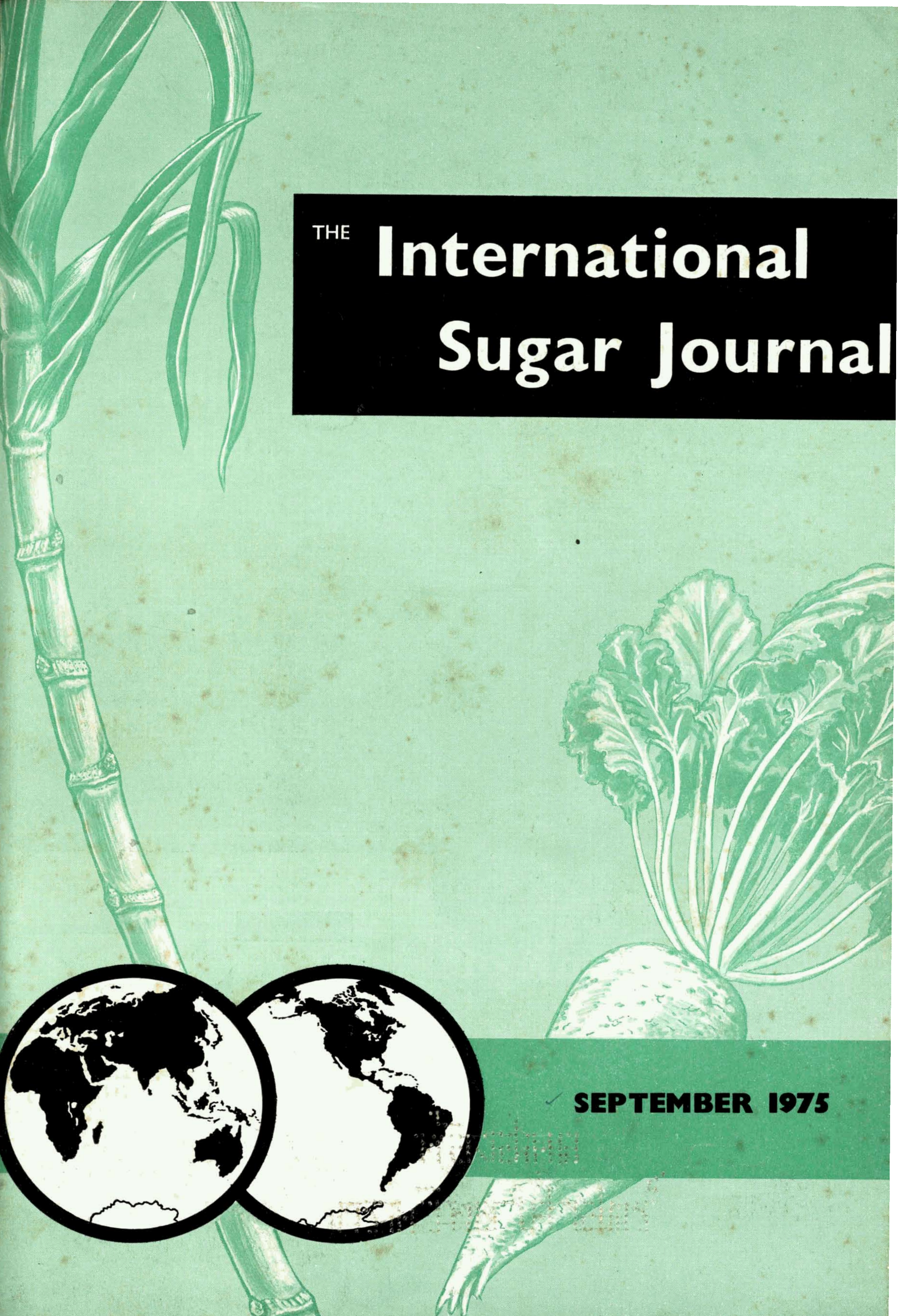
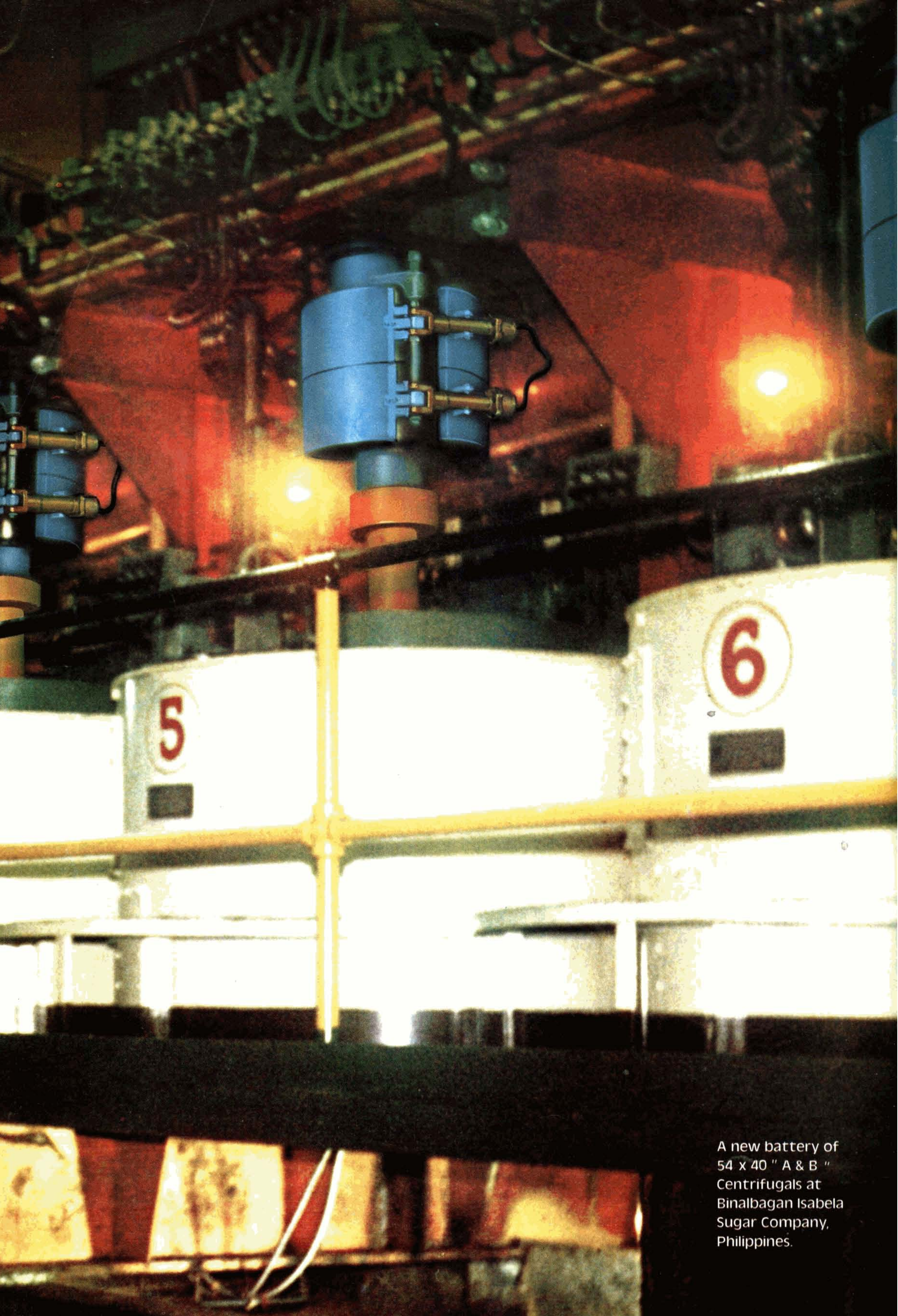
THE

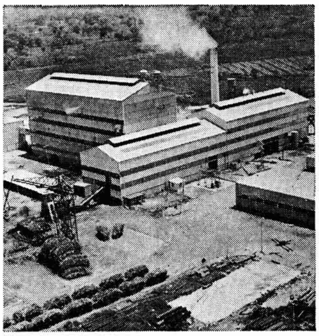
International Sugar Journal

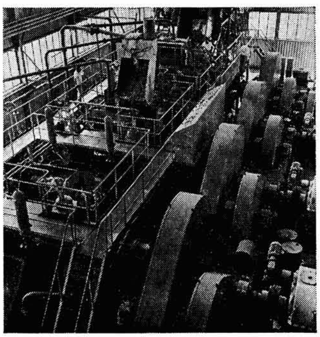


SEPTEMBER 1975



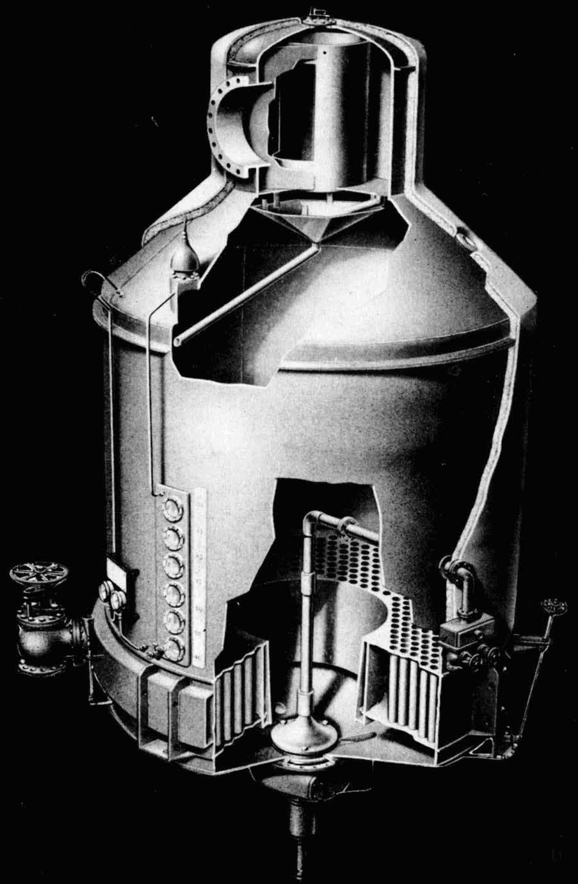
A new battery of 54 x 40 " A & B " Centrifugals at Binalbagan Isabela Sugar Company, Philippines.





When you think of sugar machinery...

The Super Squat Calandria Vacuum Pan



MAXIMUM HEAT TRANSFER

MINIMUM CIRCULATION RESISTANCE

LOW HYDROSTATIC HEAD

IMPROVED STEAM FLOW

INDEPENDENT VENTING OF GASES

MULTIPLE CONDENSATE OUTLETS

REDUCED ENTRAINMENT

...think of FS

FS design and construct complete sugar factories and refineries, and supply a fully comprehensive range of unit equipment and spares for the sugar industry.

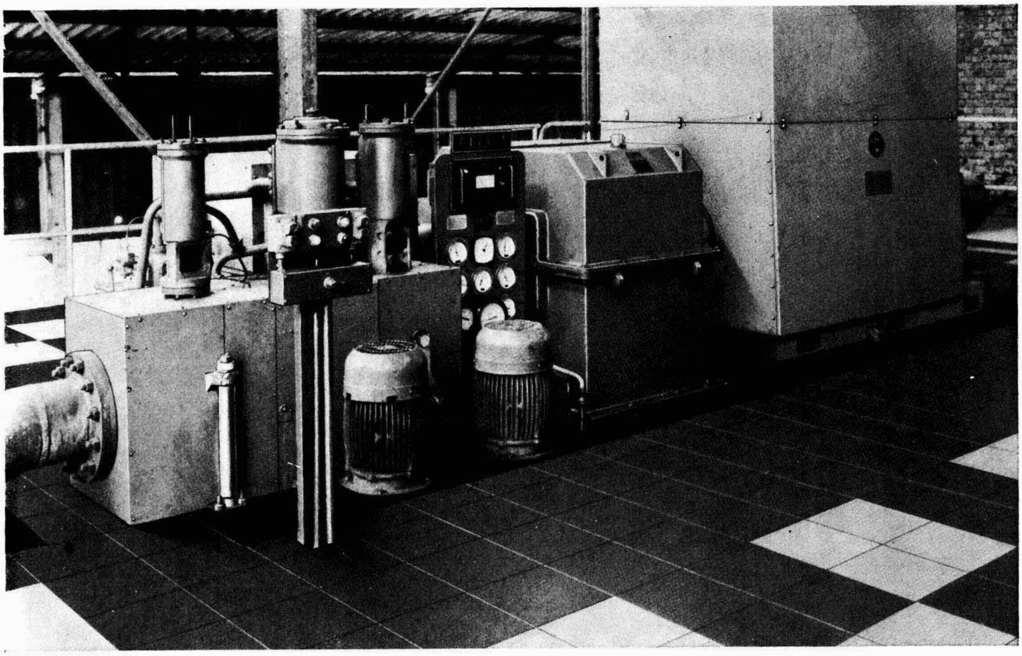
FS Fletcher and Stewart Limited
DERBY - ENGLAND - DE2 8AB

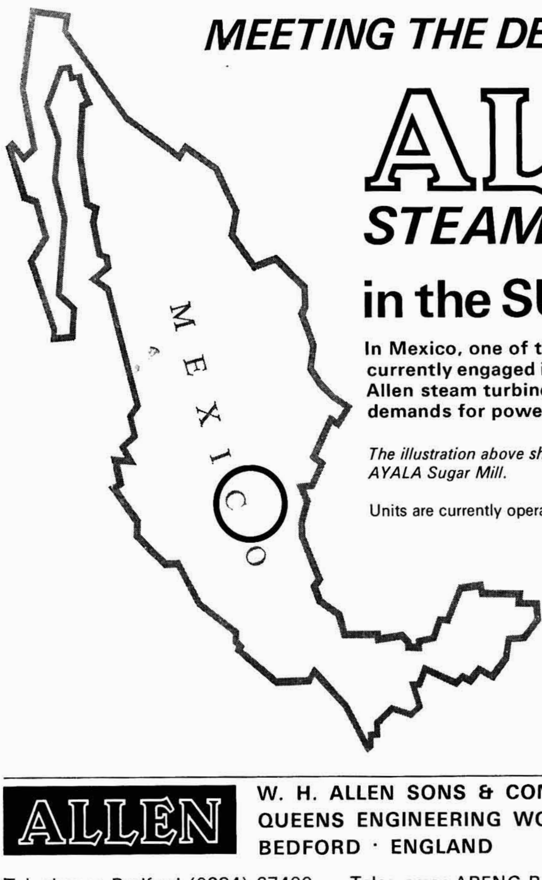
1966 1972

Telephone: Derby 40261 Telex: 35714 Telegrams: Amarilla Derby Telex

A Member of the Booker McConnell Group of Companies

H5




MEXICO

from part-time

restores full-time performance

tinuously to those evaporator bodies where scaling is most serious. Low dosage levels typically reduce cleaning-time without extending the operating cycle. Higher dosage levels extend the time between cleanings 3 or more times. In fact, in many areas today, with Fabcon's Scaling Index Control, evaporators can be operated throughout the crop *without* cleaning.

Example of typical increase in revenue

A. Compressed milling time	
Basis 5% reduction in time to mill equal amounts of cane; 10% Sucrose in cane at crop start or end. 13% average Sucrose in cane throughout crop. For 100,000 tons cane	
100,000 TC x .13 Sucrose x .85 BHE x .93 extraction x .05 of total time sucrose produced at overall average sucrose content	= 513.8 tons
100,000 TC x .10 Sucrose x .85 BHE x .93 extraction x .05 of total time sucrose at crop beginning or end	= 395.2 tons
Additional sugar produced	
118.6 tons additional sugar x $250.00/ton estimated sugar price	= $29,650.00
B. Reduced operating cost	
Basis 100,000 tons cane; $2.50 per ton cane average factory operating cost; 5% reduction in time	
100,000 TC x $2.50/TC x .05 time saved	= $12,500.00
C. Cost of I-12S usage	
Basis 100,000 tons cane; 6 ppm overall average I-12S usage	
600 kilos I-12S used. Approx. delivered cost $26.40 per 1,000 tons cane	= $2,640.00
Less 50% of current cleaning cost	
Cleaning cost estimated at $25.00 per 1,000 tons cane	less $1,250.00
Net additional I-12S cost	= $1,390.00
ADDITIONAL REVENUE FROM I-12S USAGE per 100,000 tons cane	**= $40,760.00**

What is Scaling Index Control?

Scaling Index Control is a convenient analytical technique to determine accurately the amount of scale actually forming in the evaporator. When the Scaling Index shows scales are forming, I-12S dosage is increased to restore scale-free operation. If the index is unusually low, I-12S dosage is reduced for increased economy.

I-12S chemically holds calcium soluble and deactivated in the juice preventing precipitation of the calcium salts. It is these calcium salts which act as the matrix, cementing together the scale-forming components directly onto heat transfer surfaces.

When you combine I-12S usage with S.I. Control you get predictable performance day by day, despite variations in cane condition, variety or weather. If you can obtain reliable cane delivery and operate the factory without stopping for 2, 5, 8 even 10 weeks, except for part time evaporators, Fabcon's I-12S is your answer. If your evaporators work full-time, only occasionally falling victim to unexpected scaling conditions or inefficient cleaning, Fabcon's I-12S is also the answer; together with S.I. Control. A minimum I-12S maintenance dosage keeps evaporator scale light and soft. The Scaling Index blows the whistle when more I-12S must be used to prevent an unusual scaling condition —all at a very low average cost for I-12S.

With metering pumps, mixers and technical service provided by Fabcon, it is the most efficient way to maintain your evaporators. With the increasing cost and scarcity of cleaning chemicals, labor and materials, it is certainly the *least expensive* way to maintain your evaporators. Considering today's high sugar prices the regular use of I-12S should help increase total revenue significantly.

If you suffer from part time evaporators, Fabcon has the cure. Let us prove it to you! Buy I-12S for three months usage or longer and we will supply the equipment and technical service during this usage without charge. Call your local Fabcon Service Engineer or representative, or write for additional details on I-12S usage with S.I. Control today.

Fabcon: a world of service to the sugar industry

Published by
The International Sugar Journal Ltd.
23a Easton Street, High Wycombe,
Bucks. England.
Telephone: High Wycombe 29408
Cable: Sugaphilos, High Wycombe
Telex: 21792 REF 869

* * *

Annual Subscription: £5.00 or $15.00 post free
Single Copies: 60p or $1.80 post free

* * *

UK ISSN 0020-8841

International Sugar Journal

September 1975

Contents

SOMMAIRES : ZUSAMMENFASSUNGEN : SUMARIOS

Récupération du sucre des mélasses de betteraves par le procédé d'exclusion d'ion de P. & L. Partie I. H. G. SCHNEIDER et J. MIKULE. *p*. 259–264

Les principes fondamentaux d'exclusion d'ion sont expliqués et l'application du procédé de récupération de sucre à partir de mélasses de betteraves est décrite. Des tests sont décrits dans lesquels les mélasses étaient séparées par exclusion d'ion en 1° un produit de grande pureté et de faible contenu en cendres 2° un produit de basse pureté et de contenu élevé en cendres et dont le sucre est récupéré par cristallisation. Les recherches, grâce à une usine pilote, furent concentrées sur le comportement de certains constituants des mélasses, la purification mécanique des mélasses avant exclusion d'ion, le fonctionnement de l'usine et l'efficacité de la résine. Les résultats indiquaient que le sucre peut être récupéré économiquement seulement si la charge en calcium et magnésium de la résine n'excède pas 15 à 20% de sa capacité totale. Le mécanisme du remplacement de l'ion calcium par les ions potassium et l'effet de la concentration de la solution furent également étudiés.

* * *

Amélioration du brûlage avec des agents dessicants comme aide à la moisson mécanisée. R. P. HUMBERT. *p*. 265–268

Des investigations ont été conduites relatives à l'efficacité du "Gramoxone" agent dessicateur sur l'efficacité des performances relatives au brûlage et à la moisson de la canne. Les résultats ont indiqué une réduction des déchets dans la canne traitée comparée avec la canne non-traitée et une augmentation dans l'efficacité de la moisson de la canne, aussi bien manuelle que mécanique. Les bénéfices dus à la réduction des déchets sont indiqués.

* * *

Lavage des betteraves en Belgique. *p*. 269–271

Une information est donnée sur le lavoir à betteraves du type RT à pulvérisation, installé à la sucrerie de Brugelette, où le lavoir s'est montré d'une grande efficacité en ce qui concerne le lavage de betteraves très sales durant la campagne 1974/75.

Zuckergewinnung aus Rübenmelasse nach dem Ionenausschlussverfahren der Fa. Pfeifer & Langen. Teil I. H. G. SCHNEIDER und J. MIKULE. *S*. 259–264

Die Autoren erläutern das Prinzip des Ionenausschlussverfahrens und seine Anwendung auf die Zuckergewinnung aus Rübenmelasse. Es werden Versuche beschrieben, bei denen die Melasse durch Ionenausschluss in eine "Produktfraktion" hoher Reinheit und mit niedrigem Aschegehalt und in eine "Abfallfraktion" geringer Reinheit und mit hohem Aschegehalt aufgetrennt wird; der Zucker wird aus der "Produktfraktion" durch Kristallisation gewonnen. Die Untersuchungen mit Hilfe einer Versuchsanlage konzentrierten sich auf das Verhalten bestimmter Melassebestandteile, die mechanische Reinigung der Melasse vor Anwendung des Ionenausschlussverfahrens, die Arbeitsweise der Anlage und die Harzkapazität. Die Ver suchsergebnisse lassen erkennen, dass der Zucker nur dann in wirtschaftlicher Weise wiedergewonnen werden kann, wenn die Beladung des Harzes mit Calcium und Magnesium 15 bis 20% der Gesamtharzkapazität nicht überschreitet. Der Mechanismus der Verdrängung der Calciumionen durch Kaliumionen und der Einfluss der Konzentration der Lösung wurden ebenfalls untersucht.

* * *

Verbessertes Abbrennen durch Trockenmittel als Mittel zur Leistungssteigerung bei mechanischen Ernteverfahren. R. P. HUMBERT. *S*. 265–268

Es wurden Untersuchungen über den Einfluss des Trockenmittels "Gramoxone" auf den Prozess des Abbrennens und die Leistung mechanischer Ernteverfahren durchgeführt. Die Ergebnisse lassen eine Verringerung des Schmutzanteils beim behandelten Zuckerrohr gegenüber unbehandeltem und einen Leistungsanstieg sowohl bei manuellen als auch bei mechanischen Ernteverfahren erkennen. Der finanzielle Vorteil der Verringerung des Schmutzanteils wird aufgezeigt.

* * *

Das Waschen von Zuckerrüben in Belgien. *S*. 269–271

Es wird ein illustrierter Bericht über die RT-Düsenwäsche in der Zuckerfabrik Brugelette in Belgien gegeben, wo sich diese Waschvorrichtung als sehr vorteilhaft bei der Behandlung sehr schmutziger Rüben in der Kampagne 1974/75 erwiesen hat.

Recuperación de azúcar de melaza de remolacha por el proceso P. & L. de exclusión de iones. Parte I. H. G. SCHNEIDER y J. MIKULE. *Pág*. 259–264

Los principios de exclusión de iones se explican tanto como aplicación del proceso a recuperación de azúcar de melaza de remolacha. Se describen ensayos en que la melaza se separó por exclusión de iones en un produto de alta pureza y bajo contenido de ceniza y una fracción sobrante de baja pureza y alto contenido de ceniza, y azúcar se separó del produto por cristalización. Las investigaciones con una planta pilota se conciernaba con el comportamiento de ciertos constituentes de melaza, la purificación mecánica de la melaza antes del tratamiento por exclusión de iones, operación de la planta, y eficiencia de la resina. Las resultas indican que es posible economicamente recuperar azúcar solamente si la carga de calcio y magnesio sobre la resina no excede 15–20% de su capacidad total. El mecanismo de repuesto de iones de calcio por iones de potasio y el efecto de la concentración de la solución se estudiaban también.

* * *

Mejoramiento de la quema de caña con materias desecantes como ayuda para la cosecha mecánica. R. P. HUMBERT. *Pág*. 265–268

Se ha investigado el efecto de "Gramoxone", materia desecante, sobre la eficiencia de la quema de caña y sobre la cosecha. Las resultas indican una dismunución de materia extraña en caña tratado por comparación con caña no-tratado, y un aumento del eficiencia de cosecha manual y mecánica. Los beneficios en dinero de la reducción cel contenido de materia extraña se indican.

* * *

La limpia de remolacha azucarera en la Bélgica. *Pág*. 269–271

Se presenta un informe sobre el lavador marca RT del tipo con rociadores (*ISJ*, 1974, **76**, 268–269) con cuadros de la planta en la fábrica de Brugelette en la Bélgica, donde el lavador se ha demostrado de sumo beneficio en el manejo de remolacha muy terrosa durante la campaña 1974/75.

THE

INTERNATIONAL SUGAR JOURNAL

VOL. LXXVII | SEPTEMBER 1975 | No. 921

Notes & Comments

World sugar production

F. O. Licht K.G. have recently published[1] their fourth estimate of world sugar production for the crop year September 1974/August 1975 and details, with comparative figures for the previous two crop years, appear elsewhere in this issue. By comparison with the third estimate, published in February, many more crops had closed and the estimates are actual results or nearly so, although there remains a number of countries for which the figures remain estimates of crops in progress.

The total of world production is set some 700,000 tons lower than expected in February, the greatest factor being a 500,000 tons reduction in the USSR crop which is set at only 8,000,000 tons. The Thailand crop is set some 20% lower at just over a million tons, while reductions of about 150,000 tons each have been made in the estimates for Brazil, the Dominican Republic, and the US beet sugar crop.

