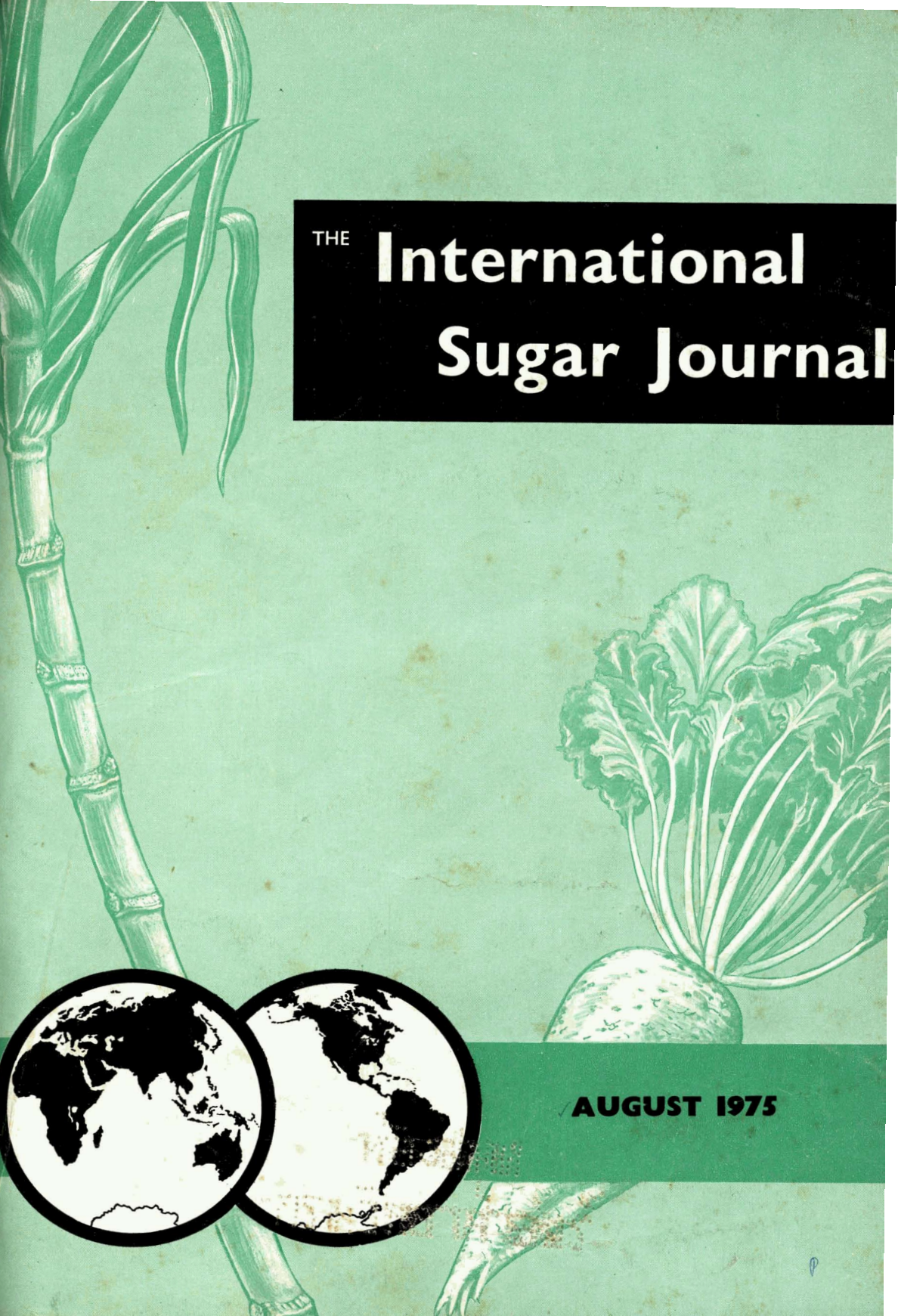

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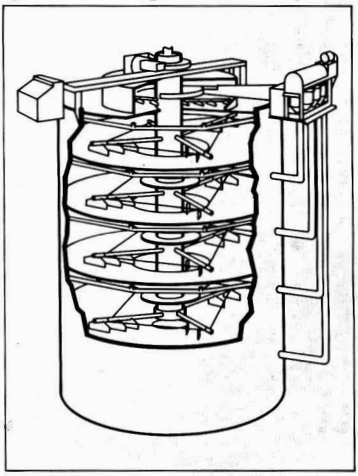

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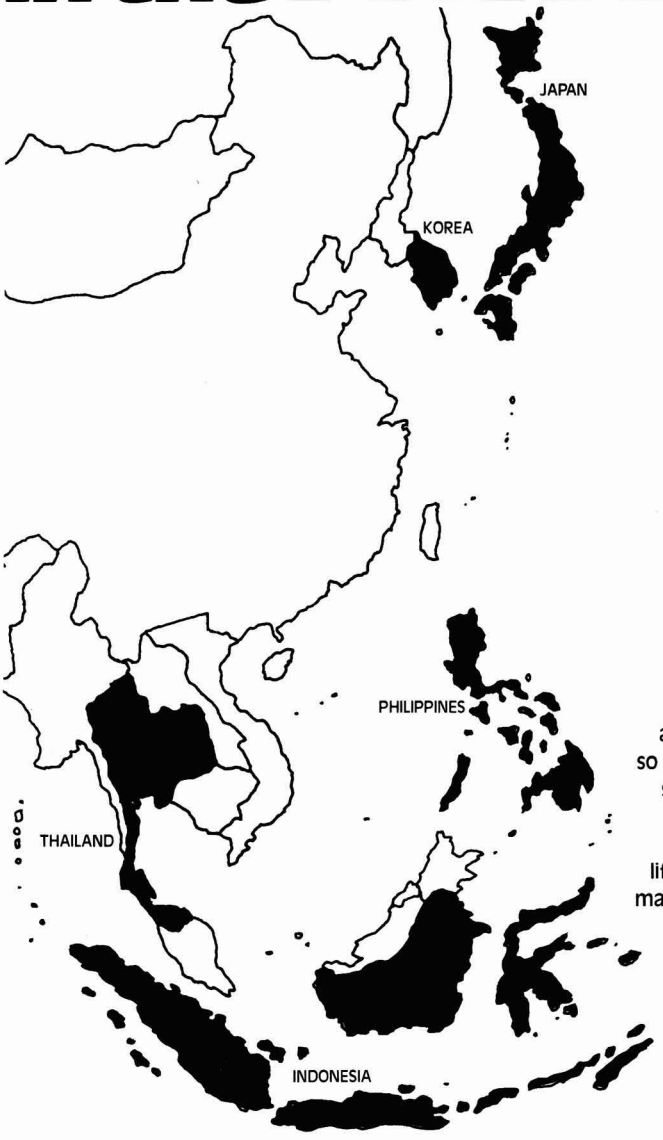

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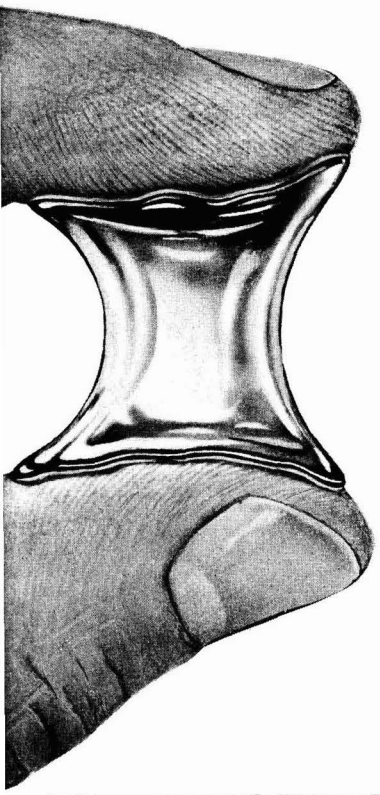

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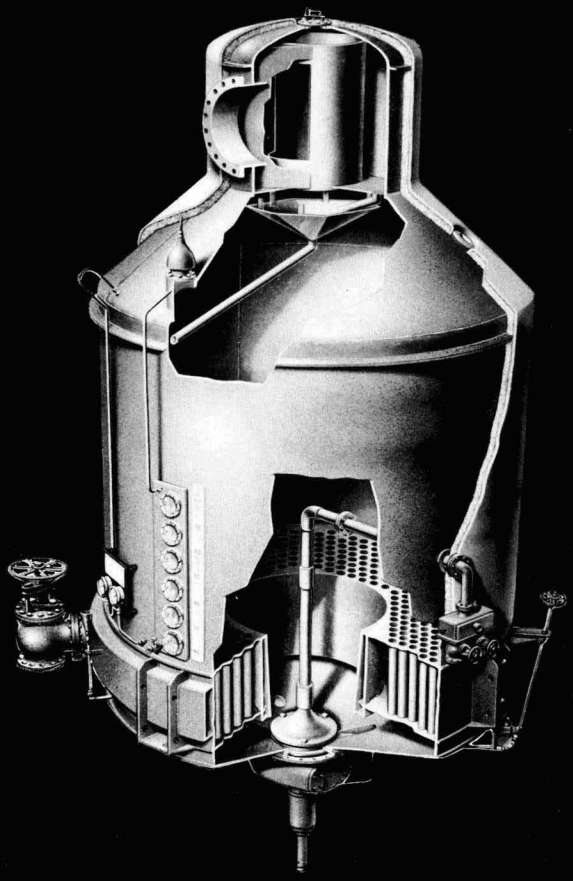

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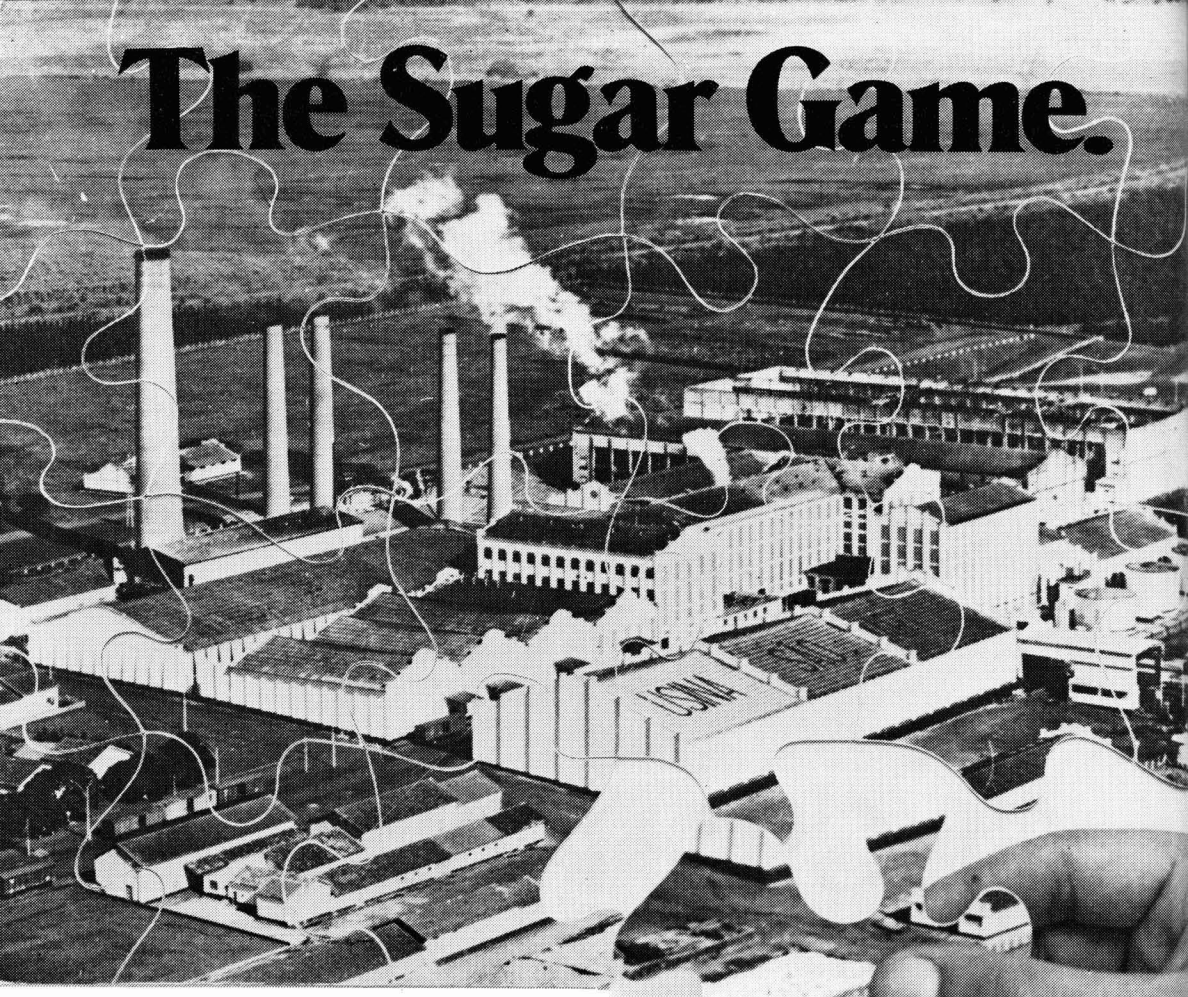

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International Sugar Journal

August 1975

Contents

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Séparateurs magnétiques—elément essentiels d'efficacité en sucrerie de canne. R. F. MERWIN. *p.* 227–230

Les origines d'objets métalliques errants dans une sucrerie de canne sont étudiées et les avantages de l'installations de séparateurs magnétiques sont discutés. Le meilleur moyen d'éliminer ces objets métalliques est donné et les endroits auxquels les électroaimants sont le plus efficace sont décrits.

* * *

Commission Internationale Technique de Sucrerie—15e Assemblée Générale 1975. *p.* 231–232

On présente le rapport de l'assemblée générale de la CITS 1975 quie s'est déroulée du 13 au 15 mai à Vienne. Le programme est résumé et les détails des communications présentées y sont joints.

* * *

Dommages causés à la canne par chenilles. R. A. AGARWAL. *p.* 232–234

Les caractéristiques d'identification des larves et des adultes de chenilles, dont une douzaine d'espèces détruisant la canne à sucre dans l'Inde, a été inventoriée ainsi que la nature des dommages causés par chaque espèce.

* * *

Réduction du bruit dans les sucreries du Queensland. D. MACEY et J. R. ALLEN. *p.* 234–236

Les auteurs passent en revue les sources de bruit dans les sucreries de canne du Queensland, comprenant: les locomotives pour la canne, les couteaux préparant la canne, les hachoirs, les engrenages des broyeurs, les sorties de vapeur, les valves, les compresseurs et les pompes à vide. On décrit quelques méthodes pouvant constituer des solutions valables à ces problèmes communs. Elles sont basées sur deux techniques principales: l'enveloppement technique par laquelle le bruit dans l'air est réduit lorsqu'il traverse une barrière solide, et l'absorption du bruit par des isolants en matériaux poreux. On cite aussi l'amortissement des surfaces vibrantes pour réduire le bruit.

Magnetabscheider—ein wesentlicher Teil der ökonomischen Verarbeitung von Zuckerrohr. R. F. MERWIN. *S.* 227–230

Nach einer Untersuchung für die Ursachen von in einer Rohrzuckerfabrik herumvagabundierendem Eisen werden die Vorteile der Installierung von Magnetabscheidern diskutiert. Es werden Hinweise darauf gegeben, wie man diese Eisenteile am besten entfernt, und die Stellen aufgezeigt, an denen Elektromagnete am wirkungsvollsten eingesetzt werden können.

* * *

15. Generalversammlung 1975 der Commission Internationale Technique de Sucrerie. *S.* 231–232

Es wird über die diesjährige Generalversammlung der CITS berichtet, die vom 13. bis zum 15. Mai in Wien abgehalten wurde. Nach einer Uebersicht über das Gesamtprogramm werden Einzelheiten über die eingereichten Beiträge mitgeteilt.

* * *

"Moth borer" und Zuckerrohrschäden. R. A. AGARWAL. *S.* 232–234

Die charakeristischen Merkmale der Larven und der Imagines der verschiedenen asiatischen Reisbohrerarten ("moth borer"), von denen etwa ein Dutzend das Zuckerrohr in Indien befällt, wurden in einer Liste zusammengestellt, in der auch die Natur der von jeder Art verursachten Schäden angegeben ist.

* * *

Lärmminderung in Zuckerfabriken in Queensland. D. MACEY und J. R. ALLEN. *S.* 234–236

Die Verfasser geben eine Uebersicht über die Geräuschquellen in Rohrzuckerfabriken in Queensland, zu denen die Lokomotiven für den Rohrtransport, die Messer zur Vorbereitung des Rohrs, die Shredder, die Kasten für die Mühlenantriebe, die Dampfauslassöffnungen, die Ventile, die Kompressoren und die Vakuumpumpen gehören. Sie beschreiben eine Reihe von Methoden, nach denen man technische Lösungen für die schwerwiegendsten der im allgemeinen auftretenden Probleme finden kann. Sie beruhen auf zwei grundlegenden Techniken: Gehäuse, durch die das beim Durchtritt von Luft durch feste Hindernisse erzeugte Geräusch verringert wird, und die Absorption durch Wände aus porösem Material. Die Dämpfung von schwingenden Flächen zur Lärmminderung wird ebenfalls erwähnt.

Separadores magnéticos—un parte esencial de la fabricación eficiente de azúcar de caña. R. F. MERWIN. *Pág.* 227–230

Fuentes de hierro extraño en una azucarera se examinan y los ventajes del instalación de separadores magnéticos se discuten. El autor aconseja sobre el mejor método de eliminar hierro extraño y los ingares se indican donde estarán más efectivos los electroimanes.

* * *

15a Asemblea General de la Comission Internationale Technique de Sucrerie, 1975. *Pág.* 231–232

Se presenta un informe sobre la Asemblea General en 1975 de la CITS que se celebraba el 13–15 mayo en Viena. La programa general se perfila y se presentan detalles de los papeles presentados.

* * *

Los barrenadores y daño de la caña. R. A. AGARWAL. *Pág.* 232–234

Se hace una lista de las catacterísticas para identificación de las larvas y adultas del barrenador, de que una docena de especies atacan caña de azúcar en la India, tanto como la natura del daño causado por cada especie.

* * *

Disminución de ruido en azucareras de Queensland. D. MACEY y J. R. ALLEN. *Pág.* 234–236

Se presenta un examen de fuentes de ruido en azucareras de Queensland; estos incluyen locomotores del ferrocarril cañero, cuchillas para preparación de la caña, disintegradores, cajas de engranajes para la marcha de los molinos, válvulas para escape de vapor, otras válvulas, comprimadores y bombas de vacío. Algunos métodos para demostrar soluciones prácticas de las más graves problemas comunes se describen; estos se basen sobre dos técnicas esenciales: encerramiento (en que ruido traido por el aire se reduce cuando se pase a través de una barrera sólida) y absorción por mantas de materias porosas. Amortiguación de superficies vibrantes para eliminar ruido se menciona también.

THE

INTERNATIONAL SUGAR JOURNAL

VOL. LXXVII AUGUST 1975 No. 920

Notes & Comments

The late Dr. W. R. Crawford

We very much regret to report the death in June of Dr. WILLIAM R. CRAWFORD who had been a member of our Panel of Referees since September 1970. Born in Ulster in 1908, he served an engineering apprenticeship with Harland & Wolff Ltd. of Belfast, and studied mechanical engineering as an undergraduate at Queen's University, gaining the degrees of B.Sc. (Hons.), M.Sc., Ph.D. and D.Sc. as well as becoming a Whitworth Scholar.

Dr. CRAWFORD spent some years before and during the second World War with the Department of Scientific & Industrial Research, but during the latter part of the war returned to industry as Technical Assistant to the Managing Director of Markham & Co. Ltd. of Chesterfield. In 1950 he joined the foundation staff of the newly-formed Sugar Research Institute in Mackay, Queensland, as Chief Engineer and was apppinted Deputy Director in 1954. In 1963 he joined the staff of Walkers Ltd., serving as senior development engineer and latterly as Consultant, particularly in connexion with their sugar machinery activities, until his retirement earlier this year.

During his years with the Sugar Research Institute, Dr. CRAWFORD was responsible for all engineering aspects of research on cane milling and the processing of juice into raw sugar. He travelled widely and initiated work which has had considerable influence on milling practices in Australia and elsewhere. He contributed many papers on mill engineering, particularly to the Queensland Society of Sugar Cane Technologists and to the ISSCT; his paper "Cane extraction by milling—the modern approach" received the C. W. Murray Award for 1970.

This Journal owes a debt of gratitude for his work in assessing the merit of papers submitted to his scrutiny, and we deeply regret the loss of this gifted man whose passing will be mourned by his friends all over the world.

* * *

World raw sugar price

After the brief recovery early in June the slide in sugar prices continued with the London Daily Price reaching a low of £128 per ton on the 19th. There had been more than adequate sugar offered to meet what buying interest existed and weakness was reinforced by the requests of Japanese refiners to defer deliveries of raw sugar until late this year as a consequence of heavy inventories and poor sales (refinery production has been cut back by 30%); reselling of the raw supplies is difficult and expensive because of the much lower price obtaining by comparison with the price at which it was bought.

Towards the end of the month, after fluctuating between £128 and £140, the price started to improve and reached £155 on the 1st July, partly in consequence of the depreciation of sterling in terms of other currencies and following reports of sales at higher prices.

* * *

London white sugar market

Since the problems encountered on the Paris Terminal Market last December traders have had difficulty in hedging their white sugar transactions. Pending the re-opening of the Paris Market, the United Terminal Sugar Market Association in London has introduced a new Contract, No. 2A, which will supplement the present No. 2 raw sugar contract and deal in the premiums or discounts representing the difference between the values of raw sugar c.i.f. and white sugar f.o.b. and stowed. The new Contract was to be introduced on the 15th July and the months quoted will be the same as those quoted for raws, with delivery at a wide range of European ports. A committee established by UTSMA meets each day at 11.05 a.m. to agree the London Daily Price for white sugar, much as is done for raw sugar, and the first such quotation was announced on the 1st July. The premium was £30 per ton (£180 *vs.* £150) but within two days had fallen to £15 per ton (£165 *vs.* £150).

* * *

New US sugar hearings

At the time of the expiry of the US Sugar Act in December 1974, sugar prices on the world market were so high that there was no need for protection of domestic producers such as had been afforded by the Act. As the price has declined there has been growing realization of the vulnerability of the industry, and the Chairman of the House Agriculture Committee, Rep. THOMAS FOLEY, announced early in June that there would be five days of hearings by the Committee, beginning the 14th July, on the sugar situation and the possible need for new legislation. Mr. FOLEY said that witnesses might wish to discuss the effect of a prospective resumption of relations between the US and Cuba and the threat of development of an OPEC-like producer cartel in the absence of a new programme[1]. One member of the Committee is ROBERT BERGLAND, Representative for the beet-growing state of Minnesota, who has suggested a target price

[1] *Public Ledger*, 7th June 1975.

approach like that now used for grain and cotton supports.

At a Sugar Club dinner in New York, Mr. BERGLAND said[2]: "In my mind the basic question is whether we should have a Sugar Act—to encourage increased domestic production—or if we should cancel all plans for expansion and depend on foreign supplies to meet the ever-growing domestic demand . . . If the inquiry should determine that the lack of a sugar policy in the United States would either inhibit domestic production or enhance the creation of a regional foreign cartel you can expect a new Sugar Act to be introduced and given serious consideration".

* * *

Brazil sugar crop plan for 1975/76

Details were announced during May of the official plan authorizing the level of production in Brazil from the 1975/76 crop. Total production has been set at 129 million 60-kg bags (7,740,000 metric tons), tel quel, which shows an increase of only 4 million bags over the planned level for 1974/75 of 7,500,000 tons. Actual production was only 115 million bags (6,900,000 tons) however, and the 1975/76 planned total thus allows for an expansion of 14 million bags or 840,000 tons (12·2%). The new decree makes a special provision authorizing the start of milling operations in the southern (São Paulo) area for the 1975/76 season from the 1st May instead of the traditional 1st June, as a result of the 1974/75 production shortfall in the north-eastern area.

Of the total level provided in the plan, 78·3 million bags (4,698,000 tons) are set to cover consumption requirements during 1975/76; this follows the rapid expansion which has taken place in recent years. The plan provides for the setting-up of a reserve stock amounting to 7·2 million bags, or 428,000 tons, utilization of which will be decided during the year.

