes irregularly because the direction of slip changes without fixed periodicity. It is presumed in the theoretical investigation that the direction of the extra horizontal bending moment generated at the square box coupling varies in accordance with the relative vertical positions of the drive and driven shafts, as may be supposed from Fig. 3. In this diagram the cross-section of the square box coupling and the direction of the extra forces are shown, and how the extra forces affect the gear box and mill is clearly demonstrated.

Experimental Method and Equipment

Figs. 4, 5 show the experimental equipment with torque and extra force measuring device. A tenth-scale model of a real coupling was used in the experiment.

The experimental equipment was driven by an electric motor through a stepless speed variator and gear reducer. A cast iron drum brake was used to exert the necessary torque to the coupling. Variation of the alignment of the shaft centres was obtained by liners put between the base frame and bearing box. The strain gauges were positioned on the shafts and base frame to measure the torque and extra forces.

The square shaft and box couplings are shown in Figs. 6, 7. The shaft is made of mild steel, and box couplings are made of various materials such as cast iron, mild steel and copper alloy to investigate the effect of material. Also to check the effect of different torque transmitting methods, various shapes of couplings were prepared.

The equipment was calibrated by applying the dead load. It was a major problem to exert a constant torque on the coupling, which was finally almost solved by turning the adjusting screw of the drum brake while observing the output of the torque-measuring strain gauge on the electro-magnetic oscillograph.

It would also have been desirable to trace the movement of the contacting points of the coupling box and square shaft, but since this could be roughly presumed by geometrical analysis, it was not carried out. Results were recorded on the electro-magnetic oscillograph, and experiments repeated many times under various conditions, changing the rotational speed, transmitting torque, lubricating conditions, difference between centres of the two shafts, etc.

(*To be continued*)

Experiences with cane diffusion in Queensland

By D. H. FOSTER* and D. S. SHANN†

Paper presented to the 14th Congress I.S.S.C.T., 1971

PART II

Changes in Factory Operating Technique

The introduction of a diffuser to a raw sugar factory, apart from the operating technique applying to the diffuser itself which has to be learned or developed by operating personnel, also results in changes in technique in general factory operation. Depending on the size of the diffuser, quite considerable delays occur at start-up between the establishment of fairly high steam demands and the provision of fresh fuel from the extraction process. At shut-down, there are corresponding delays between unloading of steam demand from preparation and initial milling equipment and the final passing to process of all juices. This would represent no great problem to factories which have adequate bagasse storage and reclaiming equipment as exists in most major factories in Queensland, but could cause a requirement for expensive substitute fuels on occasion in factories not so well equipped. Again, because of extended residence time of both bagasse and juice, heat losses could assume significance in areas where extended periods of cold weather are encountered. It has been apparent at Fairymead during the winter months that there is an appreciable steam demand due to this factor. Hence, lagging of diffuser walls is desirable. Again, at start-up, provision for direct steam injection to the diffuser tanks is insufficient to heat to normal operating temperatures the water with which the tanks are normally filled at this time.

It is most desirable that sufficient fluid be supplied to the diffuser tanks at start-up so as to ensure that normal circulation is built-up as soon as possible and that sufficient draft becomes readily available to wet the bagasse leaving No. 1 mill. This has meant in the past that there could be a fairly high process demand a few hours after start-up, owing to a combination of cold and lower Brix juice going to process. During 1970 season a fairly simple technique was adopted which has smoothed these peaks effectively. It consists in passing water through the press juice heater prior to start-up and displacing press juice from the clarifier where it is stored at 180°F during weekend shutdown. Thus, exhaust steam is utilized, which at that time would be passed to the atmosphere through the back-pressure relief valves, while the demand at a later period is correspondingly lessened. In addition, there is maintained a more even juice Brix; this not only reduces the possibility of disability in the primary process clarifier due to density variations, but reduces peak evaporator steam demand. In all, it is estimated that a demand of some 12,000–15,000 lb of steam is shifted from a period when boiler steam demand is high to a point where an excess is available. The admixture of water to the low Brix press juice clarifier has not cause any clarification problems in this unit.

It is obvious that in the event of sudden shutdowns, some additional time must be allowed in a diffuser-equipped factory. In addition to the straight delay in emptying bagasse from the system, there is also a considerable quantity of liquid of varying concentration in the diffuser tanks which has to be accepted into process. However, operating experience at Fairymead has shown that this does not present any insurmountable difficulty.

Operation of the press juice clarifier

From the results of experiments carried out during the installation of press juice clarification equipment, it became apparent that the level of clarification efficiency necessary to ensure satisfactory percolation through the diffuser bed was considerably below the level normally associated with the clarification of raw primary juice entering process. A satisfactory level of clarification is being attained at Fairymead with a standard "Rapi-Dorr" clarifier of 48,000 Imperial gal capacity, which allows a residence time of press juice of 50–60 min at present rates. Press juice is limed to a pH of 7·5–8·0 and then heated to 180°F before clarification. Various determinations indicate an optical density in the vicinity of 1·5 units measured at 800 nm in a 1-cm cell.

Some measurement has been made of mud underflow quantities and these approximate to 2000 gal/hr. As described above, press juice muds are combined with those from the main process muds, and are handled in a conventional clarification station without difficulty. Comparison is made in Table VI of filter capacities at Fairymead with those of adjacent factories, and average mud loss figures over a 3-year period indicate slightly superior performance at Fairymead.

Boiling house operation

The possible effect of diffuser operation on boiling house performance has been a source of great debate throughout the sugar world for some years. Its effect at Fairymead was examined closely by Jensen[3] in 1968, and after analysis of factory performance covering a period of 30 years he concluded that the available evidence did not appear to substantiate the claim that recovery is disproportionately affected by high extraction resulting from the diffusion process. While admitting that Fairymead's molasses loss is high by Queensland standards, Jensen pointed out that this is in accordance with the abnormally low

[3] *Proc. 35th Conf. Queensland Soc. Sugar Cane Tech.*, 1968, 229–234.

Table VI. Comparison of Fairymead performance with nearby milling plants

Parameter	*Year*	*Fairymead*	*Other local factories*
Rate			
Tons cane/hr	1968	232	176
	1969	226	166
	1970	249	177
Tons fibre/hr	1968	32·75	24·76
	1969	33·46	24·09
	1970	35·45	24·15
Reduced extraction	1968	97·65	96·16
	1969	97·81	95·95
	1970*	96·99	95·90
Pan capacity	1970		
High grade (gal/ton cane/hr)		189	182
Low grade (gal/ton cane/hr)		81	85
Filter capacity (ft^2/ton cane/hr)	1970	5·2	5·3
Recovery pol	1968	89·84	89·16
	1969	88·52	87·42
	1970	89·69	87·73
	Ave.	89·35	88·10
Losses			
Bagasse	1968	2·71	4·36
	1969	2·70	4·73
	1970*	3·52	4·42
	Ave.	2·98	4·50
Molasses	1968	7·04	6·25
	1969	7·69	7·01
	1970	7·31	7·08
	Ave.	7·35	6·78
Mud	1968	0·57	0·64
	1969	0·71	0·76
	1970	0·58	0·71
	Ave.	0·62	0·70
Molasses apparent purity	1968	40·7	39·3
	1969	44·1	41·9
	1970	38·6	39·6
Reducing sugar:ash ratio	1968	0·65	0·87
	1969	0·48	0·63
	1970	1·00	1·00

* No. 2 mill out of action for almost half season in 1970, leaving only 1 mill before diffuser.

reducing sugar:ash ratio and low reducing sugar content, which has always been a feature of this area, and which has caused a history of consistently high molasses losses.

Laboratory investigation at Sugar Research Institute has show that high alkalinity in press juice results in increased extraction of hemicellulose from fibre (see Fig. 3) but does not effect rate of crystallization at high purity. However, viscosity of final molasses would increase, depending on the extent to which these polysaccharides are removed during clarification. High alkalinity of press juice may also destroy reducing sugars and increase ash although there is no clear evidence of this occurring at Fairymead. However, where press juice pH is effectively controlled to a level of about pH 8·0, there is no cause for concern. Data from the last three grinding seasons are given in Table VI to compare Fairymead boiling house capacity and performance with those of the other mills in the same locality which treat similar canes. It will be noted that, in so far as pan stage

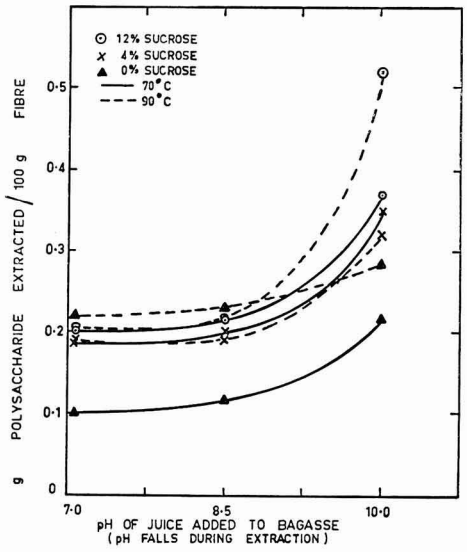


Fig. 3. Polysaccharide extracted from partially crushed cane

capacity is concerned, Fairymead has no advantage over the other factories concerned.

It will be noted further that, in terms of extraction performance, Fairymead over the 3-year period showed a gain of 1·5 units, while in terms of recovery the gain was 1·2 units over the average of the other mills. From this we conclude that there is now no evidence to suggest any special difficulty in operation or recovery resulting from the diffuser operation.

Assessment of diffuser performance

In diffusion as in milling there is the objective of replacing cane juice by water whether it be by displacement as proposed by PAYNE[4] or true diffusion as favoured by BRÜNICHE-OLSEN[5]. The main point of difference from milling lies in the fact that the cane or bagasse in the diffuser carries along with it juice equal to about 6 times the fibre weight ($6 \times F$) while another juice quantity of $6 \times F$ is percolating through it. In the milling train the juice content of the fibre alternates between $3 \times F$ and about $1 \times F$ as it goes through cycles of maceration application and crushing.

PAYNE[4] stated that in diffusion there should be a minimum of expelling juice by crushing, a minimum of mixing by maceration juices and a minimum of diffusion into the extracting liquid. He considered that it is desirable to obtain direct displacement of sugar juices by the liquid advancing through the bed, that is, by a process in which the cane fibre behaves very much as though it were sand. However, it seems that, although juice storage cells will be fractured in preparation, they will not be disintegrated, and so

[4] *Proc. 11th Congr. I.S.S.C.T.*, 1962, 971–991.
[5] *I.S.J.*, 1967, **69**, 99–101, 131–134.

for good recovery of sugar we must rely on a degree of mixing and diffusion as well as displacement.

BRÜNICHE-OLSEN[5] on the other hand developed a theory in terms of true diffusion and pointed out that the diffusion rate in 1–2 mm thick cane slices is half to one-fifth of that for equivalent beet slices, depending on whether the sections are cut transversely or longitudinally. This reduction in rate is due to the hindrance to diffusion caused by thick cell wall material in cane. To apply diffusion theory to crushed cane he treated large bagasse particles as if they were much thinner.

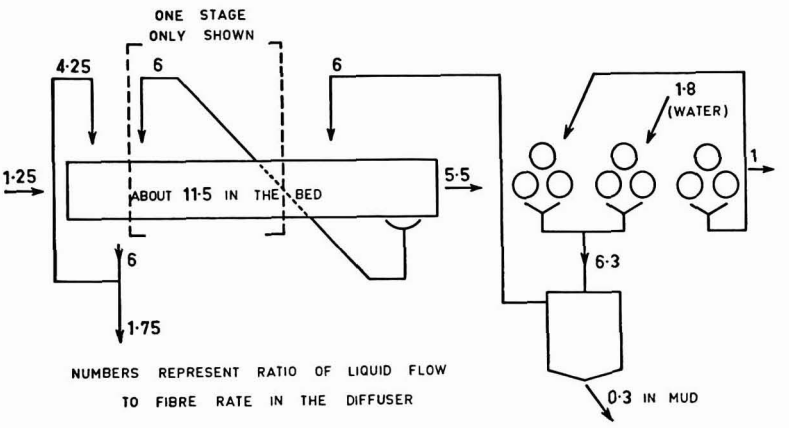


Fig. 5. Liquid balance in Fairymead diffuser

Neither of these theories is entirely satisfactory, so we prefer to regard the extraction process in terms of displacement, mixing and diffusion and to use an empirical approach to describe experimental investigation of the effects on extraction of preparation, time of diffusion and temperature.

One method of assessing the performance of the Fairymead diffuser which we have used is based on the supposition that the bed is equivalent to a number of cells in which there is complete mixing of the applied juice and the juice in the bagasse. In the cell shown in Fig. 4, B parts of liquid enter and leave the cell in the bagasse while A parts of liquid are applied and drained from the cell. If there is complete mixing,

$$\frac{A \times b_n + B \times c_n}{A + B} = c_{n+1} = b_{n-1} \text{ and}$$

$$\frac{A \times b_{n-1} + B \times c_{n-1}}{A + B} = c_n = b_{n-2}$$

From a series of such equations, the juice Brix pattern may be calculated for a hypothetical diffuser in which there are any number of stages each obtaining complete mixing followed by drainage of the free liquid.

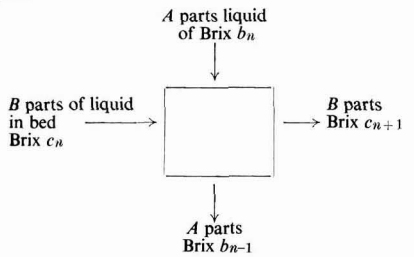


Fig. 4. Representation of mixing

The Fairymead diffuser has quantities of liquid entering and leaving the bed as shown in Fig. 5. For this situation in which 6 parts of irrigating liquid is applied to 5·5 parts of liquid in the drained bed, the Brix pattern shown in Fig. 6 would be obtained by complete mixing in 4 cells. The actual Brix pattern and quantity of liquid applied to the Fairymead diffuser (Table II) was averaged over a number of 30-minute test periods and is also shown in Fig. 6. It will be seen that the true Brix curve levels out more rapidly than the theoretical curve, and this represents the transition from the early stage, when most of the sugar is accessible, to the later stages, when more of the sugar is in closed cells and diffusion becomes more important.

The total quantity of liquid applied to the diffuser bed (apart from that recirculated into the bagasse feed) was about 240,000 gal/hr or about 32 times the weight of fibre in the bagasse fed to the diffuser. This is equal to a little over 5 applications of a quantity $6 \times F$ to the bed surface. In contrast, perfect mixing would have given the same result after 4 stages. This is a useful indication of the efficiency of the Fairymead diffuser operating with its particular type of fine preparation.

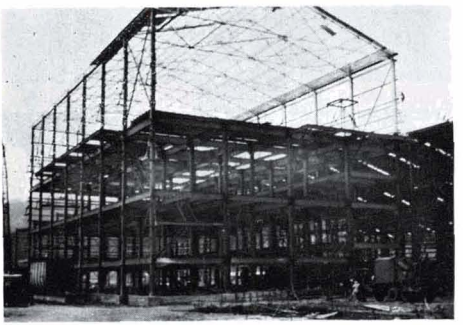
The authors feel that the stage has been reached where it can be said that a successful marriage between theory and practice has been achieved in the field of diffusion. While the Fairymead installation in current world rating is of medium physical size, in terms of residence time it is quite small. For example, diffusers in South Africa allow residence times of 45–50 min at fibre rates of between 7 and 35 tons/hr at the different factories. Fairymead has operated at 33–37 tons of fibre/hr, with residence times of 25–30 min.

In the Fairymead situation the diffuser is incorporated with 5 mills, and this combination ensures a high extraction so that a larger diffuser would be unwarranted. Results achieved to date have more than justified the extensive developmental efforts

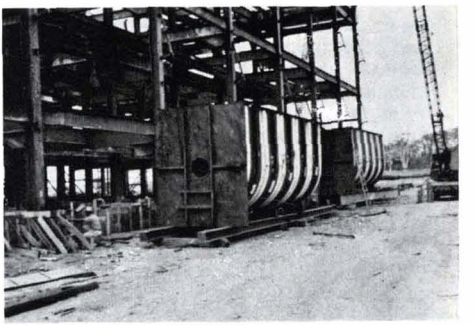
SMITH — Mirrlees'

YARACUY – VENEZUELA

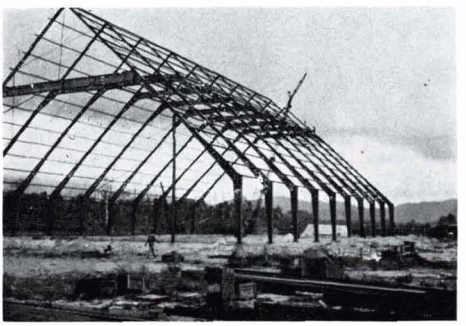
OUR LATEST TURNKEY PROJECT
ORDERED AUGUST 1971
TO PROCESS 4,000 TONS CANE PER DAY
SITE ERECTION NOW IN PROGRESS



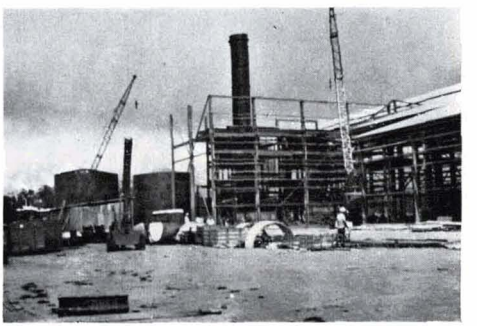
PROCESS HOUSE



CRYSTALLIZERS



RAW SUGAR STORE



BOILER HOUSE

A. & W. SMITH & CO. LTD.

Cable Address: SUGRENGINE, BROMLEY, KENT

THE MIRRLEES WATSON CO. LTD.

