THE International Sugar Journal

OCTOBER 1974

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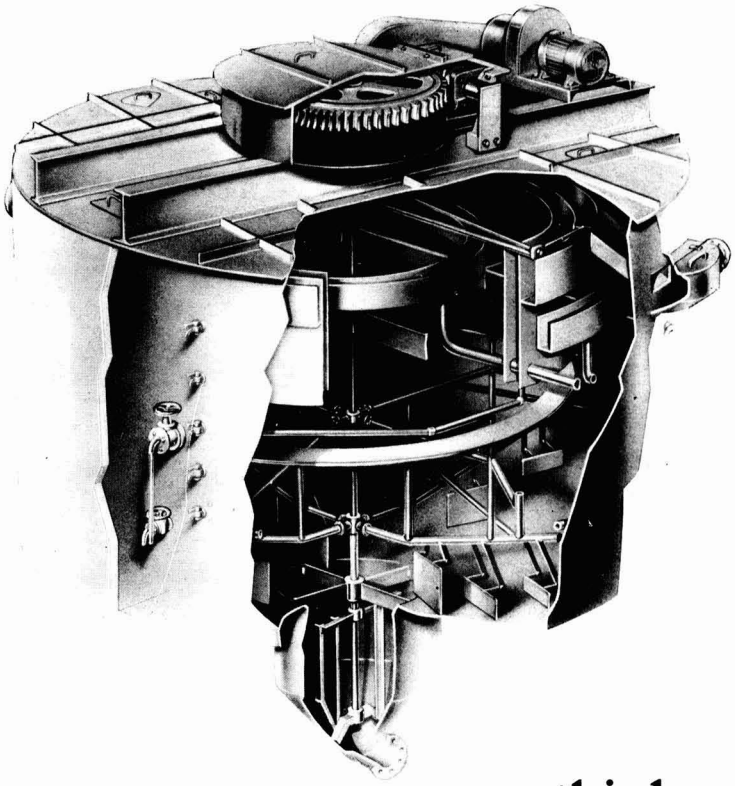

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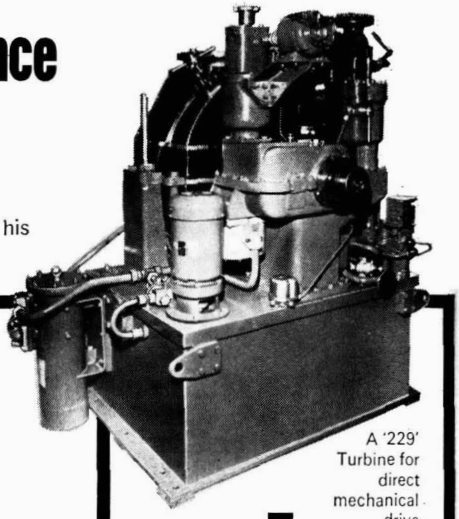

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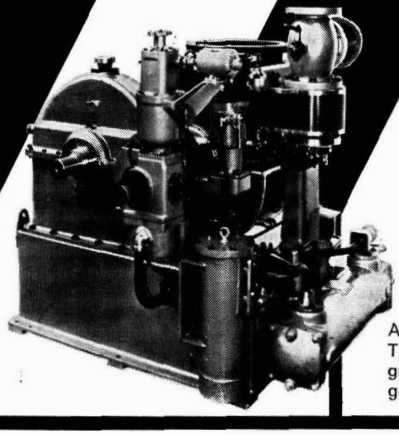

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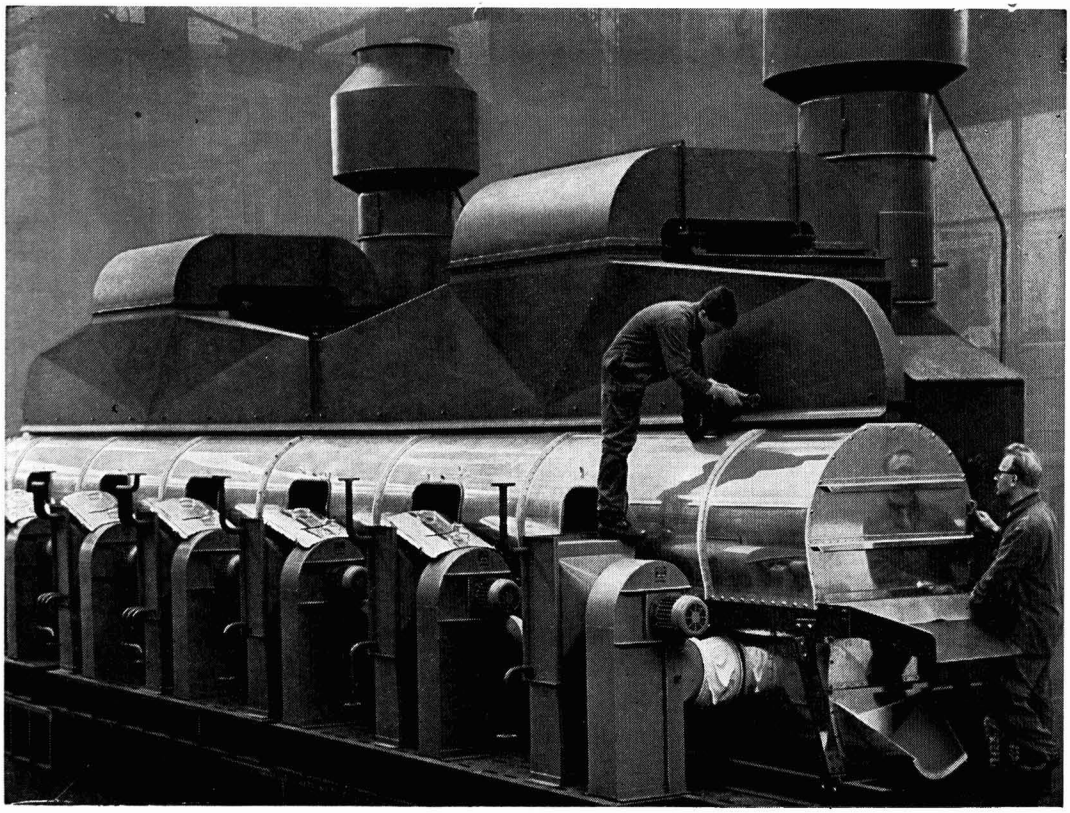

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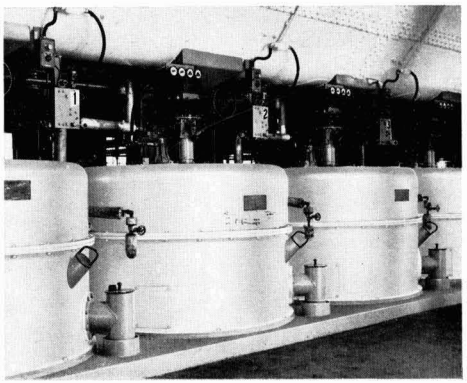

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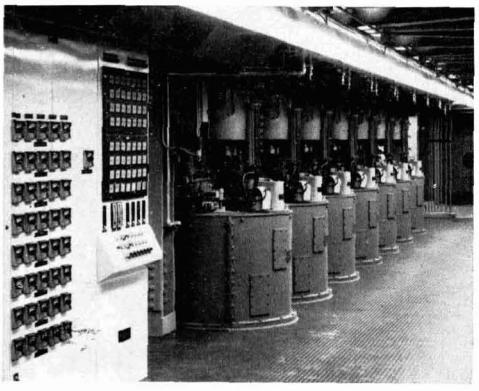

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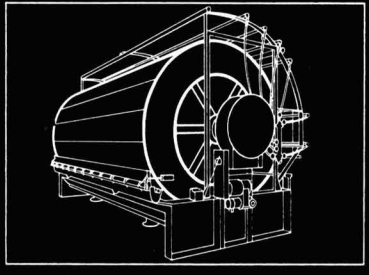

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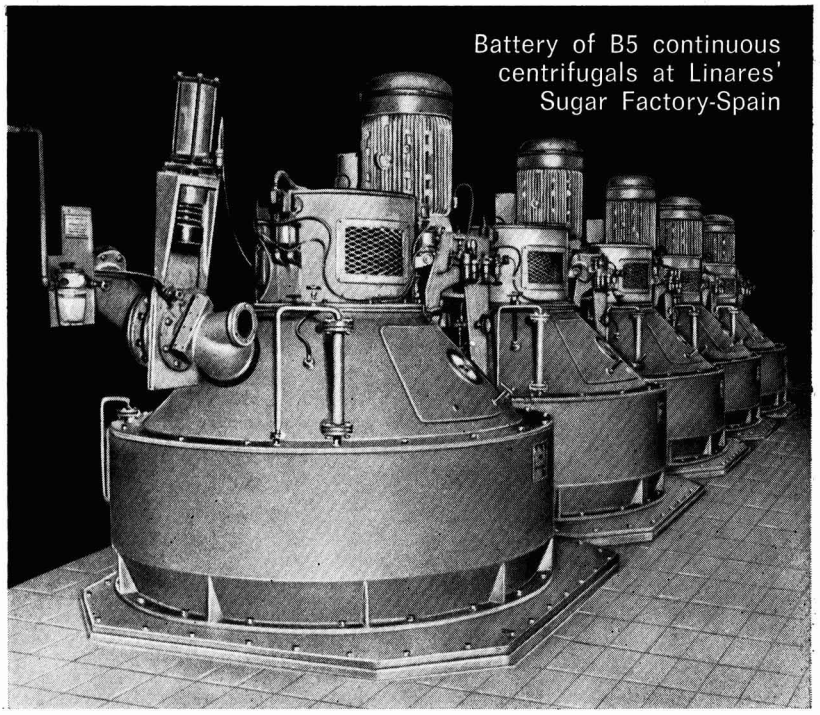

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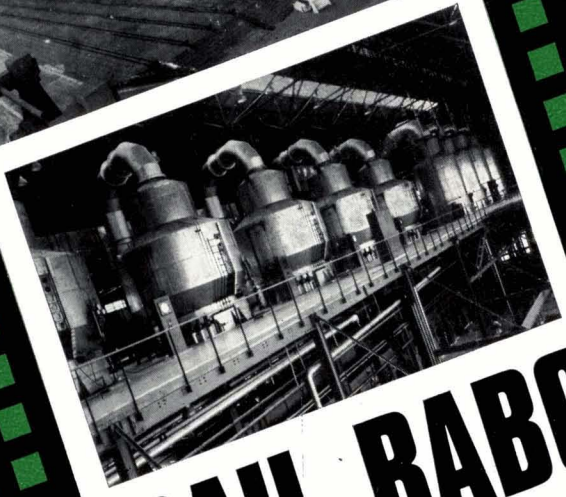

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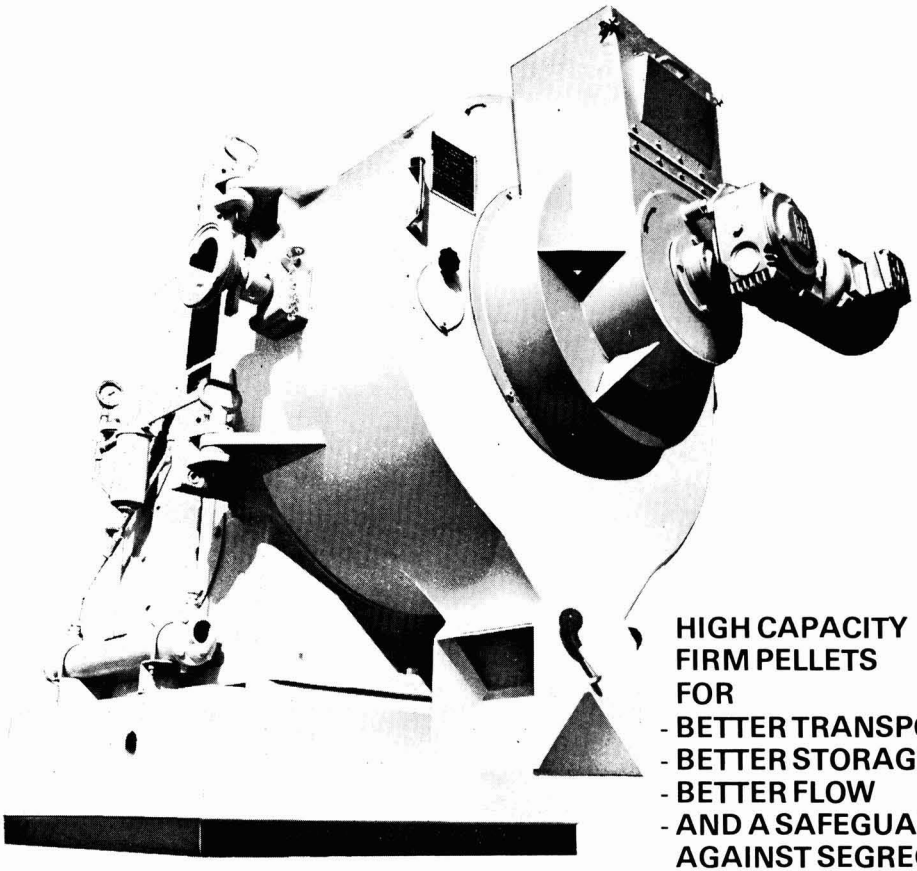