The remaining balance of planned production over the coming year amounts to 43·5 million bags (2,610,000 tons) which is the quantity authorized for export. No growth is allowed for in this figure as exports have averaged around 2·6 million tons in the last three seasons. Exports are to include 33·5 million bags (2,010,000 tons) of raw sugar and 10 million bags (600,000 tons) of whites.

* * *

Sugar in the Middle East[3]

The Economic Commission for Western Asia, meeting under the auspices of the United Nations Industrial Development Organization, has recently been looking into the situation in selected branches of the food processing industry in the Middle East. So far as the sugar industry is concerned they have noted that the processing capacity of the Arab countries as a whole falls far short of satisfying local demand. About one million tons, or approximately half domestic requirements, is imported in the form of white sugar while reliance on imports is even greater when the quantity of raw sugar arriving for refining is taken into consideration.

Accordingly it was agreed that immediate action should be taken to increase the productivity of existing processing plants and to increase the production capacity of the region. In this context it was recognized that there was a marked need for an increase in the level of technology and it was suggested that agronomical research should be carried out on a major scale in prospective areas. Meanwhile it was recommended that a programme should be initiated for the reconstruction of existing sugar industries and the establishment of new processing units. It was also suggested that special attention should be paid to the provision of finance to those countries within the region which had the production capacity but lacked the necessary capital.

It is quite customary for developing countries and groups of developing countries to draw up impressive plans for the establishment of new sugar industries. Hitherto these have sometimes been somewhat larger in the planning scale than in the ultimate achievement. However, many of the Arab countries are major oil producers and now have substantial financial resources. The recent high level of prices has forcibly drawn their attention to the fluctuations which occur in the world market and it would therefore not be surprising if a substantial expansion in the sugar industries of these countries were to be initiated. So far there has not been any actual identification of the areas in which production expansion is projected.

* * *

India sugar expansion plans[4]

India aims to raise sugar production to 5·7 million metric tons by 1978/79 under its fifth economic development plan, according to Mr. G. C. L. JONEJA, Food Secretary and Chairman of the Sugar Industry Development Council. He told the Council that in 1973/74 India produced 3·95 million tons of sugar and could produce more than 4·6 million tons in 1974/75.

In line with the development plan, installed production capacity will be raised to six million tons and licensed capacity to seven million. A number of new factories will be built and some existing units expanded.

* * *

Thailand sugar difficulties[5]

The cane crushing season this year is to close earlier than expected because of a shortage in the cane supply which could affect the production of both raw and white sugar, hampering the planned raw sugar export of 500,000 tons for the 1974/75 season.

An agreement in principle has been reached between the Government and the sugar millers that both parties should be jointly responsible for fixing the cane prices before the planting season to assure planters of their investment and income, that the millers must ensure the non-occurrence of sugar shortages for domestic consumption and that they must help the Government prevent sugar being smuggled out of the country. Upon fulfilling these conditions the millers will be allowed to engage in export trade at a price to be established by the Government.

Sugar millers have recently agreed with the Government to guarantee the minimum price of cane at 300 Baht per ton for the next season; however, planters are demanding a guaranteed price of 375 Baht per ton. Any substantial concession given to the planters is unlikely to come about without lowering of the export premium or raising the controlled price of white sugar for home consumption.

---

[1] *Lamborn*, 1975, **53**, 83.
[2] *Sugar Review*, 1975, (1232), 85.
[3] C. Czarnikow Ltd., *Sugar Review*, 1975, (1233), 89.
[4] *Public Ledger*, 3rd May 1975.
[5] *Standard and Chartered Review*, May 1975, 40.

Magnetic separators—an essential part of efficient sugar cane processing

By R. F. MERWIN,
Chairman (Eriez Magnetics, Erie, Pennsylvania, USA)

WITHIN the past decade there has been a gradual realization that the installation of magnetic separators to remove metal trash from cane and bagasse is essential in progressive sugar mills. This is particularly true in areas where cane is mechanically harvested or mechanization is anticipated in the years ahead.

Generally recognized as having the most efficient and profitably operated mills are Florida, South Africa and Hawaii. All Florida mills use powerful electromagnets to protect mill rolls and other magnetic separators to remove smaller tramp iron from bagasse. All but a few mills in South Africa and Hawaii are similarly equipped.

According to a recently completed worldwide survey, magnetic separators are being designed into more than 75% of new sugar mills being built or where major redesigning of cane conveying is being carried out.

In analysing pieces of damaging tramp iron removed by magnetic separation (Fig. 1), mill operators find a large amount of metal debris comes from:

1. The field (steel plate, welding rods, loose iron from harvesting and transportation equipment).
2. Conveying equipment and from mill tandems themselves (chains from broken slings, steel conveyor slats, knives from shredders, broken teeth from the mill rolls, etc.).

Start-up is a most vulnerable period. Tramp iron comes from mill repair work, such as welding rod, fish-plate, tools and loose iron that has been left or dropped into open conveyors. New shells or re-grooved mill rolls are sometime damaged before the second day of operation.

Mill operators who feel their final sets of mill rolls need regrooving so infrequently that they can get along without magnetic protection are rapidly diminishing in number as they make comparisons with neighbouring mills which have well-engineered magnetic separator installations.

Reasons for the large number of recent magnet installations are:

1. *Financial gain.* Fast return on investment as a result of:

(*a*) Improved juice extraction by reduction of damage to roll grooves and teeth; also, lower moisture content of processed bagasse.

(*b*) Savings from less frequent removal, regrooving of shells and reshelling of rolls.

(*c*) Reduced loss of production caused by tramp iron damage and manual removal.

(*d*) Reduced cost of regrinding cane that falls through broken grooves with juice.

(*e*) Savings from longer life of screens and pumps.

(*f*) Savings to boilers and feed mechanisms resulting from iron-free bagasse.

2. Because of the increased price of sugar in recent years, management is more receptive in approving new expenditures where mill operators can see a fast return on cost of the magnet installation which, at the same time, provides a greater insurance against a production breakdown or delay due to metal trash.

3. *Proven reliable magnetic equipment and well-engineered, trouble-free installations.*

Twenty years ago there were more poor or marginally satisfactory magnetic separator installations in the world than there were good ones. Sugar mill designers and constructors were reluctant to recommend and increase total mill cost even 1 or 2% by including magnetic protection.

Fig. 1. Workman standing on top of mountain of crusher-damaging tramp iron extracted from sugar cane by magnetic separators supplied by Eriez Magnetics

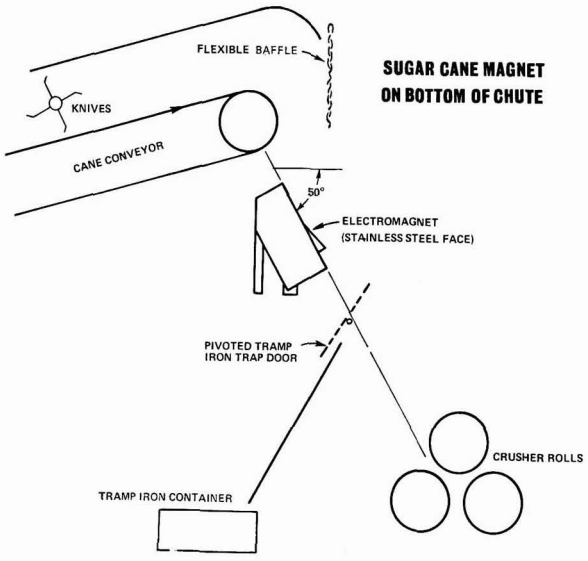


Fig. 2

All that is now changed. Great advances have been made in the strength of magnetic separation equipment and in application techniques. Many mills are removing 99% of damaging iron and the installation in no way interferes with normal production.

Taking advantage of experience gained in removing damaging metal in many other industries where strong magnetic protection is needed, engineers have developed extremely powerful electromagnets that perform faithfully for years without trouble.

Yet, the strongest magnet ever built will not successfully remove damaging iron from sugar cane unless properly applied. *Installation know-how is essential to success*! Fortunately, experience has resulted in some proven, successful points of installation.

In each country (and region within the country) different conditions exist. Also, mills vary widely in design depending on the country of origin and the manufacturer. Nevertheless, the following suggestions usually are pertinent to all proposed installations:

1. Do not waste time trying to find a place to install magnetic separators ahead of the shredding knives, although a certain amount may be caught by powerful permanent plate-type magnets installed in the chutes feeding the primary cane conveyor. Experts in magnetic separation have looked over scores of mills and cane unloading operations and have concluded that, unless cane is thinned out as a result of a water bath or other mechanical cane preparation equipment, much magnetic protection cannot be expected ahead of knives. A piece of rock—or loosened fastening—can cause shredder knife blades to break loose. Magnetic protection is needed *after* shredding to pick up cane knives.

2. The first good point of installation of magnetic protection is in the bottom of the chute immediately ahead of the crusher rolls or first piece of shredded cane processing equipment. This chute must be long enough to house a large electromagnet and still not have prepared cane back up over the magnet surface in normal operations. Most mills installing magnets in this position also build a gate with a trap-door to permit easy removal of tramp iron from the magnet (Fig. 2).

3. As an alternative to a chute magnet, a short, high-speed belt conveyor can be installed after the main conveyor and ahead of the mill rolls, with a suspended electromagnet installed over the belt (Fig. 3). There are several successful installations of this type. The conveyor should be a minimum of 16 feet long on 30-inch diameter pulleys and travelling at a minimum of 250 feet per minute to reduce depth of cane coming from the preparation equipment. It is desirable to reduce the depth of surges of cane passing under the magnet by means of a leveller at the entry end of the conveyor, so the magnet can be suspended as close to the belt as possible.

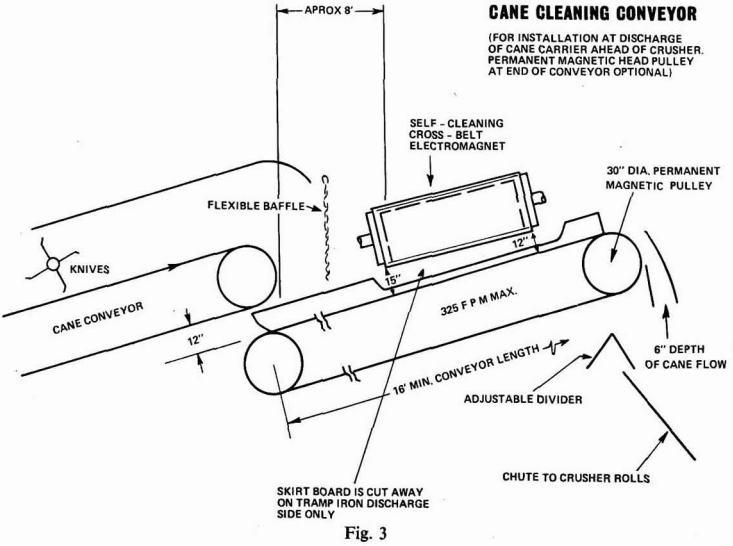


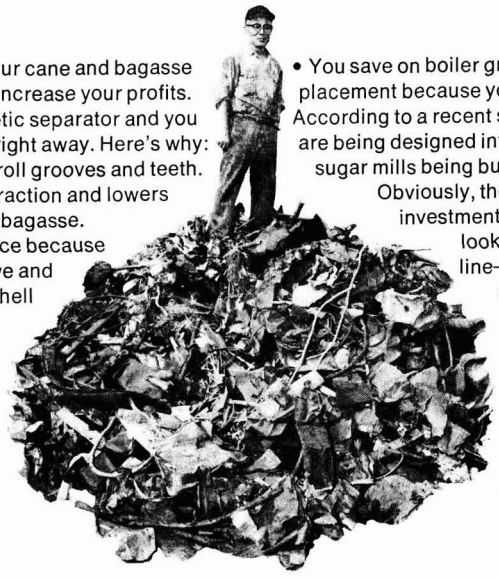
Fig. 3

A magnetic pulley at the belt conveyor will give added protection, but is secondary to the suspended electromagnet. The pulley will remove remaining smaller pieces of metal that may be on the bottom of the burden of cane.

HERE'S WHY 3 OUT OF 4 NEW SUGAR MILLS WORLDWIDE USE ELECTROMAGNETS TO PROTECT MILL ROLLS.

Tramp iron. Take it out of your cane and bagasse before processing and you increase your profits. Use a powerful Eriez magnetic separator and you cash in on your investment right away. Here's why:

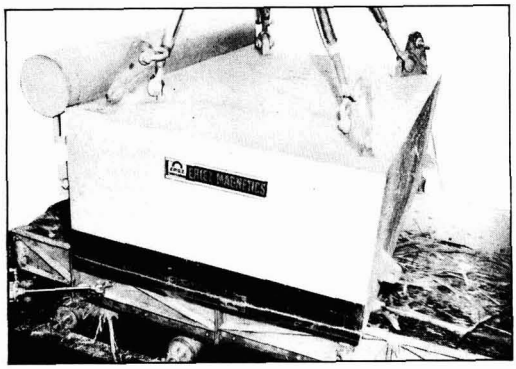
- You reduce damage to roll grooves and teeth. This improves juice extraction and lowers the moisture content of bagasse.
- You save on maintenance because you don't have to remove and regroove shells and reshell rolls as often.
- You cut production downtime caused by tramp iron damage and manual removal.
- You reduce costs of regrinding cane that falls through broken grooves with the juice.



- You save on boiler grate and feed mechanism replacement because your bagasse fuel is iron-free.

According to a recent survey, magnetic separators are being designed into more than 75% of the new sugar mills being built, worldwide.

Obviously, their annual savings justify the investment. That's why it will pay you to look into the full Eriez Magnetics line—suspended and chute-type separators to pull tramp iron from incoming cane; plate magnets to protect juice strainers; grate magnets to protect continuous centrifugals; plate, pulley and suspended electromagnets to remove iron contaminants from bagasse.



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THE NEW REVOLUTIONARY GREEN AND BURNT CANE HARVESTER

collects cuts chops cleans loads GREEN and burnt cane

CUTTER HEAD
Fully floating over uneven ground. Cutting and chopping width 1400 mm – 56". Vertical side cutter for overhanging crop. Two rotary dividers for lodged cane. Designed for upright or lodged cane in fields with more than 200 t/ha. No feedrollers causing blockages.

DRIVER'S CABIN
Ventilated. Comfort seat. Extra large windows for max. visibility. Only SIX levers to operate.

HYDRAULICS
Fully hydrostatic ground drive. Fully hydrostatic steering. Hydraulic lifting system for cutterhead. Hydraulic cross elevator drive. Hydraulic axial-type cleaning fan.

CLEANING SYSTEM
Double base cutter throw out. Perforated extra wide main elevator 1400 mm – 56". Twin-type main cleaning fan. Perforated unloading elevator. Axial-type cleaning fan.

Development of this new harvester for GREEN and burnt cane began in the early 60's and serial production started 1970.
The machine began its conquest of the world's sugar cane fields in Middle and South America by proving

1. its high capacity – up to 60 t/h,
2. its minimal amount of trash, never reached by others, and
3. its easy operation and lowest operating and maintenance costs.

The big 190 HP MERCEDES engine, the heavy duty hydrostatic drive, the heavy duty frame and special low pressure tyres ensure operation under all field conditions. Do you want to reduce your production costs? This is your cane harvester – a German quality product from one of the three biggest manufacturers of combine harvesters in the world.
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West Germany

4. The second point of installation to be considered is *after* the crusher rolls. Usually slatted metal conveyors move and elevate crushed cane from the bottom of rolls to the upper entry into the next set of finer rolls. Bear in mind that there is little likelihood of metal trash damage to crusher rolls, or even the first set of mill rolls, because of the wide clearance between rolls. It is the finer sets of rolls which suffer major damage.

Many mills suspend an electromagnet over the conveyors carrying crushed cane to the vulnerable set of rolls. The cane is now "open" enough to let metal trash go through it when subjected to the magnetic field.

In the case of the suspended electromagnet, it is desirable that the conveyor members under the magnet be non-magnetic stainless steel or some other non-ferrous, corrosion-resistant material.

Usually there is sufficient space in existing installations to erect the magnet on a heavy support. While this magnet may be self-cleaning by means of a belt, most mills install the magnet so that it can be swung out from over the cane flow when it is necessary to discharge the metal trash (Fig. 4).

Over the years it has been found that the most effective "workhorse" for cleaning cane is the most powerful, dependable electromagnet possible—either in a suspended position or in the bottom of a chute.

Some mill designers and operators opt for the self-cleaning pulleys. Magnetic pulleys are recommended on belt conveyors for cleaning bagasse or *after* suspended electromagnets on shredded cane. It should be kept in mind it is impossible to build a 360° magnetic field in a pulley (permanent or electromagnet) comparable in strength to the 180° magnetic barrier in a large electromagnet. While magnetic fields in permanent separators have grown appreciably stronger over the past decade, electromagnet materials and designs have also greatly improved, so that tramp iron can be removed from greater burden depths.

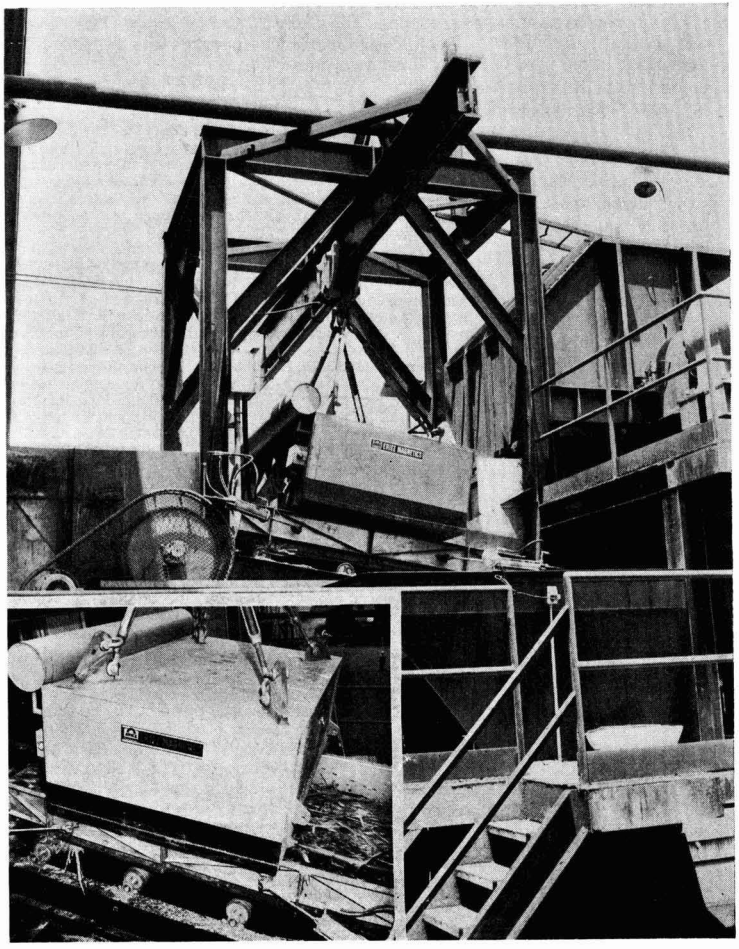

Fig. 4. A large electromagnet at Oahu Sugar Co., Hawaii; the magnet is suspended from an I-beam "track" so that it can be rolled to one side to discharge accumulated tramp iron. Inset shows close-up of the magnet in operation position

The average rectangular electromagnet used in an 84-inch sugar mill tandem contains 150,746 cubic inches of magnetic coil and cooling space, compared with 75,000 cubic inches in a 36-inch diameter by 84-inch belt width electromagnetic pulley. Dependable performance of a powerful electromagnet depends on how well heat generated by the coils is dissipated so that its strength can be effectively maintained.

A 30- or 36-inch magnetic pulley will remove most tramp iron from shredded cane provided the burden depth is even, does not exceed five inches and belt speed is under 300 feet per minute. For a higher percentage of removal, the rectangular electromagnet should be used, especially if the burden depth may be in the 10-inch range.

One particular oddity occurring in many mills is the recirculation of tramp iron and mill teeth within the tandem. Metal trash will sometimes fall into the juice pan. From the juice pan it will go through the cush-cush strainer that takes out the larger tramp iron but allows

smaller broken pieces to go back to the mill to produce additional damage.

This is a vicious circle that many times is overlooked by even the best of operators. The installation of permanent magnets at the bottom of the juice canal to the cush-cush strainer will eliminate the recycling of this damaging iron to the mill rolls.

Now that the mill rolls are protected, there are two other areas in a sugar mill where magnetic separation has proved its worth:

1. Cleaning bagasse.
2. Cleaning massecuite ahead of centrifugals to protect centrifugal screens and magma pumps.

When bagasse is additionally processed for ultimate juice extraction, the close tolerances required necessitate an iron-free product. Bagasse, when used for fuel, should be free of metal trash because it can jam and damage conveyors leading to the boilers and can shorten the life of grates in the boiler. Automatic bagasse feeders are very vulnerable to iron in bagasse. If bagasse goes to a paper box-making or cattle-feeding operation, it should be free of damaging tramp iron. Cleaning the bagasse of tramp iron is a relatively simple operation and there are several alternative points of installation.

The first simple, inexpensive option is a permanent plate magnet on the bottom of discharge chutes. The only disadvantage here is the magnet must be manually cleaned; however, this is not an onerous chore, particularly if a preceding magnet is protecting the mill rolls.

Since bagasse is dry and is usually carried on belt conveyors, a magnetic pulley on the end of the conveyor belt is a natural location. Some mills will use an electromagnet (with trap-door) on the bottom of the chute. Others may use a suspended electromagnet at the conveyor discharge.

Several mills have effected savings in centrifugal screen wear by installing permanent magnetic grates in the massecuite lines to remove bits and pieces of magnetic metal. Because of high centrifugal forces, even a small metal chip will create a hole in the light mesh.

In existing installations, space for magnets in the massecuite lines ahead of centrifugals is usually limited. Fortunately, there is a great deal of flexibility in the construction of grate magnets which consist of one-inch diameter stainless steel tubes mounted in frames that can be incorporated in vertical flows.

At Central Matilde in Venezuela, mill operating personnel were very pleased with savings resulting from nine grate magnets installed in 1970. Central Matilde fabricated rectangular housings to incorporate in their 10-inch diameter pipes carrying up to 150 gallons of massecuite per minute to their continuous centrifugals.

Drawings were furnished of all-stainless-steel magnetic grate units $9\frac{7}{8}$ inches by 12 inches on a frame only $1\frac{1}{4}$ inches deep. The one inch-diameter tubes were spaced on $1\frac{7}{8}$-inch centres and $\frac{1}{4}$-inch diameter deflector rods spaced in the upstream side of the frame in the openings between the magnetic tubes.

In some mills, magnetic traps or powerful permanent plate magnets can be installed in viscous flow lines ahead of centrifugals and pumps subject to tramp iron damage.

What would be the annual savings from an investment in magnetic separators? The amount will vary depending on individual analysis of tramp iron damage. Operators universally agree: "a roll in bad shape will not perform . . . and tramp iron is the main culprit in damaging rolls." Even the most capable mill operators cannot get good performance from shells in poor condition.

Most progressive and efficient mill operators recognize the need for magnetic protection, have made the installation, and shudder to think of what would happen if they had to gradually reintroduce several hundred pounds of removed iron back into their flow lines.

In summary, mechanical harvesting of cane is increasing and will greatly increase the amount of tramp iron going to the preparation equipment. An investment in magnetic separators requires recommendations from experienced engineers who know how to design magnetic separators into the particular flow lines involved.

$250,000,000 sugar factory and refinery for Sudan.—The Kenana Sugar Co. Ltd., a new Sudanese corporation based at Khartoum, has awarded a contract to Arkel International Inc. for the design, engineering, procurement, expediting and construction management of a new sugar factory and refinery to be located near Rabak. The total design and engineering of the factory portion of the project will be performed by F. C. Schaffer and Associates Inc. and the remaining tasks by Universal Corporation, also of Baton Rouge, La. As previously announced[1], the project will be managed by Lonrho Ltd. The ultimate capacity will be 17,000 metric tons of cane per day, with full refining capability. The project will be installed in two phases, the first, to provide facilities capable of processing 8500 tons of cane per day into refined sugar, is scheduled for completion by 1st December 1977 while the second, involving doubling the capacity, is scheduled for completion by 1st November 1978. The complete project, including the agricultural development, irrigation scheme and factory, is projected to cost approximately $250,000,000.