Cable Address: MIRWAT, BROMLEY, KENT

SUGAR FACTORY AND REFINERY ENGINEERS

No.1 COSMOS HOUSE, BROMLEY COMMON, BROMLEY
BR 2 9NA, GREAT BRITAIN

Telex No: 2-2404

Works: COOK STREET, GLASGOW, C.5.

COMPANIES IN THE TATE & LYLE GROUP

1966

1969

made over the operating period and generate confidence that further milling-diffusion installations will be seen in Queensland. There is no reason to doubt that continued careful study and experimentation, both in the operation of diffusers and ancillary equipment, will result in further improvements in both stability and efficiency.

Summary

The development of the Fairymead milling-diffusion system is described as also are methods of operation and procedures employed to obtain the best possible integration of the diffuser with the rest of the factory. Reference is made to extraction results and the diffuser, which has a residence time for bagasse of 25–30 min, is equated to 1·5 crushing mills. Very fine bagasse is fed to the diffuser, and special flow control and recording equipment have been used to maintain the bed in a just flooded condition. Flow rates of 5–6 Imperial gal/ft²/min are normal and are maintained at a maximum by a definite policy of keeping the bed as close as possible to a flooded rather than a percolating condition. Press juice clarification is carried out at pH 7·5–8, and underflow muds are added to primary muds for filtration. Factory performance figures show no cause for concern as to losses in muds or in molasses. Reference is made to the effect of sucrose concentration, pH, time and temperature on extraction of hemicellulose from fibre cell walls and to a method which has been found useful for assessing diffuser performance.

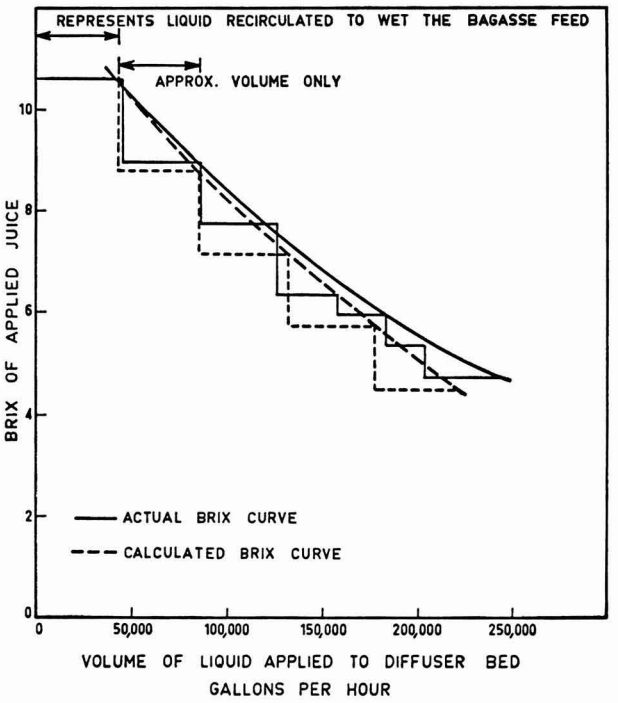


Fig. 6. Theoretical and actual Brix curves

Entrainment prevention in sugar mill evaporation plant

By R. FREW

(The Colonial Sugar Refining Co. Ltd., Australia)

Paper presented to the 14th Congress, I.S.S.C.T., 1971

Introduction

THE prevention of loss of sugar by entrainment in vapours from multiple effect evaporators, and from vacuum pans, is important from two aspects.

First, loss of sugar to drain means a direct loss of revenue to the miller, and second, loss of sugar to waste waters increases the potential pollution problem with mill effluents.

In common with many other parts of the world, strong action is being taken by Governmental authorities in Australia to ensure that pollution of the environment by factory wastes is brought within acceptable limits. This means that, in many instances, sugar mills in Australia have to arrange for treatment of liquid effluents before they are discharged from the factory premises.

Plant for effluent treatment is expensive, so that if the cost of effluent treatment is to be minimized, loss of sugar to mill waste waters should be reduced as far as practicable.

The problem of entrainment prevention in multiple effect evaporators has been accentuated over latter years with the installation of higher capacity plant. This problem has been most severe in the final vessels of quadruple and quintuple evaporator sets.

Some years ago we found that where tubes in final evaporator vessels reach 7½ ft in length, and where the diameter of the shell of the evaporator remained

the same as for the calandria, none of the known forms of arrestor was capable of preventing substantial loss of sugar by entrainment during periods of high rate operation.

Efforts were made to devise a more effective arrestor whose efficiency would not deteriorate with time, (this of course does not include disappearance of the arrestor by corrosion), and where maintenance would closely approach zero.

This led to a new type of arrestor which is the subject of this paper.

The new type arrestor

The arrestor, in the form presently used by us, comprises basically two layers of corrugated plates assembled with an angle of about 110° between the layers. Fig. 1 shows a typical arrangement of a corrugated louvre arrestor in an evaporator vessel.

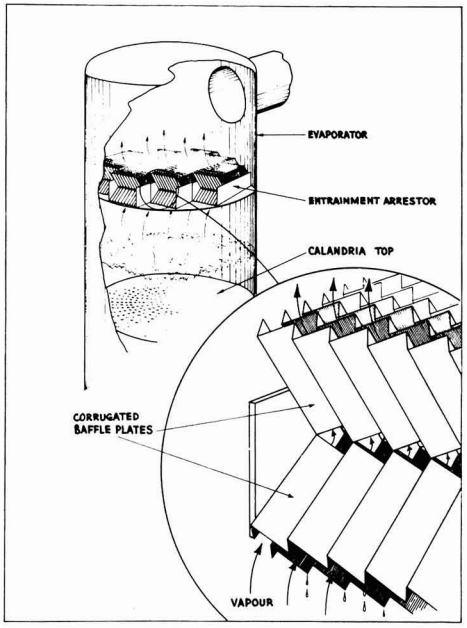


Fig. 1. Typical arrangements of corrugated louvre entrainment arrestor in final evaporator vessel. (Patent application for this invention has been filed in various countries.)

Entrained droplets of liquid in the vapour stream generally impinge on, and are retained on, the inclined surfaces of the corrugated plates. Collection of droplets is most effective on the upper plates, just after the point of change of direction of vapour travel at the intersection of the upper and lower layers of plates.

The corrugated shape of the plates assists in removal of droplets from the vapour stream in two ways. Firstly, droplets impinging on the inclined surfaces of of the plates are less likely to splash or splatter, than would be the case on plane surfaces. Consequently there is less probability of droplets, or parts of them, being re-entrained after impingement on the plates.

Secondly, droplets collected on the inclined surfaces of the baffles by impingement run down the sloping faces into the valleys of the corrugations and coalesce to form larger droplets.

The plates are arranged so that a valley in a plate in the upper layer contacts the apex of a corrugation of a plate in the lower layer. In this way liquid collected on the upper plates may pass to the lower plates without dropping through the stream of rising vapour.

Drops of liquid from the upper layer, and droplets caught by the lower layer, find their way into the valleys of the corrugations of the lower plates, and form even larger drops. These drops run down the valleys and eventually fall off into the stream of rising vapour.

The limitation to the use of this type of arrestor is when the velocity of the vapour approaching the lower face of the arrestor is such that drops falling from the lower layer of baffles are re-entrained.

The ability of the corrugated plates to concentrate the small droplets collected into much larger drops permits the arrestor to be used efficiently at high vapour approach velocities. These approach velocities are substantially higher than could be accepted if collected droplets were not concentrated before dropping off the lower plates into the rising vapour stream.

A further advantage of this type of arrestor is that there is little restriction of the vapour flow path, and the pressure drop over the plate assembly is small, even at very high rates. Tests run on installations in our factories showed that the pressure drop does not exceed 1 inch W.G. even at the highest permissible vapour velocities.

The small resistance of the arrestor to vapour flow enables the maximum vacuum to be maintained in the body of the evaporator below the arrestor, and so permits maximum evaporation rates to be attained.

Some applications and performances of the arrestor

The most important application of the arrestor in our sugar mills is the final vessels of high rate quadruple and quintuple evaporator sets.

With the arrangement of the arrestor as shown in Fig. 1 for a final evaporator vessel a height of about 12 ft is desirable from the top sheet of the calandria to the lower face of the arrestor. This separation distance is to eliminate, as far as practicable, surges of liquid rising from the boiling surface striking the baffles.

The baffles are not intended to, and will not effectively handle, gross amounts of liquid flung against them.

We have found on occasions that a violent local upsurge of liquid may occur from the boiling surface, over or near a feed inlet, owing to flashing of feed. In these cases we have either fitted larger distributing caps over feed inlets, or provided local horizontal

baffles above the boiling surface to contain local upsurges of liquid.

Fig. 2 shows the performance of the arrestor based on trials on our evaporator installations. As would be expected, entrainment increases rapidly near the limiting value of coefficient K.

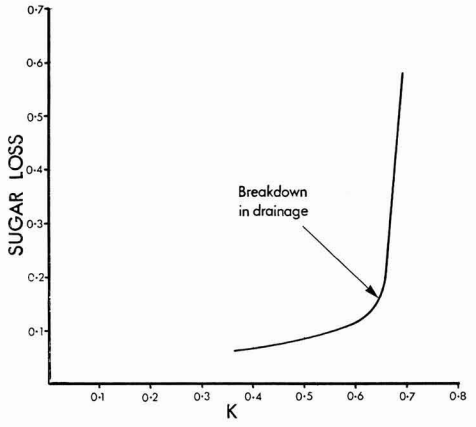


Fig. 2. Performance of corrugated louvre entrainment arrestor (based on trials on C.S.R. Co. Ltd. evaporator installations.) Sugar loss is expressed in lb/hr/sq.ft. arrestor area, where arrestor area is the horizontal projection of the opening through the arrestor. Coefficient K = lb vapour/sec/sq.ft. arrestor area $\div \sqrt{(\text{density of liquid}) \times (\text{density of vapour})}$ (lb/cu.ft.).

Coefficient K increases as vapour throughput weight increases and as density of vapour decreases. Thus the most difficult duty to handle is high vapour rate at a high vessel-operating vacuum.

At values of K not exceeding 0·55, losses of sugar by entrainment will be low. This value of K is somewhat less than the limiting value suggested in Fig. 2 to allow for some fouling of corrugated plate surfaces.

Where evaporator vessels are of the order of 12 ft diameter the horizontal projected area of the arrestor is approximately 75% of the gross cross-sectional area of the vessel. As vessel diameter increases over 12 ft the maximum obtainable arrestor area, as a percentage of vessel cross-sectional area, increases.

Fig. 3 shows how the arrestor may be used in a vacuum pan. The duty in a vacuum pan is far easier than in a final evaporator vessel. Sugar losses by entrainment from vacuum pans fitted with this type of arrestor are too low to be detected in the torricellian water.

Acknowledgment

The author gratefully acknowledges the permission of the Colonial Sugar Refining Co. Ltd. to publish this paper which reports results of work conducted in the Company's premises over recent years.

Summary

A new type of high-capacity entrainment arrestor is presented suitable for general use in the separation of liquid droplets from gas streams and in particular for use in evaporation plant in sugar factories.

In the latter application the arrestor consists of two layers of louvres inclined at about 110° to each other installed across the body of a vessel. The louvres have sharp pointed corrugations running parallel to the flow of vapour.

Droplets of liquid are collected by impinging on the inclined surfaces of the corrugations, the most effective area of collection being just after the change of direction of vapour flow at the junction of the two layers of plates.

The corrugated shape of the plates minimizes re-entrainment due to splash or splatter of droplets on impingement and also concentrates the collected droplets into larger drops.

The upper and lower layers of plates are in contact so that liquid collected by the top plates may run to the bottom plates without dropping through the vapour stream.

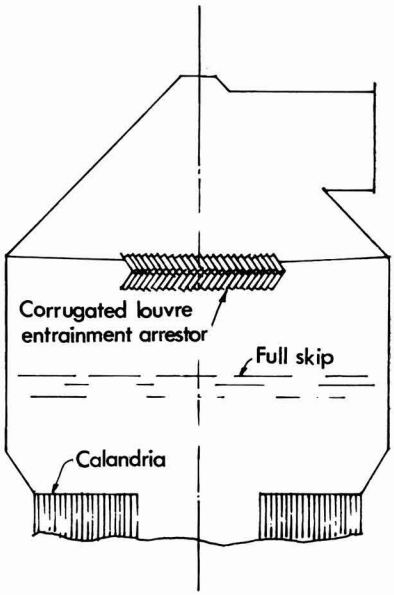


Fig. 3. Typical arrangement of corrugated louvre entrainment arrestor in a vacuum pan.

The size of the concentrated drops permits them to fall off the lower edges of the bottom plates into the rising stream of vapour without re-entrainment even at high vapour approach velocities.

A performance curve is given and a limiting vapour throughput rate suggested that would result in less than 2–3 ppm sucrose in torricellian water.

The pressure drop across an arrestor would not exceed 1 inch W.G. at the highest permissible vapour velocities.

Sugar cane agriculture

Analysis of the productivity of sugar cane. III. Respiration in the shade of leaves and stalks of five varieties of sugar cane and nocturnal losses of dry matter. E. MEDINA, J. J. SAN JOSE, and P. E. SEQUERA. *Azúcar y Productividad* (Venezuela), 1971, (1), 26–30.—The daily respiration rates of leaves and stalks of the five varieties were not significantly different. Two varieties had higher night respiration rates, which suggests that increased yield might be expected from them when cultivated in areas with a wide daily temperature range. The respiration rate of both stem and leaves decreased markedly with the ageing of the crop. The node zone had a respiration rate 2–3 times higher than that of the internodes.

* * *

Some varietal characteristics of the more important commercial varieties. D. T. LOUPE. *Sugar Bull.*, 1971, **49,** 316.—Field characteristics, advantages and disadvantages, of 5 commercial varieties of sugar cane in the United States are given, the varieties being L 62-96, CP 61-37, L 60-25, CP 48-103 and CP 52-68.

* * *

Sugar cane variety recommendations for Louisiana for 1971. ANON. *Sugar Bull.*, 1971, **49,** 317–318.—The varieties recommended for 1971 were L 62-96, CP 61-37, L 60-25, CP 48-103 and CP 52-68. Details of these varieties and their field performances are given.

* * *

Controlling Johnson grass seedlings and annual weeds in sugar cane planted in Louisiana in summer and fall, 1971. E. R. STAMPER and R. MILLHOLLON. *Sugar Bull.*, 1971, **49,** 318–319.—The good results obtained from the use of certain modern herbicides, notably "Fenac" and "Terbasil" ("Sinbar") are described. Recommendations are made under three headings: (A) Control of Johnson grass seedlings and annual weeds in planted cane (including a "Fenac" and a "Terbacil" programme), (B) Control of Johnson grass seedlings and annual weeds in cane cut for seed and early harvested cane and (C) General cultural practices.

* * *

Recommendations for the control of ratoon stunting disease in sugar cane in Louisiana, 1971. ANON. *Sugar Bull.*, 1971, **49,** 320–321.—In the hot air treatment of planting material the importance of making sure that the ovens are functioning properly is stressed. The various points that need attention are outlined. Unsuitable baffle adjustment or loading may cause hot and cold spots. Cutting edges and sticker chains of harvesters should be thoroughly cleaned and disinfected before cutting seed plots for heat treatment, or seed plots should be harvested first before harvesting other fields during the day. Harvesters and loaders should be disinfected when moving from variety to variety and from seed plot to seed plot.

* * *

Noble cane performance. ANON. *W. Indies Central Sugar Cane Breeding Sta. and Barbados Sugar Cane Variety Testing Sta., Joint Ann. Rpts.*, 1967–68, 9–10. Progress in the selection plots of polycross progeny at both Barbados and Trinidad nurseries are described, where Brix, softness scores and ratooning were again taken into account. In all some 246 selections from Barbados and 370 selections from Trinidad were established in the field at Groves as single stools in 3 replications. Leaf scald appeared to some extent and roguing was needed.

* * *

Spontaneum and nobilization programme. ANON. *W. Indies Central Sugar Cane Breeding Sta. and Barbados Sugar Cane Variety Testing Sta., Joint Ann. Rpts.*, 1967–68, 11–12.—A table summarizes the successful crosses made. Families from 19 new *Saccharum spontaneum* clones have now been established.

* * *

Commercial programme. ANON. *W. Indies Central Sugar Cane Breeding Sta. and Barbados Sugar Cane Variety Testing Sta., Joint Ann. Rpts.*, 1967–68, 13–19. In the crossing season marcots were again used with some success. The solution formula remained the same as previously used but on about half the crosses an oil covering, as used by WAUD in Romana, was used (100 ml per bucket). These solutions remained remarkably clean (SO_2 content in a few tests seemed to remain at about 40 ppm), and needed no changing for the duration of crossing (about 12 days). Confidence was gained with the method, particularly for the saving of water and labour. Selection of B 69, B 70 and other groups of seedlings are described.

* * *

Variety testing. ANON. *W. Indies Central Sugar Cane Breeding Sta. and Barbados Sugar Cane Variety Testing Sta., Joint Ann. Rpts.*, 1967–68, 20–23.—Results of third-year trials on B 64-series plant canes are embodied in a table. This series produced only one outstanding variety, B 64305, which outyielded most of the other varieties and standards by up to 10 tons/

acre. Its juice quality was regrettably only average and was worse in the low rainfall area. In its early stages of growth, the leaves of B 64305 are erect, spikey and always curled. The cane is thick, moderately trashy and perhaps too open in habit for mechanical harvesting, though it does not lodge badly.

* * *

Analysis of parent performance. D. I. T. WALKER. *W. Indies Central Sugar Cane Breeding Sta. and Barbados Sugar Cane Variety Testing Sta., Joint Ann. Rpts.*, 1967–68, 24–27.—An empirical summary is presented in tabular form which shows the number of times crosses with individual parent varieties were compared with annual averages, and the total number of years each variety was used. A statistical analysis of families for general combining ability over the years was made using the method of GILBERT[1] and coefficients derived for both male and female parents which are thus graduated from best to worst.