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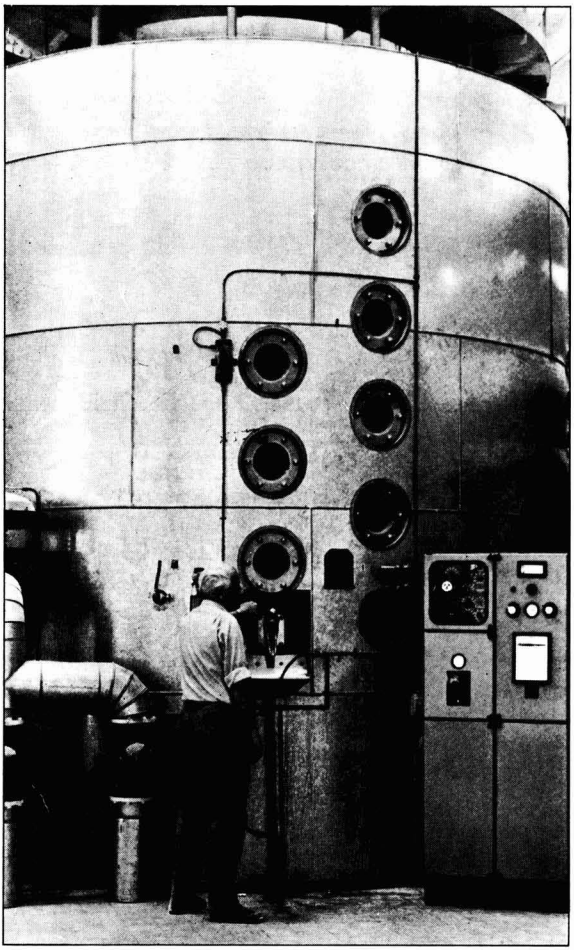

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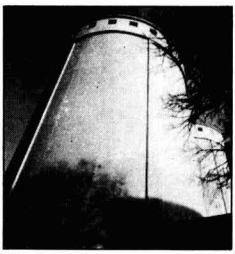

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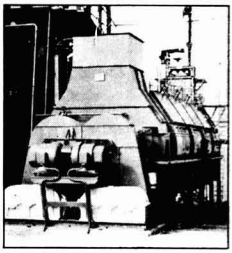

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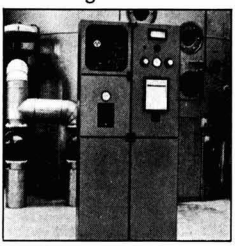

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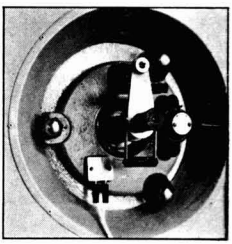

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October 1974

Contents

SOMMAIRES : ZUSAMMENFASSUNGEN : SUMARIOS

15me Congrès de la Société Internationale des Technologues du Sucre de Canne. *p.* 291–301

On donne des détails sur le 15me Congrès ISSCT qui s'est tenu du 13 au 29 juin à Durban, Afrique du Sud. On décrit les usines visitées en Afrique du Sud et dans l'Ile Maurice après le congrès, ainsi que les visites touristiques qui étaient incluses.

* * *

Effets d'activité thermophilique en diffusion de betteraves. Partie II. J. F. T. OLDFIELD, J. V. DUTTON et M. SHORE. *p.* 301–305

On discute de la mesure du nitrite comme indicateur de contrôle pour l'activité thermophilique. On décrit l'effet nuisible du imido-disulfonate formé aux dépens des jus riches en nitrite, ainsi que du nitrite lui-même. L'effet se rapporte surtout à la consommation de SO_2 à la sulfitation. On examine plusieurs moyens pour inhiber l'activité thermophilique. Le formol est considéré comme étant le meilleur bactériostat. On conclut qu'il n'est pas économique de maintenir un bas pH en diffusion par développement d'organismes thermophiliques pour obtenir une bonne pressabilité des pulpes.

* * *

La séparation des isomères du kestose par chromatographie en phase gazeuse. D. NUROK. *p.* 305–307

On décrit brièvement la séparation par chromatographie en phase gazeuse des trois isomères du kestose, trouvés dans la canne et dans la betterave (neo-, 1- et 6-kestose), sous forme de leurs dérivés triméthylsilylés. La séparation était impossible sur colonne à remplissage; par contre, en utilisant une colonne tubulaire ouverte à parois recouvertes de OV17, la séparation complète a été réalisée au débit optimum et on a obtenu une séparation partielle à des débits élevés.

---

15. Kongress 1974 der "International Society of Sugar Cane Technologists" (ISSCT). *S.* 291–301

Es werden Einzelheiten mitgeteilt über den vom 13. bis zum 29. Juni in Durban/Südafrika abgehaltenen 15. Kongress der ISSCT. In diesem Zusammenhang werden auch die in Südafrika und nach dem Kongress in Mauritius besuchten Zuckerfabriken beschrieben und Hinweise auf die übrigen Besichtigungsfahrten gegeben.

* * *

Einfluss der Aktivität von Thermophilen während der Saftgewinning auf die Verarbeitung der Zuckerrüben. Teil II. J. F. T. OLDFIELD, J. V. DUTTON und M. SHORE. *S.* 301–305

Die Bestimmung von Nitrit als Indikator für die Kontrolle der thermophilen Aktivität wird diskutiert, und der gegensätzliche Effekt von aus nitrithaltigem Saft gebildetem Imidodisulfonat einerseits und andererseits von Nitrit selbst, besonders auf den Schwefeldioxidverbrauch in der Sulfitation, beschrieben. Ferner untersuchen die Verfasser verschiedene Mittel zur Hemmung der thermophilen Aktivität. Sie halten Formaldehyd für die am besten geeignete bakteriostatisch wirkende Verbindung. Es wird der Schluss gezogen, dass es nicht wirtschaftlich ist, in der Saftgewinnung durch thermophile Bakterientätigkeit einen niedrigen pH-Wert zu halten, um eine gute Abpressbarkeit der Schnitzel zu erreichen.

* * *

Die Trennung von Kestose-Isomeren mit Hilfe der Gaschromatographie. D. NUROK. *S.* 305–307

Der Verfasser berichtet kurz über die gaschromatographische Trennung der drei in Rohr und Rübe gefundenen Kestose-Isomeren (Neo-, 1- und 6-Kestose) in Form ihrer Trimethylsilylderivate. Die Trennung war nicht an einer gepackten Saule möglich; an einer Kapillarsäule (Golay-Säule), deren Wandung mit OV17 beschichtet war, liess sich jedoch eine vollkommene Trennung bei optimaler Strömungsgeschwindigkeit und eine partielle Trennung bei hohen Strömungsgeschwindigkeiten erreichen.

15o Congreso de la International Society of Sugar Cane Technologists, 1974. *Pág.* 291–301

Se presentan detalles del 15o Congreso de la ISSCT (Sociedad Internacional de Tecnólogos de la Caña de Azúcar) que se celebró el 13–29 junio en Durban, República de Sud-Africa, con descripciones de fábricas azucareras visitado por los miembros en Sud-Africa y también en Mauricio después del Congreso, tanto como informes sobre otras vísitas turísticas.

* * *

Efectos de actividad termofílica en difusión sobre tratamiento de remolacha de azúcar. Parte II. J. F. T. OLDFIELD, J. V. DUTTON y M. SHORE. *Pág.* 301–305

Se discute medición de nitrito como indicador para control de actividad termofílica y se describen los efectos adversos de imidodisulfonato producido en jugo que contiene nitrito y también del nitrito mismo, especialmente sobre consumo de SO_2 en sulfitación. Varios métodos para inhibir actividad termofílica se han investigado y los autores consideran que formaldehido es el más convenio. Concluyen que no es económico mantener un bajo pH en difusión por desarrollo de organismos termofílicos para obtener buena calidad de la pulpa de remolacha para prensamiento.

* * *

La separación de isómeros de kestosa por cromatografía de gas. D. NUROK. *Pág.* 305–307

Se presenta una breve descripción de la separación por cromatografía de gas, en la forma de su derivados trimetilsililicos, de los tres isómeros de kestosa que so originan en remolacha y caña. No pueden separarse en una columna llenado; sin embargo se obtuvo separación completa a la velocidad óptima de flujo en una columna tubular abierta donde las paredes se han tratado con una capa de OV17, y separación parcial se logró a velocidades más alta de flujo.

THE

INTERNATIONAL SUGAR JOURNAL

VOL. LXXVI OCTOBER 1974 No. 910

Notes & Comments

World raw sugar price

The London Daily Price faltered after reaching the level of £300 per long ton c.i.f. UK and fell again to £290 on the 12th August. A new surge started on the 19th and carried the price to a new record level of £370 by the 4th September although this had fallen to £365 the following day. C. Czarnikow Ltd. referred[1] to the latest advances being sparked off by the statement by the US Secretary of Agriculture that he favoured the suspension of US import quotas for sugar for the remainder of this year; although this might well remove supply difficulties for the United States, it was felt by the trade that the absence of quotas might lead to the adsorption of sugar which would otherwise have been reserved for shipment to the world market.

The guess of E.D. & F. Man[2] is that prices will go higher still in the coming months; "The rise in the last month (an incredible £78 per ton) has happened with no appreciable change in the sugar supply/demand situation. The price rise therefore has been mostly led by sentiment or tone, the only sugar features being lack of any actuals selling pressure and an apparent willingness by buyers to pay whatever price is asked. Far too little sugar throughout the world is subject to true market factors. If farmers growing sugar cane or beet were receiving the current high prices for their efforts, vast new areas would be planted or sown. At the same time many countries throughout the world protect, by subsidy or otherwise, their housewives or sugar-using industries from present levels, and so the finest inducement of reduced consumption due to high prices is largely absent. We are forced, therefore, to conclude that prices are likely to continue to rise."

* * *

International Sugar Organization

The Consultative Sub-Committee which has been established by the International Sugar Council was to meet in London in early September. The Sub-Committee was established to facilitate discussions at a less formal level than the full Council and to establish, if desired, working groups to consider various technical aspects of a new possible Agreement.

C. Czarnikow Ltd. comment[3]: "The difficulties which multilateral sugar arrangements have encountered recently do not augur well for the rapid establishment of a new International Sugar Agreement. Current economic conditions have led certain Commonwealth countries to feel that they have no option but to ship part of the sugar which would otherwise have come to the United Kingdom to other destinations, while the US Sugar Act has failed in its task of keeping the cost of sugar within the price corridor. Meanwhile it is understood that the price which Cuba is paid by the Soviet Union has been increased to about £180 per ton, which is the second major increase since the bilateral arrangement was first agreed."

* * *

World sugar production estimates

F. O. Licht K.G. recently issued[4] their fourth estimate of world sugar production for the campaign year September 1973–August 1974. The beet crops had been completed for some time so that little change was indicated for most of these by comparison with the third estimate. The Polish figure has been raised by 77,000 metric tons, raw value, however, and the Soviet Union estimate by 80,000 tons. The US beet sugar production figure has been raised by 150,000 tons and the Moroccan estimate reduced by 40,000 tons. The total beet sugar production for 1973/74 is set at 32,675,974 tons as against the previous estimate of 32,436,500 tons and the revised 1972/73 figure of 31,321,456 tons.