* * *

Guatemala sugar exports, 1974[2].—Exports of sugar from Guatemala totalled 143,890 metric tons, raw value, in 1974 as against 130,190 tons in 1973. Destinations included the USA which took 81,479 tons (61,878 in 1973), the UK with 31,396 tons (34,497), Egypt with 9243 tons, Portugal with 9098 tons, Finland with 7620 tons and Canada with 5054 tons, none of these four last countries having received any sugar from Guatemala in the previous year when the remaining exports had been to Algeria (6298 tons) and the USSR (27,517 tons).

* * *

New Pakistan sugar factory[3].—The Larkana sugar factory in Naudero was recently put into operation. Erection of the factory was part of an agreement between Pakistan and China and it includes machinery supplied by the Takila heavy machinery complex. With a capacity of 1500 t.c.d. the factory will produce between 15,000 and 18,000 tons of white sugar per year.

* * *

Greece sugar expansion[4].—Sugar consumption in Greece is estimated at 240,000 tons in 1975 as against 220,000 tons in 1974. The Hellenic Sugar Industry S.A. is to expand production and will eventually build a new factory, either in the Tricala region of Thessaly or the Pyrgos region of Peleponnesos; the decision as to which has not been made as the prior expansion of the existing factories is being considered first, and would delay a start on a new plant.

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[1] *I.S.J.*, 1975, **77**, 96.
[2] F. O. Licht, *International Sugar Rpt.*, 1975, **107**, (10), 7.
[3] *Zeitsch. Zuckerind.*, 1975, **100**, 223.
[4] F. O. Licht, *International Sugar Rpt.*, 1975, **107**, (14), 7.

Commission Internationale Technique de Sucrerie

15th General Assembly, 1975

THE magnificent throne-room of the former Imperial Palace in Vienna, now the Wiener Hofburg Congress Centre, was the setting of the 1975 meetings held during the 13th–15th May which formed the major part of the 15th General Assembly of the CITS. Members had gathered during the 12th and were entertained to a reception in the Palais Schwarzenberg by the Austrian Sugar Industry Association.

The working sessions began on the following morning, the modern translation facilities contrasting with the baroque architecture and marble columns of the throne room. The Chairman of the Austrian Sugar Industry Association, Dr. O. STRAKOSCH, welcomed the visitors to his country, after which Professor F. SCHNEIDER, President of the Commission, introduced the programme which comprised 46 papers (although 5 were not presented). He mentioned that the number of participants was a record with more than 230 persons present, including 60 ladies. He reviewed the history of the CITS and spoke about the themes chosen for past meetings, also paying tribute to personalities who had played important parts in development of the Commission.

After reviewing the activities of the Scientific Committee of the CITS between Assemblies, he described the results of the meetings of this and the Administrative Committee on the previous day. He introduced Mr. F. MICHEL who spoke on arrangements for the meetings, group photograph, excursions, etc., and then called on Dr. R. PIECK to take the Chair for the first session. Dr. D. SCHLIEPHAKE first presented his paper on the distribution of retention times and mechanisms for movement in diffusers without forced displacement of cossettes, after which Dr. G. GENIE discussed theoretical aspects of sugar extraction by diffusion under non-steady conditions[1]. After presentation by Dr. N. MARIGNETTI of his paper on the simulation and regulation of continuous extraction of sugar beets, Mr. J. BLOK described the optimization of parameters, scalding and sugar loss in beet diffusion.

The next paper, by Prof. S. ZAGRODZKI, discussed the possibility of increasing sucrose extraction by addition of SO_2 and $CaSO_3$ in diffusion, while his associate, Dr. H. ZAORSKA, discussed the influence of this addition on the exhausted pulp. Dr. F. HOLLAUS described the effect of the method of acidifying diffusion supply water on the activity of formalin, after which Prof. SCHNEIDER thanked Dr. PIECK and summarized the contributions presented in the morning.

After lunch, Mr. R. DE VLETTER took the Chair, while Dr. D. MATTEUZZI presented the first paper on the inhibition of microbial activity in beet extraction juices using various antiseptic materials. Prof. E. REINEFELD then described gas chromatographic investigations into the behaviour of some non-sugars during sugar extraction. Mr. N. KUBADINOW discussed the behaviour of free amino-acids during juice purification, after which Mr. P. DEVILLERS presented a balance of metal elements for five sugar factories during the 1973 campaign and discussed the forecasting of purity and yield from beet analysis. Dr. M. BURBA described his work on the behaviour of quality-determining components in sugar beet during the preparation and storage of deep-frozen brei, and Prof. SCHNEIDER closed the meeting after thanking Mr. DE VLETTER and summarizing the afternoon's papers.

In the evening, members were able to visit the famous Vienna Opera House for a special performance of "Tales of Hoffman" by Offenbach. The next morning, however, the technical sessions recommenced, under the Chairmanship of Dr. L. WIENINGER, the first paper, by A. R. SAPRONOV and R. A. KOLCHEVA, being presented in their absence by Dr. A. EMMERICH. Dr. H. SCHIWECK then reported on the results of industrial tests on the degradation of invert sugar during juice purification as a result of the presence of aerial oxygen, while Prof. V. PREY discussed the influence of a physico-chemical pre-treatment of raw juice on its subsequent purification.

Mr. J. V. DUTTON presented a paper by himself and his colleagues on the effect of dextran on 2nd carbonatation filtration, and Mr. G. RENS provided some comments on non-sugar removal in juice clarification by carbonatation, particularly when using calcium saccharate. Mr. P. DEVILLERS discussed the pattern of behaviour of Ca, Fe, Mg and Si during evaporation and efforts against corrosion and scaling, after which Dr. D. GROSS described work on the enzymic formation of colour in beet and cane juices. The final paper of the morning was one by A. R. SAPRONOV and coworkers on colour formation and its inhibition in the sugar industry, read in their absence by Prof. REINEFELD. Prof. SCHNEIDER then thanked Dr. WIENINGER and summarized the papers presented.

In the afternoon, Prof. REINEFELD took the Chair and introduced Dr. J. C. WILLIAMS who discussed the properties of colorants produced by the degradation of reducing sugars, while Dr. K. VUKOV later discussed the adsorption of colouring matter during juice purification. Dr. L. WIENINGER presented his paper on the formation of colour at the sugar end of the factory, after which Mr. F. PERSCHAK described a method of measuring uronic acid as a means of determining the content of pectin decomposition products in sugar manufacture.

Mr. A. DANDÁR discussed the application of magnesium salts for beet juice purification and Mr. R. DETAVERNIER described the application of enzymatic sucrose determination in sugar factories during the 1974 campaign and Prof. G. MANTOVANI demonstrated the effect of non-sugars on sucrose crystal habit. Prof. SCHNEIDER then thanked Prof. REINEFELD and closed the meeting after summarizing the papers presented. Following the meeting, members were invited to a special concert by the Vienna Boys' Choir in the Hofburg Chapel.

On the 15th May, with Dr. D. GROSS as Chairman, the morning session began with a paper by Mr. I. S. GULYI on the interaction between recirculation and crystal growth in continuous boiling pans, after which Mr. K. AUSTMEYER gave an analysis of rheological measuring methods in the regulation of sugar crystall-

[1] See *I.S.J.*, 1975, 77, 133–138.

ization. Mr. M. MUNIR then presented a new process for sugar recovery from molasses by ion exchange chromatography, and Dr. M. T. HERNÁNDEZ described the influence of micro-organisms on deterioration of cane sugar in bulk. After this, Prof. MANTOVANI discussed the conditioning of white sugar silos, Mr. T. CRONEWITZ described the influence of pulp retention time on energy requirements and dust production in pulp dryers, and Mr. L. SUÉ referred to the production of lime and CO_2 in the sugar industry. Mr. R. DE VLETTER reported on the use of COD balances as a tool in waste water management, and Prof. SCHNEIDER then summarized the papers after thanking the Chairman.

The Chairman for the last afternoon's papers was Mr. DEVILLERS, who called on Mr. J. P. DUBOIS to present his paper on the use of ammoniacal condensates as a nitrogen supply for the biological purification of waste water. Mr. L. GONRY then commented on the value of protein-containing water from the saccharate process in cattle feeding, and Dr. H. HARTL discussed the influencing of beet quality by amendment of fertilizers. Prof. PREY presented his research on the behaviour of different groups of colorants during crystallization, and Mr. F. HEITZ reported on various physical properties of sugar in solution. The last paper, by Dr. N. P. SILINA, read in her absence by Dr. EMMERICH, concerned the interaction of salts with sucrose and their role in molasses formation.

Prof. SCHNEIDER again thanked the Chairman and summarized the papers. He thanked authors who had limited themselves to the time allotted and had thereby permitted completion of the programme. He referred to important aspects of the work described and emphasized the need to provide time for basic work in applied research laboratories. He thanked Dr. J. HENRY, General Secretary of the Commission, and Dr. PIECK, Assistant General Secretary, as well as the Austrian organizing committee under Dr. STRAKOSCH, for their work in preparation of the Assembly, and also thanked the Congress Centre staff and interpreters. He announced that the next General Assembly is to be held in Amsterdam in 1979 by invitation of the Dutch sugar industry.

In the evening the Assembly Banquet was given by the Austrian Sugar Industry Association in the Palais Pallavicini with speeches by the Chairman of the Association and by the CITS President, Prof. SCHNEIDER. The following day saw an opportunity to visit either the Tulln sugar factory or the Sugar Research Institute in Fuchsenbigl, with an afternoon excursion to Burgenland, while for those interested, a post-Congress visit was arranged for the week-end in Budapest.

Moth borers and cane damage

Identifying characters of the larvae, adults and the damage caused by moth borers to sugar cane in India.

By R. A. AGARWAL

SUGAR cane is attacked by about a dozen species of moth borers in India. There is a striking similarity among the larvae, pupae, moths and the nature of damage of the various species. The sexual and seasonal dimorphism exhibited by some of them creates further confusion. Thus it becomes exceedingly difficult to identify them correctly when more than one species occurs in the same locality. The identity of the adults becomes still more difficult if the wing scales are mutilated or the specimens are damaged.

AGARWAL[1] presented a new system of nomenclature for the pinacular arrangement of the Crambid larvae on Craminae in Louisiana. Later, AGARWAL & CHAUDHRY[2] described the same system using the larvae found on sugar cane in India. The number and arrangement of setae and pinaculi on the bodies of the larvae of different species were illustrated by drawings. AGARWAL *et al.*[3] further established the extent of reliability in identifying the larvae on the basis of pinacular character in comparison with setal arrangement. The nomenclature used by the above authors was based on the names assigned to various setae by HINTON[4]. The name assigned to each pinaculum is the name of the sclerite on which the pinaculi are located. The details of these are given in Table I and illustrated in Fig. 1. Since HINTON's names for designating setae always have numerical suffixes, the

Table I. Names assigned to body pinaculi of a typical Crambid larva

Pinaculum	*Abbreviation*	*Body segment on which the pinaculum is present*	
Prothoracic shield	PS	Prothorax	
Dorsaldorsal	DD	Meso-, metathorax and abdominal segment	1–9
Dorsalanterior	DA	" " " "	1–9
Dorsalposterior	DP	" " " "	1–8
Middorsal	MD	" " " "	1–9
Subdorsal-dorsal	SDD	" " " "	1–9
Subdorsal-ventral	SDV	Abdominal	1–9
Subdorsal-posterior	SDP	Abdominal	1–7
Midsubdorsal	MSD	Meso-, and methathorax ..	
Lateralanterior	LA	Pro-meso-, metathorax and abdominal	1–9
Lateralposterior	LP	Meso-, metathorax and abdominal	1–9
Lateralventral	LV	Meso-, and metathorax	
Midventral-dorsal	MVD	Pro-, meso- and metathorax	
Midventral-medium	MVM	Pro-, meso- and metathorax	
Midventral-ventral	MVV	Pro-, meso-, metathorax and abdominal	1–9
Subventral	SV	" " " "	1–9
Ventral	V	" " " "	1–9
Ventralposterior	VP	Meso- and metathorax	

[1] AGARWAL: "*Diatraea saccharalis* (Fab.) and some related Pyralid stem borers in Louisiana". (Ph.D. Thesis, Louisiana State University, 1963)
[2] *J. Research* (Punjab Agric. Univ.), 1969, **3**, (3), 301–312.
[3] *ibid.*, 1969, **6**, (3), 668–677.
[4] *Trans. Royal Soc. Lond.*, 1946, **97**, 1–37.

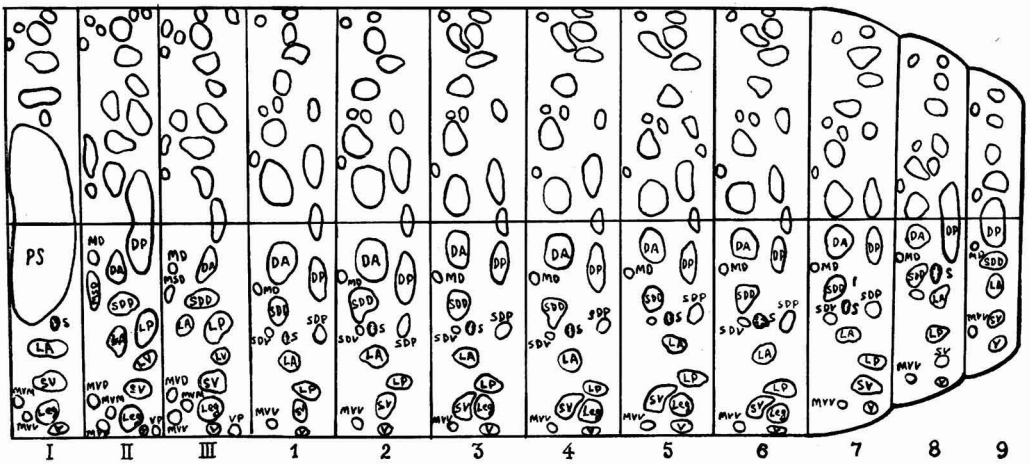

Fig. 1. Pinacular map of body segments of a tytpical lepidopterous larva

new names for pinaculi employ only capital letters. The morphological characters of the pupae of various moth borers damaging sugar cane were described by ISSAC & VENKATARAMAN[5]. This paper presents the identification keys of the larvae, moths and nature of damage by borers damaging sugar cane in India.

KEY FOR IDENTIFICATION.

1. Pinaculum distinct on lateral and ventral sides 5
   1′—Pinaculum not distinct on lateral and ventral sides 2
2. Crochet uniordinal 3
   2′—Crochet biordinal 4
3. Body creamy yellow, crochet arranged in complete circle ..... *S. nivella*
   3′—Body pinkish, crochet arranged in semicircle *S. inferens*
4. Body milky or creamy white, crochet arranged in pear-shaped design ..... *E. depressella*
   4′—Body green, crochet arranged in brood oval design *R. ablutella*
5. Pinaculum SDP present on abdominal segment 1–7.. 6
   5′—Pinaculum SDP absent on abdominal segment 1–7 8
6. Four pinaculi, DA, DP, MD and SD on abdominal segment 9 7
   6′—Four pinaculi, DA, DP, MD and SD on abdominal segment do not form one big pinaculum and are three distinct pinaculi ..... *P. indicus*
7. Pinaculum DP of both sides of metathorax and abdominal segment 8 coalesced ..... *C. zonellus*
   7′—Pinaculi DP of both sides on metathorax and abdominal segment 8, not coalesced ..... *B. steniellus*
8. Pinaculum DD present on abdominal segment 1–7 *C. infuscatellus*
   8′—Pinaculi absent on abdominal segment 1–7 .....
9. Pinaculi DP, SDD and MD on abdominal segment 9, coalesced ..... *C. tumidicostalis*
   9′—Pinaculi DP, SDD and MD on abdominal segment 9, not coalesced ..... *C. auricilius*

KEY FOR IDENTIFICATION BY FEMALE GENITALIA

1. Signum present 2
   1′—Signum absent 6
2. Signum, like a phylloclade of *Opuntia*..... 3
   2′—Signum not as above 4
3. Ductus bursae, narrow and equal to bursa copulatrix *C. infuscatellus*
   3′—Ductus bursae, broad and bigger than bursa copulatrix ..... *E. depressella*
4. Signum oval, having fish-like scale; bursa copulatrix, equal to ductus bursae ..... *B. steniellus*
   4′—Signum not oval, ductus bursae longer than bursa copulatrix 5
5. Signum small, sclerotized streak, surrounded by a weakly chitinized triangular area ..... *C. zonellus*
   5′—Signum round, small sclerotized ..... *R. ablutella*
6. Bursa copulatrix bigger than ductus bursae; latter convoluted ..... *P. indicus*
   6′—Bursa copulatrix smaller than ductus bursae, latter not convoluted 7
7. Bursa copulatrix rond like a ball.....*S. nivella* or *S. nivella* var. *monostigma*
   7′—Bursa copulatrix pear-shaped..... 8
8. Ovipositor conical ..... *S. inferens*
   8′—Ovipositor funnel-shaped 9
9. Genital opening ring-like ..... *C. auricilius*
   9′—Genital opening oval, V-shaped .... *C. tumidicostalis*

KEY FOR IDENTIFICATION BY MALE GENITALIA

1. Costa of harpes simple, straight..... 2
   1′—Costa of harpes dentate, curved 7
2. Harpe, triangular 3
   2′—Harpe, rectangular 5
3. Cornuti, a double row of spines ..... *P. indicus*
   3′—Cornuti, single or pointed, spinous 4
4. Aedeagus curved, blunt at both ends, a blind sac on the inner side ..... *C. infuscatellus*
   4′—Aedeagus straight, tubular, pointed at apex, blind sac on the inner side absent ..... *R. ablutella*
5. Aedeagus undivided and vinculum with spur .. *S. nivella* or *S. nivella* var. *monostigma*
   5′—Aedeagus divided, vinculum without spur 6
6. Aedeagus division forked, lateral anterior and posterior ends convex, middle concave, apex blunt..*C. tumidicostalis*
   6′—Aedeagus division tongue-like, laterally notched at 2/3 length, apex pointed ..... *C. auricilius*
7. Aedeagus curved with sword-shaped conuti ..*E. depressella*
   7′—Aedeagus straight, double tubular; cornuti, absent 8
8. Aedeagus divided, of uniform breadth .....*C. zonellus*
   8′—Aedeagus, undivided, not uniformly broad 9
9. Inner margins of costa bear broad teeth; uncus and gnathos beak-like; vinculum flat, collar-shaped.. *B. steniellus*
   9′—Inner margin of costa curved, harpe bear forked claspers on the outer margins; vinculum V-shaped uncus, cylindrical ..... *S. inferens*

KEY FOR IDENTIFICATION OF THE DAMAGE BY BORERS IN SUGAR CANE

1. Top whorl dried with no shot holes in any opened leaf, midrib clear 2
   1′—Top whorl green, with shot holes in 1–2 opened leaves, midrib of one of the leaves bears red or black line ..... *S. nivella*
2. Shoots with central leaf dried (dead heart), ... 3
   2′—Shoots with no central leaf (dead heart), pulled out with difficulty, internodes formed 4

[5] *Indian J. Agric. Sci.*, 1941, **11**, (5), 804–815.

3. Central leaf (dead heart) easily pulled out, having a foul smell ..... *C. infuscatellus* or *S. inferens* or *R. ablutella*
   3′—Central leaf (dead heart) pulled out with difficulty *E. depressella*
4. Top 5–6 immature internodes with holes..... 6
   4′—Top 5–6 immature internodes with no holes..... 5
5. Any internode with new holes and brown frass, cane top intact ..... *C. auricilius*
   5′—Cane top broken 7
6. 1–2 holes in top immature internodes with fresh brown frass, top whorl green ..... *P. indicus*
   6′—Number of spirally arranged shot holes, top whorl dried ..... *B. steniellus* (Gregarious phase)
7. Gallery in the stalk extending from top to bottom, only 1–2 larvae or larval excuvae present..... *B. steniellus* (Solitary phase)
   7′—Number of holes in top 1/3 stalk and inside voraciously eaten, *several larvae* occasionally present *C. tumicostalis*

Noise reduction in Queensland sugar mills

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Paper presented to the 15th Congr. I.S.S.C.T., 1974

Introduction

ALTHOUGH it has been known for many years that permanent impairment of hearing can result from exposure to loud noise, there has only recently been a general awareness of the problems and concern shown about their solution.

In recent years relationships have been established showing the nature of the problems and quantitative evaluations have led to generally accepted criteria relating the noise levels and exposure to loss of hearing.

The Sugar Research Institute, Mackay, has for some years measured and evaluated noise levels in Queensland sugar mills, located the most troublesome areas and set out obtaining satisfactory solutions.

In common with other states and countries, Queensland is drafting legislation to limit occupational noise exposure. The Standards Association of Australia[1] has adopted the criteria that the maximum allowable noise level for full-time exposure should be 85 dbA and that for every increase in level of 3 db the allowable time of exposure should be reduced by a factor of 2.

INITIAL NOISE SURVEYS

Noise surveys have been carried out in 10 mills and isolated problems examined from time to time in other mills. It has been found that within the main mill buildings, there are positions occupied by operators having average noise levels greater than 85 dbA, and a few have levels greater than 95 dbA. This demonstrated that the majority of noise problems within a typical mill can be overcome by a reduction at the source of 10 db or less.

It was apparent from the noise surveys that the problem was similar from mill to mill. Most of the major noise problems for any mill were contained within the following list of common sources:

Cane locomotives; preparation equipment; mill-drive gearboxes (primary reduction); hydraulic pumps; high-pressure fans; boiler feed pumps; steam valves, vents, and leaks; turboalternators; vacuum-breaking valves; compressors; vacuum pumps; centrifugals; pneumatic tools; workshop and maintenance operations.

METHODS OF NOISE REDUCTION

Practical methods of engineering noise reduction are described in many standard texts (e.g. BERANEK[2], HARRIS[3]) and will not be dealt with in detail here. The two methods which have found most widespread application in the treatment of the above list of problems are enclosure and absorption.

The reduction of noise by enclosure relies simply on the fact that airborne noise is usually greatly reduced when it passes through a solid barrier—the noise reduction increases with increasing barrier mass and sound frequency.

Sound waves are absorbed by blankets of porous materials such as mineral wool or glass wool if the blanket is used in conjunction with a hard reflective backing surface. In simple applications the thickness of the absorbing layer must be of the same order as one quarter of the wavelength of the sound to be absorbed.

A third general method of noise reduction which is particularly applicable to impact noises is the damping of vibrating surfaces. This method, however, is only of value when resonant vibration is predominant.

Cane locomotives

Most of the cane is transported to Queensland mills by rail—there are some 3000 km of narrow-gauge rail line and more than 100 locomotives in operation. Locomotives represent one of the most serious noise problems for mills—the noise level is high, the exposure time is high, and a relatively large number of operators is involved. Typically, a noise reduction of 10 to 15 db is required in the cab.

It has been observed that the noise level inside a locomotive cab is invariably several decibels higher than that found when the sound level meter is held at arm's length outside the open door. This is due to the repeated reflection of sound within the cab which has no capacity for sound absorption. In one locomotive a noise reduction in the cab of 6 db has been obtained simply by fixing a 50 mm thickness of mineral wool to all inner surfaces. Of course a perforated facing is required to protect the driver from skin irritation and to protect the absorptive blanket from mechanical damage.

Locomotives have invariably been supplied to mills with an inadequate engine exhaust silencer. A further

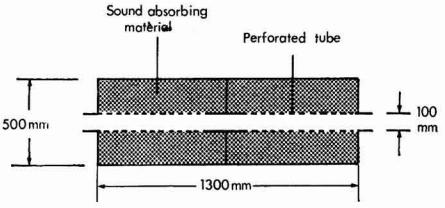

Fig. 1. Prototype locomotive exhaust muffler

[1] "Australian Standard Code of Practice for Hearing Conservation", (Standards Association of Australia). Draft DR72084 (1972).

[2] "Noise and Vibration Control", (McGraw-Hill, New York). 1971, 650pp.

[3] "Handbook of Noise Control", (McGraw-Hill, New York). 1957, 1006pp.

noise reduction of 4 db was achieved in the cab of the locomotive described above by fitting an exhaust muffler of the design shown in Fig. 1. Note that the muffler is of the "straight-through" type, so the reduction in noise is not accompanied by high engine back-pressure and loss of power.

Owing to its size, the muffler shown in Fig. 1 would be difficult to install as a permanent fixture without extensive modifications to the engine cowling and possible rearrangement of the fuel tank. A series of four smaller mufflers have been constructed and are under test.