An increase of 100,000 tons has been made in the Cuban crop estimate while the Indian figure is set no less than 350,000 tons higher, at 4,850,000 tons. The Bangladesh figure is amended to 111,162 tons as against 99,793 tons in 1973/74; this compares with the earlier forecast of 40,000 tons which had represented a drop of more than half of the third estimate of 89,814 tons for the previous crop. Other minor changes provide a total sugar production estimate of 78,880,486 tons, 1·72 million tons less than produced in 1973/74 and 1·76 million tons more than in 1972/73. The cane sugar sector shows an increase of 1·3 million tons between 1973/74 and 1974/75 so that the 3 million tons drop in beet sugar production—almost all of it in Europe and representing more than 10%—shows the disastrous nature of the last campaign.

* * *

World sugar prices

The world price of raw sugar on the London market rose early in July to £210 per ton and for a month fluctuated between £170 and £215 per ton. The white sugar quotation which started on the 1st July with a differential of £35 per ton rapidly dropped to £15 and has been at about this level on most days, although it has dropped lower on occasions and on the 7th August had even sunk to —£2, with white sugar costing £198 per ton and raw sugar £200.

A number of factors have influenced the market during the month, in particular rumours and claims from the Philippines of sales to the USSR. In view of Russian purchases of grain from the USA it seemed quite likely that the beet crop had also been affected by the prolonged dry spell and that sugar would also be needed. Soviet sources strongly denied this, however, and the rumours have faded.

Reports have also circulated of drought reducing crops in the Caribbean, however, and frost and flood damage in Brazil, as well as of returning demand in the USA. All these factors have had a strengthening effect on the market, while the low crop and sugar weight shown by the first beet tests from Sweden indicate that it might be prudent to allow for lower output in Western Europe as a result of the hot dry summer it is enjoying.

* * *

UK sugar import differences

Under the agreement reached early this year, the British Government agreed to pay £260 per ton for raw sugar imported during 1975 from the ACP countries, this price being about double the guaranteed price offered by the EEC to suppliers signatory to the Lomé Agreement. The latter agreement includes a guaranteed access of 1·4 million tons a year, starting 1st July 1975. The ACP countries wanted to send the whole of this amount to the UK within the 1975 calendar year so as to obtain the higher price for all the 1,400,000 tons; however, in contrast to the high prices prevailing when the price of £260 was agreed, world values are considerably lower and sugar plentiful. Thus it is possible to import white sugar and sell it in Britain at a lower price than is paid for the ACP raw sugar.

A pooling arrangement had been agreed by the refiners and the British Sugar Corporation whereby a common price applied to all white sugar sold by them, the BSC sugar subsidizing the refined cane sugar; this agreement was to end on the 30th September and the refiners notified the ACP suppliers that they would not accept deliveries at £260 a ton until they knew what Government arrangements would be made to permit them to operate competitively.

Negotiations took place and it was agreed to extend the pooling agreement beyond September; however, the British Government informed the ACP countries that it would not accept all the 1,400,000 tons of sugar before the end of the year and at the higher price. An offer was made to accept 700,000 tons but the ACP companies are reported to have rejected any curb. It is difficult to see how the UK can be forced to accept sugar it does not want or need at a premium price, and the terms of the agreement

[1] *International Sugar Rpt.*, 1975, **107**, (18), 1–4.

would be met even if no sugar were delivered between July and December 1975 so long as the full 1·4 million tons were accepted in the first half of 1976. In the present economic circumstances of the UK it would seem reasonable that she should look after her own interests (as the ACP countries did in 1974), especially as in this case it would not involve breaking any agreement to do so.

* * *

EEC devaluation for sterling

At the Council of Agriculture Ministers of the EEC held on the 21st–22nd July, it was agreed to devalue the "green pound" by 5%. In order to avoid constant variation of sterling prices in relation to the Community's units of account, an agreed fixed parity was established for those currencies which had a "floating" exchange rate, the "green pound" being the rate fixed for sterling. With the decline of the value of sterling, this rate had become unrealistically high and a devaluation of 5% from 4th August will increase the return to British and Irish farmers. Thus, for instance, the guaranteed minimum price for sugar beet for the 1975 crop will now be £13.11 per ton.

* * *

EEC sugar refiners' problem deferred[1]

French and British requests for increased Community aid for their sugar refiners were referred back to the EEC Commission's Management Committee after Britain had rejected a Commission offer. Britain insisted on a package deal for both countries, wanting an increase in the differential premium imposed on cane sugar refined in beet factories. This resulted from fears that continental beet sugar plants would use their out-of-campaign capacity to refine imported ACP raw cane sugar to the detriment of UK port refiners.

The UK wants the premium to be almost doubled to 1·97 units of account per 100 kg but the top Commission offer was 1·20 U.A. A French request for an increased subsidy to its refiners of sugar from France's former overseas territories was also shelved when Britain insisted on linking the two issues.

* * *

UK sugar expansion plans

The British Sugar Corporation has announced a five-year factory modernization and expansion programme which will make Britain 50% self-sufficient for sugar by 1980. It is planned to spend £15 million in the first year of the programme, 1975/76, and it is hoped to increase the annual expenditure substantially in the following four years of the programme. At present the Corporation supplies one-third of the UK's sugar.

B.S.C.'s chief executive, KENNETH SINCLAIR, said: "This expansion will save £50 million a year on the country's food import bill, and as our sugar—without the special levies operating at the moment in the aftermath of the sugar crisis—is amongst the cheapest produced, it should substantially help in the future to keep prices down for both the housewife and manufacturers using sugar".

By 1980, B.S.C., the biggest beet sugar producer in the western world, aims to increase its present annual sugar production from 950,000 to 1·25 million tons of sugar in an average crop year, and to 1·35/1·40 million tons in above-average years. The investment will be funded from depreciation and retained profits.

British Sugar has 17 factories and the increased production will be achieved mainly through major expansion at five of these: Bury St. Edmunds, Cantley, Newark, Wissington and York. The expansion planned is the equivalent of building three large new factories. A similar level of expenditure will be devoted to modernization and replacement of equipment at all the factories.

Before entry into the EEC, the Corporation had operated under the 1956 Sugar Act which restricted beet acreage and imposed an artificial financial structure on the UK sugar beet industry.

To grow the sugar beet for half of Britain's sugar the acreage will have to expand from the present 500,000 acres to 600,000. A survey by British Sugar has shown the land is available at economical transport distances from existing factories.

* * *

CSR Ltd. Annual Report, 1975

CSR's seven sugar mills in 1974 made 498,000 metric tons, 33,000 tons more than in 1973. Mill efficiencies were satisfactory; although manufacturing costs increased, higher prices for raw sugar led to much higher milling profits. Farmers supplying cane to CSR's four Queensland mills have shared in the expansion of cane lands. To process bigger crops within shorter periods the mills are substantially increasing their capacities.

The two wholly-owned and one partly-owned mills of the Australian Estates Company, acquired on 1st April 1975[2], produced 340,000 tons in 1974 and are being expanded. In New South Wales, mechanization of harvesting developed further in 1974 and will be almost completed for the 1975 season. Discussions are taking place with representatives of cane growers supplying CSR's three NSW mills, concerning the long-term future of the mills and their ownership.

CSR sold 711,000 tons of refined sugar products in the year ended March 31, 1975, or 22,000 tons more than the previous year. Refined sugar, as a basic material in many foods and beverage industries, is holding its position in Australia against other sweeteners and fermentable products. Promotion of specialty sugars such as brown, coffee, caster and cube sugar has led to good increases in sales. Retail demand for unrefined sugar continues to grow, met by specially selected and packed raw sugar.

The New Zealand Sugar Co. Ltd. sold 183,000 tons, 18,000 tons more than in the previous year. The gain reflected customer stockpiling, influenced by industrial problems and by news of sugar shortages in other sugar-importing countries.

As marketing agents for the Queensland Government, CSR conducted negotiations for long-term contracts with some overseas buyers, covering about 1,200,000 tons from each crop for the next five years. The Company are also substantially involved in investigation and planning of handling and storage developments now in progress at two sugar ports, to be financed by $A50 million withheld from 1974 export proceeds. CSR has also helped to develop bulk sugar handling facilities in a number of sugar-importing countries, in the interests of widening market outlets for Australian exports.

---

1 *Public Ledger*, 28th June 1975.
2 See *I.S.J.*, 1975, 77, 159.

Recovery of sugar from beet molasses by the P. & L. exclusion process

By H. G. SCHNEIDER and J. MIKULE

(Pfeifer & Langen, Euskirchen, Germany)

PART I

IN the laboratories of Pfeifer and Langen the recovery of sugar from molasses has been studied for several years.

By the combination of different types of ion exchange resins it was found possible to produce a water-white, odour-free and marketable invert syrup.

Using ion exchange resins in this way, however, the resins must be regenerated with sulphuric acid and ammonia. Lime is needed for the recovery of the ammonia and for the neutralization of the excess of acid used for the regeneration of the cationic resin.

For the treatment of 1000 kg molasses dry substance of 60 purity about 300 kg of sulphuric acid and 135 kg of calcium hydroxide are necessary.

To this amount of chemicals for the regeneration of the resins at least the mineral constituents of the molasses (ca. 14% ash) have to be added for disposal. (In this case it is assumed that the organic non-sugar can be recovered and used, for instance, as a cattle feed additive.)

Thus approximately 575 kg of inorganic waste has to be disposed of per metric ton of the treated molasses dry substance. As this is getting more and more difficult, a process had to be found which was practically independent of chemicals; a process, in which the "waste" non-sugar could be used to bring profit and no loss.

The Steffen process was considered for molasses treatment. As this process normally is concurrent with the beet campaign, the investment was considered too high for a process which could operate economically only for about 70 days a year.

Looking for a process suitable for sugar recovery without chemicals, we discussed ion exclusion. After several small tests it appeared very interesting and worth further study.

The principle of the ion exclusion process

For the performance of this separation process an exclusion column is needed. This column should be a cylinder with a screen at the bottom, supporting the resin. The column is filled with a strongly acidic cation exchange resin in the monovalent salt form.

Cation exchange resins consist of a polystyrene skeleton, cross-linked with divinyl benzene. Active sulphonic groups are affixed to the fine network of the resin, having irregular channels of molecular size. These channels will be filled with water as soon as the resin comes into contact with it. The resin swells in the water and a diffusion of dissolved substances within the resin particles take place.

When a solution containing ionized and non-ionized components, for instance sodium chloride and sucrose, is percolated through a column containing this resin, the sucrose will enter the resin gel by diffusion and remain in there.

The ionized part of the solution, in this case the sodium chloride, will be hindered by the active sulphonic groups from entering the resin as well. The sodium chloride remains in the solution between the single beads of the resin and leaves the exclusion column as the first fraction, the "salt fraction".

To recover the sucrose, water is passed through the resin the same way as the solution mentioned above. It displaces the salt fraction and washes the sugar out of the resin again.

After the "salt fraction" the second part of the column's effluent contains salt and sugar together. This fraction is called the "overlapping fraction" and in a technical process will be recycled.

Finally a fairly pure solution of sucrose, the "sugar fraction" leaves the column.

About 20 years ago WHEATON & BAUMAN published the first paper on ion exclusion[1]. Since that time many well-known scientists and technologists have studied this process and have done good work[2–19]. Nevertheless, there is no report of a full-scale plant working satisfactorily. In the literature several problems are set forth:

(1) High dilution of the products
(2) Difficulties in the removal of calcium and magnesium from the molasses, causing additional waste and costs
(3) Swelling and shrinking of the resin in the course of the cycles, jamming the filter bed
(4) Clogging of the column by suspended matter
(5) Difficult automation
(6) Difficulties with the upper distribution and the lower collecting system
(7) Large exchanger column

Broad outlines of the recovery of sugar from molasses by ion exclusion

Molasses is separated by ion exclusion into a *product* of high purity and low ash and a *waste fraction* of low purity and high ash content.

An example of this separation is shown in Table I.

---

1 WHEATON & BAUMAN: *Ind. Eng. Chem.*, 1953, **45**, 226; US Patent 2,684,331.
2 NORMAN, RORABAUGH & KELLER: *J. Amer. Soc. Sugar Beet Tech.*, 1963, **12**, 363.
3 SCHNEIDER, EMMERICH & SCHNEIDER: *Zucker-Beihefte*, 1952, **1**, 57; 1953, **4**, 78.
4 COLONIAL SUGAR REFINING CO. LTD., Australian Patent 252,328.
5 STARK: *J. Amer. Soc. Sugar Beet Tech.*, 1965, **13**, 492.
6 DOS. 1 567 261 Centropa, Gryllus.
7 TAKAHASHI & TAKIKAWA: *Proc. Research. Soc. Japan Sugar Refineries' Tech.*, 1965, **16**, 51.
8 HOUSSIAU: *Sucr. Belge*, 1968, **87**, 423.
9 ČÍŽ, ČEJKOVÁ & HOBÍKOVÁ: *Listy Cukr.*, 1970, **86**, 109.
10 SARGENT: *Ind. Eng. Chem., Proc. Des. Dev.*, 1963, **2**, (2), 89.
11 SCHULTZ, STARK & LOWE: *I.S.J.*, 1967, **69**, 35, 104.
12 MYER, OLSEN & KALWANI: *Ind. Eng. Chem., Proc. Des. Dev.*, 1967, **6**, (1), 55.
13 SUTHERLAND & MOUNTFORT: *ibid.*, 1969, **8**, (1), 75.
14 SIMPSON & BAUMAN: *Ind. Eng. Chem.*, 1954, **46**, 1958.
15 RUBICON G.M.B.H.: French Patent 1,425,816.
16 SAUNDERS: *Carbohydrate Res.*, 1968, **7**, 76.
17 US Patent 2,937,959.
18 ASHER: *Ind. Eng. Chem.*, 1956, **48**, 1465.
19 GROSS: *Proc. 14th Gen. Assembly C.I.T.S.*, 1971, 445–465.

Table I

Molasses

100 %	Dry substance
63·0	*Q* (apparent purity)
14·5 %	Ash/100 D.S.
8·2	pH
60·0°Bx	

Product	*Waste*
55·9 % Dry substance	44·1 % Dry substance
87·3 *Q*	32·2 *Q*
5·3 % Ash/100 DS	26·1 % Ash/100 DS
19·0°Bx	5·2°Bx
9·0 pH	6·3 pH

As can be seen from Table I, the molasses, or the two resulting fractions, respectively, are diluted during the ion exclusion process and will have to be concentrated later for the recovery of the sugar and also for the further use of the waste.

This concentration should be done in a multiple effect evaporating system with good heat economy and good condensate recovery in order to keep the demand for make-up water low.

In the course of the exclusion process, the resin eventually becomes loaded with calcium and magnesium ions taken out of the molasses. For this reason the exclusion resin has to be regenerated from time to time as will be shown later.

The waste water, after concentration to about 70°Brix, is called fodder molasses, being a molasses from which sugar has been removed under gentle conditions. It bears some similarity to concentrated Steffen wastes, but it contains more sugar and is slightly acidic (pH 5–6) and not alkaline like Steffen waste.

The simplest way to recover the sugar from the product is to crystallize it, when 70% of the sugar can be obtained. The "waste" is molasses, a saleable product.

Pan boiling tests were run on a 2-litre micro-pan developed by the Groupement Technique de Sucrerie in Paris. The product crystallized extremely well. The recovery had to be in two steps, corresponding to a good intermediate- and after-product. The latter was obtained after three days of temperature-controlled crystallization in a crystallizer.

The data of the molasses before exclusion (primary molasses), the exclusion product and the secondary molasses are set out in Table II:

Table II

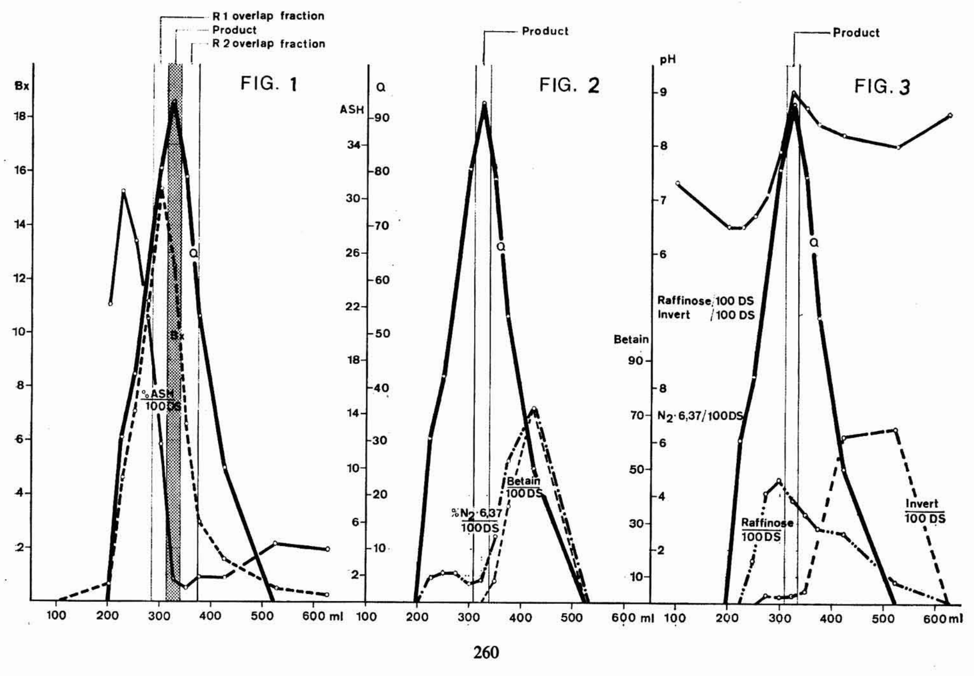
	Molasses before exclusion (Primary molasses)	*Exclusion product*	*Secondary molasses*
Apparent purity	63·1	87·7	61·5
Ash % D.S.	14·8	4·7	12·4
pH	8·5	8·9	8·9

Another way to process the exclusion product is an ion-*exchange* treatment into liquid sugar, but chemicals would be needed for the regeneration of the resins and the question of waste water would possibly be difficult. For this reason Pfeifer & Langen decided on the recovery of the sugar by crystallization.

The behaviour of some molasses constituents in the course of the exclusion process

In the sugar industry certain technical data are used to characterize a process such as juice purification or crystallization in a boiling pan. Four of the most important parameters are Brix, apparent purity, ash content and pH. The first three data are, in fact, sufficient to control the exclusion process.

Molasses is a very complex material, consisting of many organic and inorganic components. For ion exclusion one should know what is hidden behind these summarizing terms, because the distribution of this or that substance to product or to waste can influence the further process.



Figs. 1–3 show characteristic curves of a simple exclusion procedure without recycling. Fig. 1 contains only the Brix, apparent purity (Q) and ash % Brix. The product fraction is indicated by the overlaid pattern. Before the product and after it there are the "overlap fractions" which will be recycled in a technical process.

It should be noted that the purity of the product fraction and the separation of the ash is good.

In Fig. 2 the concentration of the α-amino-nitrogen (measured by the MOORE & STEIN method) and of betaine in the column's effluent are demonstrated. As can be seen from the diagram, these substances can be separated from the product fraction very efficiently.

To determine the behaviour of invert sugar and raffinose, these sugars were added to a molasses, which was then treated by ion exclusion the same way as before (Fig. 3).

Whereas raffinose precedes sucrose, invert or the individual reducing sugars leave the resin after the sucrose.

It should be noted that the pH is at a maximum in the product fraction. It may also be seen that the reducing sugars are much better separated from the product than raffinose.

Fig. 4 is a diagram of the exclusion process under recycling conditions. In principle it supports the prognosis made earlier. The original molasses characteristics were: 59·5°Bx, 61·8 purity, pH 8·5, 0·33 invert/100 D.S., 6·52 Betaine/100 D.S., and 0·26 N/100 D.S. (MOORE & STEIN). It should be noted that there is obviously no accumulation of noxious substances towards the product fraction. Unfortunately only about 40–50% of the raffinose is eliminated.

The mechanical purification of molasses before exclusion

Molasses to be treated by ion exclusion should be free of any turbidity. Only then is it possible to run a column for two or three weeks without interruption, for instance, for the purpose of backwashing.

At about 60–65°Brix this fine filtration is difficult. Owing to suspended and colloidal matter in technical molasses, even carefully precoated pressure filters lose efficiency rapidly, even when filter-aid is constantly added.

The efficiency of the filters was increased significantly when the molasses was treated before filtration using a Westfalia centrifugal separator, and in this way the major part of the suspended matter was removed before filtration. To supply our pilot plant, containing 2·5 m³ resin, with mechanically cleaned molasses, the installation described in Fig. 5 was used.

In tank 1 the molasses was heated and diluted to 60°Brix; afterwards it was passed through the separator. The mud concentrate (ca. 30% suspended solids) was discharged periodically, to be added to the fodder molasses.

Filter-aid was added to the overflow of the separator, which was then sent through a precoated Seitz filter-press fitted with disposable filter paper sheets.

The expenses for filtration are still high at present: 0·93 DM/ton molasses for filter-aid, and 3·60 DM/ton molasses for filter sheets. These figures are maximum costs, which might be much lower in a big plant. The use of other filter systems is under investigation.

The main technical data of the exclusion pilot plant

Fig. 6 is a schematic diagram of the pilot plant installation. The column (1), of stainless steel, has an overall length of 9 m, a resin bed depth of 7·5 m and a diameter of 0·63 m.

It was built to stand a controlled air pressure of 3 bar maximum. To avoid thermal losses, the column is well insulated. The bottom of the column is formed

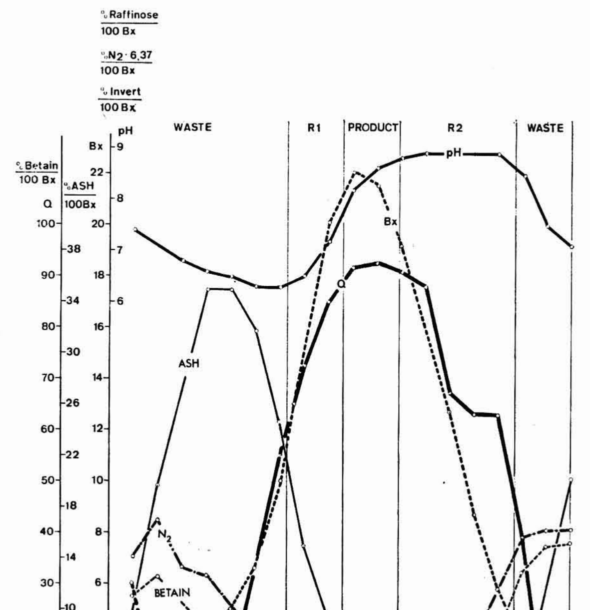


Fig. 4

by a special screen (2), supplied by Industrial Filter & Pump Mfg. Co. On this screen, we used a layer of 20 cm fine gravel (3) to support the resin.

During the operating cycles the resin is subjected to shrinking and swelling, caused by osmotic changes, resulting in an alternating level of the resin.

A bubble-tube, fixed to a float (4) resting on the resin surface, allows a liquid level of about 5 mm above the resin by means of a differential pressure transmitter operating the feed valve.

A constant, predetermined rate of flow through the column is obtained by use of an inductive flow control system (5).

The effluent from the column can be directed into different tanks through the product valve (6), waste valve (7), or recycle valves I and II (8 and 9). A predetermined volume of mechanically purified molasses from tank 11 is fed automatically via flowmeter (20) through heat exchanger (15) to the column.

After addition of the preselected amount of molasses, the exit valve of tank 11 is closed and the discharge valve of tank 12, containing recycle I, is opened.

Recycle I has been collected during the previous cycle and now follows the molasses.

When tank 12 is empty, the bottom valve of this tank closes again automatically and the discharge valve of tank 13, containing recycle II from the previous cycle, opens to allow recycle II to follow recycle I.

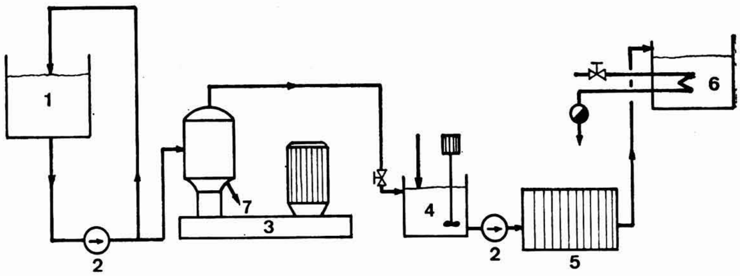


Fig. 5. The mechanical purification of molasses. KEY: (1) Tank for dilution and heating. (2) Pump. (3) Westfalia centrifugal separator. (4) Tank for addition of filter-aid. (5) Seitz filter-press. (6) Tank for purified molasses. (7) Underflow from separator to feed molasses.