The overall cane sugar production figure is set over a million tons lower than the third estimate, owing to reductions in a number of major producing countries including the USA (270,000 tons), Hawaii (100,000 tons), Brazil (217,000 tons), South Africa (100,000 tons), India (317,000 tons) and the Philippines (190,000 tons) which are not offset by increases expected in other areas including Cuba (100,000 tons),

[1] *Sugar Review*, 1974, (1194), 147.
[2] *The Sugar Situation*, 30th August 1974.
[3] *Sugar Review*, 1974, (1194), 148.
[4] F. O. Licht, *International Sugar Rpt.*, 1974, **106**, (19), 1–4.

Dominican Republic (120,000 tons) and Mexico (100,000 tons).

Total cane sugar production, according to the latest assessment, is put at 47,817,225 tons, compared with the earlier figure of 48,921,250 tons and a revised estimate for 1972/73 of 45,991,508 tons. The world total from both beet and cane, at 80,493,199 tons, represents an increase of 4·1% on the 1972/73 figure of 77,312,964 tons.

* * *

The EEC and Commonwealth sugar supplies

It has been reported[1] that a series of secret meetings has taken place between Commonwealth sugar exporters and representatives of the European sugar industries. The meetings are said to have been successful in that the beet sugar lobby is claimed to have agreed to give up its fight to prevent continued EEC access for Commonwealth supplies after the Commonwealth Sugar Agreement expires at the end of 1974. In exchange, the Commonwealth exporters would drop their demand that an EEC agreement to import 1·4 million tons of Commonwealth cane sugar should be accompanied by some limitation on Community sugar exports. There is an important qualification, however, to the second point: that the Commonwealth's abandonment of its demand for a limitation of Community sugar exports should only apply when, as at present, the world sugar market is in a period of shortage. If conditions of surplus returned, the EEC would join with others in a new International Sugar Agreement and accept a limitation of its exports along with other major sugar producers. It is felt that the conclusion of this informal agreement will mean that access for 1·4 million tons of Commonwealth sugar should now be capable of acceptance without too much difficulty, leaving price as the only major issue to be resolved between the Community and Commonwealth suppliers.

During the 3rd–5th July the British Government held a round of talks with Commonwealth sugar producers. The UK side pressed the developing sugar exporting countries to fill the 1·4 million tons quota which the British authorities have consistently urged the EEC to recognise—the shortfall is currently about 290,000 tons. The Jamaican Minister of Trade stated that the ability to supply the sugar needed was closely linked with price.

Bilateral consultations also took place between the Governments of the UK and Australia; these were concerned with the possibility of a separate arrangement for the future supply of Australian sugar, in the light of the British Government's view that the Community will need for some years an assured supply of Australian sugar to maintain a reasonable balance between supply and demand.

The EEC Commission has recently sent revised proposals to the Council of Ministers among which it reiterates its view that the Community should confirm that guaranteed access for up to 1·4 million tons should be afforded to the developing countries of the Commonwealth; however, it has not followed up the British proposals concerning privileged access for Australian sugar after 1974 and this is seen[2] as the first specific UK renegotiation demand to be firmly rejected by the EEC authorities. The Commission is apparently now assuming that the world shortage is likely to continue for several years at least. On this assumption, Community growers would be allowed to produce extra amounts to supply the EEC market under the Commission's proposals.

Moreover, at a meeting of Ministers toward the end of July, the EEC Commissioner for Overseas Development stated that, in view of the fact that some of the Commonwealth producers had not filled their CSA quotas, the figure of 1·4 million tons was no longer acceptable[3]. However, the British Secretary for Trade and Industry said that it would be impossible for the UK to accept any diminution of the Commission's figure as this was implicit in Britain's Treaty of Accession and had been pledged to Commonwealth producers by the previous British Government. Accordingly he had not found it right to accept a Community plan aimed at stabilizing the export earnings of a large number of developing countries from other primary products.

At a Conference in Kingston, Jamaica, between representatives of the EEC and a group of 44 developing countries, which started at the end of July, the French Foreign Minister put the EEC's case and confirmed that the Community was unwilling to commit itself to importing the 1·4 million tons sought by Britain for the developing CSA suppliers.

* * *

US sugar supply quota

On the 27th July, the US Dept. of Agriculture declared shortfalls in the quotas of several countries totalling 104,569 short tons, raw value. They were reallocated to other suppliers and the current quotas are tabulated elsewhere in this issue.

* * *

Brazil-China trade agreement[4]

It has been announced that a Trade Agreement is to be signed between Brazil and China, with sugar as one of the commodities to be supplied by Brazil. The Agreement is to extend for a period of three to five years and it is understood that in each of these years a quantity of up to 200,000 tons of sugar will be delivered to China. The Agreement will not adjust the overall world statistical situation as China is, in any case, an important world market buyer. Nevertheless, the arrangement will lead to a further diminution of the tonnage traded in the open market and, in view of current suggestions that Brazil will have rather less sugar available for sale this year than had earlier been anticipated, supplies in the second-hand seem likely to remain low for some time to come.

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[1] *Commonwealth Producer*, 1974, (461), 45.
[2] F. O. Licht, *International Sugar Rpt.*, 1974, **106**, (20), 6.
[3] C. Czarnikow Ltd., *Sugar Review*, 1974, (1189), 127–128.
[4] *ibid.*, 1974, (1193), 143.

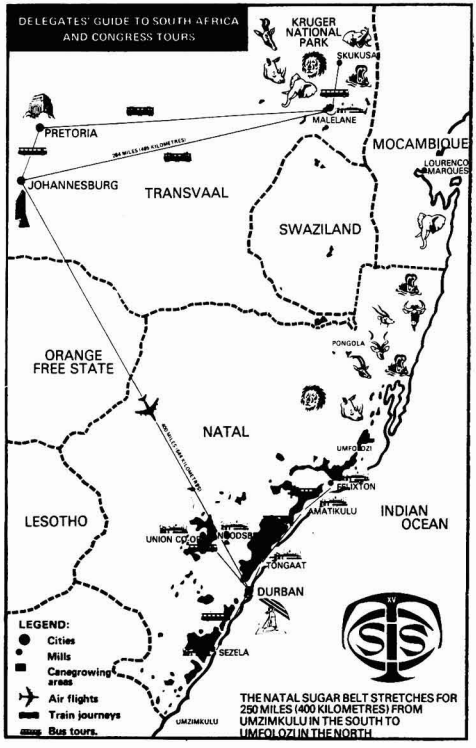
International Society of Sugar Cane Technologists

15th Congress, 1974

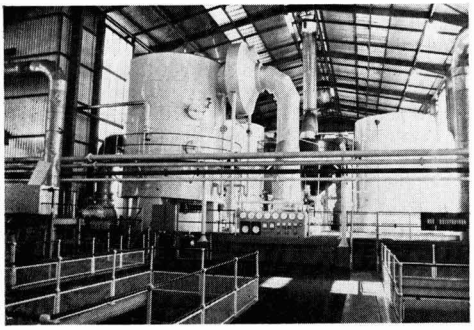
THE hallmark of the 16th Congress of the ISSCT during its Golden Jubilee year of 1974 was the superb organization, efficiency and generosity of the South African hosts. From the moment that delegates arrived at Jan Smuts Airport in Johannesburg, they met with a warm welcome from representatives of the South African Sugar Technologists Association—which more than made up for the cold weather—and similar kindness was experienced throughout the Congress.

Pre-Congress Tour

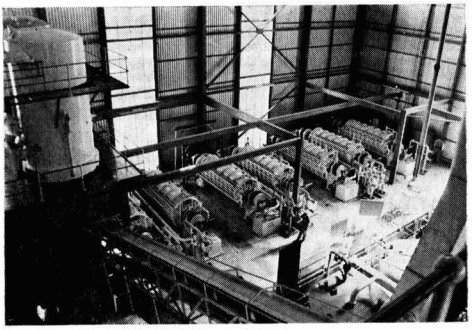
Members gathered at the Carlton Hotel during the 13th and 14th June and were provided with kits giving details of the pre-Congress travel programme, all of which had been scheduled by computer and arranged by South African Railways. Delegates and wives travelled by train and bus to the Eastern Transvaal where on the morning of the 15th June they were able to visit the Malelane sugar factory and Tenbosch cane areas of the Transvaalse Suikerkorporasie Bpk.



After through inspection of the TSB installations, the visitors were entertained to lunch served by wives of the staff, dressed in traditional Voortrekker costume, and they then returned to buses for conveyance to the Kruger National Park where some stayed in camps and other in hotels just outside. The day ended for delegates in the Park with a braavleis, or barbecue, which included giraffe meat kebab, buffalo steak and impala chops.



The pan floor at Malelane



Rota filters for carbonatated liquor in the refinery section at Malelane

A pre-dawn awakening permitted the delegates to see animals at their most active, in the early morning, and during the journeys in the Park a wide range of wild life was seen and photographed. After an exciting visit, delegates continued their journey by bus and train, reaching Pretoria on the morning of the 17th June. A short tour of this, the capital city of the Republic of South Africa, was followed by a visit to the C.S.I.R. complex where they saw the large number of departments and were shown a film describing the manifold activities of this large research organization. From Pretoria delegates continued by bus to Johannesburg and thence by air to Durban.

Meetings in Durban

The Congress proper began the next morning, with the Opening Ceremony performed at the City Hall in Durban. Delegates, numbering over 850, from 46 countries, and accompanied by over 200 wives, were welcomed by Dr. T. G. CLEASBY, General Chairman of the Congress, who spoke of the Society's history since its inception in 1924, and of the importance of the development of sugar technology. He discussed the future of the sugar industry and its problems and also the future of the ISSCT and matters to be considered during the Congress. The 1974 Congress was the biggest ever and, even with strict control, there were 212 papers to be presented. He thanked the many organizations and people who had contributed to making the Congress possible and then introduced the Mayor of Durban, Cllr. R. WILLIAMS, who spoke of his pride in the fact that his city had been chosen for one of the largest and most important Congresses ever held in South Africa. He referred to the development of Durban as a metropolis with almost a million inhabitants and as the 4th biggest port in the world.

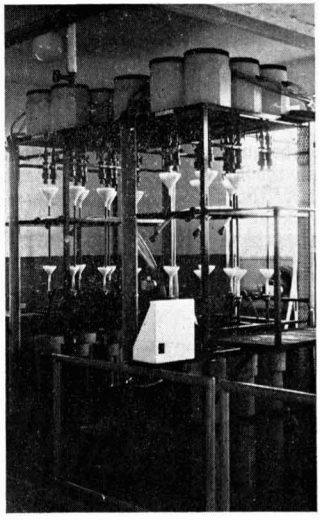
Dr. CLEASBY then introduced the Administrator of Natal, Mr. W. W. B. HAVEMANN, who welcomed ISSCT members to the Province, and also spoke of the importance of the sugar industry to Natal, offering his best wishes for the success of the Congress.

Mr. BRUCE MORRIS, Chairman of the South African Sugar Association, then welcomed members on behalf of the Association and gave information on the South African industry which, he said, was the only sugar industry controlled by Act of Parliament. The Sugar Industry Agreement governs the operation of the industry, prices, etc., and the cane growers and millers have equal say in the South African Sugar Association which administers the industry. Their cooperation has worked well, giving high productivity and growth in production of sugar. He gave further information on the South African industry and then called on the Prime Minister of the Republic, the Hon. B. J. VORSTER, to perform the Official Opening.

Mr. VORSTER, welcoming visitors to South Africa, announced that a special commemorative stamp featuring sugar was being issued to coincide with the Congress. He referred to the importance of sugar as a renewable resource providing by-products including paper and building materials, in contrast to non-renewable and vulnerable resources such as oil. South Africa was proud of her sugar industry and technologists whose work had led to her position as a leading sugar exporter. South Africa's problems provided challenges which were constantly being met to maintain this position. Mr. VORSTER described the stages reached in the development of the country in regard to its economy, agriculture, medicine, infrastructure with special mention of water conservation, and indicated how, in the past 30 years, South Africa has changed from a primarily agricultural producer to an industrial and technical economy well-placed to help other countries, particularly elsewhere in Africa. He declared the Congress open and expressed his hope that guests would enjoy their stay in South Africa and take away good memories of the country.