Cane preparation knives

One of the most serious sources of noise around the carrier is caused by the hammering of pieces of cane inside the carrier enclosure. Since the tip speed of the knives may be 50 m/sec, pieces of cane are likely to strike the inside of the casing at this speed. In one mill a noise reduction of 4 db over the entire area surrounding the carrier has been obtained by fitting a double-sheet sand-filled casing to the primary impact regions. It is expected that a further noise reduction will be gained by extending this treatment. The dry sand filling provides damping by means of interparticle friction and consequently suppresses the natural frequencies of vibration of the inner plate. The outer plate, of course, acts as an additional damped noise barrier.

Shredders

The problem of shredder noise is growing more serious as mills install machines of higher speed and greater capacity. The noise contains strong low-frequency components which are propagated readily throughout the entire mill building.

It has been found that the dominant feature of shredder noise is the presence of a component at hammer-passing frequency—usually 100 to 200 Hz. It would therefore seem reasonable to attack the problem by spreading the hammers over the whole rotor periphery rather than in 6 or 8 axial rows as is current practice. A full-diameter, partial-width, experimental shredder operated by the Sugar Research Institute at a Mackay mill has been modified to test the effect on noise of spreading the hammer complement over 24 pivot pins rather than 8. As a result of this modification the noise was reduced by 7 dbA and the dominant frequencies were changed from the 125 Hz and 250 Hz octave bands to the 500 Hz and 1000 Hz bands. It is well known that higher frequency noise is easier to control by the standard techniques of enclosure and absorption. The staggered hammer arrangements had no adverse effect on the preparation obtained with the shredder or on the ability to accept cane at the intake.

Shredder noise appears to be transmitted from the inside of the machine to surrounding areas via airborne paths rather than through vibration of the shredder casing itself. Several mills have made a significant reduction in noise by placing a cover over the elevator from the shredder delivery.

Mill-drive gearboxes

Some high-speed mill-drive gearboxes, particularly those with fabricated rather than cast casings, generate a loud piercing noise at a single frequency equal to the tooth contact frequency of the primary reduction. This frequency is typically about 1000 Hz. Criteria for occupational noise exposure are always intended for broad-band noise for which the sound energy is distributed over a wide frequency range. When a noise contains prominent tonal components, the allowable noise limit should be reduced—10 db is a commonly accepted adjustment. For this reason a reduction of 20 db was considered necessary for the tooth-contact tone of the gearboxes in question.

Three types of noise-reducing enclosures have been demonstrated for gearboxes. The first consisted of an arrangement of sheet lead (20 $kg.m^{-2}$) supported on a steel frame which was isolated from gearbox vibration and supported on coil springs. A lining of mineral wool (30 $kg.m^{-3}$) was used on the inside of the enclosure to prevent a build-up of noise. The bearings on the input shaft had a history of overheating and were left exposed. The noise reduction through the sheet lead was expected to be 40 db, but the actual noise reduction obtained was only 22 db, owing to the radiation of noise from the bearing covers.

On another gearbox, sheet lead was attached to the panels of the casing rather than on a vibration-isolated frame. A layer of felt (10 mm thickness) was interposed between the casing and the lead to prevent direct transmission of vibration and the lead was fixed to the edges of the panels where the amplitude of vibration was expected to be small. A noise measurement was not made before treatment, but the enclosure was generally considered to be successful.

An objection is often raised to the enclosure of gearboxes on the grounds of possible overheating. For this reason an enclosure was constructed with an incorporated cooling fan and acoustically lined air inlet and outlet ducts. The noise of this gearbox was reduced to a level well below the backbround noise in the mill.

In an effort to overcome noise in the design stage, discussions were held with a manufacturer prior to the supply of three new gearboxes to a Mackay mill. It was decided to improve the accuracy of tooth form and uniformity of pitch by grinding the high speed pinion and shaving the wheel. The casing thickness was increased to 25 mm, additional rib-stiffening was used, and the hollow sides of the casing below the parting line were damped by filling with dry sand. As a result the characteristic whine of these gearboxes has been eliminated. Unfortunately it is not possible to say which design change produced the result. However, it was found that regrinding of the high speed wheel and pinion in another similar gearbox had virtually no effect on noise.

Steam vents

Atmospheric venting of steam from main exhaust lines, boiler safety valves, and small vents and drains, is the most widespread single source of noise in mills. Low pressure venting can be expected for prolonged periods at the beginning and end of the week and whenever operational difficulties occur or the steam system becomes unbalanced.

Although most of the noise is radiated from the vent the source is at the control valve where the flow is usually sonic. It has been shown that this noise can be controlled simply by installing a sound-absorbing device, such as that shown in Fig. 2, between the valve and the outlet. The silencer is nothing more than a section of duct lined with mineral wool or fibreglass. The amount of noise reduction is determined by the thickness of the lining, its absorption characteristics, and the area facing the flow. Means are available for determining these parameters, given the temperature and pressure upstream from the control valve and the maximum flow rate. For high-pressure exhaust a "pepper-pot"

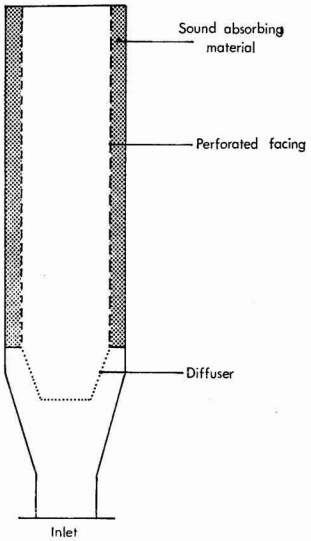

Fig. 2. General arrangement of steam vent silencers

diffuser is placed before the absorptive section to change the noise spectrum from low to high frequency. An elaborate facing on the absorptive material is required to prevent erosion by the steam flow.

This method of reducing steam vent noise has found wide acceptance in Queensland sugar mills for major vents. In any mill, however, there is a multitude of small vents whose combined effect is probably far more significant than that of the major vents. Small vents can be dealt with economically with a simple rule-of-thumb design—for example by using an absorptive section whose thickness is greater than $\frac{1}{2}$ pipe diameter and whose length is greater than 10 pipe diameters.

Absorptive vent silencers are equally effective on air lines cooling bearings or vacuum breaking valve inlets on pans.

Valves

Although most of the noise generated at a valve travels down the line as fluid-borne noise, a significant amount is radiated by the valve body and downstream pipework. A simple enclosure will overcome this problem. When noise travelling down the pipe is a problem, an inline muffler, similar in principle to those described in the previous section, may be used.

Compressors and vacuum pumps

The main source of noise for a compressor is usually the intake, and for a vacuum pump the exhaust. It has been found that this noise can be controlled effectively with a muffler similar to the dissipative steam vent silencers previously described.

Discussion

The role of the Sugar Research Institute in the problem of noise reduction in necessarily limited to the demonstration of solutions to the most significant common problems. It would be impossible to examine every problem in each of the 27 member mills in Queensland. The detailed engineering effort must inevitably be undertaken by mill staff. And yet the successful solution to a noise problem requires both an intimate knowledge of the plant and process, and an appreciation of the fundamental methods of noise reduction—enclosure, absorption, damping, and so on. Many sad failures can be attributed to ignorance of the plant operation or to ignorance of the fundamental acoustics.

There is a trend in Queensland sugar mills towards the appointment of chemical engineers with formal qualifications, whose duties are removed from the urgent day-to-day problems of running the mill. Most formal engineering courses would give an adequate background for a short training course in noise reduction. Some universities and institutes of technology in Australia already provide such courses.

Detailed engineering effort and the acquisition of expertise by mills is of course only one aspect of the problem. In recent years, owing to the specification of maximum noise levels on orders for new equipment, there has been a remarkable increase in interest shown by suppliers of equipment in competitive fields, notably locomotives, mill-drive gearboxes, and hydraulic pumps. Wherever possible, the noise problem should be solved by manufacturers, who can spread the cost of research and development over a large number of units.

There is a need for more research in noise reduction. In order to achieve our objective of demonstrating working solutions to the common problems referred to previously, Sugar Research Ltd. cannot afford to examine any one problem in great depth. Such problems as the absorption of low frequency sound by Helmholz resonators, the transmission of gearbox vibrations between the teeth and the casing, and so on, could well form the basis of higher-degree projects in the universities.

The implementation of a noise reduction programme in an industrial plant should be accompanied by some means of judging its success. Since the main purpose of noise reduction in sugar mills is hearing conversation, it follows that the best means of measuring the result is by regular monitoring audiometry. Furthermore, the 85 dbA criterion does not ensure absolute safety for all employees—there is a small percentage who are particularly susceptible to noise-induced hearing loss. By monitoring hearing at regular intervals this small percentage could be identified and protected.

Of all the factors involved in the elimination of the noise problem in sugar mills, the attitude and motivation of the entire staff, from the highest levels of management to the most menial plant operators, is most important. Unless the management appreciates the extent of the problem no action will be taken, but unless the operators understand the reasons for a noise reduction programme, they can effectively obstruct its implementation.

Summary

A study of noise in Queensland sugar mills has been undertaken to evaluate the technical problems involved in satisfying the hearing conservation criteria which have emerged in recent years. Initial noise surveys have shown that many problems are common from mill to mill and that in most cases a noise reduction of about 10 db at the source would be acceptable. This paper describes some methods used to demonstrate working solutions to the most serious common problems. Satisfactory methods of noise reduction have been found for locomotives, cane preparation equipment, mill turbine reduction gearboxes, steam vents from low pressure exhaust and high pressure relief valves, vacuum pumps, and air compressors.

Sugar cane agriculture

Wide furrow planting. L. L. LAUDEN. *Sugar Bull.*, 1974, **52,** (23), 4.—With an increased interest in the use of wider furrows for cane planting, the author gives a warning on covering of the seed cane, which should be done carefully and lightly.

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The Louisiana sugar cane variety census for 1974. R. J. MATHERNE and D. T. LOUPE. *Sugar Bull.*, 1974, **52,** (23), 5–7.—Information is given on the varieties grown and their percentages in the three major cane areas of Louisiana.

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Sugar cane variety outfield experiments in Louisiana during 1973. H. P. FANGUY. *Sugar Bull.*, 1974, **52,** (23), 8–13.—Louisiana cane varietal trials are reported. On both light and heavy soil as plant and 1st ratoon, CP 65-357 was the highest yielder and gave 7593 tons of sugar per acre compared with 6603 tons given by the next best variety.

* * *

Effect of certain pesticides on the sugar cane crop. H. S. GILL and O. SINGH. *Indian Sugar*, 1974, **24,** 169–172.—While treatment with "Agallol", "Telodrin" and gamma-BHC in various combinations as well as on their own all increased cane germination compared with untreated controls, "Agallol" also improved the rate of germination. All treatments had a positive effect on tillering, cane height and number of millable canes, but maximum results were obtained with "Agallol" + "Telodrin". Significant differences occurred between the various treatments as regards cane yield, "Telodrin" proving superior to the other two chemicals. No significant differences were found in sugar content or cane juice purity.

* * *

Studies on the relationship of soil desiccation period and sugar cane yield in Uttar Pradesh. U. S. SINGH and M. SINGH. *Indian Sugar*, 1974, **24,** 175–177. Results of experiments to study the effect on cane of delays in water application during the pre-monsoon period showed that cane yield fell with drop in soil moisture, the effect being more marked in the 90 da ys after planting, after which the rate in fall of yield was lower up to 105 days after planting.

* * *

Experiments on releasing parasites in combination with insecticidal application for the control of the sugar cane internode borer. S. SITHANANTHAM, G. VARADHARAJAN and S. D. RAJAN. *Indian Sugar*, 1974, **24,** 179–184.—Release of the parasite *Trichogramma australicum* in cane fields infested with the internode borer *Chilo indicus* 120 days after planting increased the sugar yield per acre (compared with the untreated crop) to a greater extent than did combinations of parasite release with various insecticides. The increase of 157 kg per acre was brought about by a parasite adult population of 20,000 per acre per week.

* * *

Weed control in Java cane fields: results of preliminary trials. N. H. HARAHAP, R. S. HARPER and M. S. SITANGGANG. *Sugar y Azúcar*, 1974, **69,** (10), 32–36. While, in chemical weed control experiments in Java, best results were obtained with "Paraquat" plus 2,4-D, the most consistent results were given by "Paraquat"/"Diuron" as a 20%–20% formulation ("Para-Col") and at one of the two sites gave as good performance as "Paraquat" + 2,4-D.

* * *

The Sugar Cane Research Institute works for cane development. M. ANDÉREZ. *ATAC*, 1974, **33,** (2/3), 4–17.—A survey is presented of work undertaken by the Cuban Sugar Cane Research Institute (IICA) in respect of agronomy, planting, weed control, soils and fertilizers, phosphorus and potassium fertilizers, plant protection against disease, nematode control, entomology, bacteria and viruses, selection and genetics, inheritance studies, etc. as well as biometry and technical information services.

* * *

Friction properties of sugar cane. J. A. SILVEIRA R. and C. ROMERO P. *CubaAzúcar*, 1974, (July/Sept.), 3–10.—Specially developed equipment was used for the measurement of the coefficient of friction between sugar cane and materials using in the working parts of sugar cane harvesters, viz. steel, painted steel, rubber, plastic and wood. The values obtained are tabulated and illustrated in graph form for five varieties, and the results of the measurements are discussed.

* * *

The principal cane soils of Cuba: classification and characteristics. L. L. SHISHOV, R. VILLEGAS and V. SHISHOVA. *CubaAzúcar*, 1974, (July/Sept.), 11–19. The fundamental characteristics of the cane soils of Cuba have been determined and classified by the method developed by the Sugar Cane Research Institute. Five soil types predominated: red ferralitic, yellow ferralitic, brown sialitic, dark plastic montmorillonitic and humic sialitic soils, the first of these being most suitable for sugar cane.

* * *

Aspects of Cuban soil magnesium and its relation with the nutrition of sugar cane. L. L. SHISHOV and R. VILLEGAS. *CubaAzúcar*, 1974, (July/Sept.), 45–56. The results of research on soil magnesium in Cuban cane fields are presented. Based on the results, it has been possible to make an analysis of magnesium supply in different types, sub-types and genera of soils and to show its distribution in the profile of magnesium available in genetic horizons. Thus, Mg-deficient soils were determined not only in the upper

arable layer but also in the soil profile comprising most of the root zone. The pecularities of available Mg from the soil are analysed from the standpoint of the Ca:Mg and Mg:K ratios, and a possibility of Mg blockage owing to a high ratio of Ca:Mg is pointed out. Using the lysimeter method, the magnitude of descending migration of Mg in the different genetic types of soil was determined by means of experiments to study Mg sorption. The character of Mg fertilizer sorption in red ferralitic and yellow leached ferralitic soils was demonstrated. The results of the above-mentioned experiments have revealed the effectiveness of Mg fertilizers in non-saturated red ferralitic soils.

* * *

An analysis of the factors of plant competition in regulation of sugar cane yield. U. S. SINGH. *Sugar News* (India), 1974, **6**, (3), 11–16.—The effect of plant competition on cane yield is discussed and reference made to investigations of factors governing plant density and hence the degree of competition, including seed cane planting rate, germination, tillering and tiller mortality. It is emphasized that a high planting rate will not necessarily lead to greater numbers of millable canes, and that the greater the competition the higher will be the mortality rate, so that the overall effect in a cane field is one of self-regulation.

* * *

Effect of rayungan planting on the growth and yield of sugar cane in Madhya Pradesh. R. K. SHARMA and D. V. S. CHAUHAN. *Sugar News* (India), 1974, **6**, (3), 21–23.—The rayungan method of cane planting (in which the youngest part of the cane stalk was cut, the cut end dipped in "Aretan" solution, left for two months to sprout, the upper shoots cut down and individual shoot nodes knifed and the sprouted shoots planted at 32 cm spacing in fertilized and irrigated trenches, 20 cm wide and 40 cm deep, prepared by double ridging) was compared with the ridge-and-furrow method, in which the furrows were spaced 90 cm apart and two eye-budded setts planted eye to eye after fertilization of the furrow. Results of the experiments showed that the rayungan method is better than the other method under conditions in the alluvial tract of Madhya Pradesh, giving greater cane height, more millable canes and increased yield.

* * *

Green cane unit. W. P. KERR. *Producers' Rev.*, 1974, **64**, (9), 10–11.—Details and illustrations are given of a green cane harvester developed and operated by Creber and Sons on a 190-hectare farm in Queensland and which will cut up to 45 tons of cane per hour. Advantages of green cane cutting mentioned include the mulching of the trash to conserve the soil and less deterioration in the cut cane compared with burnt cane.

* * *

Effect of filter press cake and sodium chloride on infection of sugar cane. *Thielaviopsis paradoxa* **in Puerto Rico.** L. J. LIU and A. RODRIGUEZ-MARCANO. *Sugar y Azúcar*, 1974, **69**, (11), 25–27.—Experiments to establish whether application of filter cake to the soil encouraged development of *T. paradoxa*, the causal agent of pineapple disease, showed that in fact the rate of infection of cane by the fungus did not increase with the amount of filter cake applied, although the rate fell with higher soil salt content at temperatures in the range 22–25°C, the optimum concentration for mycelial growth in the water agar medium used being 0·3–0·6%.

* * *

Fertilizer—1974 and beyond. R. B. MOLLER. *Cane Growers' Quarterly Bull.*, 1974, **38**, 40–43.—The merits and demerits of four different forms of nitrogenous fertilizers (including costs) available to Australian cane growers are discussed. The fertilizers are: sulphate of ammonia, "Nitram", urea and "aqua ammonia". The question of fertilizer mixtures (many of which are considered to have been unjustifiable but merely satisfying the whim of the individual) is also examined.

* * *

Q 94 in the central district. A. V. RUDD. *Cane Growers' Quarterly Bull.*, 1974, **38**, 44–45.—The advantages and disadvantages of this cane variety are discussed. While it has good ratooning ability, is a good yielder and is resistant to leaf scald, it is susceptible to chlorotic streak, is unsuitable on poorly drained soils and in dry areas, and is a late maturer. Nevertheless, with these limitations in mind, the author still regards it as a worthwhile variety for the central district of Queensland.

* * *

Fighting the common reed. A. I. LINEDALE. *Cane Growers' Quarterly Bull.*, 1974, **38**, 46–48.—The incidence of *Phragmites communis*, a persistent weed in cane fields in southern Queensland, is discussed and possible chemical means of controlling it examined. It is emphasized that the reed requires constant attention and that no spray available will completely eradicate it, even at heavy rates in drains, since the underground root system of the weed "simply shuts off and regenerates when conditions are favourable".

* * *

Arrowing oddity. J. WRIGHT. *Cane Growers' Quarterly Bull.*, 1974, **38**, 52.—An illustration shows an example of Q 68 cane, a block of which arrowed on a Queensland farm and gave rise to fertile seed, a rare occurrence under normal field conditions.

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Steps to efficient drainage. G. R. CULLEN and C. R. HENKEL. *Cane Growers' Quarterly Bull.*, 1974, **38**, 57–60.—Advice is given on drainage, including choice of system, preparation of surface and sub-surface drains, and maintenance of surface drains.

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"Aqua ammonia"—its use and misuse. W. A. C. WEBB. *Cane Growers' Quarterly Bull.*, 1974, **38**, 61–62. While this is the cheapest and most convenient form of N fertilizer to handle and yet has the same effect as any other N fertilizer, there are aspects of its use which the author considers should be brought to the attention of users. Factors discussed include time, speed and depth of application and general handling, which requires caution.

* * *

The incidence of the yellow cicada in the Lower Burdekin. C. W. CHARDON. *Cane Growers' Quarterly Bull.*, 1974, **38**, 63–64.—Increase in the incidence of *Parnkalla muelleri* in the Lower Burdekin area of Queensland is possibly a result of increased popularity of ratooning, since the pest causes most damage in

2nd or later ratoons after development beneath the stools, although some damage is caused to plant cane by residual populations. Although not serious for the district as a whole, losses caused by the pest have been noticeable on individual farms. Commercially available chemicals have proved ineffective, but trials with fumigants have shown promise. One recommended measure is to plough fields or cultivate with a rotary hoe in early December when most nymphs are near the surface, followed by a second cultivation some weeks later to destroy nymphs at a lower level.

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Cane grower builds an effective stone picker. C. G. STORY. *Cane Growers' Quarterly Bull.*, 1974, **38**, 65–66.—Details and illustrations are given of a home-built stone picker which in three years has removed about 300 tons of stones from eight hectares of cane land. Stones weighing more than 50 kg are left to be collected by a front-end loader to avoid damage to the stone picker, which collects all other stones and soil to a depth of 20 cm and drops them into a revolving cylinder covered with mesh. The soil sifts through the screen and falls behind the machine, but the stones are carried through the cylinder by a scroll to drop into a hopper.

* * *

Trickle irrigation. L. S. CHAPMAN. *Cane Growers' Quarterly Bull.*, 1974, **38**, 67–69.—Drip irrigation was tested in late 1973 during what proved to be one of the wettest growing seasons ever recorded for Mackay. While its effectiveness could therefore not be evaluated, the system is considered to have some advantages in terms of water utilization and savings in labour, although there are a number of problems remaining to be solved before the system could be recommended for use in Queensland. Major snags encountered included: choking of the trickle holes by iron precipitated in the lateral lines; chewing of the surface lateral lines by rats; the inconvenience of laying the lateral lines, removing them if cultivation is necessary and recovering them before harvest; and the extra labour involved in orientating the lateral lines so that the water trickles to young plants. The cost factor is only briefly mentioned.

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The increasing use of ratoon crops in the Burdekin area. I. T. FRESHWATER. *Cane Growers' Quarterly Bull.*, 1974, **38**, 70–71.—The author briefly examines reasons for the increased growing of ratoon crops in the area and equally looks at causes of reluctance in the past to grow ratoons.

* * *

Use of pre-grown tops of flowered cane as seed material for better yield and quality of sugar cane. S. B. CHAUGULE and R. S. SACHAN. *Indian Sugar*, 1974, **24**, 247–249.—When sprouted side buds from cane which has flowered are used for seed, the top portion of the cane is usually discarded. An experiment was carried out to establish if the discarded material could be used as seed material. Top setts from cane stalks which had flowered were planted vertically in 45 cm-deep slit trenches; the yield from these setts, in which the side shoots had sprouted before planting, was compared with setts planted horizontally in furrows as normally and in which the side shoots had not sprouted. While the sprouted setts did give an appreciably higher yield as well as juice of higher purity, further studies are required to determine whether the same advantages would occur with horizontal planting.

* * *

Pyrilla epidemic in north Bihar during 1973. M. M. SINHA, Y. P. SHREEVASTAVA and G. PRASAD. *Indian Sugar*, 1974, **24**, 251–254.—Of various insecticides applied to cane to control *Pyrilla perpusilla* leafhopper infestation, the most effective was "Dichlorphos" ("Vapona 50 E.C.") which gave a 100% kill of both nymphs and adults within 48 hours of application. Good control of the pest was also achieved by three parasites (*Tetrastichus pyrillae*, *Lestodryinus pyrillae* and *Epipyrops melanoleuca*) which occurred in appreciable numbers and obviated the need for further spraying.

* * *

Effect of fungicide treatment on the germination of sugar cane varieties. S. MUTHUSAMY, S. D. RAJAN, K. DURAISAMY and R. DURAI. *Indian Sugar*, 1974, **24**, 257–258.—Field experiments with seven fungicides and four cane varieties showed that the effects of the chemicals on germination 35 days after application differed with variety; the only cane of which germination was increased by all seven fungicides was Co 853, even the untreated control showing much greater % germination than the other varieties. The most effective treatment with three varieties was 0·2% "Dithane M-45", which was far superior to 0·5% "Agallol".

* * *

Damaging effects of frost on sugar cane in Punjab. II. Effect on quality of cane juice. H. S. GILL and S. SINGH. *Indian Sugar*, 1974, **24**, 261–266.—The adverse effects of severe frost on cane juice purity and sucrose content during 1961–62 and 1963–64 in the Punjab are discussed.

* * *

Influence of the density of red ferralitic soil on its other physical properties and the growth, development and productivity of sugar cane. O. AGAFANOV, J. E. ROLDOS and R. AVILES. *CubaAzúcar*, 1974, (Oct./Dec.), 23–35.—Results are reported of 3-year experiments in bottomless tanks to determine the effect of degree of compaction of leached ferralitic red clay soil on its other physical properties and on growth and yield of C-87-51 as plant cane and 1st and 2nd ratoons. A low density (1·0–1·2 g.cm^{-3}) with moderate compaction of the top 10 cm layer of soil and a relatively friable condition at 10–20 cm were the best conditions for root development and uniformity of spread as well as cane yield, number and length of stalks. Greater compaction caused restriction of root penetration and hence deformation. A very friable condition (0·8–0·9 g.cm^{-3}) led to rapid moisture evaporation, while with increase in density from 1·0 to 1·3 g.cm^{-3} there was considerable reduction in the amount of moisture available to the plant. The cane sugar content was not affected by soil density in the range of values studied.