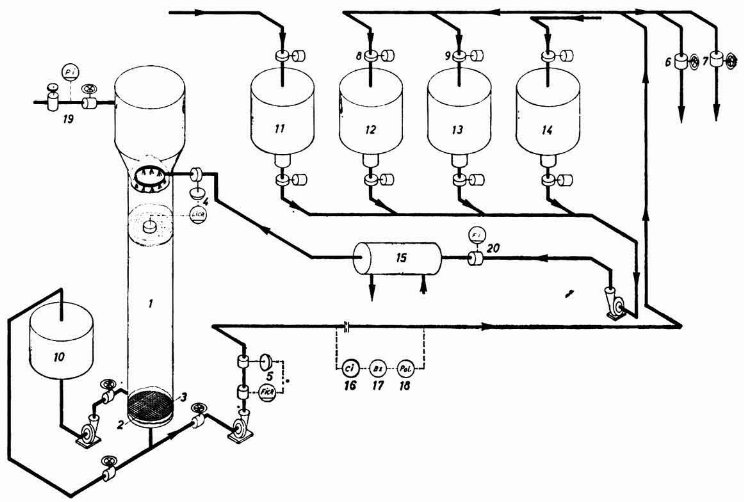


Fig. 6. KEY: (1) Column. (2) "Nevaclog" screen. (3) Gravel. (4) Level control. (5) Column effluent flow control. (6) Product. (7) Waste. (8) Recycle I. (9) Recycle II. (10) Backwash tank. (11) Tank for molasses. (12) Tank for recycle I. (13) Tank for recycle II. (14) Tank for condensate. (15) Heater. (16) Conductivity recorder. (17) Refractometer. (18) Polarimeter. (19) Air pressure control. (20) Flowmeter.

When recycle II is spent, the valve of tank 13 closes again and the valve of tank 14 opens.

A preselected amount of condensate from tank 14 now follows recycle II, after which the valve for condensate closes and the next cycle can start again with another addition of molasses.

It is difficult to backwash the resin in the service column. For this, a wide diameter backwash tank (10) was provided below the column. In a full-scale installation, one backwash tank will be used for several columns. After backwashing, the resin is pumped back into the column.

The operating principle of an exclusion plant

To *start* the process the resin in the column is completely submerged in water at 85°C. The water layer above the resin is less than 1 cm.

About 0·08 bed volumes (B.V.) of molasses of 60°Brix are added, while at the same time water is withdrawn through the draining system.

When the level of the molasses has reached the resin surface, water at the same temperature is sent the same way, until the volume of water + molasses is about 0·6—0·7 B.V.

The "run-off" of the column is divided into fractions. The first 0·7 B.V. is the so-called "sweetening-on water". It can be reused for the dilution of molasses.

The following fractions correspond generally to the conditions described in Fig. 7, starting at the arrow x.

Waste water I:	*waste water with low sugar content*	
(= A I):	Brix	3–4°
	Purity	0–10
	Ash % Bx	25–35
	pH	5·8–6·2
Waste water II:	*waste water with high sugar content*	
(= A II)	Brix	5–11°
	Purity	35–48
	Ash % Bx	23–26
	pH	6·2–6·6

Recycle I: *Overlapping fraction* between the waste water and the product fractions; this composition is close to that of the molasses introduced, but it is more dilute.

Product: (= P)	Brix	15–25°
	Purity	84–91
	Ash % Bx	1–4
	pH	8–9·5

Recycle II: Overlapping fraction between the product and waste water fractions.

In *continuous* operation, the column is charged for example with 0·04 B.V. of molasses of 60°Brix. Directly after the molasses, the recycled fractions I and II are introduced (top column in Fig. 7).

Both recycled fractions are taken from the column in the preceding cycle and, depending on the equilibrium of the column, pumped back to the latter with a longer or shorter time lag. After recycle II, 0·32 B.V. water is added to the column. Thereupon the next cycle begins again with the addition of molasses.

The quantities of the various fractions indicated above constitute only approximate values. Optimum operation is possible only if the fractions are continuously analysed and operation adjusted accordingly.

For this purpose, use is made of the measuring cells shown in Fig. 6:

(1) The recording conductimeter 16 measures the conductivity corresponding to the ash content.

(2) The polarimeter 17 measures the optical rotation and consequently the sucrose content, expressed in mg.cm^{-3}.

(3) The refractometer 18 measures the refractive index and consequently the total dry substance in °Brix.*

Fig. 7 shows the values of the column output obtained in this way for a complete cycle. The set-points for the classification of the individual fractions can also be seen therefrom. The following abbreviations are used:

P 1: Determined by measuring polarization between recycled fraction II and waste water I.

B 1: Determined by refractive index between waste water I and waste water II fractions.

B 2: Determined by refractive index between waste water II and recycled fraction I.

C 2: Determined by conductivity between recycled fraction I and the product fraction.

B 3: Determined by the refractive index between the product fraction and the recycled fraction II.

There are thus obtained the following definitions for the individual fractions:

Begin AI:	Conductivity > C1	Polarization < P1	Bx < B1
End of AI:			Bx = B1
Begin A II:	Conductivity > C2	Polarization > P1	Bx > B1
End of AII:			Bx = B2
Begin R1:	Conductivity > C2	Polarization > P1	Bx > B2
End of R1:	Conductivity = C2		
Begin P:	Conductivity < C2	Polarization > P1	Bx > B2
End of P:			Bx = B3 = B2
Begin RII:	Conductivity < C2	Polarization > P1	Bx < B3 = B2
End RII:		Polarization = P1	
Begin AI:	Conductivity > C1	Polarization < P1	Bx < B1
End of AI:			Bx = B1

etc.

The recycled fractions RI and RII have enough purity and sugar concentration to enable them to be profitably resubjected to the exclusion process after the molasses. As compared with the molasses, these recycled fractions are very dilute and, together with the water following them, serve for the elution of the exclusion resin, while at the same time a proportion of the sugar contained in them is separated.

Coming back now to the practical performance; according to Fig. 7 there are 5 set-points.

The values for the various points may for example be:

Conductivity: $C1 = 1{\cdot}0 \times 10^{-4}$ S.cm^{-1}

$C2 = 2{\cdot}5 \times 10^{-4}$ S.cm^{-1}

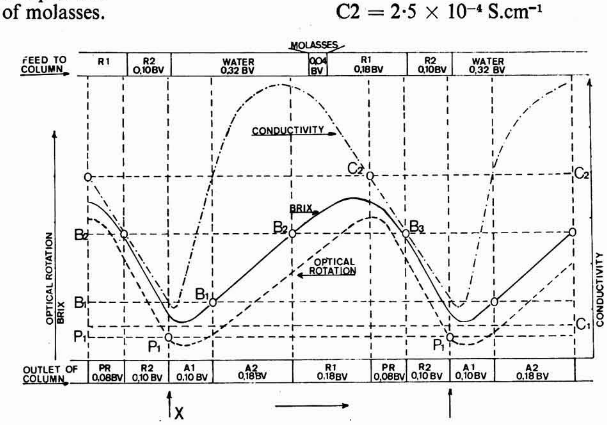


Fig. 7

Optical rotation: P1 = 0·2 g.l^{-1} referred to the polarization of sucrose

Refractive index: B1 = 5°Bx

B2 = 12°Bx

The operator has to watch these setpoints. The pilot-plant is automated to such an extent that the operator has only to push a button when he has reached the individual set-point to introduce the next phase of the process.

The efficiency of the ion exclusion resin

For the exclusion process a gel-type, strongly acidic cation exchange resin is used, crosslinked with ca. 4% D.V.B.—apart from the low crosslinking, this is an ordinary cation exchange resin. The resin should be in the monovalent salt form.

In the course of the operating cycles, the resin picks up calcium and magnesium ions from the molasses. This calcium and magnesium pick-up adversely affects resin capacity.

* *Conductimeter:* Conductivity recorder for pan boiling control by Wösthoff, Bochum, Germany.
Polarimeter: OLD IV by C. Zeiss, Oberkochen.
Refractometer: Zeiss Model B. Abbe refractometer.

Fig. 8 shows the loading of the exclusion resin with calcium and magnesium ions in relation to the number of exclusion cycles carried out.

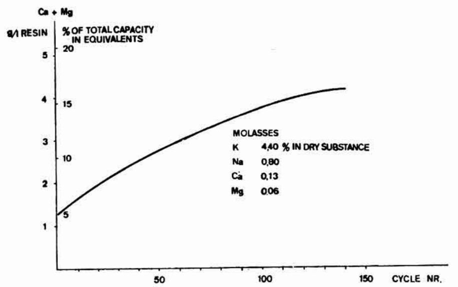


Fig. 8

Fig. 9 shows the loading of the exclusion resin with calcium and magnesium ions in relation to the sugar yield obtained in the exclusion process.

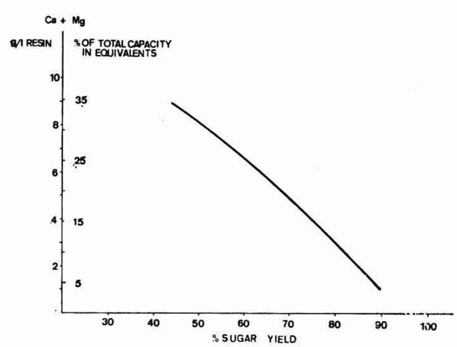


Fig. 9

Fig. 10 shows the loading of the exclusion resin with calcium and magnesium ions in relation to the ash content of the product obtained.

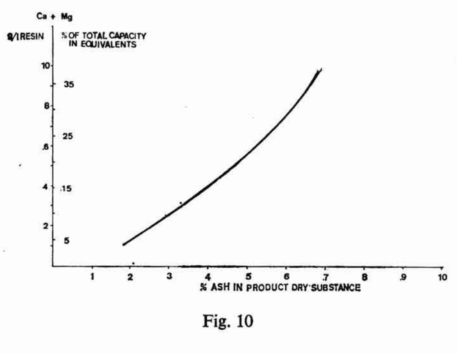


Fig. 10

From the two last figures it may be seen that the extraction of sugar can be carried out economically only if the exclusion resin is loaded with calcium and magnesium ions at the most to the extent of 15–20% of its total capacity. A resin loaded with alkaline earth ions to this extent is regarded as exhausted. From Fig. 8 it may be seen that the resin is exhausted after about 100–150 cycles and accordingly must be regenerated.

The equilibrium loading of an ion exchange resin and consequently also of the exclusion resin used in the replacement of bivalent (Ca^{2+}) by monovalent (K^+) ions is illustrated in accordance with the law of mass action by an expression which includes the total concentration of the solution:

$$\left(\frac{X_{Ca^{++}}}{X^2_{K^+}}\right)_R = K\,\frac{C_R}{C_S}\left(\frac{X_{Ca^{++}}}{X^2_{K^+}}\right)_S$$

$X_{Ca^{++}}$ and X_{K^+} = Fraction of the total concentration in equivalents per volume or unit of weight, which is attributable to calcium or potassium, C = Total concentration in equivalents per volume or unit of weight, K = equilibrium constant, R and S = indices for the exchange resin and the solution respectively.

For the sake of simplicity, the calcium plus magnesium ion contents will be calculated here as calcium content.

With a constant ratio of potassium to calcium in the solution, the adsorption of calcium by the resin is a function of the total concentration C_S in the solution.

C_R is the total capacity of the resin and, consequently, a constant factor.

The exchanger will therefore preferentially absorb calcium ions from solutions of low concentrations even if the concentration of potassium is several times that of calcium.

With a high total concentration, however, the potassium ions will displace the calcium ions from the exchanger. This process takes place during regeneration.

In the ion exclusion treatment of molasses the total concentration of the solutions passed over the ion exclusion resin is variable.

A molasses of 60°Brix for example is introduced. Elution is then effected with recycled fractions and finally with water.

A mean concentration of about 15°Brix is thus attained at the outlet of the column, and consequently also a correspondingly lower total concentration C_L in the solution.

A molasses solution of 60°Brix is about 1 normal with respect to the ions, but at 15°Brix it is only about 0·2 normal. This dilution is sufficient to influence the equilibrium between the resin and the sugar solution in such a manner that calcium and magnesium are absorbed by the resin.

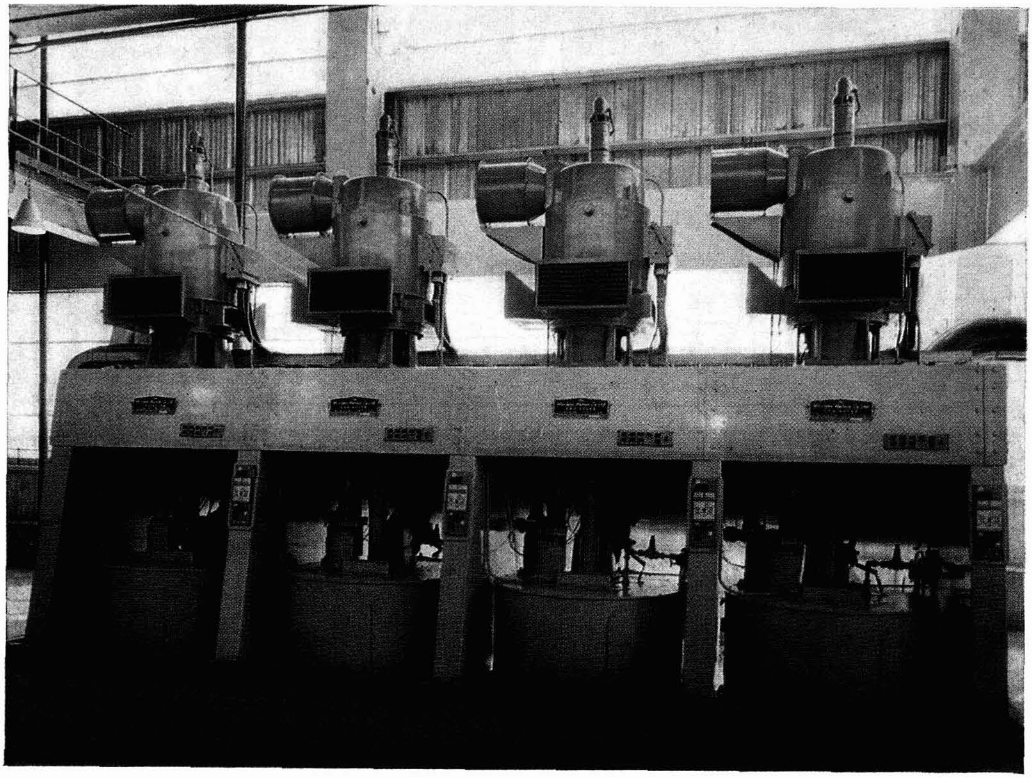
Tests involving precipitation of the calcium and magnesium ions of the molasses were not very successful. Only a small part of the alkaline earths could be removed this way.

(to be continued)

SMITH MIRRLEES

sugar centrifugals

BATCH TYPE



OUR DESIGN BASIS

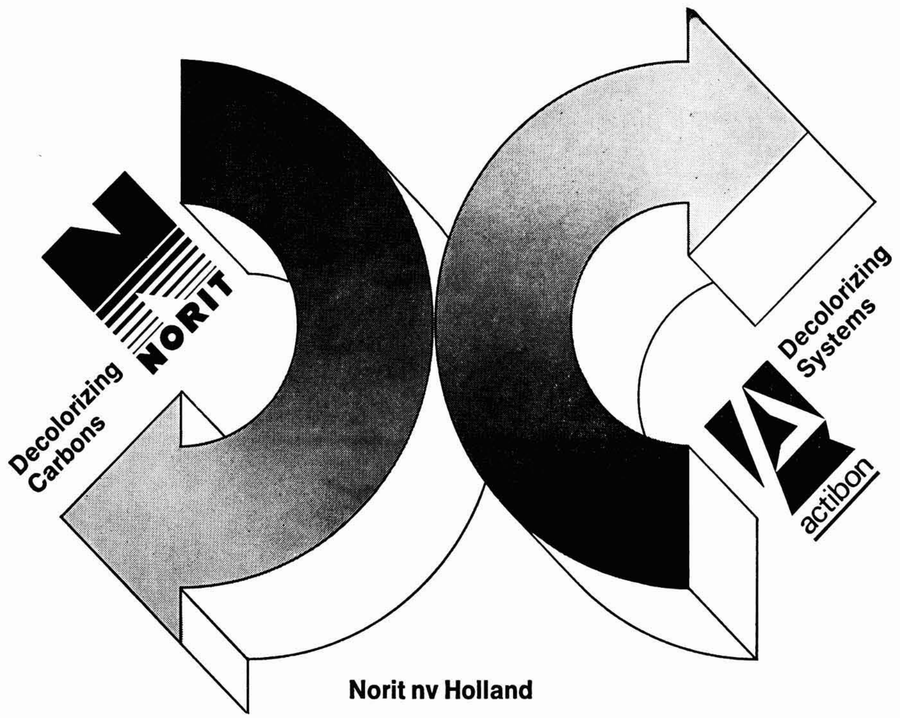
1 Maximum Efficiency and Reliability
2 Minimum Number of Working Parts
3 High Output
4 Minimum Maintenance
5 Low Operating Costs

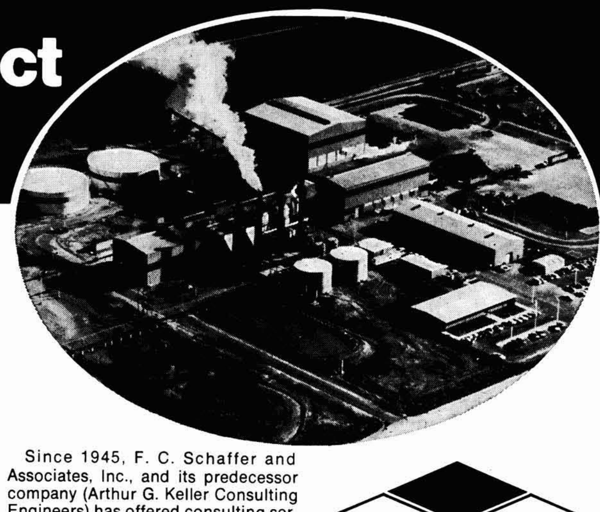
A. & W. Smith & Co. Ltd.,
Registered Office:
Eglinton Works, Cook Street
Glasgow, G5 8JW
Registered in Scotland No. 3517.
Telegrams: Sugrengine, Bromley, Kent.

The Mirrlees Watson Co. Ltd.,
Registered Office:
21 Mincing Lane, London, EC3R 7QY.
Registered in England No. 891546.
Telex: 2-2404
Telegrams: Mirwat, Bromley, Kent.

Head Office:
No. 1, Cosmos House,
Bromley Common, Bromley, Kent,
England. BR2 9NA.
Telephone: 01-464 5346
Telex: 2-2404

members of the Tate & Lyle Group


NORIT
Decolorizing Carbons
Decolorizing Systems
actibon
Norit nv Holland



Improving burns with desiccants as an aid to mechanical harvesting

By ROGER P. HUMBERT

Paper presented to the 15th Congr. ISSCT, 1974

Introduction

MECHANICAL harvesting is developing rapidly in many sugar cane producing countries, and others are programming for its eventual use. Hawaii was the first to be forced to make the change from hand cutting to mechanical harvesting. Hawaii chose a system of push-raking and grab loading that necessitated the installation of costly wet-cleaning plants for the removal of most of the extraneous material brought to the mills with the cane.

The Louisiana industry developed whole-stick harvesters that cut and windrowed the cane on the ground. Mechanical loading resulted in relatively high levels of trash in the cane taken to the mills.

The Australian cane sugar industry started mechanization of cutting with whole-stick harvesters, but rapidly changed to chopper-harvesters, which are now finding widespread acceptance in many countries.

Desiccants are now being used to improve burns prior to harvesting. This reduces the trash in the cane in early and late-season harvests and results in higher sugar recoveries.

The trash problem

Hand cutting, in many countries, is slowly but surely deteriorating. The chopper-harvesters often do a better job of cutting at the base of the stools than the hand cutters do now. In standing cane, the topping devices are as effective as the hand cutters. In lodged cane, the chopper-harvesters do deliver more growing points than are delivered in most hand-cut cane but hand cutters are becoming reluctant to top at all.

The increasing costs of hand cutters, and their declining performance in many areas, has resulted in an increasing interest in mechanical cutting and loading. Table I shows the increase in factory fibre % in the years during which Los Mochis, Mexico, converted from hand-cut, hand-loaded cane to hand-cut, mechanically-loaded cane. Note that the laboratory fibre % remained constant during this 4-year period, while the factory fibre % climbed steadily, owing to the increased quantity of tops, leaves and soil delivered with the cane.

Fig. 1 shows the proportion of cane loaded mechanically, the proportion cut mechanically, and the % fibre in cane in the period 1950 to 1970, inclusive, for the Puerto Rican sugar industry. As the proportion of mechanically loaded and mechanically cut cane increased, the fibre % rose proportionally. The extraneous material in cane averaged 25% in 1970,

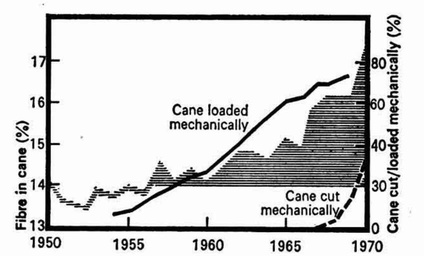


Fig. 1. Extraneous material in cane related to mechanical loading and mechanical cutting in Puerto Rico

and this was one of the principal reasons for the drastic decline in sugar production in Puerto Rico.

Trash continues to be a problem even with the excellent engineering that has gone into the development of the chopper-harvesters. CASTRO & BALDERI[1] reported that 23 Toft single-row crawler cane harvesters were used to harvest the entire 1972-73 crop of 1,100,000 tons cane at Talisman Sugar Corporation, Florida. The harvesters, even with two trash extractor fans, delivered cane that averaged 10·9% trash compared with a previous average of 5%. The trash for 15-day periods ranged from a low of 8·5% to a high of 15·3%. Fibre % cane increased from 12·3 to 13·34 and bagasse % cane increased from 29 to 32·47.

Increased mud at the clarifiers resulted in more sucrose losses in filter cake. The clarifier and filter station capacities were reduced by 20%, but other station capacities were normal. Sugar quality was unchanged.

The increased milling costs and sugar losses were counterbalanced by savings in harvesting costs. The mechanical harvest of 1,100,000 tons cane was reported to have cost $1.13 per ton whereas the cost of hand cut and mechanically loaded cane was $2.29 per ton.

Reducing trash in the cane

Ingenio La Esperanza, Argentina, has successfully mechanized harvesting operations, and has learned to minimize trash in the cane by using the desiccant "Gramoxone"[2]

When Esperanza first changed from hand-cut, hand-loaded cane to hand-cut, push-rake and grab-loaded cane, the sugar recovery dropped significantly.

[1] *Proc.* 1973 *Meeting Amer. Soc. Sugar Cane Tech.* In press.
[2] HUMBERT: *Outlook on Agric.*, 1972, 7, (1), 10–13.

Table I. Mechanical harvesting changes at Ingenio Los Mochis, Mexico

	1962-63	1963-64	1964-65	1965-66
Hand-cut, hand-loaded cane, tons	421,045	160,660	150,497	139,340
,, ,, ,, %	52·3	17·9	15·0	12·4
Thompson grab-loaded cane, tons	381,430	434,441	449,222	351,223
,, ,, ,, %	47·7	48·5	44·8	31·4
J & L continuous-loaded cane, tons	—	300,069	402,288	631,119
,, ,, ,, ,, %	—	33·6	40·2	56·2
Total	802,476	896,170	1,001,996	1,121,682
Factory yield	9·05	8·76	8·08	7·74
Factory fibre, %	15·30	15·56	16·71	18·20
Laboratory fibre, %	15·22	15·07	15·21	15·06

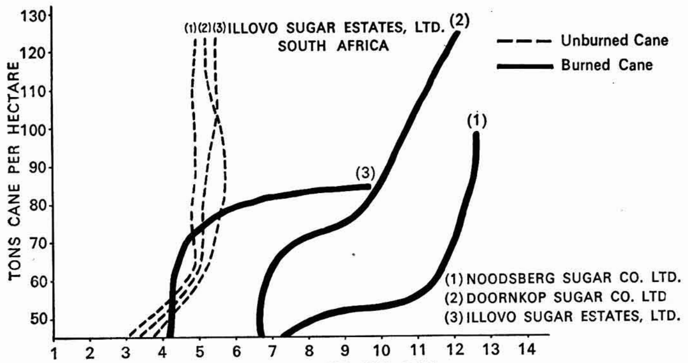


Fig. 2. Relationship between cane yield and cutter output

This was caused by increased soil in the cane, which climbed drastically when poor burns resulted in unusually large quantities of leaf trash remaining with the hand-cut cane which was being pushed into piles near the infield roads for grab-loading.

Controlled studies showed that trash in the cane could be reduced by 50% or more by using "Gramoxone" at 1·5 to 3 litres in 70 to 80 litres of water/ha. Esperanza, which started using "Gramoxone" commercially as a desiccant in 1969, at present uses 10,000 litres per season to reduce the trash in the cane to a minimum.

When to burn

Selecting the time to burn is very important and techniques have been developed at Esperanza to determine the optimum for treated cane. The third leaf down from the spindle is ignited with a match, in the centre of the leaf blade, starting five days after treatment. Tests are made in mid-afternoon on successive days until the leaf burns through the midrib and breaks. The field is then burned by means of a mobile flamethrower which quickly develops walls of fire. The time of day to burn is also important, particularly early in the season when the cane is immature. Mid-afternoons are usually selected unless strong winds force an earlier or later burn.

Higher cutter performance with "Gramoxone"

Shortage of hand cutters for cane in Mexico during the maize harvesting season, in November and December, has resulted in mills stopping for as much as 29% of the time on account of lack of cane. These delays are extremely costly as many mills are expanding their production and need every hour of milling time to process their larger crops.

Studies at Ingenios Tamazula and Tala, Mexico, have shown that the trash in the cane following "Gramoxone" treatment averages 5·4% early in the milling season, while that of the untreated cane averages 10%, with standard hand cutting and grab loading. Investigations show that the hand cutters cut up to 50% more cane per day in cane treated with "Gramoxone," followed by good burns.