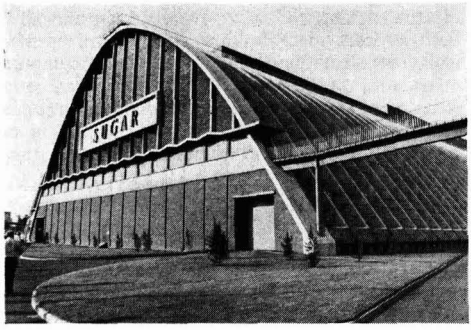
Dr. DENVER T. LOUPE, Vice-Chairman of the Congress, on behalf of overseas visitors, thanked Mr. VORSTER, Mr. WILLIAMS and Mr. HAVEMANN for their welcomes and expressed the appreciation by the Society of their presence at the opening. Dr. CLEASBY then closed the meeting, thanking members for their attendance.

In the afternoon, the factory delegates were separated into two groups who visited the Sugar Milling Research Institute and the Durban bulk sugar terminal, respectively, while field delegates were taken for a tour of the S.A.S.A. Experiment Station at Mount Edgecombe. At the S.M.R.I., delegates were able to inspect the work of the three divisions (Analytical Services, Research and Advisory) which had set up displays featuring current and recent projects

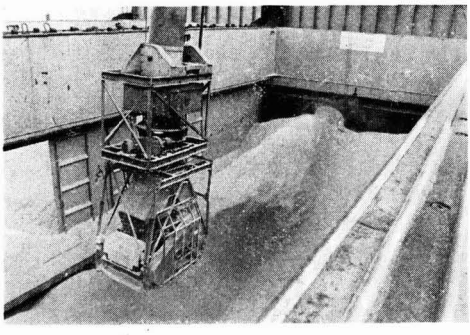


Effluent treatment experiments at the Sugar Milling Research Institute

including maintenance of sugar quality records and development of new analytical techniques, investigation of non-sugars, clarification and sugar crystallization, equipment investigations, and the training of students in sugar technology. At the terminal, the facilities for receiving very high purity raw sugar by road and rail, its weighing and storage in three silos, reclamation and purity adjustments by mixing with added high-test molasses and loading of ships in bulk (and to a small extent in bags filled in the terminal) were examined. At the Experiment Station, the research, extension and advisory services were demonstrated by the staff of the various departments concerned with cultural practices, experimental design and analysis of results, soil properties, cane breeding, pathology, mechanization and farm planning



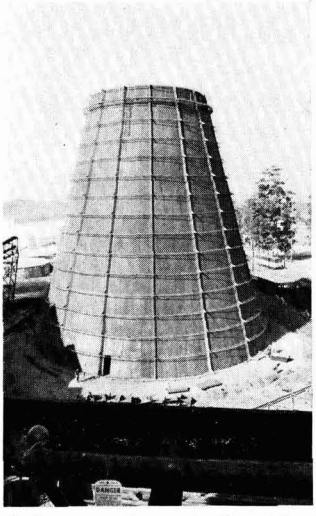
Store No. 1 at the Durban terminal



Thrower for loading bulk sugar into a ship's hold at Durban

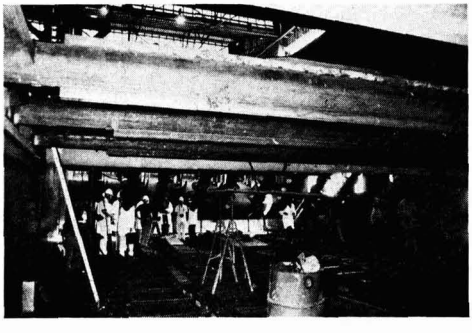
and counselling. The day ended with a reception given to delegates by the Society.

On the following day the presentation of papers began for the field delegates, with separate meetings for the Agronomy, Plant Breeding and Agricultural Engineering sections; in the evening they were entertained at a South African Cane Growers' Association cocktail party. Factory delegates visited the Amatikulu sugar factory in Zululand where they were able to inspect the equipment which includes the largest cane diffuser in the world, a 450 t.c.h. travelling-bed fixed-screen percolation-type unit built to the design of the Hulett Group. This was not yet completed but this meant that delegates were thus able to walk inside to see its construction. Other features of the factory included the pressure-feeders fitted to the mills to be used for bagasse dewatering, the internal-condenser type pans, also of Huletts design and construction, and the new bagasse incinerator under construction from below by use of circumferential lifting jacks.

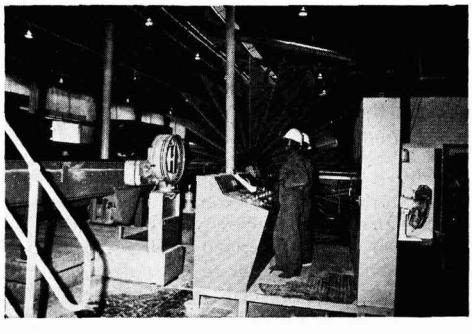


Bagasse incinerator under construction at Amatikulu

Also at Amatikulu, delegates were able to visit the Hulsakane board mill where surplus bagasse from the sugar factory is depithed, dried and baled for storage. From the store the bagasse is reclaimed, glue is added and the boards prepared in a press line which gives 8 ft × 20 ft panels of desired thicknesses which are trimmed and cooled, sanded and sawn to required sizes, after which they may be veneered. After lunch, delegates were entertained by a group of Zulu dancers



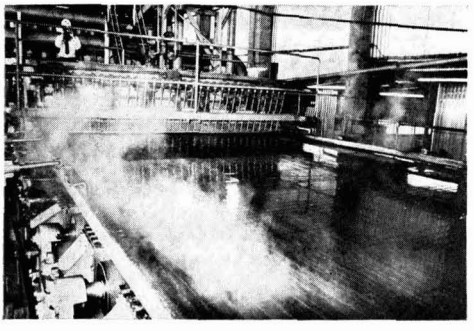
Inside the diffuser under construction at Amatikulu



Boards cooling after compression and heating at the Hulsakane plant

Zulu dancers at Amatikulu

and were later transported to Felixton, where they were able to visit another Huletts installation, Ngoye Paper Mill, where bagasse, wet-stored in bulk, is reclaimed and pulped by cooking with caustic liquor, washed and refined, with the addition of wood pulp and waste paper pulp, before conversion to brown paper.

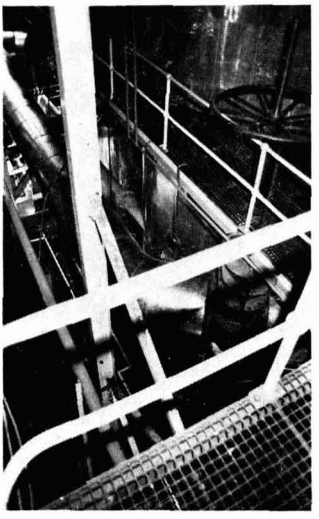


The wet paper layer at Ngoye

On the 20th June, factory paper presentation commenced, while field delegates were able to visit Tongaat Sugar Ltd. where they saw manual cutting and mechanized loading of cane on steep slopes, mechanized production and harvesting as well as extension activities among Zulu cane suppliers. They were also able to visit New Guelderland Sugar Estates, a large farm, where they were able to see underground pipe drainage, harvesting, trash mulching, fertilization and land preparation, as well as housing and amenities for the labour force and a cane transhipment zone. They were also able to visit an Indian cane-growing community to study the farming practices employed.

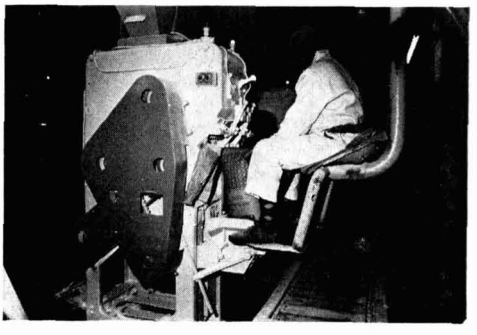
In the evening, Mr. A. A. LLOYD, Chairman of the South African Sugar Millers' Association, opened a display of sugar factory and agricultural equipment presented at the Elangeni Hotel by a range of manufacturers; this exhibition remained open during the remainder of the Congress and delegates were welcomed by representatives in attendance at the stands.

The following day, while field paper presentation continued, one group of factory delegates visited Sezela sugar factory and refinery where the Walkers turbine-driven shredder and mill tandem have a rated capacity of 36·3 tons of fibre per hour or over 300 t.c.h. The factory includes two unusual long-tube pre-evaporators and has a refinery section which



Long-tube pre-evaporator at Sezela

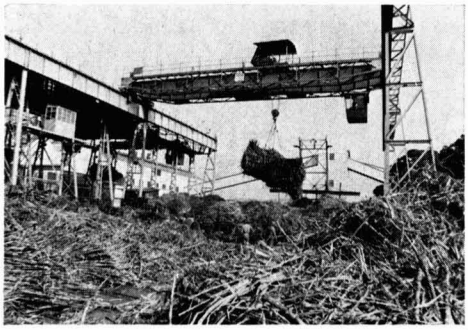
operates a melt carbonatation process to produce white sugar at the rate of 18 tons/hour. A distinctive feature is the "ship's bridge" attached to the factory which affords a view over a long stretch of the Indian Ocean shoreline. After lunch the group then visited



Filling bagged sugar at Huletts Rossburgh refinery in Durban

the Rossburgh plant of Huletts Refineries Ltd. in Durban where a wide variety of white sugars, soft brown sugar, high-test molasses, caramels and liquid sugars are produced, from a melt up to 1800 metric tons/day, using a carbonatation—bone char process.

The second group of factory delegates visited Tongaat sugar factory where they saw the Indian and African villages and facilities provided for staff as well as the two tandems crushing an aggregate of some 300 t.c.h., as against 33 t.c.h. when the factory was built 50 years ago. After their tour of the installations, the group returned to Durban where they in their turn were able to visit the S.M.R.I. The evening programme included a Civic Reception at the City Hall, given by the Mayor of Durban, Cllr. WILLIAMS.



Cane reception at Tongaat

Sugar loading into a road tanker at Tongaat

A mid-Congress break

On the following morning a number of delegates and their wives flew to Capetown for a sight-seeing tour during the week-end, visiting the castle and museum, etc. Unfortunately, wet weather prevented an ascent of Table Mountain by cable car. Another group visited Swaziland where a demonstration tour had been arranged by the Swaziland Sugar Association. The delegates remaining in Durban were invited to attend a special meeting of the Clairwood Turf Club where they enjoyed lunch and an afternoon's racing, which included a special event, the "Golden Jubilee Sugar Stakes". The Sunday afternoon programme included a short tour of Durban and an exhibition of Zulu dancing and an outstanding braavleis at Hulett's Country Club at Mount Edgecombe.

Meetings and tours continued

With the 24th June there was a return to the Congress meetings for factory delegates while field delegates visited Lee Farms at Eshowe, a high-elevation area where features included sound land use planning, efficient exploitation of cane varieties and natural resources, and conservation of rain water. By contrast, another visit was to Umhlatuzi Valley Sugar Estate where cane is farmed on relatively flat high-yielding coastal river soils. Here delegates could study the drainage problems, harvesting systems and labour accommodation. In the evening, factory delegates were entertained at a cocktail party given by the South African Sugar Millers' Association.

On the next day field delegates attended paper presentation meetings while factory delegates in their two groups visited Tongaat sugar factory and the Durban sugar terminal or Sezela sugar factory and Huletts Rossburgh refinery, depending on which they had visited earlier in the Congress. In the evening they attended a cocktail party given by the South African Sugar Technologists' Association at which a feature was the magnificent array of floral displays which decorated the City Hall. During this function, the opportunity was taken for the presentation to Mr. J. L. DU TOIT, General Secretary/Treasurer of the 15th Congress, of the Gold Medal of the S.A.S.T.A. in recognition of his meritorious service to the Association in the years of his membership.

