International Sugar Journal

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* * *

La carbonatation de liqueur. 3ème partie. Méthodes laboratoires pour la comparaison de la qualité d'échantillons de liqueur ou de chaux. M. C. Bennett et S. D. Gardiner. p. 173–175

La seconde section de cet article traite des différents types de filtres laboratoires qu'on peut appliquer à la mesure de la filtrabilité de liqueur carbonatatée sous les conditions telles que dans la raffinerie. On présente les résultats d'essais de filtrabilité sous la forme de graphiques et donne des informations sur une installation laboratoire de carbonatation continue qui comprend deux appareils de réaction.

* * *

L'emploi de filtres-épaississeurs pour la première carbonatation dans les sucreries danoises. 2ème partie. R. F. Madsen. p. 179–176

Dans le deuxième partie de cet article l'auteur donne les détails de filtres à poches employés dans les sucreries de la Compagnie Sucrière Danoise (DDS) et des pressions et des contrôles automatiques. On discute l'expérience dans deux sucreries danoises, y comprit la consommation du pierre à chaux et des toiles filtrantes.

* * *

Les nouvelles laboratoires de recherche de la British Sugar Corporation. p. 179–181

On donne une description des nouvelles laboratoires de recherche de la BSC récemment inaugurés à Colney, près de Norwich.

* * *

Recherches sur la canne à sucre à Maurice. p. 181–183

On présente une condensation du rapport annuel de l'Institut de Recherches de l'Industrie Sucrière de l'Ile Maurice pour l'année 1966.

Der XIII Kongress des International Society of Sugar Cane Technologists. *S.* 163–172

Nach Beschreibungen der verschiedenen Zuckerfabriken und anderen Anlagen in Taiwan, die von den Mitgliedern des XIII Kongresses des ISSCT besucht wurden, gibt man eine kurze Bericht über die Eröffnungszeremonie, die Sektionssitzungen und die Vollversammlung. Man erwähnt den von mehreren Mitgliedern nach dem Kongress gemachten Besuch der Philippinen.

* * *

Karbonatation von Kläre. Teil 3. Labormethoden für den Vergleich der Qualität von Klären- oder Kalk-Proben. M. C. Bennett und S. D. Gardiner. *S.* 173–175

In der zweiten Sektion dieses Aufsatzes betrachtet die Verfasser Laborfilter verschiedener Arten, die für die Messung der Filtrierbarkeit von karbonatierter Kläre bei Bedingungen wie in der Raffinerie angewandt werden können. Man gibt die Ergebnisse von Versuchen auf Filtrierbarkeit in der Form von Diagrammen, und gibt Informationen über eine Laboranlage für kontinuierliche Karbonatation, die zwei Reaktionsapparate enthält.

* * *

Anwendung von eindickenden Filtern für erste Karbonatation in den dänischen Zuckerfabriken. Teil 2. R. F. Madsen. *S.* 176–179

Im zweiten Teil dieses Aufsatzes gibt der Verfasser Informationen über die in Zuckerfabriken der dänischen Zuckergesellschaft (DDS) angewandten Beutelfilter und über die angewandten Drücke und Automatik. Er bespricht die Erfahrung in zwei dänischen Zuckerfabriken, u.a. den Kalkstein- und Filtertuch-Verbrauch.

* * *

Neue Untersuchungslaboratorien der British Sugar Corporation. *S.* 179–181

Man beschreibt die neuen Untersuchungslaboratorien der BSC, die in letzter zeit in Colney, bei Norwich, eröffnet wurden.

* * *

Zuckerrohr-Forschungsarbeit in Mauritius. *S.* 181–183

Eine Zusammenfassung des Jahresberichts des Forschungsinstituts der Zuckerindustrie in Mauritius für 1966 wird gegeben.

El 13° Congreso de la International Society of Sugar Cane Technologists. *Pág.* 163–172

Después de descripciones de las varias fábricas de azúcar y otras instalaciones y lugares en Taiwan visitado por miembros del 13° Congreso de la ISSCT, una cuenta breva se presenta de la ceremonia de abertura, las asembleas de las secciones de la Sociedad, y la sesión plenaria. Se refiere a la visita a la República Filipina de algunos miembros después del Congreso.

* * *

Carbonatación de licor. Parte III. Procedimientos de laboratorio para comparar la calidad de muestras de licor o cal. M. C. Bennett y S. D. Gardiner. *Pág.* 173–175

La segunda sección de este artículo trata de los varios tipos de filtro de laboratorio que puede usarse para medir la filtrabilidad de licor carbonatatado en las mismas condiciones de la refinería. Se presentan en forma gráfica las resultas de pruebas de filtracion y se da información sobre un instalación de laboratorio para carbonatación continua que incorpora dos vasos de reacción.

* * *

Uso de filtros espesantes para primera carbonatación en la Danish Sugar Corporation. R. F. Madsen. *Pág.* 176–179

En la segunda parte de este artículo se presentan detalles de los filtros a bolsa instalado en las fábricas de la Danish Sugar Corporation, y de las presiones y de los controles automáticos que se usan. Se discute la experiencia de dos azucareras danesas, que incluye notas del consumo de caliza y de tela de filtrar.

* * *

Nuevos laboratorios de investigación para la British Sugar Corporation. *Pág.* 179–181

Se describen los nuevos laboratorios de investigación de la BSC que se han inaugurado recientemente a Colney, cerca de Norwich.

* * *

Investigaciones sobre la caña de azúcar en Mauricio. *Pág.* 181–183

Se presenta un sumario del reporte anual del Instituto de Investigaciones de la Industria Azucarera de Mauricio para el año 1966.

THE

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Notes & Comments

International Sugar Conference.

As mentioned earlier in our issues, a Conference organized under the auspices of UNCTAD was scheduled to start on the 17th April and continue for some six weeks in an attempt to arrange a system whereby production and consumption of sugar could be correlated in a way which would provide adequate returns to the producers without excessive costs to consumers. The Conference duly opened in Geneva and the Hon. ROBERT LIGHTBOURNE, Minister of Trade and Industry of Jamaica, was elected Chairman. Some 133 members of the UN were invited and 66 countries have sent representatives.

Speeches were made at the early opening sessions by certain of the representatives and by Dr. RAUL PREBISCH, Secretary-General of UNCTAD, after which the Conference went into closed session for the business of hammering out their differences and achieving, if possible, an amicable settlement which would be acceptable to all.

Most of the published comment before and since the Conference started has been gloomy, with much emphasis on the difficulties which lie in the way of such a settlement; these include the political differences between the USA and Cuba, the wish of the latter country to have its exports to the USSR and Mainland China increase outside the scope of an agreement, the attitude of the EEC countries whose market support system appears incompatible with an international quota system, and the imbalance of desire for an agreement between producers with preferential markets for much of their crops and those supplying mainly to the world market.

While these difficulties are real and cannot be ignored, it seems unduly pessimistic to concentrate on these and to take insufficient note of the strong pressures which must lie on producers to reach an agreement which will lift them out of the depressed situation in which many of them have been as a result of the past four years of low sugar prices.

Sugar exporters have submitted quota bids to the Chairman but these will be kept secret until he has decided how to recommend the overall quota should be shared out. Writing on this question[1], C. Czarnikow Ltd. quote their assessment based on country-by-country statistics from the International Sugar Council's Sugar Year Book; this indicates "that the total tonnage of sugar exported to the international market, outside the various regional groupings, during the period from 1962 to 1966 ranges from 8·4 million tons in 1962 to 10·0 million tons in 1965, with an average over the five years of 9·2 million tons. Of this quantity about 400/500,000 tons were physically delivered twice, as in the case of world market raws imported into the United Kingdom, refined and then re-exported. The effective world market outlet during these years, therefore, averaged 8·7/8·8 million tons. No major change in import requirements has developed since 1966, so that if an effective Agreement is to be brought into being total availabilities must be limited to something in the range of 8·5/9·0 million tons.

"Meanwhile, a calculation based upon recent export performance and known expansion plans makes it clear that the total of the individual hopes of exporting countries is likely to be well in excess of 10 million tons. To a large extent the fate of the Conference rests upon the skill with which the Chairman, and the committee which has been appointed to assist him, attempt the very difficult task of persuading exporting countries to accept quotas which in many cases they will believe to be below their proper entitlements".

The best wishes of the sugar world must be with Mr. LIGHTBOURNE in this task, and it is to be hoped that the representatives of the producers do not forget one simple truth—that it is better to make a profit on a smaller quantity of sugar than to make a loss on a larger quantity.

* * *

UK sugar surcharge.

As the world price of raw sugar had fallen during the previous weeks, the UK Minister of Agriculture, Fisheries and Food increased the surcharge from 3½d per lb (32s 8d per cwt) to 3¾d per lb (35s 0d per cwt) from the 17th April. It is the second increase in surcharge in 1968, the first having been on the 5th March[2].

[1] *Sugar Review*, 1968, (866), 97.
[2] *I.S.J.*, 1968, **70**, 127.

World sugar stocks and prices.

On the 19th April, F. O. Licht, K.G., issued their latest estimates of world sugar balances[1]. These were provided by continents, but the totals are summarized as follows:—

	September/August		
	1967/68	1966/67	1965/66
	metric tons, raw value		
Production	67,020,477	65,654,335	63,276,934
Imports	21,874,902	20,925,929	20,952,360
Initial stocks	18,530,212	18,794,728	18,225,515
Total	107,425,591	105,374,992	102,454,809
Final stocks	17,363,761	18,530,212	18,794,728
Deliveries	90,061,830	86,844,780	83,660,081
Exports	22,190,287	21,314,431	20,776,267
Consumption	67,871,543	65,530,349	62,883,814
Production increase		1,366,142 (2·08%)	2,377,401 (3·76%)
Consumption „		2,341,194 (3·57%)	2,646,535 (4·21%)

The final stock figure expected at the end of the crop year 1967/68 is thus expected to be 1·2 million tons lower than a year earlier and this was nearly 300,000 tons lower than the year before. Sugar consumption is increasing, as it has for the past quarter-century, at a geometric rate of 4% per annum or currently about 2½ million tons. Consequently, to maintain stocks at their presently expected level of 17·3 million tons would require an increase of production in 1968/69 of about 3·7 million tons, while the average increase over the past two years has been 1·87 million tons.

If this rate of production increase were to be maintained in 1968/69, the final stock in August 1969 would be reduced by a further 1·8 million tons to 15·5 million tons. Discussing stocks recently, C. Czarnikow Ltd.[2] commented:—

"Mistakes in production or consumption figures are immediately reflected in the stock situation but, while other statistics apply to one year only, stock figures are carried forward from year to year and inaccuracies can be perpetuated. This being said, there is, nevertheless, an obvious relationship between prices and the level of stocks and, when analysing market movements, statisticians have frequently attempted to ascertain the minimum quantity which must be available to service the market before it can be said that a surplus exists. Of course conditions vary from year to year but it may be of interest to note that, according to figures published by Licht, initial stocks at the beginning of September 1963 amounted to 10·1 million tons, or more than 18·6% of consumption during the year 1963/64, yet within two months the London Daily Price had risen to £105 per ton c.i.f. UK. Whatever may be the minimum level for initial stocks for normal market purposes, it is clear that in that year 18·6% was not sufficient".

It might be as well to point out, therefore that a stock of 17·3 million tons represents 25·6% of the 1967/68 level of consumption and 24·6% of the anticipated consumption level of 1968/69. On the other hand a stock of 15·5 million tons would represent only 22·0% of this anticipated level and is obviously nearing the inadequate level which might force prices high. Of course, as Czarnikow pointed out, "in existing financial circumstances, when tight money policies are being pursued in many parts of the world, there is pressure in importing countries to hold stocks at low levels and in consequence exporting countries are carrying a larger proportion of the world's sugar. Any suggestion of a noticeable reduction in world supplies would bring about a change in attitude with the importers soon reverting to more normal sized inventories".

* * *

European beet area, 1968.

F. O. Licht K.G., in their second estimates of beet areas in Europe[3] set their anticipated total at 6,914,571 hectares, less than 1% up on the figure for 1967, and apart from the EEC countries little changes are expected by comparison with last year. Yugoslavia is expected to reduce sowings by 10,500 to 91,500 ha, while Poland will also reduce her beet area by 24,000 ha following the heavy 1967 crop.

Of the EEC countries, Italy is the only one where a reduction—of 32,000 ha—is expected, following her heavy sugar surplus, while France is undertaking a major expansion to 350,000 ha compared with 278,000 ha in 1967 and 255,000 ha in 1966. Belgium is also expanding from 78,000 to 85,000 ha, while increases of 3000 and 6000 ha are expected for Holland and West Germany, respectively.

* * *

Tate & Lyle Ltd.

The 1967 annual report of the company shows a 28% increase in profits over the 1966 level. Features of the activities of the parent company and of subsidiary companies during 1967 include expansion of Belize Sugar Industries Ltd. in British Honduras to permit production of 70,000 tons of sugar per annum (total cost of the development was about £8 million), development of raw sugar production in Zambia, where 5000 acres are under cane and where the first crop is expected to commence in May of this year, and direct involvement in French sugar production through European Sugars (France), creation of which was officially announced in Paris in February. This controls the consortium which won control of Raffineries at Sucreries Say[4], and has as its first board members representatives of Tate & Lyle Ltd., Tate & Lyle Investments Ltd., Tate & Lyle Refineries Ltd., Raffinerie Tirlemontoise S.A., Raffinerie Belge S.A., Société Sucrière d'Etude et de Conseil, and M. Eugene Demont, who is on the board of Compagnie Sucrière and Compagnie Française de Sucrerie. Should the UK join the EEC, Tate & Lyle would have the option of buying a majority holding in Say.

[1] *International Sugar Rpt.*, 1968, **100**, (11), 1–4.
[2] *Sugar Review*, 1968, (861), 75.
[3] *International Sugar Rpt.*, 1968, **100**, (12), 8.
[4] *I.S.J.*, 1967, **69**, 193.

The 13th Congress of the International Society of Sugar Cane Technologists

THE island of Taiwan was the location chosen for the 1968 Congress of the ISSCT which was held during the 2nd–17th March. A total of 469 delegates took part, 374 being from 39 countries outside Taiwan, of whom 53 were accompanied by wives. Most delegates were present for the first half of the congress which included visits to sugar-growing areas of the island as well as tourist attractions, while a number were only able to be present for the meetings where papers were read to the various sections of the Society.

Fig. 1. Ambassador Hotel, Taipei

Foreign delegates arriving at Taipei Airport on the 2nd March were met by officials of the Congress and escorted to their hotels, one of which—the Ambassador Hotel (Fig. 1)—was the principal location of the Congress. The following morning a visit was arranged to the National Palace Museum which houses Chinese art treasures and antiques of great rarity. After lunch, an outing was arranged to Yangmingshan Park (Fig. 2), a beauty spot near Taipei where delegates and large numbers of Taipei's citizens were able to enjoy the flowers on the cherry trees which had just blossomed.

The delegates were separated into three groups for the island tour, each visiting the same places but in a different sequence. One group was taken by bus first to Taoyuan where they were able to learn of the Land Reform Programme by means of a film and lecture presented at the Exhibition Centre (Fig. 3). The party then visited the Shihmen reservoir (Fig. 4), an important source of hydroelectric power, before leaving for Tapu. Here is located the Hog Breeding Station of the Taiwan Sugar Corporation (Fig. 5) which carries out experiments on feeding of the animals as well as improving the strains available to the Chinese farmers for whom hog-raising is the most important source of meat.

After travelling to Taichung and staying overnight, the group went to Tatushan Cane Plantation, a reclaimed hilltop where they were able to see the heavy machinery of the Taiwan Sugar Corporation in action (Fig. 6). Intercropping of cane with rice was demonstrated nearby (Fig. 7) and it was explained that by this technique the same land could be made much more productive since the cane yield was scarcely affected by the cropping of rice between rows during its early growth. Chungshing Village, the site of the Taiwan Provincial Government, was the next stop and the group were addressed by the Governor and entertained to lunch.

From Chungshing, the tour continued through typical Taiwan scenery (Fig. 8) with terraced rice fields where water was carefully controlled to flow from one level to the next, often with a fall of only a few inches, to ensure maximum utilization. Arriving at Sun-Moon Lake, a famous resort in Taiwan, the party were taken by boat to visit a shrine to Confucius (Fig. 9) on the mountainside overlooking the lake.

Next morning the first stop was at Changhwa Bagasse Board Plant, a Taiwan Sugar Corporation project now owned by Chien Yeh Corporation Ltd., where they were able to see the manufacture of boards. Bagasse in bales is broken open and conveyed to a digester where it is cooked with water, followed by washing, screening and disc-refining, before it is screened and fine pulp sent to the stock chest. Here size and other chemicals are added and the pulp delivered to a board forming machine which leads to a conveying table where the boards are trimmed, a roller press for removing excess water, and a saw which cuts the board into lengths which are automatically fed to a multiple-deck dryer, where the moisture content is reduced to 0·5–1·5%. This soft board is for insulation purposes and can be trimmed into suitable small panels, perforated, etc. Alternatively it may be sent to a press which takes 20 boards and converts them into hardboard panels.