Studies in South Africa[3], as shown by Fig. 2, indicate that hand cutter performance reaches a peak of 5 tons cane per day in unburned cane, regardless of the tonnage per hectare. In burned cane, workers cut more than double this amount in areas at higher elevations with cooler climates, and at higher cane tonnages per hectare.

Higher cutter performance of chopper-harvesters in "Gramoxone"-treated cane

Time and motion studies at a number of estates show that the performance of the mechanical cutters is significantly improved with well-burned cane. A summary of these studies is shown in Table II.

Type of trash in chopper-harvested cane

The type of extraneous matter in mechanically harvested cane is extremely important. Soil in the cane is considered to be the most serious cause of reduced sugar recovery. Tops and growing points are next in importance, and leaf trash is least important.

[3] Private communication (Illovo Sugar Estates Ltd.), 1971.

Table II. Range in chopper-harvester performance and % increase with well-burned cane

Estate, location	*Chopper harvester*	*Number of units*	*Range in tons cane/effective hour cutting*	*% increase in cutting well-burned cane*	*Average % trash in cane*
Santa Rosa, Panama	Toft CH364 & 464	4	15–35	23*	5–12
Primavera, Mexico	Toft CH364	3	20–40	20	8
Los Mochis, Mexico	Massey Ferguson 201	1	19–25	15*	7·2
Los Mochis, Mexico	Claas	1	15	—	11·3
La Esperanza, Argentina	Toft CH364	2	20–40	25*	6–12
Ledesma, Argentina	Massey Ferguson 201	10	10–25	—	—
Tabacal, Argentina	Toft CH364	1	12–25	—	8·7

* "Gramoxone"-treated.

Table III. Range in percentage of soil, leaves, and points in trash delivered with mechanically harvested cane

Estate, location	*Chopper harvester*		*% Soil*	*% Leaves*	*% Points*	*% Total*
Tabacal, Argentina	Toft CH364		2·1	4·9	1·7	8·7
Los Mochis, Mexico	Massey Ferguson 201		0·8	3·5	2·7	7·0
Los Mochis, Mexico	Claas		5·6	1·7	4·0	11·3
Tabacal, Argentina	Toft CH365	July	0·5	3·0	0·6	4·1
		August	1·0	3·7	1·3	6·0
		September	1·5	5·4	2·1	9·0
		October	6·6	5·3	1·6	13·5
		November	8·0	7·6	2·0	17·6
	Weighted average		2·1	4·9	1·7	8·7

Fig. 3. Well-burned cane after "Gramoxone" treatment, La Esperanza, Argentina

Daily analyses for trash in the cane are made at a number of mills to assist in evaluating the economics of obtaining good burns of mechanical harvesting. Examples obtained in the 1972 milling season are shown in Table III. Also shown are the seasonal fluctuations of trash in the cane at Tabacal, Argentina, where there were marked increases late in the milling season associated with frequent showers.

Economic losses from extra trash in the cane

Economic losses were studied at Ingenio Tamazula, Mexico, where growers and millers share equally, on condition that sugar recovery equals the average of the last five crops. The plant cane for the 1972 crop averaged 125 tons cane/ha. Eight per cent trash in the cane was estimated for the first two months, or 250,000 tons cane ground. On the basis of commercial experience with "Gramoxone" as a desiccant in Argentina, and from tests in Mexico, a reduction of 5% trash in the cane to 3% was considered to be achievable for hand-cut, grab-loaded cane.

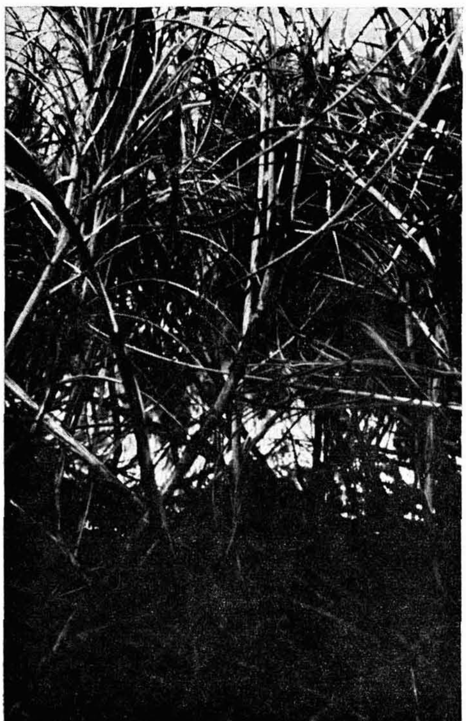


Fig. 4. Poor burn in immature, untreated cane, La Primavera, Mexico.

Cost to growers, per hectare

The cost to growers of the extra 5% trash in the cane is calculated as follows:

Trash = 5% of 125 tons cane/ha = 6·25 tons/ha.	
Cutting cost: 6·25 tons × $Mex6/ton =	$Mex37·50
Loading and transport costs: 6·25 × $14.25 (mean of $12 and $16.50)	89.06
Sugar lost in bagasse by extra fibre in trash†	115.50
Sugar lost in reduced extraction‡	269.50
Total losses	511.56
Sugar gained in "rabo"§	20.82
Net loss/ha	$Mex490.74 or $US39.26

Cost to miller, per hectare

Sugar lost in bagasse from extra fibre from trash†	$Mex115.50
Sugar lost in reduced extraction‡	269.50
Cost of operating factory 9 days (22,755 tons cane)	?
Total losses	385.00
Sugar gained in "rabo"§	20.82
Net loss/ha	$Mex364.18 or $US29.13

(†) 250,000 tons cane × 8% = 20,000 tons trash.
20,000 tons trash × 40% bagasse on cane = 8000 tons bagasse from trash.
Bagasse at Tamazula contains 3·30% sucrose:

$$\therefore \frac{8000 \times 3{\cdot}30}{100} = 264 \text{ tons sucrose in bagasse from trash.}$$

264,000 kg sugar at $1.75 = $462,000 ÷ 2000 ha = $231.00/ha; 50% for growers and millers = $115.50 each.

(‡) The following calculation, for one hectare, is based on milling data from 7th–13th January 1973:

Extraction, sucrose = 89·44% ; sucrose % juice = 12·47%; imbibition % cane = 18·29%; sucrose % bagasse = 3·29%; Bagasse % cane = 36·55%.

From these figures 125 tons cane × 18·29% = 22·86 tons imbibition water; 125 tons cane × 36·55% = 45·69 tons bagasse; 125 tons cane + 22·86 tons water = 45·69 tons bagasse + 102·17 tons juice. Subtracting 6·25 tons trash from each side, 118·75 tons cane + 22·86 tons water = 39·44 tons bagasse + 102·17 tons juice.

In the absence of 5% extra trash:

39·44 tons bagasse × 3·29%	=	1·195 tons sucrose in bagasse
102·17 tons juice × 12·47%	=	12·74 tons sucrose in juice
		13,935 tons sucrose in cane, or 91·42% extraction of sucrose.

In the presence of 5% extra trash:

45·69 tons bagasse × 3·29%	=	1·503 tons sucrose in bagasse
102·17 tons juice × 12·47%	=	12·740 tons sucrose in juice
		14·243 tons sucrose in cane, or 89·44% extraction of sucrose.

Thus the difference in extraction with 5% less trash is 91·42 — 89·44 = 1·98% extraction of sucrose, or 1·503 tons sucrose in bagasse — 1·195 = 308 kg sucrose worth 308 kg × $1.75 = $539.00/ha; $539.00 ÷ 2 = $269.50 for growers and miller.

(§) Analysis of Tamazula "rabo" (tops)
1·743 kg sample
0·355 kg juice extracted Analysis:

	Brix	*Sucrose*	*Purity*
20·37% juice			
79·63% bagasse	9·70	1·88	19·38

On 125 tons cane/ha, the extra 5% trash amounts to 6·25 tons. This contains 6·25 tons × 20·37% juice = 1·27 tons juice, containing 123·2 kg solids and 23·8 kg sucrose.

Assuming 100% recovery, this sucrose is worth 23·8 kg × $Mex1·75 = $Mex41·65/ha gain, or $Mex20·82 each for growers and miller.

Note: 10% trash on net cane causes about 1·5% decrease in extraction if milling rate is kept approximately constant, and 10% trash on net cane causes 1·0 decrease in juice purity[2].

The net loss to both grower and miller is substantial and, when one considers the costs of operating a factory an additional two to four weeks at the end of each season because of the excess trash, one can account for the accelerating interest in desiccants to minimize these losses.

Potential for savings for mechanically cut cane

The trash from mechanically cut cane at Talisman for the 1972/73 crop averaged 10·9%, and the average of the data shown in Table II, at 9%, indicates that the potential for the use of desiccant during the first two months, and the last four to eight weeks when showers occur, is high. The use of desiccants is discontinued during the cold, dry winter when good burns are obtained without them. It is estimated that, during the early and late harvesting periods, the trash in the cane can be lowered by 5% with desiccants.

Desiccant to use

Controlled tests have been conducted by the author and associates in Argentina, Hawaii, Mexico, Panama, Puerto Rico and Africa with sodium and magnesium chlorates, dinitro compounds in water and oil, oil- and water-soluble forms of pentachlorophenol and its sodium salt, aromatic and diesel oils, sea water, "Phytar 560", "Gramoxone" and other desiccants.

"Gramoxone", applied at 1·5 to 3 litres in 70 to 80 litres water/ha has given the best results, and is therefore being recommended for commercial use. Ansul's "Phytar 560" has given equally good results in some tests, but its lack of consistency makes further testing necessary.

The volume of spray used is very important, as the droplets must penetrate the dense, large tops and cover the lower green leaves so that they too will dry and burn as well as the dry ground trash and the dead upper leaves. Ultra-low volume sprays have not been effective in penetrating to the lower green leaves, and drift has been a problem during application on windy days.

Preparation of fields for mechanical harvesting

The poor performance of some of the chopper harvesters is traceable to the lack of preparation of the fields. Infield drainage ditches, rocks, trees, stumps, etc. all combine to lower the cutter's performance. Co-ordinating cane transport is extremely important in keeping the cutters operating.

Irrigation layouts must be modified so that, at harvest time, the surface is compatible with the successful operation of mechanical cane cutters. Inter-row irrigation without decline in yield, is proving feasible in most soils and often has much higher efficiency of water use. Inter-row irrigation, from the time the plant cane is knee-high until the last ratoon has been ploughed-out, means lower water requirements with the cane on a slightly raised bed and a flat U-shaped inter-row. The cane is in an ideal position for cutting at or slightly beneath the soil surface.

Trash in the cane is always lower in fields that have been properly prepared for mechanical harvesting.

Summary

Mechanization of harvesting is developing rapidly in many countries, and others are programming for its eventual use. The problem of trash in cane is considered to be one of the most important difficulties in the shift to mechanical cutting and loading.

Extraneous material in cane delivered to mills is increasing from a normal 4 to 7% in hand-cut, machine-loaded cane to 9 to 12% in cane cut by Australian-type chopper-harvesters, which are finding widespread acceptance in many countries of the world. The increased milling costs and sugar losses caused by the extra trash in the cane are counterbalanced by savings in harvesting costs.

Trash in cane is being reduced from 3 to 5% through the use of the desiccant "Gramoxone" to improve burns prior to harvest. Investigations have shown that hand cutter performance increases from 50 to 100% in "Gramoxone"-treated, well-burned cane by comparison with unburned or poorly burned cane.

Studies with chopper-harvesters show their performance to be increased from 15 to 25% in "Gramoxone"-treated, well-burned cane.

The use of desiccants to improve burns results in a surprising reduction in soil in the cane when it is mechanically cut and loaded.

Economic losses from 5% extra trash in the cane were calculated for Ingenio Tamazula, Mexico at $US68.39 per hectare, in addition to costs for extending the milling season 2 to 4 weeks. The potential for savings by means of desiccants in mechanically harvested cane is large, and accounts for the increased interest in the use of desiccants.

[4] HUMBERT & PAYNE: *Hawaiian Planters' Record*, 1960, **15**, (4), 345–348.

Sugar beet cleaning in Belgium

THE 1974/75 campaign in Belgium, as in so much of Western Europe, was one to recall with relief that it is over. The incidence of virus yellows disease, endemic to the country, was higher than normal, but a major problem for farmers and sugar factories resulted from the very wet conditions during the harvesting period.

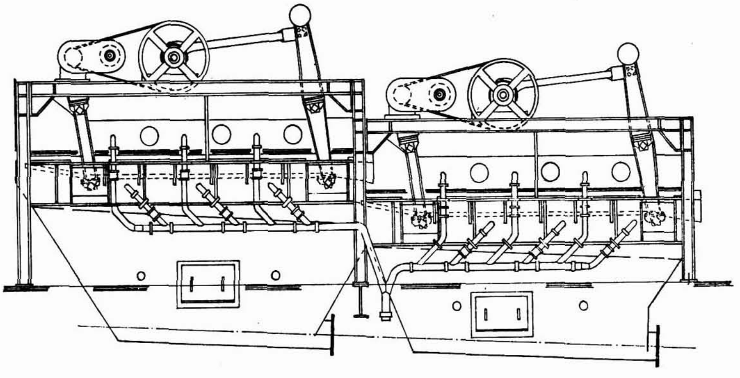


Fig. 1.

Many fields became waterlogged and harvesting machinery was often unable to enter the fields or lift the beets. Resort had to be made to the manual lifting of roots which most farmers thought belonged to the past and, because of the low output and shortage of labour for this task, men of the Belgian army were called upon to assist.

The beets which were brought to the factories were very much caked with soil; in some cases the dirt tare of a truckload of beets was as much as 70%, and a figure of 50% was quite common. This presented the factories with a double problem; the same number of trucks delivering their loads as normal were providing much less than the normal weight of dirt-free roots and the factories persistently had to operate below capacity even when the farmers were able to harvest their beets for supply to the factory. When the farmers were unable to get into their fields the rate of supply dwindled further and stoppages occurred at several factories during the campaign.

The second problem for the factories was the elimination of all the dirt from the roots and its separation from the wash water and disposal. At four Belgian sugar factories (Brugelette, Genappe, Quévy and Veurne) the RT beet washers carried out the first part of this task with great success. The washer has been described in this Journal[1] and details need not be given again; briefly, however, it comprises a reciprocating-bed conveyor over which the beets pass, with water sprays mounted above the below, the lower ones washing the roots through slots in the bed (Fig. 1).

An idea of the efficiency of the washer under the very difficult circumstances of the 1974/75 campaign is given by the fact that the insoluble ash content of the dried beet pulp produced at the four factories averaged about 2½%, whereas it averaged more than 7% for those factories where the roots were washed in conventional rotary-arm equipment. The difference in the cleanliness of the beets is apparent from the photographs of the beets entering the flumes (Fig. 2) which carried them to the washer and those on the conveyor leaving the washer (Fig. 3).

The washer at Brugelette sugar factory is housed in the building shown in Figs. 4 and 5; control of the whole operation is by means of a panel (Fig. 6) on the upper floor, the operators being able to oversee the delivery, piling and fluming through the nearest window on that floor (Fig. 4).

Before entering the washer the beets travel over two weedcatchers and two stone catchers located on the lower left roof in Fig. 4.

[1] DE VLETTER & VAN GILS: *I.S.J.*, 1974, **76**, 268–269.

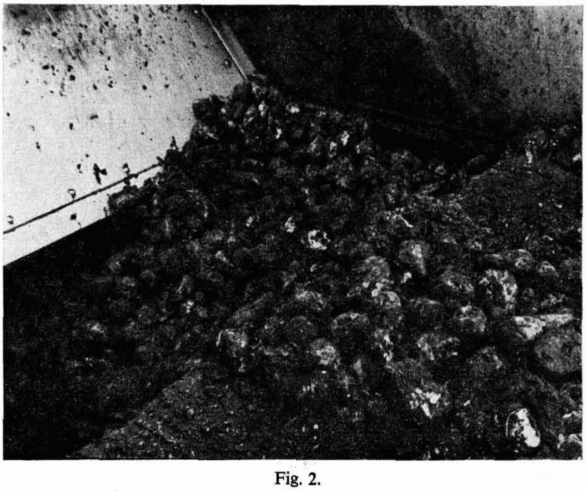


Fig. 2.

Fig. 3.

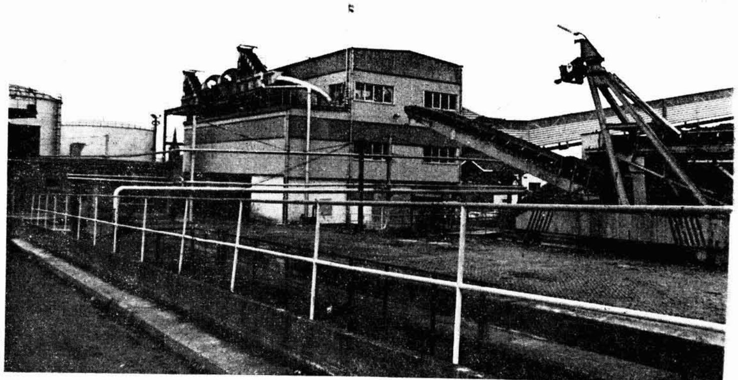


Fig. 4.

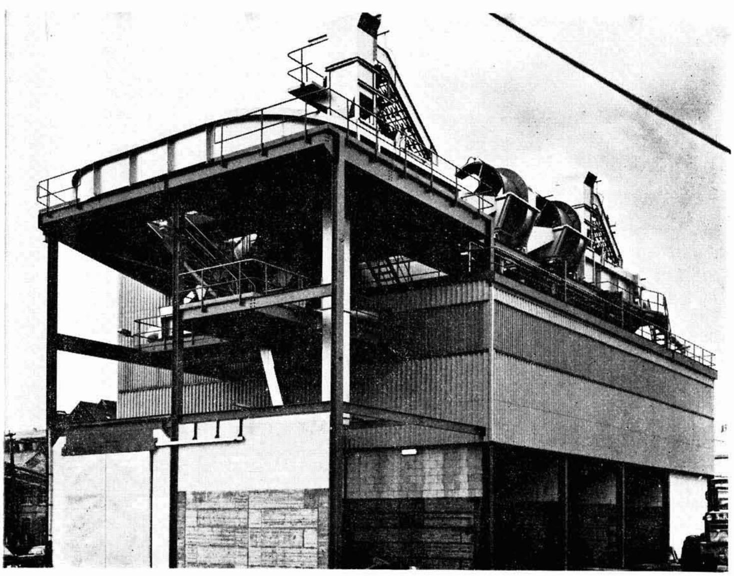


Fig. 5.

The stone catchers are of a new design and very efficient. These catchers include an initial set of buckets collecting the stones and carrying them around and out of the catcher to one of the bays on the ground floor of the building. The set of buckets is followed by a perforated drum, collecting water to feed the pump, operating the stone catcher and located just under the catcher (Fig. 7).

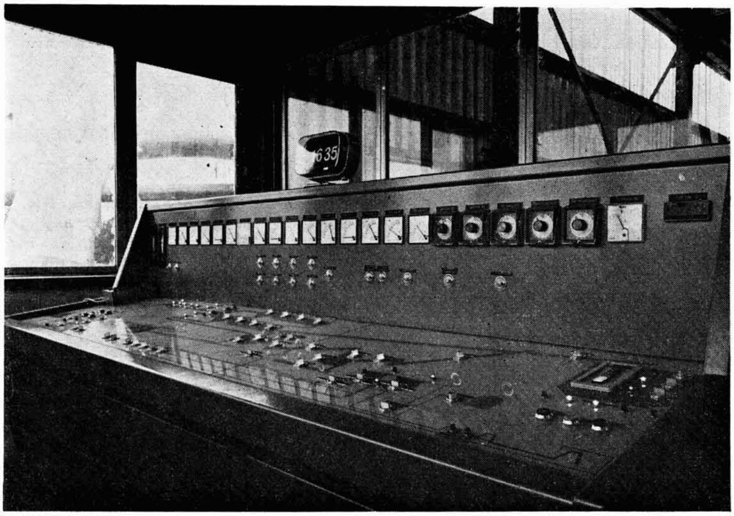


Fig. 6.

The drum also catches the small stones and sand settling after the buckets and brings them backwards with an internal scroll arrangement to the lifting buckets.

Weeds, stones, sand and mud are collected in the different bays located in the bottom of the building (Fig. 5). At intervals they are taken out and loaded in trucks for return to the farms; some 350 metric tons had to be evacuated daily as a consequence of the bad weather conditions.

The prismoidal base of the trough of one washer is seen in Fig. 8; into this drains the wash water which contains the soil removed from the roots, plus small grass and beet tails. The wash water and flume water are screened and most of the solids removed before the flume water can be sent either to the lagoon or to the Elfa pumps and flumes.

Water used for feeding the washers is return water back from the lagoons. It is first filtered on a very fine mesh (300μ) rotary filter shown in Fig. 8.

The solids removed from the screens contains beet tails, grass, etc. The whole lot is sent to a tail washer which separates the good beet tails; these are recovered and added to the belt conveyor which carries the clean beets to the slicing machines.

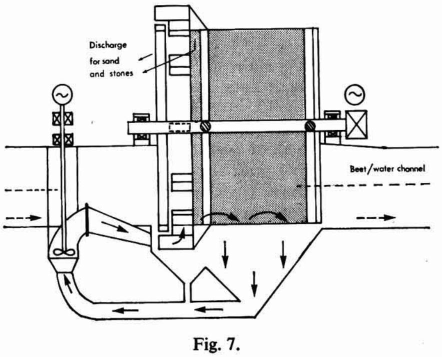


Fig. 7.

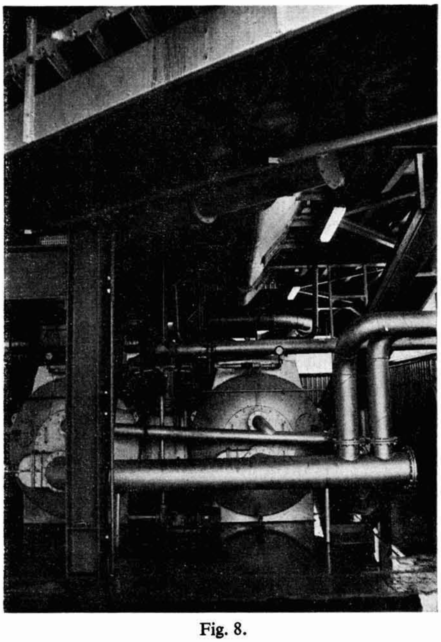


Fig. 8.

Sugar cane agriculture

Studies on sugar cane irrigation. IX. Effect of ground water table and nitrogen levels on the irrigation efficiency of spring-planted sugar cane. Y. T. CHANG. *Rpt. Taiwan Sugar Research Inst.*, 1974, (63), 1–13. Lysimeter studies of the effects of water table levels of 0·6 and 1·6 m and nitrogen application at 100, 200, 300 and 400 kg.ha^{-1} on cane yield showed that the highest N application rates (300 or 400 kg.ha^{-1}) plus the higher water table gave the greatest yield (15–30% greater than did the other treatments) as a result of increased monthly stalk elongation, number of tillers, total stalk length and number of millable stalks. Cane juice from the high-yield plots contained about 700 ppm N. With the lower water table, a positive correlation was found between total precipitation during the growth period and amount and duration of percolation. N loss by percolation was appreciable, and soil moisture was almost identical to the maximum soil water holding capacity. Since there was considerable loss of N by volatilization with the higher water table, the treatments with the two lower N application rates showed symptoms of N deficiency.

* * *

The technique of the clay barrier and its effect on sugar cane growth. M. T. CHEN and S. Y. LIAO. *Rpt. Taiwan Sugar Research Inst.*, 1974, (63), 15–26. Reclamation of sandy and gravel soils in Taiwan by applying a 10 cm thick band of clay on the soil surface and ploughing in may cause difficulties in land preparation, have an adverse effect on water infiltration and cause poor ratooning. Experiments were conducted on introducing a 10-cm clay barrier at a depth of 50 cm instead of on the soil surface. Results showed that the barrier, introduced by deep ploughing, gave a higher cane yield than with cane grown in the untreated control plot and with a surface band of clay in both plant and ratoon cane. The clay barrier would act as an impermeable layer to retain sub-soil moisture after irrigation or rain and thus enhance deep root development.

* * *

Physical characteristics of the low humic gley soil in Taiwan. S. J. YANG and Y. C. LEE. *Rpt. Taiwan Sugar Research Inst.*, 1974, (63), 27–43.—The physical properties of low humic gley soil, which covers more than 8000 ha of land owned by the Taiwan Sugar Corporation, have been determined. Results indicate the difficulty of cultivating such soil, which contains about 40% clay and more than 45% silt, and possible means of amending it are suggested.

* * *

A study on the decomposition of organic manure and the formation of humus in the soils with ^{14}C tracer method. K. M. HUANG and T. S. C. WANG. *Rpt. Taiwan Sugar Research Inst.*, 1974, (63), 45–58.—The use of the ^{14}C tracer method in studying the decomposition of organic manure (including cane leaves) and formation of humus in soil is described and results discussed.

* * *

Leaf blight of sugar cane in Taiwan. V. Host range and hypersensitive reaction. L. S. LEU, Z. N. WANG and W. H. HSIEH. *Rpt. Taiwan Sugar Research Inst.*, 1974, (63), 59–68.—The various plants which can act as hosts ot *Leptosphaeria taiwanensis*, the causal agent of cane leaf blight, were determined in investigations in which occurrence of visible lesions after inoculation was noted. A hypersensitive reaction was found in 75 cane varieties out of 473 inoculated, and descriptions are given of the symptoms.