For field delegates the next day provided the opportunity to visit Illovo Sugar Estates Ltd. for "Sugarmech 74", the latest of the annual demonstrations—static and in action—of machinery and

SUGARMECH 74

Stands and demonstrations at this show include those illustrated on the next two pages. The four columns of photographs, from top to bottom, show:

Column 1: A demonstration field for cane loaders with the Funkey-Bell loader in the left foreground; SAME tractors; International tractors and ploughs; Ford and County tractors.

Column 2: The "Gobbler" small whole-stalk harvester developed by the South African Sugar Association Experiment Station; Cameco cane loaders and harvesters; Case-David Brown tractors; and the Farmers' Organization Pty. Ltd. heat treatment tank for cane setts.

Column 3: John Deere tractors, loaders and cultivation equipment; Komatsu tractors; Metal Structures cane cultivation equipment and toolbars, etc.; and Atlas cane loaders and Farrow "Dolphin" irrigation equipment.

Column 4: Leyland tractors; Massey-Ferguson tractors and cane harvesters; Hi-Wide special high-clearance tractors; and the McConnel whole-stalk cane harvester.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equipment for cane farmers, organized by the South African Sugar Association. This was opened by Mr. W. J. F. CHANCE, Chairman of the S.A. Cane Growers' Association, who warned farmers of the need to prepare themselves for mechanization, which would involve the need to replan fields to permit the operation of harvesters and other equipment. A number of delegates then continued to a separate demonstration of the McConnel harvester, while the remainder returned to Durban to visit the bulk terminal.

Factory delegates who had spent the 26th June attending the presentation of papers went the next day to visit two more sugar factories: Union Co-operative Bark and Sugar Co. Ltd. at Dalton, and the Jaagbaan factory of Noodsberg Sugar Co. Ltd., also near Dalton. The first originally was a wattle extract plant, and has since been adapted for sugar manufacture; features include the BMA diffuser installed for extraction of cane sugar, while at Jaagbaan extraction is by means of a Fives-Lille tandem of electrically-driven mills. Both juice and syrup are clarified at Jaagbaan and there is access to a C.S.I.R. data logging computer. Field delegates attended paper presentation meetings during the day and both groups were able in the evening to attend a lecture and demonstration of African music by Mr. H. TRACEY.

The final papers of the Congress were presented to meetings of factory delegates on the 28th June while field delegates visited the Experiment Station for Committee and Section meetings, taking the opportunity to visit the plant breeding complex and adjacent fields, the pathology glasshouse, the insectary and laboratories, the root laboratory, etc.

The plenary session

On Saturday the 29th June began the final plenary session of the Congress; this was opened by Dr. CLEASBY who introduced Mr. H. F. OPPENHEIMER, Chairman of the Anglo-American Corporation, whose keynote speech described the history of industrial development in South Africa which dated from the discovery of gold and diamonds in the country. High wages were necessary to attract the skilled European miners and engineers needed for exploitation of the mines, yet the value of the work of the unskilled low-productivity black labour force was such that only low wages were appropriate, creating a large wage differential which still remains although from the end of the boom in 1970 it has become apparent that for future development of the country a much larger force of skilled workers is necessary and this will have to include black workers. Productivity increase is essential but this needs continuity of employment and education, and this is incompatible with the separation of white and black populations and the continuance of the migrant labour system. Special problems in the gold industry, arising from a fixed price for more than a generation but with constant inflation, had hindered development and education, but its future was secure. There is tremendous scope for growth in South Africa and the realization of the limitations caused is resulting in a change in social attitudes over a wide range of parties and people. An active Parliamentary system exists in South Africa which can permit peaceful change and Mr. OPPENHEIMER is optimistic about this evolution and the future of his country. He expressed his hope that delegates would return to their own countries more aware of the complexities of the problems involved, of the goodwill of South Africans, and would feel that the country was worthy of friendship and support. Mr. J. M. PATURAU of Mauritius, in response to Mr. OPPENHEIMER, thanked him for his interesting and thought-provoking exposé.

In his report as General Secretary/Treasurer of the 15th Congress, Mr. J. L. DU TOIT described the growth of the Society to a membership of 2065 compared with 1558 in 1971 and 1156 in 1968. He believed that the introduction of *Newsletters* between Congresses had contributed to this growth and hoped they would become a permanent feature. Attending the Congress were 853 members from 33 regions including seven new regions (Belgium, Costa Rica, Holland, Malawi, Peru, Salvador and Thailand). The papers had been pre-printed and after edition would be incorporated in a two-volume *Proceedings*. He reported on the state of assets held for the Society in the care of the Custodian at the H.S.P.A. Experiment Station in Hawaii, amounting to $23,310.96.

Mr. C. W. DAVIS, presenting the report of the Constitution Committee, proposed that the membership fee be raised to $50 to cover the cost of printing the *Proceedings*, and this was carried by the assembly. An anomaly in the status of life members was corrected and five new life members were elected, viz. O. WIEHE, E. HUGOT, H. W. KERR, K. DOUWES DEKKER and J. L. DU TOIT.

The report of the Resolutions Committee was presented by Mr. DUDLEY SMITH: of the resolutions proposed and accepted, perhaps the most unusual was that an expedition be arranged into New Guinea and West Irian to gather new varieties of cane to provide germ plasm of value in breeding; up to $15,000 from ISSCT funds was to be released for part-financing.

An invitation from Brazil to act as host country for the 16th Congress was presented by Dr. G. M. AZZI and was accepted by the Congress; officers were then elected, including Dr. H. MORGANTI as General Chairman, J. L. DU TOIT as Vice-Chairman and Sr. H. ANTUNES as General Secretary/Treasurer.

Dr. CLEASBY then thanked all the authors of papers, section chairmen, hotel management, transport organizers, translators, the estates and sugar factories visited and then closed the Congress.

In the evening, members attended the Congress Banquet which was held in a transformed No. 1 store of the bulk sugar terminal. Entry was through a passageway decorated with plants, and recordings of bird noises were played to correspond with the stuffed birds mounted on the plants. Inside the

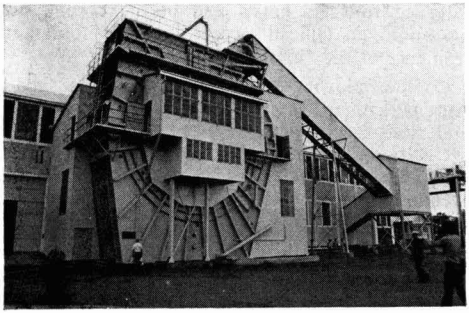
reception area was a miniature lake with a sailing boat and lighting was arranged to provide the impression of a tropical sunset. The dining area was between two large mounds of sugar and entertainment was provided by the Band of the South African Air Force during the meal and by cabaret artists afterwards. The Guest of Honour was the State President of South Africa, the Hon. J. J. FOUCHE, who addressed the gathering, as did Dr. CLEASBY, who bade farewell to members leaving South Africa the following day.

Post-Congress Tour

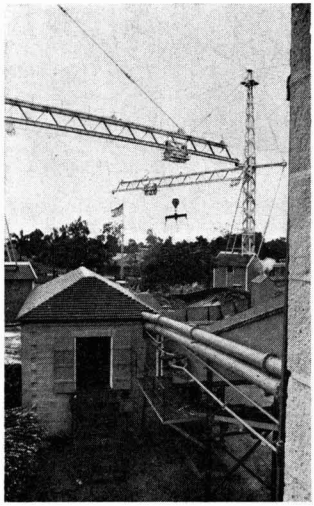
Specially chartered aircraft brought over 200 members, accompanied by a number of wives, from Durban to Plaisance Airport, Mauritius, during the morning of Sunday 30th June and they were then separated into field and factory groups, the first staying at Le Morne in the south-east of the island and the second at Trou-aux-Biches in the north-east. An early start was made the next morning, field

The mill house at F.U.E.L.

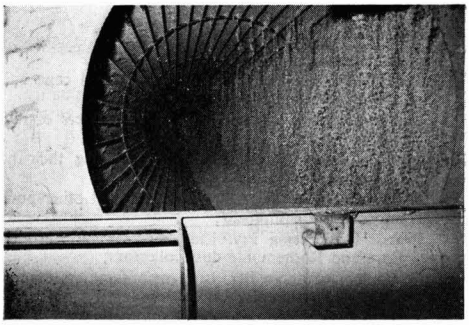
Flowering cane in Mauritius



The Saturne cane diffuser at St. Antoine Sugar Estate, Mauritius



Cane fed to the carrier at Highlands Sugar Estate, Mauritius



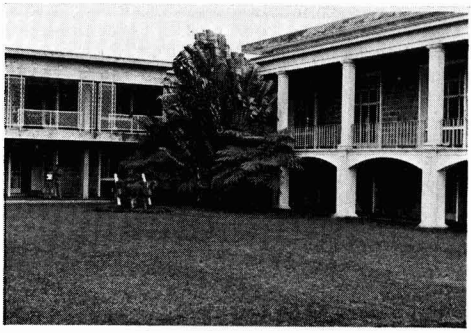
Sugar dryer at Highlands Sugar Estate

delegates visiting Belle Vue Mauricia and Beau Plan estates, while factory delegates visited F.U.E.L. (Flacq United Estates Ltd.) After lunch, delegates

returned to their hotels and in the evening were invited to an Official Reception at Le Réduit, the residence of the Governor-General.

On the following day the factory group visited St. Antoine Estate where they inspected the sugar factory and plant for making bagasse particle board. Field delegates were taken to Constance-La Gaieté estate after which they returned to their hotels where in the evening they were entertained by an exhibition of the local "Sega" dancing.

The last day of the post-Congress tour provided a number of alternatives and field delegates were able to visit Médine Estate while factory delegates visited Highlands sugar factory. In addition both groups were able to visit the Sugar Industry Research Institute where they were welcomed by Mr. ROBERT ANTOINE, Director and Regional Vice-Chairman of the ISSCT, and by Mr. J. DUPONT DE R. DE ST. ANTOINE, Deputy Director and organizer of the factory delegates' tour. Both groups were also able to visit a demonstration of the feed lot and cane derinding machine from Canadian Cane Equipment Ltd. which is undergoing tests at Richelieu Experiment Station.



Mauritius Sugar Industry Research Institute, with primitive stone mill roller

Rocks in Mauritius cane field

ISSCT STATIC DISPLAY

Companies exhibiting at the display of factory and field equipment held in the Elangeni Hotel, Durban, during the Congress included the following:

Johannes Schuback & Sons (S.A.) Pty, representing Dr. W. Kernchen and featuring the Sucromat automatic saccharimeter;

F. W. McConnel Ltd., manufacturers of cane harvesters and loaders;

Massey-Ferguson Export Ltd., manufacturers of cane harvesters and cultivation equipment and featuring a mobile training unit;

Wright Rain Ltd., manufacturers of irrigation equipment and pumps, etc.;

John Deere, manufacturers of tractors and cane cultivation equipment;

United Electronics Corp. Ltd., manufacturers of radio transceivers;

A/S De danske Sukkerfabrikker, featuring their pan boiling control equipment;

Renold Ltd., manufacturers of chains and other power transmission equipment;

Brandt Engineering Pty. Ltd., representing Eurodrive gears and Rothemühle dust collectors;

Computer Advances Pty. Ltd., manufacturers of computers and terminals;

Siemens AG., featuring their automatic pan boiling equipment;

McKinnon Chain Ltd., manufacturers of chains and cane slings;

Ciba-Geigy AG., featuring their weed control chemicals;

A.P.E. Ltd., featuring Allen turbines and pumps;

May & Baker Ltd., manufacturers of weed control chemicals;

Vivians Ltd., representatives for Saunders valves, Harland pumps, Mintex friction materials and Fuchs electrical equipment;

Hewlett-Packard, manufacturers of computers and calculators;

Tate & Lyle Enterprises Ltd., manufacturers of chemicals for sugar refining, enzymes for clarification, colorimeters, control equipment, etc.;

G.E.C. Ltd., featuring electric motors;

FG Licence (Pty.) Ltd., representing Flexible Drives scale cleaning equipment;

Krauss-Maffei, manufacturers of bagasse paper plant;

Fischer & Porter GmbH., manufacturers of automatic boiling control equipment;

E. L. Bateman Ltd., representing Dorr-Oliver Co., Edwards Engineering Corp., Stork-Werkspoor Sugar B.V., Veco centrifugal screens, Western States Machine Co., all well-known manufacturers of sugar equipment;

S.A. Furnace Pty. Ltd., representing Goodyear rubber belts for cane carriers and other conveyors;

Metcon, representing Don Mizzi cane harvesters, Santal cane loaders, SAME tractors, etc.;

Bishop Process Equipment Inc., manufacturers of cane pelletizing equipment for animal feed production;

Daimler-Benz AG., manufacturers of Mercedes-Benz trucks, tractors and the Unimog multipurpose vehicle; and

SPM Corporation, manufacturers of equipment for bagasse board and paper production.