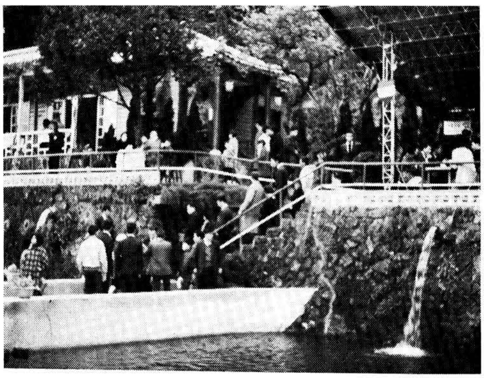


Fig. 2. Yangmingshan Park

Fig. 3. The Land Reform Exhibition centre at Taoyuan

Hsingying paper and bagasse pulp mill was the next stop (Fig. 11) where delegates were able to see the production of bleached bagasse pulp which is an important export of the Taiwan Sugar Corporation and goes to nearby countries for making into paper. At Hsingying also is the TSC yeast factory which has a capacity of 40 tons of dried yeast per day which is produced by Torula fermentation on diluted and clarified cane molasses, using stainless steel equipment. The yeast is recovered by centrifuge and dried, and is largely used for animal fodder, although a certain amount is converted into sugar-coated tablets for human and especially child consumption to repair any vitamin B deficiency.

At Shanhwa there was a demonstration of the block-farm system which has been introduced and cane varieties and cultural techniques adopted to give very high yields of cane, estimated at up to 210 tons/ha. Here also, intercropping was practised (Fig. 12), and the typical cane harvesting operation was demonstrated (Figs. 13, 14). The stools were uprooted by use of a mattock and pulled from the soil by a man who passed them to women for trashing.

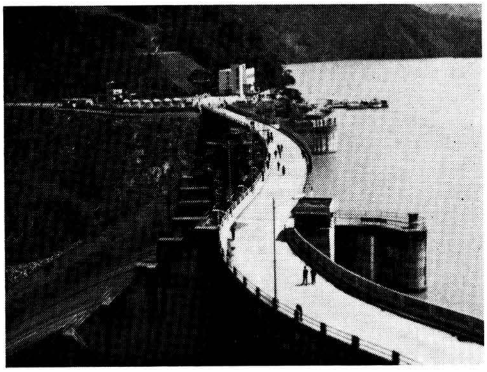


Fig. 4. Shihmen reservoir

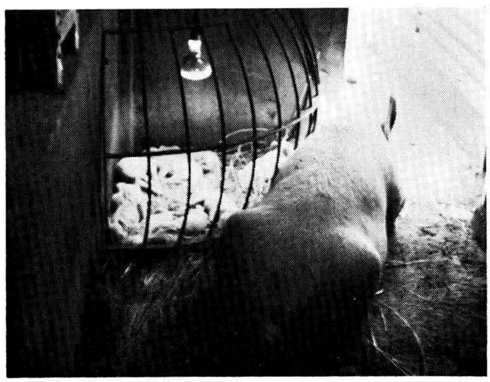


Fig. 5. Sow and litter at Tapu hog breeding station

Fig. 6

Fig. 7. Intercropping of cane and rice at Tatushan

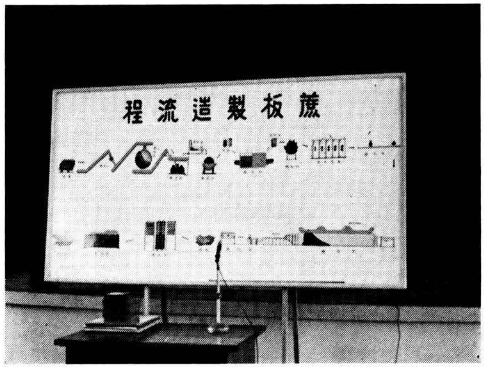


Fig. 10. Flow diagram of bagasse board production at Changhwa

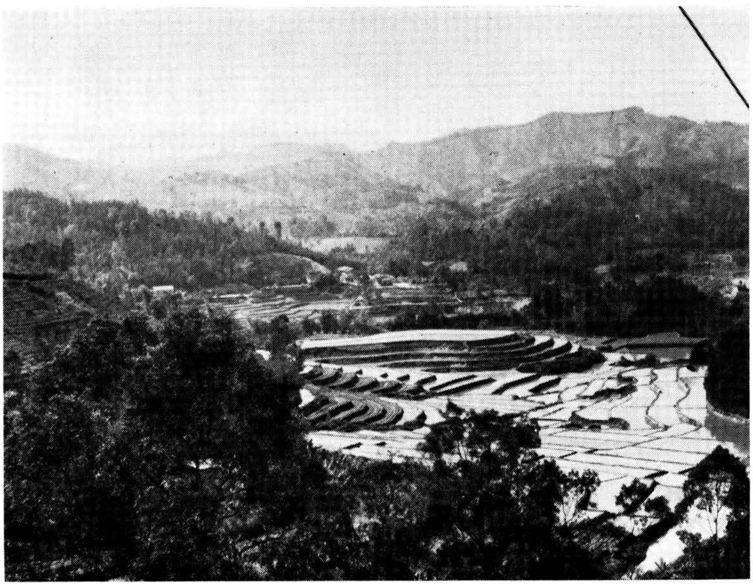


Fig. 8. Typical Taiwan scenery

These women, wearing cowls, leggings and gloves to protect them from the sun, cut off the tops and leaves from the stalks and laid them in bundles which were lifted by hand on to the carts used for transport to the factory (Fig. 15).

After stopping overnight in Tainan, the next morning was spent at the Sugar Experiment Station (Fig. 16) to which delegates were welcomed by the Director, Dr. K. C. Liu. Exhibits were presented of various aspects of the Station's work, e.g. Fig. 17, and delegates were able to discuss projects in hand which included the development of continuous carbonatation in white sugar manufacture, ion exchange treatment to raise white sugar quality, clarification of refractory juices, extraction and refining of cane wax, breeding of new sugar cane varieties, evaluating molasses exhaustibility, production of furfural and structural board or rayon pulp from bagasse, grafting polymerization of styrene on bagasse, etc.

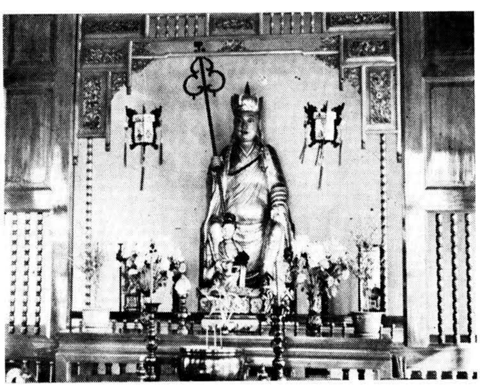


Fig. 9. Confucius shrine

Part of the group returned to the Experiment Station after lunch while the remainder visited places of interest in the neighbourhood of Tainan, including the temple (Fig. 18) built by the emperor Koxinga who led a rebellion again the Portuguese and finally overthrew them in the 17th Century A.D., and Chen-Kan castle (Fig. 19), before leaving for Cheluchien. Here they were able to inspect the work of the Cane Growers' Association who have aided the cooperative farming by villagers whose individual holdings of land were scarcely sufficient to support a family. By giving advice on soil improvement, cane growing, raising of hogs and chickens, and improvement of the living quarters of the families, the Association had aided the villagers to obtain better lives for themselves at low cost.

Next morning, the group visited Kaohsiung bagasse particle board plant which was erected in 1961 and has a capacity of 55 metric tons of board per 24 hours. It operates 320 days per year and produces a standard board 12 ft × 4 ft × $\frac{3}{8}$ in, although a range of thick-

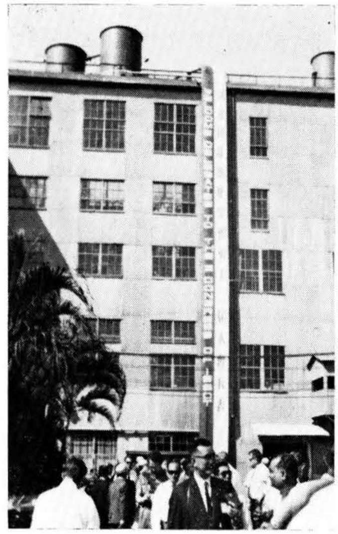
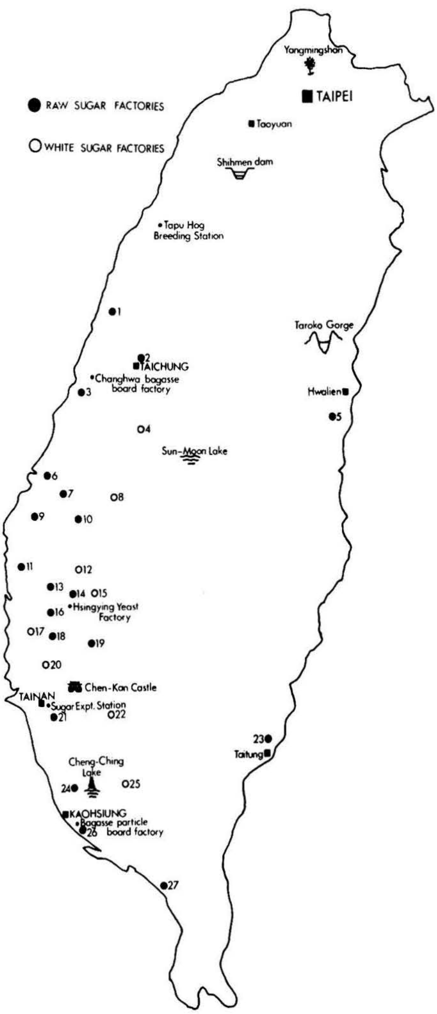


Fig. 11. Hsingying paper and pulp mill

Fig. 12. Young cane plants intercropped with sweet potato

Fig. 13



Taiwan sugar factories: (1) Yuehmei, (2) Taichung, (3) Chihu, (4) Nantow, (5) Hwalien, (6) Lungyen, (7) Huwei, (8) Towliu, (9) Peikang, (10) Talin, (11) Suantow, (12) Chiayi, (13) Annei, (14) Hsingying, (15) Wushulin, (16) Machia II, (17) Machia I, (18) Shanhwa, (19) Yutsing, (20) Sankanten, (21) Cheluchien, (22) Chisan, (23) Taitung, (24) Siaokang, (25) Pingtung, (26) Kaohsiung, (27) Nanchow.

Fig. 14

Fig. 15. Water-buffalo cart

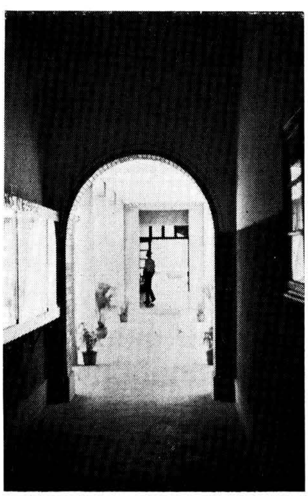


Fig. 16. Tainan Sugar Experiment Station

nesses from $\frac{1}{4}$ to $1\frac{1}{2}$ inches is available. Boards may be made termite-proof and may be coated with plastic materials or veneered (Fig. 20).

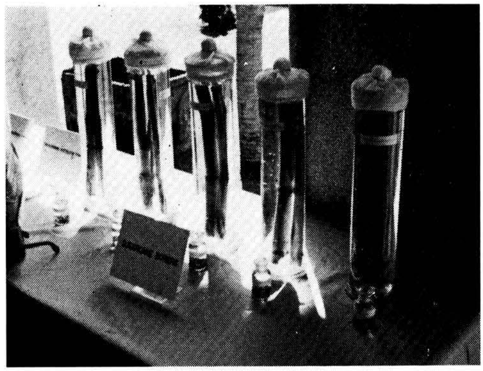


Fig. 17. Borer specimens at Tainan Sugar Experiment Station

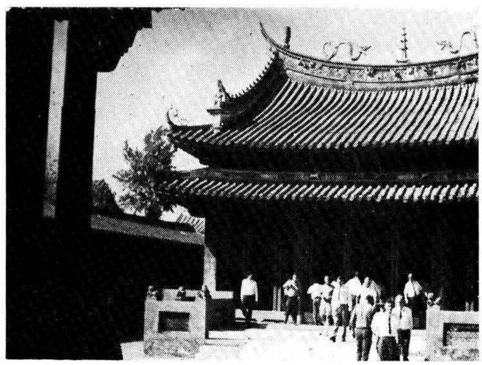


Fig. 18. Koxinga temple

The Kaohsiung Export Processing Zone was the next stop; this is built on a 170-acre reclaimed island which serves as a combination of duty-free zone and industrial estate to which raw materials are brought, e.g. electronic components, textiles, etc., for making

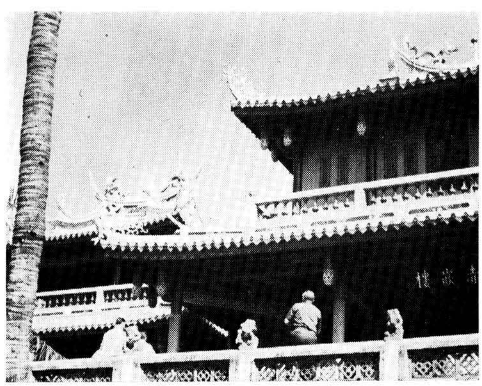


Fig. 19. Chen-Kan castle

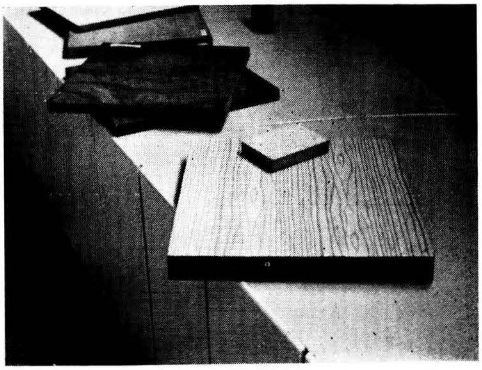


Fig. 20. Veneered bagasse particle board at Kaohsiung

into finished goods by Chinese labour before being re-exported to foreign markets through Kaohsiung port which is the largest on the island. The Zone is provided with factories built by the Taiwan Government and has attracted 48 companies from Europe, America and Japan who are able to employ the readily-available low-cost skilled labour with greater economy than is found by assembly of their finished products in their own countries. The number of factories is expected to rise to 100 by the end of 1968 and the number of employees from 8000 to 12,000.

After lunch, a visit was made to Pingtung sugar factory, a 3600 t.c.d. plant which is to be expanded to 4000 t.c.d. It produces 420 tons/day of white sugar by the double carbonatation process, double sulphitation and triple filtration being also employed. Another factory visited the same day, after a visit to a site where an old river bed was being reclaimed for cane cultivation at Lin-Hou, was that at Nanchow where a Silver Ring diffuser has been installed and recently put into operation by Mitsubishi Heavy Industries Ltd. This is a 2200 t.c.d. plant producing raw sugar.

The Kaohsiung sugar factory, visited on the following morning, has been chosen for installation of automatic equipment to determine the improvements possible in sugar quality and savings in labour possible, for the future when such savings might be necessary. It is the oldest factory on the island and originally had a capacity of 200 t.c.d. but now crushes 3400 t.c.d. During its season, November to April, it produces 55–60,000 tons of raw sugar. The pneumatic controls are for five sections: cane unloading, milling, evaporation, boiling and the boiler house, and a centralized control panel (Fig. 21) is housed in an air-conditioned room in the factory. The control instruments, etc., cost U.S.$250,000 and their installation another similar sum. Plug-in relays with glass covers are used for easy and rapid replacement. Surplus bagasse is made into 30-kg bales and sent to the board factory. The mills are turbine-driven and a new generator and high efficiency boilers installed; excess power produced is sold to the Taiwan Power Corporation. Vapour is used for preheating juice and exhaust steam for the evaporators. Juice is clarified in two "RapiDorr" units and the muds filtered on rotary vacuum filters. Automatic batch centrifugals are installed for *A*- and *B*-sugar, while continuous centrifugals are used for the *C*-sugar.

During the ISSCT Congress, the Taiwan Post Office issued two commemorative stamps, illustrated on the right. They were of 1.00 and 4.00 NT$ denominations and portray a cane harvesting scene in Taiwan.

The stamps were designed by Mr. T. Y. HUANG, who is in charge of the Art Department of the General Affairs Division of the Taiwan Sugar Corporation and who also designed the ISSCT symbol above which, with elimination of the figures 13, was adopted as a general insignia for the Society.

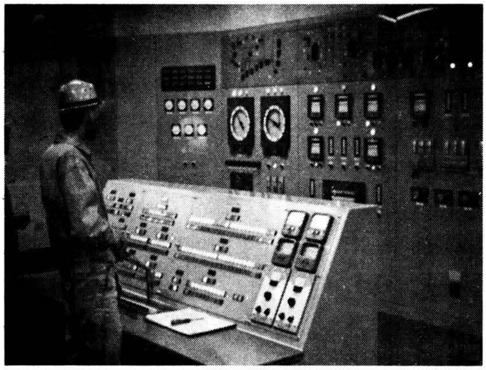


Fig. 21. The control panel at Kaohsinug

From Kaohsiung, the party continued to Cheng-pu cane plantation where a project is under way for the manufacture and use of "compost" which is, in fact, a mixture of bagasse and hog manure (1:3 by weight) which is produced at the rate of about 80 tons/day, costs about U.S. $2.40 per ton and is applied to the fields (Fig. 22) at the rate of about 32 tons/ha, raising sugar yield by 1·10 tons/ha. It contains 82·55% water, 15·30% organic matter, 0·13% nitrogen, 0·06% phosphorus and 0·05% potassium.