* * *

Fungal flora of roots and rhizosphere from ratoon cane in Taiwan. S. S. TZEAN, L. S. LEU and H. T. CHU. *Rpt. Taiwan Sugar Research Inst.*, 1974, (63), 69–117.—Details are given of systematic investigation conducted in 1971–72 at six sites in Taiwan to determine fungi occurring on cane roots and in the rhizosphere soil. From more than 5000 isolates, about 149 species belonging to 94 genera of fungi were identified. No noticeable differences were found between the sites. Lists are given of the fungi as well as 180 photomicrographs, which are explained.

* * *

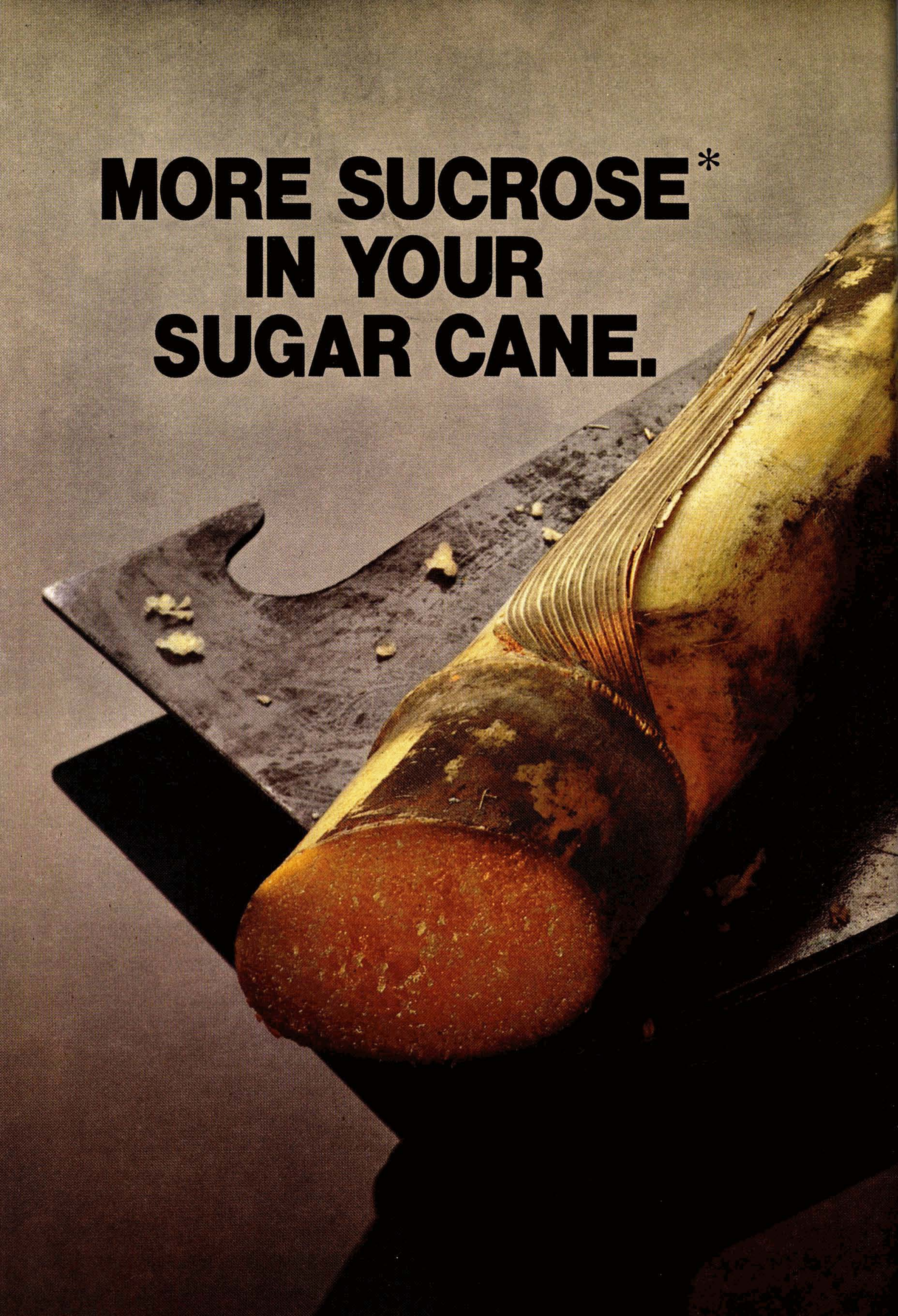
The Philsugin sugar cane breeding project. R. R. COVAR. *Sugar News* (Philippines), 1974, **50**, 326–337. See *I.S.J.*, 1975, **77**, 208.

* * *

Soil conservation: a guide to farming practices in the sugar cane industry. ANON. *Bull. Expt. Sta. S. African Sugar Assoc.*, 1974, (20), 1–27.—Advice is given on soil conservation and the sequence of steps, from obtaining an initial development plan (based on an aerial photograph of the farm in question) to implementation of the plan over a phased period, is explained. The plan should contain details on areas suitable for total mechanization, waterways, diversion terraces, in-field structures, cropping strips, roads and fire protection measures. Guidance is given on a number of these features with the aid of diagrams.

* * *

Effect of growth regulators on rooting and initial development of sugar cane variety Co 740. I. G. E. SERRA, S. RUGAI, J. O. FILHO, J. A. G. C. SOUSA and V. F. N. FILHO. *Brasil Açuc.*, 1974, **84**, 349–355.—The effects were studied of naphthyl acetic acid, indolebutyric acid (in 100 ppm solution) and a commercial product "Exuberone" (in 2% solution) on cane setts. Treatment hindered germination of the setts, the effect of IBA being greatest. The development of the aerial parts of the cane was improved by the regulators but sett root growth was not satisfactory, probably as a consequence of the wrong levels of regulator chosen. Lower concentrations are thought likely to give better results.


MORE SUCROSE*
IN YOUR
SUGAR CANE.

Introducing Polaris.® It can help you produce up to 15%* more millable sucrose from every ton of cane.

The world's first commercial sugar cane ripener, Polaris® plant growth regulator by Monsanto helps growers generate higher sucrose levels, in spite of most poor harvest ripening conditions.

What does Polaris do?

Polaris works in the following ways. First, it hastens ripening and increases sucrose levels during the ripening period when sucrose levels are normally rising. Secondly, Polaris minimizes declines in sucrose levels caused by rainfall during the ripening period.

How does Polaris help growers?

Poor weather conditions for natural cane ripening have always been a grower's major harvesting problem. Now, with Polaris, weather can be less of a factor. Because Polaris sugar cane ripener is at its <u>best</u> when conditions for natural ripening are at their <u>worst</u> — such as high constant temperatures; rain at ripening time; and excessive fertility. With Polaris, cane growers can obtain increased millable sucrose levels from their sugar cane —in spite of these poor ripening conditions.

How is Polaris applied?

Polaris should be applied by airplane early in the ripening and harvest periods.

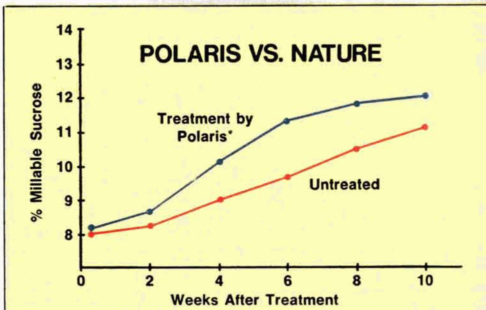
How do I know it will work?

Prove to yourself that Polaris works — leave a part of your field untreated, and compare with the Polaris treated cane at harvest time. This product is the result of 6 years research on more than 20,000 acres of sugar cane test plots in the United States and around the world. This research has shown that Polaris is effective on most major varieties of cane — either plant or rattoon.

Check with your local sugar cane specialist or with Monsanto (see coupon below) to determine recommended varieties and responses.

**The average varies between 0-15% more; depending primarily on the variety, time of application and climatic factors during the ripening period.*

Polaris doesn't increase or decrease the amount of millable tons of can per acre. Instead, **Polaris acts to increase the sucrose and purity levels,** primarily in the upper third of the cane stalk. Another frequent effect with Polaris can be the noticeable yellowing and drying of upper leaves. So, you not only get greater sucrose recovery, but can have less trash and improved trash burning at harvest.

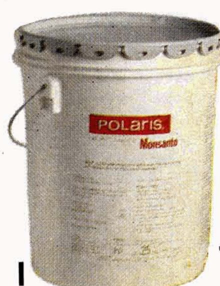


Optimum effect of Treatment by Polaris is usually noted between 4 to 10 weeks after application depending on geographical area. (Generalized response curve.)

Polaris is a major breakthrough in sugar cane management.

Monsanto would like you to know more about how Polaris sugar cane ripener can help you get more sucrose in your sugar cane. Clip the coupon below and send it to us for the full Polaris story. We'll send information on how you can put Polaris to work in your sugar cane fields this year including the EPA label for Polaris®

The world's first commercial sugar cane ripener:



POLARIS.

PLANT GROWTH REGULATOR BY **Monsanto**

The Polaris label: As with all agricultural chemicals, please read and follow the Polaris label instructions carefully.

Monsanto Agricultural Products Company
800 North Lindbergh Boulevard C3NC
St. Louis, Missouri 63166

Please send me more information on Polaris® sugar cane ripener.

NAME______________________________

ADDRESS___________________________

TOWN____________ STATE________ ZIP_______

Influence of climate, soil and age on the juice:fibre ratio of different cane varieties. A. A. RODELLA. *Brasil Açuc.*, 1974, **84**, 368–371.—Correlations were made between value of fibre % fresh weight and expressed juice % cane for monthly means of data from 27 cane varieties in a 1st ratoon crop in two locations. The correlation coefficient was affected by the time of the year, i.e. age of the crop, and also by soil conditions. No varietal influence is recorded.

* * *

Effects of phosphate fertilization on the juice phosphate content in sugar cane. G. E. SERRA, J. P. STUPIELLO and S. Z. DE PINHO. *Brasil Açuc.*, 1974, **84**, 372–392. Trials with varying addition of phosphorus as simple superphosphate fertilizer were made on three kinds of soil, cane being sampled at monthly intervals at age 14–19 months. On two soils the applied phosphate was reflected in higher juice inorganic phosphate although this did not occur with the other soil and in no case was the organic phosphate content affected.

* * *

Ripening of sugar cane. S. RUGAI and J. A. G. C. SOUSA. *Brasil Açuc.*, 1974, **84**, 393–402.—A survey of the literature on cane ripening, both natural and with the aid of chemicals, is presented, and an account given of trials with "Polaris" in Brazil. In one case cane weight was reduced by 5·19%, but in 5 cases out of the six it was increased by amounts ranging from 8·00% to 21·98% for different varieties.

* * *

Sugar cane production: growing interest in chemical ripeners. R. P. HUMBERT. *World Farming*, 1974, **16**, (12), 25–26.—Brief reports are given of tests with chemical ripeners in a number of countries. "Polaris" is the ripener most discussed, but "Ethrel" also figures in two reports, while "Racuza" ("Velsicol"), having overcome volatilization problems, is now being tested.

* * *

Intercropping with sugar cane in Uttar Pradesh. K. KAR and R. S. DIXIT. *Cane Grower's Bull.*, 1973, **1**, (3), 3–5.—Advice is given on intercropping of various crops with autumn- and spring-planted cane in UP.

* * *

Insect pests of sugar cane—termites. D. K. BUTANI and R. A. AGARWAL. *Cane Grower's Bull.*, 1973, **1**, (3), 7–10.—A description is given of the damage caused to cane by termites, 10 species of which are found in India. Detection of termites in a cane field is explained, and control measures at the time of planting and in standing cane are briefly described. "Aldrin" and BHC dust are effective. Natural control by predators is very slight.

* * *

Pre-harvest maturity survey of the sugar cane crop. M. LAKSHMIKANTHAM. *Cane Growers' Bull.*, 1973, **1**, (3), 11–12.—The author describes a special puncturing needle, which he has designed and subsequently modified, for sampling of cane juice for Brix determination by hand refractometer.

* * *

Special spray boom to control sugar cane stalk borer (*Chilotraea auricilius* Ddgn.). K. M. GUPTA, R. A. SINGH and S. P. SINGH. *Cane Grower's Bull.*, 1973, **1**, (3), 13–14.—Details are given of a special spray boom designed to introduce insecticide into the 4th, 5th and 6th leaf sheaths at a time when the young larvae of this borer are feeding before entering the stem. Results of experiments demonstrated the effectiveness of treatment with the boom, whereby the borer incidence was reduced from 13·37% in untreated cane to 2·9% in cane treated with "Endrin" at the rate of 6·25 litres per hectare. Total cane and sugar yield were thereby increased.

* * *

Improved practices for sugar cane cultivation in Mysore State. ANON. *Cane Grower's Bull.*, 1973, **1**, (3), 15–18. Advice is given on optimum cane growing, with information on pest and disease identification and control.

* * *

Retrospects and prospects of sugar cane research at Rudrur, Andhra Pradesh. K. K. P. RAO. *Cane Grower's Bull.*, 1973, **1**, (3), 19–20.—Information is given on the development of the research station at Rudrur which has an area of 75·30 hectares, with descriptions of work conducted since its establishment in 1931; problems to be tackled in the future are also briefly mentioned.

* * *

"Terracur P" for the control of the sugar cane shoot borer, *Chilo infuscatellus* Snell. G. VARADHARAJAN, A. S. SATHIAMOORTHY, K. SAIVARAJ, S. D. RAJAN and K. GOVINDARAJAN. *Cane Grower's Bull.*, 1973, **1**, (3), 21–23.—Of various treatments tested against the shoot borer, the most effective was found to be a nematicide, "Terracur P", which at 15 kg a.i. per hectare (or 300 kg of 5% granules added to the furrows) a month before planting reduced the incidence from 27·20% and 35·67% in the untreated controls to 7·27% and 13·69% in 1971–72 and 1972–73 and increased the mean number of healthy tillers per 60 m^2 to 298·7 and 317·8 compared with 209·7 and 203·5 in the controls in 1971–72 and 1972–73.

* * *

Studies on the effect of pre-treatment on the germination of sugar cane. V. S. SHANMUGASUNDARAM, T. R. SRINIVASAN, N. ARUNACHALAM and N. SANKARAN. *Sugar News* (India), 1974, **6**, (6), 16–18.—The effect of cane sett pre-treatment with various chemicals on the germination rate was investigated with Co 419 cane. Results indicated that four hours of soaking in 100 ppm "Ethiral" (a phosphate compound which is claimed to reduce inversion), 2000 ppm ammonium sulphate, 100 ppm α-naphthyl acetic acid, 100 ppm superphosphate or 100 ppm potassium sulphate induced early germination and vigour, as did even water, compared with the untreated control, while 100 ppm gibberellic acid, 100 ppm 2,4-D or 100 ppm indole-3-acetic acid gave only the same results as or slightly poorer results than absence of treatment. However, at 42 days after planting the number of germinated setts was greater with the control than with any of the treated cane.

* * *

McConnel harvester now operating in Zululand. ANON *S. African Sugar J.*, 1974, **58**, 651.—Illustrations are given of a McConnel cane harvester in operation at Glen Park Estate, Hluhluwe; the machine is intended only for use with burnt cane at Glen Park, where it has permitted a 50% reduction in cane cutting labour requirements. Over a 2-month period the harvester averaged an hourly rate of 35 tons of cane in a crop yielding about 60 tons of cane per acre. No modifications to the existing transport system have been necessary.

* * *

A general view of the Indonesian sugar industry. ANON. *Taiwan Sugar*, 1974, **21**, 150–153.—A short survey is presented of the Indonesian sugar industry, which includes 55 sugar factories of which all but seven are state-owned. Much of the article is concerned with cane agriculture and with a major scheme for rehabilitation of the industry.

* * *

Competition effect of *Panicum repens* Linn. on sugar cane and its eradication by herbicides. S. Y. PENG and W. B. SZE. *Taiwan Sugar*, 1974, **21**, 155–166. Trials with a number of herbicides were conducted on control of *P. repens* (torpedo grass), which spreads by rhizomes beneath the surface and therefore cannot be controlled by killing only the aerial parts. A reduction in cane yield has been found which is proportionate with the density of rhizomes, although at only 5 tons per hectare cane yield is reduced by 50%, whereas the maximum rhizome density can be 15 tons per ha in a field of ratoons. Best results were achieved with "Dalapon" plus 2,4-D (as sodium salt), both at the rate of 5 kg a.i. per ha, 7 applications during the fallow period plus 3 cross-ploughing killing more than 90% of the rhizomes and increasing cane yield in the autumn-planted crop by 62–98%. However, there was no statistically significant difference between the results for 1st and 2nd ratoons on the one hand and the untreated control on the other; this was attributed to considerable increase in the rhizome population from those rhizomes which survived the herbicide treatment.

* * *

Maintenance of the sucrose content of cane by pre-harvest foliar application of chemicals. ANON. *Ann. Rpt. Sugar Ind. Research Inst. and Sugar Research Dept.* (Jamaica), 1973, 8–13.—Trials with "Polaris" and "Racuza" are reported, in which cane was burnt and harvested 5–7 weeks after spraying. "Polaris" caused a reduction in cane yield per acre but gave an increase in tons of sugar per acre. On the other hand, "Racuza" adversely affected both cane and sugar yield. Analysis of cane immediately after harvesting and after stacking for up to 96 hours revealed a possible stabilizing effect of "Polaris" on juice from B 4362 cane, although further studies are required to confirm this effect. Both chemicals had a desiccating effect on leaves and reduced laminae N content; they also stimulated axillary bud sprouting, "Polaris" stimulating side shoot development to a greater extent than "Racuza". The chemicals were found not to inhibit germination of setts. Scorching of leaves occurred 3–4 weeks after spraying. No consistent relationship between spraying and jumping borer damage was established.

* * *

Chemical treatment of seed material to improve germination. ANON. *Ann. Rpt. Sugar Ind. Research Inst. and Sugar Research Dept.* (Jamaica), 1973, 13–17. Studies of the effects of eight treatments on cane sett germination indicated that even where germination was increased, there was no significant increase in cane yield, and in two cases (treatment with "Cycocel" and with "Ethrel") cane yield was significantly reduced despite a considerable increase in germination, this effect possibly being associated with rapid and profuse tillering brought about by the treatments 2–4 months after planting, followed (it is suggested) by choking of many of the younger tillers. Filter press mud applied at 10 tons per acre significantly increased leaf phosphate and significantly reduced the potassium content, the latter effect being ascribed to properties of the soil. Organo-mercurial compounds had a greater germination-stimulating effect than did non-mercurial compounds. However, any treatments to encourage germination are regarded as of limited value in Jamaica. "Ethrel" had highly detrimental effects on the cane after planting, and these effects are compared to those listed by MACCOLL as descriptive of an inferior cane variety.

* * *

Potassium reserves of sugar cane soils. ANON. *Ann. Rpt. Sugar Ind. Research Inst. and Sugar Research Dept.* (Jamaica), 1973, 17–19.—The available K in 30 soils representing the most important cane land soils in Jamaica was determined by four chemical methods. While no correlation was found between K in solutions extracted from saturated soil pastes and K removed by one of three extraction methods, high correlation was found between extraction with ammonium acetate, with 0·05N sulphuric acid and with 1% citric acid.

* * *

Herbicides. ANON. *Ann. Rpt. Sugar Ind. Research Inst. and Sugar Research Dept.* (Jamaica), 1973, 20–23. Details are given of pre- and post-emergence herbicide trials at three sites. Pre-emergence herbicides were at best only slightly effective against *Sorghum verticilliflorum* (rice grass), while two other grasses, *Leptochloa domingensis* and *Chloris* sp., also proved difficult to control. A marked reduction in herbicide performance was observed as a result of frequent sprinkler irrigation.

* * *

Soil moisture stress on sugar cane growth. ANON. *Ann. Rpt. Sugar Ind. Research Inst. and Sugar Research Dept.* (Jamaica), 1973, 23–26.—In field trials, in which irrigation water was applied 10–14 days after all available moisture had been consumed by evapotranspiration, it was established that higher water use efficiencies were obtained by irrigation every other furrow rather than each furrow. The alternate-row irrigated plots used much less water than did the other plots and gave as good cane yields. However, caution is required when saline water is used for alternate-row irrigation.

* * *

Furrow design criteria for Caymanas sandy loam soils. ANON. *Ann. Rpt. Sugar Ind. Research Inst. and Sugar Research Dept.* (Jamaica), 1973, 27–29.—See RAMDIAL: *I.S.J.*, 1975, **77**, 113.

* * *

Insect pests in Jamaica. ANON. *Ann. Rpt. Sugar Ind. Research Inst. and Sugar Research Dept.* (Jamaica), 1973, 80–89.—Various aspects of the subject are discussed, including surveys of cane damage by borers and borer control experiments with a number of insecticides. Biological control of borers is also briefly discussed. Other pests mentioned include *Longuinguis sacchari* (grey aphis), *Saccharosydne saccharivora* (cane fly), termites and wireworms.

Sugar beet agriculture

Beet yellows—were treatments effective? L. van Steyvoort. *Le Betteravier*, 1974, **8**, (81), 7.—Despite a high incidence of yellows in Belgian beet fields, the author insists that spraying was profitable, since the yellows in many cases was caused by just a few aphids which introduced the disease too late to cause marked falls in yields. The author mentions the various systemic chemicals which have proved effective against yellows, including a newly introduced preparation, "Pirimor WP 50". The best treatment is still considered to be "Temik", which has raised yield from 11 to 17 metric tons per ha, or 5–10 tons more than with other treatments.

* * *

Sugar beet fertilization—not too little, but especially not too much! A. Jardin and N. Roussel. *Le Betteravier*, 1974, **8**, (81), 8–11.—Advice is given on quantities and proportions of N, P and K to apply to beet, and various aspects of fertilization (including application of micronutrients) discussed.

* * *

Powdery mildew epiphytotic on sugar beets. D. G. Kontaxis, H. Meister and R. K. Sharma. *Plant Disease Reporter*, 1974, **58**, 904–905.—Reference is made to the first reported epiphytotic of powdery mildew on beet in the USA and to the first recorded incidence of the disease in the Imperial Valley of California. The epiphytotic, identified as *Erysiphe polygoni*, was found on beet of USH 9 variety in early April 1974 and infected most of the 65,000 acres under beet in the region; the high incidence is attributed to growing of two susceptible varieties (USH 9 and USH 10), an unusually mild winter and a protracted cool spring.

* * *

Modified cultural methods in sugar beet agriculture and their effect on the sugar economy. A. Graf. *Zucker*, 1974, **27**, 635–641.—Changes in the beet growing and fertilization techniques which have taken place during recent years in Austria are reported, and results and their effects on the sugar economy of the country indicated.

* * *

National sugar beet variety trials in 1971-73 (in Czechoslovakia). L. Karaman. *Listy Cukr.*, 1974, **90**, 241–248.—Full details are given of beet varietal trials, in which Dobrovická A consistently proved the most outstanding variety in terms of yield, juice purity and sugar yield.

* * *

Results of sugar beet varietal tests. N. Roussel, W. Roelants and T. Vreven. *Le Betteravier*, 1974, **8**, (82), 7–8, 13–14.—Details are given of a beet varietal trials conducted in Belgium in 1974, emergence and yield figures being compared between the different varieties and for each variety between 1972, 1973 and 1974.

Further development of agricultural engineering for beet agriculture. W. C. von Kessel. *Die Zuckerrübe*, 1974, **23**, (6), 7–19.—Descriptions and illustrations are given of latest agricultural equipment available for beet agriculture. The machinery, manufactured in various West European countries, was on show at a West German demonstration.

* * *

Mineral fertilization of sugar beet adapted to nutrient requirement and nutrient availability. K. Mengel. *Die Zuckerrübe*, 1974, **23**, (6), 22.—Advice is given on N, P and K application to beet, with attention focused on the feeding of the roots rather than on general soil application.

* * *

Carbonatation mud—a valuable lime fertilizer. Anon. *Die Zuckerrübe*, 1974, **23**, (6), 22.—Experience in Holland and Belgium is referred to in a discussion of the merits of carbonatation mud as a fertilizer. Results have shown that it improves the soil structure and thus increases beet yield. It is best dried to about 70% dry solids and then applied with a manure spreader; 10 tons of mud contains 6500 kg $CaCO_3$, 110 kg P_2O_5, 30 kg N and 700 kg organic matter. The initial application should be at the rate of 30 tons per hectare, with subsequent applications of 10–20 tons per ha.

* * *

Has the spring beetle disappeared? G. Castano. *Hautes Etudes Betterav. Agric.*, 1974, **6**, (27), 17–20. Details are given of the spring beetle and its life cycle. Factors having a reducing effect on populations of the pest are moisture deficiency (to which older larvae are particularly sensitive), cultivation (exposing the eggs and larvae to the sun's heat in August-September) and maintenance of whatever rotation crop is grown free of weeds, thereby reducing the moisture content and disturbing the soil. While beet, because it is a root crop and because of the nature of the beet agricultural techniques, is not usually associated with considerable numbers of spring beetles, it is nevertheless one of the most sensitive of crops to attack by the pest, as is demonstrated by an illustration showing damage to the root of a beet. A marked decrease in numbers of the beetle in recent years is attributed to frequent applications of "Heptachlor" and to dry summer periods.