Stord Bartz Industri a·s

C. Sundtsgt. 29 Bergen, Norway

The final function of the tour was the Farewell Banquet at Le Morne, in the presence of the Chief Justice of Mauritius, representing the Governor-General, and a number of Mauritius Government Ministers. Mr. ANTOINE addressed the overseas visitors and hoped that their short stay on the island had been entertaining and instructive and he looked forward to welcoming them again on another occasion. The evening concluded with a fashion show by a local designer and dancing, after which delegates prepared for return to their own homes, with vivid memories of the remarkably clean and efficient sugar factories and the rock-strewn cane fields of the island.

Effects of thermophilic activity in diffusion on sugar beet processing

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

Paper presented to the 22nd Tech. Conf., British Sugar Corp. Ltd., 1974.

PART II

Nitrite production by thermophilic bacteria

Sugar beet does not contain measurable quantities of nitrite and it appears that the presence of nitrite in raw juice was not suspected prior to 1957. In that year, however, a few strikes of first product sugar at one factory had to be remelted owing to the presence of traces of a potassium salt which had co-crystallized with the sugar. This material was subsequently identified as potassium imidodisulphonate[11] which is not a component of beet, and the only reasonable route leading to the synthesis of imidodisulphonate involved reaction with nitrite. Accordingly it was deduced that nitrite was a constituent of at least ~~some~~ samples of raw juice[11].

The imidodisulphonate was not positively identified until after the close of the 1956–57 campaign and so this deduction could not be confirmed immediately, but it was found that raw juice produced in the laboratory micro-batterydid not contain nitrite and no chemical reactions leading to nitrite production could be initiated. It was therefore postulated that the nitrite must be produced by microbiological synthesis and this possibility was investigated in the following campaign[6,12].

It was then found that raw juice produced in the absence of bacterial activity has a nitrite content of less than 1 ppm whereas the raw juice at some factories frequently contains 2–15 ppm of nitrite nitrogen and occasional samples of 25–45 ppm have been found[12]. In the factory, bacteria could cause the formation of nitrite in one of two ways:

(*a*) by the oxidation of ammonia
(*b*) by the reduction of nitrate.

Of these alternatives, the latter was considered the more likely as, at the temperatures prevailing in all of the diffusion systems, activity by nitrifying organisms would probably be suppressed.

Sugar beet do contain nitrate, while the nitrate nitrogen concentration may vary from about 20 to 200 ppm with an average level at 120 ppm. There is a similar wide variation in the nitrate nitrogen content of raw juice with an average value of 100 ppm.

The results of a metabolic study, using nitrite-free raw juice inoculated with soil and incubated at 65–70°C, demonstrated that the nitrite in factory raw juice does arise as a result of nitrate reduction by the thermophilic bacteria[6], and the different phases of activity provide an explanation for the large variations of nitrite level found in factory juices.

Raw juice inoculated with soil and incubated at 65°C initially undergoes a lag phase lasting about 3½ hours after which nitrate reduction and acid production commence, the nitrite production normally becoming established before significant amounts of lactic acid are produced. In an isolated system the nitrate level soon falls to zero as a result of nitrite production but nitrite is not the final product; it is itself still further reduced, in part to nitrogen.

As the complete reduction involves loss of an anion, the early stages of thermophilic fermentation may lead to a small rise in pH before the fall caused by the later production of lactic acid. If the temperature is not too high in diffusion, the counter-current system can permit the bacteria to remain permanently in the active phase with no lag period and, as the fresh cossettes provide a continuous source of nitrate, nitrite can accumulate in the raw juice

Since the nitrite is easy to measure[13] and accumulates in the juice before very much lactic acid has been formed, it can be used as a sensitive indicator for

[11] CARRUTHERS *et al.*: *Paper presented to the 10th Tech. Conf., British Sugar Corp.*, 1957; *I.S.J.*, 1958, **60**, 113.
[12] *idem*: *Paper presented to the 11th Tech. Conf., British Sugar Corp.* 1958,; *Zeitsch. Zuckerind.*, 1959, **84**, 197–199.
[13] BUCKETT, DUFFIELD & MILTON: *Analyst*, 1955, **80**, 141.

control of thermophilic activity in the diffuser. Indeed, if mineral acid is injected towards the head of the diffuser to improve pressing, monitoring of nitrite content may be the only practicable routine procedure for assuring freedom from thermophilic infection.

Formation of aquo-ammono sulphuric acids

It is extremely rare for conditions to permit the production of imidodisulphonate in sufficient quantity, and at a sufficiently early stage in the beet process, to initiate co-crystallization of potassium imidodisulphonate with first product sugar. Nevertheless, examination of evaporator juice and sugar end syrups demonstrated that imidodisulphonate is almost universally present, at least in trace amounts, in all liquor subsequent to sulphitation[12].

Imidodisulphonate is one of a family of aquo-ammono sulphates:

(i) nitrilo-sulphonate $N(SO_3^-)_3$

(ii) imidodisulphonate $HN(SO_3^-)_2$

(iii) sulphamate $H_2N{-}SO_3^-$

The related members can be obtained by successive hydrolysis of the fully substituted nitrilo-sulphonate and it is probable that this compound is a short-lived intermediate in the production of imidodisulphonate in beet process juices. Nitrite and bisulphite ions react readily to form nitrilo-sulphonate which rapidly decomposes to form imidodisulphonate which is stable to further hydrolysis except in acid conditions. As the sulphur dioxide in juice exists as an equilibrium mixture of sulphite and bisulphite ions, with the equilibrium displaced far towards sulphite in alkaline conditions, it is remarkable that traces of imidodisulphonate are formed from nitrite-containing juice, even in the relatively alkaline conditions in the sulphur tower. Probably localized conditions of lower pH exist to favour the reaction. As the pH falls during the process and in the sugar end, the production of sulphur dioxide in the bisulphite form becomes greater, though still small, and the rate of reaction with nitrite becomes more rapid so that, except in factories operating at high pH in the sugar end, it is unusual for any nitrite to remain as such in the final molasses.

The potassium salt of imidodisulphonic acid is relatively insoluble and so, as the potassium concentration increases in the lower syrups at the sugar end, crystallization of potassium imidodisulphonate could occur if the imidodisulphonate content is high. Co-crystallization of potassium imidodisulphonate with the after-product sugars can be remedied by passing the sugar back to the liming and carbonatation stages, in which the imidodisulphonate is eliminated, but the difficulties associated with this co-crystallization are much more readily avoided by preventing the nitrite production by thermophilic activity in diffusion.

Wastage of sulphur dioxide due to nitrite formation

As the thermophilic bacteria which reduce nitrate to form nitrite can also reduce the nitrite further to nitrogen and other products[6] the concentration of nitrite does not continue to increase even when the thermophilic activity is high because the juice ultimately becomes depleted of the nitrite precursor.

Occasional nitrite nitrogen levels of 25–45 ppm have been measured in second carbonatation juice but the thermophilic activity is more usually responsible for production of nitrite nitrogen in the range 2–15 ppm. Such a nitrite production may be thought to be of little importance, particularly if co-crystallization of potassium imidodisulphonate with the sugar does not occur. In white sugar factories, however, virtually all of the nitrite in second carbonatation juice is decomposed chemically in the later stages of the factory process. In the evaporation and crystallization stages the nitrite reacts with the sulphur dioxide absorbed in the juice to form aquo-ammonosulphates, particularly imidodisulphonate, and in this reaction further sulphur dioxide is oxidized to sulphate. On average the presence of 1 ppm of nitrite nitrogen in thin juice has been found to result in consumption of some 8–11 ppm of sulphur dioxide in reactions of the type

$$NO_2^- + 3HSO_3^- \longrightarrow HN(SO_3^-)_2 + SO_4^{--} + H_2O$$

Thermophilic activity in diffusion to produce a nitrite nitrogen level of 10 ppm in thin juice may therefore result in a wastage of 25% of the sulphur burnt in the factory. A wastage of 25% of the sulphur burnt does not merely reduce the efficiency of sulphitation by 25% because the colour suppressant action of sulphur dioxide is not linear with respect to concentration. The non-linear relationship, shown in Fig. 1, can be demonstrated by heating a simple artificial syrup, buffered with sodium bicarbonate at pH 7·8, containing 60% sucrose and 0·3% invert. If such a syrup is heated at 85°C for 17 hours without added

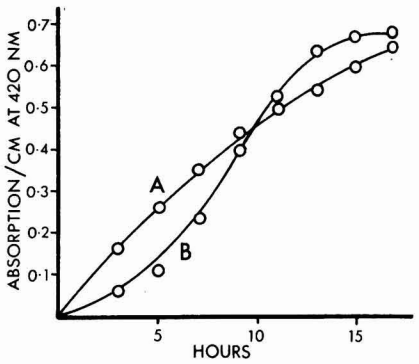


Fig. 1. Variation in colour production with time of heating, at 85°C, 60°Bx syrups containing 0·3% invert. (A) No sulphite present. (B) Initial sulphite concentration 50 ppm SO_2

sulphur dioxide, there is a steady increase in colour owing to the alkaline degradation of the reducing sugars.

In contrast, if similar heating at the same pH is carried out in the presence of 50 ppm of sulphur dioxide, the colour production is greatly suppressed at first but after about 3 hours' heating some colour formation commences; but now the colour formation is much more rapid than occurred in the absence of sulphur dioxide so that after 10 hours the colour of the syrup is the same regardless of whether or not sulphur dioxide had been present[14]. If the initial sulphur dioxide is increased to say 100 ppm, there is a longer interval before perceptible colour formation occurs but again the full colour is developed within 17 hours. This effect can be examined in a different way by measuring the colour production after 17 hours for initial syrups all containing 0·6% invert but differing amounts of sulphur dioxide as shown in Fig. 2. Small amounts of sulphur dioxide up to about 150 ppm have virtually no effect on the final colour but thereafter increasing amounts of sulphur dioxide give considerable successive improvement in colour suppression until about 300 ppm of sulphur dioxide is present. Beyond this, further additions of sulphur dioxide give no improvement, although even at this stage a small amount of colour is still produced[14].

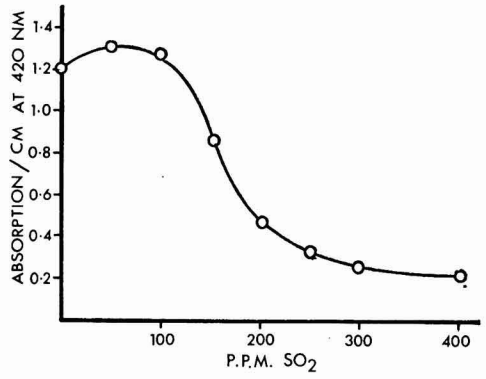


Fig. 2. Effect of initial sulphite concentration on the colour produced as a result of invert sugar degradation at 85°C in 60°Bx syrup containing 0·6% invert

A similar non-linear pattern is obtained on heating thin or thick juice with varying amounts of sulphur dioxide and it appears that for any given degradation demand there is an optimum amount of sulphur dioxide for effective colour suppression. To use a larger amount of sulphur dioxide gives very little benefit but colour suppression deteriorates rapidly if the addition falls short of this optimum and half of the optimum amount may serve little useful purpose.

Attempts to produce a small amount of acid by thermophilic bacteria to aid pulp pressing either result in a continued vigorous fermentation producing excessive amounts of acid or else periods of excessive bacterial activity alternating with periods of low activity. Both of these situations give rise to an irregular and unforseeable pattern of nitrite production by the thermophilic bacteria.