* * *

Mutation experiments. D. I. T. WALKER. *W. Indies Central Sugar Cane Breeding Sta. and Barbados Sugar Cane Variety Testing Sta., Joint Ann Rpts.*, 1967–68, 28–35.—Germination of setts irradiated with gamma-rays was very erratic, although root germination was much less affected than bud germination. Survivors from the treatment were grown for three seasons and the characteristics and behaviour of these are described with emphasis on B 52107 and B 49119 varieties.

* * *

Stomatal length related to chromosome number. P. S. RAO. *W. Indies Central Sugar Cane Breeding Sta. and Barbados Sugar Cane Variety Testing Sta., Joint Ann. Rpts.*, 1967–68, 36–38.—In the chromosome doubling induced by colchicine, a major handicap had been the size of population to screen for doubling. A technique for rapid preliminary screening for likely doubled plants is much needed. The length of stomata in relation to chromosome number has been checked for its possible use in screening. Measuring stomatal length takes only 15 minutes for a plant while a chromosome count takes several hours. A wide number of clones were studied but in general "no positive correlation between chromosome number and stomatal length can be assumed." Families with the same chromosome number may differ in stomatal length.

* * *

Control of flowering. D. MACCOLL. *W. Indies Central Sugar Cane Breeding Sta. and Barbados Sugar Cane Variety Testing Sta., Joint Ann. Rpts.*, 1967–68, 39–47. Steps required in control of photoperiod so as to govern the flowering of cane varieties (and so permit crossing) are described; they included determining the approximate time of floral induction in clones with known different flowering times and finding the effect of selective leaf removal on the flowering date and intensity. The varieties studied were then subjected to various treatments for control of photoperiod and induction of flowering and could be classified into appropriate groups for this purpose.

* * *

Some changes in components of leaf area and growth during the ripening period in several sugar cane varieties. A. VREUGDENHIL. *W. Indies Central Sugar Cane Breeding Station and Barbados Sugar Cane Variety Testing Station, Joint Ann. Rpts.*, 1967–68, 48–56. Ripening in sugar cane is a complex process which is evidently hastened by age, drought and cooler temperatures. Part of the rise in storage of sugar is due to increased diversion of photosynthate from the active growing points as growth slows down. Leaf area was found to be uncorrelated with cane yield, and varieties differed considerably in leafiness relative to yield. The moisture content of leaf sheaths and internodes 8–10 are very sensitive indicators of cane moisture status, however.

* * *

Water resources investigation of Del Carmen Mill district. M. P. SANDOVAL and F. B. MAMARIL. *Sugar News* (Philippines), 1971, **47**, 305–310, 323–325.—The district in question is low-yielding in sugar cane. This is considered to be due to inadequate soil moisture and the absence of irrigation. The geological formation and water resources of the area are discussed. Available surface water is largely used for rice but ground water could be used for cane irrigation.

* * *

Sugar industry in Bihar—poor cane cultivation. P. L. DHANUKA. *Indian Sugar*, 1971, **21**, 133–134.—The depressed condition of the sugar industry in Bihar, with many mills closing, is described. The reasons for this state of affairs are discussed. It is thought that uneconomical land holdings are largely to blame, plus lack of improved varieties, inadequate facilities for irrigation and fertilizers. The setting up of seed nurseries in different parts of the State in order to propagate new, improved varieties rapidly is advocated.

* * *

Research needs of sugar cane development. P. S. GILL. *Indian Sugar*, 1971, **21**, 199–200.—In order to raise sugar cane output from the same area, research is needed on determining the extent of adoption of agronomic practice recommendations by farmers, development of new varieties, multiplication of seed cane, intercropping, ratooning, artificial ripening of cane and pest control.

* * *

Innovations in companion cropping with sugar cane. K. SINGH. *Indian Sugar*, 1971, **21**, 203–207.—Good results have been obtained at the Indian Institute of Sugar Cane Research, Lucknow, on the intercropping of wheat, berseem and sugar beet, especially with autumn-planted cane. Other crops are also under study. The extra cash return to the farmer persuades

[1] *Biometrics*, 1967, **23**, 45.

farmers to plant cane on better land and not to use irrigation water supplies only on other crops. By adoption of two cane rows 30 cm apart and separated from another double row by 180 cm, the land yields as much cane as with single rows 80–90 cm apart but the inter-row area is more convenient for cultivation. Suitable implements have been devised, and it is concluded that the practice will be of great benefit.

* * *

The uptake of nutrients by (the) cane crop. K. KAR and P. D. BAJPAI. *Indian Sugar*, 1971, **21**, 209–217. The interactions of variety × time of planting were observed, for five consecutive years under field conditions, on the absorption of N, P, K and Ca, and the results tabulated and discussed. Nitrogen recovery was influenced by the date of planting but more so by total cane yield—a varietal characteristic. No such relationships were observed for P and Ca, but K recoveries tended toward the maximum,showing luxury consumption; there was, however, an inverse relationship between age of cane and K recovery.

* * *

Can sugar cane borers in India be controlled by indigenous parasites ? V. P. RAO and S. NAGARKATTI. *Indian Sugar*, 1971, **21**, 219–223.—Although natural parasite species exist, they do not multiply fast enough or to adequate levels to control the various borer pests of sugar cane in India. Consequently parasitism is too low to be significant. Reasons for this are set out and discussed. It is thought that introduction of parasites from other countries might have more success, as have Indian parasites when used for control of pests elsewhere. Such potential imports are listed.

* * *

Occurrence of the tachinid fly, *Sturmiopsis inferens* **Tns. as a natural enemy of the sugar cane shoot borer,** *Chilo infuscatellus* **Snell., in (the) Rayagada area of Orissa State.** A. N. KALRA and C. P. DUTTA. *Indian Sugar*, 1971, **21**, 225–226.—Parasitization of the shoot borer was observed in nature and may be the reason for the low incidence of shoot borer infestation in the Rayagada area. The fly was readily reared and it is proposed to test its efficacy against shoot borers and pink borers in other parts of India.

* * *

Chlorosis in sugar cane. K. V. SRINIVASAN. *Indian Sugar*, 1971, **21**, 229–238.—Causes of chlorosis in cane are briefly surveyed. Two types have been observed recently in South India; one is the result of a parasite, and could be cured by hot water treatment of setts (50°C for 2 hr), while the other is a biologically-induced iron deficiency. The latter is partly controlled by ferrous sulphate treatment or soil sterilization with "Ceresan" and "Nemagon", fumigation with DD, application of ethylene dibromide, steam or certain bactericides, and incorporation of the powdered inflorescences of *Orobanche cernua* (a tobacco parasite). *Saccharum spontaneum* is resistant to the disease, *S. officinarum* susceptible and hybrids vary in their reaction.

* * *

Whether cane yield or sugar recovery. C. N. BABU. *Indian Sugar*, 1971, **21**, 227–228.—Cane varieties tend to have either high yield per acre and low sugar content or *vice versa*. Breeding must attempt to produce cane of high yield and high sucrose content and techniques used to this end are discussed. It is pointed out that it is more economical to crush a smaller tonnage of richer cane than a larger tonnage of cane of lower sucrose content if the total sugar output is the same.

* * *

R)le of basal manures in sugar cane cultivation. P. M. GOVITRIKAR. *Sugar News* (India), 1971, **3**, (2), 11–13.—Conditions for the cultivation and manuring of cane in the Deccan are discussed in regard to N, P and K. With the shortage of farmyard manure it is urged that greater use might be made of cane trash, there being an urgent need to study and develop proper means of incorporating it into the soil. At present most trash is burned. Other nitrogen-containing organic manures, such as oil press-cake, are discussed. With the increase in the number of distillers more distillery wastes are becoming available.

* * *

Nitrogen fertilization for quality cane production. R. A. KALE. *Sugar News* (India), 1971, **3**, (2), 14–16. The importance of balanced nutrition of the cane crop is emphasized and it is pointed out that excessive N fertilization can lead to high fibre and low sugar content, heavy crowns and side sprouting which all reduce the quality of the cane for sugar extraction.

* * *

Aspects of sugar cane production. E. FRETAY. *Ind. Alim. Agric.*, 1971, **88**, 1041–1047.—An account is given of a successful sugar cane enterprise commenced in the Congo (in the valley of the Niari) in 1957. An abundance of good labour is given as one of the main reasons for success. The climatic and edaphic conditions of the area, in relation to the requirements of sugar cane, are described.

* * *

13th annual mechanization demonstration. ANON. *S. African Sugar J.*, 1971, **55**, 469–475.—An account is given of a field mechanization demonstration (at Powerscourt, Natal) organized by the Experiment Station. About 2000 people attended over the two days. A wide range of machinery for use with cane was on display, some of the machinery being illustrated with photographs.

* * *

Planters' sugar cane yields. ANON. *Mauritius Chamber of Agric., President's Rpt.*, 1970–1971, 16.—It is known that, in Mauritius, the average yield of cane obtained by independent planters is much lower than the average yield achieved by the large estates or miller growers. A table shows this disparity over the

last 8 years. From this it is apparent that the difference is in the neighbourhood of 10 tons of cane per arpent. If planters' yields could be increased to a level nearer to that of the sugar estates, the result would be an increase in the planter's income and in employment and foreign exchange earnings.

* * *

The Sugar Industry Research Institute (Mauritius). ANON. *Mauritius Chamber of Agric., President's Rpt.*, 1970–1971, 17–20.—Some of the main technical matters dealt with by the Sugar Industry Research Institute during the year 1970 are briefly reviewed. Two new varieties were released during the year: S.17 and M.351/57. These are discussed as is the performance of other new varieties. Cane diseases, weed control and food crop cultivation are other matters discussed.

* * *

Traffic lights for rail crossings. S. R. REICHARD and J. R. ALLEN. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 9 pp.—Details are given of an electronic train detection system developed at the Sugar Research Institute in Queensland to warn road traffic of the approach of cane trains by means of flashing lights. The scheme is intended to replace two systems in general use which have proved unsatisfactory. Advantages of the new system are discussed.

* * *

4-H Club activities in the Louisiana sugar cane industry. D. P. LANDRY. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 4 pp.—Four-H is the world's largest coeducational youth organization, involving more than 6·5 million young people in 6 countries. The purpose of the 4-H programme is aptly stated as "learn to do by doing". In this paper the motto and objectives of 4-H are discussed, together with the procedure followed in organizing a club, some of the accomplishments of 4-H and some of the projects. The sugar cane project, available to 4-H farm boys in Louisiana, provides an opportunity for these youths to learn about sugar cane production, marketing and record keeping. Awards are provided for those who complete their projects.

* * *

The rôle of leaves in production of flowering stimulus in sugar cane. T. L. CHU and J. L. SERAPIÓN. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 7 pp. This is an account of two foliar trimming experiments to study the rôle played by leaves in the flowering of sugar cane. Treatments included the removal of the leaf spindle and the removal of all leaves except the leaf spindle. It was found that the differentiation period includes a stage prior to photo-induction. The spindle leaf was found to have a predominant rôle in the production of the flowering stimulus in 3 cane varieties, including N:Co 310. Its essential contribution was not fulfilled until floral initiation was well under way, an observation true for all varieties used. Absence of the leaf spindle at any time during the differentiation period substantially reduced or completely stopped flowering. All leaves, other than the leaf spindle, played a less important rôle in producing the flowering stimulus. The leaf contribution was essentially complete about 1·2 weeks before floral initiation took place. Leaf removal during the early part of the differentiation period tended to increase the production of flowering stimulus.

* * *

Progress report on training of personnel in Mexico for the sugar industry. A. GONZÁLEZ G. and S. FLORES C. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 2 pp.—Details are given of the extensive training schemes for sugar cane technologists run by the Instituto para el Mejoramiento de la Producción de Azúcar in Mexico. Between 1958 and 1970 no less than 110 fellowships were awarded, mainly for study in the United States, especially the sugar cane areas. Most Mexican plantations now have one or more agronomists trained in this way.

* * *

Breeding sugar cane varieties for Louisiana with new germ plasm. P. H. DUNCKELMAN and R. D. BREAUX. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 7 pp.—An expanded programme is being conducted to assimilate new basic breeding material into acceptable commercial sugar cane varieties for Louisiana. Characteristics being sought are higher cane tonnage in more ratoon crops, erectness, resistance to the different strains of mosaic, resistance to sugar cane borer and cold tolerance. These characteristics have been recognized in clones of *Saccharum spontaneum*, *S. robustum* and related genera. A programme of back-crossing and selection has been introduced since 1965. A study of second backcross progeny of the more promising lines shows that valuable characteristics of the wild parents are being transmitted to clones that equal or approach commercial standards.

* * *

Description of sugar cane clones. I. Agricultural description. J. DANIELS. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 8 pp.—A system is presented for recording agricultural descriptions of sugar cane clones. Breeders are urged to deposit descriptions in a central file which has been established by the Germ Plasm Committee. Researchers will be able to locate clones readily for breeding for specific objectives e.g. disease and pest resistance, high sugar content, low fibre content, etc., if all breeders co-operate and deposit descriptions.

* * *

Description of sugar cane clones. II. Genetical and disease resistance information. P. B. HUTCHINSON and J. DANIELS. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 4 pp.—A system of recording disease resistance and genetical characteristics of sugar cane clones is described in this paper. The agricultural, disease and genetical descriptions sheets should enable breeders to record characteristics which are used in sugar cane selection and breeding. Complete

data sheets deposited with the Germ Plasm Committee will be available to all sugar cane research workers on request.

* * *

Description of sugar cane clones. III. Botanical description. J. C. SKINNER. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 4 pp.—This paper describes a system for recording botanical descriptions of sugar cane clones. It is recommended that model descriptions of common commercial varieties in an area be prepared and used for comparison when preparing descriptions of new varieties. The most constant characters available were chosen for botanical descriptions of new varieties, although in practice it is necessary to use some characters which show considerable environmental variation. Standardization of botanical descriptions in different countries would be most advantageous. A sample botanical description form is included, dealing with stool, leaf blade, hair groups, internode, node bud and main distinguishing characteristics.

* * *

The reduction of the intergeneration interval in the Fiji breeding programme. J. DANIELS and N. D. STEVENSON. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 11 pp.—The reduction of the intergeneration intervals in sugar cane will (*a*) accelerate progress in breeding and (*b*) result in superior clones becoming more rapidly available for commercial exploitation. The intergeneration interval in Fiji is at present a minimum of 8 years. In this paper Project DIGIT (Decrease the Inter-Generation Interval Time) is presented and described, being an approach to selection which will enable the intervals to the considerably reduced. A schedule for a DIGIT-style selection programme is presented. It utilizes a pot method of growing and ripening sugar cane and rapid screening tests for yield, biochemical and disease characters. The results of an initial selection experiment indicate that similar results may be achieved by DIGIT and traditional early stage field testing procedures.

* * *

Brittleness of sugar cane varieties in Louisiana. H. P. FANGUY. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 5 pp.—A stalk-breaking device was used to measure stalk brittleness of 32 sugar cane varieties in the field. Varieties differed significantly in brittleness. The experimental results agreed closely with breakage by storm damage or machine harvesting. The variety CP 52-68 was one of the least brittle varieties tested and shows little field breakage. The varieties CP 48-103 and L 60-25 were the most brittle tested and show extensive breakage in the field. There was a significant variety × date interaction, so varieties should be rated for brittleness during the peak growth period and again at harvest time. The use of stalk deflection as an indication of brittleness can help evaluate varieties for brittleness at early stages of a testing programme.

The mass stool population technique of sugar cane selection. J. DANIELS, D. R. HORSLEY, A. S. MASILACA, K. G. MILES, H. SINGH, N. D. STEVENSON and B. WILSON. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 7 pp.—The desirable attributes of sugar cane selection systems are discussed. They include the ability to produce commercially acceptable clones combined with speed, precision, feedback of clones of marginal performance, and assessment of genotype interaction effects between sites. A mass stool population (MSP) technique is described. It incorporates the above attributes, requires a minimal input of resources, and is suitable for testing 500–1000 clones simultaneously at several ecological sites. Results of 3 cycles of MSP selection at each of 4 sites are presented and show that the technique is effective.