* * *

The sugar beet in Spain. A. Silvan. *Hautes Etudes Betterav. Agric.*, 1974, **6**, (27), 22–26.—A brief survey is presented of beet agriculture in Spain, with particular mention of tests to determine optimum plant density (found to be 80,000–85,000 per hectare). Wide double rows have proved of advantage where the soils have a high clay content.

Seedbeds and beet drills. E. DALLEINNE. *Hautes Etudes Betterav. Agric.*, 1974, **6**, (27), 35–37.—Reasons for poor beet emergence in the Oise area of France are suggested and remedial measures discussed.

* * *

New herbicides in sugar beet agriculture. W. R. SCHÄUFELE and C. WINNER. *Zucker*, 1975, **28**, 2–7. Field trials (lasting 3–4 years) conducted at the Göttingen Sugar Beet Research Institute in West Germany are reported in which the effects of certain new herbicides on grasses and broad-leaved weeds were determined. While none of the herbicides adversely affected beet emergence, their effectiveness against weeds differed widely, and the disappointing performances of "Merpelan AZ" and "Tramat" were attributed to lack of rain during some of the tests. "Ro-Neet" and "Tramat" on their own did not always give satisfactory results, but in mixtures did show some promise. As regards beet yield, "Pyramin" + "Avadex" still gave the best results, although "Pyramin" alone was generally not as effective as the new herbicides tested.

* * *

Investigations on the microflora of sugar beet root rot under conditions of modern agricultural practices. II. N. JAROWAJA. *Gaz. Cukr.*, 1974, **82**, 324–326. Investigations showed that microflora on seedlings from untreated beet seed differed from those on seedlings from fungicide-treated seed: in the former case *Phoma betae* was prevalent, while in the latter case *Pythium* sp. and *Aphanomyces* sp. were the major pathogens. However, differences also occurred according to the fungicide used for treatment; if "Dithane-M 45" was used, *Pythium* sp. occurred rarely on damaged seedlings, while *Aphanomyces* sp. was almost absent when "Quinolat V4X" had been used for seed treatment.

* * *

Scientific analysis compares cost of fertility. L. DAIGGER. *Upbeet*, 1974, **62**, (3), 10.—Samples of soil from two sites in Nebraska were sent to four laboratories and to the laboratory of the Nebraska University Soil Testing Service. While the soil analyses from the laboratories were approximately the same, fertilizer recommendations and hence total fertilization costs differed considerably between the laboratories, although there were no significant differences in the beet and sugar yields obtained by following the recommendations. Addition of micronutrients and of P and K did not increase yields, although all four laboratories apart from the University Soil Testing Laboratory recommended application of P, one recommended K and various recommendations were made regarding trace elements.

* * *

Problems of seedbed preparation. A. C. OWERS and R. W. CLARE. *British Sugar Beet Rev.*, 1974/75, **42**, (4), 9–11.—Details are given of 3-year experiments at the Norfolk Agricultural Station to determine the effects of seedbed preparation, soil moisture and compaction on beet sugar yield. Indications were that seedbed preparation by two passes of shallow-working implements gave the finest tilths and that seedling establishment was more rapid and emergence rate greater with the greater proportion of fine soil aggregates (less than $\frac{3}{16}$ inch in diameter), the relationship being linear. With early sowing (19th March) initial emergence during the following 30 days was more rapid with higher soil moisture contents; although the difference was not so marked at subsequent counts (e.g. 35 days after sowing), the final populations were still affected by the initial soil moisture levels. On the other hand, later sowing (16th April) was followed by much more rapid emergence (which was complete within 30 days of drilling) than with early sowing, while the initial soil moisture content had no effect. Sugar yield was reduced by soil compaction, which was greatest where the seedbed was prepared by repeated passes of conventional implements; the compaction was caused by both tractor wheels and by the action of the implements themselves. Yields with early sowing were lower in such a seedbed than in ploughed land into which the seed had been drilled. With later sowing, the compaction pattern was as with early sowing, but yields were similar for all methods of preparation and drilling. It is thought possible to prepare a narrow seedbed for each row and to drill the seed and apply herbidice in one pass; this would permit a greater area to be drilled earlier in the spring by working at high soil moisture contents without compaction problems.

* * *

Damage by pests to sugar beet in the early stages of cultivation. B. B. JONES. *British Sugar Beet Rev.*, 1974/75, **42**, (4), 9–11.—Investigations are reported in which damage to beet seedlings, characterized by removal of one or both cotyledons and/or growing point and the possible occurrence of depressions in the soil where the seedlings had been excavated, was found to be caused by fieldmice and not, as previously thought, by skylarks and insects. While fieldmice are susceptible to anti-coagulants, trials on baiting methods have yet to be carried out. A considerable reduction in the fieldmouse population is required to obtain any marked decrease in damage, but this is as likely to be achieved by a severe winter as by baiting, it is suggested.

* * *

Authorized agricultural chemicals and approved products for beet. N. B. DAVIS. *British Sugar Beet Rev.*, 1974/75, **42**, (4), 14–15.—Lists are given of agricultural chemicals (herbicides, fungicides, pesticides and growth regulators) approved for use on sugar beet farms in the UK. Alternative names are given as well as names of manufacturing companies and distributors.

* * *

Virus yellows in 1974. R. HULL. *British Sugar Beet Rev.*, 1974/75, **42**, (4), 16–17.—A report is presented of the virus yellows outbreak in the UK in 1974, the extent and severity of which was much greater than expected. In East Anglia, the worst affected area, 69–81% of plants were infected. Major causes of the epidemic are discussed, and particular mention is made of the ineffectiveness of sprays against aphids.

* * *

Groundkeepers. G. D. HEATHCOTE. *British Sugar Beet Rev.*, 1974/75, **42**, (4), 17.—The author examines the problems created by beet left in the ground ("groundkeepers"), particularly the danger of spread of virus yellows if such beet are infected, and the harbouring of aphids, again potential causes of disease spread.

Holland, heavily mechanized, highly productive. D. Charlesworth. *British Sugar Beet Rev.*, 1974/75, **42,** (4), 18–20.—A brief survey is presented of beet agriculture in Holland; mention is also made of the system of beet payment, of the sugar factories, use of beet pulp as animal fodder, the farm renting system, and beet transport by barge.

* * *

Annual weed beet. P. C. Longdon. *British Sugar Beet Rev.*, 1974/75, **42,** (4), 21.—A few years ago, annual wild beets growing near seed crops in southern Europe cross-pollinated with some English commercial varieties; both correctly pollinated seed and contaminated seed was harvested and sold for growing crops in the UK. While contaminated seed cannot be detected visually and the seedlings it produces also appear normal, the annual habits differ from those of the proper seed. These characteristics are described, and it is pointed out that measures adopted ensure that there will be no recurrence of the situation.

* * *

A look at the herbicide roguing glove. T. Breay. *British Sugar Beet Rev.*, 1974/75, **42,** (4), 21.—Details and illustrations are given of a special glove, the palm of which contains a sponge pad and a pressure bulb. When a tall weed or bolted wild beet (not easily dealt with in a field of growing beet) is grasped and squeezed, enough herbicide is ejected from the sponge pad (to which it is fed by a tube from a container) to kill the plant. It is stated that the glove should not be used immediately before the onset of rain and that the herbicide should be allowed to dry on the plant, as otherwise the rain will wash the chemical onto surrounding plants and kill them.

* * *

Herbicides. T. Breay, P. B. Mindham, R. Dunnicliffe and I. Briggs. *British Sugar Beet Rev.*, 1974/75, **42,** (4), 24–27, 29.—Herbicide trials in beet trial fields at different locations in England are reported.

* * *

Band sprayers—maintenance and service. D. Roebuck. *British Sugar Beet Rev.*, 1974/75, **42,** (4), 28–29.—The maintenance and servicing of herbicide band sprayers are discussed and reference made to the testing service offered by the British Sugar Corporation.

* * *

Drill maintenance and servicing. C. W. Peck. *British Sugar Beet Rev.*, 1974/75, **42,** (4), 31–32.—Advice is given on the maintenance and servicing of beet drills of the types widely used in the UK.

* * *

Are short rotations in beet possible? L. van Steyvoort. *Le Betteravier*, 1975, **9,** (83), 11, 14.—In contrast to cereals, monoculture of beet over a number of years has not revealed any decline in yields in cases cited by the author, but after about 12 years rotation with cereals has proved necessary because of the weed problem. Moreover, eventually the soil would suffer from lack of humus, so that crop rotation is desirable, if only on a biennial basis. The major drawback in the adoption of short rotations is considered to be the detrimental effect of nematodes in the soil, but the author feels that even this need not be regarded as so important in view of the effectiveness of such chemicals as "Temik 10 G". From the standpoint of beet payment alone, there is every advantage in keeping intervals between beet crops as short as possible. Whatever the system adopted, the author lists a number of recommendations to follow so as to maintain high yields.

Microgranulators. R. Vanstallen and A. Vigoureux. *Le Betteravier*, 1975, **9,** (83), 12–13.—Information with illustrations is given on various types of microgranulators for use in applying granular chemicals such as "Temik 10 G" ("Aldicarb").

* * *

Sugar beet cultivar and systemic insecticide interrelationships in the control of curly top virus. R. E. Finkner and P. R. Scott. *J. Amer. Soc. Sugar Beet Tech.*, 1972, **17,** 97–104.—"Phorate" and "Disyston" were applied to beet in tests to control the beet leaf hopper and hence prevent curly top virus infection. Application was made before sowing and to the beet seedlings some 10 weeks later. Two beet varieties were involved, one sysceptible to the disease and the other tolerant. "Phorate" was the more effective of the two insecticides in reducing disease incidence and increasing yield of the susceptible variety. The effects were due basically to the pre-planting application, the later application having little effect on the disease or yield. In years with light to moderate curly top infection, there was no advantage in using a soil-applied systemic insecticide with a resistant beet variety. Either of the insecticides could be applied with liquid or dry fertilizers.

* * *

Predicting sugar content and petiole nitrate of sugar beets from soil measurements of nitrate and mineralizable nitrogen. S. Roberts, A. W. Richards, M. G. Day and W. H. Weaver. *J. Amer. Soc. Sugar Beet Tech.*, 1972, **17,** 126–133.—Utilization of residual soil nitrogen by beet was studied at ten sites, measurements of the residual soil N being based on the initial nitrate N in the soil profile (N_i) and on the quantity of mineralizable organic N (N_m). Multiple regression analysis revealed a significant correlation between beet sugar content at harvest and petiole nitrate N content on the one hand and N_i and N_m on the other. Late-season increases in petiole nitrate N were found to be predictable by multiple regression analysis based on pre-season values of N_i and N_m. However, N_m was not as important as N_i for predicting beet sugar content and petiole nitrate N, although tests for both N_i and N_m may be necessary as a basis for N fertilizer recommendations.

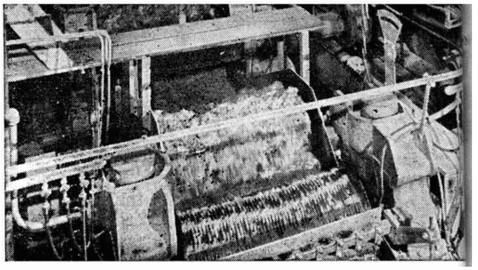
* * *

NC 8438, a promising new broad spectrum herbicide for sugar beet. W. L. Elkins and C. H. Cronin. *J. Amer. Soc. Sugar Beet Tech.*, 1972, **17,** 134–143. Tests with NC 8438 (2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulphonate) at three sites in the USA are reported in which the herbicide, applied before planting or before emergence, gave good control of a number of named weeds and had a residual effect which ensured complete control of the weeds for up to 10 weeks following application.

* * *

Damage to sugar beet by breakage with full mechanization of the raw material sector in sugar production. F. Kapol. *Zeitsch. Zuckerind.*, 1975, **100,** 69–75. Results of investigations are given in which the causes of damage to beet during operations from harvesting to beet yard handling were analysed. A number of tables indicate the extent of beet surface breakage for each process and with specific equipment, while a simple diagram shows the proportions of damage caused during each process. This clearly demonstrates that the backward tipping means of beet unloading is responsible for the greatest proportion of damage.

Cane sugar manufacture



Unit operations in the sugar industry. F. H. C. KELLY. *Paper presented at meeting on selection of equipment for the sugar processing industry* (UNIDO, Vienna), 1974, 17 pp.—The individual processes in sugar manufacture are described. While the author considers both beet and cane as raw materials, the bulk of the work is concerned with cane sugar factory operation.

* * *

Questions of nomenclature in the sugar industry. F. H. C. KELLY. *Paper presented at meeting on selection of equipment for the sugar processing industry* (UNIDO, Vienna), 1974, 10 pp.—The problems of standard nomenclature in five main areas of the sugar industry are briefly discussed, viz. analysis, processing, equipment, agriculture and commercial aspects.

* * *

Water, steam, gas and energy supply for a sugar factory. F. H. C. KELLY. *Paper presented at meeting on selection of equipment for the sugar processing industry* (UNIDO, Vienna), 1974, 9 pp.—Water supply for steam generation and other purposes in a cane sugar factory is discussed, with mention of recycle water and treatment of both this and fresh water for steam generation. The possibility of carelessness in regard to steam consumption because of availability of ample supplies of fuel in the form of bagasse is mentioned; the author points to the high potential of bagasse for steam production where, through judicious use, the factory could produce sufficient electricity to sell to the national grid or to use for such items as irrigation pumps. The possible use of surface condensers to treat the vapour from evaporators and pans and thus produce condensate recoverable for various purposes, including raw sugar melting in a refinery (where one existed adjacent to the factory), is also discussed. The production of fuel gas as a cane sugar factory by-product is considered.

* * *

Thermo-technical evaluation of the sugar production process. F. H. C. KELLY. *Paper presented at meeting on selection of equipment for the sugar processing industry* (UNIDO, Vienna), 1974, 14 pp.—The steam requirements for power generation and process heat production in a beet sugar factory, cane sugar factory and refinery are discussed, and ways in which savings in steam can be achieved are examined. The great advantage enjoyed by cane sugar factories of having bagasse as a source of fuel, while beet sugar factories and refineries have to use outside sources, is emphasized.

* * *

Quality control requirements of the sugar industry. F. H. C. KELLY. *Paper presented at meeting on selection of equipment for the sugar processing industry* (UNIDO, Vienna), 1974, 15 pp.—Raw material quality evaluation, end-product quality control and sugar factory process control are examined for both beet and cane sugar factory, raw and white sugar.

Sugar production equipment characteristics and spare parts. F. H. C. KELLY. *Paper presented at meeting on selection of equipment for the sugar processing industry* (UNIDO, Vienna), 1974, 8 pp.—Sugar factory equipment characteristics and selection are discussed generally as well as the question of spare parts supply, i.e. whether they can be made locally, purchased locally or within the country or whether they have to be imported. Among aspects of equipment selection examined are capacity, operating conditions, the problems associated with excess noise and vibrations, and design precision.

* * *

Industrial feasibility calculations in the sugar industry. F. H. C. KELLY. *Paper presented at meeting on selection of equipment for the sugar processing industry* (UNIDO, Vienna), 14 pp.—Feasibility studies for the erection of a cane sugar factory are explained, and advice given on the various factors which need to be taken into consideration.

* * *

Offers and quotations for sugar production equipment and complete plants. F. H. C. KELLY. *Paper presented at meeting on selection of equipment for the sugar processing industry* (UNIDO, Vienna), 1974, 12 pp. The items to be covered in the drawing-up of a contract for the supply of a factory or equipment are listed and the meanings given of a number of terms used in the preparation of contracts.

* * *

Test runs and take-over certificates of sugar production plants. F. H. C. KELLY. *Paper presented at meeting on selection of equipment for the sugar processing industry* (UNIDO, Vienna), 1974, 14 pp.—What to look for in test runs of steam generation plant, evaporator automatic control and process changes in clarification is explained.

* * *

Water, steam, gas and energy supply and consumption problems experienced in the sugar industry. M. H. TANTAWI. *Paper presented at meeting on selection of equipment for the sugar processing industry* (UNIDO, Vienna), 1974, 27 pp.—Uses of water in a beet and cane sugar factory are listed and calculations of condenser capacity, as governed by type of condenser and quantity of vapour to be condensed, discussed. The chief characteristics of exhaust steam condensate and juice vapour condensate are described. Steam requirements in a sugar factory, the main consumers and steam loss reduction are also examined, as are CO_2 and SO_2 requirements and production. Water and steam production in a refinery are briefly discussed. Finally, the amount of electricity required as a function of process mechanization and power consumption of steam-driven units is considered, and possible sources of supply described.

Repair and maintenance problems experienced in the sugar industry. S. N. G. RAO. *Paper presented at meeting on selection of equipment for the sugar processing industry* (UNIDO, Vienna), 1974, 21 pp. Problems encountered with specific pieces of equipment from cane harvesters to centrifugals are described. The paper deals with structural failures caused by e.g. corrosion and with means of preventing process deterioration brought about by inadequacy of equipment or its setting as well as by mechanical impurities, although mention is also made of subjects not associated with the title theme, e.g. the merits and demerits of cane milling in contrast to diffusion.

* * *

Research and development needs of our sugar industry. R. K. SIRDESHMUKH. *Sugar News* (India), 1974, **6**, (5), 16–18.—Some of the more important problems facing Indian sugar factories in cane preparation and milling are discussed, with many references to practices in Australia.

* * *

Effect of dextran on sugar processing. Z. THOMAS and M. V. VIJAYAKUMAR. *Sugar News* (India), 1974, **6**, (5), 19–21.—The adverse effects of dextran on cane sugar factory processes and possible remedial measures are discussed.

* * *

Studies on boiling in cane sugar manufacture. VIII. J. G. THIEME. *Brasil Açuc.*, 1974, **84**, 403–411.—See *I.S.J.*, 1975, **77**, 54.

* * *

Production of raw sugar and its advantages over the production of white sugar. I. P. F. JAIN. *Sugar News* (India), 1974, **6**, (6), 5–10.—The author sets out to show why it is economically more advantageous in India to produce raw sugar for export rather than white sugar for domestic consumption. Apart from the reduction in lime, sulphur and superphosphate consumption in the simple defecation system used for raw sugar, evaporator scale is reduced, the massecuite load on the pan station is decreased, there is no excessive melting, and moreover export of raw sugar will bring in the necessary foreign exchange.

* * *

Corrosion in the sugar industry. M. P. MATHUR. *Sugar News* (India), 1974, **6**, (6), 11–15.—Corrosion in boilers, mills, evaporators, vacuum pans and centrifugals is discussed and remedial measures described.

* * *

Taiwan's new bulk sugar terminal has many similar features to that of Durban's. ANON. *S. African Sugar J.*, 1974, **58**, 647–649.—See CHEN: *I.S.J.*, 1975, **77**, 211.

* * *

Usina Santa Elisa—Brazil's newest sugar factory. ANON. *Sugar y Azúcar*, 1974, **69**, (12), 18–22.—Information is given on the extensions to Santa Elisa sugar factory which were completed in 1973. Rated output of the modernized factory is 90,000 metric tons of sugar, compared with just over 1000 metric tons in 1937. The factory is only the third in Brazil to use the Honig sulphitation system.

* * *

Methods of measuring sucrose inversion in sugar cane mills. M. L. PULIDO. *Sugar y Azúcar*, 1974, **69**, (12), 23–30.—A survey is presented of methods available for determining cane juice invert sugar, and the advantages of "Busan 881" in reducing inversion are indicated.

* * *

Mechanical circulation in vacuum pans. A. C. CHATTERJEE, A. R. BHIDE and C. SHYAMSUNDER. *Indian Sugar*, 1974, **24**, 535–539.—Advantages and disadvantages of massecuite stirrers in vacuum pans are discussed. Tabulated data are presented which compare results achieved with and without mechanical stirring; these indicate the reduction in boiling time generally obtained with stirring as well as the benefits of smoother pan operation, with good grain size, little fluctuation in Brix and the absence of false grain.

* * *

Automation of evaporators at Ingenio San Antonio. F. G. CASTRO L. *Sugar y Azúcar*, 1975, **70**, (1), 28–30. The evaporator station at San Antonio sugar factory in Nicaragua comprises three pre-evaporators operating in parallel and two multiple-effect evaporators, also operating in parallel, one a quadruple- and the other a quintuple-effect evaporator. Information is given on automatic control of the process; in the two years since its introduction, the system has provided a 15% increase in evaporation efficiency, a 50% increase in the interval between evaporator cleaning, and maintenance of almost constant juice Brix.

* * *

Sugar as a boiler fuel is an expensive product. G. FILGUEIRAS. *Brasil Açuc.*, 1974, **84**, 506–517.—Arguments are put forward for the use of cane diffusion and bagasse presses to increase extraction and reduce bagasse losses.

* * *

Lubrication of roller bearings in sugar mills. K. B. SHRIVASTAVA. *Indian Sugar*, 1974, **24**, 367–371. Advice is given on lubrication of mill roller bearings, on determining causes of bearing over-heating, and on temporary means of alleviating the condition.

* * *

New method of crediting untested consignments. ANON. *S. African Sugar J.*, 1975, **59**, 21.—There are three basic reasons for failure to analyse cane delivered to sugar factories in South Africa, it is stated; they are: (i) insufficiency of cane in the consignment to permit accurate demarcation for sampling purposes, (ii) inadvertent mixing of deliveries on the cane carriers before the sampling points, and (iii) short shut-down periods for repairing, servicing and cleaning of sampling and analytical equipment. The method now used to credit the grower for untested consignments involves calculation of an average of several closely related test results by a computer. The new and previous methods are outlined.

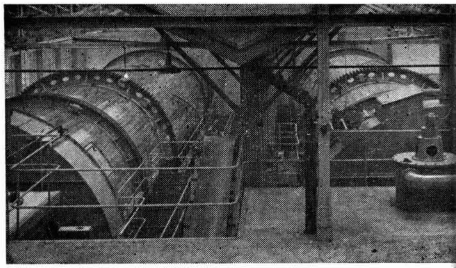
* * *

Noise reduction in Queensland sugar mills. D. MACEY and J. R. ALLEN. *S. African Sugar J.*, 1975, **59**, 37–40. See *I.S.J.*, 1975, **77**, 234–236.

* * *

The sugar industry in Mauritius. L. ROSENBERG. *Zeitsch. Zuckerind.*, 1975, **100**, 89–91.—A brief survey is given of the Mauritian sugar industry, with certain technical data tabulated for each sugar factory and a map showing the distribution of the regions supplying the cane to each factory.

Beet sugar manufacture



Effect of acoustic vibrations on intensity of heat transfer in sugar solutions. A. A. PERES'KO, L. G. FEDOROV and M. S. ZHIGALOV. *Sakhar. Prom.*, 1974, (11), 54–56.—Experiments in which sugar solutions of 15, 30 and 45°Bx were allowed to flow at varying velocities through a 2·4 m tube of 92 mm diameter while subjected to the effect of acoustic vibrations in the range 200–3000 Hz showed that heat transfer from an electric element wound around the outside of the tube was 1·5–2·2 times greater than without vibrations, the effect increasing with increase in acoustic pressure and with fall in the flow rate and Brix.

* * *

No loss of sugar beet in the GDR. H. J. HALOUNA. *Listy Cukr.*, 1974, **90**, 229–232.—The author describes the general system used in East Germany to store beet whereby losses are minimized.

* * *

The effects of low raw massecuite on molasses exhaustion. V. M. JESIC. *Sugar J.*, 1974, **37**, (4), 31–33.—See *I.S.J.*, 1975, **77**, 246.

* * *

Fully-automatic sugar centrifugals. ANON. *Ind. Alimentari,* 1974, **13**, (11), 115–117.—Information is given on the ASEA-Weibull fully-automatic centrifugal and its operation. The slightly conical basket has a massecuite capacity of 840–1000 kg per cycle, according to model (of which there are three), and the maximum speeds of the models are 1300, 1450 and 1700 rpm. Reference is made to the SKF bearings provided.

* * *

Application of macromolecular complexes of calcium hydroxide, carbon dioxide and sucrose to juice purification. J. BURIÁNEK. *Listy Cukr.*, 1974, **90**, 248–256. Laboratory and pilot-scale experiments are reported in which a 20°Bx mixture of raw juice heated to 90°C, low-grade sugar and lime (of approximately 5% CaO concentration) containing about 17% sucrose was gassed with CO_2 to give a viscous solution which, when added to raw juice, gave optimum mud coagulation at alkalinities in the range 0·070–0·100% CaO. The mixture was added to the 2nd and 3rd stages of 3-stage preliming, some of the 2nd stage juice being recycled to the 1st stage. Purified thickened carbonatation mud was also recycled to the 1st stage. The juice in the 1st, 2nd and 3rd stages was brought to pH 7·5, 8·8 and 9·5, respectively. Results indicated that the prelimed juice had better filtrability than did normal 1st carbonatation juice.

* * *

Fundamentals of conductimetric control of massecuite boiling. V. Building up the grain. V. VALTER. *Listy Cukr.*, 1974, **90**, 257–263.—For programming the pan boiling process, a suitable parameter is the reduced conductivity ψ (ratio between conductivity of the massecuite and that of the initial saturated solution), which was established at a massecuite purity of 92, a mother-liquor purity of 80, a temperature of 80°C and a supersaturation of 1–1·4. The course followed by ψ during boiling was determined and plotted on a graph from which its control bases were derived. It was found that in pans with insufficient circulation it was best to bring the grain together by means of periodic drinks, whereby ψ varied between minimum and maximum, although the range should not exceed 100 $\mu S.cm^{-1}$.