To cope with this situation, the factory can either use an excessive amount of sulphur dioxide so that even when nitrite production is high the residual sulphur dioxide is not less than the optimum for colour supression, and in this case the extra sulphur dioxide will be of little value when the nitrite level is low, or alternatively the sulphur dioxide usage can be kept just in excess of the optimum level, in which case the removal of even small amounts of available sulphur dioxide by reaction with nitrite will cause a substantial rise in colour production.

Even small amounts of nitrite production by the thermophilic bacteria can therefore be responsible for a serious reduction in the efficiency of the sulphitation process.

Inhibition of thermophilic activity by bacteriostats

The activity of thermophilic bacteria can be suppressed by raising the temperature or by the addition of chemical bacteriostats. Complete suppression of the bacteria by heat is hardly practical since a temperature of at least 80°C would be necessary[15] and at such temperature, losses of pulp marc would be excessive. When thermophilic activity is allowed to develop in continuous diffusers it can normally be detected in samples from any of the compartments with the region of most intense activity being between the centre and the head of the diffuser. It is clear therefore that any chemical bacteriostat added must reach all compartments and particularly this region of highest activity.

Formaldehyde is particularly suitable for this purpose because it is not inactivated by contact with raw juice or pulp. The usual factory practice is therefore to employ a moderately high diffusion temperature of about 68–73°C in combination with formaldehyde addition. Most factories with continuous diffusers have facilities for adding formaldehyde into compartments approximately one-third, halfway and two-thirds of the way down the diffuser in order that the bacteriostat may reach all compartments.

In practice the pipeline feeding formaldehyde into the region two-thirds of the way down the diffuser is rarely used because infection in this region is not normally serious. Additionally the pipeline feeding the region one-third of the way down the diffuser and even the line to the mid-point are often closed to allow some activity to produce lactic acid and so improve pulp pressing.

It has been shown in the laboratory that a level of 50 ppm of formaldehyde is normally effective in suppressing thermophilic activity in juice[16]. This is

[14] CARRUTHERS *et al.*: *Paper presented to the 8th Tech. Conf. British Sugar Corp.*, 1955; *I.S.J.*, 1956, **58**, 22.
[15] *idem: Paper presented to the 14th Tech. Conf. British Sugar Corp.*, 1961; *I.S.J.*, 1961, **63**, 285.
[16] OLDFIELD *et al.*: *I.S.J.*, 1968, **70**, 296–298, 330–332.

approximately equivalent to 37 lb of 30% (w/w) formaldehyde per 100 tons of beet if made as a continuous addition. In fact continuous addition is discouraged because bacteria build up resistance to low concentrations of formaldehyde and it has been found more effective to shock-dose or to make discontinuous additions every 2 hours of 5 gallons of formaldehyde into each of two compartments over a period of 20 minutes for a factory slicing 4000 tons of beet per day. Such additions, corresponding to 33 lb of 30% (w/w) formaldehyde per 100 tons of beet, give localized concentrations of approximately 300 ppm of formaldehyde and have been shown to control the pH effectively.

Sulphur dioxide has been shown to be less effective than formaldehyde in suppressing thermophilic activity and has been found to be less persistent because it is more readily oxidized. Thus it has been shown that more than 300 ppm of sulphur dioxide was required to achieve suppressant effects similar to those achieved by 50 ppm of formaldehyde[16]. On the other hand sulphur dioxide is used at some factories instead of sulphuric acid to control the pH of diffusion supply water and at these factories some benefit is gained from its bacteriostatic effect. Because sulphurous acid is a weak acid it is necessary to add half as many moles again as sulphuric acid to achieve the same pH drop but the resultant diffusion supply water is more highly buffered so that the lower pH can be maintained further down the diffuser with sulphurous acid.

Chlorine is a very efficient bactericide in water containing little organic and inorganic matter and its instantaneous bactericidal effect in juice has been demonstrated but it has been found to be inactivated rapidly by reaction with juice components[15] so that the inhibitive effect of chlorine could not be transmitted through a diffuser. From time to time other chemical bacteriostats have been tested in comparison with formaldehyde but have been rejected either on the grounds of increased cost (e.g. dodecyldiaminoethylglycine) or on the grounds of possible toxic hazards (e.g. sodium azide).

It is concluded that of the available chemical bacteriostats formaldehyde is the most effective and persistent and, because it is a liquid, it is relatively easy to add. It is also relatively cheap. The most effective way to add formaldehyde is to shock-dose or to add rapidly by pumping discontinuously.

Fate of formaldehyde

It is essential that any chemical treatment to suppress thermophilic activity should leave no taint, odour or toxic residues in any of the products of the sugar factory. It is also desirable that sensitive methods of analysis should be available in order that the stability of potential bacteriostats may be studied.

In battery diffusers it was common to employ heavy formaldehyde dosing at the water end but the use of formaldehyde at the juice end greatly increased with the adoption of continuous diffusers and much of this formaldehyde is carried forward in the raw juice to process.

In an investigation of the fate of this formaldehyde[17] it proved possible to measure formaldehyde concentrations down to levels of less than 10 ppm in raw juice by the method of NASH[18] which depends on the synthesis of diacetyldihydrolutidine by the Hantzsch reaction between formaldehyde and acetylacetone in the presence of excess ammonium salt. Unexpectedly it was found that very little of the formaldehyde reacts with pulp constituents in the diffuser and only small amounts combine irreversibly with juice constituents or combine in the reversible condensation with amino-acids. The greater part is carried forward as free formaldehyde into the raw juice to process.

When formaldehyde was treated alone in aqueous solution at 80°C with milk-of-lime, under the conditions corresponding to batch carbonatation, only a slow decomposition occurred at first but thereafter the formaldehyde was rapidly decomposed, the concentration falling to zero with an almost equivalent production of reducing material. This reducing material itself was then decomposed.

The nature of the decomposition products was studied by liming and carbonatation of raw juice containing formaldehyde labelled with ^{14}C. About 70% of the formaldehyde could be accounted for as radioactive acidic products in the carbonatation juice. These acidic products were separated by electrophoresis and detected by autoradiography and proved to be simple carboxylic acids and the lower homologues of the saccharinic acid series. In fact these products were very similar to acidic products produced by alkaline degradation of glucose or fructose[2,9]. It appears that some decomposition product of formaldehyde catalyses the formaldehyde degradation which occurs initially by condensation to form short-chain compounds similar to the simple carbohydrates which are then decomposed by the lime in the manner analogous to that in which glucose and fructose are decomposed in carbonatation.

It was also demonstrated that the products of alkaline degradation of fructose catalysed formaldehyde degradation in a manner similar to the catalysis by degradation products of formaldehyde itself.

Since completion of the above investigation, batch carbonatation with plate-and-frame filtration has been replaced by continuous carbonatation and clarification in the UK. In this latter system, the limed juice is never at such a high alkalinity as in batch work but is retained for a longer period at moderate alkalinity at about pH_{80} 9·8, (corresponding to about pH 11·0 measured at 20°C). At this lower alkalinity, formaldehyde in juice is destroyed less rapidly but the destruction is still complete within the normal time required for carbonatation and clarification.

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[17] CARRUTHERS & OLDFIELD: *ibid.*, 1964, **66**, 355–359.
[18] *Biochem. J.*, 1953, **55**, 416.

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Consequently, formaldehyde provides a bactericide which retains activity when mixed with juice, and so can be transmitted by the juice into inaccessible regions of the diffuser, and yet is rapidly and completely decomposed in the normal liming and clarification process to yield products which are predominantly those already present in juice from the normal alkaline destruction of glucose and fructose.

Summary

Thermophilic bacteria, in particular *B. stearothermophilus*, can thrive in continuous diffusers at temperatures in excess of 70°C to produce lactic acid from sucrose and to reduce nitrate to nitrite. This formation can be suppressed by shock-dosing with formaldehyde. The formaldehyde is subsequently decomposed completely during liming and carbonatation to produce a range of decomposition products similar to those produced in juice by the alkaline degradation of glucose and fructose.

Diffusion in slightly acid conditions yields pulp which can be pressed to comparatively high dry substance and some consider that better pulp pressing can be achieved if the acid conditions are brought about by thermophilic bacteria rather than by use of mineral acids.

The effects of efficient pulp pressing are so obvious in the economics of the beet sugar process that there is temptation to permit some thermophilic activity in diffusion. Such bacterial activity however has many serious but insidious effects including increased losses of sucrose, increased soda ash usage, less efficient sulphitation, higher juice colour, lower stability of juice during evaporation and crystallization, excessive ash in after-product sugars requiring additional processing and increased molasses production.

It is considered that these disadvantages outweigh any advantages gained in pulp pressing efficiency and that it is desirable to suppress thermophilic activity in diffusion and employ controlled additions of mineral acids to the diffuser supply water and, if necessary, also to sites within the diffuser to achieve the required pulp pressing efficiency.

Acknowledgement

The authors wish to thank their colleague Mr. A. C. FERGUSON for developing the TLC method for lactic acid which is referred to in the Appendix.

APPENDIX

Thin Layer Chromatography (TLC) Method for the Determination of Lactic Acid

Apply 2 × 5 µl quantities of raw juice, drying between each application, and 1 × 5 µl each of standard lactic acid solutions, made up to contain the equivalent of 100–600 ppm lactic acid in juice, to the start line of a thin layer plate of 0·5 mm thickness of Cellulose MN 300 G. Irrigate the plate by upward development for 60–90 minutes with a solvent made up by mixing the two separate solutions A and B described below:

Solution A contains 15 mg of bromophenol blue and 40 mg bromocresol green dissolved in 26 cm³ of water plus 6·5 cm³ of glacial acetic acid. Solution B comprises 70 cm³ *iso*-propanol, 25 cm³ toluene, and 10 cm³ of *n*-butanol.

After development remove the plate from the solvent and direct a draught of cold air onto the cellulose layer to remove the solvent and reveal the lactic acid present as a yellow spot, R_f 0·75, on a blue background.

The amount of lactic acid is determined by visual comparison of the intensity of the colour developed with those for the standard solutions of lactic acid run on the same plate.

The separation of kestose isomers by gas chromatography

By D. NUROK

(Sugar Milling Research Institute, University of Natal, Durban, South Africa)

THE kestoses are a three-membered family of fructosylsucroses that may be prepared in the laboratory by the action of invertase on sucrose[1]. Their chemical names are 0-α-D-glucopyranosyl-(1→2)-0-β-D-fructofuranosyl-(6→2)-β-D-fructofuranoside (6-kestose), 0-α-D-glucopyranosyl-(1→2)-0-β-D-fructofuranosyl-(1→2)-β-D-fructofuranoside (1-kestose) and 0-β-D-fructofuranosyl-(2→6)-0-α-D-glucopyranosyl-(1→2)-β-D-fructofuranoside (neo-kestose).

Their presence in sugar cane[2] and beet[3] has been widely reported[4]. This presence is undesirable as they inhibit crystal growth rate[5] and in addition have specific rotations[1] varying from 21° to 28° causing interference with the determination of sucrose by polarization measurement. There are also indications that elongated crystals occur in *C*-sugars when the

[1] GROSS: *Methods in Carbohydrate Chemistry*, 1962, **1**, 360.
[2] BINKLEY: *I.S.J.*, 1964, **66**, 46.
[3] BICHSEL and JOHNSON: *J. Amer. Soc. Sugar Beet Tech.*, 1963, **12**, 449.
[4] SCHAFFLER and MOREL DU BOIL: *J. Chromatogr.*, 1972, **72**, 212
[5] SMYTHE: *Aust. J. Chem.*, 1967, **20**, 1097.

amount of kestoses present is greater than normal[6]. The amount of interference caused by these compounds can only be determined if the isomer composition of the kestoses is known as each isomer has a different $[\alpha]_D^{20}$ and a different effect on crystal growth rate.

The isomers may be separated by paper chromatography[7], thin layer chromatography[4] and paper electrophoresis[1]. However, these methods do not exhibit the quantitative accuracy and precision that may be obtained with gas chromatography and, with the exception of electrophoresis, are more time-consuming than gas chromatography.

Attempts in this laboratory to separate the trimethylsilyl derivatives of the individual kestose isomers by gas chromatography on packed columns coated with a variety of stationary phases were unsuccessful. This confirms the results of WALKER[8], PREY[9] and SCHÄFFLER[10].