Fig. 22. "Compost" spreading at Cheng-Pu

An industrial reservoir has been beautified and provided with park-like surroundings at Chen-Ching Lake where trees and shrubs have been planted and shelters and a pagoda (Fig. 23) have been built. After visiting this pleasant spot, the group continued to Siaokang where a display of modern farming equipment was given; this included crop spraying by helicopter (Fig. 24), a demonstration of the latest Massey-Ferguson MF 81 chopper harvester (Fig. 25) and the Crichton whole-stalk harvester (Fig. 26), as well as a Massey-Ferguson cane loader (Fig. 27), etc. A further demonstration was also given of the rayungan method of cane planting for rapid increase of a variety and for reducing the growing time for a cane crop. The tops of stalks of a growing cane stool are removed, when the buds start to develop at the nodes (Fig. 28). After a time these stalks can then be cut up and the billets planted, each having a well-developed shoot growing.

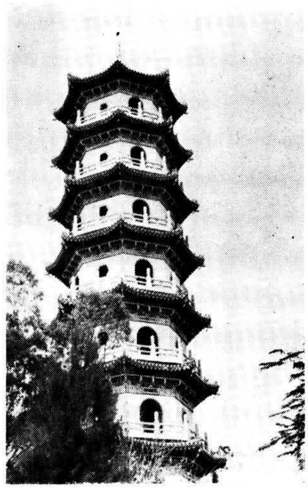


Fig. 23. Pagoda at Chen-Ching Lake

Fig. 24. Crop-spraying helicopter

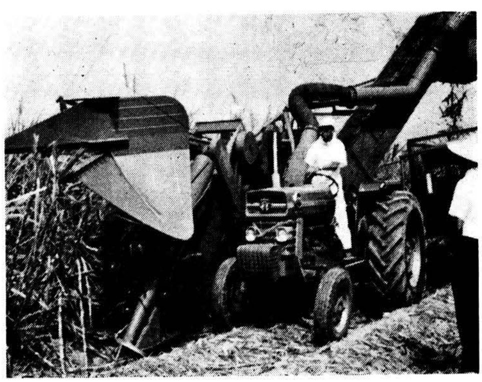


Fig. 25

ห้องสมุด

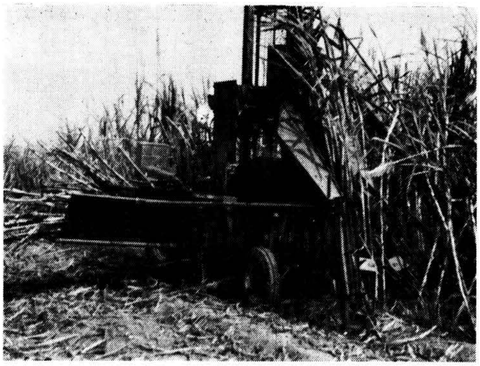


Fig. 26

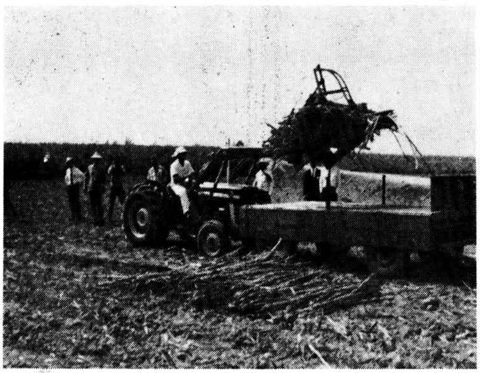


Fig. 27

Fig. 28. Stool with growing shoots for rayungan planting

The party then returned to Taipei by express train, arriving on the evening of 9th March. The following morning a tour was arranged to Hwalien where delegates visited a village of the Ami people, one of the aboriginal tribes living in Taiwan before the mainland Chinese came to the island. They were entertained by a group of dancers and singers in colourful costumes (Fig. 29) and were able to see traditional handicrafts including carving. There followed a visit to a marble factory where the local stone was sawn and shaped and turned into vases, dishes, and many beautiful objects. Some of the marble came from the bed of the Taroko Gorge, a breath-taking canyon (Fig. 30) along which passes a road which connects two important parts of the island, and which was travelled by the group before returning to Taipei.

Fig. 29. Ami dancers in costume

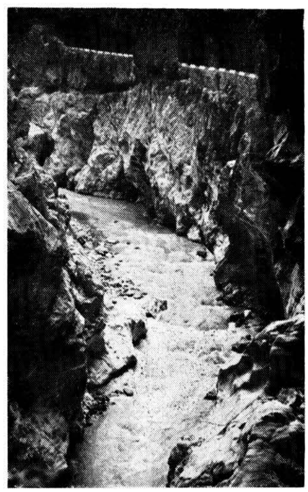


Fig. 30. Taroko Gorge

The delegates assembled at the Ambassador Hotel on the 11th March for the Opening Ceremony where they were welcomed by the General Chairman of the Congress, Mr. M. H. Yuan, President of Taiwan Sugar Corporation, who recounted the history of the Corporation and its achievements and goals. A welcome address to delegates was then given by Dr. C. K. Yen, Vice-President of the Republic, who spoke of the importance of sugar in the diet for direct consumption or in other products, and of the necessity for its availability and cheapness for all, best obtained through efficient production which is promoted by the Society. He referred to the interchange of ideas and knowledge and the need for closer coordination by producers to achieve stability in sugar marketing. He described the activities in agricultural reform and progress in Taiwan and cooperation in agricultural matters with other countries by technical training and advisory work.

The Mayor of Taipei, Mr. H. Y. S. KAO, then welcomed delegates to his city, which he referred to as the "safest in the world", and described aspects of Taipei life which exemplify Chinese family structure and culture. Mr. R. LUCAS of the U.N.O. spoke on behalf of Dr. A. H. BOERMA, the new Director-General of the F.A.O., who was not able to be present. He referred to three watch-words—action, cooperation and trust—which, he said, are required for promotion of progress to a better life for mankind, promotion in which a rôle existed for the ISSCT, in its own field seeking agricultural progress in conjunction with industrial development.

A "key-note" speech was made by Dr. R. K. S. LIN, Academician of Academica Sinica, and famous brain surgeon, who on a rather tenuous connexion with sugar in its necessity for the operation of the brain, gave an illustrated account of the brain and the function of the human nervous system. Finally Dr. K. C. LIU, Vice-President of the Taiwan Sugar Corporation and Director of the Sugar Experiment Station, gave an introduction to the Taiwan Sugar Industry, describing first the island and a little of its history, the importance of sugar to its economy, production, research, and modernization of the industry, education and persuasion of the farmers to use modern methods and cooperative cultivation, and agricultural and industrial diversification of the industry.

Following this Ceremony, the delegates then attended the symposia and meetings held by the sections of their own particular interest, which meetings were held daily and lasted until noon on the 16th March. During the Congress, a group of delegates from representative countries were presented to President CHIANG KAI-SHEK. Abstracts of papers presented at these meetings will appear in this Journal in due course.

The Plenary Session of the Congress was held on the 16th March, when the General Chairman called for the report of the General Secretary-Treasurer, Dr. H. S. WU. Membership of the Society at 1st March had been 987 and it was expected that final membership for the Congress would be over 1000. There were 31 regional divisions, the largest being that of Mexico. He presented the audited accounts, after which committee reports were presented. Mr. E. HUGOT presented the resolutions prepared by the resolutions committee, all of which were adopted; these included: (i) expression of sincere thanks to President CHIANG, Vice President C. K. YEN, the Minister of Economic Affairs K. T. LI, the Municipal Governor and Mayors of Taipei, Tainan and Taichung, the Taiwan Sugar Corporation and Taiwan Cane Growers' Association, participants from the Corporation, especially Dr. LIU and Experiment Station Staff; (ii) thanks to the organizing Committee of the Congress; (iii) sorrow at the death of members between 1965 and 1968; (iv) that ICUMSA standard or tentative methods be adopted where practical for sugar quality determination and these given in factory data, that sugar producing countries establish national committees of ICUMSA and close cooperation be sought between the Society and ICUMSA; (v) a committee be set up to study cane yield decline; (vi) publication be started of a pathology newsletter at 6-monthly intervals; (vii) a new physiology and biochemistry section be formed and a committee appointed; (viii) appreciation expressed to the US and Indian Governments for maintaining germ plasm collections; (ix) thanks to the South Pacific Sugar Mills Ltd. and Mr. JOE DANIELS for services to cane breeding in publishing the newsletter; (x) thanks to J. L. WARNER, recently-resigned Chairman of the cane breeding section; (xi) that the symposium method adopted for the Taiwan Congress be followed at future Congresses, and that greater selectivity be adopted towards topics and length of papers; and (xii) that the device adopted for the 13th Congress be adopted as a permanent insignia but with the figures 13 deleted, and that a flag be adopted in which this insignia appears in gold on a green background.

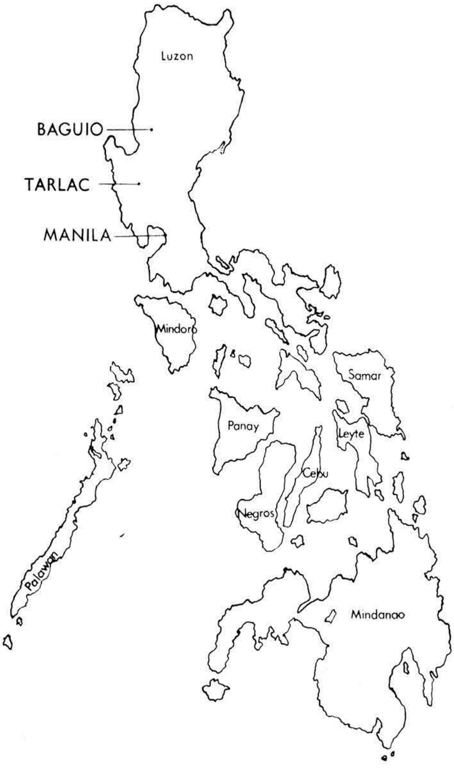
J. L. CLAYTON, Chairman of the Constitutional Committee, proposed that reading of papers at a Congress constituted publication so that they could then be re-published elsewhere (with due acknowledgement) before appearance of the Proceedings, which were liable to be delayed.

It was also resolved that vacancies in the office of General Chairman or General Secretary-Treasurer should be filled by selection from the Region where the Congress was to be held, and that a vacancy for a Vice-Chairman should be filled from the organizing committee. In regard to Mr. CLAYTON's private proposals regarding inter-congress organization, a committee is to be appointed by the General Chairman to study proposals.

Dr. WU reported invitations for the next Congress from the U.S.A. and Cuba; delegates voted to accept the former, whereupon W. S. CHADWICK was elected General Chairman, J. L. CLAYTON General Vice-Chairman and D. T. LOUPE General Secretary-Treasurer of the 14th Congress to be held in New Orleans in October 1971.

H. R. ROSALES then made a welcome speech to delegates intending to participate in the post-Congress tour of the Philippines, and D. T. LOUPE made a speech as representative of the host country for the 14th Congress. Mr. YUAN then gave a closing speech of farewell to delegates, although this was followed in the evening by the farewell banquet during which speeches were made by delegates on behalf of the various continents represented, and a "manpower show" presented 14 people from various parts of the Taiwan Sugar Corporation in their respective working clothes.

On the following day some 150 delegates made their way by air to Manila where they were met by representatives of the Philippines Sugar Institute and conducted to their hotels. In the evening they were entertained to a cocktail party by Victorias Milling Co. Inc. during which an amateur group gave a polished performance of dances of many kinds originated by the ethnic groups which have combined to produce the Filipino people.



On the next morning the delegates left for Tarlac where field delegates visited the sugar cane plantations while factory delegates visited Central Azucarera de Tarlac, a 7080 t.c.d. raw sugar factory to which is annexed Luisita sugar refinery, a newly built plant producing 5225 100-lb bags of refined sugar per day, and Tarlac distillery which has a capacity of 40,000 litres of 189° proof spirit per 24 hours. Lunch was provided at the Tarlac Club, Bahay Kubo, by Jose C. Cojuangco & Sons Inc., Managers of the Tarlac complex, with entertainment provided by an orchestra formed by Tarlac workers (Fig. 31).

Fig. 31. Factory orchestra at Tarlac

The group continued to Baguio, the summer capital of the Philippines, arriving in the evening. The next morning a guided city and shopping tour was arranged after which delegates returned by bus to Manila. A cocktail party was given for delegates by Caltex (Philippines) Inc., at which a fashion show was presented, and delegates then returned to their hotels, ready for departure but grateful to their hosts in Taiwan and the Philippines for an exhausting but useful and enjoyable Congress and post-Congress tour.

Brevities

Malta sugar imports[1].—Imports of sugar into Malta in 1967 totalled 18,510 metric tons, white value, compared with 16,869 tons in 1966. The 1967 total included 2100 tons from Cuba, 2772 tons from Czechoslovakia, 400 tons from Hungary, 7973 tons from Rumania, 4519 tons from the USSR and 746 tons from other countries, while in 1966 8771 tons were imported from Czechoslovakia, 580 from Hungary, 4100 from Rumania, 2816 from the USSR and 602 tons from other countries.

* * *

US beet area, 1966[2].—According to a US Dept. of Agriculture report, the sugar beet area in the United States will amount to 1,414,000 acres (572,226 hectares) in 1968, compared with 1,199,000 acres (485,219 hectares) in 1967. On the basis of average beet yields, a sugar beet production of about 23·0 million tons of beet would be possible from this area, compared with the 1967 crop of 19,366,000 tons.

Italian surplus sugar disposal[3].—The EEC authorities have given permission to Italy to export her existing surplus[4] at any time up to June 1969. Although subsidies will have to be provided by the Italian Government, this nevertheless represents a substantial concession as it had hitherto been stated that no surpluses in excess of the permitted level of stocks would be allowed to be carried forward into the first EEC sugar year which commences on 1st July 1968. It may be that other countries within the EEC will now be considering whether they will also request permission to carry forward stocks in excess of the level which had previously been agreed.

[1] C. Czarnikow Ltd., *Sugar Review*, 1968, (857), 56.
[2] F. O. Licht, *International Sugar Rpt.*, 1968, **100,** (8), 8.
[3] C. Czarnikow Ltd., *Sugar Review*, 1968, (858), 62.
[4] *I.S.J.*, 1968, **70,** 98.

Liquor Carbonatation

Part III. Laboratory procedures for comparing the quality of liquor or lime samples

By M. C. BENNETT and S. D. GARDINER (Tate and Lyle Ltd., Research Centre, Westerham Road, Keston, Kent)

(*continued from p.* 137)

(*b*) *Filtration*

To measure the filtrability of carbonatated liquor under the conditions of refinery practice a constant pressure filter operating at 50 p.s.i.g. must be used. Furthermore, it is essential that the unfiltered carbonatated liquor is stirred so that the precipitated $CaCO_3$ does not settle on top of the filter cake. The cake must be deposited as a perfect disc.

The type of pressure filter used in these laboratories has been indicated in a previous publication[2]. There are many other types of pressure filter which would be equally suitable. For convenience, the filter is mounted above the receiving cylinder and the whole assembly is placed in the (deep) glass-fronted water thermostat bath at 80°C. The receiving cylinder is vented to atmosphere through a small bore copper tube protruding above the water level. The filter septum is a Whatman 42 paper mounted on a perforated brass disc.

200 ml of the carbonatated liquor sample at 80°C is poured into the pressure filter, and the stirrer and stop-clock are started. After 5 min, the pressure is raised to 50 p.s.i.g. in about 1 min and the times for 20 ml volume increments are noted as in Table III below. The few drops of filtrate which appear during the first 5 min under atmospheric pressure do not affect the measurement and are not recorded.

Table III. Typical filtration data

t (min)	*V (ml)*	Δt	ΔV	$\Delta t/\Delta V$	$\bar{V}$
0		cell filled			
5		pressure applied			
6·12	30	—	—	—	—
6·95	50	0·83	20	0·042	40
8·00	70	1·05	20	0·053	60
9·35	90	1·35	20	0·068	80
10·96	110	1·61	20	0·082	100
12·85	130	1·89	20	0·095	120
15·02	150	2·17	20	0·109	140

The choice and definition of the filtrability term $\sqrt{F}$ has been explained in detail in a previous paper[2]. F is defined as $1/\bar{r}C$, where $\bar{r}$ is the average specific filtration resistance and C is the concentration of cake-forming solids. These terms appear in the filtration rate equation:

$$dt/dV = \eta\bar{r}CV/PA^2 + \text{constant}$$

where η is the filtrate viscosity at filtration temperature, P is the applied pressure and A is the filtration area.

$\sqrt{F}$ may be calculated from the filtration data exemplified in Table III by the following method. The reciprocal rate $\Delta t/\Delta V$ is plotted against the average volume $\bar{V}$ and the slope (S) of the straight line is measured. In the above example, $S = 0{\cdot}69 \times 10^{-3}$ min ml^{-2}. For liquors of high gum and starch content, the cake is often compressible and the plot is not strictly linear. In such cases, the best straight line is taken.

From the above equation

$$F = \eta/(0{\cdot}414 \times 10^7\, PSA^2)\ \text{cm}^2$$

where η is taken as the viscosity of pure sucrose at the same concentration and temperature (in this case 65·5% solids at 80°C, $\eta = 0{\cdot}094$ poise), P is the pressure (50 p.s.i.g.), and A is the filtration area ($A^2 = 46{\cdot}9$ cm^4). The constant $0{\cdot}414 \times 10^7$ corrects all units to the c.g.s. system. For the example given in Table III, $F = 140 \times 10^{-10}$ cm^2 and $\sqrt{F} = 11{\cdot}8 \times 10^{-5}$ cm. In order to calculate the average specific resistance ($\bar{r}$) of the cake, it is also necessary to know the concentration (C) of precipitate in the original carbonatated liquor. In the example given, the concentration was 0·0103 g/ml, and $\bar{r} = 0{\cdot}69 \times 10^{10}$ cm/g.