* * *

Fully-automatic control of the boiling process at Düren sugar factory using the "Rhecrymat" rheometer system. K. H. WESCHKE and H. KEMTER. *Zucker*, 1974, **27**, 581–594.—Descriptions and illustrations are given of the components of the Fischer & Porter automatic boiling control system, based on the rheometer, employed at Düren since 1973. Both central control room and pan instrumentation is described and a diagram of the complete control scheme presented. Start-up and experiences with the system are briefly described.

* * *

Results of operation of a coke-fired shaft lime kiln with newly developed charging system. H. SCHNEIDT. *Zucker*, 1974, **90**, 595–598.—The Eberhardt lime kiln at Larissa sugar factory in Greece is described, with particular mention of the charging system. Performance exceeded guarantees for all parameters during the 5-day commissioning trials, the waste gas CO_2 content averaging 42·6% compared with a guarantee of 40%.

* * *

The frost of 2nd December 1973. P. DEVILLERS, P. GORY and M. LOILIER. *Sucr. Franç.*, 1974, **115**, 393–406.—The effect on beet physiology and processing of a severe frost which occurred on 1st–2nd December 1973 and effected some 8 million metric tons of beet are reported.

* * *

Recommendations on the use of displacement pumps for liquid sugar plants and tankers. G. ALLEWELT and R. NEUMAIER. *Zucker*, 1974, **27**, 598–600.—Guidance is given on the pumping of liquid sugar. Difficulties which have arisen are attributed by the authors to errors in planning and dimensioning of pipelines and to lack of knowledge on flow through pipelines rather than to defects in the pumps themselves.

* * *

The evaporator station and its heat economy. V. SÁZAVSKÝ. *Zeitsch. Zuckerind.*, 1974, **99**, 583–585. Various aspects of evaporation are briefly examined and various arrangements of effects discussed. It is emphasized that it is not only the number of effects that will govern steam consumption, operation of the vacuum pans playing a far greater role which can be

regarded as the decisive one. For scale prevention, the author offers some advice which centres on use of magnetic means, but mentions the lack of success with the Cepi process.

* * *

Depuration of beet raw juice by means of ultrafiltration membranes. S. LANDI, G. PALLA, N. MARIGNETTI and G. MANTOVANI. *Zeitsch. Zuckerind.*, 1974, **99**, 585–591.—See *I.S.J.*, 1975, **77**, 91.

* * *

Storage of beet in the factory yard. A. FOURTES. *'Ellen. Biomehania Sakh. Trimen. Delt.*, 1971, (7), 9–22; through *S.I.A.*, 1974, **36**, Abs. 74-1424.—Physical and chemical changes occurring in beet during storage and consequential effects on the compositions of raw and thick juices are briefly discussed. The effects of temperature and degrees of wilting, damage and cleanliness of beets are also described. A diagram is given of the storage system used at Serrai factory.

* * *

Effect of the technological characteristics of the raw material on industrial production. D. HATZEANTONIOU. *'Ellen. Biomehania Sakh. Trimen. Delt.*, 1972, (8), 53–69; through *S.I.A.*, 1974, **36**, Abs. 74-1418.—The main characteristics of sugar beet considered are the sucrose, ash, harmful N, invert sugar and marc contents; their effects on the process are outlined.

* * *

Improving sugar extraction from cossettes by acidifying diffusion water. K. WAGNEROWSKI. *Gaz. Cukr.*, 1974, **82**, 234–239, 255–260.—Factors having a detrimental effect on diffusion are discussed, including extraction water pH on the alkaline side. Of means examined for acidifying the water, the most suitable was found to be SO_2, since this not only maintained the pH at a required level under buffered conditions but also had a bactericidal effect, helped to reduce juice colour formation and had a beneficial effect on the exhausted cossettes.

* * *

Comparison of methods for cleaning an evaporator. J. GRABKA and T. KOLODZIEJ. *Gaz. Cukr.*, 1974, **82**, 260–262.—Comparison was made between the conventional method of evaporator cleaning (two-stage treatment with sodium carbonate and caustic soda followed by treatment with HCl, the complete work taking 24–36 hours), use of a higher concentration HCl solution together with corrosion inhibitor, which took only 8–12 hours, and the system described earlier[1] in which no shut-down is necessary. While the last system (which uses a mixture of sodium carbonate, sodium hydroxide and sodium triphosphate for boiling-out, followed by HCl treatment and rinsing with water and weak sodium carbonate solution) is suitable for an 80-day campaign, if the campaign is longer, then the second method mentioned is recommended.

* * *

Problems of quality and storage of sugar beet under conditions of intensive cultivation and mechanical harvesting. J. TRZEBIŃSKI. *Gaz. Cukr.*, 1974, **82**, 267–270.—The effects of beet mechanism (particularly topping and harvesting) and of immaturity, infection and pest damage on losses in storage are discussed.

ADC—a programmable software system for automation with a process computer. H. SCHULZE. *Zucker*, 1974, **27**, 648–653.—Information is given on the ADC automatic control system and examples of application in the sugar factory are given in the form of 1st carbonatation mud density control and filter station control.

* * *

Survey on first carbonatation juice filtration in sugar factories. G. GAUDFRIN and E. SABATIER. *Zucker*, 1974, **27**, 654–663.—See *I.S.J.*, 1974, **76**, 279.

* * *

Experience in the operation of Uspenskii sugar factory at reduced fuel consumption. S. I. NEDZVEDSKII and V. I. BLAZHKO. *Sakhar. Prom.*, 1974, (12), 19–21. Information is given on the various measures adopted at this Soviet sugar factory to reduce steam and hence fuel (mostly gas) consumption.

* * *

Effect of oxygen on the thermal stability of sugar factory products. V. A. KOLESNIKOV and D. M. LEIBOVICH. *Sakhar. Prom.*, 1974, (12), 21–23.—Because raw juice, carbonatation juice and thick juice come into contact with atmospheric oxygen, laboratory experiments were conducted to determine the effect of oxygen on them. Raw juice was treated with pure oxygen (24 g per litre of juice) at 60°C for up to 6 min and subsequently carbonatated and concentrated to thick juice. The rise in pH of the raw juice as a result of the oxygen treatment was greater the lower was the initial pH; a fall in the reducing sugars content was attributed to oxidation. The raw juice treatment caused an increase in carbonatation juice colour and lime salts contents, and an increase in thick juice colour, lime salts and reducing sugars. On the other hand, treatment of 1st carbonatation juice with oxygen did not affect the lime salts content, but did increase the colour; the colour of 2nd carbonatation juice was also increased by the treatment, as was the colour of the thick juice produced from it, whereas treatment of thick juice with oxygen did not affect colour so much as optical density, although after heating at 100°C the juice had a greater colour content, more reducing sugars and a lower pH than did untreated juice.

* * *

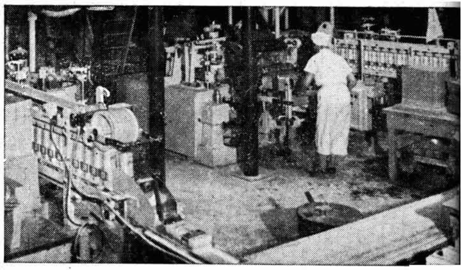
Physical properties and chemical composition of components of Class III waste waters from beet sugar factories. A. P. PARKHOMETS and S. A. TARGANCHUK. *Sakhar. Prom.*, 1974, (12), 24–27.—Average physical properties and chemical composition of Class III waste water samples from 73 Soviet sugar factories are tabulated, including flume-wash and filter muds, press water and acid water from stored pulp, water from carbonatation gas scrubbers, turbo-compressor and boiler drainage water, as well as water emanating from the cleaning of various pieces of equipment and components.

* * *

Experience in checking the position of the scroll shafts in DDS diffusers. M. I. YANITSKII and V. L. MOSTAVLYUK. *Sakhar. Prom.*, 1974, (12), 33–34.—Advice is given on correct positioning of the scrolls in a DDS diffuser during assembly of the equipment; at a number of Soviet factories incorrect positioning has resulted in damage to the shafts, journals and scroll sections.

[1] KUTERMANKIEWICZ: *I.S.J.*, 1971, **73**, 151.

Sugar refining



A study on sugar ash for the improvement of plantation white sugar quality. S. L. SANG, Z. H. HSU and H. T. CHENG. *Taiwan Sugar*, 1974, **21**, 121–124.—A series of laboratory experiments was carried out with the aim of reducing the ash content of plantation white sugar (usually 0·04–0·06%) to that of refined sugar. Results indicated that well-controlled 1st carbonatation could remove most ash constituents, while further removal was possible by maintaining syrup at above 65°Bx and well filtering it. The relationship between Brix and ash content is demonstrated by tabulated data for syrup at two sugar factories.

* * *

Experience in transporting and processing liquid sugar at Berdichev sugar refinery. E. M. KARNASEVICH. *Sakhar. Prom.*, 1974, (11), 27–29.—Advantages of liquid sugar production by raw sugar factories for processing at a refinery are discussed, with particular mention of the monetary savings achieved by Berdichev refinery which in 1973 produced more than 17,000 tons of liquid sugar.

* * *

Refining of Cuban raw sugar in the Soviet Union. V. CHOPIK. *ATAC*, 1974, **33**, (2/3), 18–22.—The USSR imported 2,392,200 metric tons of Cuban raw sugar in 1973; this was refined in 76 of the country's 316 sugar factories which have been adapted to refining in the interval between beet campaigns. In the early years of Cuban imports after 1960, the raw sugar was processed at the same time as beet, being added to the juice for carbonatation or in the syrup or massecuite. This has been stopped, however, because of the difficulty in assessing losses, and the raws are now treated separately by melting, carbonatation, filtration and sulphitation before refiltering and boiling in three stages. White sugar from the first strike is dried and bagged, while second sugar is remelted and returned to the sulphitation tank and third sugar is remelted and returned to the raw sugar melter, together with 60% of the first strike run off and the sweet water from the filters. Final molasses purity is about 50–52.

* * *

Study of the effect of the method of refining raw cane sugar on the melassigenic capacity of non-sugars. L. BOZHKOV and KH. MICHEV. *Nauchni Trudove, Vissh Inst. Khran. Vkusova Prom.* (Plovdiv), 1972, **19**, (3), 67–72; through *S.I.A.*, 1975, **37**, Abs. 75–32. Cuban raw sugar was refined (a) at Lom, by affination, defeco-saturation and a 5-massecuite boiling scheme, and (b) at Gorna Oryakhovitsa, without affination, by vigorous defecation, carbonatation and a 3-boiling scheme; parameters of the molasses produced are compared. Molasses (a), with a Brix of 81·2°, pol 48·0, and purity 59·1, contained 7·62% reducing sugars and 7·5% ash, 1·11% being Ca salts; molasses (b), with a Brix of 83·0°, pol 48·6 and purity 58·6, contained 1·25% reducing sugars and 11·84% ash, with 2·04% Ca salts. Graphs show that for a given non-sugars:water ratio, the saturation coefficient was approx. 0·06 lower for (a); the normal (70 poise) molasses purity was approx. 2·8 lower for (a), since for a given Brix both the purity and the viscosity were lower. Melassigenic coefficients of factory molasses and normal molasses were respectively 1·41 and 1·06 for (a) and 1·415 and 1·186 for (b).

* * *

A continuous melter. F. F. KOLESNIK and R. E. NIKITIN. *Sakhar. Prom.*, 1975, (1), 46.—A brief description is given, with diagrams, of a continuous melter designed by engineers at a Soviet sugar factory. An experimental model has operated effectively during post-campaign processing of cane raw sugar. The authors state that the melter can be constructed at any sugar factory.

* * *

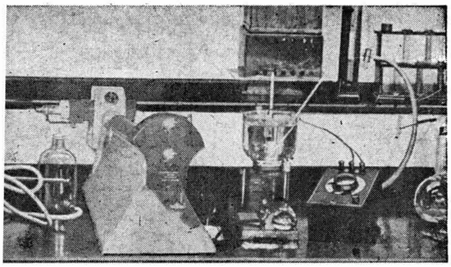
Losses of sucrose during heating of semi-products in the processing of cane raw sugar. L. P. REVA, N. L. IZBINSKAYA, S. P. KHIL'CHUK and L. A. LENEVA. *Pishch. Prom.*, 1974, **19**, 3–6.—Sucrose decomposition was investigated in heated syrup and run-off in the Brix range 57–65°, pH of 6–7 and temperatures of 80–110°C. Results indicated that the level of losses was governed by the quantity of non-sugars present. Decomposition rate constants and sugar losses per unit time have been calculated for each product examined.

* * *

Regeneration of AGS-4 granular active carbon at Shepetovka refinery. S. F. ZHELUD'KO, TS. M. DRUZHKOPOLLER and M. T. DOMBROVSKAYA. *Sakhar. Prom.*, 1975, (2), 10–12.—Details are given, with the aid of a diagram, of the carbon regeneration unit at Shepetovka. Main feature of the plant is a horizontally-rotating drum. Regeneration efficiency is 97–98%, and no carbon dust is found in syrup after treatment.

* * *

The state and further development of ion exchange technology in refined sugar manufacture. G. A. CHIKIN and V. S. PAVLENKO. *Sakhar. Prom.*, 1975, (2), 12–17.—While treatment of syrup with decolorizing resins has given very much better results than in other Soviet refineries not using the process, the authors emphasize the importance of strict control of syrup preparation and of the decolorization process itself. They discuss other important factors associated with the use of decolorizing resins, including the problems of toxicity and syrup viscosity, and examine the particular case of AV-16GS resin, which has a high decolorizing efficiency but suffers from a low chemical stability so that organic substances are transferred to syrup in contact with the resin. Reference is made to the need for resins based on polystyrene which are chemically more stable, as indicated by tests in other countries. Promising results with AV-17-2P resin are mentioned.



Laboratory methods & Chemical reports

Preparation of a solution for determination of sugar content. P. KADLEC and K. KNAP. *Listy Cukr.*, 1974, **90**, 223–227.—Advice is given on the use of an electric mixer to prepare a molasses solution for refractometric solids measurement. By the simple method proposed, which is rapid and obviates the need for establishing constant temperature conditions, the molasses is dissolved in water at room temperature, the total quantity of molasses + water being approximately 200 g. To avoid the need for precise 1:1 dilution, a factor f is calculated from (weight of sample + weight of water)/(weight of sample), and the Brix then found from $a.f + b$, where a and b are correlation and prediction coefficients, respectively. Results of tests are statistically evaluated.

* * *

A new conductimetric method for determining ash content. W. WÖHLERT and E. JUNGHANS. *Sakhar. Prom.*, 1974, (12), 36–37.—Reference is made to investigations on the use of an East German LM 301 conductimeter for determination of ash in beet brei extracts.

* * *

Determination of the colour content of sugar refinery products in optical density units. L. A. KOROBEINIKOVA and A. YA. ZAGORUL'KO. *Sakhar. Prom.*, 1974, (12), 37–40.—Results are described of investigations into the effects of a number of factors on photocolorimetric measurement of the colour of refinery products; among the factors studied were concentration, filtration method, cell length, wavelength, nature of sample used for comparison and pH. Guidance is given on the optimum values of the various parameters in connexion with use of an Al-ETs2-S instrument.

* * *

Major volatile components of cane molasses. M. YOKOTA and I. S. FAGERSON. *J. Food Sci.*, 1971, **36**, 1091–1094; through *S.I.A.*, 1974, **36**, Abs. 74-1596. Diluted molasses was vacuum distilled (25 mm Hg at 35°C) and the distillate was separated into basic and acidic fractions; the former, containing the characteristic aroma compounds, was analysed by gas chromatography, mass spectrometry and infra-red spectrophotometry. Compounds detected which had not previously been reported as volatiles from molasses were: δ-valerolactone, acetyl pyrrole, 4-methyl-2-propyl furan, 5-methyl-2-furaldehyde, furfuryl alcohol, furfuryl methyl ketone and furfuryl ethyl ether. Gas chromatography of the silylated acid fraction revealed lower fatty acids.

* * *

Separation of sugars. Y. TAKASAKI. *Agr. Biol. Chem.*, 1972, **36**, 2575–2577; through *S.I.A.*, 1974, **36**, Abs. 74–1647.—The separation of D-fructose from D-glucose using a column containing the bisulphite form of "Dowex 1-X8" ion exchange resin at 5, 10, 20, 30, 35 or 42°C using water as eluant was studied. Separation improved with increasing temperature and was optimum at 35°C or over. Other sugar mixtures were also investigated; affinities for the resin were D-glucose > D-fructose > sucrose.

* * *

Biological sugar content determination and its practical application. G. POLLACH. *Zeitsch. Zuckerind.*, 1974, **99**, 633–639.—The process described earlier[1] was tested in an automatic system and results during the 1972/73 campaign compared with polarimetric measurements for press water and diffusion juice; close agreement was found between both sets of values. Further investigations were carried out in 1973/74, in which the sugar content in the exhausted cossettes determined polarimetrically was compared with the juice sugar content determined by the micro-biological method.

* * *

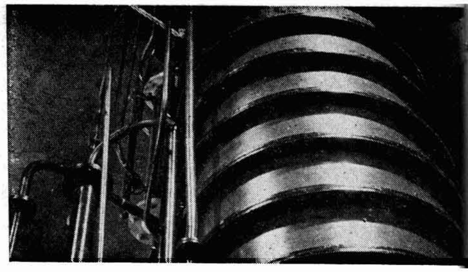
The distribution of non-sucrose matter in sucrose crystals. S. SINGH and H. J. DELAVIER. *Zeitsch. Zuckerind.*, 1974, **99**, 575–582, 639–651.—The fundamentals of crystallization and the effect of non-sucrose constituents are discussed with 99 references to the literature. The distribution of ash, potassium, sodium and calcium in sugar crystals has been studied, and a relationship established between non-sucrose content of the bulk crystal fractions containing single crystals and crystal size, for which a third-degree equation has been derived. However, it has not been possible to establish a mathematical relationship for the distribution of non-sucrose matter in a mass composed only of conglomerates; sharp fluctuations in the non-sucrose content were attributed to the way in which the conglomerates formed. Generally, the non-sucrose content of the conglomerates was only significantly greater in the large size fractions than in single crystals, while in the other fractions it could be higher or smaller than or the same as in single crystals. The non-sucrose content of a crystal was found to fall with crystal size. In single crystals, the non-sucrose material was found to decrease towards the centre, the relatively large non-sucrose content occurring on the very outside layer as a result of the surface properties. A linear correlation was found between the conductimetric ash content and (K + Na + Ca) content of a sugar.

* * *

The wetting angle of sucrose solutions. K. ČÍŽ. *Listy Cukr.*, 1974, **90**, 273–274.—The wetting angle of aqueous sucrose solutions was measured at 25°C as a function of Brix in the range 10–60° in 10° intervals. At 30°Bx, in association with structural changes in the solutions, there was a sharp increase in the angle, which had a value of 17°45′ at 10–30°Bx and a value of 24°30′ at 60°Bx.

[1] POLLACH & KLAUSHOFER: *I.S.J.*, 1972, **74**, 219.

By-products



Distillery effluent treatment and disposal. R. S. DUBEY. *Sugar News* (India), 1974, **6**, (1), 9–26.—A survey is presented (with 63 references to the literature) of methods for treatment of distillery waste and of recovery and utilization of certain constituents.

* * *

Development of technology for de-ashing vinasse with simultaneous ammoniation. A. I. SKIRSTYMONSKII *et al. Trudy Ukr. Nauch.-Issled. Inst. Spirt. Likero-Vodoch. Prom.*, 1971, **13**, 93–100; through *S.I.A.*, 1974, **36**, Abs. 74-1266.—The fodder value of vinasse can be improved by removing most of the K^+, with partial replacement by NH_4^+; this is achieved by passing pre-treated vinasse through a strongly basic cation exchanger in NH_4^+ form until breakthrough of K^+ occurs. Pre-treatment consists of adding part of the eluate from regeneration (which is rich in K_2CO_3) to precipitate $CaCO_3$ and some of the colloids, which would otherwise foul the resin; $(NH_4)_2CO_3$ is used as regenerant rather than NH_4OH, since its greater extent of dissociation effects faster regeneration with lower throughput. During evaporation of the product from 9 to 68% dry solids, 70% of the initial NH_3 was retained, bound to organic acids; the organic N content was 9–10%, i.e. 56–62% protein on dry solids.

* * *

Studies on improving the yield of fermentation alcohol. I. Effect of sugar concentration and temperature. S. WINDISCH, M. STOBBE and G. KOPPENSTEINER. *Branntweinwirtschaft*, 1974, **114**, (8), 183–185; through *S.I.A.*, 1974, **36**, Abs. 74-1323.—With many brewer's yeasts, alcohol formation and fermentation rate decrease only at sugar concentrations greater than 17·5%. Addition of small amounts of sugar at regular intervals gives better results than addition of the whole amount of sugar at the beginning. Osmotic changes during fermentation were monitored by cryoscopic measurements. From this it was concluded that good brewer's yeasts should possess a high resistance to alcohol. Tests at different fermentation temperatures showed that, for the yeasts studied, alcohol formation and fermentation rate did not vary significantly in the range 24–37°C; at higher temperatures, however, the start of fermentation was more rapid.

* * *

pH and temperature as factors in the production of citric acid by submerged fermentation. M. V. S. GONZALEZ, M. SHAFIQ and R. SAMANIEGO. *Proc. 21st Conv. Philippines Sugar Tech.*, 1973, 302–311. In investigations of the effects of pH and incubation temperature on citric acid yield in terms of titratable acidity, 1 litre of 15°Bx cane molasses medium ~~containing 1·5 g ammonium nitrate~~, 0·5 g magnesium sulphate (hydrated) and 1·0 g potassium orthophosphate was adjusted to different pH levels with HCl and NaOH and inoculated with *Aspergillus niger* before incubation at one of three temperatures for 10 days. Highest citric acid yield (about 66%) was obtained at pH 3·4 and 30°C.

* * *

Dried molasses in pig feed. G. BURGSTALLER. *Zucker*, 1974, **27**, 601–603.—Tests showed that up to 30% of the corn in pig feed can be replaced with dried beet molasses without any adverse effect on daily weight increase in fattening stock. While characteristics of the meat did not show any statistically significant differences between rations with and without molasses, there was a tendency for the meat:fat ratio in the long dorsal muscle to increase with increase in the proportion of molasses.

* * *

Characteristics of cane molasses in the fermentation industry. N. H. NGUYEN and I. SZEP. *Szeszipar*, 1973, **21**, (2), 46–50; through *S.I.A.*, 1974, **36**, Abs. 74-1453. The effects of varying the fermentation conditions on the yields of *Saccharomyces cerevisiae*, *Torulopsis utilis* or *Candida utilis* grown using Cuban, Indian and especially Vietnamese molasses of stated compositions were studied. Optimum conditions were: 9–13 g molasses per 300 ml, 30–60% pressed yeast inoculum (on molasses), 600 litres of air per hour, and a pH of 5; rate of growth increased with temperature in the range 25–40°C, and $(NH_4)_2SO_4$ or urea was a better N source than NH_4NO_3.

* * *

Utilization of by-products from the production of fatty acid esters of sucrose. J. NOVAK, V. SYHOROVÁ and P. SEDEK. *Veda Vyzk. Prum. Potravin.*, 1969, **19**, 77–84; through *S.I.A.*, 1974, **36**, Abs. 74-1460.—It was shown that the unreacted sucrose which remained after esterification could be used in the production of fodder yeast, and that the thickened filtrate, containing 8% dimethylsulphoxide, could be used instead of molasses in cattle fodder. These processes would improve the economics of sucrose ester production by avoiding the need for sucrose recovery.

* * *

A note in interrelationships among growth traits in pigs fed maize or high-test molasses. F. J. DIÉGUEZ. *Cuban J. Agric. Sci.*, 1974, **8**, 219–223.—Estimation of correlations between feed intake, feed conversion and daily weight gain for pigs (i) fed on maize or high-test molasses *ad libitum*, and (ii) fed on restricted amounts of molasses, gave results which suggested that daily weight gain depends mainly on feed conversion when animals are fed on a restricted ration, whereas with *ad libitum* feeding weight gain seems to be a function of feed intake.

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 M il/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 £5.00 or U.S. $15.00 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 £5.00/$15.00

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

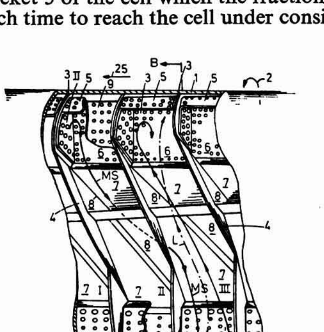
UNITED KINGDOM

Electrodialysis of sugar solutions. TAITO K.K. and ASAHI KASEI KOGYO K.K. **1,351,910.** 7th June 1972; 1st May 1974.—Salts are removed from sugar solutions by electrodialysis between cation exchange membranes made of films of a polymer having a vinyl alcohol structure in which the mole fraction of vinyl alcohol groups is 10–100%, the polymer being formed by polymerization of a monomeric vinyl ester and a monomeric copolymer.

* * *

Beet diffuser. RAFFINERIE TIRLEMONTOISE, of Brussels, Belgium. **1,352,350.** 21st June 1971; 8th May 1974.