* * *

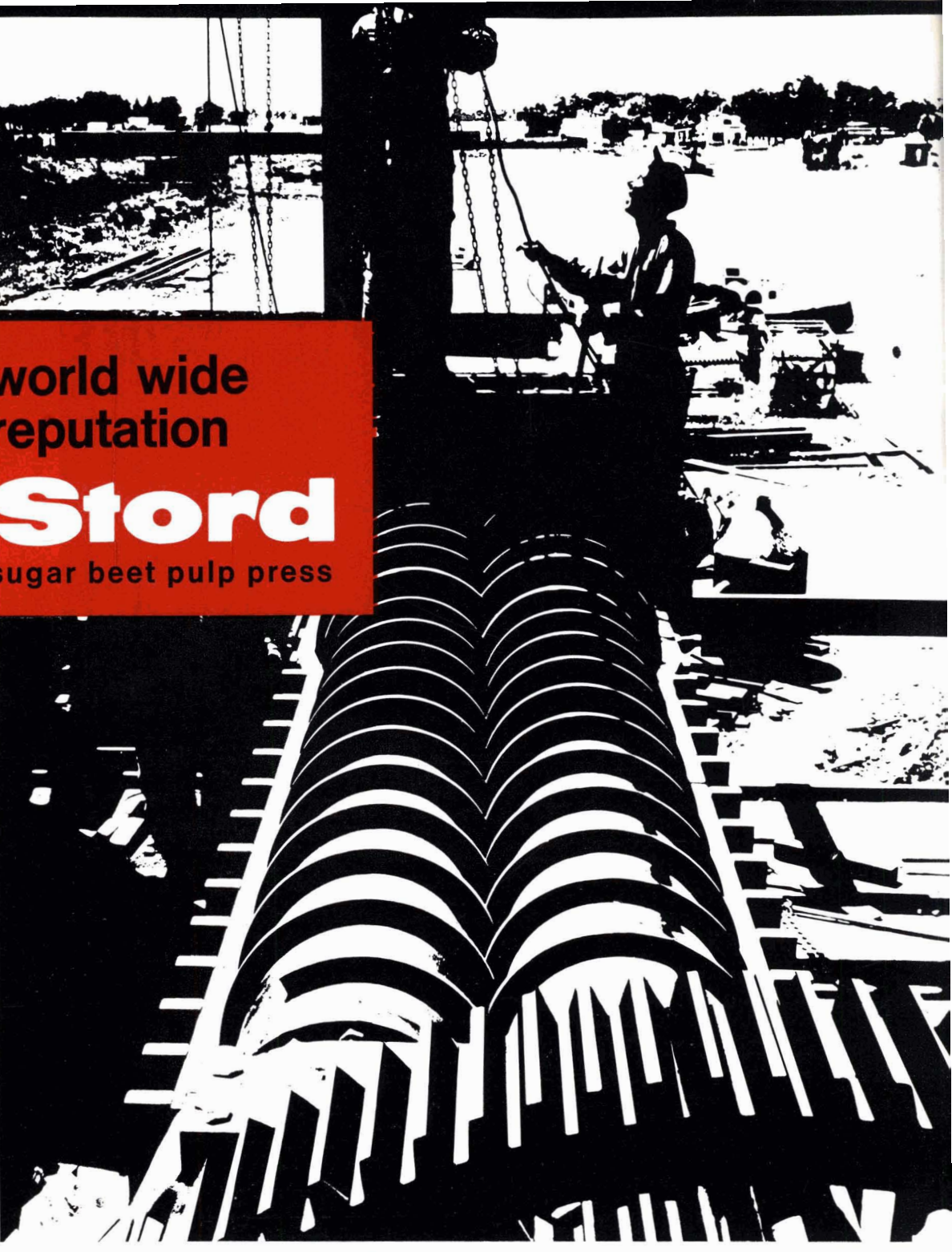
Taxonomy of *Saccharum* relatives: *Sclerostachya*, *Narenga*, and *Erianthus*. C. O. GRASSL. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 9 pp. On the basis of morphology and hybridization the genus *Narenga* is combined with *Sclerostachya*. The genus *Erianthus* is considered to be a complex of diverse elements, of which a major part of the Old World species are placed in *Ripidium* as distinct from the New World species which remain in *Erianthus*. *Erianthus longisetosus* and *E. hookeri* are transferred to *Eccoilopus* while *Erianthus rufipilus* is transferred to section *Diandra* of *Miscanthus*. New artificial hybrids, involving the groups in question, are listed. The genera and their hybrids are considered in relation to their potential use in basic sugar cane breeding. Breeding principles based on phylogenetic concepts are briefly discussed.

* * *

Selection in sugar cane: a review. J. C. SKINNER. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 14 pp.—Selection in sugar cane is reviewed with emphasis on selection principles rather than selection methods. Quantitative genetics experiments relevant to the selection of parent varieties and experiments to determine optimum generation interval in sugar cane are discussed. Seedlings produced by hybridization provide the main material for selection in sugar cane so the review is mainly concerned with this aspect of selection. The procedures of bunch *vs.* single planting and individual *vs.* family selection are discussed. The relationship of the genotype and environment and how that relationship affects selection procedure are considered. Aspects thought to be promising for future research are indicated.

* * *

Gamma irradiation-induced mutations in sugar cane. R. URATA and D. J. HEINZ. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 6 pp.—Seedpieces from two clones of sugar cane (in Hawaii) were exposed to 4 dosages of gamma radiation. Large numbers of mutations—involving changes in bud, rootband, ligule, leaf sheath, stalk size, vigour, colour, waxiness in the rind, and other characteristics, were produced.



Stord Bartz Industri a·s

C. Sundtsgt. 29 Bergen, Norway

Fifteen sub-clones derived from the irradiated material failed to flower in two plant crops and one ratoon crop. The variety H 53-263, which is susceptible to the herbicide "Diuron", produced a mutant sub-clone highly tolerant to the herbicide.

* * *

Genetic behaviour of resistance in sugar cane to the sugar cane borer, *Diatraea saccharalis*. D. P. VIATOR and M. T. HENDERSON. *Paper presented to the* 14*th Congr. I.S.S.C.T.*, 1971, 10 pp.—A study was conducted to determine the genetic behaviour of resistance to the borer, *Diatraea saccharalis*, in sugar cane. Two hundred randomly-chosen clones from a cross between resistant N:Co 310 and susceptible CP 48-103 were used in the study. The two parental clones were included in the investigation as checks. N:Co 310 was significantly lower in infestation, expressed as percentage of bored points, than CP 48-103 in each of three experiments conducted during 1968 and 1969. In the progeny approximately 27% apparently possessed resistance equal to that of N:Co 310.

* * *

Utilization of noble and *Saccharum spontaneum* **germplasm in the West Indies.** D. I. T. WALKER. *Paper presented to the* 14*th Congr. I.S.S.C.T.*, 1971, 9 pp.—In the West Indian breeding programme there is emphasis on both noble canes and forms of *S. spontaneum*. Nobles are being developed by successive polycrossing and selection, the aim being to have a diverse but steadily improving population of clones for use as parents for interspecific hybridization. Nobles are selected particularly for high sugar content, low fibre content and thick stalks. *S. spontaneum* clones from a wide range of latitudes and ecological conditions were chosen with no pre-conceived ideas as to their breeding value. Their first nobilizations are being tested fairly rigorously for adaptability and by cane analysis. Hybrid families indicate the possibilities of useful breeding lines being developed from quite unlikely looking forms of *S. spontaneum*.

* * *

Flower induction of *Saccharum* **species and hybrid clones.** H. F. CLEMENTS. *Paper presented to the* 14*th Congr. I.S.S.C.T.*, 1971, 6 pp.—At the University of Hawaii experiments have been carried out continuously since 1958 with non-blossoming sugar cane varieties to force them into flower. Ultimately by crossing these with otherwise commercially desirable canes, completely non-tasselling commercial canes would become realities. Several collections of Hawaii non-tasselers or very reluctant tasselers were obtained from the Experiment Station, Hawaiian Sugar Planters' Association. In addition some very ready tasselers and several species of *Saccharum* were used. Of the 34 clones all but 3 were successfully flowered. Because some clones show preferences for abnormally long night periods, efforts to induce flowering should provide several night lengths. It also seems that imitating increasing night conditions at 7·5–15° is better than using 20° as a standard.

Isoenzymes as a method of varietal identification in sugar cane. J. C. WALDRON and K. T. GLASZIOU. *Paper presented to the* 14*th Congr. I.S.S.C.T.*, 1971, 8 pp.—Sugar cane breeders have become interested in the possibility of using isoenzymes for the identification of sugar cane varieties. Some have shown successful identification of clones of sugar cane using the enzymes peroxidase and esterase. In this paper the effects of age of plants and specificity of tissues on isoenzyme patterns are discussed. Esterases appeared to show greater variation among varieties than did acid phosphatases. Isoenzyme patterns of related genera could be distinguished from those of *Saccharum*.

* * *

Maturity studies of commercial sugar cane varieties in Florida. L. P. HEBERT and E. R. RICE. *Paper presented to the* 14*th Congr. I.S.S.C.T.*, 1971, 8 pp.—A two-year study of maturation patterns of six commercial varieties revealed important differences in the amounts of Brix and sucrose in the different one-third segments of six varieties. The two late-maturing varieties contained relatively less sugar in the upper one-third segment than the other four varieties in both the plant crop in 1968 and the first ratoon crop in 1969 when samples were taken on 1st November. On 1st March the differences among segments were much smaller than on 1st November each year. There were real differences in the total amount of sugar present in the stalks of different varieties on 1st November and in the rate at which the different varieties accumulated sugar during the harvest season.

* * *

A rating scale for sugar cane characteristics. P. B. HUTCHINSON and J. DANIELS. *Paper presented to the* 14*th Congr. I.S.S.C.T.*, 1971, 4 pp.—The adoption of a new rating scale for all characteristics of sugar cane clones is recommended in this paper. The scale ranges from 0 to 9 with the lower end of the scale representing useful and desirable levels for each characteristic. The upper end indicates levels which are not useful and are undesirable. The scale serves for rating disease resistance as well as agricultural, genetical and botanical characteristics.

* * *

A field method for selecting for fibre content in sugar cane varieties. J. E. IRVINE. *Paper presented to the* 14*th Congr. I.S.S.C.T.*, 1971, 6 pp.—Accurate fibre determinations that permit the measurement of small but significant variety differences are a routine part of multiple milling tests. In this field method a hand-held probe was used to measure electrical resistance of sugar cane stalk tissue. The variation in resistance values reflected changes in intercellular water. This was related to the total moisture content of the tissue. Electrical resistance of stalk tissue differed with varieties, and these differences were correlated with extraction of juice and with fibre. When resistance readings were combined with hardness ratings, higher correlations with extraction and fibre were obtained.

Effect of maturity on milling quality of five sugar cane varieties. L. P. HEBERT. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 5 pp.—Because of the long harvest season in Florida, more information is needed on the effect of age of cane on juice extraction and on fibre content. Mature stalks of 5 commercial sugar cane varieties, including 4 recently released Canal Point varieties, were sampled and milled on 7 days from 23rd October to 3rd March. Duplicate 80-lb samples were milled 4 times under hydraulic pressure with addition of imbibition water to simulate commercial milling. The bagasse and fibre content as percentages of the cane weight remained essentially the same throughout the season. The 5 varieties had the same relative bagasse and fibre content at each date of harvest. All varieties produced less juice at the end than at the beginning of the harvest season.

* * *

New procedures for sugar cane breeders. D. J. HEINZ. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 9 pp.—New techniques and procedures available for use by the plant breeder or sugar cane breeder are reviewed. Five methods which now show potential are briefly considered. They are (1) use of callous tissue and cell suspension cultures to increase variability, (2) use of isoenzymes for clone identification and screening for metabolic variability, (3) use of new tests in screening for drought resistance, (4) screening for disease resistance using toxins, and (5) computer processing in plant breeding.

* * *

Cytogenetics of sugar cane. D. JAGATHESAN. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 14 pp. Progress in this field during the last decade is reviewed. The culturing of pollen grains and cells *in vitro* have been new additions in the progress of cytogenetics. The basic chromosome number of *Saccharum* may be 5, 6, 8 and 10. A new line of investigation, i.e. study of chromosome morphology in several clones of *Saccharum* species, has been reported. The interspecific and intergeneric hybrids and nature of their chromosome constitution have been investigated. There is support for the hypothesis that *S. barberi* developed as a result of hybridization between *S. spontaneum* and *S. officinarum*.

* * *

Photoperiod control in the USDA sugar cane crossing programme. N. I. JAMES and J. D. MILLER. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 7 pp. Photoperiod research at Canal Point between 1965 and 1970 permitted the making of many crosses that would otherwise have been impossible. A 12·5-hr photoperiod retarded the rate of development of inflorescences when applied after floral initiation. The reduced rate of development resulted in synchronization of flowering and in induction of male fertility. Photoperiods other than 12·5 hr drastically reduced the intensity of flowering and did not appear to be useful in the crossing programme. Several late-, sparsely- or non-flowering clones were induced to flower with various photoperiod schedules. About 40% of all viable seed produced during the past 4 crossing seasons came from flowering stalks which were previously subjected to various photoperiod treatments.

* * *

Shoot apex development in early-, mid-, and late-season flowering sugar cane clones. N. I. JAMES and J. D. MILLER. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 7 pp.—Shoot apex development was studied in 9 sugar cane clones but ranged from early to late in time of flowering. Floral initiation occurred up to 35 days later in late-flowering clones than in early flowering clones. Linear regression of time of emergence on time of initiation indicated that for each day initiation was later, flower emergence was 1·39 days later. It was considered that floral initiation was that stage of development at which the inflorescence primordium could first be detected by microscopic examination of median longitudinal sections of shoot apices.

* * *

The photoperiodic control of flowering in *Saccharum*. M. H. R. JULIEN. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 11 pp.—Flowering in two clones of *Saccharum spontaneum* and one clone of *S. robustum* was found to be controlled by photoperiod. In the two *S. spontaneum* clones the earliest stage of development—induction and initiation of inflorescence axis primordium—required intermediate days of about 12½ hr, while the subsequent stage—initiation of inflorescence branch primordia—had a short day response, with a critical photoperiod of 13 hr. The final stages—initiation of spikelet primordia and growth—were quantitative short day responses with optimum photoperiods of 11 hr and 9 hr respectively. In the *S. robustum* clone all stages were short-day responses with gradually shortening critical photoperiods from induction to growth. It was apparent that normal floral development in these *Saccharum* clones required a precise sequence of photoperiods. The relevance of this for the manipulation of date of flowering in breeding material is discussed.

* * *

How the Louisiana sugar cane industry helps in variety development and increase programmes. L. L. LAUDEN. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 5 pp.—The breeding, selection, testing, increasing and distribution of planting material of promising new sugar cane varieties for commercial production in Louisiana is a co-operative effort of the Louisiana Agricultural Experiment Station, the USDA, and the American Sugar Cane League. The agreements under which the three agencies operate are discussed and a Secondary Increase Station Agreement is included in the paper. The first agreement was signed in January 1926 and time has proved that the co-operation provided for in the agreement has served the industry well. The variety situation is better now than at any other time in history.

Sugar beet agriculture

Spring mechanization in Belgian sugar beets. M. MARTENS. *Sugar J.*, 1971, **34,** (2), 23–26.—What spring mechanization has meant to sugar beet production in Belgium is discussed from all angles. Without it many farmers would have given up growing sugar beet because of labour shortage. The utilization of the different types of seed is as follows: technical seed, bare 93%; technical seed, pelleted 6·5%; genetic monogerm seed, pelleted 0·5%. It is imperative to pellet genetic monogerm seed if 5 to 10% of mechanical doubles are to be avoided. But present methods of pelleting are unfavourable to germination. Electronically controlled thinners were first experimentally developed in 1968 but have not been adopted; drilling to stand has become common, however.

* * *

Principles of a new unpublished method for research into the effectiveness of millipede control chemicals. E. SEUTIN and J. BIERNAUX. *Publ. Trimest. Inst. Belge Amél. Betterave*, 1971, (1), 33–37.—Determination of the effectiveness of chemicals for control of millipedes is not always conclusive because of the effect of supervening factors such as weather. A new method is proposed for determining effectiveness and persistence of the materials by artificial introduction of millepedes into soil extracted at regular intervals from treated plots.

* * *

Experiences from southern Germany on sugar beet growing and weed control. A. VETTER. *Zucker*, 1971, **24,** 538–540.—In Bavaria long usage of the simpler form of herbicide based on phenoxyacetic acid has resulted in a serious predominance of some of the more resistant weeds, difficult to control, such as speedwell, goosegrass, polygonum, common chickweed and henbit. Only a part of such weeds are destroyed by conventional doses of "Pyramin" and "Merpelan". Weed control needs to be as complete as possible where drilling to stand is practised.

* * *

Control of sclerotium root rot of sugar beet with systemic fungicides. A. N. MUKHOPADHYAY and R. P. THAKUR. *Plant Disease Reporter*, 1971, **55,** 630–634. Field and laboratory studies were carried out on the control of sclerotium root rot (*Sclerotium rolfsii*) with the systemic fungicides "Carboxin" and "Chloroneb". Greenhouse studies using soil treated with the two compounds showed systemic protection of seedlings against infection by *S. rolfsii* for at least 20 days. Protection tended to increase with increase in fungicide concentration. Field studies demonstrated that ridge-soil drenching with "Carboxin" and "Chloroneb" at 2 and 15 kg in 3000 litres of water/hectare, respectively, significantly reduced sclerotium root rot and increased yields.

* * *

The relationship between volunteer sugar beets and occurrence of beet mosaic and beet western yellows viruses in Washington beet fields. W. E. HOWELL and G. I. MINK. *Plant Disease Reporter*, 1971, **55,** 676–678.—Results are given of surveys made in eastern Washington state, USA, in 1967-69. Sugar beet seedlings infected with mosaic virus (BMV) and beet western yellows virus (BWYV) were first observed in the spring in fields replanted to beets for a second successive year. Both viruses appeared earlier and developed more extensively in second year fields than in fields not planted to beets the previous year. The pattern of BMV and BWYV development in beet fields adjacent to infected volunteer beets demonstrated these to be the source of primary infection. Only BWYV occurred in fields isolated from volunteers. The occurrence of both viruses was not only related to the occurrence of volunteers but also to their mode of vector transmission.

* * *

Seedling disease in sugar beets. L. D. LEACH. *Sugar J.*, 1971, **34,** (3) 18–19.—The main seedling diseases due to fungi, such as *Phoma ultimum*, *Aphanomyces cochlioides* and *Rhizoctonia* spp. and their effects are described. Remedial measures, involving the use of modern fungicides, are discussed.

* * *

How much nitrogen? A. P. DRAYCOTT and P. J. LAST. *British Sugar Beet Rev.*, 1971, **40,** 21–25.—Over 200 field experiments have been carried out during the last 15 years on nitrogen fertilizing of sugar beet. Some of these, which required special apparatus or techniques, were carried out at Broom's Barn Experimental Station. This article summarizes and reviews the results that have appeared in reports and scientific journals. Matters discussed include: forms of nitrogen, nitrogen requirement in the presence of farmyard manure, effect of previous cropping, sub-soiling and compaction, effect of sodium, potassium and magnesium on nitrogen requirement and general recommendations on mineral soils. Current work at Broom's Barn on response to nitrogen includes the effects of long-term rotational manuring, residual values and compaction. Trials elsewhere investigate nitrogen requirement on specific soil types.