The term $\sqrt{F} \times 10^5$ is used as an index of filtrability and values range from about 1 to 40 depending on the type of raw, the lime concentration, the type of lime and the reaction conditions chosen for the carbonatation.

Results

(*a*) *Reproducibility*

In order to demonstrate that steady state conditions had been achieved during the period of the carbonata-

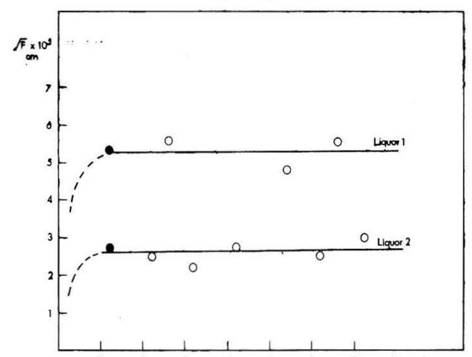


Fig. 3. ● filtrability of liquor from single-tank carbonatation in 57 min
o filtrability of samples taken when steady state operation is continued

[2] Bennett: *I.S.J.*, 1967, **69**, 101

tion procedure described above, we arranged to continue pumping limed liquor at the equivalent of 334 ml/hr of 65% solids liquor, maintaining a constant residence volume of 334 ml by withdrawing carbonatated liquor through a second pump. Samples were taken for filtrability measurements over a period of 7 hr continuous operation and results for two liquors are shown in Fig. 3.

The reaction conditions were the same in both cases, namely 65% solids, 0·5% CaO on solids, 1 hr residence time and pH 8·0 at 76°C. The open circles are values determined on samples taken during the continuous operation, and the closed circles are the values determined in a separate experiment by the procedure given in detail in the previous section. In other experiments of this nature, fluctuations in the filtrability have been traced to departures from the required steady state conditions, in which the prime causes of non-reproducibility were variation in % solids and accumulation of large $CaCO_3$ aggregates in the reaction vessel.

(b) Comparison of different sugars

Typical data for a number of different affined sugars are presented in Fig. 4, which shows $\sqrt{F}$ as a function of lime concentration. Reaction conditions were as follows: 65% solids, commercial dry lime hydrate [$Ca(OH)_2$] type C (see below), 1 hr equivalent residence time, pH 8·0 at 76°C.

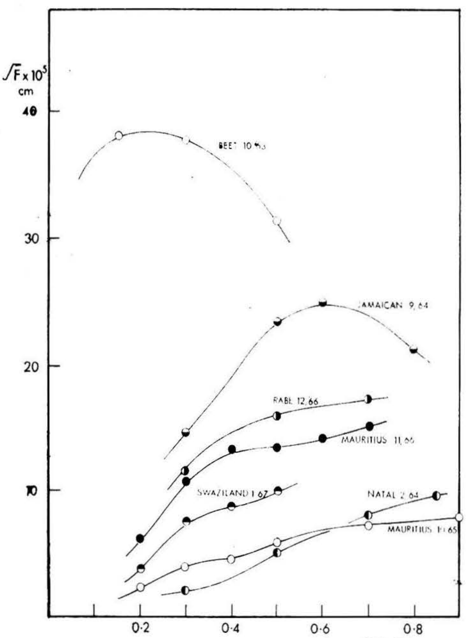


Fig. 4. Filtrability of various types of liquor as a function of % CaO on solids.

The appearance of a maximum in the plot of $\sqrt{F}$ *vs.* % CaO has been discussed fully in an earlier paper[2]. For beet sugars, the maximum lies generally around 0·3% CaO, for affined West Indian raws it lies around 0·6% CaO, and for affined South African raws it lies around 1·2% CaO. The maximum value of $\sqrt{F}$ also varies with the type of sugar. The importance of examining the filtrability at a number of lime concentrations is illustrated by the two lower curves (Natal 2/64 and Mauritius 10/65) which cross around 0·6% CaO.

The Natal Rabe 12/66 was an experimental sample of raw sugar kindly supplied by Mr. J. B. ALEXANDER of Hulett's S.A. Refineries Ltd. This sugar was manufactured at Umzimkulu Mill, Natal, by the Rabe clarification process[4] which eliminates starch from the raw sugar. The starch content of the raw sugar was 42 p.p.m. and this was reduced to 35 p.p.m. on affination in the laboratory. All other sugars were taken from the refineries after affination.

(c) Comparison of different lime samples

Typical plots of $\sqrt{F}$ against % CaO are shown in Fig. 5 for the same affined South African raw, carbonatated using four different sources of $Ca(OH)_2$. Lime A was, analytically, the purest lime available in the laboratory: B.D.H. "extra pure" $Ca(OH)_2$, made by calcining "Analar" (analytical reagent grade) $CaCO_3$. This lime was used in most of our earlier studies, but it now appears to be the least suitable for liquor carbonatation. Limes B and C were commercial

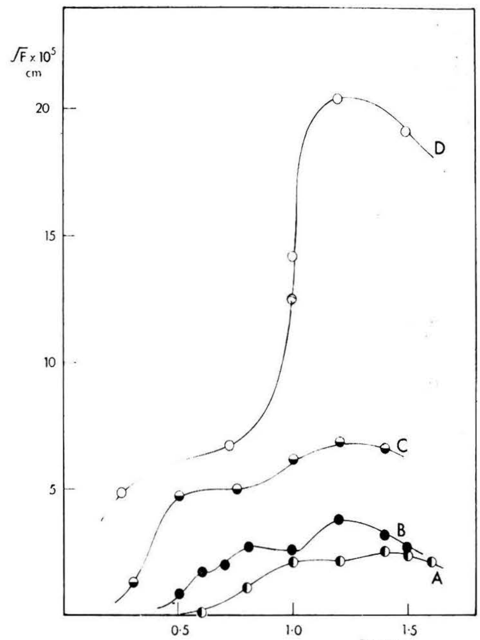


Fig. 5. Filtrability of a South African liquor carbonatated using four types of lime. (*A*) Calcined precipitated $CaCO_3$. (*B*) Chalk lime. (*C*) Limestone lime. (*D*) $CaCl_2$ and KOH.

[4] ANON.: *S. African Sugar J.*, 1966, **50**, 628.

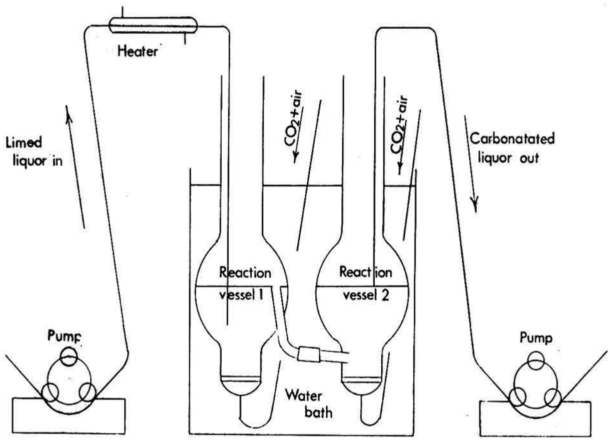


Fig. 6. Apparatus for continuous carbonatation matched with refinery practice.

dry lime hydrates, both of which are used in Tate & Lyle refineries. Lime B was manufactured from chalk and lime C from limestone, a generic difference which has been confirmed by the examination of many other samples of commercial lime hydrates.

Lime D was synthetic, and was made in the liquor by adding solutions of $CaCl_2$ and KOH to provide the required concentration of $Ca(OH)_2$; the additional concentration of K^+ and Cl^- ions has no bearing on the result. The striking effect of lime quality on carbonatated liquor filtrability has been the subject of a detailed investigation in these laboratories and apparently concerns the solid phase of calcium hydroxide.

(d) Relation to refinery performance

The filtrabilities reported in Fig. 4 for liquors prepared by single tank carbonatation are about three times greater than those which are achieved in normal refinery carbonatation practice at equivalent lime concentrations. Thus, when standardized laboratory tests are carried out using lime concentrations between 0·5 and 0·8% CaO, the filtrability values range from about 6 to about 25, while refinery carbonatated liquors generally range from 3 to 8. When the laboratory test shows a low filtrability, every effort is made to blend the raw with another of better filtration characteristics, so that a direct comparison of laboratory test and refinery performance data is seldom possible.

To predict more accurately the result of a refinery carbonatation procedure it is necessary to depart from the idealized conditions of single tank carbonatation and set up a two-tank continuous flow system, as indicated in the diagram in Fig. 6.

Since no two refineries operate carbonatation stations which are identical in every respect, the choice of operating conditions for the apparatus shown in Fig. 6 must be matched arbitrarily with the particular refinery where the sugar is to be processed. We have found that operating at pH values of 9·5 and 8·0 in the first and second tanks respectively, both measured at 76°C, with 30 min residence time in each tank and continuous operation for 3 hr before sampling, produces carbonatated liquor similar to that of refinery practice. Each test takes not less than 5 hr and about 4 litres of liquor is required.

The outstanding superiority of single tank carbonatation over two and three-tank systems, which was first demonstrated in Part II of this series of papers[3], was not found by HERTZBERG *et al.* in their pilot plant studies[5]. Using a two-tank system, they found optimum filtrability with 75%, not 100%, of the total lime concentration gassed out in the first tank. The reasons for this difference are not clear, but almost certainly concern the interaction between the many variables which determine the course of the precipitation reaction.

Brevities

Argentina sugar exports, 1967[6].—Exports of sugar from Argentina in 1967 totalled 65,105 metric tons, tel quel, of which 58,567 tons went to the USA and 6538 tons to Chile. In 1966 exports were 52,330 tons and in 1965 60,505 tons, all going to the USA.

* * *

US beet sugar factory expansion[7].—The Amalgamated Sugar Company plans to increase the capacity of its beet sugar factory at Nampa, Idaho, to 9600 tons per day which will make it the largest plant in the United States and the second largest in the world. Extensions to the plant should be completed by October 1969.

* * *

Jordan sugar imports, 1967[8].—Imports of sugar by Jordan during 1967 totalled 68,775 metric tons, white value, compared with 85,017 tons in 1966. The principal suppliers were the USSR (22,761 tons), Czechoslovakia (16,757 tons) and Rumania (14,216 tons).

* * *

Argentina sugar production quota, 1968[9].—The Argentine Government has raised the production quota for 1968 from 750,000 to 800,000 metric tons[10]. In addition, the sugar factories in the north of the country have been authorized to produce 130,000 tons of raw sugar for export. In 1967 sugar production amounted to 731,975 tons, equivalent to 813,305 tons, raw value.

* * *

Cyprus sugar imports[11].—Official statistics of white sugar imports into Cyprus show a total of 16,496 metric tons, compared with 15,312 tons in 1966. In both years the major supplier was the UK, with 11,326 tons in 1967 and 9283 tons in 1966.

[5] *Proc. 4th Tech. Session on Bone Char*, 1955, 53.
[6] C. Czarnikow Ltd., *Sugar Review*, 1968, (857), 57.
[7] F. O. Licht, *International Sugar Rpt.*, 1968, **100**, (8), 8.
[8] C. Czarnikow Ltd., *Sugar Review*, 1968, (857), 58.
[9] F. O. Licht, *International Sugar Rpt.*, 1968, **100**, (9), 7, 8.
[10] See *I.S.J.*, 1968, **70**, 39.
[11] C. Czarnikow Ltd., *Sugar Review*, 1968, (859), 67.

Use of Thickening Filters for First Carbonatation by the Danish Sugar Corporation

by R. F. MADSEN (A/S De Danske Sukkerfabrikker, Copenhagen, Denmark).

Paper presented to the 13th General Assembly Commission Internationale Technique de Sucrerie (CITS), 1967.

PART II

The filter box

Our filters are built with a filter casing, shaped as shown in Fig. 4, which is built of 4 plates rolled into circular arcs. This gives the filter a very strong construction which allows the building of filters for high pressures without demanding any kind of stay inside. The normal design pressure is 2 kg/sq.cm., but filters for higher pressure can easily be constructed, as only a strengthening of the bolts and the edge of the lid is needed. In addition, this construction gives a good inside utilization and, as in a normal bag filter, all frames can be identical so that in respect of design pressure we obtain the same advantages as with a cylindrical filter casing.

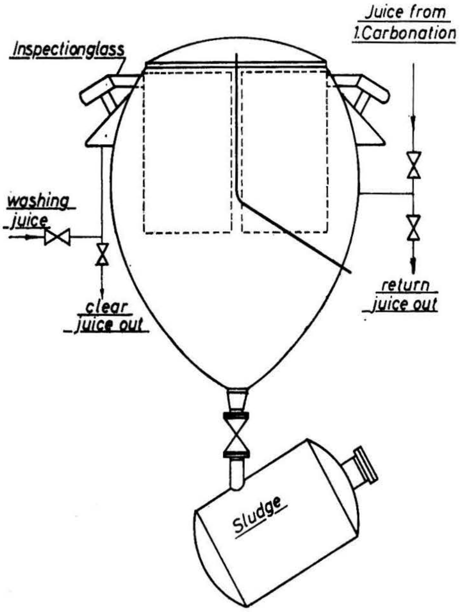


Fig. 4.

This design also has the advantage that it gives space for the incoming juice in such a way that the juice comes almost uniformly to all the bags. It gives the advantage that the bags can separate from each other during the return washing, as the outer bags can separate rather far apart and thereby facilitate the discharge of the sludge between the bags. This improves the cleaning, as it gives better space for the sludge than in normal filter constructions.

The frames are placed in two rows. The outlets from both rows are collected in a manifold around the filter, which is shaped like a triangular tube. This frame is used at the same time as support for the filter and as strengthening of the edge of the filter.

The filter frames are built from 2 layers of coarse net (20 mm square holes) which are fixed to a round iron frame. The frames are treated with "Rilsan" (nylon), which gives a good corrosion resistant surface. The building of the filter with two rows of frames permitted us to produce a compact, big filter without making the frames bigger than can easily be handled by one person only.

Many bag filter constructions have the drawback that it is very difficult to mount the bags in such a way that the bag is absolutely tight along the outlet tube and in the corners under the tube.

We made many experiments with different types of bag design and different methods for packing the cloth to the tube.

From these experiments we found one satisfactory method for the solving of this small, but serious, problem. The main features of this method are:

(1) The bag is mounted with what we would call the wrong side outward, i.e. that the bag is not turned after sewing.

(2) We constructed a special spring loaded clamp, which keeps the bag completely tight to the tube.

(3) The cloth is fixed to the tube in such a way that there is nowhere any kind of fold which can give small holes with consequent turbid juice.

When following these precautions we never had turbid juice from the bags.

The outlet from each filter bag goes through an inspection glass and a valve before it enters the triangular manifold.

We mounted a valve on each bag to make it possible to shut a single bag running with turbid juice. Our experience has shown, however, that the bags very rarely give turbid juice; in fact, valves were closed only 2 or 3 times during the last campaign, and in the next installation we will not fit separate valves for the bags.

The function of the inspection glass has been very difficult to make satisfactory, because the juice has a rather high air content, and it can be very difficult to see whether the juice is clear or not. A construction where the inspection glass is mounted in a short appendix has solved this problem in a satisfactory way (See Fig. 4).

Filtering pressure

In the installations we have made so far, the outlet from the filters goes down to a tank which is placed about 4 m below the filters with outlet under the level. In this way we get 3 m w.g. vacuum at the outlets of the filters under normal conditions.

The inlet for the filters comes via an intermediate container direct from the continuous carbonatation vessels.

At Odense the juice runs direct to the filters from the intermediate container, whereas at Gorlev a pump which can give about 3 m w.g. pressure is inserted between the intermediate container and the filters. In spite of the fact that at Gorlev we cannot get more than 2·5 m w.g. inlet pressure without using pumps, experience has shown that it is unnecessary to use the pump in order to get sufficient capacity. The use of the pump increased the filter capacity by about 20% and gave no unfavourable side effects with regard to filtration qualities.

Automatic control

In order to get a satisfactory result with an installation like this, it is absolutely necessary that the automatic controls are reliable and worked out in an appropriate way. In order to get the best possible reliability we have used a combination of solid state components and mercury wetted relays for as many purposes as possible. The relay system for the filters is built on printed circuits in drawers in the panel in order to give an easy and quick change of spare parts.

The panel is built as a graphic panel where the operation of all automatic valves is shown with semaphores.

The continuous controllers necessary in connexion with the juice purification are all conventional pneumatic controllers.

The automatic systems have given very little trouble, and in the two years the filters have been in operation they have never had a stop which influenced the production of the factories.

The automatic juice valves A, B, C and D are synthetic rubber-lined butterfly valves with pneumatic cylinders. The sludge valve is a pneumatically-operated ball valve.

The smaller valves for acid wash, etc., are pneumatically-operated Saunders patent valves.

All the valves are operated from solenoid valves. All the solenoid valves for one filter are mounted in a box on a common manifold. This gives a clear and appropriate mounting and permits easy service and maintenance.

There is no permanent staff on the filter stations; the filters are looked after by the man at the carbonatation.

Operational experience

Operational experience from the two years we have been working with these installations, which filter the total amount of juice of the whole factory, has been very good.

With our clarifiers in the juice cleaning system previously used we now and then encountered short periods when sedimentation and filtration were not quite satisfactory.

When coming across that kind of difficulty we often blamed the beet quality (an excuse often used by sugar technicians). It is remarkable that at Odense in 1965 and 1966, and at Gorlev in 1966, i.e. at the factories where filter thickeners have been introduced, we have never encountered juice filtering difficulties, and it has been unnecessary to use the good old excuse of poor beet quality.

The non-occurrence of these difficulties is naturally a direct consequence of the ability of the installation to absorb irregularities from the operation of the factory without giving troubles itself.