The drum type diffuser 1 includes an internal conveyor in the form of a double-screw conveyor formed by portions of diametral solid walls 3 connected by portions of solid walls 4, operating in the manner of conventional drum-type diffusers. In order to slow down and spread more uniformly the liquid fraction separated each time from a fraction of solids during a half-rotation of the drum, a baffle 9 is provided upstream when considered in the direction of rotation of the drum or, when considering the advance of liquid in the drum, downstream from the bottom 6 of the bucket 5 of the cell which the fraction of liquid leaves each time to reach the cell under consideration.



The baffles are made of irregularly perforated walls extending axially between the scroll sections, running substantially parallel to the bottom 6 of the buckets 5 and radially from the peripheral walls of drum 1 through a distance at least equal to the radial dimension of bottom 6. Lengths of solid walls connect the baffles 9 to the solid axial walls 7. The ratio between the perforated and solid areas of the walls 9 increases from the peripheral wall of drum 1 towards the drum axis, the perforation area increasing with distance from the wall.

Purification of levulose. MITSUI SEITO K.K., of Tokyo, Japan. **1,357,399.** 29th October 1971; 19th June 1974.—Crystals of a $CaCl_2$-levulose addition compound are obtained by mixing $CaCl_2$ with an aqueous levulose solution which contains dextrose (an invert sugar, isomerized sugar, crude levulose, etc.) and the mixture, at pH 5, heated under reduced pressure such that it boils at 40–70°C. The crystals of the addition compound separate from the boiling liquor and are recovered by centrifuging. They are dissolved in water, sulphuric acid added to precipitate the calcium, the HCl content removed mostly by dialysis through a strongly basic anion exchange membrane and the residual HCl and salts removed by means of ion exchange to give a substantially pure levulose.

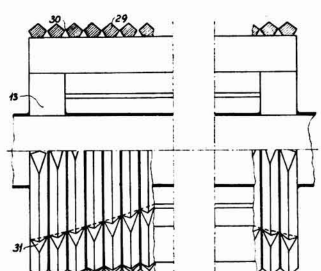
* * *

Production of caramel syrup. GÉNÉRALE SUCRIÈRE S.A., of Paris, France. **1,358,807.** 9th August 1972; 3rd July 1974.—Sugar or carbohydrate syrup is passed along a pipe into a heating zone where it is subjected to pressure and temperature conditions causing it to caramelize and produce steam. The pipe ends at a steam extraction zone at atmospheric pressure from which the steam is allowed to escape, to be condensed and the condensate discharged. The caramel passes on to a caramel cooling zone where water is added to give the desired concentration of caramel syrup, as well as any other additives desired.

* * *

Diffusion bagasse dewatering. A/S DE DANSKE SUKKERFABRIKKER, of Copenhagen, Denmark. **1,359,515.** 3rd August 1971; 10th July 1974.

Wet bagasse from a diffuser is discharged through a chute so that it passes between two rollers, provided with scrapers, before continuing to a dewatering mill. The pivoting upper pressure roller is solid and is provided with end flanges which overlap the ends of the lower roller.



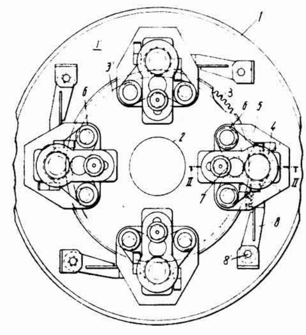
The latter is made up from a large number of closely spaced pentagonal-sectioned rings 29 forming passages 30, each ring being provided with several incisions 31 which engage the bagasse and carry it through the space between the rollers. The angles in the grooving of the upper roller correspond to but are greater than those of the lower roller 13, so tending to press the liquid in the bagasse though the passages 30 to the interior from which it drains, to be returned to the diffuser. Passage of the liquid from the inside to the outside in the lower part of the bottom roller keeps the passages 30 clear.

* * *

UNITED STATES

Beet diffusion tower drive. W. DIETZEL and S. MATUSCH, of Braunschweig, Germany, *assrs.* BRAUNSCHWEIGISCHE MASCHINENBAUANSTALT. **3,807,250.** 7th August 1972; 30th April 1974.

The shaft 2 which carries the scroll for transport of cossettes within the tower diffuser 1 projects above the top of the tower where it is fitted with a large spur gear 3. This is driven by means of a number of pinions 4 in housings 5. The pinions are driven by individual motors operating through gearboxes 7 and guide followers 6.



The housings 5 are connected by rocker arms 8 to a pivot or journal 8′ so that the housing and pinion can take up movement of the shaft caused by uneven diffuser loading, etc., so that they act as shock absorbers while maintaining smooth drive to shaft 2. Use of a number of small motors instead of a single larger one permits replacement of one with continued operation, as well as easier assembly and repair, etc.

* * *

α-Sulpho fatty acids of hexitol and sugars. R. G. BISTLINE, F. D. SMITH, J. K. WEIL and A. J. STIRTON, *assrs.* US SECRETARY OF AGRICULTURE. **3,808,200.** 7th January 1971; 30th April 1974.—Sodium sucrose or glucose α-sulphopalmitate or α-sulphostearate are prepared by direct esterification, acid chloride or alcoholysis methods and are easily-soluble, biodegradable anion surface active agents with foaming, detergent, emulsifying and lime soap dispersing properties and excellent stability to metal ions and to acid or alkaline hydrolysis.

* * *

Beet harvester storage tank and cleaner. R. W. HOOK and W. W. JACKSON, *assrs.* DEERE & CO., of Moline, Ill., USA. **3,809,164.** 21st May 1973; 7th May 1974.

Beet diffuser. G. F. DUCHATEAU, of Tienen, Belgium, *assr.* RAFFINERIE TIRLEMONTOISE. **3,809,538.** 28th June 1971; 7th May 1974.—See UK Patent 1,352,350[1].

* * *

Production of levulose and dextrose from sucrose. E. NITSCH, of Linz, Austria, *assr.* LAEVOSAN GESELLSCHAFT CHEM. PHARM. INDUSTRIE FRANCK & DR. FREUDL. **3,812,010.** 4th August 1971; 21st May 1974. Levulose and dextrose (in 10:90–70:30 mixture) are separated from a mineral acid-free solution of both (obtained by sucrose hydrolysis on a strongly acidic cation exchanger or by isomerization of a dextrose solution), by evaporating at 50–120°C and adding methanol or methylene glycol and precipitating the sugars sequentially, controlling the water content so that it is $\not>1\%$ when the levulose is precipitated. The mother liquor may be mixed with other invert solution for further treatment.

* * *

Formation of crystalline levulose-dextrose blends. A. J. MELAJA of, Kantvik, Finland, *assr.* SUOMEN SOKERI OY. **3,816,175.** 3rd July 1972; 11th June 1974.—An aqueous solution of 75–25% dextrose and 25–75% levulose, containing at least 95% solids, is combined at 40–50°C (20–50°C) with (0·3–10 parts of) a dry crystal mass of the two hexoses and the mixture agitated in a relatively dry atmosphere (less than 30 R.H.) to give a dry granular mixture. Alternatively, the sugar solution may be seeded with or added to the crystal mass.

* * *

Continuous centrifugal. A. MERCIER, of La Madeleine, France, *assr.* FIVES LILLE-CAIL. **3,821,857.** 1st May 1973; 2nd July 1974.—The passage of a body depends on the density of the fluid through which it moves; consequently, in order to slow down the speed of sugar crystals discharged from a continuous centrifugal, the whole machine is enclosed in a fluid-tight casing which is maintained full of compressed air during operation.

* * *

Selective weed control in beet. W. LORENZ, L. EUE and H. HACK, *assrs.* FARBENFABRIK BAYER AG., of Leverkusen, Germany. **3,823,006.** 15th October 1971; 9th July 1974.—Undesired vegetation among beet is combatted by application of a herbicidally-effective amount of N-phenyl-N′,N′-pentamethylene urea.

* * *

Cane loader-cleaner. L. G. FOWLER, of Belle Glade, Fla., USA., *assr.* SUGAR CANE GROWERS COOPERATIVE OF FLORIDA **3,828,536.** 1st May 1972; 13th August 1974.

* * *

Cane harvesters. G. A. ROLLITT, *assr.* MASSEY-FERGUSON (AUSTRALIA) LTD., of Sunshine, Va., Australia. **3,830,046.** 5th October 1972; 20th August 1974.

* * *

Cane ratooning device. V. ASUMENDI, of Ayr, Queensland, Australia. **3,830,047.** 15th November 1972; 20th August 1974.

[1] *I.S.J.*, 1975, **77**, 285

World sugar production estimates 1974/75[1]

BEET SUGAR	1974/75	1973/74	1972/73
EUROPE	(metric tons, raw value)		
Belgium/Luxembourg	620,000	797,000	685,000
Denmark	424,000	376,000	349,000
France	3,010,000	3,240,000	3,050,000
Germany, West	2,489,933	2,509,566	2,267,522
Holland	794,444	850,589	772,448
Ireland	148,597	196,101	174,306
Italy	1,000,000	1,040,000	1,316,665
United Kingdom	631,333	1,068,778	984,296
Total EEC	*9,118,307*	*10,078,034*	*9,599,237*
Austria	402,660	371,096	406,812
Finland	84,231	82,789	93,170
Greece	190,978	161,927	131,470
Spain	528,000	805,126	818,317
Sweden	313,333	270,000	299,000
Switzerland	73,873	79,531	68,424
Turkey	852,198	752,330	829,400
Yugoslavia	571,000	468,751	395,377
Total West Europe	*12,134,580*	*13,069,584*	*12,641,207*
Albania	16,000	19,000	19,000
Bulgaria	200,000	240,000	200,000
Czechoslovakia	750,000	730,000	770,000
Germany, East	590,000	560,000	650,828
Hungary	345,692	326,022	336,966
Poland	1,588,900	1,817,114	1,826,000
Rumania	620,000	580,000	680,000
USSR	8,000,000	9,750,000	8,500,000
Total East Europe	*12,110,592*	*14,022,136*	*12,982,794*
Total Europe	24,245,172	27,091,720	25,624,001
OTHER CONTINENTS			
Afghanistan	9,000	8,259	9,200
Algeria	14,100	3,400	10,000
Azores	7,000	6,500	8,000
Canada	103,355	119,300	127,612
Chile	221,000	129,432	90,779
China	950,000	900,000	850,000
Iran	593,000	570,000	574,216
Iraq	9,000	10,000	10,000
Israel	28,000	13,300	26,667
Japan	277,000	408,889	418,838
Lebanon	7,940	11,584	24,400
Morocco	272,830	226,875	251,800
Pakistan	25,000	9,800	11,446
Syria	18,000	18,432	20,000
Tunisia	5,000	5,022	5,100
United States	2,600,000	2,899,457	3,206,048
Uruguay	84,837	57,203	44,951
Total Other Continents	5,225,062	5,397,453	5,689,057
TOTAL BEET SUGAR	29,470,234	32,489,173	31,313,058

CANE SUGAR	1974/75	1973/74	1972/73
EUROPE			
Spain	30,000	29,377	31,140
NORTH & CENTRAL AMERICA			
Belize	76,803	91,028	71,956
Costa Rica	225,000	210,000	204,000
Cuba	5,300,000	5,800,000	5,350,000
Dominican Republic	1,170,000	1,194,104	1,192,980
Guadeloupe	86,000	97,471	126,751
Guatemala	390,000	325,358	269,888
Haiti	73,039	68,503	67,596
Honduras	85,680	80,640	68,543
Martinique	19,512	13,586	22,352
Mexico	2,919,930	2,837,372	2,820,873
Nicaragua	196,700	160,400	147,287
Panama	134,000	108,860	89,118
Puerto Rico	272,157	260,607	231,333
El Salvador	250,000	232,227	190,164
USA—Mainland	1,325,034	1,288,626	1,470,000
Hawaii	1,018,952	944,151	1,023,800
West Indies—Barbados	92,800	111,807	121,735
Jamaica	405,426	382,390	350,637
St. Kitts	26,893	27,879	24,463
Trinidad	236,135	192,298	190,000
Total N & C. America	14,304,061	14,427,307	14,033,476
SOUTH AMERICA			
Argentina	1,541,103	1,641,837	1,328,959
Bolivia	166,964	188,613	138,604
Brazil	7,450,000	6,933,354	6,162,906
Colombia	976,000	897,300	809,891
Ecuador	291,700	283,493	270,000
Guyana	349,257	344,615	273,469
Paraguay	78,214	76,287	58,722
Peru	1,026,535	1,020,816	948,634
Surinam	10,614	7,910	11,415
Uruguay	22,655	23,047	28,276
Venezuela	530,000	586,777	533,111
Total South America	12,443,042	12,004,049	10,599,987
AFRICA			
Angola	80,000	85,000	81,301
Cameroun	27,778	21,400	16,942
Congo (Brazzaville)	44,000	37,492	35,254
Egypt	588,000	611,000	651,000
Ethiopia	145,111	134,072	142,000
Ghana	12,523	8,784	12,000
Kenya	186,667	176,854	117,000
Madeira	2,900	2,778	2,264
Malagasy Republic	117,000	106,700	110,162
Malawi	70,000	52,000	34,416
Mali	10,000	10,000	10,000
Mauritius	737,966	760,782	727,410
Mozambique	300,000	315,356	336,000
Nigeria	41,000	38,982	30,277
Réunion	227,916	239,210	251,052
Rhodesia	265,000	248,000	200,000
Somalia	39,000	35,000	50,000
South Africa	1,983,000	1,831,575	2,035,344
Sudan	144,000	134,413	100,000
Swaziland	195,200	172,651	172,916
Tanzania	118,889	117,889	102,667
Uganda	48,800	60,310	96,325
Zaire	52,142	49,126	39,481
Zambia	97,000	64,550	58,185
Total Africa	5,533,892	5,313,924	5,411,996
ASIA			
Bangladesh	111,162	99,793	21,439
Burma	100,000	100,000	116,000
China	2,600,000	2,550,000	2,500,000
India, excl. khandsari	4,850,000	4,375,000	4,289,000
Indonesia	1,030,000	936,628	890,000
Iran	83,000	98,300	69,435
Iraq	12,000	12,000	12,000
Japan	235,000	247,000	234,168
Nepal	6,768	8,778	7,175
Pakistan	525,896	612,273	462,868
Philippines	2,500,000	2,534,584	2,303,807
Sri Lanka	19,031	21,650	13,432
Taiwan	750,000	892,066	780,200
Thailand	1,058,400	926,312	823,445
Total Asia	13,897,257	13,430,384	12,522,969
OCEANIA			
Australia	2,921,000	2,593,000	2,893,000
Fiji	281,000	319,000	320,193
Total Oceania	3,202,000	2,912,000	3,213,193
TOTAL CANE SUGAR	49,410,252	48,117,041	45,812,761
TOTAL BEET SUGAR	29,470,234	32,489,173	31,313,058
TOTAL SUGAR PRODUCTION	78,880,486	80,606,214	77,125,819

[1] F. O. Licht, *International Sugar Rpt.*, 1975, **107**, (18), 1–4.

Brevities

Danish sugar equipment contracts[1].—A/S De danske Sukkerfabrikker is to supply a beet diffuser of 3600 tons/day capacity to Sucrerie Montcornet in France. In addition, DDS are to supply equipment for automatic control of boiling to the factory for use in the 1975 campaign.

* * *

Zanini S/A. 1974 report.—In 1974 Zanini completed Usina Abraham Lincoln, 92 km from Altamira in Pará State, the first in the Amazonia region. Despite heavy rainfall and the distance of 3000 km from the workshops, the factory was completed in 12 months. It is designed to produce 30,000 tons of sugar in a 150-day crop. In addition, in 1974, Zanini supplied more than 50 other sugar factories with equipment, including factories in Paraguay, Dominican Republic and USA.

* * *

New El Salvador turn-key project for Fletcher and Stewart. The Government of El Salvador has awarded a contract worth £12,000,000 for the supply and construction of a new sugar factory and refinery designed to process 3175 metric tons of cane per day to produce roughly 320 metric tons of raw sugar, of which 114 tons will be refined and sold as white sugar. The factory, to be completed in 1977, will alone increase El Salvador's sugar production by about a quarter. Provision is included for expansion to 5800 t.c.d. capacity, with proportional increase in refined sugar output. At full capacity the plant will produce 120,000 tons of raw sugar per year or half the country's present production. The factory will be situated on the lower slopes of an extinct volcano called Chinchontepeque, south-west of the small town of San Vicente in the Jiboa Valley, a region providing excellent conditions for the extensive cultivation of cane.

* * *

Allen turbine orders for sugar mills.—In the past few months, W. H. Allen, Sons & Co. Ltd. of Bedford, England, have secured orders for multi-stage and single-stage steam turbines for use in the sugar industry, generally having outputs between 3000 and 11,000 bhp and complete with alternator, control gear and ancillary equipment for base-load electric power generation and process steam supply. The turbines are either Allen type SLC or HES machines for which there has been a high demand from the sugar industry. Two 7250 kW turbo-alternator sets are to be supplied to The Tongaat Group Ltd. of South Africa, while a 2500 bhp turbine is to be supplied to Babinda Coop. Central Mill Society of Australia for use as a shredder drive; other turbines are to go to mills in Brazil, Jamaica and Nigeria.

* * *

EEC white sugar tenders.—The EEC Commission opened a permanent weekly selling tender for a maximum of 200,000 metric tons of white sugar, starting 16th July. The awards are based on the lowest export restitutions submitted. Officials in favour of such tenders argued before their adoption[2] that, unless the Community sold sugar shortly, it could be faced with a surplus of over a million tons later this year, particularly in view of the record EEC beet plantings and good weather. The opposition view was that it was too early to commit sugar since 500,000 tons would be needed to replenish stocks and no upturn was visible in retail demand.

* * *

Spain sugar imports 1974[3].—Sugar imports by Spain during the calendar year 1974 reached 517,030 metric tons, raw value, which is 390,000 tons above the quantity imported in 1973. The major supplier was Cuba with 274,000 tons, compared with 55,309 tons in 1973. Other main suppliers were Brazil (43,003 tons of refined sugar), France (38,756 tons of white sugar) Poland (35,328 tons of white sugar), Argentina (24,459 tons of white sugar) and Rumania (14,650 tons of white sugar). Imports from Belgium declined by 5000 tons and from Holland by 3000 tons.

US mainland cane sugar production 1974/75[4].—Cane sugar production in Florida from the 1974/75 crop, which ended on the 11th April, totalled 793,339 short tons, raw value, compared with 824,198 tons produced from the previous crop. Final sugar production from the 1974 Louisiana crop was 593,922 tons, raw value, compared with 557,854 tons a year earlier. The Texas cane area finished its second crop, producing 76,203 tons of sugar, raw value, compared with 38,407 tons from its first crop. Total mainland cane sugar production amounted to 1,463,464 tons for 1974/75, compared with 1,520,459 tons produced in 1973/74.

* * *

UK refineries modernization[5].—Tate & Lyle Ltd. has announced that it plans to modernize and improve its refineries extensively. The company is raising about £18·5 million by a 1-for-4 rights issue at £1.70 per share. The company is reviewing its policy in other areas of interest. Its research programme has been expanded and several new sugar-based products are now at the pilot plant stage. The company's shipbuilding interests are also under review and its building programme is to be revised despite the poor state of all sectors of shipping at present. The funds raised by the rights issue will also be put into the more general side of the business's running costs, which include varying interest rates on loans and normal expansion.

* * *

Colombia sugar exports 1974[6].—Exports of sugar from Colombia in 1974 totalled 128,661 metric tons, raw value, as against 142,471 tons in 1973. The USA received most of this, viz. 92,626 tons (67,805 tons in 1973) while the remainder went to Chile (24,000 tons) and the USSR (12,035 tons).

* * *

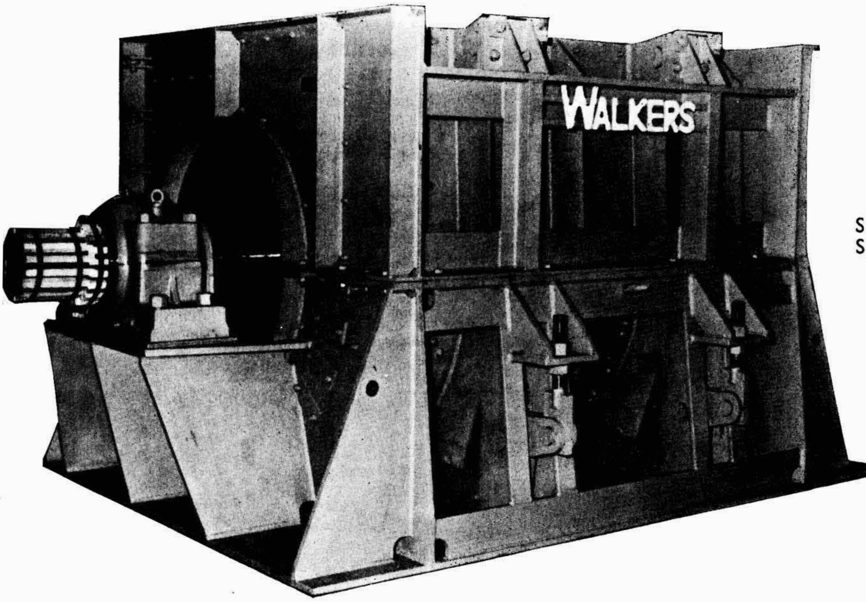
Egypt beet sugar proposals[7].—According to a USDA report, Egypt's sugar cane area had increased from 89,514 acres in 1963 to 142,000 acres by 1973 but, according to agricultural experts, this is the maximum arable land area suitable for cane production. Following a feasibility study in late 1974, the Government now hopes to produce about 100,000 metric tons of beet sugar to be used for domestic consumption and thereby increase cane sugar availability for export to obtain much-needed hard currency. Experimental plantings in the Nile Delta have proved successful, with sugar yields averaging 2–2·5 tons per acre. Plans have been made to install a complete beet processing facility at Kafr el Sheikh and a similar facility at Noubarich.

* * *

India acceptance of EEC sugar quota[8].—India has accepted an EEC quota of 25,000 metric tons of white export sugar a year for five years, with a special quota of 22,000 tons for 1975 up to the end of June. The five-year scheme was included in an annexe to the Lomé Convention last year when the Indian quota of 25,000 tons a year was set in the context of 1·4 million tons which the EEC agreed to import from Commonwealth sugar producers after Britain joined the Common Market. India is to supply at fixed prices related to the internal EEC price; for the year to 30th June 1976 these have been set at 25·53 units of account per 100 kg for raw sugar and 31·72 units for white sugar. Under the agreement, if India fails to deliver its full quota in any one year, except for reasons of force majeure, the quota will be reduced to the amount the EEC actually received during that year.

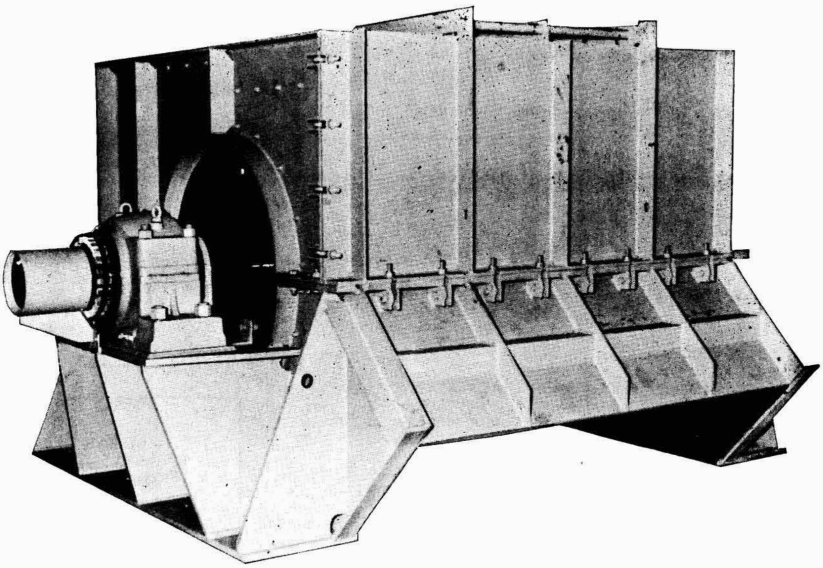
---

1 *Sukkerposten*, 1975, (19), 18.
2 *Public Ledger*, 5th July 1975.
3 F. O. Licht, *International Sugar Rpt.*, 1975, **107**, (19), 6.
4 *U.S.D.A. Sugar Rpts.*, 1975, (276), 4.
5 *Public Ledger*, 5th July 1975.
6 *I.S.O. Stat. Bull.*, 1975, **34**, (6), 30.
7 F. O. Licht, *International Sugar Rpt.*, 1975, **107**, (21), 11.
8 *Public Ledger*, 28th June 1975.



SHOWING SHREDDER
SECTOR ADJUSTMENT

REAR VIEW INDICATING
SHREDDED CANE EXIT



THIS IS OUR LATEST HEAVY DUTY CANE SHREDDER. IT IS OF ALL STEEL CONSTRUCTION, WITH HEAVY CAST STEEL HAMMERS, AND AN ADJUSTABLE SHREDDING SECTOR. THE DIAMETER OVER THE TIPS OF THE HAMMERS IS 60 in. AND THE HAMMERS COVER AN AXIAL LENGTH OF 84 in. CELL RUPTURES OF UP TO 90% HAVE BEEN ACHIEVED WITH THIS TYPE OF SHREDDER.

CONSULT US ON YOUR SHREDDER PROBLEMS

WALKERS LIMITED **CONSULTANTS DESIGNERS ENGINEERS**

P.O. BOX 211, MARYBOROUGH, QUEENSLAND, AUSTRALIA

Telex: 71578

Index to Advertisers

PAGE

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.