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Influence of cane burning and mechanical harvesting on the physical properties of the soil. O. AGAFANOV, J. E. ROLDOS and R. AVILES. *CubaAzúcar*, 1974, (Oct./Dec.), 45–58.—A one-year study on clay soil showed that no major changes occurred in its physical properties when cane was burnt, whereas mechanical harvesting caused a certain amount of compaction and increase in soil hardness, although soil infiltration remained at a satisfactory level.

Sugar beet agriculture

Investigations on the microflora of sugar beet root rot under conditions of modern agricultural practices. I. N. JAROWAJA. *Gaz. Cukr.*, 1974, **82,** 205–209. Investigations on some 2500 infected seedlings taken from various regions of Poland showed that the major causal agents of root rot were *Pythium* spp. (*P. debaryanum* and *P. mamilatum*) and *Fusarium* spp. Other pathogens were also found, and their proportions of the total and the degree of infection they caused are tabulated as well as those of the major pathogens mentioned above. The situation is viewed within the context of modern practices of planting to stand, using multigerm as opposed to monogerm seed.

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Parasitic fungi in sugar beet piles. J. ORLOWSKA. *Gaz. Cukr.*, 1974, **82,** 209–211.—The species of fungi found in stored beet in Poland are discussed. *Botrytis cinerea* has been found to cause more sugar and beet weight losses than any other fungus; *Penicillium* spp. are the second in importance, while the third group is *Fusarium* spp. Other fungi occurring to a lesser extent are also named, and the article concludes with a brief list of recommendations on ways of reducing fungal infection of stored beet.

* * *

Western storage practices. W. AKESON and P. BRIMHALL. *Proc. Reg. Meeting, Amer. Soc. Sugar Beet Tech.*, 1973, **17,** 65–70; through *S.I.A.*, 1974, **36,** Abs. 74–1057.—Methods of decreasing sugar losses during the storage of beet were tested by the Great Western Sugar Company in the USA. Traditionally, beets are stored from early October in piles 20 ft high and 120 ft wide at the base; a 6-inch layer of straw is applied in mid-December. Temperatures can vary between —20°F in winter and 70°F thereafter. Woven polypropylene was more effective than 6 or 18 inches of straw, or 6 inches of straw plus woven polypropylene, in decreasing sugar losses at the edges of the piles, and these methods of covering were more effective than using no covering; sugar losses in covered piles were 20% lower than in uncovered piles. Losses of recoverable sugar could be reduced by a further 14% by storage in trenches. Topped beets stored in piles lost 15–20% more recoverable sugar during 180 days than did non-topped beets. Wide variations in sugar losses were observed with different varieties of beet.

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Changes occurring in beet agriculture (in Poland) and notes on the economic suitability of varieties. W. TRZCIŃSKI and J. NIEGOWSKI. *Gaz. Cukr.*, 1974, **82,** 229–234.—The various changes which have come about in recent years in Polish beet agriculture are discussed. While there is now little difference between beet and sugar yields and profit per unit area for the different varieties grown, the yields are considered still too low, and the authors call for at least twice the number of present varieties to be made available for sowing; half of these should be suitable for long-term storage. The agronomic and processing properties of a number of varieties are tabulated.

Perennial weeds can be removed. R. FOGG. *Sugar Beet J.*, 1974, **38,** (1), 4–5.—The point is made that there are no chemicals which a grower can suitably use against perennial weeds in a field of growing beet, so that any spraying will have to be carried out before the beet is planted. Crop rotation is mentioned in this respect. The major perennial weeds encountered in US beet fields and the most suitable herbicides to apply for their control are discussed.

* * *

For a more profitable beet harvest. P. B. BRIMHALL. *Sugar Beet J.*, 1974, **38,** (1), 6–7.—Maintenance of beet harvesting equipment in a clean, efficient condition will reduce the amount of extraneous matter taken up with the beet and will ensure that injury to the beet is minimal so as to provide good storage properties. Ideal conditions for beet storage are set out, and the inadvisability of storing beet that are frozen before harvesting is emphasized. It is recommended that beet topping should not be carried out too far in advance before harvesting in order to provide some protection against frost. Moreover, loaded trucks of beet should be protected against low temperatures.

* * *

Surface drainage can save money. G. E. MALONE. *Sugar Beet J.*, 1974, **38,** (1), 10–11.—The author explains how surface drainage of a beet field will maintain the soil in good tilth and enable it to absorb water and air for the growing crop. Photographs and a diagram are used to illustrate the best means of establishing random shallow ditches.

* * *

Quality tests on sugar beet deliveries expanded for 1974. M. G. FRAKES. *Sugar Beet J.*, 1974, **38,** (1), 12–15.—The Director of Agricultural Research of Michigan Sugar Co. discusses the composition and processing quality of beet delivered in 1971–73, briefly describes the various tests conducted and gives recommendations on fertilizer application.

* * *

Sugar beet agriculture in eastern Bohemia. Z. JAROŠ and L. SCHMIDT. *Listy Cukr.*, 1974, **90,** 193–198. A survey is presented of agricultural practices (including beet varieties grown) and factory results achieved in eastern Bohemia. Data are tabulated and in many instances compared with average values for the whole of Czechoslovakia.

* * *

Seed bed preparation in modern sugar beet agriculture. M. ZACH and H. KLÜGEL. *Die Zuckerrübe*, 1974, **23,** (4), 13–15.—Criteria of good seed bed preparation and means of obtaining the desired results are briefly discussed and equipment available for the work is described.

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Soil preparation for sugar beet. E. RUHM. *Die Zuckerrübe*, 1974, **23**, (4), 18–23.—The objectives of good soil preparation are listed and advice given on correct approach to the problem and the best equipment to use.

* * *

Transport problems with sugar beet. W. C. VON KESSEL. *Die Zuckerrübe*, 1974, **23**, (5), 6–9.—The author examines the problem of modern beet transport (including loading and unloading) as carried out in West Germany and indicates major causes of beet damage and loss. He emphasizes the need for maintaining transport in a roadworthy condition, particularly under load, and warns against excessive falling of beet onto the road surface. Particular mention is made of a rapid coupling unit which is available for most tractors. Containerization, as used to a certain extent for beet transport in Holland, is considered of possible advantage only if other uses can be made of the containers when they are not being used for beet. Generally, the major problem is still considered to be unloading at the factory, but future problems will arise with the need for greater loads per vehicle.

* * *

Economical sugar beet harvesting by high quality work. E. KESTEN. *Die Zuckerrübe*, 1974, **23**, (5), 10–11. Possible damage which can occur to the beet during harvesting as a result of poor-quality topping and lifting are discussed and the monetary losses involved are indicated. A warning is given against excessive work rates, since beet damage rises with increase in the work rate, and a low rate is advisable where the beet line is irregular or the soil hard.

* * *

Effect of topping height on sugar beet quality. E. BORNSCHEUER. *Die Zuckerrübe*, 1974, **23**, (5), 16–17. As regards sugar and non-sugars contents, it is still considered advisable to top beet at a point between the hypocotyl and the crown (epicotyl), although the tendency in West Germany is to top at too high a point. While the demand for "flat" topping persists, the question of variety is important, since high-yielding varieties tend to grow to a greater height above the soil level; however, the plant density also affects growth height, and optimum is considered to be 65,000–75,000 plants per hectare.

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Working time and power requirements for the French six-row beet harvesting process. F. P. SÖRGEL and H. STEINKAMPF. *Die Zuckerrübe*, 1974, **23**, (5), 18–20. Tests on the French six-row process, in which topping, lifting and loading of beet can be carried out in parallel or as group operations (topping and lifting as one group and loading and departure of transport as another), were carried out in West Germany. Results showed that, while the technique permits large areas of beet field to be handled relatively quickly, it is limited to large undertakings because of the considerable demands on tractor and labour force. Should a harvester become inoperative, use of the other machines becomes limited. Soil conditions have a considerable effect on work capacity, and working time can be increased by 10–15% under unfavourable conditions.

Suitability for irrigation and fertilizer value of sugar factory waste waters. V. T. DODOLINA. *Sakhar. Prom.*, 1974, (11), 24–27.—The value of Class III waste water (which includes flume and wash water, filter muds and press water) as a liquid fertilizer, particularly in the black earth regions (where the majority of Soviet sugar factories are situated), is discussed and typical analyses of treated and untreated waste water are given, with recommended ranges of contents of the more important components.

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Winter beet growing and length of campaign in the sub-tropical dry belt. B. ANDREAE. *Zucker*, 1974, **27**, 575–580.—Winter beet growing in countries of the sub-tropics (represented by North Africa, the Middle East as well as Italy, Pakistan, Spain, Uruguay and southern USA) is of importance in regard to the world sugar situation, but problems arise, particularly with regard to the necessarily curtailed campaign (60–75 days) which is squeezed in between the end of the rainy season and the onset of the hot period of full summer, so that storage losses may be high. Possible ways in which the campaign can be extended are examined.

* * *

Beet transplanting: research profitable or not? M. MARTENS, R. VANSTALLEN and A. VIGOUREUX. *Publ. Trimest. Inst. Belge Amél. Betterave*, 1974, **42**, 103–120. Transplanting tests in Belgium over a period of 3 years have shown an average 22·7% increase in sugar yield per ha compared with results from beet seed sowing. Among a number of specific problems studied were: bolting, the growth stage at transplanting time, harvesting date, the effect of mechanical harvesting and the processing quality of transplanted beet. While it is accepted that the transplanting techniques used under Belgian conditions are not economically justifiable, the authors believe that research on the subject should be continued, since in long-term research cost criteria cannot be considered a valid argument.

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Mineral nitrogenous fertilizer for sugar beet—its relationship with population, varieties and harvesting dates. N. ROUSSEL, A. JARDIN and W. ROELANTS. *Publ. Trimest. Inst. Belge Amél. Betterave*, 1974, **42**, 121–143.—Details are given of trials during 1971–73 in which the effects of plant population, nitrogen rates, variety and harvesting dates on beet yield were studied as well as possible interaction between the various parameters. While the results, discussed in some detail, showed no significant interactions, they nevertheless seemed to indicate that they exist, particularly between the nitrogen rate and plant population. The use of slow-release and liquid fertilizers was also investigated, as well as comparison between mineral fertilizers and farmyard manure.

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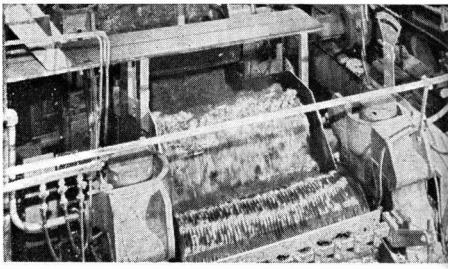
Genotype-year interaction in sugar beet. H. M. SHRIVASTAVA, B. K. TRIPATHI and R. K. SHUKLA. *Indian Sugar*, 1974, **24**, 191–193.—The performances of 14 commercial varieties of sugar beet under sub-tropical conditions in India were investigated in 3-year trials. Results are tabulated and indicate those varieties (diploid, triploid and polyploid) which are suitable for general cultivation under both favourable and unfavourable growth conditions.

Cane sugar manufacture



Special quality granulate (SQG) from plantation white sugar. P. F. KUO. *Taiwan Sugar*, 1974, **21**, 131–135. Information is given on a scheme for manufacture of SQG (a refined-quality sugar) directly from cane at Talin sugar factory.

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A study on improvement of a continuous crystallizer. C. H. CHEN. *Taiwan Sugar*, 1974, **21**, 140–142.—The author examines the theory of continuous crystallization, particularly the extent of the dead space and the degree of massecuite mixing, and indicates ways in which a continuous crystallizer can be improved.

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Corrosion-resistant fibreglass-reinforced plastic (FRP) pipes and tanks for the sugar industry. A. ZAYCO. *Proc. 21st Conv. Philippines Sugar Tech.*, 1973, 167–168.—Advantages of fibreglass-reinforced plastic are discussed and information given on pipes and tanks made of the material at Victorias Milling Co. Inc. for use in sugar manufacture and fermentation processes.

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Pollution and the sugar industry. M. F. GLORIA. *Proc. 21st Conv. Philippines Sugar Tech.*, 1974, 169–176.—Causes of water and air pollution are discussed generally and then with particular reference to the sugar industry, and details given of official Philippine regulations covering the subject. Means of controlling both forms of pollution and the establishment of a control programme are examined.

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National Water and Air Pollution Control Commission. ANON. *Proc. 21st Conv. Philippines Sugar Tech.*, 1973, 176–210.—Full details are given of the rules and regulations as laid down by the official Philippines body described in the title.

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An appraisal of the cane trash problem. T. R. ANCHETA. *Proc. 21st Conv. Philippines Sugar Tech.*, 1973, 211–224.—See *I.S.J.*, 1975, **77**, 53.

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Basic concepts of in-plant investment study. E. C. SUPETRAN. *Proc. 21st Conv. Philippines Sugar Tech.*, 1973, 225–232.—The value of an "in-plant" investment study as a means of determining the economics of changes in processes and the costs of chemical additives is discussed.

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"Fabcon I-12" proven anti-scalant in sugar evaporators. R. O. NAVARRO, V. R. SANTOS and J. A. CASEY. *Proc. 21st Conv. Philippines Sugar Tech.*, 1973, 233–241.—The benefits of adding "Fabcon I-12" anti-scale additive to thick juice before or during evaporation are indicated by results of tests conducted in the Philippines in which boiling out with soda has been obviated and tube scaling minimized.

The influence of non-sugar in crusher juice on low grade ratio. J. M. BINUEZA. *Proc. 21st Conv. Philippines Sugar Tech.*, 1973, 264–274.—See *I.S.J.*, 1975, **77**, 151.

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Boiling house operational techniques. V. H. LOPEZ. *Proc. 21st Conv. Philippines Sugar Tech.*, 1973, 275–279.—The author emphasizes that efficient boiling house operation is not just dependent on good pan station work but relies on the efficiency of other processes as well, of which the most important is liming. Liming efficiency in turn is governed by juice heater temperature, adequate clarifier residence time and efficient filter performance. For pan boiling, a 3-strike system is advocated in which *A*-massecuite is boiled from straight syrup ("virgin" strike). Advantages of this boiling scheme are listed.

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Expansion of the capacity of the boiling house. W. B. PANGAN. *Proc. 21st Conv. Philippines Sugar Tech.*, 1973, 280–288.—The problem of balancing the capacity of the boiling house with that of milling plant operating at an expanded crushing rate is discussed and guidance given on calculation of the performance ratios as a means of establishing the required equipment capacities.

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Proposed programme for reduction of bagasse consumption in sugar centrals. M. F. GLORIA. *Proc. 21st Conv. Philippines Sugar Tech.*, 1973, 289–301.—Proposed changes to boiler plant and its use, and other means of increasing bagasse fuel utilization (reducing bagasse moisture, steam and heat loss and steam consumption) are discussed as a step towards increasing the amount of bagasse available for other uses.

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West U.P. sugar industry need for fuel economy and improvement in sugar recovery. S. V. SAMPATH. *Indian Sugar*, 1974, **24**, 89–91.—Excessive fuel consumption in sugar factories of western Uttar Pradesh is discussed in relation to the use of bagasse for paper production and to the need for reductions in oil consumption. The detrimental effect of Co 1148, a new cane variety, on boiler performance (as well as clarification) because of its high fibre moisture content (52%) is mentioned. Causes of low sugar recovery in western U.P. are discussed, including adverse climatic conditions, poor cane quality, *Pyrilla perpusilla* infestation and post-harvest deterioration of cane.

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Problems of corrosion in sugar manufacture. D. P. KULKARNI. *Indian Sugar*, 1974, **24**, 97–99.—Sources of corrosion in cane sugar factories are briefly discussed and results obtained by use of corrosion-resistant materials in Indian factories reported. Other

measures to prevent corrosion, including application of special paints, are briefly examined.

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Selection of a suitable boiling scheme. M. V. RAO. *Indian Sugar*, 1974, **24**, 163–166.—The various boiling schemes used in India are discussed. Solids distribution in the boiling house and the steam consumption involved in melting all the *C*-sugar are calculated. Provided the melt is of sufficiently high purity, this scheme is preferred to the so-called "multi-seed" system in which *C*-sugar is used as footing for *B*-massecuite, *B*-sugar is used for *A*-massecuite boiling and the excess *B*- and *C*-sugar is melted.

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Molasses formation—reasons and remedy. S. NARAIN. *Sugar News* (India), 1974, **6**, (3), 25–28.—Causes of increased cane molasses formation discussed include cane deterioration after harvesting, inversion during milling, low clarification efficiency and non-sugars recirculation in the boiling house. Possible ways of reducing molasses formation are discussed.

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Elimination of extra fuel consumption. G. S. JAIN. *Indian Sugar*, 1974, **24**, 245–246.—Measures adopted at the author's sugar factory to reduce steam and hence fuel consumption are briefly reported.

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Heavy-duty chopper fiberizer. V. DUCASSE. *Sugar News* (Philippines), 1974, **50**, 259–263.—See *I.S.J.*, 1975, **77**, 140–142.

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Standardization of juice clarification equipment in the Cuban sugar industry. R. QUESADA G. *CubaAzúcar*, 1974, (Oct./Dec.), 10–22.—In 1960 there were 13 different types of clarifiers in use in the Cuban industry. A number of these are briefly described with the aid of diagrams, and information is given on the dimensions and parameters of the standard clarifier now being introduced; it is available in 7 models, covering a capacity range of 40,000–114,000 gal of juice.

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Chemical methods for scale removal in sugar industry evaporators. V. K. SUPRUNCHUK, J. LODOS, E. CASANOVA and V. V. SUPRUNCHUK. *CubaAzúcar*, 1974, (Oct./Dec.), 36–44.—The various methods used for evaporator scale removal in Cuba and elsewhere (particularly the Soviet Union) are surveyed.

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The application of bacterial amylase in the cane sugar industry. G. MADSEN. *Sugar News* (Philippines), 1974, **50**, 314–319.—The starch-hydrolysing effect of amylase which occurs naturally in cane juice is limited by its optimum temperature range of 70–75°C; below 70°C starch is not completely gelatinized and so is not completely susceptible to enzyme attack, while above 75°C the amylase is too rapidly inactivated. Moreover, the optimum range is also optimum for invertase activity, so that increased sugar losses may occur, while a further drawback to the use of "natural" amylase is the fluctuation in its content and its low heat tolerance. However, amylase produced from *Bacillus licheniformis* can tolerate temperatures up to 95°C before it becomes inactivated. Tests with this form of amylase have been carried out at Umfolozi in South Africa, where its starch-reducing effect has been confirmed. Approximately 3·5 g of the *B. licheniformis* amylase would replace 1 g of *B. subtilis* amylase (previously used) per ton of cane crushed, but the former amylase has the advantage of being cheaper, even at the greater dose, while it is also more heat- and pH-tolerant. Optimum results have been obtained when the amylase is added at the inlet to the 2nd evaporator effect. A table of results indicates an approximate 50% reduction in the starch content from clear juice to syrup when slightly over 4 g of amylase was added per ton of cane.

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Study on bentonites in the clarification of cane juice by the simple defecation process. A. A. DELGADO. *Thesis for Doctor em Agronomia* (Universidade de São Paulo), 1969, 56 + xi pp; through *S.I.A.*, 1974, **36**, Abs. 74-1564.—Bentonite clays and their use in the clarification of cane juice are reviewed, with 63 references to the literature. Laboratory-scale tests were carried out to compare the effectiveness of an American bentonite ("KWK Volclay", manufactured by the American Colloid Co.) and a Brazilian bentonite ("NT-30", manufactured by Bentonit União de Nordeste S.A.) as clarification aids. Raw juice was limed to pH 7·1 or 7·7 at room temperature (approx. 20°C) or 50°C; the quantities of bentonite used corresponded to about 450 g per ton of cane. Use of either bentonite gave better quality clarified juice than was obtained by using lime alone; optimum results were obtained by liming to pH 7·7 at 50°C and using the American bentonite.

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Technical and technological processing considerations for beet and cane sugar production. G. MORVAI. *Paper presented at meeting on selection of equipment for the sugar processing industry* (UNIDO, Vienna), 1974, 103 pp.—Every aspect of beet and cane agriculture and processing, including molasses and bagasse utilization and financial factors, is considered in this paper aimed at explaining to the non-sugar technologist what is involved in setting up a sugar factory.

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Process flow in the sugar industry. F. H. C. KELLY. *Paper presented at meeting on selection of equipment for the sugar processing industry* (UNIDO, Vienna), 1974, 14 pp.—After briefly discussing whether to grow beet or cane for processing, the author describes processing in a generalized sense with the aid of a flow diagram and then examines decolorization techniques, the role of crystallization as a purification process, sugar purity control and juice purification to achieve the required end-product purity.

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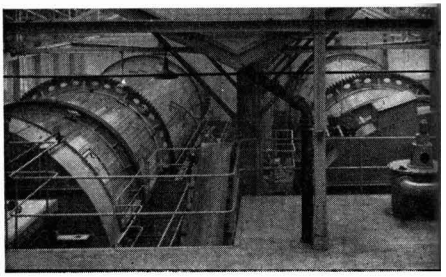
Safety and sanitary requirements in the sugar industry. F. H. C. KELLY. *Paper presented at meeting on selection of equipment for the sugar processing industry* (UNIDO, Vienna), 1974, 9 pp.—Sources of possible danger to life in a sugar factory, particularly where fire and explosion hazards are concerned, are briefly examined and aspects of factory sanitation discussed, e.g. prevention of bacterial infection in juices, maintenance of equipment in a clean state and close regard to the polluting effects of factory effluent.

Beet sugar manufacture



Possibilities for disinfection with chlorine derivatives of isocyanuric acid and "Septosol I 31" in sugar manufacture. L. FASSATIOVÁ, J. SMOLÍK, J. PAŘÍKOVÁ-VRÁNOVÁ and O. KALINA. *Listy Cukr.*, 1974, **90**, 169–176.—Details are given of tests which demonstrated the superiority of "Chlorazine 90" (trichloroisocyanuric acid) and of "Septasol I 33" (containing iodoacetone as active ingredient) over chloride-of-lime and 37% formaldehyde in reducing the numbers of micro-organisms in beet diffusion. The only drawback to the use of "Septosol I 31" is the difficulty in dosing, since for continuous diffusion desired results were obtained with 0·00005–0·0001% (on beet) of the disinfectant, compared with 0·014% formaldehyde to achieve the same effect. In preliminary tests to determine the effects of disinfectants on named micro-organisms, dichloroisocyanuric acid and sodium dichloroisocyanurate were only slightly better than formaldehyde.

* * *

Beet tail and leaf catcher for waste water. F. HRUŠKA. *Listy Cukr.*, 1974, **90**, 189–191.—Brief descriptions are given of two beet tail and leaf catchers of Czechoslovakian construction, one a rotary drum type, while the other is an inclined trough with a grid at the lower end and scraper brushes at the top.

* * *

Heat consumption in the sugar industry. F. DAMBRINE. *Ind. Alim. Agric.*, 1974, **91**, 807–811.—The author explains how it is possible to reduce steam consumption in a beet sugar factory by using horizontal juice reheaters before evaporation, cossette pre-scalding with raw juice, continuous boiling and quintuple-effect evaporation with re-compression of all or some of the vapour bled to the 1st and 2nd strike pans from the 3rd and 4th effects.

* * *

Beet storage at a sugar factory. J. RISBEZ. *Ind. Alim. Agric.*, 1974, **91**, 823–829.—The parameters determining the dimensions of a beet yard and the methods used for dry reclaiming of the stored beet are discussed, and the advantages of the dry yard (reduction in the quantity of polluted water from wet unloading and fluming and in sugar losses) indicated. Various arrangements used (both wet and dry) are described, and the merits of the dry polar silo explained.

* * *

Theoretical and practical aspects of filtration on filter plates. J. P. ETCHEVERRY. *Ind. Alim. Agric.*, 1974, **91**, 865–872.—After a general discussion of filtration, the author examines the various types of plate filters available and discusses factors governing the choice of filter for a specific purpose. The manufacture of filter plates based on asbestos, cellulose and kieselguhr is described with the aid of photomicrographs, and some results achieved in laboratory-scale tests on syrup filtration are discussed.