Rather big fluctuations in TC of the sludge juice appear often during irregularities, as filling or emptying of the main liming will cause TC to fluctuate rather widely. Several experiments, intentional as well as unintentional, have shown that while using clarifier operation we have to keep TC constantly $> 2{\cdot}5$; with the new installations we can let TC vary from 1·6 to 3 without registering any changes. Not until TC becomes less than 1·5 does the capacity of the filters decrease noticeably.

Experiments where we have stopped sludge returning and thus lowered the TC to about 0·9% CaO w/v showed a decrease in the net filtering capacity from the normal about 22 kg beet/sq.m./min. to about 13 kg beet/sq.m./min. The direct-measured F_k increased from about 2 to 4–5 (TC/F_k from about 0·8 to about 4–5).

At the factory at Gorlev we have been able to run the first campaign without at any time needing to have more than 200 sq.m. filter area (four filters) in operation, and under normal circumstances the whole juice production could be managed with 150 sq.m. filter area in operation (three filters).

Gorlev has a maximum capacity of 5400 tons beet/24 hours. The average for the campaign was 4991 tons beet/24 hours.

At Odense in the 1965 campaign it was now and then necessary to use all 4 filters (about 220 sq.m.), but after having modified the filter station at specific points, and having got sufficient operational experience, it was unnecessary during the rest of the 1965 campaign and the whole 1966 campaign to use more than 3 filters (about 165 sq.m.).

The throughput of Odense in 1966 averaged 3603 tons beet/24 hours with a maximum of 4200 tons. At both factories the normal differential pressure over the filters was 4–6 m w.g.

From these figures it may be noted that Gorlev's filters, even though they are a little smaller than Odense's, have a bigger capacity, because the valve arrangement is better, using bigger and quicker valves.

From the experience we have obtained so far, the number of filters to be installed in a factory can be calculated according to the table below:

Number of filters	3	4	5	6	8	10
Max. capacity tons—beet/24 hours	2,800	4,200	5,700	7,200	10,000	12,000

The actual number of filters at a factory may of course have to be adapted to local conditions which may stipulate that more filters are necessary.

Consumption of limestone

The consumption of limestone, calculated as weight percentage of unburned limestone, was on an average

at Odense in 1965 2·82% on beet,

at Odense in 1966 2·87% on beet, and

at Gorlev in 1966 2·49% on beet.

We have tried to use even smaller amounts of limestone.

Thus at Odense in 1966 we operated for one week with an average consumption of 2·31% on beet without getting any difficulties. The capacities of the filters were, however, apparently somewhat lower than at a higher percentage of limestone, as the filtering pressure became a little higher than normal.

The sugar quality and the colour of thick juice were on the other hand uninfluenced by the lower percentage of limestone.

In the table below we have made a survey of the results obtained with varying percentages of limestone at Odense in 1966.

Period	*Percentage of limestone*	*Colour of thick juice*	*Colour of sugar**
21/11–27/11	2·31	10·0°St.	0·18°St.
14/11–20/11	2·50	11·3°St.	0·20°St.
31/10– 6/11	2·90	9·4°St.	0·19°St.

*Mixed A and B product.

As will be seen from the survey, there are no signs of any substantial change on reducing the percentage of limestone from 2·9 to about 2·3.

Filter cloth

"Neotex No. 3670" is used for the filters; this quality has proved well suited for the purpose—the bags keep well, and they have had to be repaired only in certain places, probably mainly owing to damage when inserting or removing the frames.

After operation at Odense for 2 campaigns it has not yet been necessary to discard filter cloths, and apparently they will keep for a long time to come.

Acid wash in the filters is necessary at intervals. At Gorlev it has proved necessary to wash the filter cloth only at intervals of about 3 weeks, whereas it has been necessary at intervals of 1 week at Odense.

It is recommended to take the cloth out of the filters and wash it once or twice during the campaign.

Summary

In the Danish Sugar Corporation we have during the past two years installed filter thickeners of a new design for first carbonatation at two factories.

The filter thickeners are used in connexion with the juice purification system which has been developed at the Danish Sugar Corporation for use in connexion with clarifiers. This system includes cold preliming and main liming, and returning of sludge to the second compartment of the BRIEGHEL-MÜLLER preliming. The system gives good heat economy, and also gives satisfactory juice purification and low filtration coefficients with a low consumption of limestone (2·4–2·7% $CaCO_3$ on beet).

The special filter casing design has made it possible to achieve good utilization of the space as well as using rather high pressures without the need for internal stays. Furthermore this design facilitates the cleaning and prevents the building-up of sludge cakes in the filters.

The filters have a very high capacity. For a factory with a maximum capacity of 4200 tons/day an installed filter area of 200 sq.m. (4 filters) is sufficient.

The filters are equipped with an automatic control which is based on flow measurements instead of the normal time-control. Thus the number of filter cleanings is controlled by a measurement of the amount of raw juice from the main liming.

The cleaning is controlled by measurement of the amount of washing juice in such a way that the cleaning of a filter is finished when a fixed amount of washing juice has been added. The amount of sludge taken out at each cleaning is also measured volumetrically. This method of cleaning gives the biggest possible capacity of the filters while at the same time the content of dry substance of the sludge can be kept very high (about 20% CaO).

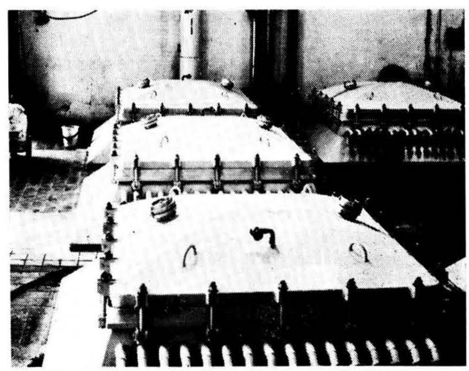
The automatic control systems embody semiconductor controls combined with mercury wetted relays.

The filter stations have worked without operation stoppages or difficulties during their working periods (one and two campaigns, respectively).

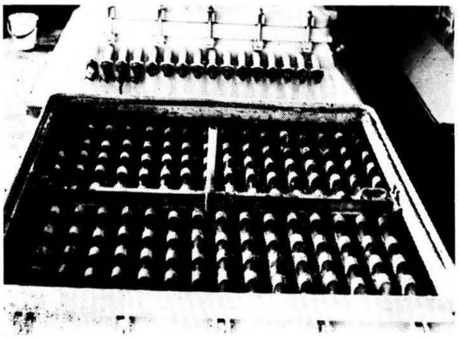
* * *

Experience in the 1967/68 campaign

In 1967 two new filter stations for 1st carbonatation juice were put into operation (at Stege and Saxkjobing), so that a total of 4 Danish sugar factories are now equipped with the filter thickeners.



First carbonatation filter-thickener at Saxkjobing



Open filter

Juice purification at Stege is of particular interest; the factory has a juice station, with a throughput of about 2200 tons/day, situated about 20 km away. The juice is prelimed at the juice station to an alkalinity of about 0·4–0·5% CaO and is then pumped to the sugar factory. The factory uses the purification scheme shown in Fig. 3 for the juice extracted at the factory from about 2400 tons of beet/day, the prelimed juice from the juice station being added at main liming. The system gives a F_k (measured direct) varying in the range 4–10 and a TC of about 2·5. The total juice from 4600–4800 tons of beet/day is normally handled by four filters, but five are necessary when the F_k exceeds 8.

New British Sugar Corporation Research Laboratories

On 22nd March the Minister of Agriculture, Fisheries and Food, the Rt. Hon. Fred Peart, M.P., opened the new research laboratories of the British Sugar Corporation Ltd. at Colney, East Anglia, within a very short distance of the Food Research Institute and the John Innes Institute. The site was chosen so that the laboratories would be close to the centre of the main beet-growing areas and Norwich. The original laboratories were established in 1950 in a converted country house at Bramcote, Nottingham; the development of more sophisticated research techniques necessitated finding more suitable and larger premises, and the new building was erected on a satellite site of the new University of East Anglia, within a very short distance of the Food Research Institute and the John Innes Institute. The site was chosen so that the laboratories would be close to the centre of the main beet-growing areas and would be able to work in close cooperation with the University, particularly with the biology and chemistry schools.

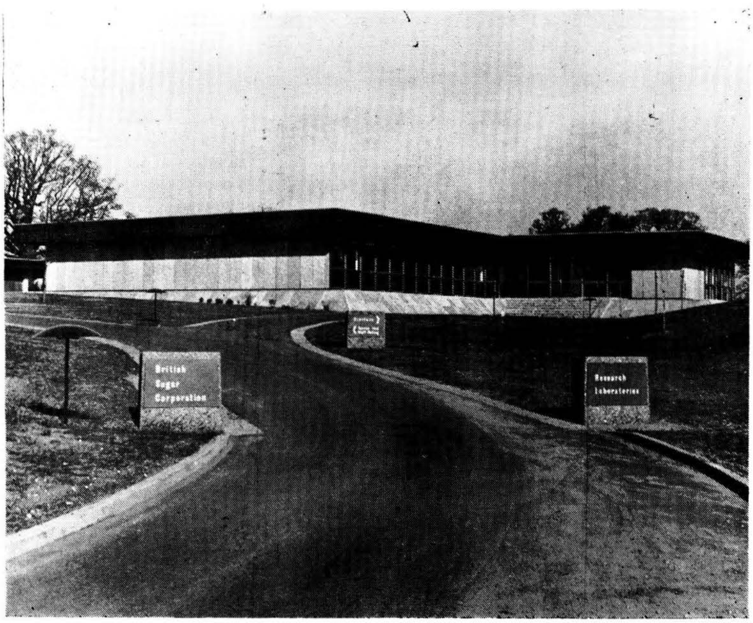


Fig. 1. Research laboratories viewed from south

Sir Edmund Bacon, until recently Chairman of BSC, in his address of welcome at the opening of the laboratories, paid a tribute to the previous

Director of Research, Dr. A. CARRUTHERS, who played a considerable part in the establishment of the new laboratories.

Fig. 2. General chemical laboratory

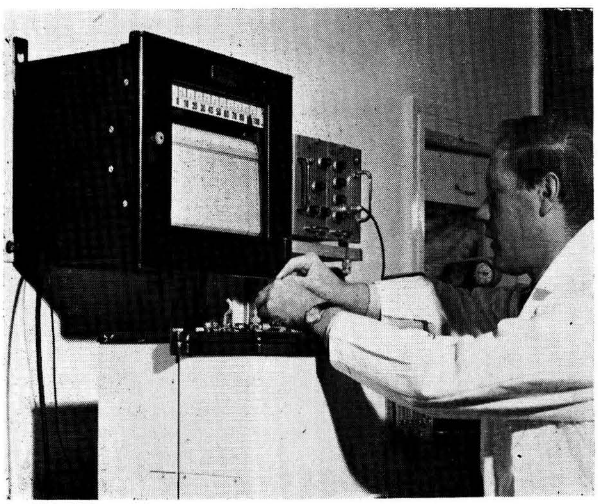


Fig. 3. Gas-liquid chromatographic unit

The building is of open-plan design, with just one main corridor running approximately through the centre, communication being largely obtained by passage through laboratories to supporting rooms. At one side of the corridor is a block comprising the general chemical laboratory (Fig. 2) surrounded by subsidiary rooms such as the polarimeter room, a darkroom, rooms for storage of glassware and various materials, including a long-term storeroom, rooms for chromatography and electrophoresis, and for instruments. The purpose of the last-mentioned is to allow measurement of test solutions without the need to have instruments on the laboratory bench. (A Bendix ETL-NPL automatic polarimeter of very high accuracy is the only instrument to be found in the general laboratory, an older standard polarimeter being used for routine measurements.)

From the general laboratory access can be gained via a small private laboratory (which may be used for small-scale plant physiology research or as a radio-chemical laboratory) to a plant physiology laboratory which is separated from an all-purpose laboratory by sterilization and furnace rooms. The two last-named laboratories can operate independently, or together, for plant physiology and microbiology, or the all-purpose laboratory may be used to analyse material produced in the semi-technical laboratory situated on the other side of the main corridor. Thus, at present it houses a gas-liquid chromatographic unit (Fig. 3) for determination of organo-pesticides, such as "Aldrin" and "Dieldrin" in beet juice. The semi-technical laboratory is used for pilot-scale experiments and contains few permanently fixed benches, so that equipment can be assembled as required at one of the service sites and the required benches brought alongside for the experiment, after which the whole can be cleared away. The ceiling of this laboratory is higher than those of the other laboratories to provide headroom for ion exchange columns and absorption towers constructed from glassware (Fig. 4). (Larger-scale pilot work can be carried out at Cantley sugar factory, which is only a few miles away and at which a considerable area has been set aside for this purpose.)

Other rooms include a beet store, a store for heavy machinery, which also houses a beet slicer and washer, a workshop and glass-blowing room, a boiler room, a centrifuge room, an electrical service room, a store for chemicals, and a cold store. The last is lined with 6–8 in polystyrene insulation and has a floor of compressed cork. The temperature range is between —10°C and +10°C, permitting ½ ton of beet to be cooled to—5°C within a day. There is no mains gas supply, so that the laboratory burners and furnaces operate on propane stored in a tank located at a safe distance from the laboratories. Heating is provided by two oil-fired boilers.

The building is steel-framed throughout and double-glazed to prevent heat loss through the large window areas. The design of the roof permits adequate natural lighting without undue penetration of sunlight. The laboratories are pleasant to work in, every effort having been made to reduce noise and allow adequate space in which to work, while permitting greatest possible integration of separate projects into an overall scheme.

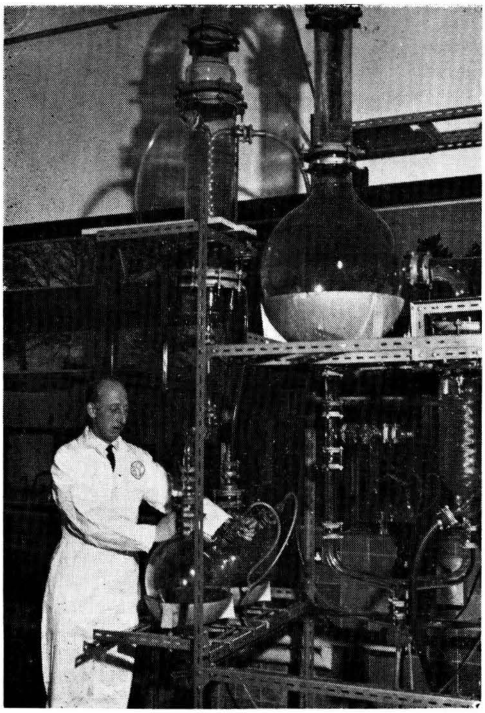


Fig. 4. All-glass apparatus for reduced pressure evaporation of sugar solutions

We anticipate that the Research team of the Corporation under their Director of Research, Mr. J. F. T. OLDFIELD (Fig. 5) will achieve even greater success in their new residence than with the more limited facilities in their old premises at Bramcote.

Fig. 5. J. F. T. OLDFIELD, Director of Research, British Sugar Corporation Ltd.

Sugar cane research in Mauritius

(Mauritius Sugar Industry Research Institute Annuul Report, 1966)

THE present position with regard to commercial sugar cane varieties cultivated in Mauritius is discussed. Three varieties, M.147/44, M.202/46 and M.93/48, were largely responsible for the 1966 crop, i.e. about 45% of the area cultivated. Among varieties occupying more than 10% of the area, M.202/46 and M.93/48 were the best cane producers. Yields of M.147/44 were lower than average because this variety suffers from prolonged dry periods. The mediocre yield of Ebène 1/37 was attributed to susceptibility to high winds. Among varieties occupying less than 10% of the cultivated area M.31/45 gave good results.

With regard to the general varietal trend, cultivation of the established commercial varieties M.31/45, M.202/46, M.93/48 and M.442/51 is being extended while the newly released varieties are being rapidly multiplied. Large-scale extension of M.202/46 is not recommended because of susceptibility to leaf scald (*Xanthomonas albilineans*) and *Fusarium* wilt. As a result of further studies on the effects of gumming disease on the variety M.147/44, it is recommended that this variety be maintained on the list of approved canes until 1973 instead of 1970 as previously decided. Release of the following now well-proven varieties has been recommended: M.409/51, M.13/53, M.13/56, M.377/56 and N:Co 376.

Cane breeding

Some modifications to the breeding programme are described, these having been introduced in order to streamline selection procedure and keep the number of seedlings at various stages of selection at a manageable level. The decision was made to transfer all available information from 1953 onwards to punched cards. An automatic puncher, a sorter and a tabulator were installed at the Institute and a full-time assistant employed. Much time and effort is now spent on planning and running the system. Processing of available data is in progress and it is hoped that enough information will soon have been gathered to help rationalize the selection and crossing programme. This change in data recording and processing has called for some standardization in selection procedures which have already been made.

Investigations on cane flowering

Experiments are discussed which have been initiated in order to obtain a better understanding of the mechanism of flowering in sugar cane. Such knowledge, it is thought, might help in controlling arrowing or flowering for breeding purposes. With regard to induction of flowering, investigations were carried out on the effect on flowering of different soil moisture tensions during induction time, on the onset of the induction period and its duration, on the number of cycles required for induction of flowering and on the perception of the flowering stimulus and its translocation. Investigations are also in progress on the retardation of flowering with chemicals ("CCC" and "Phosfon") and on "night interruption", using lights of various intensities and wavelengths at different times during the night. Experiments are being carried out on noble varieties of sugar cane to induce them to flower or flower more freely.