New beet hybrids. A. W. ERICHSEN. *Sugar J.*, 1971, **34**, (3), 22–23.—In this article performance data of the new "GW Mono-hy" varieties in Great Western areas of the USA are discussed with particular reference to the promising "GW Mono-Hy A1". Much of the information is condensed in the form of tables.

* * *

Problems of precision drilling of sugar beets to "alternating spacings". O. NEEB. *Zucker*, 1971, **24**, 572–578.—The problems that arise with the drilling of monogerm seed are discussed, largely from a mathematical angle. The desirability of wider seed spacing when drilling to stand is considered.

* * *

Problem of acid soils in the fens. G. PICKWELL. *British Sugar Beet Rev.*, 1971, **40**, 26.—It has long been the practice for farmers in Cambridgeshire to use sugar factory waste lime on their land, this being especially beneficial on the acid peat fens. This waste lime is now required over a wider area, owing to erosion of the fens and the appearance of the acid layer which is now nearing the topsoil. The advantages of this liming is especially favourable with sugar beet. The Ely sugar factory has instituted a delivery and spreading service for farmers.

* * *

Irrigation equipment used to activate herbicide. ANON. *British Sugar Beet Rev.*, 1971, **40**, 30.—On the stony Lincoln Heath, where both hand- and tractor-hoeing can be extremely difficult, the successful control of weeds by chemical means is essential. Normally the irrigation system is not used until mid-summer but in 1970 it was used by one large beet-growing concern to activate a residual herbicide on 65 acres of stony land, which had been drilled to stand during a very dry period in April. Photographs show the four semi-automatic irrigation machines in action and applying $\frac{1}{3}$ inch water per acre, thus ensuring that the herbicide was carried below the surface of the soil.

* * *

Sugar beet research and education. ANON. *British Sugar Beet Rev.*, 1971, **40**, 31–32.—The history of sugar beet research and education in Britain is briefly discussed, as is the machinery that exists today in the industry to achieve these aims.

* * *

Tests show drills perform better at lower speeds. ANON. *British Sugar Beet Rev.*, 1971, **40**, 33–38.—The tests referred to were carried out at the 1971 Spring demonstration at Parkgate Farm, Rivenhall, in Essex. The drilled area included some 30 acres with monogerm pelleted seed planted to stand at 6½ inches and a like area with polyploid pelleted seed planted to stand at 5½ in. The remainder was mostly monogerm pelleted seed sown at 3½ and 6½ in, except that multigerm diploid seed was used on areas where hand work would be required. Results are shown in a table. In an attempt to demonstrate the effect of speed on drill performance, manufacturers were invited to drill at two, three and four miles per hour. In most cases an increase from two to three miles per hour had little effect on seedling emergence, but an increase from three to four miles per hour resulted in a reduction of more than 14% in the number of seedlings.

* * *

The phytotoxic effects of soil insecticides on sugar beet emergence. R. VAN STALLEN and L. VAN STEYVOORT. *Publ. Trimest. Inst. Belg. Amél. Betterave*, 1971, (2), 57–63.—Laboratory studies are reported on the effects of insecticides on the germination or emergence of sugar beet. With various insecticides there was no effect but, in some cases, seedling vigour was affected. It is considered that all new insecticides for beet should be tested in this way.

* * *

Curly top epidemic in western Idaho. D. L. MUMFORD and W. E. PEAY. *J. Amer. Soc. Sugar Beet Tech.*, 1970, **16**, 185–187.—This severe epidemic took place in 1969, owing to the movement of an unusually high population of viruliferous beet leafhoppers into the affected area 3 to 4 weeks earlier than usual. The increased prevalence of more virulent strains of the virus was clearly indicated and is suggested as a major factor in the increased frequency of curly top outbreaks in recent years.

* * *

Beet yellows disease: correlation between amino-acid ratio and tolerance with respect to % sucrose and yield. J. M. FIFE. *J. Amer. Soc. Sugar Beet Tech.*, 1970, **16**, 188–190.—Significant tolerance to beet yellows was obtained, both with respect to yield and % sucrose, by mass selection from beet yellows-infected populations, on the basis of a high amino-acid ratio in the leaves and root weight. Selection on the basis of a high amino-acid ratio alone resulted in a highly significant increase ($P > 0{\cdot}01$) in the % sucrose over that of the parent variety.

* * *

The effect of manure on sprangling of sugar beet roots. J. M. NELSON and E. G. RUPPEL. *J. Amer. Soc. Sugar Beet Tech.*, 1970, **16**, 191–196.—Sprangling or the abnormal development of secondary roots in sugar beet often takes place after heavy manuring (with organic manure). It may also occur after injury to the tap-root. It is not known what the effect is on yield or sucrose content. The field and greenhouse experiments here described were undertaken to investigate the influence of manuring on sprangling and to obtain, if possible, information on the factor(s) in manure which may cause sprangling. Field applications of 40 tons of manure to the acre, which is much higher than commercial practice, produced severe sprangling. Sterilized manure caused the same incidence of sprangling as non-sterilized manure, indicating that micro-organisms in manure are not the direct cause of sprangling. When leached manure was used in manure-soil mixtures, sprangling tended to be less severe. Irrigating seedlings with a manure leachate resulted in some sprangled roots.

Sugar beet breeding and seed production. S. ELLERTON. *Agricultural Progress*, 1971, **46**, 9 pp.—The different stages that both breeding and seed production have been through over the years are described. Disease resistance and the advantage of monogerm varieties are discussed. Through the years, the amount of sugar beet seed sown per acre has been progressively reduced from about 15 lb per acre of natural multigerm to about 2 lb per acre of processed monogerm seed. The UK beet area is set each year by the Ministry of Agriculture and has been more or less constant for a long time, to keep a balance between home and Commonwealth cane sugar supplies. The process of rubbing, grading and separating, accompanied by the discarding of unsatisfactory seed lots, has meant that as much material is now removed in the warehouse as was formerly wasted in the field.

* * *

Preliminary report on breeding sugar beet for combined resistance to leaf spot, curly top and *Rhizoctonia*. J. O. GASKILL, D. L. MUMFORD and E. G. RUPPEL. *J. Amer. Soc. Sugar Beet Tech.*, 1970, **16**, 207–213. This report is a summary of the last two years' results in breeding sugar beet with immunity or resistance to these three diseases, all serious sugar beet diseases in the United States. Breeding experiments have shown that *Rhizoctonia* resistance can be transferred from resistant to susceptible material with relative ease. It was concluded that resistance to leaf spot, curly top and *Rhizoctonia* root and crown rot is inherited independently and that it is feasible to combine genetic resistance to these three diseases in the same sugar beet strain.

* * *

Effects of *Aphanomyces cochlioides* **and** *Pythium ultimum*, **alone and as complexes with** *Heterodera schachtii* **on sugar beet.** E. D. WHITNEY and D. L. DONEY. *J. Amer. Soc. Sugar Beet Tech.*, 1970, **16**, 214–218. This study was undertaken to determine the effects of the sugar beet nematode in combination with soilborne organisms on sugar beet yield. Subsequent tests were conducted to determine if the effects of the *H. schachtii-A. cochlioides* complex observed in naturally infested soil in the initial test were synergistic. In 3 tests yield losses due to the complex were slightly more than additive; however, averaged over 2 years, there was no significant interaction. The loss due to the complex exceeded the combined losses due to each alone by 9·4%, 6·9% and 4·1% respectively with three soils. There was no marked difference in numbers of sprangled roots. There was a reduction of sucrose in some instances.

* * *

Genetic diversity in sugar beet lines selected for nematode resistance. D. L. DONEY and E. D. WHITNEY. *J. Amer. Soc. Sugar Beet Tech.*, 1970, **16**, 219–224. Because of the need for disease resistance in sugar beets grown in the United States the potential sugar beet gene pool has been narrowed. This has reduced the genetic diversity between inbred parents of commercial hybrid sugar beets. A greater heterosis effect might be realized by incorporating disease resistance material of divergent origin into a breeding programme. This study was initiated to evaluate this approach. Significant general combining ability variances among heterozygous populations were obtained for root yield, % sugar and gross sugar. A significant specific combining ability variance was observed for gross sugar only. There were significant differences in mean heterosis between these heterozygous populations. Those populations believed to be the most divergent genetically exhibited the most heterosis.

* * *

Seasonal leaf area, dry weight, and sucrose accumulation by sugar beets. R. F. FOLLETT, W. R. SCHMEHL and F. G. VIETS. *J. Amer. Soc. Sugar Beet Tech.*, 1970, **16**, 235–252.—The results reported here are from a field study of leaf area, dry weight accumulation, and sucrose accumulation throughout a growing season as affected by nitrogen fertilization and variety. The work was carried out on irrigated beets at Fort Collins, Colorado. Maximum values of net assimilation rate occurred at the same harvest as maximum values of mean solar radiation and soil temperature, while maximum values of leaf area index and dry blade weight per unit ground area were reached about 2 weeks later. Nitrogen fertilization increased leaf area index, leaf area duration and the dry weight of crowns plus petioles, but had little effect on net assimilation rate. Nitrogen decreased the sucrose percentage significantly and tended to reduce the ratio of roots to tops and purity of this juice.

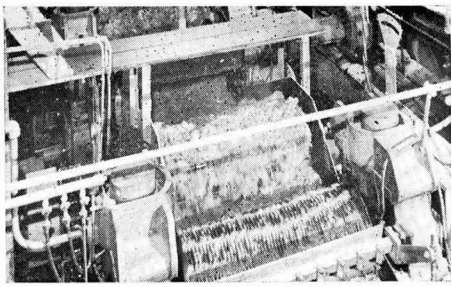
* * *

Variability in partial male-fertile sugar beet. J. C. THEURER. *J. Amer. Soc. Sugar Beet Tech.*, 1970, **16**, 253–263.—This is an account of an endeavour to learn more about the variation that occurs within partial male-fertile sugar beets. The data demonstrate that all white-anther male-sterile sugar beets are not of the same genotype. There are generic modifying characters which interact under conditions poorly understood at present, resulting in varied degrees of pollen fertility. Although the actual inheritance pattern is inconclusive, the data show that partial male sterility inheritance in the sugar beet is complex. Critical studies utilizing clonal or isogenic material under highly controlled environmental conditions will be required to elucidate the complex inheritance of partial male sterility in sugar beet.

* * *

Current problems of sugar beet growing from the practical point of view. H. C. SEELIGER. *Zucker*, 1971, **24**, 631–636.—Problems of modern beet growing are discussed from the practical point of view or that of the actual grower, with special emphasis on the use of mineral fertilizers. The writer deals particularly with the need for close co-operation between science and practice.

Cane sugar manufacture



Dry *vs.* wet cane cleaning at Laupahoehoe Sugar Company. F. H. MIDDLETON, L. J. RHODES, G. E. SLOANE and W. O. GIBSON. *Paper presented to the* 14*th Congr. I.S.S.C.T.*, 1971, 12 pp.—Tests in 1969 in which a cane dry-cleaner was compared with a wet-cleaner at Laupahoehoe are reported[1]. While the dry-cleaner removed less total trash than the wet-cleaner (64% *vs.* 70%) and significantly less soil (58% *vs.* 78%), trash fibre removal was higher (72% *vs.* 61%) and sugar losses in cleaning and milling were much lower at 7·31% in the cane from the dry-cleaner compared with 13·15% from the wet-cleaner, and even allowing for higher losses in filter cake and molasses, the dry-cleaner still gave a gain at 5·30% sugar compared with the wet-cleaner. A somewhat higher mill extraction (94·10% *vs.* 93·76%) obtained with dry-cleaning was attributed to the greater amount of imbibition water used and a lower fibre load on the mill through the greater removal of fibrous trash. Despite the higher amount of imbibition water used with dry-cleaning, the mixed juice refractometric Brix was higher than for juice obtained after wet-cleaning, indicating that the incoming prepared cane was drier. An even greater increase in extraction is believed possible by increasing the imbibition water during dry-cleaning to give the same evaporator load as with wet-cleaning. The greater quantity of soil in the dry-cleaned cane resulted in higher insoluble solids in mixed juice and more ash in bagasse, necessitating more frequent furnace grate cleaning and probably causing increased mill roller wear. Clarifier mud levels were also higher because of the greater soil, and shutdowns resulted, although use of a polyelectrolyte flocculant plus the use of two instead of one filter would possibly have prevented these. No significant differences were found in the syrup and *A*-sugar properties for both types of cleaning.

* * *

Extraction properties of crushed or shredded cane. H. BRÜNICHE-OLSEN and A. G. BUNDGAARD. *Paper presented to the* 14*th Congr. I.S.S.C.T.*, 1971, 8 pp. Laboratory cane extraction tests are reported in which cane was either shredded or crushed and placed in a metal beaker containing about 300 g of fresh cane per litre in unloaded form. At pre-determined intervals the cane was compressed by a pneumatically-operated, perforated piston; juice extracted from the cane was recirculated by a pump having a capacity corresponding to complete circulation of all the juice 3–4 times/min. Temperature was automatically controlled and heat supplied by a coil. The overall rate of extraction in the case of crushed cane was increased considerably by compression to $\frac{1}{4}$ the original volume 3 times/min compared with extraction without squeezing at the same temperature. A similar effect was also observed with shredded cane, but the extraction rate without squeezing was very much greater than with crushed cane not subjected to compression and corresponded to the rate for squeezed crushed cane. The difference is attributed to the greater number of ruptured cells in shredded cane and to the fact that all the ruptured cells in the shredded cane are directly exposed to the juice, whereas in crushed cane the sugar from inside the cane particles has to be transferred to the particle surface by a process of diffusion through the spongy cane tissue. Hence, for efficient extraction frequent squeezing is required during the diffusion process or the cane must be disintegrated so that it is split into single fibres.

* * *

A high extraction washing process for the separation of juice from disintegrated cane fibre. J. FARMER. *Paper presented to the* 14*th Congr. I.S.S.C.T.*, 1971, 17 pp.—Full details are given of the Honiron "Hi-Extractor" cane diffuser installed at Honokaa in Hawaii. A two-stage system is also described which it is proposed to introduce at the factory to replace the five existing cane mills. (See also *I.S.J.*, 1972, **74**, 52.)

* * *

Application of magnetic separators in the sugar industry. A. A. STENT and T. W. VORFELD. *Paper presented to the* 14*th Congr. I.S.S.C.T.*, 1971, 11 pp. Technical considerations in the selection of magnets and applications of magnetic separators in cane sugar factories are discussed with the aid of diagrams and photographs.

* * *

Bagasse storage and handling in Queensland. D. J. MUIR. *Paper presented to the* 14*th Congr. I.S.S.C.T.*, 1971, 6 pp.—Details are given of a system generally adopted in Queensland for the storage of bagasse and feeding to boilers. At Kalamia the bagasse in the storage shed is reclaimed by a conveyor belt from which it is ploughed onto a tray beneath a scraper conveyor supported on an overhead traversing gantry. The scraper, which is raised during storage operations and lowered for reclamation, feeds the bagasse to a boiler supply belt. A full-time operator is required because of a number of difficulties which

[1] *See also* BOUVET: *I.S.J.*, 1972, **74**, 179.

are mentioned. A proposed system which has been considered for Kalamia includes a circular storage shed in which a pair of scraper conveyors store and reclaim the bagasse and prevent avalanches. Some refinements to the original design are described as is an automatic control system for the bagasse level in boiler feed chutes at Kalamia, where a chopper-type plough for diverting the bagasse from the main stream to each feed chute hopper was to be installed on all chutes in 1971.

* * *

Design and installation aspects of sugar mill final reduction gears. D. C. D. COOPE. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 13 pp.—The author, a representative of David Brown Gear Industries Ltd., of England, describes modern analytical techniques used in designing final reduction gears for cane mill transmission systems and discusses alignment problems commonly encountered in these applications.

* * *

Electric power factor in the cane sugar factory. K. S. ARNOLD. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 11 pp.—The disadvantages of a low power factor in cane sugar factories, where the usual requirement of electrical machinery is usually 0·8 but the actual value is often about 0·7 and even as low as 0·6, are discussed. Particular attention is drawn to the adverse effect of an under-loaded motor on the power factor and to the correcting influence of capacitors. Motor applications receiving special treatment in the article are those of drives for cane knife sets and centrifugals.

* * *

Design and modification of steam systems with the aid of computers. D. B. BATSTONE. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 8 pp.—The use of a general design programme for simulation of sugar factory operations is described and the component parts of such a programme explained. As an example the author presents evaporation data obtained by this means, showing a low heat transfer coefficient in the 1st vessel of a quintuple-effect evaporator. The point is made that the costs of simulation, as carried out at the University of Queensland, are considerably lower than problem solving without the aid of a computer and were about $A1 per simulation, or even less when more than two runs occurred in the same batch.

* * *

Steam utilization in a raw sugar factory. J. A. MCGINN. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 10 pp.—Steam utilization in a large modern raw sugar factory with a 7-mill tandem was investigated in 1970 and average flows during 24- and 48-hour test periods are reported. Most low-pressure steam was used by the pans and evaporators and totalled 1024 lb/ton of cane, compared with a total high-pressure steam consumption of 1079 lb/ton of cane. It is shown that modifications to the low-pressure steam cycle could reduce the factory steam requirements to about 924 lb/ton of cane, which would be less than the high-pressure steam requirements of the prime movers. Methods of reducing high-pressure steam consumption by the prime movers to a level consistent with an improved low-pressure steam cycle are suggested.

* * *

Dextrans and dextranase. R. H. TILBURY. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 15 pp. See *I.S.J.*, 1972, **74,** 278.

* * *

The development of a trayless high capacity clarifier. D. J. HALE and E. WHAYMAN. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 9 pp.—See *I.S.J.*, 1972, **74,** 6–10, 40–45, 72–75.