Sugar juice decolorization in a multiple column battery immediately after deliming. H. ZAORSKA. *Ind. Alim. Agric.*, 1974, **91**, 881–885.—The ammonia-soda method for beet juice deliming[1] and the active carbon method for decolorization of the delimed juice[2] were applied on a factory scale during a beet campaign. Comparison with conventional 2nd carbonatation showed that the soda-ammonia method reduced the lime salts content to a far greater extent (28 mg CaO per 100°Bx as opposed to 143 mg CaO per 100°Bx). The specific extinction of the juice at 560 nm was reduced from 0·030 to 0·026 by the carbon treatment.

* * *

Thick juice storage. J. PONANT. *Ind. Alim. Agric.*, 1974, **91**, 889–911.—All aspects of thick juice storage are covered in this article, which briefly examines the history of the process, the agricultural factors which have led to introduction of thick juice storage, pre-treatment of the thick juice before storage, storage methods, the effect of storage on the factory steam balance and the economics of thick juice storage.

* * *

The possibility of biological treatment of sugar factory waste waters with a high load. G. CATROUX, P. BIDAN, A. IWEMA and F. HEITZ. *Ind. Alim. Agric.*, 1974, **91**, 939–950.—Despite some difficulties, a pilot plant of 300 litres capacity operating on the activated sludge principle during a 3-month period was able to effect an 85–90% reduction in BOD from an average daily load of 11·36 kg BOD per m^3. At double this load a contact time of 4–5 hours would be sufficient to give the same efficiency, it is concluded from the results. Full details are given of the tests and of preliminary laboratory experiments.

* * *

Device for automatic control of the pH of water in diffusion. R. ODER. *Gaz. Cukr.*, 1974, **82**, 200–201. A system for automatic control of diffusion water pH is described which operates by regulating the withdrawal of SO_2 from the sulphur burner to the ejector feeding the water to diffusion.

* * *

Evaluation of the load of sugar factory waste waters. K. SKALSKI. *Gaz. Cukr.*, 1974, **82**, 201–205.—An appraisal of the general situation as regards sugar factory effluent load in Poland showed that there has been a general sharp increase in the BOD_5 during 1970–72 compared with previous years, although the presence of N, P and K from fertilizers has made the effluents more amenable to biological treatment. The situation in Poland is discussed and advice offered on waste water treatment.

[1] ZAGRODZKI & ZAORSKA: *I.S.J.*, 1973, **75**, 254.
[2] ZAORSKA: *ibid.*

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Improvement of thin juice without alkalinity reserve by partial anion exchange. F. SCHNEIDER and F. PERSCHAK. *Zucker*, 1974, **27**, 542–549.—The concept of "alkalinity reserve" is explained and the adverse effects of its deficiency discussed. A method for calculating the increase in molasses sugar caused by addition of alkali is described which allows for the anions present in the juices and the effects of the alkali salts and other non-sugars on sucrose solubility. Results show that failure to correct alkalinity deficiency can be less economical than addition of alkali, while still greater economy can be obtained if the juice is brought to the required alkalinity by passing it through a strongly basic ion exchange resin and then treating it with NaOH before 2nd carbonatation (possibly also before evaporation). The dimensions of an ion exchange unit for treatment of juice from 1000 tons of beet per day are given and a flow diagram of the process is presented.

* * *

Lime treatment and re-use. G. F. KRONEBERGER. *Paper presented at 16th General Meeting, Amer. Soc. Sugar Beet Tech.*, 1970.—Lime recovery from slurry and its subsequent regeneration are discussed in some detail with reference to the use of BSP Corporation multiple-hearth furnaces.

* * *

Some physical characteristics of sugar crystals affecting dust formation. S. A. FARAG, C. L. SCHMALZ and L. W. NORMAN. *Paper presented at 16th General Meeting, Amer. Soc. Sugar Beet Tech.*, 1970.—See *I.S.J.*, 1973, **75**, 119.

* * *

Lime recalcining plant at Mendota, California. J. JONGENS. *Paper presented at 16th General Meeting, Amer. Soc. Sugar Beet Tech.*, 1970.—Details are given of the rotary kiln and materials feeding system for lime regeneration at Mendota. Operation and controls of the kiln, which has worked satisfactorily for some years, are also described.

* * *

Progress report on low raw continuous centrifugals. R. D. SMITH and B. S. SILVER. *Paper presented at 16th General Meeting, Amer. Soc. Sugar Beet Tech.*, 1970.—Tests with continuous centrifugals used for low-grade massecuite are reported.

* * *

The direct production of liquid sugar from ion exchange-treated thick juice. L. T. ZANTO and S. E. BICHSEL. *Paper presented at 16th General Meeting, Amer. Soc. Sugar Beet Tech.*, 1970.—See *I.S.J.*, 1972, **74**, 181.

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Calcium saccharate carbonatation. C. L. SCHMALZ and R. B. PARK. *Paper presented at 16th General Meeting, Amer. Soc. Sugar Beet Tech.*, 1970.—In the Steffen process, the calcium saccharate is usually mixed with raw juice and gassed with CO_2 which purifies the raw juice and releases the sucrose from the saccharate into the process stream. However, where thick juice is stored, the question arises as to whether carbonatation can still be used in the absence of raw juice. Tests showed that there was in fact no difficulty, although the carbonatated juice did have a higher colour content than conventional raw juice; however, treatment with 4% sodium carbonate and 300–350 ppm SO_2 reduced the colour (the bulk of which was due to invert sugar destruction) as well as providing a higher alkalinity, which was otherwise lower than for conventional raw juice.

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Beet juice demineralization. S. OIKAWA and A. MIYAHARA. *Paper presented at 16th General Meeting, Amer. Soc. Sugar Beet Tech.*, 1970.—See *I.S.J.*, 1972, **74**, 53.

* * *

An effective chemical technique to prevent salt flake contamination of white sugar. J. A. CASEY. *Paper presented at 16th General Meeting, Amer. Soc. Sugar Beet Tech.*, 1970.—Addition of Fabcon I-12 sequestering agent to white sugar massecuite in boiling has been found to reduce contamination from salt flakes believed to originate from scale. The interval between pan descaling has also been increased.

* * *

Macin lime kiln. C. J. AMOS. *Paper presented at 16th General Meeting, Amer. Soc. Sugar Beet Tech.*, 1970. See *I.S.J.*, 1972, **74**, 53.

* * *

Recommendations on improving the slicing of bolted and woody beet. E. V. LITVINOV. *Sakhar. Prom.*, 1974, (10), 21–24.—Experience in the USSR and elsewhere with slicing of bolted and woody beet is used as basis for a number of recommendations, and mention is made of special knives (as used in the USA) and cossette shapes produced by them.

* * *

Improvement in the operation of a KDA-25-59 tower diffuser. R. N. KATERINICH. *Sakhar. Prom.*, 1974, (10), 24–25.—A brief description is given of a scheme for preventing build-up of exhausted cossettes on the screen near the discharge port at the bottom of a rotary KDA-25-59 tower diffuser. By maintaining a layer of cossettes and juice at a given level above the screen, the system (embodying a hydraulic trap) has permitted a reduction in losses and in electricity consumption.

* * *

Increasing the elasticity of beet cossettes during processing. A. A. LIPETS, I. A. OLEINIK, M. Z. KHELEMSKII and V. A. KNYAZEV. *Sakhar. Prom.*, 1974, (10), 25–27.—Laboratory experiments in which beet samples were extracted at 70°C for up to 80 minutes with water which had been treated (i) with SO_2 to pH 6·0, (11) with aluminium sulphate to pH 6·0, and (iii) with aluminium sulphate to pH 4·5 showed that the elasticity modulus and hence stability fell with extraction time, but that the fall was greatest with treatment (i) and lowest with treatment (iii). Since the deterioration is associated with cell damage, leading to loss of permeability and hence increased losses, the results are seen as an indication of the advisability of using aluminium sulphate to treat diffusion water.

* * *

Determination of standard molasses viscosity for Sangerhausen high-speed centrifugals. N. P. SILINA, I. P. SLAVGORODSKAYA and A. N. PUCHKA. *Sakhar. Prom.*, 1974, (10), 28–29.—Results of investigations, in which molasses standard viscosity was determined for Sangerhausen 1450 rpm centrifugals of 500-kg massecuite capacity, are discussed.

Processing low-grade white sugar. S. A. BRENMAN, I. L. ZDANOVICH, F. P. ALEKSEENKO, L. V. OGOROD-NIICHUK and O. A. KUZ'MENKO. *Sakhar. Prom.*, 1974, (10), 30–33.—Investigations in which dextrose and levulose solutions (and their 1:1 mixtures) were subjected to carbonatation and sulphitation in the presence or absence of colorants (invert sugar alkaline decomposition products, caramels and melanoidins) are reported. Results demonstrated the greater decolorizing effects which were obtained by simultaneous liming and gassing followed by sulphitation as opposed to liming for 5 minutes followed by gassing with CO_2. Further investigations on sugar solution treatment with 0·5, 1·0% and 2·0% CaO (on weight of dry solids) showed that carbonatation and sulphitation could adequately reduce the colour from the initial 4–5°St. With a small quantity of reducing sugars, 1·0% CaO was found to be enough, while 2·0% CaO was necessary with a reducing sugar content of some 2·0% on weight of dry solids.

* * *

A drum-type water separator. T. G. SHIBAEVA. *Sakhar. Prom.*, 1974, (10), 44–45.—A brief description is given of a perforated rotary drum-type separator for removal of water and mechanical impurities from beet before they enter the washer. Economic advantages of the separator, in which the small screen perforations minimize beet tail removal, are indicated.

* * *

Magnetic treatment of 1st carbonatation juice before 2nd carbonatation juice heaters. I. I. SAGAN' and E. L. STRASHEVSKII. *Sakhar. Prom.*, 1974, (10), 51–53. Details are given of a device for magnetic treatment of 1st carbonatation juice to reduce scale formation in juice heaters. Tests showed that the magnetic treatment was effective in maintaining the heat transfer coefficient at almost constant level after more than 30 days, while without treatment the coefficient fell gradually to a constant level which was much lower than with treatment.

* * *

Non-sugar:water ratio control in low raw massecuites. L. TOTH. *Paper presented at 18th General Meeting, Amer. Soc. Sugar Beet Tech.*, 1974.—See *I.S.J.*, 1975, **77**, 212.

* * *

High-speed packaging of brown sugar. B. M. STEIN. *Paper presented at 18th General Meeting, Amer. Soc. Sugar Beet Tech.*, 1974.—To overcome problems associated with the high moisture content and stickiness of brown sugar, it was decided to freeze the sugar by spraying with a cryogenic material in order to improve flow. However, the sprayed sugar became hard and lumpy but subsequent grinding of the sprayed sugar was found to solve the problem. Moreover, the shelf life of the sugar was increased to 1 year, compared with 6 months for normal brown sugar, while the treated sugar was found to be easier to blend when tested under kitchen conditions.

* * *

The effect of low raw massecuite cooling rate and non-sugar:water ratios on molasses exhaustion. V. M. JESIC. *Paper presented at 18th General Meeting, Amer. Soc. Sugar Beet Tech.*, 1974.—Tests indicated that molasses purity is primarily dependent on the molasses alkali salt content and that, for optimum low-grade massecuite processing, the final non-sugar:water ratio should be 2·8, the massecuite crystal content no greater than 40%, the final temperature no lower than 40°C after 30–50 hours' cooling, and the massecuite heated to 52–54°C before curing in the centrifugals. For good quality raw sugar production it is recommended to use continuous centrifugals, introduce split pan boiling when batch and fully-automatic centrifugals are used, and use affination.

* * *

Long-term storage of sugar beet attacked by downy mildew. J. ŽDÁRSKY and A. SVOBODA. *Sb. Vys. Sk. Chem. Technol. Praze Potraviny*, 1973, (E37), 135–143; through *S.I.A.*, 1974, **36**, Abs. 74-1247.—Beets which were lightly or heavily infected by downy mildew were stored in sand in a cellar at 6–10°C for 181 days. Compared with control beets, the dry weight after storage was about 20% lower and the sugar content 18–26% lower; the invert sugar content was about twice and the total N and protein contents 2–2½ times those in the controls; the ash content was up to 20% higher. It is concluded that lightly infected beet should not be stored for more than two months, while heavily infected beet should not be stored at all.

* * *

Porosity of bulk sugar beet. V. A. BOIKO, G. E. BEM and R. M. ZAICHENKO. *Kharch. Prom., Nauk.-Vyrob. Zb.*, 1974, (4), 37–40; through *S.I.A.*, 1974, **36**, Abs. 74–1354.—The porosity ε, i.e. unoccupied fraction of volume (1 — bulk density/s.g. for clean beet), was measured for beet of various sizes and shapes, under known pressures, corresponding to different pile heights h; results are tabulated and graphed. At h = 2 and 6 m, ε was 40·6 and 36·3%, respectively; extrapolation gives a value 30% for ε when $h = 10{\cdot}5$ m. Values of ε are tabulated for bulk density 625–750 kg.m^{-3} and trash content p 0–25%, and an equation is given for the effect of p on ε. For $h = 4{\cdot}7$ m at $p = 2{\cdot}5\%$, ε was 36% and the hydraulic resistance to air flowing at 21·8 cm.sec^{-1} was 5·6 kg.m^{-2}; for $h = 4{\cdot}7$ at $p = 8{\cdot}6\%$, ε was 32·3% and the resistance was 10·3 kg.m^{-2}. It is recommended that beets stored together be uniform in size, and that those nearest the ventilation inlets be of top quality.

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Fundamentals of conductimetric control of massecuite boiling. IV. Bases for programming of nucleation and crystal development. V. VALTER. *Listy Cukr.*, 1974, **90**, 207–215.—A generalized nomogram has been developed for establishing the required values of conductivity during thickening-up, nucleation and grain development as a function of supersaturation, with temperature, Brix and purity as the other variables.

* * *

Operation of a coke-fired vertical lime kiln. P. CUVELIER. *Sucr. Belge*, 1974, **93**, 405–411.—Various aspects of coke-fired shaft lime kiln operation are examined, in particular: coke combustion and the height of the oxidation zone; the importance of the oxidation and decarbonation zones; amount of combustion air consumed, CO_2 reduction to CO and the relationship between the quantity of coke and the amount of monoxide formed (since CO formation is also a function of the specific surface area of the coke, it is preferable to use as large a grade of coke as is compatible with the limestone and kiln dimensions, but this will also affect the oxidation zone, while the

reduction zone will start at lower temperatures); heat exchange between coke and limestone; gaseous fluid circulation and pressure loss; tightness of seal; regularity of kiln charging and discharging; and refractory lining thickness and its effect on kiln daily throughput.

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Improving the quality of thin juice in the absence of alkalinity reserve by partial anion exchange. F. PERSCHAK. *Sucr. Belge*, 1974, **93**, 413–425.—See SCHNEIDER & PERSCHAK: *I.S.J.*, 1975, **77**, 245.

* * *

The active alkalinity of sugar factory juices. K. VUKOV. *Zeitsch. Zuckerind.*, 1974, **99**, 525–531.—The activity of the hydroxyl ions is the decisive factor in juice purification and evaporation. While the equation $pOH = -\log K_w - pH$ (where K_w is the ion product of water at a given temperature) gives only an approximate value of pOH and hence of hydroxyl ion activity, the author considers that the value obtained does have some practical significance as "active alkalinity"; the effect of temperature on it and on pOH is considerably smaller than on active acidity or pH. The role of active alkalinity is examined as the decisive factor governing (i) invert sugar destruction rate in juice during pre- and main liming and thus the required reaction times and associated colour formation, (ii) 1st and 2nd carbonatation end-point (the optimum 1st carbonatation end-point being almost constant at pOH = 3·0, while that of 2nd carbonatation must be established for each individual case), and (iii) sucrose hydrolysis in evaporation, the quantity of invert sugar remaining in the thick juice, colour formation and even heating tube corrosion. For automatic control of juice purification and evaporation it is recommended to take pH measurements at high temperatures and calculate the pOH values from the readings, thereby permitting the set value for the pH controllers to be adjusted to the correct pH.

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The treatment of sugar factory waste water using a recycling process. K. VIEHL, H. TEICHMANN and H. D. LESWAL. *Zeitsch. Zuckerind.*, 1974, **99**, 536–541. Details are given of the waste water treatment scheme at Bedburg sugar factory in West Germany after part of the original system had to be re-sited because of local mining needs. The new scheme embodies four ponds in series, the water from each spilling over into the next, while that from the last pond is discharged in a recirculation channel and pumped to the first pond. Two screw pumps are used for the recycling, which provides aeration in addition to that taking place on the surface of the effluent in the ponds. The average BOD_5 reduction is from 1800 to below 25 mg.litre^{-1}, which meets the requirements of the local authorities, at low running costs. Total surface area is 200,000 m^2 and average pond depth 2·0 m.

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The effect of mud separation after preliming on the quality of thin juice. R. OSVALD, J. ČEPELÁK and J. CVACH. *Listy Cukr.*, 1974, **90**, 217–220.—Laboratory carbonatation tests are reported in which mud was removed from juice after preliming. Best results in terms of purification efficiency, juice colour and lime salts content as well as filtration coefficient were obtained when the muds were separated after recycling of 1st carbonatation mud to preliming.

Mingling of low-grade sugar as footing for middle product massecuite boiling. A. KOVAŘÍK, K. ČÍŽ and F. VINTNER. *Listy Cukr.*, 1974, **90**, 220–223.—Boiling *B*-massecuite on a footing obtained by mingling low-grade sugar with water, carbonatation juice or syrup was found in tests to give better results than did melted low-grade massecuite in terms of boiling time, steam economy, grain size uniformity and labour requirements.

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Modernization of a condenser unit for vacuum filters. YU. I. KOLOMIETS and A. A. CHUKHVANTSEV. *Sakhar. Prom.*, 1974, (11), 46–47.—Details are given of the modifications made to the vacuum filter station at the authors' sugar factory in order to raise the vacuum, found to be too low because of inadequate condenser dimensions and excessive resistance in the air lines.

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Raising the CO_2 coefficient of utilization. I. F. POPOV and A. F. POPOV. *Sakhar. Prom.*, 1974, (11), 48–49. Information is given on modifications to 1st carbonatation vessels in order to increase the extent of CO_2 utilization at two Soviet sugar factories.

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Sugar losses during storage in silos supplied by BMA. I. N. AKINDINOV, T. N. MRYKHINA and N. V. ORLOVA. *Sakhar. Prom.*, 1974, (11), 50–53.—Losses in bulk sugar stored in three Lucks & Co. 10,000-ton capacity silos at Timashev sugar factory are discussed. Major cause of the losses, which in 1972/73 amounted to 0·001% on weight of incoming sugar (97 kg), was considered to be inadequacy of the air conditioning plant, which failed to produce the required relative humidity of 60–70% but merely heated and dried the air, so that excessive sugar dust was formed.

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Measurement and estimation of the quality characteristics of beets for the years 1963-71 at Platy sugar factory and their effect on the cost. P. HRISTODOULOU. *'Ellen. Biomehania Sakh. Trimen. Delt.*, 1972, (8), 38–52; through *S.I.A.*, 1974, **36**, Abs. 74–1415.—The following characteristics of beet were measured and are discussed: pol (on reception at the factory and after slicing), purity and invert sugar, ash and harmful N contents of expressed juice, and dry solids and marc contents of beet. The purity, Ca salt content and colour of thick juice were measured, and the yields of sugar and molasses % beet, the processing coefficient (ratio of sugar yield to sugar in beet at reception) and difference in yield were calculated. Statistics are tabulated and the effects of these factors on the cost of sugar are discussed.

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Experiences with a process computer for fully-automatic diffuser operation. P. MOSEL. *Zucker*, 1974, **27**, 528–541.—Details are given of an experimental scheme for automatic control of the two tower diffusers (one of 3600 and the other of 4000 tons per day capacity) using a Type 301 (12K store core) Siemens computer at Plattling beet sugar factory in West Germany. After a number of years, it is concluded that maintenance of optimum conditions in a tower diffuser at large throughputs is difficult with manual control, whereas a computer-controlled diffuser operates more smoothly, is easier to supervise and is more reliable even when approaching maximum load.

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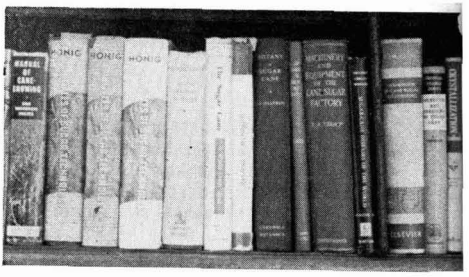

Les principaux parasites et maladies de la betterave (The major pests and diseases of the sugar beet). ANON. 51 + vii pp; 13·5 × 21 cm. (Institut Technique Français de la Betterave Industrielle, 45 rue de Naples, 75008 Paris, France.) 1975

The major insect pests of sugar beet and three important diseases (*Cercospora beticola, Peronospora schachtii* and *Rhizoctonia violacea*) are featured in this booklet, as well as two useful insects, viz. the ladybird (*Coccinella* sp.) and the hover fly (*Syrphus* sp.), both of which are particularly valuable against aphids. The arrangement of the subject-matter is alphabetical, two pages being devoted to each pest or disease; the left-hand page describes symptoms of attack, the appearance and biology of the pest (or pathogen), type of damage caused and cultural precautions to take in order to reduce infestation or infection, while the right-hand page carries very clear colour photographs (amply magnified where necessary) of the pest or disease symptoms. A 7-page supplement inserted inside the back cover gives recommended chemical treatments for each pest or disease. The quality of the printing, particularly of the illustrations, is excellent and the Institute is to be congratulated for producing such an admirable work which must be of great value to all beet farmers. Since the Latin names are given in all cases, the book can even be recommended to non-French speaking readers for the illustrations alone.

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Manuel de sucrerie (Sugar factory manual). 273 pp; 21 × 29 cm. (Société Sucrière d'Etudes et de Conseils, Aandorenstraat, 3300 Tienen, Belgium.) 1975. Price: 500 Belgian Francs.

This publication is based on a work produced in 1964 by Messrs. HERSSENS, HULPIAU and VANDORMAEL to act as a basis for training staff employed by Raffinerie et Sucreries de Grand-Pont, and it is emphasized in the preface that the intention is not to produce an advanced scientific work. Raffinerie Tirlemontoise and SSEC used the manual for the same purpose, but decided to revise the work to take account of the major developments that have taken place since 1964. As such, the work is suitable for use by university graduates entering the industry and could be used as a starting-point from which to progress to more advanced material in other books on various aspects of sugar manufacture. It is separated into a number of sections, covering history of the beet sugar industry, sugar factory chemistry, beet conveying and washing, diffusion, lime kiln operation, juice purification, evaporation, steam utilization and heat balances, boiling and crystallization, centrifugals and their operation, sugar drying and storage, high-quality sugar production and sugar classification, molasses sugar extraction, water consumption and waste water treatment, and measuring and control instrumentation.

As would seem natural, the emphasis is on practices and equipment used in Belgium, but there is much that the French-reading newcomer to the sugar industry in other countries could glean from the work. Certainly, there is a shortage of books on beet sugar manufacture, and the most recent publication on the subject ("Beet sugar technology" by R. A. MCGINNIS) tends to reflect Western Hemisphere practices. The only criticism the reviewer has to make about the Belgian book concerns the lack of a contents page and subject index, so that reference is somewhat hampered. Certainly, in these days of high inflation, the price (corresponding to about £6.00) is not exorbitant.

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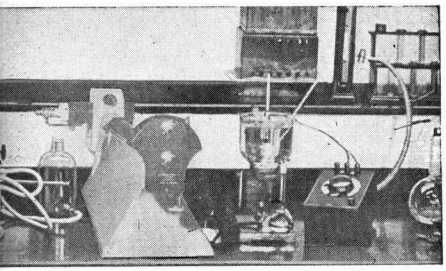
Manbré: a 100 years of sugar in Hammersmith, 1874-1974. J. STODDARD. 55 pp; 14 × 21·5 cm. Fulham and Hammersmith Historical Society, Fulham Library, 598 Fulham Rd., London S.W.6, England.) 1974. Price £1.95

This short history of the Manbré Group, one of the three sugar refining companies in the UK (responsible, however, for only 16% of the country's refined sugar production) which is also very active in production of glucose and specialty sugars, is the outcome of the discovery by one of the firm's employees of a number of old photographs showing the Hammersmith works in its early days. The book follows the course of developments in three phases, the first from the filing of the first of ALEXANDRE MANBRÉ's patents (for production of "colouring spirits from the sugar of potatoes known as glucose") in 1858, to the second during which the two Manbré companies produced glucose for brewing with great commercial success, although finally coming close to bankruptcy as a consequence of competition, ill-timed investment in new plant and World War I. The third phase started in 1919 when the company was bought by ALBERT BERRY, who turned loss into profit, followed by expansion in both glucose, invert sugars and caramel production and refining by acquisition of various refiners such as Sankey Sugar Co., Martineau Ltd. and Westburn Sugar Refineries Ltd. The Hammersmith refinery of Manbré and Garton Ltd. was completed in 1876, but there have been many alterations and additions since to allow for expansion and changes in processes under BERRY's two sons; moreover, Manbré were pioneers in bulk transport, establishing delivery of liquid sugar in the early 1930's.