Cane nutrition and soils

Unfavourable growth conditions in 1966 affected field trials on cane nutrition. In many cases the results of experimentation were completely invalidated by the prolonged drought and cyclonic winds early in the season. However, since the results of foliar diagnosis from the permanent sampling units are averaged over a period of three years, it was still possible to make recommendations for the best fertilizer treatments to be adopted.

Comparisons were carried out between sulphate of ammonia and a high nitrogen-containing fertilizer which may prove suitable for gravelly soils. Unfortunately, this fertilizer is an expensive one and its use cannot be envisaged for the time being. The phosphate status of cane soils on estates is now generally good, but it is still essential to obtain a basic understanding of the behaviour of fertilizer phosphorus on the different soil groups of Mauritius. Preliminary work on the effect of phosphate spraying on the ripening of sugar cane has shown that, past the peak of maturation, phosphate spraying carried out a month before harvesting has a deleterious effect on sucrose content. More trials are to be carried out to investigate the effect of phosphate spraying during the pre-maturation period.

Soil-plant-water relations

The Institute is devoting special attention to studies of soil-plant-water relations; these have assumed much importance following the development of irrigation on the island. Outside assistance in this field of research has been promised and will comprise the services of a soil physicist from the FAO Special Fund Project team and the loan of a neutron probe. Various research projects carried out included experiments on the effect of varying soil moisture stresses on cane growth, measurements of plant-water potential, and studies on varietal drought resistance.

Spray irrigation

The efficiency of water distribution by spray irrigation was investigated. Experiments were carried out to compare the results obtained from a "Vermeer" boom spray irrigation unit at different pressures, viz. 45, 55 and 75 p.s.i., respectively, and to assess the merits of the instrument under each working condition. The boom was set in an open space with rain gauges placed at set intervals around it, the water being recorded at the end of each test. Conclusions reached were that the low coefficient of uniformity obtained at a working pressure of 45 p.s.i. rules out the possibility of working at this pressure on a commercial scale. The total precipitation, combined with the efficiency of water use when irrigating for periods of 3 hours, indicates no appreciable advantage for a working pressure of 70–75 p.s.i. over that of 55 p.s.i. For irrigation rounds of 2 to 2½ hours, i.e. for precipitations of 1·10 inches to 1·5 inches per round, an advantage of 9% would be obtained by working at 70–75 p.s.i. rather than at 55 p.s.i. as far as water applied is concerned. The advantage, however, would be offset by the required increase in energy which would raise the total cost of water application by about 18%.

In view of the above considerations and of the fact that coefficient of uniformity is highest at a working pressure of 55 p.s.i., it seems that the most advantageous pressures for operating the "Vermeer" boom, equipped with the nozzles installed during the tests, would be between 55 and 60 p.s.i.

Cane diseases

Investigationary work was concerned mainly with gummosis (*Xanthomonas vasculorum*), leaf scald (*Xanthomonas albilineans*) and *Fusarium* wilt, but some other diseases also claimed attention. The lower incidence of gummosis during 1966 compared with earlier years was attributed to the severe drought that prevailed during the growing season. The disease does not appear to cause damage in the dry coastal areas of the North and North West or a decline in yields of the variety M.147/44. A thorough study was made of the effects of the disease on M.147/44, especially in sub-humid regions, where an early maturing drought-resistant substitute still has to be found. The testing of varieties for susceptibility to both the old and the new strains of gummosis is continuing as well as an investigation on the effect of systemic infection on yield.

With regard to *Fusarium* wilt, the variety M.202/46 was the most affected. The varieties M.93/48 and Ebène 1/37 also showed some susceptibility. In cases where infection had set in at the beginning of the growing season, severe reductions in yield and sucrose content were experienced. The disease is often to be associated with specific unfavourable growth conditions. It is recommended that susceptible varieties should not be cultivated in poorly drained fields as the disease is at its worst under water-logged conditions.

Leaf scald was still a problem in fields of M.202/46, especially in humid to super-humid regions. Cane knife sterilization during preparation of cuttings and rogueing of diseased stools in nurseries have been effectively followed on several estates, but the results have not been entirely satisfactory. However, it has been found that wherever such practices are not followed, disease incidence can increase considerably. A new resistance trial for leaf scald was established with 24 varieties.

Studies on transmission of chlorotic streak (a virus) were continued. These included greenhouse experiments as well as a field trial to study the effect of organic soil amendments in delaying reinfection of treated cuttings. Yellow spot (*Cercospora koepkei*) was less severe and symptoms disappeared from affected fields earlier than usual, probably on account of the dry conditions which prevailed.

Insect pests

Much attention was given to the raising of the Javanese fly (*Diatraeophaga striatilis*) in a special insectiary, or building adapted for the purpose, for subsequent use in the field against the spotted borer (*Proceras sacchariphagus*) on which it is parasitic, in the hope that it may eventually be used to control this troublesome borer which causes much damage in Mauritius. Full details are given of the elaborate technique adopted for breeding the Javanese fly artificially in this way. These are accompanied by a dozen excellent photographs showing different aspects of the work and different stages in the parasite's life cycle. Nine generations of the parasite were raised in this way. Borer larvae used in breeding the parasite were collected by a roving field gang of about a dozen labourers and boys, but the borers collected never exceeded the demand. Big borers gave the best results. The release of laboratory bred *Diatraeophaga* is now being carried out concurrently in Mauritius and Réunion with the common object of releasing as many flies as possible at different seasons and in different localities to establish the insect and explore its potential as a control agent of *Proceras*.

Heavy infestations of the scale insect, *Aulacaspis tegalensis*, were again experienced in many fields of the Central Cane Nursery. Hot water treatment of planting material is known to destroy scales but it was thought that hot air treatment might be more appropriate or convenient at the nursery, and tests were therefore made, a thermostatically-controlled oven with a fan for internal air circulation being used. Temperatures employed ranged from 50 to 80°C and treatment times from 30 to 180 minutes. However, germination tests gave unfavourable results and it was concluded that hot air treatment of nursery seed cane for this pest was unpractical.

White grub (*Clemora smithi*) was abundant in some cane fields in the super-humid zone, and it is recommended that planters should not ignore the advisability of growing *Eupatorium* bushes to encourage the parasites of white grub to frequent cane areas. An attack of *Alissonotum piceum* occurred in some virgin cane, the beetles destroying small shoots by chewing them below soil level.

Weed control

An account is given of screening trials carried out with three new herbicides, coded NPH/1231, UC 40.0 and UC 40.1. These were compared with DCMU. Each experimental plot consisted of four cane rows 45 feet long and each treatment was replicated twice. The herbicides were applied before crop and weed emergence and the plots were surveyed three months after application. The weeds *Kyllinga polyphylla* and *Plantago lanceolata*, resistant to DCMU, were also not affected by the other herbicides tested. The herbicide NPH/1232 was also not effective against *Oxalis* spp. and *Cyperus* spp. Germination and growth of *Ageratum conyzoides* was only slightly checked by NPH/1232. Poor control of *Kyllinga polyphylla*, *Ageratum conyzoides* and *Alternanthera sessilis* was shown by UC 40.1. The least effective of the three new herbicides tried was UC 40.0. The grass *Digitaria timorensis* was not affected by this herbicide at all concentrations.

Trials with "Herban" and "Cotoran", compared with DCMU and "Atrazine" as pre-emergence weed-killers, were also carried out. They did not prove superior to the last two mentioned. Trials with "Ultracil" compounds (H 732 and H 767) were also carried out. They proved to be highly efficient in controlling weed growth but showed a high toxicity to sugar cane. Excellent control of the vine *Paederia foetida* in stone walls was obtained with "Tordon K" at rates recommended previously (2 lb per 60 gallons water).

Interline cultivation with potatoes

As the cultivation of potatoes in cane interlines has recently greatly increased in Mauritius, it was decided to study the influence of this crop on sugar cane yields. Twelve trials were laid out in the sub-humid, humid and irrigated localities with the potato varieties "King George", "Up-to-Date" and "Kennebec". Some trials failed because of bacterial wilt and severe drought conditions. The satisfactory nature of the remaining trials led to the conclusion that this form of potato cultivation should be encouraged, having regard to the returns that may be expected. The crop which had been separately manured had apparently no adverse effect on the cane stand. A marked gain in production resulted from planting double lines of potatoes in every cane interline.

F.N.H.

Sugar cane agriculture

The preparation of land for cane. M. MENÉNDEZ A. *Bol. Ofic. A.T.A.C.*, 1966, **21,** (4, 5, 6), 14–30.—Observations are made on the use of various agricultural implements on different soil types in Cuba in an attempt to obtain good soil tilth prior to cane planting.

* * *

Irrigation and drainage of sugar cane in Java. J. M. JUANTORENA. *Bol. Ofic. A.T.A.C.*, 1966, **21,** (4, 5, 6), 31–36.—The author reports his observations and impressions of sugar cane cultivation in Java made on a visit to the island to study irrigation methods and drainage as applied to sugar cane and rice.

* * *

Control of woolly aphis. ANON. *Victorias Milling Co. Expt. Sta. Bull.*, 1966, **14,** (7–8), 3.—An account is given of the successful treatment of 24 hectares of 5–8 months old cane heavily infected with woolly aphis (*Oregma lanigera*). The systemic insecticide "Metasystox R" was sprayed aerially on the cane. After 7 hours 60% of the colonies were destroyed, 80% after 24 hours and all the colonies after 4 days.

* * *

The stale cane problem. B. T. EGAN. *Producers' Rev.*, 1967, **57,** (6), 3, 81.—Post-harvest deterioration of cane harvested with chopper harvesters and means of reducing it are discussed. Emphasis is placed on the urgent need to reduce storage of chopped cane to a minimum thereby reducing bacterial deterioration, i.e. loss of sucrose and production of acids, gums, alcohols and reducing sugars, causing difficulties at the factory. Reference is made to the problem being reduced in some areas by controlling Friday harvesting and thereby reducing weekend storage. Re-scheduling of transport and the working of overtime has also assisted.

* * *

Burning cane for harvest. ANON. *Producers' Rev.*, 1967, **57,** (6), 8.—Regulations regarding the burning of trash and cane tops after harvest are discussed, especially a new or additional regulation. This provides that tops and trash must be raked one chain clear from any headlands or inflammatory material to provide a fire-break, also that burning of trash may not be carried out prior to 3 p.m. each day.

* * *

Are other grasses important in the survival of sugar cane diseases in Queensland. B. T. EGAN. *Producers' Rev.*, 1967, **57,** (6), 57.—Grasses that may be alternative host plants for diseases that attack sugar cane in Queensland are discussed, the diseases in question being chlorotic streak, mosaic, bacterial mottle and *Scleropthora* disease.

* * *

Soldier fly in Central Area. R. W. MUNGOMERY. *Producers' Rev.*, 1967, **57,** (6), 79–80.—Control measures with this Queensland sugar cane pest in the central districts are discussed. Reference is also made to a new soldier fly recently discovered, first recorded near Proserpine and later at North Eton, Koumala and Koremal. It is similar in size to the common black species but its body colour is yellowish brown.

* * *

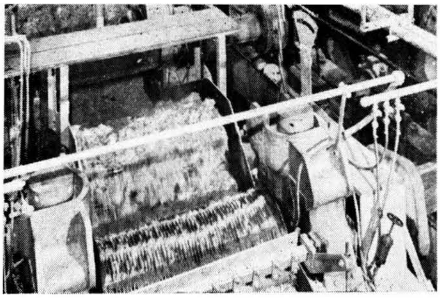
Lime for cane lands. ANON. *Producers' Rev.*, 1967, **57,** (6), 29.—The question whether lime applications are necessary with sugar cane in Queensland and, if so, under what conditions, is discussed. The opinion is expressed that modern sugar cane varieties are more tolerant of acid soils than were the noble varieties formerly grown.

* * *

Destroy those unreleased cane varieties now. G. M. THOMSON. *S. African Sugar J.*, 1967, **51,** 565–569. The following somewhat surprising statement is made: "A number of instances where unreleased sugar cane varieties have been propagated have recently come to the notice of the Experiment Station. Growers so doing risk prosecution." It is pointed out that this practice could jeopardize the whole plant breeding and variety programme of the Experiment Station. The great danger of anyone surreptitiously introducing and growing a piece of sugar cane from another country is pointed out. In this way serious cane diseases not known in South Africa, such as Fiji disease, leaf scald and downy mildew, could become established.

* * *

The fertilizer requirements and yield potential of forage crops grown on soils formerly planted to sugar cane. E. P. THERON. *S. African Sugar J.*, 1967, **51,** 579–587.—Results from a series of experiments on various sugar cane soils on the Natal coast indicated clearly that certain pasture grasses, particularly paspalum (*Paspalum dilatatum*), had a high yield potential if adequately fertilized. Nitrogen and phosphates are the important nutrients needed. If livestock are not to be grazed, potash may later be required. With regard to lucerne or alfalfa (*Medicago sativa*), indications are that adequate quantities of lime may be important.



Cane sugar manufacture

Reheating of low-grade massecuites. T. MORITSUGU and W. T. SHIRAMIZU. *Rpts.* 1965 *Meeting Hawaiian Sugar Tech.*, 10–16.—Investigations showed that the rate of crystal dissolution and molasses purity rise were directly related to the difference between the massecuite reheating and saturation temperatures and were appreciable at a reheating temperature of even 2° above saturation. They were also greater with higher crystal content and lower viscosity, all other factors being equal. These effects resulted from undersaturation of the hot molasses and from increased diffusion rates at higher temperatures. Although the effect of stirring was not examined, it has been found elsewhere that dissolution in undersaturated molasses is greater at higher stirring rates.

* * *

Control developments at Paia mill. G. R. WEBSTER. *Rpts.* 1965 *Meeting Hawaiian Sugar Tech.*, 17–19. Information is given on the automatic controls for the cane cleaning plant and crushing plant at Paia sugar factory.

* * *

The potential of digital computers in sugar factory operation. H. R. COOPER. *Rpts.* 1965 *Meeting Hawaiian Sugar Tech.*, 20–24.—See *I.S.J.*, 1968, **70**, 20.

* * *

Automatic control—industry's key to progress. E. C. FOX, R. E. PUTMAN and J. G. TRASKY. *Rpts.* 1965 *Meeting Hawaiian Sugar Tech.*, 25–31.—The potential applications of automatic control are generally discussed and a diagram presented showing the possible "levels of control hierarchy" in a cane sugar factory.

* * *

Automation in a sugar factory. R. C. GREER. *Rpts.* 1965 *Meeting Hawaiian Sugar Tech.*, 32–39.—Sugar factory automation is exemplified by schemes for boiling, milling and clarification, and evaporation control at a US sugar factory. Diagrams are presented for each of the three stations, and the sequence of operation of the pan controls is described in greater detail.

* * *

Heat transfer with stainless steel tubes in heat exchangers. W. E. BLOCKLEY and N. J. SAXBY. *Rpts.* 1965 *Meeting Hawaiian Sugar Tech.*, 40–46.—Investigations of stainless steel tubing in heat exchangers showed that the overall heat transfer rate should be about the same as in copper tubing under identical conditions. Reference is made to experience with stainless steel tubes in Queensland and Hawaii, and it is concluded that welded stainless steel tubing, used correctly, is better and cheaper than brass tubing.

* * *

Hydraulic system maintenance. J. F. DEVENY. *Rpts.* 1965 *Meeting Hawaiian Sugar Tech.*, 55–59.—Terms used in hydraulics are defined and requisite components of a hydraulic system and their maintenance are listed.

* * *

"Controlled Maintenance". E. FORGERON. *Rpts.* 1965 *Meeting Hawaiian Sugar Tech.*, 60–64.—"Controlled Maintenance", a lubrication oil analysis system developed by Analysts Inc., is described and its advantages discussed with the aid of case histories.

* * *

Using PERT techniques at H.C. & S. Company. M. C. BALDWIN. *Rpts.* 1965 *Meeting Hawaiian Sugar Tech.*, 70–80.—PERT (Programme Evaluation Review Technique) is described as "basically a graphical representation of a detailed work schedule" which takes the form of an arrow diagram[1] to show the inter-relationships in various activities in a project. Applications of the system at H.C. & S. Co. in conjunction with "Planalog" (a simple analogue computer used in analysis and representation of network planning techniques) are described.

* * *

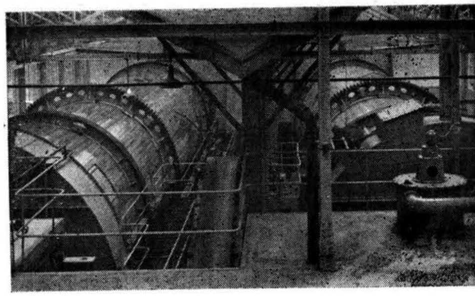
Silver continuous low-grade centrifugal operations at H.C. & S. Company. E. T. OGASAWARA. *Rpts.* 1965 *Meeting Hawaiian Sugar Tech.*, 81–84.—Operation of Silver continuous centrifugals at Puunene sugar factory proved satisfactory, with final molasses purities comparable to those with batch machines, while screen life was longer than expected, the Monel metal baskets showing no signs of corrosion or erosion. Power consumption was also lower than that of batch machines. When massecuite supply was low, low wash water and massecuite feed rates for all the station was preferable to operation of only part of the battery at higher rates with the rest of the station shut down, since in the latter case molasses purity rose.

* * *

Interesting applications in boiler controls. G. R. WEBSTER. *Rpts.* 1965 *Meeting Hawaiian Sugar Tech.*, 85–87.—Among the aspects of boiler operation discussed are: combustion control based on flue gas oxygen and combustibles contents, flame detectors, and feeding of chemicals into the boiler for feed water treatment.

[1] CHANCELLOR & MEIKLE: *I.S.J.*, 1968, **70**, 51.