* * *

Effet condenser performance. P. N. STEWART. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 12 pp. See *I.S.J.*, 1968, **70,** 53; 1970, **72,** 21; 1971, **73,** 52; 1972, **74,** 147.

* * *

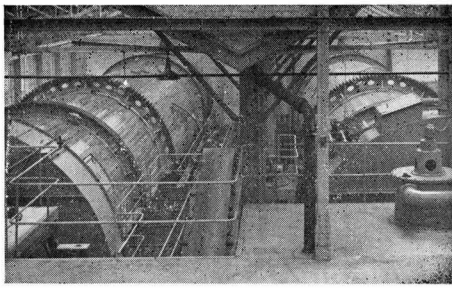
Preliminary pilot plant studies of the production of raw sugar from sorghum. B. A. SMITH. R. V. ROMO, R. C. SMITH, R. A. DE LA CRUZ, F. P. GRIFFITHS and W. R. COWLEY. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 8 pp.—In pilot-plant studies on starch removal from sweet sorghum juices the results were not as good as those obtained in earlier experiments[1], although 89·1% removal was achieved after liming a 13–16°Bx juice to a required pH and adding a flocculant. The starch content was further reduced from 0·144% in the clarified juice by evaporating to a semi-syrup, adding 29–250 ppm P_2O_5 as phosphoric acid, liming, if necessary, to pH 7·3–7·4 and adding 3–5 ppm "Separan AP-30". This gave a starch content reduced to 0·025%. Subsequent concentration to 60–65°Bx, liming to pH 7·3–7·5 and adding $CaCl_2$ and $MgCl_2$ to remove aconitic acid followed by heating to boiling and standing overnight in a settling tank yielded a product from which a clear syrup was obtained by syphoning. This 65°Bx finished syrup, ready for vacuum pan boiling, had a starch content of 0·014%, a pol content of 49, a true purity of 79·83 and 7·41% reducing matter The carbonate ash content was 7·28% and the aconitic acid content 0·50%. *A*- and *B*-sugars boiled from the syrup had an average starch content of 50 ppm, while *C*-sugar contained 140 ppm starch and 7·44% carbonate ash. Higher than normal levels of minerals in the juices, mainly potassium salts and excessive $CaCl_2$, were considered responsible for a large quantity of KCl in the *C*-sugar.

* * *

Vacuum pan construction and automation. R. F. MADSEN. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 12 pp.—Vacuum pan design and automatic control in the Danish Sugar Corporation are described, including massecuite stirrer construction and operating speed, measurement of supersaturation, and the theory behind good crystallization. (See also *I.S.J.*, 1968, **70,** 247.)

[1] *I.S.J.*, 1971, **73,** 84.

Beet sugar manufacture



Conversion of (coal) gas-fired lime kilns to limestone calcination with natural gas. M. P. KHAZIN and L. P. IGNAT'EV. *Sakhar. Prom.*, 1971, **45**, (9), 42–48. More details are given of the line kiln at Samborskii (see LYAKHOV & FERENCHAK: *I.S.J.*, 1972, **74**, 280), where a CO_2 content of 23–24% in the carbonatation gas is easily achieved.

* * *

Some aspects of the 1970 campaign. F. SCHNEIDER. *Zucker*, 1971, **24**, 557–566.—The aspects of the 1970/71 campaign in West Germany which are discussed include: molasses composition compared with that of previous campaigns; the processing quality of bolted beet; tests on a cylindrical screen of 5 m^2 surface area through which the juice-cossette mixture from a pre-scalder passes to the bottom of a tower diffuser, thereby permitting reduction of the pulp content and increased permeability as well as recirculation (via a heater) of juice passing through the screen; experiments with a counter-current pre-scalder, from which between 50 and 100% of the juice used to heat the cossettes is passed through a vessel in which it is degassed and the foam dispersed by steam, after which it returns to the pre-scalder, in which the bacterial population is reduced by the treatment; the question of molasses nitrite content, which at high values can have adverse effects on yeast production; the harmful effect on soil in raw juice on carbonatation juice filtration and thick juice colour; the unsuitability of limestone containing more than 2% magnesium oxide or 5% magnesium carbonate for use in sugar factory lime kilns, since at the higher levels the magnesium adversely affects juice filtration, lime salts and colour; the use of filter-thickeners for carbonatation juice, which should have good filtrability if difficulties are to be avoided; massecuite seeding; comparative performances of batch and continuous centrifugals; factory waste disposal; sugar determination in waste water; and molasses destruction in storage.

* * *

A mathematical model of the Brieghel-Müller prelimer. O. WIKLUND. *Zucker*, 1971, **24**, 566–571.—See *I.S.J.*, 1971, **73**, 213.

* * *

The sugar dust explosion at Offstein sugar factory of Süddeutsche Zucker-AG. G. SCHNEIDER. *Zucker*, 1971, **24**, 579–584.—Investigations at this West German sugar factory showed that a sugar dust explosion on 12th December 1970 was probably caused by infiltration of metal particles into the fine sugar mill despite the presence of magnetic separators before the mill. Details are given of the damage caused by the explosion, which spread because of the absence of pressure relief mechanism, while the unfavourable location of the mill contributed to the effect. The question of dust separator design and means of reducing the intensity of explosions are briefly discussed.

* * *

The carbonate process for removal of non-sugars. J. ELMER, H. HITZEL and E. MOEBES. *Sucr. Belge*, 1971, **90**, 429–438.—See *I.S.J.*, 1972, **74**, 116.

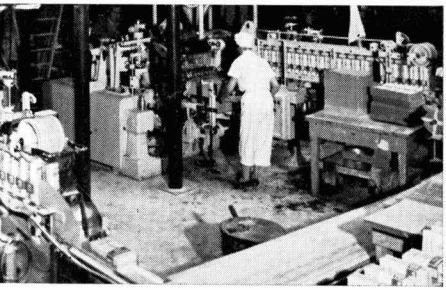
* * *

Notes and comments on the article "Molasses desugaring by the Steffen process at Kermanshah/Iran". R. J. M. GOOS. *Zeitsch. Zuckerind.*, 1971, **96**, 445–447. A number of points made in the article by TSCHERSICH & RICHEY[1] are discussed and possible errors in the calculation of the mass balances for the Steffen plant at Kermanshah indicated. The question of lime kiln capacity for a beet sugar factory equipped with a Steffen house is also considered, and a short glossary of technical terms used in connexion with the Steffen process is appended. In answer to the criticism, TSCHERSICH emphasizes that the quantity of white sugar produced by the Steffen process was calculated from the factory sugar balance and the quantity of molasses processed. The 75% extraction was obtained as a result of a low reaction temperature (no higher than 7°C compared with 18°C quoted by MCGINNIS[2]), thorough washing of the filter cake with cooled water, and the very small particles of lime used. Two lime kilns have been installed at the factory, but one is used only for the Steffen plant.

* * *

Quality of products after beet syrup purification successively by carbonatation, sulphitation and anion exchange treatment. N. M. KODENKO and D. M. LEIBOVICH. *Izv. Vuzov, Pishch. Tekh.*, 1971, (3), 94–95.—Beet syrup treatment as indicated in the title caused only a slight fall in its thermal stability as shown by the very slight increase in colour after 2 and 4 hr at 80°C compared with untreated syrup. The treatment led to a considerably increased crystallization rate 150% greater than without treatment, while the colour of 97·6 purity 2nd-strike sugar washed with 3% water on weight of massecuite was only 3·10°St compared with 19·05°St for unwashed sugar of 96·5 purity.

[1] *Zeitsch. Zuckerind.*, 1971, **96**, 165–169; *I.S.J.*, 1972, **74**, 84.
[2] "Beet sugar technology", 2nd edn. (Beet Sugar Development Foundation, Fort Collins, Colo., USA) 1971, pp. 440–441.



Sugar refining

Solvent affination of raw sugar. P. E. BARKER and R. ATKINSON. *Paper presented at Ann. Symposium, Inst. Chem. Eng.* (London), 1971, 13 pp. + tables & figs.—Experiments are reported on affination of raw sugar with a solvent consisting of a 3:1 v/v methanol: acetone mixture to which SO_2, water and molasses were added. A horizontal drum mounted on rollers and rotated by means of a variable-speed drive was used as continuous contactor, although it was concluded that, provided adequate mixing of the two phases was achieved, the design of contactor did not affect affination. At feed rates in the range 10–25 lb/hr and speeds of 40–100 rpm the raw sugar ash content was reduced from 0·52% to 0·14–0·21% (corresponding to about 70% affination efficiency) at a retention time of 1 min and 2% SO_2 in the solvent. Molasses had an adverse effect and its presence necessitated increased SO_2, while the water content of the system should be minimal, since over-affination occurred as a result of dissolution of crystal sucrose.

* * *

Experimental examination of a refined sugar dryer as an object of automatic control. L. I. KON and V. A. DEMCHENKO. *Sakhar. Prom.*, 1971, **45,** (9), 35–38. Examination of the input and output parameters of a Chambon drying unit at Odessa refinery showed that while the initial sugar moisture content was the dominant factor affecting the moisture content of the sugar leaving the dryer, fluctuations in the initial moisture content were infrequent. However, since this factor cannot be regulated, the pressure of the heating steam and thus the temperature of the air in the dryer must be controlled in order to ensure a constant final moisture content of 0·2%. Whereas a 1% change in the initial moisture content caused a 0·57% change in the final moisture, a change in the temperatures of the air in the four zones of the dryer by as much as 5·5, 3, 7 and 6°C caused only a 0·06% change in the final sugar moisture. The effect of variation in the initial sugar moisture on the weight of sugar in a packet was also noted.

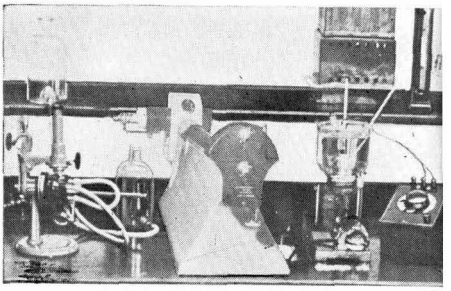
* * *

The "Talofloc" decolorization process. M. C. BENNETT, F. J. GARDINER, J. C. ABRAM and J. T. RUNDELL. *Paper presented to the 14th Congr. I.S.S.C.T.*, 1971, 20 pp.—The process described is based on the ability of cationic surface-active agents to precipitate colorants and other anionic impurities from washed raw melter liquors. The surfactant must have a strong cationic centre, e.g. the quaternary ammonium group, and an *n*-alkyl hydrocarbon chain of not less than 16 C atoms. Studies on the electrical nature of the interaction involving particle electrophoresis and examination of the net anionic charge on colorant fractions have shown that most effective precipitation takes place up to zero zeta-potential and that the cationic surfactant tends to precipitate colorant fractions carrying the greatest anionic charge. Results of investigations on the activities of six series of cationic surfactants as a function of molecular structure have shown that dioctadecyl dimethylammonium chloride (manufactured to a patented specification of Tate & Lyle Ltd. under the name "Talofloc") was the most active. However, in development work it was found that separation of the colorant "Talofloc" precipitate was difficult without the use of very fine-grade kieselguhr in filtration; on the other hand, such fine grades of filter aid reduced the liquor throughput rate. The difficulty was overcome by subjecting the "Talofloc"-treated liquor to conventional phosphatation using 0·02–0·05% P_2O_5 on solids, adjusting the pH to 7·5–8·0 with milk-of-lime and ensuring thorough mixing of the reagents. Complete flocculation is obtained by this means, and separation of the floc by flotation or centrifuging will give a brilliant liquor. Another advantage provided by the "Talofloc" is the ability created by the hydrocarbon chains of the surfactant to aerate the floc merely by stirring air bubbles into the system as in mineral ore flotation. Lower flotation rates with "Talofloc" than without it were attributed to the smaller size of the flocs, but addition of a few ppm of an anionic polymer produced a considerable growth in floc size and permitted 50% clear, decolorised subnatant liquor to be obtained in less than 1 min.

* * *

Investigations on crystal sugar crushing. I. E. A. NIEDIEK. *Zeitsch. Zuckerind.*, 1971, **96,** 432–439, 492–498.—The crushing properties of individual sugar crystals where the crushing is brought about by one solid surface (under impact) or between two solid surfaces (rollers) are described and practical investigations reported. A minimum, crystal size-dependent impact speed was established which was necessary for any marked crushing (20–30% of the initial crystals). The extent of agglomerate formation from each crystal was also examined. Measurements of the energy required to crush individual crystals indicated that the energy used in crushing and not the specific surface energy of the material used to crush was the important factor in determining mill efficiencies. Factors affecting the energy consumption are indicated. Agglomeration can be reduced by adjusting the roller friction. Milling temperature had no effect on crushing between 20° and 100°C.

Laboratory methods & Chemical reports



Determination of refined sugar dissolution time. A. YA. ZAGORUL'KO, T. P. KHVALKOVSKII, L. A. KOROBEINIKOVA and L. A. RUGAEVA. *Sakhar. Prom.*, 1971, **45**, (7), 37–40.—After a brief survey of methods used in the USSR and other countries to determine the time taken for cube and tablet sugar to dissolve, a number of experiments are reported and details given of a method found to be the most suitable for the task. It involves weighing 5 standard cubes or tablets (or, in the case of slabs, 5 pieces each measuring 22 × 22 × 12 mm) to within ± 0·1 g and calculating the average weight. Five 750-ml flasks are filled with water of 20°C to within 20–30 mm of the top, and wire sieves of 50 mm diameter and perforations measuring 7 × 7 mm placed on wire supports of such a length that the sieves are 110–120 mm from the flask bottom. The dissolution time is taken as that up to passage of the sugar lump through the sieve. The average result is calculated in terms of a 5-g sample by a formula which is given.

* * *

The relative effect of the organic and the inorganic non-sugars of mixed juice on the formation of the corresponding final molasses. J. C. FANDIALAN and A. G. GUERRERO. *Sugar News* (Philippines), 1971, 158–160.—Investigations at Canlubang have indicated a relationship between mixed juice non-sugars and final molasses yield and purity, the inorganic non-sugars having greater effect than the organic non-sugars. Further studies to determine which inorganic constituents have greatest effect on molasses formation are recommended.

* * *

Polarization and moisture of Philippine raw sugar exports for fiscal year 1969-70. CENTRAL LABORATORY DEPT. STAFF, PHILIPPINE SUGAR INSTITUTE. *Sugar News* (Philippines), 1971, **47**, 164–165.—From polarization and moisture determinations carried out on Philippine raw sugar samples from 34 cane sugar factories it is shown that the sugar conforms to the standard requirements set by the US authorities for imported raw sugar.

* * *

Viscosity effect on the rate of formation of sucrose crystal nuclei. A. I. BYVAL'TSEV and A. V. ZUBCHENKO. *Izv. Vuzov, Pishch. Tekh.*, 1971, (2), 127–129.—Mathematically it is shown that addition of glucose to a pure sucrose solution will cause a change in all the kinetic parameters involved in crystallization. However, reduction in the rate of formation of crystal nuclei is not basically due to the increase in viscosity brought about by the glucose, but is primarily a result of increase in the length of the "relaxation" period and in the surface energy at the nucleus-solution phase boundary.

* * *

Rheological equation and model of the deformation behaviour of sugar beet roots. V. A. MASLIKOV and YU. G. BLEDNOV. *Izv. Vuzov, Pishch. Tekh.*, 1971, (2), 145–148.—A mathematical model based on load test data is developed for representation of beet deformation when subjected to pressure along one axis. An equation is derived which describes the conditions of creep, when the beet acts as a lineal, visco-plastic body deformed beyond the elastic limit.

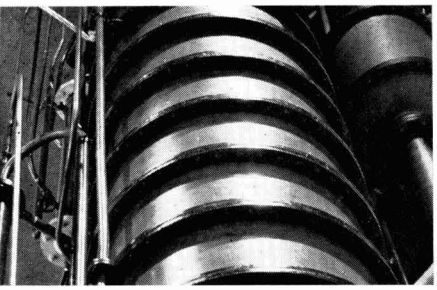
* * *

Determination of the colloid content in sugar products. S. T. KRYLOV and S. E. KHARIN. *Izv. Vuzov, Pishch. Tekh.*, 1971, (2), 158–161.—A method is described in which the colloidal fraction precipitated from 10 ml of 10°Bx beet juice is subjected to peptization with 25 ml of hot water and the concentration of the disperse phase found from the intensity of scattered light reflected by the sample cell at an angle of 45° and 135° from the original horizontal beam of light to two prisms linked through a galvanometer. Little difference was found between the values given by weighing and the proposed method using a formula, while the latter can be used to determine concentrations as small as 2×10^{-4} g/cm³. The relative error rises, with fall in concentration, to a maximum of 10%.

* * *

Problem of sugar crystal uniformity and structure in the light of massecuite boiling methods used. K. WAGNEROWSKI. *Gaz. Cukr.*, 1971, **79**, 153–158. Sugar crystallization during boiling is analysed on the basis of GENIE's work[1], and the effect of pan design on crystal size and inter-crystal distance during the initial and final boiling stages examined. The ratio of the total massecuite volume to the initial syrup volume at nucleation is treated as a primary characteristic of a vacuum pan, existing types of which are not considered to provide good crystal uniformity and structure. A 2-stage system for *A*- and *C*-massecuites is proposed whereby the crystals are formed and the massecuite brought to optimum Brix in one pan and transferred to a main pan for further conventional boiling. The main advantage is increase in the heat transfer coefficient with the resultant improvement in crystallization.

[1] *I.S.J.*, 1962, **64**, 232–236, 260–264, 298–300.



By-products

The Taiwan Sugar Corporation's diversification programme. M. H. YUAN. *Taiwan Sugar*, 1971, **18,** 41–52.—A survey is presented of the TSC diversification programme which includes 15 major products. Of these, the cane-by-products are: bagasse board, paper and pulp, molasses (sold for a number of purposes), and alcohol and yeast produced from the molasses.