The book contains a number of illustrations showing modern processing as well as historical photographs, and a short appendix containing some terms used in refining. A subject index is appended. While the work cannot be considered as anything more than an interesting history of one of the leading firms in the UK sugar industry, it does make a valuable contribution to the literature on sugar enterprises and early work in the field of refining and glucose production.



Laboratory methods & Chemical reports

Physico-chemical properties and composition of scale in sugar juice heaters. I. I. SAGAN', YU. S. RAZLADIN and S. I. RYBALKO. *Izv. Vuzov, Pishch. Tekh.*, 1974, (4), 157–158.—Analysis of scale from raw juice heaters revealed a large quantity of organic substances (36% of the total); it was these which had a significant effect on the properties of the scale. X-ray phase analysis failed to detect any crystalline structure, although thermography revealed the presence of a clay mineral of the montmorillonite group. Scale from carbonatation juice heaters contained much less organic material (2·7–6·3%) than did the raw juice heater scale, while the lime salts content was considerably greater, as were the silicon, aluminium, magnesium, calcium, iron and sodium contents; the basic mineral was calcite, although montmorillonite, illite, caolinite and a montmorillonite + hydromica mixture were also present. The scale was found to have a layered structure, while spherolites were also discovered in the incrustations. Observations in polarized light confirmed the non-metallic origin of the substances. The heterogeneous nature of the scale was associated with marked fluctuations in the hardness, although the flow conditions of the juice had a greater effect on hardness and on scale density; electron microscopy showed that the surface of the scale had a crystalline structure linked with portions of an amorphous mass; a porous structure in the incrustations became more compact and homogeneous with increase in juice flow.

* * *

A new formula for reduced boiling house recovery (E.S.G.). K. PATCHAPPALAM. *Indian Sugar*, 1974, **23,** 947–950.—A formula is presented for calculation of the reduced boiling house recovery as a function of losses in press cake and molasses as well as unknown losses. The formula's derivation is explained.

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Study on the physical state of sucrose after lyophilization. I. Physical state of sucrose solutions at temperatures below 0°C. M. MATHLOUTI. *Ind. Alim. Agric.*, 1974, **91,** 841–845.—In an examination of the crystallization of sucrose during the freezing phase which precedes lyophilization of aqueous solutions, direct and differential thermal analysis was made of the frozen solutions and a study made of certain factors influencing low-temperature crystallization: temperature, concentration and viscosity. It is concluded that crystallization of the water causes supersaturation in the interstitial solution which should permit nucleation, although no crystallization of the sucrose was observed. Sucrose crystal growth was not induced by heat treatment, addition of surface-active agents (to reduce viscosity) or by seeding, although it is believed that the treatments did lead to formation of molecular clusters in the pre-nucleation centres. However, at low temperatures the viscosity was too high for crystal growth from these centres, while this condition is the basis for the hygroscopicity of lyophilized products.

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Alkaline potassium ferricyanide method (colorimetric) for the direct determination of reducing sugars in cane juice. K. C. RAO and S. ASOKAN. *Indian Sugar*, 1974, **23,** 951–954.—The photocolorimetric methods were compared with the van der Plank micro-method used as standard for determination of reducing sugars in juice from 13 cane varieties. Details are given of the procedures used and results are tabulated. While the alkaline potassium ferricyanide method gave results in close agreement with those of the van der Plank method, the other method, using triphenyl tetrazolium chloride, gave consistently higher values than the standard method. Recovery of added dextrose was about the same with all three methods.

* * *

Thin layer sucrose crystallization. M. ROCHE. *Ind. Alim. Agric.*, 1974, **91,** 849–853.—Sucrose crystallization from thin layers of syrup at very high supersaturation was studied under a microscope provided with a polarizing device, permitting photographs to be taken of nucleation occurring under difficult situations, of very slow crystal growth and of crystals having peculiar shapes. Crystallization in a solution containing one-third reducing sugars was only just possible. It is emphasized that the phenomena observed are a long way from the normal crystallization process in a factory, although they do have some bearing on them.

* * *

Alkaline sucrose decomposition. B. KOPŘIVA. *Sb. Vys. Sk. Chem. Technol. Praze Potraviny*, 1973, (E37), 107–134; through *S.I.A.*, 1974, **36,** Abs. 74-1361. Reactions of sugars in alkaline solutions, leading mainly to the formation of acids, are reviewed (with 21 references to the literature). The most important reaction from a practical viewpoint is lactic acid production from sucrose; an attempt was made to find conditions which gave maximum yield. Reactions were carried out with CaO:sucrose molar ratios of 4·46:1 and 5·58:1 at 130 and 150°C. Contents of total sugars, invert sugar, total carboxylic acids and lactic acid after 2, 4, 6 and 8 hours are graphed; invert sugar contents were low at all stages; the maximum yield of lactic acid obtained was 66% of the theoretical, which is near the highest amount reported by other authors. A regression equation relating yield to the CaO:sucrose molar ratio, temperature and reaction time was derived.

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Evaluation of several rapid quantitative lactic acid procedures utiling G.L.C. separation of volatile derivatives. T. D. CARPENTER and L. L. WHEELOCK. *Paper presented at 16th General Meeting, Amer. Soc. Sugar Beet Tech.*, 1970.—A brief review of the literature on gas-liquid chromatography is followed by

details of a procedure for determination of lactic acid in beet juice and molasses using diazomethane as esterifying agent.

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A rapid method for the determination of lactic acid in molasses and process juices. J. F. T. OLDFIELD, R. PARSLOW and M. SHORE. *Paper presented at 16th General Meeting, Amer. Soc. Sugar Beet Tech.*, 1970. See *I.S.J.*, 1970, **72**, 35–40.

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A gas-liquid chromatographic method for the determination of sucrose in molasses. J. KARR and L. W. NORMAN. *Paper presented at 16th General Meeting, Amer. Soc. Sugar Beet Tech.*, 1970.—The determination of sucrose in beet molasses by gas-liquid chromatography after conversion of the sucrose to its octatrimethylsilyl ether is described; results indicate a slightly lower value than that given by polarimetry.

* * *

Method for sucrose determination in beet which eliminates polarimetric errors due to the presence of monosaccharides. N. A. ARKHIPOVICH and N. I. SHTANGEEVA. *Sakhar. Prom.*, 1974, (10), 46–48.—A method is described in which the effect of invert sugar on sucrose determination is eliminated by adding NaOH to the expressed juice which is stood for 10 minutes on a boiling water bath, cooled and neutralized with HCl. The sucrose content is determined by polarimetry both before and after the NaOH treatment, and tabulated data indicate the differences in measured values before and after monosaccharide decomposition.

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Automation of the conductimetric determination of the ash content in sugar beet. W. WÖHLERT and E. JUNGHANS. *Die Lebensmittelind.*, 1974, **21**, 497–499. Details are given of the automatic determination of the ash content in beet brei by an LM 301 conductimeter coupled with a digital computer. Ash and sucrose are determined successively in the same sample.

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Infrared spectroscopic studies on different constituents of sugar colorants as obtained by paper chromatographic elution and on dialysis. S. K. D. AGARWAL, P. C. JOHARY and D. S. MISRA. *Zeitsch. Zuckerind.*, 1974, **99**, 532–535.—See AGARWAL *et al.*: *I.S.J.*, 1975, **77**, 125.

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The need for an integrated standardization of the different chemical control apparatus, equipment and other control factors used in our Philippine sugar industry. L. L. SAN JOSE. *Proc. 21st Conv. Philippines Sugar Tech.*, 1973, 242–263.—See *I.S.J.*, 1975, **77**, 218.

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Crystal content: an index of sucrose recovery. R. G. CAMURUNGAN. *Proc. 21st Conv. Philippines Sugar Tech.*, 1973, 312–319.—See *I.S.J.*, 1975, **77**, 61.

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Investigation of the mineral composition of white sugar. O. B. TSEREVITINOV, E. V. ANDREEVA and I. L. GOLUBEVA. *Sakhar. Prom.*, 1974, (11), 21–24.—Atomic absorption spectrophotometry using a Perkin-Elmer instrument was carried out on 10% white sugar solutions which were first ashed and then fed directly into the burner flame. Marked variation in the ash contents and concentrations of the individual components was found for 120 samples representing 21 sugar factories in the USSR. Values for K, Na, Ca, Mg, Fe, Cu, Mn and Zn are tabulated. Further tests in which sugar samples from four factories were separated into three size fractions showed that the ash content in the medium-size crystals was lower than in the smallest fraction, while the largest crystals contained most ash because of imperfections, it is concluded from microscopic studies. Using glacial acetic acid as solvent, investigations were conducted on the distribution of ash components inside and on the surface of the crystal. Results showed that more than two-thirds of the total K and Na content and more than half of the Ca and Mg contents occurred on the surface together with traces of Cu, whereas the amount of Fe inside the crystal was greater than on the surface. The ash content in crystals of sugar which underwent marked browning over a period of some months was three times greater than in sugar of medium size fraction, the K content being four times greater, the Na and Mg three times greater, the Fe 3½ times greater and the Ca twice as great.

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Rheological behaviour of final molasses from Oriente province. K. KOLAROV and L. GARCELL. *CubaAzúcar*, 1974, (July/Sept.), 22–34.—Molasses samples from six sugar factories of Oriente province have been examined for their rheological properties using a rotating cylinder-type viscometer and measuring flow characteristics. Measurements were made for a range of Brix (86·24–90·64°), temperature (25–55°C) and velocity gradients (0·5–200 sec^{-1}), and it is concluded that the molasses exhibits pseudo-plasticity of coefficient n between 0·856 and 0·964. Viscosity depends to a large extent on chemical composition; for the same Brix and temperature, samples showed viscosities double that of others. Coefficients are evaluated for substitution in equations which relate viscosity to Brix and temperature.

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Precise measurements of the rotary dispersion of aqueous sucrose solutions from 18°C to 30°C as basis for the International Sugar Scale. K. ZANDER, W. SEILER and R. BÜNNAGEL. *Zucker*, 1974, **27**, 642–647. Details are given of the polarimetric equipment and method used to measure the optical rotation of sucrose solutions at 18°, 20°, 25° and 30°C. From the measurements, base values for correction of the International Sugar Scale are obtained for a wavelength of 546·2271 and 589·4400 nm at 20°C.

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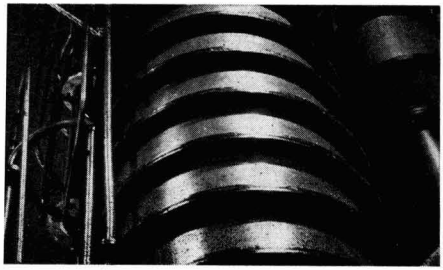
A new method for determining soluble ash in sugar beet. M. Z. KHELEMSKII and S. N. KALINA. *Sakhar. Prom.*, 1974, (12), 35.—The conductivity of a number of filtered and unfiltered extracts from beet brei samples was measured, whereby the relative error for the unfiltered extracts was found to be 0·48%, indicating that it was unnecessary to filter before making such measurements. The explanation for the results is to be found in the fact, it is stated, that the dissociated ions in the solution give rise to the conductivity, while the insoluble pulp fractions at the concentration used (26 g in 178·2 ml water) do not affect the viscosity nor the conductivity.



By-products

Organic acid production by mycelial fungi. J. E. SMITH, A. NOWAKOWSKA-WASZCZUK and J. G. ANDERSON. *Ind. Aspects Biochem., Fed. Eur. Biochem. Soc. Meeting*, 1973, 297–317; through *S.I.A.*, 1974, **36**, Abs. 74–1090.—Processes for the production of citric or itaconic acids by fermenting sugars with *Aspergillus* are outlined. Citric acid is produced by *A. niger* from e.g. refined sugar, raw sugar, syrup or molasses; metallic ions, if present, must be partially removed from the carbon source before fermentation. The pH of the medium should be ≥ 3 and a pellet-form inoculum is generally used; the Cu, Fe, KH_2PO_4, $MgSO_4$, Zn and $(NH_4)_2CO_3$ contents of the medium should be 5–200 ppm, < 1 ppm, 0·01–0·02%, 0·08–0·15%, 0·002–0·004% and 0·02–0·15%, respectively. Suitable strains of *A. terreus* or *A. itaconicus* are used for the commercial production of itaconic acid from raw sugar or beet or cane molasses; the optimum sugar content of the medium is 10–20% and $CaSO_4$, $(NH_4)_2SO_4$, $MgSO_4,7H_2O$ (0·05%) and KH_2PO_4 (0·01%) should be added. Possible biochemical mechanisms of acid accumulation are discussed.

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Preparation of fructose-1,6-diphosphate by yeast. M. LEISOLA, I. HÄYHÄ and M. LINKO. *Proc. Nat. Meeting Biophys. Biotechnol. Finland*, 1973, 145–147; through *S.I.A.*, 1974, **36**, Abs. 74-1120.—The calcium salt of fructose-1,6-diphosphate was prepared by the fermentation of fructose, glucose, sucrose, mannose or molasses by *Saccharomyces* yeast followed by precipitation with ethanol. The optimum conditions were: 30°C, pH 6·6 and 36–38 g $NaH_2PO_4,2H_2O$, 500 g fresh yeast, 40–45 ml toluene and about 80 g fructose per kg of medium; 34–35·5% conversion was thereby obtained. Fresh *S. carlsbergensis* or spray-dried *S. cerevisiae* could be used.

* * *

Utilization of bagasse. V. R. SRINIVASAN and Y. W. HAN. *Advan. Chem. Ser.*, 1969, **95**, 447–460; through *S.I.A.*, 1974, **36**, Abs. 74-1139.—The uses of bagasse are discussed with particular reference to its use as a substrate for the culture of *Cellulomonas* sp. either alone or with *Alcaligenes* sp. An economic analysis showed that bagasse *Cellulomonas* single cell protein could be one of the cheapest sources of protein. The rate of growth of *Cellulomonas* is enhanced by the presence of *Alcaligenes*. The uses of bagasse as a fuel, a raw material for paper, a structural material, an agricultural soil conditioner and a cattle food are briefly considered.

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Beet pulp pressure and density distribution during pressing in an open passage. YU. I. MITEREV, V. P. BORODYANSKII and N. N. DOVGAL'. *Izv. Vuzov, Pishch. Tekh.*, 1974, (4), 162–164.—During beet pulp briquetting by a roller-type press, the free-flowing material is condensed in an open passage, and briquette pressure and density in the zone of relative standstill decrease from the centre of the passage to the discharge point. However, the relationship between these two factors and briquette depth can only be applied approximately to briquetting in a closed chamber, where the pulp does not undergo any laterial expansion when under pressure, although over a specified pressure range there is almost no difference between density in the centre of the open passage and in the closed chamber.

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Sugar cane juice—a cheap source of fungal protein. K. SINGH. *Indian Sugar*, 1974, **23**, 967.—Cane juice diluted with distilled water to 2% soluble solids concentration was converted to fungal protein by treatment with a basal medium made up from one of four fungi: *Gladosporium herbarium*, *Aspergillus terreus*, *Curvularia pallescens* and *Fusarium equiseti*. Ammonium nitrate was used as N source. Incubation lasted 96 hours at 25–28°C. *F. equiseti* produced the greatest amount of protein, followed by *A. terreus*, *C. herbarium* and *C. pallescens*.

* * *

Dry pulp. Technological and economic aspects of production and utilization. M. DEMAUX. *Ind. Alim. Agric.*, 1974, **91**, 915–923.—Beet pulp pressing and drying are examined within the context of fuel consumption and anti-pollution regulations, and the value of the product as animal fodder is discussed.

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Checking of pulp pressing in beet sugar factories. J. GENOTELLE and A. CARRIÈRE. *Ind. Alim. Agric.*, 1974, **91**, 925–929.—A laboratory press is described and details given of its use to determine the pressing properties of beet pulp and to evaluating pressing parameters.

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"Yeasted" pulp. P. BIROLAUD. *Ind. Alim. Agric.*, 1974, **91**, 933–936.—Some distilleries producing alcohol from beet dry the residual yeast and pulp separately. Pulp drying is not difficult, while yeast drying does present problems. Hence, it has been suggested that the two waste products be combined to yield an animal fodder constituent capable of replacing cereals in compound rations. At a yeast content in the mixture of 8% (on weight of dry solids), tests showed that it was possible to replace up to 66% of the cereal in rations fed to young cattle, up to 100% in lamb rations and up to 20% in pig and rabbit feed. The economics are briefly discussed.

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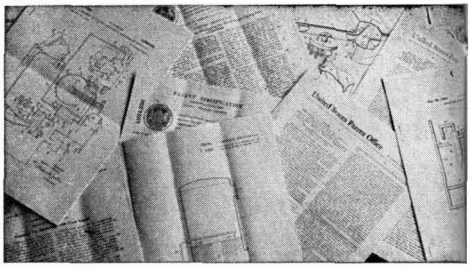
Effect of application methods and dose of ammoniacal water on quality of beet pulp. M. M. BORISENKO. *Khim. Sel. Khoz.*, 1970, **8**, 785–787; through *S.I.A.*, 1974, **36**, Abs. 74–1304.—During ensilage, 8 or 16 litres 25% NH_3 solution was added per ton of pulp; within three days, 82 or 80%, respectively, had been bound. In the case of acid pulp, 8 litres was added and 95% was bound.

Patents



UNITED STATES

Beet harvester. O. F. CRANDALL and R. THOMPSON. **3,792,733.** 15th February 1973; 19th February 1974.

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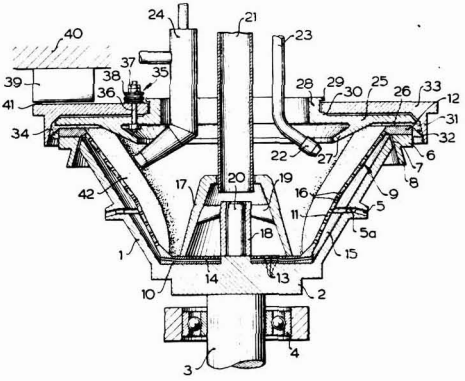
Continuous centrifugal. K. PAUSE, of Grevenbroich, Germany. **3,799,353.** 13th October 1972; 26th March 1974.

The continuous conical centrifugal is driven from below by shaft 3 mounted in bearings 4 and includes a basket 1 which houses a lining 9 which is provided with a bottom wall 10, a perforated double-conical wall 11 and a flange 12. Massecuite is admitted through pipe 21 into a bell 17 which can be raised or lowered on the pin 20 by means of a sleeve 18 and webs 19. Liquid separating in the bell passes through perforations 13 into a channel 14 in bottom wall 10 and this communicates with the chamber 15 between the lining 9 and the basket 1. Molasses separating from the sugar 42 on the inner surface of the lining 9 passes through perforations 16 and into chamber 15 from which it leaves through collecting annular groove 5 and ports 5a, while wash liquor supplied through pipe 23 and nozzle 22 passes through the upper part of the sugar layer and is discharged through outlets 7 into a separate part of the curb. This thickness of the sugar layer is governed by a sensing device 24 which controls the feed.

Surrounding the upper opening is an annular baffle 25 which provides a narrow gap 26 for discharge of sugar and which is provided with a flow control mechanism in the form on an annular plate 33 held against baffle 25 by means of spring-loaded bolt devices 35. At one point above plate 33 is an electromagnet 39 which attracts that part of the plate, closing the gap 41 between them in opposition to the springs 38. As the plate revolves each part of the periphery is thus raised and lowered once per revolution and this causes reciprocating movement of the vertical flange 31 on plate 33 relative to the edges of flange 12 and the corresponding flange 6 on the basket 1. The angle of the inner surface 32 of flange 31 is so chosen that the sugar will not flow out of the machine without the reciprocation of flange 31 and thus the flow rate can be controlled while the thickness of the sugar layer 42 and its time of residence is such as to provide optimum elimination of molasses.



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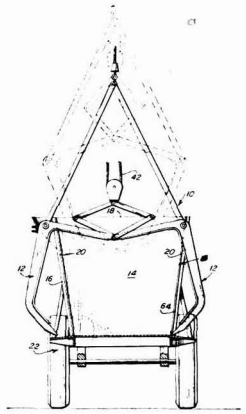
Cane cart unloader. M. J. HYMEL, of Gramercy, La., USA. **3,799,371.** 7th January 1972; 26th March 1974.

The cane cart 14 has an open top 18 and walls 16 with openings 20 for the fingers 12 of a grab 10. The latter is operated by the rope 42 which raises the lever pivot, so causing the fingers to enter the sides of the cart along its bottom surface. When the grab is then raised, the entire contents of the cart are removed in one load instead of needing several operations of the usual type of grab/cart combination.



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Purification of sugar juices involving ultrafiltration. R. F. MADSEN, of Nakskov, Denmark, *assr.* A/S DE DANSKE SUKKERFABRIKKER. **3,799,806.** 20th April 1972; 26th March 1974.—Insoluble contaminants are removed mechanically from beet or cane juice and the treated juice (brought to pH 6–11·5 with lime and) subjected to ultrafiltration with a semi-permeable membrane which permits the passage of water and

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

sugar molecules but not high molecular weight compounds. Water is added to the concentrate and the ultra-filtration repeated to recover additional sugar, and the process repeated if desired. The residual concentrate is dried either alone or after mixture with other materials, while the combined permeates are purified by chemical treatment, filtration, ion exchange, electrodialysis and/or reverse osmosis.

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Beet cleaner-loader. R. D. ZAUN and R. W. HOOK, of Des Moines, Iowa, USA, *assrs.* DEERE & Co. **3,802,019.** 15th February 1973; 9th April 1974.

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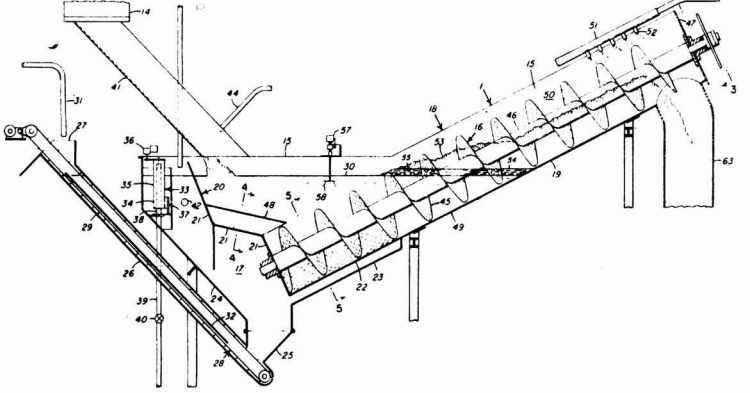
Displacement rinsing apparatus (Washer for disintegrated cane). J. FARMER, of Honolulu, Hawaii, USA, *assr.* WARD FOODS INC. **3,804,670.** 20th October 1971; 16th April 1974.

Cane after disintegration in a shredder 14 passes through chute 41 to tank 15 which contains a large amount of rich juice for washing dirt in the form of sand, mud and gravel from the cane. The cane floats and is removed from the tank by means of scroll 16 within the tank and its upward extension 18, while the heavier dirt sinks to the bottom of the tank,



passing through the screen bottom 22 into the settling compartment 17.

The dirt is withdrawn by means of the conveyor 28 which lifts it above the juice level 30 when it is washed with fresh water from pipe 31 before discharge. Juice is withdrawn from the top of compartment 17 through the overflow device 33 which includes a fine screen 34 to remove cane particles which are sufficiently small to be carried through the perforations of screen 22.

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Absorptiometer. C. V. RICH, of Tonbridge, Kent, England, *assr.* TATE & LYLE LTD. **3,806,258.** 15th February 1972; 23rd April 1974.—See UK Patent 1,323,662[1].

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Separation of levulose. Y. TAKASAKI, of Chiba, Japan, *assr.* AGENCY OF INDUSTRIAL SCIENCE & TECHNOLOGY. **3,806,363.** 12th January 1973; 23rd April 1974.