Beet sugar manufacture



Growth of crystal mass in a vacuum pan. Yu. D. Kot. *Sakhar. Prom.*, 1967, **41**, (7), 14–18.—A formula presented earlier by Popov to describe crystal mass growth during pan boiling is shown to be invalid since it assumes a decrease in the crystal mass growth rate from the start of boiling. In refinery and 1st beet massecuite boiling there should be an increase in the growth rate to the end of boiling, while in 2nd and 3rd strikes the rate should rise to a maximum and then fall gradually.

* * *

Crystallization of high purity 2nd (final) product massecuite. I. N. Akindinov. *Sakhar. Prom.*, 1967, **41**, (7), 18–19.—Among the advantages of pre-spinning 2nd strike massecuites of about 82 purity before crystallizer treatment was a 0·32% drop in molasses sugar (on weight of beet) and a considerable improvement in the massecuite crystal structure, with consequent increase in centrifugal throughput and improvement in yellow sugar quality and affination. The method has been introduced into several Soviet sugar factories.

* * *

Continuous massecuite centrifugalling. A. Ya. Sokolov, S. M. Grebenyuk and V. G. Andreev. *Sakhar. Prom.*, 1967, **41**, (7), 21–24.—Tests with a pilot-scale continuous conical centrifugal are discussed. They involved artificial massecuites of known viscosities and molasses contents, and results are given in graph form for varying throughput (g/sec), speed of rotation (1150–1800 r.m.p.) and screen mesh size. The value of backing screens was also tested. The effects of the different variables are discussed.

* * *

Results of accurate techno-chemical control and calculation of production at sugar factories. A. I. Shapiro, N. V. Kheize and A. Ya. Zagorul'ko. *Sakhar. Prom.*, 1967, **41**, (7), 25–32.—The beet throughput, cossette sugar content, sugar and molasses yield, molasses sugar content and total sugar losses (the last four factors expressed on weight of beet) and sugar losses in individual processes as well as undetermined losses are tabulated for six Soviet sugar factories. The data, obtained from the second half of 1966, are discussed.

* * *

Automatic control of alkalinity and acidity of certain media in beet sugar production. A. S. Sidorov, V. V. Radchenko and F. A. Samonov. *Sakhar. Prom.*, 1967, **41**, (7), 38–40.—In tests on automatic control of raw, 1st and 2nd carbonatation juice and condenser water pH at two Soviet sugar factories, the maximum measurement error was $\pm$ 0·19 units ($\pm$ 2·2%), and 1st and 2nd carbonatation juice alkalinity was maintained constant with a maximum deviation of $\pm$ 0·005% CaO. Without temperature compensation, pH measurement error did not exceed experimental error provided the temperature was maintained constant within $\pm$ 5°C. The glass electrodes used needed cleaning with 0·1N HCl solution every 12–14 days.

* * *

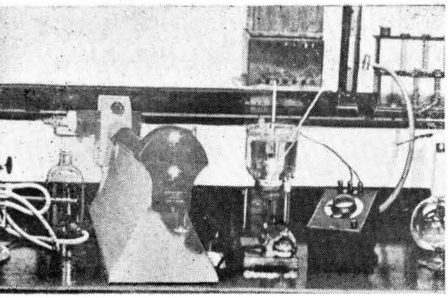
Efficient water preparation systems used in sugar factory boiler units. A. D. Polozhentsev and V. I. Vinnichenko. *Sakhar. Prom.*, 1967, **41**, (7), 41–45. Details are given of various methods for preparation of boiler feed water, including (i) removal of colloids and suspended matter by coagulation, followed by replacement of Ca^{++} and Mg^{++} cations with ammonium and sodium in two-stage ion exchange; (ii) as (i), but with simultaneous coagulation and liming; (iii) passage through a cation exchanger on Na^{+} cycle followed by a strongly basic anion exchanger on Cl^{-} cycle; (iv) treatment by Na^{+}-form cation exchanger, followed by desalting in a single- or two-stage evaporator or steam converter; and (v) treatment by H^{+}-form cation exchanger (after coagulation and clarification, if necessary) regenerated by the "starvation" process with a quantity of acid under that equivalent (stoichiometric) to the difference between the alkalinity of the feed and its residual alkalinity. The carbonates in the water are then removed by Na^{+}-form cation exchange resin.

* * *

Elimination of juice spillage during rotary diffuser operation. V. G. Dmyshko and A. P. Miroshnik. *Sakhar. Prom.*, 1967, **41**, (7), 47–48.—Modifications to the raw juice circulation tank at a Soviet sugar factory are described. These were carried out to eliminate juice spillage from the discharge end of the diffuser and to reduce foaming, a 10–15% increase in diffuser throughput and a reduction in sugar losses being obtained.

* * *

Selective replacement of filter cloth on disc filters. M. A. Ogorodnik. *Sakhar. Prom.*, 1967, **41**, (7), 49.—A method of staggered replacement of damaged filter cloth frames in a 1st carbonatation juice disc filter is described. It is claimed to have increased cloth life from 17–35 to 60–70 days.



Laboratory methods & Chemical reports

Separation of high molecular colouring matter from carbohydrates by means of gel filtration. H. ROTHER. *Zucker*, 1967, **20**, 318–325.—Results of gel filtration of thin juice and of thick juice and molasses diluted to 20°Bx are expressed in the form of graphs showing Brix and extinction of the various eluates. These as well as the course of separation on "Sephadex G-25" indicate whether high molecular colouring matter was present. The high molecular fractions were acid-hydrolysed and treated with paraldehyde and alcohol. In the presence of caramels a brown precipitate was observed.

* * *

Colorimetric standards. IV. Properties of mineral standards and coloured foils. V. VALTER. *Listy Cukr.*, 1967, **83**, 132–139.—The spectral transmittancy of colour standards prepared according to MIRČEV[1], MIRČEV & ŠANDERA[2] and BROEG & WALTON[3] and of $KMnO_4$ - impregnated polyamide foils prepared according to ŠANDERA & SÁZAVSKÝ[4] was measured and the colorimetric characteristics calculated in terms of the CIE trichromatic system. The foils gave the closest match with all sugar solution colours, while the MIRČEV standards were the most divergent. At low extinctions the other two standards tested gave good reproduction of sugar solution colour and approached the colour of Stammer glasses.

* * *

Improved method for preparation of two spray reagents (aniline phosphate and *p*-anisidine phosphate) for detection of sugars on chromatograms. J. P. MARAIS. *S. African J. Agric. Sci.*, 1966, **9**, (1), 267; through *Anal. Abs.*, 1967, **14**, Abs. 4267.—The methods described avoid the need for filtration and subsequent dissolution of the precipitate. To prepare the *p*-anisidine (I) phosphate reagent, add 3 ml of 85% H_3PO_4 to 0·5 g of I and dissolve the crystals of I phosphate in 30 ml of H_2O and 40 ml of 95% ethanol. For the aniline phosphate reagent, mix aniline, butanol, H_3PO_4 and H_2O in the ratio 1:300:13:2.

* * *

Modification of the Tryller electrometric method for determination of sugars. J. J. MONSELISE. *Israel J. Technol.*, 1966, **3**, (4), 233; through *Anal. Abs.*, 1967, **14**, Abs. 4268.—Loss of sensitivity of the plaster of Paris plug in the inner cell is a weakness in the original method[5]. This is avoided in the apparatus described, which has no cells, and the proportion of electrolyte that becomes contaminated is decreased. The electrolyte is led into the titration flask from a sealed reservoir via a rubber tube terminating in a jet and fitted with a clip; as air cannot enter, there is no flow of electrolyte when the clip is opened. Electrical contact is made by a copper wire passing through the bung of the reservoir and another through the bung of the titration flask, ending in a loop near the tip of the jet.

* * *

A comparative study of the true content of Steffen and straight house molasses by isotope dilution. M. J. SIBLEY, F. G. EIS and R. A. MCGINNIS. *J. Amer. Soc. Sugar Beet Tech.*, 1966, **14**, 190–196.—The isotope dilution method[6] was compared with the Clerget method for determination of the sucrose content in Steffen and normal final molasses at four Spreckel sugar factories. Results showed that the isotope dilution method gave higher sucrose contents than did Clerget analysis but less than indicated by direct polarization.

* * *

Sugar transformations in stored sugar beets. R. M. MCCREADY and J. C. GOODWIN. *J. Amer. Soc. Sugar Beet Tech.*, 1966, **14**, 197–205.—Beets stored under controlled conditions for up to 115 days at 2°C or for 86 days at 2°C and then for 21 days at 25°C after being warmed to this temperature were then analysed for refractometric dry solids, invert, sucrose, galactinol, raffinose and 1-kestose. Paper chromatography revealed no galactinol but did indicate increase in the raffinose and 1-kestose contents during storage at 2°C, with a drop in raffinose during subsequent storage at 25°C. Sucrose content fell during storage, while reducing sugars rose much more rapidly during storage at 25°C than during previous storage at 2°C.

* * *

Polysaccharides of sugar beet pulp: a review of their chemistry. R. M. MCCREADY. *J. Amer. Soc. Sugar. Beet Tech.*, 1966, **14**, 260–270.—The structure and properties of four carbohydrate polymers which make up 76% of beet pulp on dry weight are discussed, viz. pectin and cellulose (each consituting 25% of beet pulp), araban (20%) and galactan (6%).

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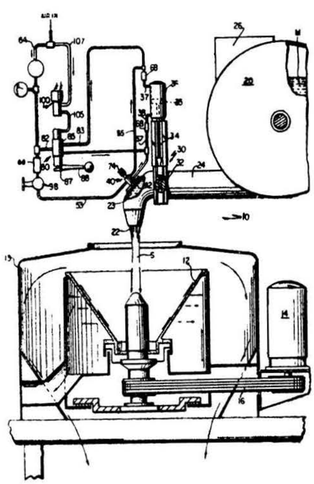
[1] *Listy Cukr.*, 1941/42, **60**, 211.
[2] *I.S.J.*, 1954, **56**, 172.
[3] *ibid.*, 1952, **54**, 312.
[4] Analytika cukro (Sugar analysis). (SNTL, Praha, Czechoslovakia.) 1959. pp. 255–257.
[5] *I.S.J.*, 1932, **34**, 353.
[6] *ibid.*, 1967, **69**, 57.

Patents

UNITED KINGDOM

Massecuite feed to a continuous centrifugal. THE WESTERN STATES MACHINE COMPANY, of Hamilton, Ohio, USA. **1,086,508.** 30th November 1964; 11th October 1967.

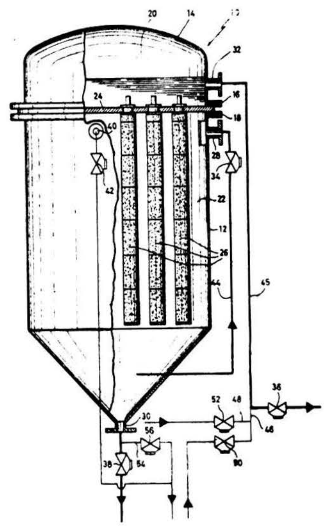
When the supply tank 20 receives massecuite from a pan or crystallizer, the level *M* is suddenly altered and the consequent hydrostatic pressure, which causes the flow of massecuite through the outlet 24 and nozzle 22 to the continuous centrifugal 13, is abruptly changed, with harmful results to even feeding and



crystal separation. In order to prevent this, the diaphragm 42 in the bend 23 of the feed pipe senses the hydrostatic pressure continuously and is connected to a device 40 having an adjustable cap 74 whereby the movement of an internal mechanism within the device under the action of the diaphragm and against a return spring governs the pneumatic pressures in the pipes leading to either side of the double acting piston 35 in cylinder 36. This is connected to the sliding gate of valve 32, so adjusting the feed orifice to compensate for changes in the feed pressure. An over-riding manual control 80 and an automatic cut-off mechanism 100 are also provided.

Filter. W. MAYER, W. KOCH, K. U. MEYER-RUDOLPH and H. H. MESSNER, trading as SCHUMACHER'SCHE FABRIK, of Bietigheim/Württ., Germany. **1,088,524.** 26th March 1965; 25th October 1967.

The upper and lower parts 14, 12 of the filter 10 are held together by bolting of the flanges 16,18, between which is a partition 24 which separates the interior of the filter into a filtrate compartment 20 and a compartment 22 for turbid sugar juice. Suspended from partition 24 are a number of filter candles 26.



Turbid juice is admitted through a number of inlet ports 28 around the periphery of the lower part 12, while clear juice is withdrawn from part 14 through port 32, the juice flows being controlled by valves 34 and 36, respectively. Insolubles collecting in the conical base of the lower part 12 are discharged through the port 30 under the control of valve 38. A spill port is provided at the same level as feed inlets 28 and contains an intermediate valve 42.

The cake which builds up during filtration is removed by closing the valve 36 and allowing pressure to build up on the feed side, when the air above the level of juice in the upper part 14 is compressed. The pressure in part 12 is then suddenly released, when

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 (price 4s 6d each). United States patent specifications are obtainable from: The Commissioner of Patents, Washington, D.C. 20231 U.S.A. (price 50 cents each).

the gas expands, driving clear juice back through the candles and dislodging the cake. Controls may be fitted to the valves for automatic operation, and the candles can be subjected to regeneration agents admitted to the upper part 14 through conduit 46 by way of valves 50 or 52.

* * *

Method of moulding bagasse. TATE & LYLE LTD., of London E.C.3., England. **1,088,529.** 5th May 1966; 25th October 1967.—A board or other compression moulding is made from bagasse and resin by the application of heat and pressure in which the (dried) bagasse is treated with a solution of (1–5% on weight of bagasse of) trimethylolphenol, as a resin forming agent, in an organic solvent [a volatile aliphatic alcohol (ethylene glycol, ethanol or methanol)] [having a water content of less than 2% (less than 0·5%)].

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Beet harvester. INTERNATIONAL HARVESTER CO., of Chicago, Ill., USA. **1,089,472.** 11th May 1965; 1st November 1967.

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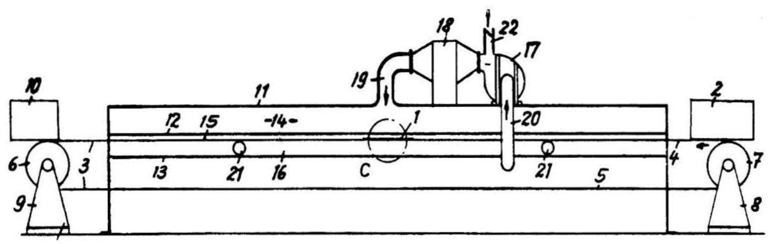
Sugar cuber dryer. MASCHINENFABRIK BUCKAU R· WOLF AG, of Grevenbroich, Germany. **1,090,063.** 20th April 1965; 8th November 1967.

Sugar cubes 1 formed by an apparatus shown diagramatically as 2 are transported to a packing station shown diagramatically as 10 by an endless steel belt conveyor 3 which extends between the pulleys 6 and 7 mounted on supports 9 and 8. The conveyor is surrounded by a housing 11 which is divided by a nozzle plate 12 and a base plate 13. The upper part 4 of the conveyor divides the space between plates 12 and 13 into an upper processing chamber 15 while the part above plate 12 is a pressure chamber 14. Below the conveyor surface 4 is formed a return air conduit 16. The cover of the chamber carries an air recirculator 17 which draws air from chamber 16, together with about 10% of fresh air to prevent excessive moisture content in the air. Part of the combined air equivalent to the 10% of fresh air is discharged through vent 22 while the remainder is directed through preheater 18 and sent by way of duct 19 to the pressure chamber.



The plate 12 is provided with nozzles which direct jets of hot air over the cubes on the conveyor surface and then down to the return conduit. The drying may be carried out in a number of stages whereby vertical partitions separate the pressure and processing chambers which are each provided with their own recirculator-preheater units, and similar partitions separate the return air chambers which are used to supply used air to the next recirculator except for the last used air chamber from which the air is withdrawn and carried to the first recirculator. Alternatively, each drying zone may have its own air circuit which is independent of the others.

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Massecuite boiling. J. M. MALEK, of Paris 16e, France. **1,090,273.** 4th February 1965; 8th November 1967.—Syrup is boiled in a series of vessels in each of which it circulates through a column which contains a (calandria-type) heater, a vertical cylinder and then a return conduit (inside or external to the main column) which brings it below the heater again. Vapour is withdrawn from above the syrup in the column and its steam-saturated gas (air) content separated and injected under the heater to aid circulation; the space above the heater permits subsequent separation of the bubbles. Crystal nuclei are introduced into the material in the first stage and each stage is supplied with massecuite from the previous stage and also an amount of syrup necessary to make up for the consumption of syrup by evaporation and crystal growth. Massecuite may be extracted from a number of different stages to obtain products of graded crystal size.

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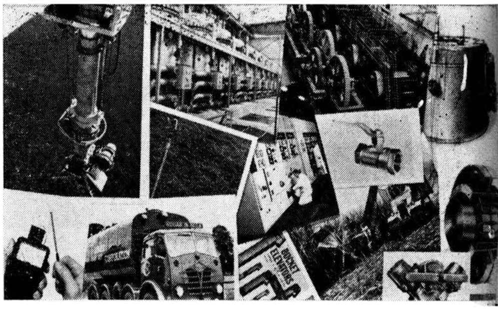
Animal fodder. PFEIFER AND LANGEN, of Köln, Germany. **1,091,264.** 16th September 1966; 15th November 1967.—Pressed beet cossettes, having a dry matter content of 13–25% (17%) at 60–70°C, are impregnated by spraying with an aqueous solution (at pH 7) of urea, a phosphate, and (Quentin) molasses at 70–80°C, having a dry matter content of 70–80%, and then dried. The solution is made up by heating together urea, two parts of $Na_2HPO_4,12H_2O$ with one part of $NaH_2PO_4,2H_2O$ and molasses of 75–85°Bx, and contains 15–30% (21·5%) urea, 15–20% (17·7–16%) sodium phosphate solution and 61–55% molasses. The urea may be used either in crystalline form or as a 50–60% solution at 60–70°C to avoid crystallization. The solution may also contain (10–30%) of a fluid yeast culture containing up to 20% dry matter. The impregnated cossettes are dried to 87–95% (90%) dry matter and may be ground together with a stabilized vitamin concentrate (molasses) (and 2–6% of yeast) (and pelleted).