* * *

A programme for overall improvement in bagasse mill efficiency. K. RUCKSTUHL. *Sugar y Azúcar*, 1971, **66,** (4), 13–14.—Pulp mill efficiency and pulp quality are affected not only by bagasse storage conditions but also by numerous factors not usually considered, ranging from cane harvesting technique to mill roller condition and settings, etc. These affect the size and proportion of fibre in the green bagasse and it is possible to improve pulp mill operation and pulp quality by varying mill conditions in accordance with regular shift screen analyses of the green bagasse and the depithed fibre. Examples of the advantages gained in this way are given, and storage of bagasse in briquette form and in bulk are discussed.

* * *

Plant for bagasse fibre board manufacture in Mauritius. R. HESCH. *Bol. Azuc. Mex.*, 1970, (252), 13–14.—See *I.S.J.*, 1972, **74,** 192.

* * *

Simple method for calculation of alcohol distillation columns. E. DÍAZ G. *Ind. Alimenticia*, 1969, **2,** (1), 13–22.—A method is described for calculation of the dimensions of an alcohol distillation column having perforated plates.

* * *

Solid (powdered) molasses. A. P. PELLEGRINI. *Brasil Açuc.*, 1971, **77,** 208–213.—A new animal feed preparation is proposed, comprising molasses combined with calcium phosphate, which is solid and thus easier to handle; while containing the minerals and vitamins of the molasses, etc., it also contains calcium sugar phosphates, formed by chemical reaction, which are of great value in the animal's metabolism.

* * *

Study on the sorption properties of bagasse—introductory communication. J. B. RUSEK. *Bol. Cienc. Técn. Univ. Central Marta Abreu* (Cuba), 1968, **3,** (5), 7–12.—A major cost in the use of ion exchangers is that of regeneration and an ion exchanger which could be discarded after a single use might be economical if it had sufficient exchange capacity and was produced from sufficiently cheap raw material. Bagasse was studied in this respect as an ion exchange material for nickel solution purification; samples were washed free of cations with HCl, water-washed and dried. Portions were then treated with 61% H_2SO_4 at 42° and at 70°C and with 10% NaOH at 90–95°C; the latter gave an insoluble residue and also partly dissolved material which was precipitated on neutralization of the alkali. The ion exchange capacity of the purified bagasse, the two acid-treated portions and the alkali-insoluble and re-precipitated soluble portions were determined; they were of the order of the capacities of natural inorganic and other organic exchangers and give promise for further work.

* * *

The effect of giving increasing quantities of torula yeast protein to bulls fattened on a molasses-based diet. T. R. PRESTON and F. MUÑOZ. *Rev. Cubana Cienc. Agríc.*, 1971, **5,** 9–12.—Feeding trials with bulls supplied with a basal ration of free-choice liquid molasses containing 3% urea showed that daily weight gain increased with increasing addition of torula yeast to their diet but later decreased. The optimum amount of yeast protein to be given to bulls fattened in this way from 270 to 380 kg is approximately 700 g per day.

* * *

Molasses and molasses/urea as supplements for F_1 Holstein x Brahman bulls grazing highly fertilized pangola (*Digitaria decumbens*) pasture. G. PORRES. *Rev. Cubana Cienc. Agríc.*, 1971, **5,** 13–20.—From the gains achieved by supplementing pasture grazing with molasses or molasses/urea it is concluded that it is not economical because some 50 kg of supplement is required for each additional kg of live weight gain.

* * *

Synthesis of microbial protein in young bulls fed a protein-free diet based on molasses/urea. A. RAMÍREZ and J. KOWALCZYK. *Rev. Cubana Cienc. Agríc.*, 1971, **5,** 21–26.—Synthesis of microbial protein in the rumen and duodenum of calves was studied, their diet comprising molasses containing 3% urea, fed *ad libitum*, plus 320 g/day of rice straw. Analysis of rumen and duodenum liquor showed 25 g N of bacterial origin passing per day, corresponding to 2·5 g for each 100 g of readily fermentable carbohydrate.

The effect of housing density and the use of methionine in sugar-based diets for layers. R. PÉREZ. *Rev. Cubana Cienc. Agríc.*, 1971, **5**, 59–62.—Experiments showed that more total and saleable eggs were produced where the pullets were two per cage compared with three per cage; the size of the different cages used (1450, 1650 and 1850 cm^2) had no effect. Raising the methionine content (used as a supplement to correct the amino-acid balance in a sugar-high protein feed) by 7%, i.e. from 0·61 to 0·66% of D.M., increased saleable eggs and egg weight by 11%, but a higher level depressed feed intake and produced the same number of eggs as the basal diet.

* * *

Influence of two different nitrogen fertilizers on amino-acids and minerals of sugar beet pulp. P. BENDA, M. DVOŘÁK and J. TUSI. *J. Sci. Food Agric.*, 1971, **22**, 221–222.—Amino-acid content of beet pulp was increased on both a % dry matter basis and as total yield/ha by application of nitrogen fertilizer to the soil at the time of sowing, urea giving better results than ammonia in liquid form. Ca and P were reduced % dry matter but not significantly on a yield/ha basis. Na and K contents were increased with fertilizer application, the effect being more pronounced with urea. Of the trace elements, only Cu and Fe responded to the applications.

* * *

Preparation and characteristics of the ferri-dextran complex. J. MALEK and A. BELL. *CubaAzúcar*, 1970, (April/June), 2–8, 26–31.—Details are presented on the purification and hydrolysis of commercial Cuban dextran to give a low-M.W. product which was then reacted with ferrous sulphate in the presence of NaOH to yield an iron-dextran complex which is useful for treatment of anaemia.

* * *

Profitable uses of filter mud. A. C. CHATTERJEE. *Indian Sugar*, 1970, **20**, 681–682.—Filter cake added to 1:1 mixture of single superphosphate and ash at the rate of 4:1 was sprayed with molasses solution inoculated with *Azotobacter* sp. plus a small quantity of superphosphate. The proportions were 20 litres molasses solution per ton of filter cake. The result is a material containing 2·030% total N, 1·728% K_2O and 16·77% CaO which, it is claimed, may be useful as a bulky organic fertilizer. The possibility of recovering wax from filter cake is briefly discussed and details given of a process involving solvent extraction followed by oxidation with dichromate and sulphuric acid and eventual treatment to yield a high-quality product. (The refining process is the subject of an Indian patent.)

* * *

Criteria for evaluation of *Aspergillus niger* conidia for citric acid biosynthesis. II. Biochemical activity. H. JASZCZURA and S. KAMIŃSKI. *Gaz. Cukr.*, 1971, **79**, 141–143.—Experiments on citric acid production from beet molasses using *Aspergillus niger* strains showed that both culture strain and origin of molasses (samples from various Polish sugar factories were tested) affected yields as well as did the proportions of potassium ferrocyanide, potassium phosphate and zinc sulphate added to the molasses solution before sterilization. Maximum yield (% on sugar) was achieved with molasses from Ziebice factory using 0·08%, 0·008% and 0·0008% of the above-mentioned salts in the order given.

* * *

The development of a yeast strain and/or isolates for high alcoholic fermentation temperature. A. S. ROXAS and N. P. AGUILA. *Sugar News* (Philippines), 1971, **47**, 166–169.—Details are given of tests to find strains of *Saccharomyces cerevisiae* which would be tolerant to rising temperature during fermentation, which is of great concern in tropical countries during summer months since even a water-cooling system for fermentation vats is not sufficiently effective under these conditions. Of eleven isolates tested under laboratory conditions at temperatures gradually rising from 35°C to 41°C, three were selected for factory tests, in which the highest average fermentation efficiency was 76·64% obtained at 40–41°C.

* * *

Mud from rotary filters as raw material for manufacturing decolorizing active carbon. ANON. *Cuba-Azúcar*, 1970, (April/June), 16–18, 37–40.—Filter mud contains a high organic content and its fixed carbon content, dry matter basis, is comparable to that of wood (10–20% *vs.* 15–25%). Its inorganic ash content is very much higher, however, and variable (10–30% *vs.* 0·5–3%); this hinders its use as a raw material for active carbon production as does the need to remove the higher water content (65–75% *vs.* 40–55%). Acid treatment to remove the ash increases the cost of manufacture, and a study of the economics, also taking into consideration the poor performance of the carbon produced from mud relative to that of carbon from wood, indicates that the mud is not a suitable raw material.

* * *

Effect of ammonia on beet pulp. M. S. DUDKIN, N. S. SKORNYAKOVA and E. M. TKHORZHEVSKAYA. *Izv. Vuzov, Pishch. Tekh.*, 1971, (3), 90–93.—In beet pulp ammoniation experiments, addition of NH_4OH solution was found to cause elimination of the methoxyl and acetyl groups (this effect increasing with NH_4OH concentration and time of treatment) and polysaccharide depolymerization. The ion exchange process, whereby ammonia replaced Ca and Mg in the pulp and ammonium pectate was formed, was considerably accelerated by first treating the pulp with HCl solution to separate the cations; this resulted in maximum Ca and Mg removal after only 5–10 min according to HCl concentration. Water-soluble carbohydrates formed by ammoniation consisted mainly of galacturonic acid; they were subsequently converted by reaction with the ammonia.

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.

Patents

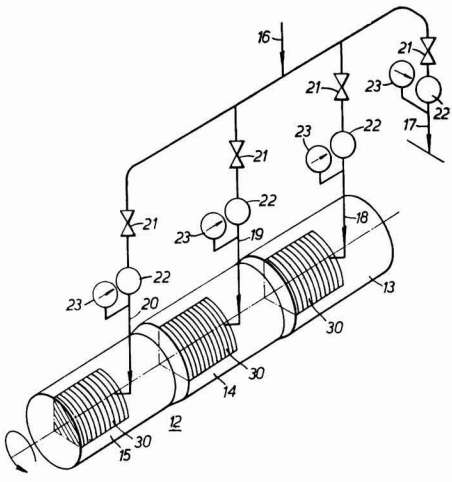
UNITED KINGDOM

Cane harvester. A. MINET, of Le Mee-sur-Seine, France. **1,250,914.** 27th September 1968; 27th October 1971.

* * *

Cane sugar extraction by screw press. ROSE, DOWNS & THOMPSON LTD., of Kingston-upon-Hull, Yorkshire, England. **1,252,451.** 12th March 1968; 3rd November 1971.

It has been proposed that sugar can be extracted from cane by multistage treatment in screw presses with intermediate mixing with liquid. It has been found, however, that better extraction is achieved if pressure is not relieved between the stages and if extraction liquid is admitted to the pressed cane or bagasse under relatively higher pressure. Thus in a multistage press 12 having a cage in three portions 13, 14, 15, cane admitted at the lowest pressure end is carried in a conventional manner to the highest pressure end and discharged from the cane section 15. While subjected to pressure, the juice content is discharged through the line perforations formed by the junctions between the liner bars 30 forming the cage and is collected in suitable compartments.



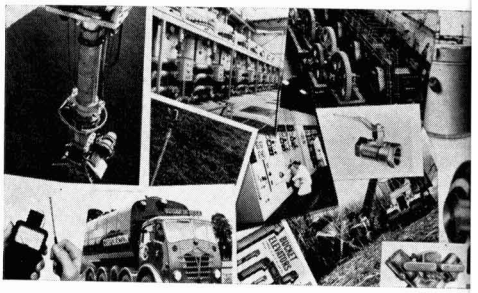
Water is admitted from pipe 16 through valves 21 to pipes 17, 18, 19, 20 delivering to the feed hopper and the three sections, respectively, the flow and pressure being indicated by meters 22, 23. The water is added by means of suitably drilled bars 30 which allow its passage under pressure into the bagasse or cane within the cage. The illustration shows water added at all three stages; they can be supplied individually with the recirculated press juices.

* * *

Manufacturing dissolving pulp for artificial yarns and fibres from bagasse. INSTITUTUL DE STUDII, EXPERIMENTARI SI PROIECTARE PENTRU INDUSTRIA CELULOZEI, HIRTEI, FIBRE SINTETICE SE VALORIFICAREA STURULI, of Bucharest, Rumania. **1,253,234.** 24th October 1968; 10th November 1971.—Bagasse is subjected to prehydrolysis using saturated steam (at 175–200°C) with an initial liquor to bagasse ratio of 0·9:1–1·5:1 (1:1–1·2:1) or using water (at 165–170°C) with an initial liquor:bagasse ratio of 2·5:1–3·0:1 (for 105–120 min at the highest temperature). Part (20–40%) of the hydrolysate (of pH 3·5–4) is removed and the remainder subjected to alkaline cooking with 22–24% NaOH on raw material, in the form of a 120–160 g/litre solution with 15–20% sulphidity (at 165-168°C and for 60–70 min at the highest temperature, with a final digestion liquor:bagasse ratio of 3·5:1–4:1). The pulp is washed and screened in several stages using fractional screening filters (in series or in parallel) as the final stage in order to remove the fine fraction (zero fibre). It is then bleached with intermediate washing by two-stage chlorination (at 20–22°C and pH 3·0–4·0 for a total time of 80–100 min at a concentration, based on cellulose material, of 3–3·5% with 40% of the total chlorine being used in the first stage, 30% in the second stage and the remaining 30% in the NaOCl treatment step), followed by washing, alkaline extraction (at 75–80°C and pH 10–10·5) and washing and treatment with NaOCl (at 38–40°C), the bleach liquor initial pH falling from 9·5–10 to 8–8·5 [followed by final bleaching with ClO_2 in one or two stages (the latter with intermediate alkaline extraction at 75–80°C and pH 10–10·5) at 70–80°C (75–80°C) and a final pH of 4–6 to give a brightness of 85–87·5% (one-stage) or 87·5–92% (two stages)]. The residual chlorine is removed with SO_2 and the cellulose treated with HCl, washed, screened and acidified before drawing on the pulp machine.

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).

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.

Renold chains for the cane sugar industry. Renold Ltd., Renold House, Wythenshawe, Manchester M22 5WL, England.

A new 16-page brochure bearing this title (Ref. C-RL716) has just been published and gives details of cane feeder chains, cane carrier chains, outboard roller cane carrier chains and slats, intermediate carrier chains, bagasse carrier chains and diffuser chains. The Renold Group, the largest manufacturer of precision chains for power transmission and mechanical handling in the world, has had over 90 years' experience in the field and now offers a wider range of chains for use in the cane sugar industry. All the chains listed are specially designed and manufactured for the arduous conditions encountered and can generally be used as replacements for existing chains. Non-standard chains and chains for special duties can be made to order. A heavy-duty block chain (No. ACC2236) of 80,000 lb breaking load is available and is particularly suitable for use where mechanical harvesting gives rise to the problem of dirty cane. Details of this chain are obtainable separately on request. The Renold cane carrier and bagasse carrier chains are specially designed and manufactured for the purpose, having generally accepted gearing dimensions and attachment hole sizes, and combine high strength with long life. Wheels can be supplied for all Renold chains and are designed with the correct tooth form and dimensions to ensure smooth operation plus maximum service. Accurately formed corrugated overlapping slats are made for use with the Renold cane carrier and apron-type intermediate carrier chains. Full details and dimensions of all the chains mentioned are given in the brochure.

* * *

Scale prevention in molasses distilleries. Fabcon Inc., 1275 Columbus Ave., San Francisco, Calif., 94133 USA.

For more than 5 years Fabcon have been supplying "Fabcon I-12" to molasses distilleries and this agent has been highly successful in preventing scale formation in the columns. A 4% aqueous solution fed at the rate of 2 lb agent per 10,000 gal of wash fed to the still completely prevents scaling, while less serious scaling can be overcome with smaller dosages. Fabcon have now published a booklet summarizing the experiences of more than 150 distillery customers in different parts of the world, indicating the effectiveness of "I-12" in preventing scaling of preheaters, beer columns and rectifying columns.

* * *

Cube sugar plant. Stork-Amsterdam, Sportlaan 198, P.O. Box 108, Amstelveen, Holland.

At the end of 1971 Stork-Amsterdam took over the manufacturing rights and selling activities of Goka N.V., so that the company's production programme has been expanded to include cube moulding units with capacities ranging from 270–450 kg/hr for the standard unit to 1620–2700 kg/hr obtainable with the "Combiner No. 6" which is fully-automatic and has 6 presses. The installations are suitable for all types of crystal sugar, ranging from easily soluble cubes at one extreme to extra hard cubes at the other. Illustrated literature is obtainable showing the units and packaging equipment as well as ancillary equipment.

* * *

Beet reception equipment. Gebr. Bütfering Maschinenfabrik, 472 Beckum (Bez. Münster), Stromberg-Str. 170, Germany.

Gebr. Bütfering is a company specializing in the manufacture of beet reception equipment involving mobile and stationary beet tipping platforms and piling units. The use of mobile units incorporating beet cleaners and waste disposal means carries a number of advantages, and illustrated literature demonstrates the benefits in the form of versatility and ease of operation. Units are obtainable with two platforms (each 10, 14 or 15 m long) having a total unloading capacity of 300 tons/hr or with two 18-m platforms having a total capacity of 400 tons/hr, while a unit with two 12-m platforms and a total capacity of 200 tons/hr is also available for location outside the factory premises. Lifting capacities of the platforms range from 20 to 50 tons. The cleaning capacities have been considerably increased, in comparison with earlier designs, by widening the roller screens used for dirt removal and modernizing the equipment for beet leaf removal. Components have been strengthened to increase their effective life, and manoeuvrability improved by considerably reducing the turning circles. Each unit requires the service of only three men. The equipment is illus-

trated in a brochure which also depicts a travelling beet discharger with belt conveyor having a capacity of 600 tons/hr.

* * *

Conveyor lubrication. Bielomatik London Ltd., Lubrication Division, Cotswold St., London SE27 07P, England.