Levulose is separated from a mixture with dextrose (other oligosaccharides) and contaminating substances (a sucrose hydrolysate or an isomerized dextrose) by supplying the mixture to a bed of anion exchange resin in the sulphite form to remove inorganic substances and then to a similar resin in the bisulphite form. The levulose and dextrose are separated by maintaining the bed at 40–60°C while eluting with water, whereby purified levulose is concentrated in one of the eluate fractions.

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Beet juice purification. M. R. GASCO, of Turin, Italy. **3,806,364.** 31st March 1972; 23rd April 1974.—Raw beet juice is treated with a mixture (in the form of a powder) of an inorganic suspending agent (montmorillonite clay, kaolin, bentonite, fuller's earth, diatomite, kieselguhr, sepiolite, bauxite, aluminium oxide or salts, Na or K aluminate, alkali metal or ammonium phosphate, alkali metal polyphosphate and/or silica) and a non-toxic quaternary nitrogen salt decolorant ($NR_1R_2R_3R_4X$ where R_1 and R_2 are the same or different lower alkyl or alkoxy groups, R_3 is a phenyl, benzyl, alkaryl or dialkaryl group, R_4 is a C_{10}–C_{16} aliphatic chain and X is chloride, bisulphate, sulphate or acetate) and/or a non-toxic polyethyleneamine [$(NH\text{-}CH_2\text{-}CH_2\text{-})_n$ having a molecular weight not less than 40,000]. The juice is further treated with a polyacrylic flocculation aid and limed (to pH 10·7–10·8) (with 0·15 – 0·4% CaO), (brought to 80–90°C) treated with more of the above mixture and flocculation aid, and then filtered before (1- or 2-stage) carbonatation (at 70–75°C to pH 8·3–8·5), followed by filtration.

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Clarification and treatment of cane juice. L. A. PALEY of Aurora, Ill., USA. **3,808,050.** 1st July 1965; 30th April 1974. The pH of fresh cane juice is raised to 6·8–8·5 by addition of NaOH or lime, active carbon and filter aid are added and mixed and the juice filtered to give a water-white filtrate from which water is evaporated to give a syrup which is filtered in the presence of active carbon and filter aid and further evaporated to give white sugar and edible syrup. The pH adjustment and filter aid may be omitted.

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Production of citric acid by submerged fermentation. A. J. KABIL, of Vienna, Austria, *assr.* AG. JUNGBUNZLAUER SPIRITUS- UND CHEMISCHE FABRIK. **3,809,612.** 23rd August 1971; 7th May 1974.—See UK Patent 1,348,798[2].

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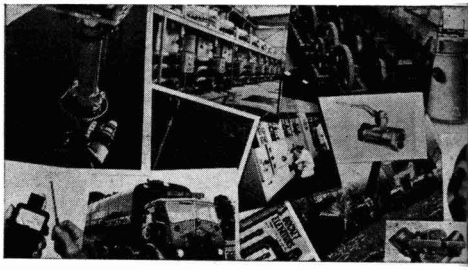
[1] *I.S.J.*, 1974, **76**, 126.
[2] *ibid.*, 1975, **77**, 189.

Trade notices



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PUBLICATIONS RECEIVED

DUST CONTROL UNITS. Dust Control Equipment Ltd., Thurmaston, Leicester, LE4 8HP England.

Publication 198 describes "Unimaster" dust filter units; the range covers five basic designs coupled with a standard range of fan sizes, filtration areas and dust container capacities, thus giving a choice of over 500 units. The five types available are: the standard unit, Type UMA, which is an integral unit complete with fan, filter, hopper and dust container; the hopper version, Type UMA H, which comprises only fan and filter assembly, the base being flanged for direct bolting to a purpose-built dust container; the sack tipping unit, Type UMA STU, with fan, filter, discharge hopper and quick-release hatch for sack tipping operations; the venting unit, Type UMA V, which consists of filter only and is designed to ventilate process equipment, silos and other storage vessels under pressure; and a venting unit with dust container. Details and dimensions, capacities, applications, etc. are to be found in the brochure.

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FLOW MEASUREMENT. Kent Instruments Ltd., Biscot Rd., Luton, Beds., England.

When fluid passes over an obstacle, a boundary layer of viscous, slow-moving fluid forms along its surface and subsequently becomes detached to produce a wake behind the obstacle. If the obstacle is not streamlined, a low pressure area is created behind it which causes the separated layers to "roll" into vortices from alternate sides of the obstacle. The frequency of the vortex shedding is directly proportional to the flow velocity, so that if a bluff body is fixed in a pipeline to act as an obstacle, the flow rate can be measured. Literature available from Kent Instruments Ltd. describes the Kent vortex flowmeter, which comprises a bluff body of special design and a measuring unit which gives the flow velocity as a function of changes in capacitance between metal diaphragms, welded to the sides of the body, and electrodes. Accuracy is $\pm 0{\cdot}5\%$. Details are given of the equipment and its method of operation.

* * *

CONVEYOR BELTS. A/S Roulunds Fabriker, DK-5260 Odense, Hjallese, Denmark; CBS (Automotive & Industrial) Ltd., Bone Lane, Newbury, Berks., England.

Literature available from the suppliers describes Roulunds conveyor belts which are available as two main groups: "RO-PLY" 2-ply belts with the patented "Stiflex"carcass, and multi-ply conventional conveyor belts. A wide range of fabrics is used, and roughened surfaces for optimum grip are available. Particularly durable are the wear-resistant rubber conveyor belts described in Brochure 358-E. "RO-PLY GRIP 4" conveyor belting for inclined transport is described in Brochure 347-E, while Brochures 350-E and 351-E give details of endless joining of "RO-PLY" belts by hot vulcanizing and cold vulcanizing, respectively. Conveyor belts with synthetic polyester/polyamide plies and "Stiflex" inner ply are also covered in Brochures 339-E and 346-1E.

* * *

STEAM BOILERS. Babcock & Wilcox (Operations) Ltd., 165 Great Dover Street, London, SE1 4YB England.

Three brochures are available which provide information on Babcock & Wilcox steam boilers: Publication 2022, which describes FM boilers of up to 350,000 lb (160 metric tons) per hour evaporation rate, up to 950 psig (60 $kg.cm^{-2}$) pressure and steam temperatures up to 900°F (485°C); Publication 2010, giving information on thermal storage boilers which cater for peak steam demands up to 33% above maximum continuous rating for about an hour or lesser peaks for longer periods; and Publication 2023, which deals with "Vaporax" steam boilers, which are compact, fully-automatic, self-contained, forced-circulation units of 4-pass design meeting the needs for a boiler of low running costs.

* * *

A.C. MOTORS. Thrige-Titan A/S, Tolderlundsvej 2, DK-5100 Odense, Denmark.

Thrige-Titan A/S, a company associated with the ASEA Group of Sweden, have introduced an entirely new type of drip-proof, squirrel-cage, ventilated A.C. motor which has great flexibility. The MS motor is available as a standard version, a modified version (in which the standard motor is provided with stock mechanical components and/or power rating variant) and a special version, which is a standard or modified version but with changes in construction or electrical design. Catalogue MK 96-2 E, Parts A and B1, provides information and specifications concerning the motor, which is available in single- and three-phase versions, both of 50 Hz.

* * *

FABCON CHEMICALS FOR THE SUGAR INDUSTRY' Fabcon International Inc., 1275 Columbus Ave., San Francisco Calif., 94133 USA.

A 4-page octagonal brochure gives details of the five major areas in which Fabcon chemicals can increase profits in sugar manufacture: inversion control by CMA ("Cane Milling Aid") bactericide, reduction of evaporator scale by I-12S, improved clarification with polyamide coagulants, increased molasses exhaustion and boiling house capacity with "Pan-Aid" or "Visc-Acid" added to massecuite, and boiler water and fuel treatment.

* * *

PUMPS FROM THE MONO GROUP. Mono Group, Mono House, Sekforde St., Clerkenwell Green, London, EC1R 0HE England.

Two new publications are now available from the Mono Group: Leaflet 0011 features the standard pump ranges of the three member companies (Mono Pumps Ltd., Stainless Steel Pumps Ltd. and Metering Pumps Ltd.), while Leaflet 1042 gives full technical details of Mono pumps in the "L" series which span a capacity range of $0{\cdot}2\text{–}56{\cdot}0\ m^3.h^{-1}$.

* * *

WASTE WATER TREATMENT FOR INDUSTRY. Ames Crosta Ltd., Heywood, Lancs., OL1O 4NF England.

Publication 119 from Ames Crosta, a member of the Pollution Control Division of Babcock & Wilcox Ltd., is a 20-page booklet in which general principles of waste water treatment are explained and descriptions given of types of waste and methods of treatment. Examples are given of some Ames Crosta installations, while Publication 119R lists plants installed by the company in the UK since 1960, including a biological filtration plant for a maximum flow of 1870 m^3 per day supplied to the British Sugar Corporation. As a guide, the statutory requirements for waste water treatment within the UK are set out.

* * *

"ROPAK III" PACKAGER. Matthews Machine Co. Inc., Decatur, Alabama, USA.

The "Ropak III" packager is designed to fill teaspoon-sized packets with sugar at the rate of 2500 packets per minute using preprinted paper. The packets are sealed and fed into a 1000- or 2000-pack carton. Full details with illustrations are given in a leaflet obtainable from the manufacturers.

International Sugar Research Foundation Inc.

FROM the 1st July 1975, International Sugar Research Foundation dues were reduced by one-half and a "voluntary" system of research replaced the present "levy" system.

The dues will be calculated on the basis of 1½ cents per ton of refined sugar delivered, and 1 cent per ton of raw sugar delivered. This will provide funds for all activities except actual research funding which will come from individual members, voluntarily committing monies to specific research projects. Under the new system, it may be possible for non-members and associations to subscribe to research projects administered by the Foundation.

In such cases where a research project is supported by one or a small group of members with the intent that any resulting royalties will revert back to the sponsors, the Foundation will act strictly as an agent. Similarly, the Foundation will act as agent in the administration of projects sponsored by non-members.

The recommended changes are intended to render the Foundation more responsive to the research needs of individual members, thus making it a more dynamic organization, and to render ISRF more attractive to potential new members.

The change from a levy system of research funding to a voluntary approach and the concomitant reduction in dues will in no way decrease the services rendered by the Foundation to its members. Such services include: surveillance and reporting of significant developments affecting sugar utilization; providing comments and opinions from experts in the various fields of research; providing occasions for members to meet and exchange views; identifying factors influencing sugar sales through regional industry meetings and consultation with scientific advisors; and defining specific research projects which will mitigate against any unfavourable aspects and promote promising product developments.

The headquarters of the Foundation are in Bethesda, Maryland, in the outskirts of Washington, D.C. The location was selected for the number of major scientific organizations, both governmental and private, in the vicinity. For information write to: International Sugar Research Foundation, Inc., 7316 Wisconsin Avenue, Bethesda, Md., 20014 USA.

New sugar factory orders for Stork-Werkspoor Sugar.—One of the world's largest sugar factories, to have a capacity of 20,000 tons of cane per day, is to be built by Stork-Werkspoor Sugar B.V. for Karun-Agro Industry Inc. of Teheran, Iran[1]. The $160 million factory is to come into operation in 1977 and will be located at Karun in the Province of Khuzestan. Approximately 30 miles away is the Haft Tappeh sugar factory which was also supplied by Stork-Werkspoor Sugar and, after expansion in 1968 and 1972, has now a crushing capacity of 12,000 t.c.d. In 1974 the company received an order for a sugar factory in Tanzania, to have a capacity of 45,000 tons of sugar per year and to be delivered by the end of 1976, finance being provided by Dutch and Danish aid funds. An order was also received from Bangladesh for the modernization of a sugar factory and from Indonesia came orders for four steam boilers for sugar factories.

* * *

Oil-fired lime kiln for Iran.—The first order for export to Iran of one of their oil-fired lime kilns has been awarded to West's Pyro Ltd. The kiln, which is rated at 120 tons per day, is to be built at the Fariman beet sugar factory, at a cost of about £160,000.

Guyana sugar statistics[2]

	1974	1973	1972
	(metric tons, raw value)		
Initial stocks*	16,427	8,459	24,832
Imports	23	29	71
Production	352,740	280,283	335,338
	369,190	288,889	360,359
Consumption	33,154	34,546	32,150
Exports—Algeria	1,821	0	0
China	10,760	0	0
Finland	14,386	0	0
Morocco	19,727	0	0
Surinam	580	0	0
Tunisia	14,151	0	0
UK	131,696	208,941	228,067
USA	106,317	28,857	91,565
Venezuela	12,265	0	0
Total	*311,703*	*237,798*	*319,632*
Final stocks	24,333	16,427	8,459

* Partly calculated.

New sugar factories for Panama.—Corporación Azucarera La Victoria S.A. of Panama recently signed a contract with F. C. Schaffer & Associates Inc., of Baton Rouge, Louisiana, for the complete design engineering of a new raw sugar factory of 6000 metric tons of cane per day capacity. The cooperative factory is to be located near the city of David, in the Province of Chiriqui and will be known as Ingenio de Chiriqui. Construction started in June 1975 and crushing of the first crop is scheduled for March 1977. The budget cost is $46·5 million excluding harvesting and cane transport equipment. The Schaffer organization has participated in over 250 sugar projects since 1959, including several in Panama. Recently they acted as the Owner's Representative in the design and construction of the 4000 t.c.d. Ingenio La Victoria at Santiago de Veraguas, erected for Corporación La Victoria by C-Itoh/Kawasaki Heavy Industries in 1971–72, and are presently engineering its expansion to 6000 t.c.d. The company has plans for further factories at Alanje, Azuero and Penonomé, giving a projected total output in 1980 of 270,000 tons a year[3]. The Schaffer firm started work in the Chiriqui area in 1970 as consultants in the expansion and modernization of the rum distillery owned by Ron Carta Vieja S.A., one of the leading rum distillers in Central America. In 1971 Schaffer assisted Hacienda Carta Vieja in experimental cane plantings and prepared feasibility studies with the objective of establishing a commercial sugar operation in the area. They have been closely involved in the Chiriqui project since that time.

* * *

EEC import levies[4].—As a consequence of the continued fall in world market prices the EEC Commission has introduced import levies on raw and white sugar entering the Community. Levies are calculated by deducting the c.i.f. Rotterdam price of world market sugar from the EEC threshold price. Meanwhile, export levies continue to apply to both raw and white sugar leaving the Community, though they have fallen substantially. The fall in world market prices has come at a most convenient time for the EEC Commission. Some 450,000 tons of sugar have been authorized for import into the Community under the special arrangement whereby the importer is granted a subsidy and also permitted to export a corresponding tonnage from the 1975/76 crop free of export levy. It was suggested at one time that the Commission, by agreeing to forego the expected return on exports from the new crop was, in fact, merely giving what was effectively a two-part subsidy. Current indications, however, are that levies, if they are payable at all, will be quite small and consequently the Commission will not be losing much in eventual income by this procedure.

* * *

Ivory Coast sugar complex[5].—A sugar complex to be built at Borotou in the north of the Ivory Coast will be financed by the French Government. A provisional sum of 22,000 million CFA francs has been pledged.

[1] See also *I.S.J.*, 1975, **77**, 191.
[2] *I.S.O. Stat. Bull.*, 1975, **34**, (5), 51.
[3] *Bank of London & S. America Review*, 1975, **9**, 342.
[4] C. Czarnikow Ltd., *Sugar Review*, 1975, (1234), 93.
[5] *Public Ledger*, 16th April 1975.

Czechoslovakia sugar exports[1]

	1974	1973	1972
	(metric tons, raw value)		
Algeria	0	0	5,435
Austria	0	196	662
Bulgaria	0	5,435	5,435
Cyprus	326	543	4,320
Germany, West	253	5,554	5,372
Greece	0	543	391
Holland	0	65	261
Hong Kong	761	0	0
Hungary	10,848	0	0
Iceland	1,567	446	1,527
Indonesia	11,935	0	0
Italy	22	1,978	637
Jordan	8,068	18,477	0
Kenya	9,135	0	0
Kuwait	0	1,630	543
Lebanon	14,208	0	4,891
Libya	5,163	0	0
Maldives	0	1,305	217
Malta	1,084	0	0
Morocco	13,609	0	0
Nigeria	5,104	4,892	1,087
Norway	12,736	15,592	13,805
Saudi Arabia	18,015	85,458	85,062
Singapore	0	4,478	2,421
Southern Yemen	0	5,435	5,778
Spain	0	0	63
Switzerland	16,433	11,497	13,793
Syria	22,478	0	0
Tanzania	0	0	3,913
Tunisia	11,984	0	0
Turkey	7,602	0	0
UK	0	2,206	27,597
USSR	0	21,739	21,766
Yemen	0	0	11,636
Yugoslavia	18	31,499	12,500
Other Countries	13,306	6,177	3,227
	188,649	225,145	228,545

Walkers 5-roller cane mills for Hawaii.—A contract has been received by Walkers Ltd. of Queensland, Australia, for supply of two 5-roller mills for Honokaa Sugar Company of Hawaii. Previous units have been supplied to Hawaii for use as dewatering units after processing of cane in diffusers but the new units, which include pressure feeders, are to be incorporated in a conventional milling tandem.

* * *

Tongaat Group Ltd. 1975 report.—Total cane crushed during the 1974/75 season was 1,658,305 tons from which 184,803 tons of sugar was made, 9·81% of South African production. The factory is embarking on a five-year expansion and modernization programme involving a new evaporator, a continuous *C*-pan, a new 450 p.s.i. boiler of 120 tons steam per hour capacity, and replacement of the milling tandem by a 220 t.c.h. BMA diffuser. First steps have been taken in the mechanical harvesting of cane in suitable areas; considerable progress was also made towards preparing fields for mechanical harvesting and other mechanized operations, and an increased tonnage of cane will be cut mechanically in forthcoming years.

* * *

Corrigendum.—In our June issue[2] we mentioned that a new retail price for sugar of 52·50 pesetas per kg had been introduced in Spain; this should have read 32·50 pesetas per kg.

* * *

Indian sugar for Iran[3].—India is to export 500,000 metric tons of sugar to Iran over the period from October 1974 to March 1977.

* * *

Cane sugar factory plans for Syria[4].—In accordance with an agreement recently signed, a cane plantation is to be set up in Syria with the aid of Brazilian equipment and "know-how", with the aim of producing sugar, molasses and alcohol.

Turkey sugar imports and exports[5]

	1974	1973	1972
	(metric tons, raw value)		
Imports			
Brazil	11,233	0	0
Canada	5,681	0	0
Cuba	11,212	0	0
Czechoslovakia	7,616	0	0
Egypt	10,029	0	0
France	7,814	0	0
Poland	13,949	0	0
Rumania	27,933	0	0
UK	11,442	0	0
	106,909	0	0
Exports			
Cyprus	0	435	652
France	0	0	10,326
Iran	0	3,261	10,869
Iraq	0	0	54,347
Italy	0	0	1,375
Switzerland	0	0	10,326
UK	0	0	34,239
	0	3,696	122,134

* * *

Kenya sugar development programme.—Tate & Lyle Technical Services Ltd., the design and consultancy arm of the Tate & Lyle Group, has been selected to prepare a programme of projects to enable Kenya to become more self-sufficient in sugar. The programme is being financed by the United Nations Development Programme and administered by the International Bank for Reconstruction and Development. At present Kenya produces some 160,000 tons of sugar per year, while annual consumption is of the order of 240,000 tons and rising by at least 7% annually. Plans by various agencies for building a further two to three factories and for increasing the capacity of existing units will be taken into consideration, along with all other relevant data in providing the Government with recommendations for a ten-year programme of action for increasing the country's sugar production and effectively reducing its expenditure on imports. The work is expected to be completed by October and will involve a ten-man team in Kenya. TLTS have secured the cooperation of the Economist Intelligence Unit of London and HVA International of Amsterdam to provide some of the highly specialized services required for the project. All three organizations have been connected with earlier sugar studies under the auspices of the World Bank.

* * *

New technique for control of witchweed.—Scientists at the North Carolina Agricultural Experiment Station, in a cooperative effort with the US Department of Agriculture, are attempting to control witchweed by a new method. USDA's Agricultural Research Service will provide $50,000 for a 2-year study which will be directed at studying the behaviour of strigol, which is a naturally-occurring germination stimulant of witchweed, a parasite that attaches itself to the roots of host plants, including sugar cane. The roots of host plants give off strigol, thus causing witchwood seed to germinate and attack the host. With the synthesized strigol, the scientists hope to cause witchweed seed to germinate in the absence of a host and, in effect, commit suicide. The weed is native to Africa and India and, through a vigorous quarantine and control programme, has been confined in the US to parts of North and South Carolina. It represents a major threat to US agriculture, since it can thrive anywhere any of its hosts can grow. It is especially persistent because a single witchweed plant can produce up to 500,000 seeds which, once in the soil, can survive 20 years or more, normally germinating only when stimulated by a host plant.

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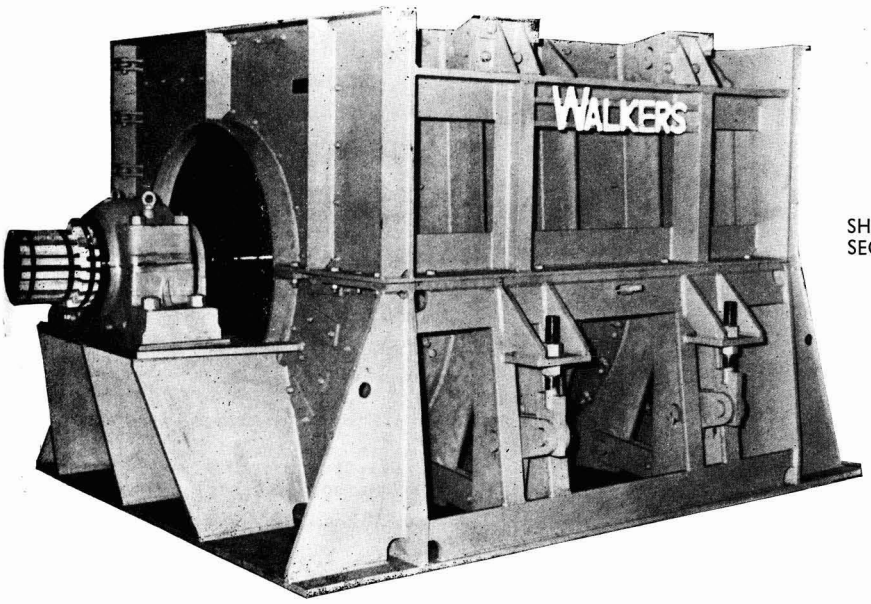
[1] *I.S.O. Stat. Bull.*, 1975, **34**, (4), 35.
[2] *I.S.J.*, 1975, **77**, 161
[3] *Standard & Chartered Review*, May 1975, 27.
[4] *Brasil Açuc.*, 1975, **85**, 156.
[5] *I.S.O. Stat. Bull.*, 1975, **34**, (5), 106.



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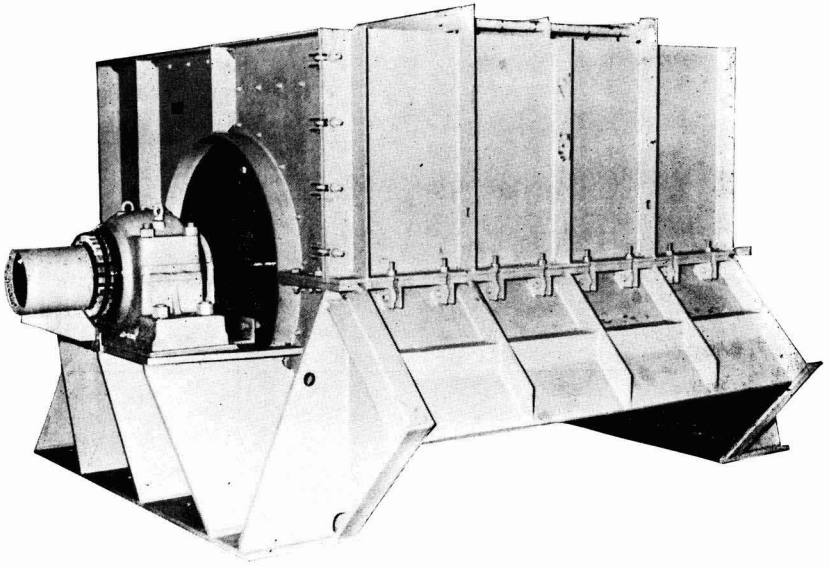

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