Trade notices



Statements published under this heading are based on information supplied by the firm or individual concerned. Literature can generally be obtained on request from the address given.

Post-emergence weedkiller. Schering AG, Berlin 65, Müllerstr. 170/172, Germany; Fisons Pest Control Ltd., Marston, Cambridge, England.

A new post-emergence weedkiller for dealing with annual weeds found in beet fields is announced. Known as "Betanal" it has proved to be suitable for all soil types, and tests on 74 farms in the U.K. over two years have demonstrated that it deals effectively with fathen, chick weed, hemp nettle and charlock, but is ineffective against knotgrass, mayweed, grasses and perennial weeds. Beet is highly resistant to its effects.

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Sugar refinery weighing equipment. Ashworth Ross & Co. Ltd., P.O. Box 5, Midland Iron Works, Scout Hill, Dewsbury, Yorks., England.

Ashworth Ross have recently installed two band weighers at the Thames refinery of Tate & Lyle Refineries Ltd. to record the total weight of raw sugar entering the refinery and to indicate the instantaneous flow rate. Each weigher is designed to handle up to 180 tons of raw sugar per hour on a 32-in wide steel band conveyor, the guaranteed maximum weighing error being $\pm 0{\cdot}5\%$. The instantaneous weight information is also used for automatic control of the syrup dosing equipment. The information is converted by a digitizer into a series of readings which are stored in a shift register. The register acts as a memory device to allow for the time taken for the sugar to reach the dosing equipment and is operated by a series of pulses derived from the weigher belt travel measurement. The syrup dosing value is automatically positioned by converting the digital to an analogue reading. The flow rate from each weigher is displayed at six remote points on 12-in and 4-in indicators, while the totalized weight is also recorded at two points on six-figure counters.

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Moisture analyser. Anacon Inc., 62 Union St., Ashland, Mass., 01721 U.S.A.

A new optical moisture analyser for solids and liquids is announced. This uses reflective infra-red radiation and is based on the reduction in light reflection caused by water when a beam of light at the wavelength of the absorption band of water is projected on the material being tested. The reflection depends on the absorption and scatter properties of the material, each substance having its specific absorption. Sugar and glucose are among the materials listed for which the analyser is suitable. Accuracy is 1% of the full scale with moisture contents in the ranges 0–5% by weight (minimum) and 0–80% by weight (maximum). Only 1–2 calibrations per month are necessary to maintain stability of the instrument.

* * *

BAGASSE PULP AND FIBRE BOARD. Defibrator AB, Stockholm 27, Sweden.

Two items of possible interest to our readers appear in "Defibrator News", 1968, (1). One concerns the production of bagasse fibre board, equipment for which is to be supplied by Defibrator AB to Pakistan for a mill scheduled to start operations in 1969. Mention is also made of an Indian mill which has used Defibrator equipment for 10 years in the production of fibre board based on 100% bagasse. The second item deals with bagasse pulping and shows a model of a Defibrator bagasse pulp plant, which includes a wetting tube and two horizontal digester tubes. Sixteen of these digesters have been delivered or are on order, the largest unit having a capacity of 110 tons of pulp/day.

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CANE SUGAR FACTORY EQUIPMENT. Kawasaki Dockyard Co. Ltd., 14 Higashi-Kawasaki-cho, 2-chome, Ikuta-ku, Kobe, Japan.

A well-illustrated brochure gives details of facilities of the Kawasaki Dockyard Co. Ltd. as well as cane sugar equipment made by them, including complete factories.

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Stork-Werkspoor activities in Iran.—Stork-Werkspoor Sugar NV supplied and established the first cane sugar factory and refinery in Iran, in Khuzestan, in 1961. The factory's planned capacity of 3600 t.c.d. has been increased in the meantime to 4200 t.c.d. and further expansion of the plant to 6000 t.c.d. is contemplated. Two existing beet factories, Bardsir sugar factory, near Kerman, and Tcheneran sugar factory, near Meshed, had their capacities expanded by Stork-Werkspoor Sugar from 350 to 1000 tons of beet per day. The extensions are, in fact, new complete beet sugar factories, each sharing beet storage, conveying and washing facilities with the original factory. The raw juice, extracted in a continuous diffuser common to both factories, is processed separately in the factories. Both new factories have already completed very successful campaigns. Neishabour sugar factory is a completely new plant in Khorassan province. Designed, built and commissioned by Stork-Werkspoor Sugar NV, it is a modern 1000 tons/day beet factory and it is planned to be expanded to 1500 tons/day. After a short trial campaign in 1966/67, the factory was handed over to the owners in 1967 and its first campaign in 1967/68 was so successful than an extension is already under discussion. The latest Iranian order booked by Stork-Werkspoor Sugar NV is for the expansion of Fariman sugar factory. This factory has had a rated daily capacity of 1800 tons of beet and aims at doubling its capacity in a number of stages.

USSR Sugar Exports[1]

Destination:	1967	1966	1965
	—(metric	tons, raw	value)—
Afghanistan	66,307	114,007	57,621
Algeria	49,223	23,530	14,613
Bahrein Islands	3,426	0	5,325
Belgium/Luxembourg	0	11,414	0
Ceylon	85,368	38,151	33,021
Cyprus	592	2,940	1,023
Egypt	88,282	11,213	11,049
Ethiopia	0	11,023	2,718
Finland	135,855	137,916	133,100
France	32,503	14,899	0
French Somaliland	2,141	6,286	571
Germany, East	38,027	0	0
Ghana	21,949	12,718	26,701
Greece	0	1,512	0
Guinea	0	2,174	0
Iran	115,766	136,246	84,020
Iraq	227,309	155,766	0
Italy	3,261	7,388	598
Jordan	24,041	27,937	11,032
Kenya	0	20,398	10,870
Korea, North	32,616	8	6
Kuwait	20,396	1,902	22,308
Lebanon	7,063	0	2,174
Libya	0	29,775	33,873
Mali	15,741	5,434	13,025
Malta	2,835	6,456	3,830
Mongolia	17,043	17,377	19,042
Nepal	2,173	0	3,243
Netherlands	0	712	0
Nigeria	19,900	5,444	3,834
Norway	7,271	3,316	2,663
Oman	2,076	4,435	3,064
Pakistan	0	0	31,794
Qatar	1,621	2,174	3,911
Saudi Arabia	0	13,385	20,166
Sierra Leone	9,505	4,350	1,086
Somalia	0	0	6,766
South Yemen Republic	14,008	16,632	10,248
Sudan	0	57,897	76,443
Sweden	22,946	30,220	14,771
Syria	10,870	0	0
Trucial Oman	3,761	0	0
Tunisia	11,413	11,443	3,261
United Kingdom	0	1,026	1,794
Yemen	43,061	62,017	50,093
Yugoslavia	61,360	151,722	10,421
Other Countries	434	1,618	554
Total	1,200,143	1,162,861	730,632

Kenya sugar statistics, 1967[2].—Sugar stocks at the beginning of 1967 amounted to 22,331 long tons, tel quel, to which were added production of 59,463 tons and imports of 8768 tons, as well as 30,096 tons transferred from Uganda. Of the total availabilities of 120,658 tons, domestic consumption took 119,465 tons, leaving end-year stocks of 1193 tons.

* * *

Ireland sugar imports and exports[3].—Irish sugar imports totalled 91,524 metric tons, raw value, in 1967, compared with 101,105 tons in 1966. The total included 60,394 tons from Guyana (51,604 tons in 1966), 15,914 tons from Jamaica (11,837 tons in 1966), 9199 tons from Barbados (23,010 in 1966), 4775 tons from British Honduras (7519 in 1966), and 1242 tons from other countries (7135 in 1966). Exports totalled 16,869 tons in 1967 and comprised 11,810 to the UK and 5059 to the US, while the 1966 total of 29,130 tons of sugar exports included 25,782 to the UK and 3348 to the US.

* * *

Tanzania sugar statistics, 1967[4].—Sugar stocks at the beginning of 1967 amounted to 12,824 long tons, tel quel, and production during the year amounted to 70,618 tons. A transfer of 1000 tons from Uganda brought availabilities to 84,442 tons. Of this quantity 71,299 tons were used for domestic consumption in Mainland Tanzania, leaving an end-year stock of 13,143 tons.

Brevities

Brazil sugar production, 1967[5].—The Instituto do Açúcar e do Alcool has announced that sugar production in 1967 amounted to 72·0 million bags (4,320,000 metric tons) compared with 64·7 million bags (3,882,000 tons) in 1966. Exports in 1967 amounted to 16·8 million bags (1,008,000 tons).

* * *

Uganda sugar statistics, 1967[6].—Sugar stocks at the beginning of 1967 amounted to 33,672 long tons, tel quel, and production amounted to 135,245 tons. Of this total, 30,096 tons were transferred to Kenya and 1000 tons to Tanzania, leaving 137,821 tons available. Domestic consumption took 100,892 tons, and 3662 tons were exported outside East Africa, leaving an end-year stock of 33,267 tons.

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Morocco-Poland trade agreement[7].—Within the framework of a trade agreement Morocco has bought 40,000 metric tons of Polish raw sugar for delivery in June–July 1968. Negotiations between Morocco and Brazil, reported earlier[8], are still without result.

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New cooperative sugar factories for India.—It is reported[9] that the Rajasthan Government has decided to set up two new cooperative sugar factories, one in Bundi and the other in Bhilwara district. The Industrial Finance Corporation is reported to have agreed to advance a loan of Rs. 12,000,000 to set up the Bundi factory through the State Government, and it is further reported that Rs. 5,000,000 will be advanced by the Rajasthan Government to the Bhilwara factory during 1967/68.

* * *

West Germany record campaign[10].—The results of the 1967/68 campaign in West Germany exceeded all expectations. The area planted to beet was 298,213 hectares, some 2% greater than the 292,379 ha of 1966/67, while the beet yield was the highest ever achieved, at 45·7 metric tons per hectare. A total of 13,688,807 tons of beets were sliced; about a million tons more than in 1966/67 and more than the previous record of 13,514,241 tons in 1964/65. Production of sugar amounted to 1,877,060 tons, white value, of which 1,623,655 tons was white sugar, 250,640 tons raw sugar and 2765 tons as syrup. The sugar recovery was thus 13·71% on beet, and the yield 6·33 tons of sugar per hectare, white value, or 7·03 tons/ha, raw value.

* * *

Texas sugar anniversary[11].—Imperial Sugar Company began its celebration in March 1968 of the 125th year of continuous sugar production at Sugar Land. Cane sugar production began at Sugar Land in 1843, during the days of the Republic of Texas, in the same spot where the Imperial Sugar Company's modern refinery now stands.

* * *

US mainland cane sugar production[12].—1968 sugar production in Florida closed at a record figure of 717,000 short tons, raw value. When added to the output in Louisiana of 740,000 short tons, also a record, sugar production from the mainland cane area in the USA for 1967/68 amounts to some 1,457,000 short tons, raw value.

1 *Lamborn*, 1968, **46**, 65.
2 C. Czarnikow Ltd., *Sugar Review*, 1968, (860), 71.
3 F. O. Licht, *International Sugar Rpt.*, 1968, **100**, (9), iv.
4 C. Czarnikow Ltd., *Sugar Review*, 1968, (860), 71.
5 *Bank of London & S. America Review*, 1968, **2**, 155.
6 C. Czarnikow Ltd., *Sugar Review*, 1968, (860), 71.
7 F. O. Licht, *International Sugar Rpt.*, 1968, **100**, (7), 6.
8 *I.S.J.*, 1968, **70**, 66.
9 *Indian Sugar*, 1967, **17**, 529.
10 *Zucker*, 1968, **21**, 132.
11 *Willett & Gray*, 1968, **92**, 105.
12 C. Czarnikow Ltd., *Sugar Review*, 1968, (862), 80.

Brevities

Indian cane area decline.—The Union Minister of State for Food and Agriculture has reported[1] that preliminary estimates of the area under sugar cane in India during 1967/68 had shown that it had declined by 15% compared to that of the previous season. He stated that the decline was mainly due to the unfavourable weather conditions at the time of sowing and shifting of acreage from cane to food grains.

* * *

Drought in Cuba[2].—Cuba is using part of her sugar cane harvest to produce molasses for cattle fodder instead of sugar, to help ease the current drought gripping the country. About 75,000 tons of sugar will be lost because of the switch. It was announced in Havana that about 300,000 cattle in Cuba's three Eastern Provinces faced certain death until delayed spring rains in early May broke the drought, which is said to be one of the worst in the country's history.

* * *

Brazilian bulk sugar terminal.—A new leaflet, available from the Commercial Section of the Brazilian Embassy in London, describes the new bulk sugar terminal being built at Recife in Pernambuco[3], which is due to be opened in 1970. It is to have a storage capacity of 200,000 metric tons of sugar and 10,000 cu.m. of molasses ; sugar will be received at up to 425 tons per hour and molasses at 50 cu.m./hr while discharging into ships will be at rates of 500 tons/hr and 120 cu.m/hr respectively. In 1967 sugar shipped through the port of Recife totalled 276,736 tons.

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Portuguese import programme, 1968/69[4].—The Portuguese Government has fixed a target of 193,000 metric tons as the amount of sugar to be imported for national consumption during the 1968/69 season.

* * *

US sugar imports for alcohol production[5].—Imports of quota-exempt sugar for production of alcohol totalled just under 29,000 short tons, raw value, in 1965 and 1966, but increased sharply to 187,796 tons in 1967, of which Brazil supplied 92,336 tons, Colombia 57,601 tons, the Dominican Republic 25,687 tons and Mexico 12,172 tons.

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Indian sugar mill closures.—All five mills in Madhya Pradesh have put up closure notices owing to inadequate cane availability[6]. Two of the mills propose to work during the present season, however.

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Argentina sugar production, 1967[7].—A total of 8,007,453 metric tons of cane was crxshed in the 1967 season, to yield 731,975 tons of sugar, tel quel, a yield of 9·141%. Of the sugar 611,391 tons were white sugar and 120,584 tons were raw sugar.

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Sugar cane research in India[8].—The State of Gujerat is to set up a sugar cane research centre at Navsari, to carry out research on cane and also on gur.

* * *

Trinidad Government ownership of sugar factory.[9]—The Trinidad Government has purchased a sugar factory and 4000 acres of land from Trinidad Sugar Estates Ltd., at Orange Grove. The operation of the Company will continue for the present under the management of the former owners.

Japan Sugar Imports[10]

	metric tons 1967	1966
Australia	597,219	582,567
Brazil	12,915	—
China	—	8,297
Colombia	22,554	—
Cuba	506,070	361,012
Fiji	41,436	—
Indonesia	7	39,246
Mexico	12,416	—
Philippines	—	1
Ryukyu Islands	204,534	219,647
South Africa	339,814	166,935
Taiwan	79,113	359,433
Thailand	—	974
USA	81	201
Total	1,816,159	1,738,313

Malaysia Sugar Imports[11]

	metric tons, tel quel 1967	1966
Australia	56,298	42,386
Brazil	21,126	—
China	38,696	63,455
Cuba	35,315	—
Fiji	—	11,130
Hong Kong	180	1,760
India	3,988	86,292
Mauritius	—	29,515
Singapore	2,789	830
Taiwan	73,000	8,828
Thailand	24	669
UK	658	24,576
Other countries	3,028	1,268
Total	235,102	270,709

Malaysian cane sugar project[12].—An American Company, Citadel International Corporation, is reported to have agreed to lend a Malaysian Company $8,000,000 to start up a sugar cane plantation and processing plant. The local company, named as Sharikat Kilang Gula (Tampin) Ltd., is reported to have acquired about 20,000 acres of land for sugar cane cultivation in the state of Negri Sembilan. The proposed factory would be capable of producing 750 tons of sugar a day and would begin operations in 1970. It is also reported that the Malaysian Government, meanwhile, is conducting its own inquiry into the feasibility of starting up the sugar cane industry in the country.

* * *

Dominican Republic sugar industry modernization[13]—The Executive Director of the Dominican Republic Sugar Council has recently announced that the twelve sugar factories of the country are to be modernized during the coming three years. The costs for this modernization will amount to some $15,000,000.

1 *Indian Sugar*, 1967, **17**, 665.
2 *Public Ledger*, 4th May 1968; 11th May 1968.
3 *I.S.J.*, 1968, **70**, 13, 128.
4 *Agence France-Presse*, 23rd March 1968.
5 *Lamborn*, 1968, **46**, 49.
6 *Indian Sugar*, 1967, **17**, 666.
7 *La Industria Azuc.*, 1967, **73**, 366–369.
8 *Indian Sugar*, 1967, **17**, 667.
9 *Barclays Overseas Review*, April 1968, p. 68.
10 *Willett & Gray*, 1968, **92**, 84.
11 C. Czarnikow Ltd., *Sugar Review*, 1968, (857), 56, (860), 72.
12 *Commonwealth Producer*, 1968, (424), 43.
13 F. O. Licht, *International Sugar Rpt.*, 1968, **100**, (11), 19.