The "Helios Cobra 1D" lubrication unit has been specifically designed for heavy duty conveyors and allied equipment. Operated entirely mechanically and therefore not relying on a fixed chain pitch, the unit follows the irregularities of the conveyor by lining itself up on each roller so that it will always centre exactly into the roller's grease nipple. Each lubrication cycle is made up of seven stages and can be completed in under 0·5 sec on high-speed conveyors. The conveyor roller pushes the arm of the unit and thus imparts lateral movement to the arm and nozzle via cam bars which in turn locate the nozzle in the grease nipple. After a measured amount of lubricant is injected, while the nozzle is compressed against the nipple, the arm, still being pushed by the roller, causes the nozzle to disengage and swing back to the original position after which it is recharged with a fresh supply of lubricant from a central pump at a pressure of 20–100 $kg.cm^{-2}$. At each lubricating stroke 0·4–0·9 cm^3 of lubricant is injected. Among applications of the unit is lubrication of scraper flight conveyors as used in sugar factories, as well as bucket elevators.

* * *

Flocculant handling. Novadel Ltd., St. Ann's Crescent, Wandsworth, London S.W.18, England.

A fully-automatic system for preparation of poly-electrolyte flocculant solution of required concentration and feeding it to a holding tank is announced. Built to customers' size and throughput specifications, the system incorporates a powder feeder to dispense the flocculant accurately to a tank provided with level probes and agitator. The intake water flow is regulated by a solenoid valve and, on demand, the freshly-prepared solution is discharged into the holding tank. The feeder can be fitted with special extension hoppers to give a holding capacity equivalent to several days' operation.

* * *

Depth indicator. Eurogauge Co. Ltd., Process Control Division, East Grinstead, Sussex, England.

The latest unit from Eurogauge Co. Ltd. is the 30/64 system for continuous contents level and depth indication. Operating on the capacitance principle which permits it to function under widely varying conditions in any type or size of vessel, it will give accurate continuous indications under pressure or vacuum at extreme temperatures. A fully-insulated electrode is inserted vertically within the vessel and forms a capacitor with the metal wall of the container to provide a capacitance measuring bridge. The change in capacitance is measured and converted into an appropriate electrical output. The unit operates at 240 V, 50/60 Hz, but can be made to operate on other voltages on request.

* * *

Tube cleaning. Kina Engineering Ltd., Hadleigh, Suffolk, England.

A new high-pressure nozzle from Kina Engineering is announced. Manufactured from specially hardened steel, the "Retro-Jet" is designed to operate at between 3000 and 11,000 psi from a water-jet blasting machine in the Kina Mark II range to remove scale and incrustation from pipes, drains and tube bundles. The nozzle includes a forward-facing jet to break through blocked pipes and three or more rear-facing jets to provide the complete nozzle with its own strong forward propulsion.

* * *

Conveyors. Brencede Ltd., The Mews, Bridge St., St. Ives, Huntingdon, England.

Among conveying equipment available from Brencede Ltd. are screw conveyors and screw elevators. The former are available with 6, 8, 10 and 12 inch screws and, although intended to move materials horizontally, can be used at up to 30° elevation. Drive is by geared motor through chain drive or flexible coupling. Direct coupling to the underside of bulk storage bins and tanks permits the units to be used as feeders for controlled flow bulk discharge. The screw elevators are available in lengths of 21 ft with standard tube diameters of $4\frac{1}{2}$ and $6\frac{1}{2}$ inches.

A sweep silo discharger also obtainable from Brencede consists of a shrouded screw suspended between two end plates and driven by a guarded geared motor unit. Installed in any flat base silo with underfloor extraction equipment, the discharger pivots through 360° about the silo centre line and transfers material through the existing central floor outlet at an even discharge rate under control from a central panel. Outputs of up to 60 tons/hr are easily achieved by the discharger which can be installed in new or existing silos.

PUBLICATIONS RECEIVED

AUTOMATIC WEIGHING SYSTEMS. Howe Richardson Scale Co. Ltd., Arnside Rd., Bulwell, Nottingham NG5 5HD, England.

Howe Richardson Scale have developed their own range of analogue and digital printed circuit cards for use in their automatic weighing systems. Designed to suit the many different conditions under which these systems operate, they are featured in a new leaflet which also describes a range of testing equipment available from the company.

* * *

BALL VALVES AND DRIVES. Saunders Valve Co. Ltd., Sabal Division, Widemarsh Common, Hereford, England.

"Sabal" ball valves and pressure-actuated and electric valve drives are featured in a brochure obtainable from Saunders Valve. Co. Ltd. at the above address.

Brevities

Japan refineries re-opening[1].—According to reports from Japanese sugar refiners, competition is to be intensified on the Japanese market. As a consequence the Nagoya Sugar Refining Company is to reopen two inactive refineries.

* * *

French sugar research institute move.—The Technical Department of the French Sugar Manufacturers' Association (Syndicat National des Fabricants de Sucre de France), formerly in Paris, has moved and now has the following address: Institut de Recherches de l'Industrie Sucrière (S.N.F.S.-I.R.I.S.), F-59650 Villeneuve d'Ascq, Sac Postal 15, France.

* * *

Argentina cane price rise[2].—The minimum price for sugar cane delivered to the mill for the 1971/72 crop was fixed by the Ministry of Commerce at 78·4 new pesos per ton, representing an increase of 111% over the price for the previous season.

* * *

Sweden sugar imports, 1971[3].—The Swedish authorities have issued information on sugar imports in 1971 which totalled 157,381 metric tons, tel quel, and included 56,645 tons from Cuba, 4,432 tons from Denmark, 33,713 tons from Finland, 18,539 tons from France, 20,493 tons from Poland, 23,366 tons from the USSR and 133 tons from other countries.

* * *

Brazil sugar factory for Venezuela[4].—The supply has started of material valued at US $6,000,000 for a complete sugar factory to be constructed by Indústria M. Dedini S.A. Metalúrgica of Piracicaba, Brazil, for erection in Venezuela. The new factory, Central Santa Maria, at Guanta, is expected to be in production in 1973.

* * *

New USSR sugar factories[5].—The Holland-USSR Institute in The Hague has made it known that the following new sugar factories are ready for operation: Chishminskii in the Bashkirskaya Autonomous Republic, Novopokrovskii in Krasnodar, Chervonoznamenskii in Odessa oblast', a sugar factory in the Kirgiz as well as the Kedainyaiskii factory in Lithuania.

* * *

Indonesian expansion plans[6].—Indonesia—a big importer of sugar in recent years—expects to be self-sufficient this year and plans to export some 80,000 tons of cane sugar in 1974, according to the Agriculture Minister. The Minister, outlining his country's switch of large areas from rice to sugar, estimated that the national sugar crop in 1974 should reach 1,080,000 tons, with domestic requirements at 859,000 tons. Meanwhile 1972 production is expected to reach 840,000 tons.

* * *

Portuguese East Africa sugar[7].—To increase sugar production by 100,000 metric tons to 250,000 metric tons, Sena Sugar Estates Ltd. have been authorized to expand the production facilities of their sugar factories at Marromeu and Luabo, Mozambique. The total investment cost will be more than 1000 million escudos.

* * *

Sugarcane Breeding Institute symposium.—The symposium to celebrate the Diamond Jubilee of the Sugarcane Breeding Institute in Coimbatore, India[8], has been postponed to 6th–9th November 1972. Session 4, originally intended to cover application of breeding advances to production, is to be extended to include the rôle of cane varieties in improving cane agriculture in various regions or states of India and problems associated with their optimum use or ideal varieties to use. A sixth session is also added to the original number and will concern the growth and development of the Sugarcane Breeding Institute.

European sugar production estimates[9]

	1972/73	1971/72
	—(*metric tons, raw value*)—	
West Europe		
Austria	367,000	278,124
Belgium	667,000	857,738
Denmark	333,000	332,222
Finland	78,000	66,076
France	2,945,000	3,268,886
Germany, West	2,200,000	2,394,180
Greece	145,000	158,313
Holland	800,000	856,785
Ireland	198,000	191,811
Italy	1,280,000	1,274,443
Spain	800,000	1,045,570
Sweden	272,000	273,000
Switzerland	72,000	75,867
Turkey	870,000	933,000
UK	1,042,000	1,206,951
Yugoslavia	411,000	388,539
Total W. Europe	12,480,000	13,601,505
East Europe		
Albania	17,000	17,000
Bulgaria	260,000	250,000
Czechoslovakia	750,000	730,000
Germany, East	600,000	542,222
Hungary	333,000	266,949
Poland	1,848,000	1,712,500
Rumania	660,000	510,000
USSR	9,400,000	8,400,000
Total E. Europe	13,868,000	12,428,671
Total Europe	26,348,000	26,030,176

New Zealand beet sugar industry possibility.—The New Zealand Government is giving "favourable consideration" to a request for a feasibility study on the establishment of a sugar beet processing industry in the Ashburton area of Canterbury province, South Island. Such an industry would eventually supply the entire South Island sugar requirement, leaving North Island to absorb imported sugar. The announcement followed a meeting between the Minister of Industries and Commerce and a three-man deputation from the sugar beet committee of Mid-Canterbury Federated Farmers. A member of the deputation said that investigations had satisfied the committee that a viable sugar beet industry could be established in Ashburton. Meanwhile, the Chairman of the South Otago Sugar Beet Investigating Co. said that he intended re-opening the case for a beet sugar industry in his area. An earlier request for a feasibility study in South Otago had been declined. In 1971 New Zealand imported 170,947 tons of sugar, of which it consumed 156,340 tons.

* * *

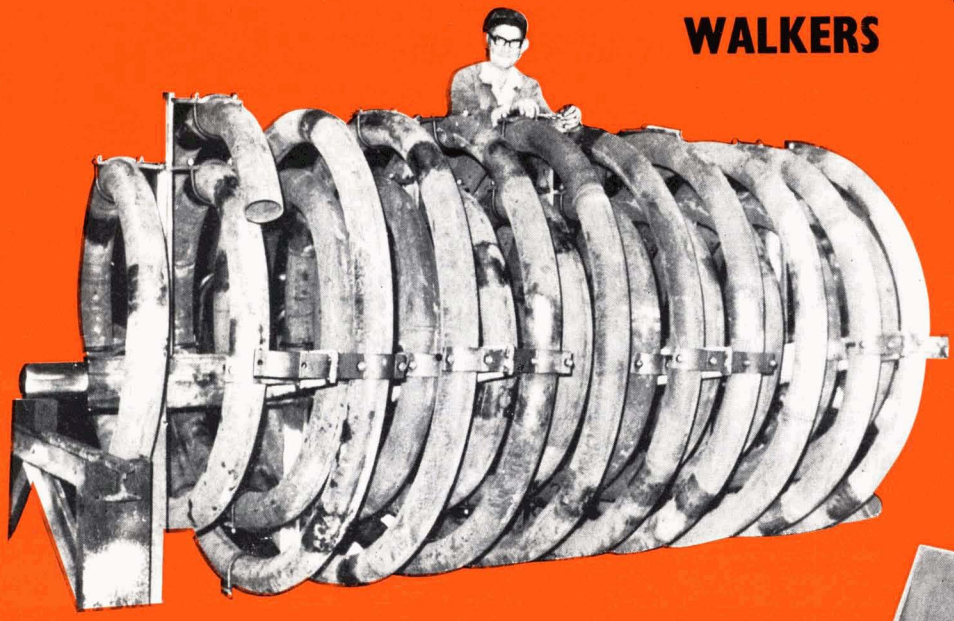
Spain to limit sugar production.—It is reported[10] that under a decree published in Madrid, Spanish sugar production in 1973/74 will be limited to 825,000 metric tons, of which 785,000 tons will be from beet and 40,000 tons from cane. Any production in excess of this, the decree says, will not benefit from guaranteed prices, transport and production subsidies. Spain's sugar requirements for 1973/74 are estimated at 960,000 tons.

---

[1] F. O. Licht, *International Sugar Rpt.*, 1972, **104**, (18), 8.
[2] *Bolsa Review*, 1972, **6**, 381.
[3] C. Czarnikow Ltd., *Sugar Review*, 1972, (1076), 95.
[4] *Brasil Acuc.*, 1972, **79**, 293.
[5] *Zeitsch. Zuckerind.*, 1972, **97**, 349.
[6] *Public Ledger*, 24th June 1972.
[7] F. O. Licht, *International Sugar Rpt.*, 1972, **104**, (24), 10.
[8] *I.S.J.*, 1972, **74**, 256.
[9] F. O. Licht, *International Sugar Rpt.*, 1972, **104**, (25), 1.
[10] *Public Ledger*, 26th August 1972.

IF YOU WANT CRYSTALLIZERS WHY NOT CONSULT

WALKERS

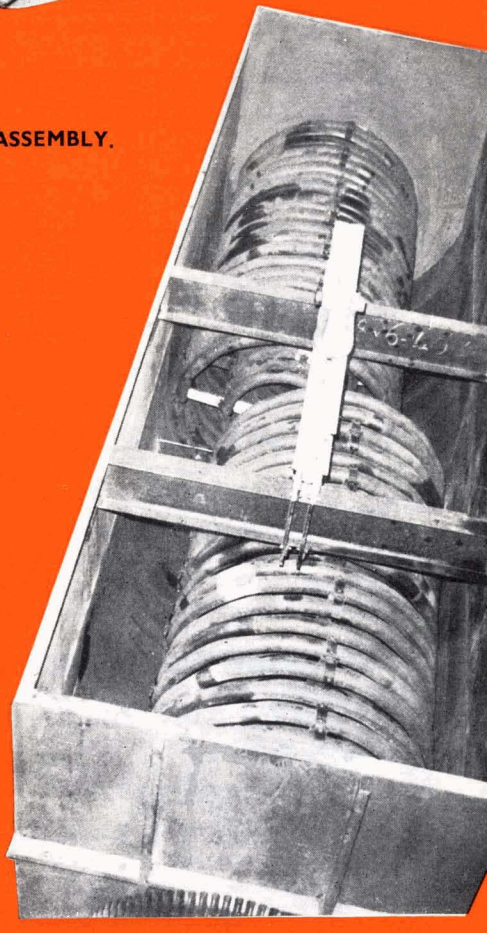


BATCH CRYSTALLIZER COIL ELEMENTS IN COURSE OF ASSEMBLY.

EACH ELEMENT CONSISTS OF TWO CONCENTRIC HELICALLY WOUND COILS WITH THE SAME SMALL HELIX ANGLE.

THE COMPLETED CRYSTALLIZER HAS TWO SUCH ELEMENTS MOUNTED ECCENTRICALLY ON A COMMON SHAFT, THE PRINCIPAL PLANES OF ECCENTRICITY BEING AT 180° TO EACH OTHER AS SHOWN IN THE PICTURE TO THE RIGHT.

THE HELIX ANGLES OF THE TWO ELEMENTS ARE OF OPPOSITE HAND. THIS PROMOTES A GENTLE TO-AND-FRO MOTION OF THE MASSECUITE, WHICH IS AN AID TO CRYSTALLIZATION.



THE COOLING WATER CIRCUIT?
WELL, THAT'S OUR SECRET. WE THINK IT IS BETTER THAN MOST, AND DETAILS ARE AVAILABLE ON A FIRM ENQUIRY.

WE BUILD CRYSTALLIZERS OF ALL SIZES AND TYPES, BOTH BATCH AND CONTINUOUS.

WALKERS LIMITED

CONSULTANTS
DESIGNERS
ENGINEERS

MARYBOROUGH QUEENSLAND AUSTRALIA

Index to Advertisers

FOR THE BUYERS' GUIDE SEE JULY ISSUE pp. xxvi-xlii

KASTEL is the registered trade mark of the ion exchange resins produced by Montedison in a wide range covering all fields of application. The following types of exchangers are available:

For industrial water treatment

KASTEL C 100 weakly acidic exchanger with carboxylic active groups

KASTEL C 101 weakly acidic cation exchanger with carboxylic active groups, and higher exchange capacity

KASTEL C 300 strongly acidic exchanger with sulphonic active groups

KASTEL C 300 P porous strongly acidic exchanger with sulphonic active groups

KASTEL C 300 AGR porous highly crosslinked exchanger with sulphonic active groups

KASTEL C 300 AGR/P porous highly crosslinked exchanger with sulphonic active groups

KASTEL A 101 highly porous, weakly basic anion exchanger, monofunctional (tertiary amine active groups)

KASTEL A 300 strongly basic exchanger (type II) with dialkyl-alkanol amine active groups

KASTEL A 300 P porous strongly basic exchanger (type II) with dialkyl-alkanol amine active groups

KASTEL A 500 strongly basic exchanger (type I) with trialkylamine active groups

KASTEL A 500 P porous strongly basic exchanger (type I) with trialkylamine active groups

KASTEL A 510 highly absorbent resin with strongly porous matrix and strongly basic active groups: specially recommended as scavenger

KASTEL®

For sugar juices treatment

KASTEL C 300 strongly acidic exchanger with sulphonic active groups

KASTEL C 300 AGR porous highly crosslinked exchanger with sulphonic active groups

KASTEL A 105 weakly basic exchanger with tertiary amine active groups

KASTEL A 501 D decolourizing resin with a highly porous matrix and strongly basic active groups

The Technical staff of Montedison, with their wide experience in both the laboratory and industrial fields, are available for consultation and collaboration on the various problems which may be encountered by end users and engineers in the application of these products.

For further information please apply to:

MONTEDISON

Divisione Prodotti Industria - Vendite Resine Kastel - Piazza della Repubblica, 14/16 - 20124 Milano (Italy)
Tel. 6333 - Telex 31679 Montedis

or to the General Representative
Joseph Weil & Son Ltd. - 11A West Halkin Street - London SWIX 8LF - Tel. 01-235 8642/50 - Telex 918743
Inland Telegrams: London Telex 918743 - Overseas Cables: Ullubrossa London

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.