It was assumed that the difficulty in separating the kestose isomers was due to a very low separation factor between the individual isomers. On the basis of this it was decided to attempt the separation using wall-coated open tubular columns. These columns have been used to effect extremely difficult separations and have even been used to resolve optical isomers[11]. The reason for this is that, whereas it is difficult to construct a packed column with an efficiency of over

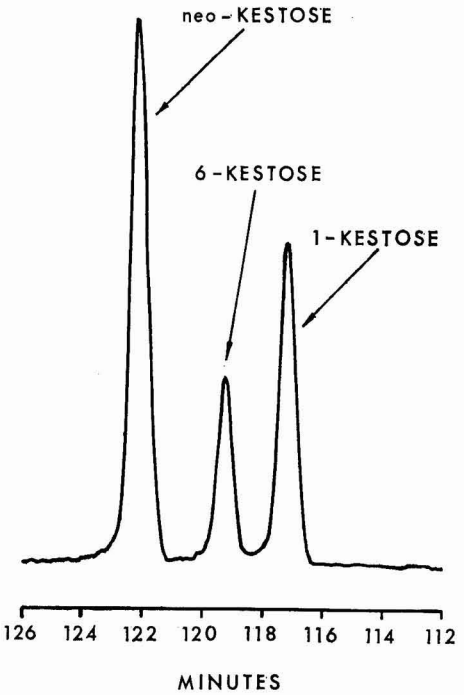


Fig. 1. Trimethylsilyl derivatives of the kestose isomers separated at 270°C on a 190 metre × 0·05 cm stainless steel open tubular column coated with OV17

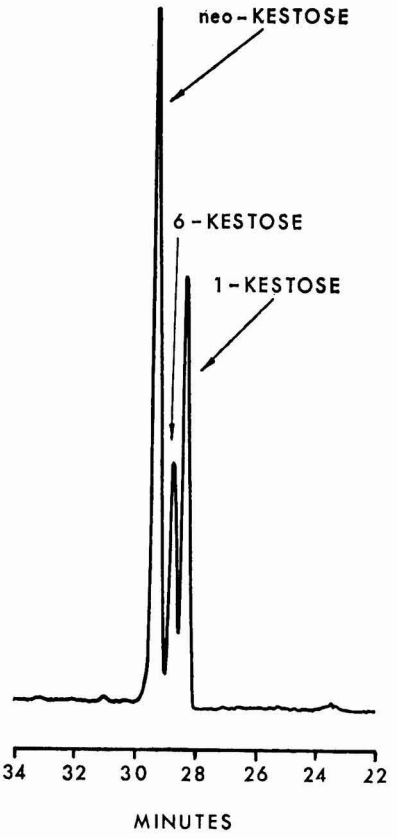


Fig. 2. Trimethylsilyl derivatives of the kestose isomers separated at 270°C on a 190 metre × 0·05 cm stainless steel open tubular column coated with OV17

about 10,000 theoretical plates, it is relatively easy for an experienced chromatographer to construct an open tubular column with an efficiency of over 100,000 theoretical plates.

This communication reports the baseline separation of the three kestose isomers as their trimethylsilyl derivatives on a 190 metre × 0·05 cm i.d. stainless steel column coated with OV17. The column was coated by the plug method using benzyltriphenylphosphonium chloride as a wetting agent.

Fig. 1 illustrates the degree of separation of the isomers that may be obtained when the column is operated at optimum flow rate at 270°C. The elution time is 2 hours and an efficiency of over 150,000

[6] COLEMAN, DAY-LEWIS and NUROK: Unpublished results.
[7] HILLER: *Z. Naturforsch.*, 1969, **24 b**, 36.
[8] WALKER: *I.S.J.*, 1965, **67**, 237.
[9] PREY, BRAUNSTEINER and GRUBER: *Zeitsch. Zuckerind.*, 1974, **99**, 245.
[10] SCHAFFLER: Personal Communication.
[11] FEIBUSH and GIL-AV: *Tetrahedron*, 1970, **26**, 1361.

Sugar cane agriculture

Some ideas on mechanization and cleaning in the gathering of sugar cane. I. Basic concepts and theoretical development. II. Evaluation of basic elements. M. LAGE. *CubaAzúcar*, 1973, (April/June), 14–22, 23–33.—Basic characteristics of cane affecting mechanical harvesting and cleaning are considered; these include vegetative structure, quantified by an index CL/ME (clean cane/extraneous matter) and erectness. Other factors are losses and the efficiency of cleaning by various processes—burning, topping, blowing by extractor fans, cane dry cleaners, and wet cleaning tables; the efficiency of each of these is referred to in terms of the residue not separated from the cane. Symbols are given to the various factors and initial relationships developed. In the second part numerical values are given to some of the factors.

* * *

The current situation and prospects for irrigation of cane in Cuba. P. L. DORTICOS. *ATAC*, 1973, **32**, (3), 18–25.—The area of cane irrigated is currently 221,500 hectares, almost all surface or gravity irrigated by water supplied from 8 reservoirs. These are to be augmented by a further 11 reservoirs by 1980 when the area under irrigation will have risen to 400–450,000 hectares. Other factors being equal, the use of irrigation will raise cane yields by 50–60% above those obtained under dry conditions. In existing irrigated areas there is experience of surface irrigation and this will not be abandoned, although greater attention will be paid to overhead irrigation especially in areas of light or impermeable soil where surface irrigation is unsuitable.

* * *

Pneumatic separation of impurities. J. ABREU and J. BRITO. *ATAC*, 1973, **32**, 39–45.—An account is given of experimental studies on the pneumatic separation of cane trash and leaves as employed in Cuban cane harvesters. By means of models the air flow patterns and pressures within the systems have been observed and the effects of modifications to the equipment have been measured in terms of efficiency of trash separation. As a result of the studies, the feed rate has been doubled while the separation efficiency has risen by 22% and losses by only 3%.

* * *

Rational organization of cane transport. M. I. CARDONNE. *ATAC*, 1973, **32**, (3), 49–55.—The importance of good organization for co-ordination of harvesting, loading and transport of cane to the factories is emphasized, particularly where cane is burnt, so as to avoid bottlenecks and situations where loading has to wait for lack of transport vehicles. A system applied at one area is described, with tabulated details, and has been shown to be practical. Other factors to be considered are listed, including attention to cane roads during the harvest, co-ordination of the work of cranes and cleaning stations with the transport, etc.

* * *

Sugar cane potash requirement and application as a function of hydroclimatic conditions. G. HUSZ. *Zeitsch. Zuckerind.*, 1973, **98**, 503–506, 564–568. After a review of the literature on potash application to cane (41 references), experiments are reported involving cane growing in silty soil in river valleys in the north Peruvian coastal region under irrigation conditions. The results, given in graphs and tables, are interpreted as showing that application of potash is unnecessary in the region as a whole, the requirements being met by the potash carried by river water and liberated in the soil by chemical decomposition. However, there may be need of application in local areas, and a routine laboratory means of determining this is recommended.

Continued from page 306

effective theoretical plates is obtained for each of the three peaks. The separation factor between the first and the second peak is 1·02 and between the second and third peak is 1·03. These low values of separation factor explain why no separation between the isomers could be obtained on packed columns.

Fig. 2 illustrates a faster separation of the isomers at the same temperature. Here the elution time was less than 30 minutes. The resolution between the peaks is poorer than in the case of the longer run but is still sufficient for a fairly good drop line integration.

Unfortunately the trimethylsilyl derivatives of raffinose and 1-kestose are not separated on an OV17 column. A partial separation between these compounds on a 32-metre open tubular column coated with OV25 has been obtained. This column however has the disadvantage that it does not separate between 6- and neo-kestose.

The effect of various stationary phases and derivatives on the separation of the kestose isomers is being investigated. By optimizing conditions it should be possible to achieve a base line separation of the kestose isomers within thirty minutes.

Industrial cultivation of cane varieties in the sugar co-operatives of Peru. O. CIFUENTES. *Bol. Técn. Inst. Central de Invest. Azuc.*, 1973, **2**, (1), 1–30.—The results of a survey on cane varieties grown in Peru show that, in all areas, the most popular variety is H 32-8560 (CH 32) followed, on a planted area basis, by H 37-1933 (CH 37) and PCG 12-745 ("Azul Casa Grande"). Other less important varieties are H 50-7209, H 44-3098 and H 49-104.

* * *

Control of *Elasmopalpus lignosellus* Z. by means of application of "Cidial 2% G" insecticide. N. MORALES and G. AYQUIPA A. *Bol. Técn. Inst. Central de Invest. Azuc.*, 1973, **2**, (1), 31–41.—Trials demonstrated that a dose of 50 kg per ha of the insecticide was effective in plant cane for control of the borer but not in ratoon cane. The best time for application is just before planting or immediately after planting and in the bottom of the furrow.

* * *

Method for determining quantitatively the influence of the sub-surface regimen on crop production. I. RISSEEUW and A. BAZAN. *Bol. Técn. Inst. Central de Invest. Azuc.*, 1973, **2**, (1), 42–48.—Maximum production of cane requires the correct level of the water table so that there will be a fall either as a result of excessive water in the root zone or with inadequate water. The latter may be adjusted by means of irrigation but there is as yet no means of establishing a criterion for drainage, and this is to be the object of work by the Dept. of Agrohydrology of the ICIA.

* * *

General considerations on the salinization and alkalization of soils. S. VALDIVIA. *Bol. Técn. Inst. Central de Invest. Azuc.*, 1973, **2**, (1), 63–72.—In connexion with the extension of cane growing to new areas the problems posed by salinity and alkalinity of soils in such areas are discussed, with an account of the origin of the salts and alkali, characteristics and classification of the soils. Critical levels for diagnosis and evaluation of saline soils are not always applicable under Peruvian conditions and it is proposed to carry out research on such soils and the problems involved, and to determine critical salt and alkali levels for the cane varieties grown in Peru under the prevailing climatic conditions.

* * *

Effects of (push rake) mechanical harvesting on crop yield. G. HUSZ. *Bol. Técn. Inst. Central de Invest. Azuc.*, 1973, **2**, (1), 73–88.—No great drop has been observed at Casa Grande in cane yield as a result of uprooting of stools by the push rake system of harvesting; however, this may not be typical since falls in yield have been observed on other estates. The loss of stools means that the number of ratoons taken is effectively reduced and thus the costs which are greater for higher levels of ratooning. Losses of sugar with mechanical harvesting amount to 6·26% against 3·96% with manual harvesting; nevertheless, the total cost per ton of cane is only two-thirds with mechanical harvesting compared with that of manual harvesting.

Report on the phytopathological state of health of the sugar cane crop in the agrarian production cooperatives (of Peru). V. A. REVILLA M. *Bol. Técn. Inst. Central de Invest. Azuc.*, 1973, **2**, (2), 1–17.—A survey of cane diseases in Peru showed that the most important was ratoon stunting disease, the degree of infection being described as "alarming" on all but one estate. Of the varieties cultivated, PCG 12-745 ("Azul Casa Grande"), LA 52/604 and H 50-7209 were the most susceptible, with almost 100% infection, while 90% of stalks were affected in the case of H 37-1933 (CH-37) and 60% in H 32-8560 (CH-32). Of the Hawaiian varieties grown in Peru, H 44-3098, H 39-5803 and H 51-8194 appeared free of the disease while H 52-4610 and H 57-5174 were somewhat susceptible with up to 30% of stalks affected. Control may be achieved by treating setts with hot water at 51°C for 2–2½ hours and the cane produced used as planting material; most of the estates have equipment for this but except in certain cases have failed to continue the original seed-treatment programme. The varieties PCG 12-745 and H 32-8560 have also shown an abnormality in the form of splitting of the internodes which has promoted infection with fungi such as *Colletotrichum sacchari* and *Ceratocystis paradoxa*. The use of borer-attacked setts has resulted in germination failures and the use of 0·5% "Agallol" fungicide dip for such setts is recommended. It is proposed that the ICIA organize a seed cane programme to provide hot water-treated seed cane for distribution to estates and to maintain observations to avoid loss by preventable disease. A new disease, originally mistaken for leaf splitting disease, caused by the fungi *Sclerospora* spp. has been observed on third ratoons at Pucalá; symptoms include development of a large number of weak shoots and of narrow leaves which yellow and die. The stalks are poorly developed and show a zig-zag deformation.

* * *

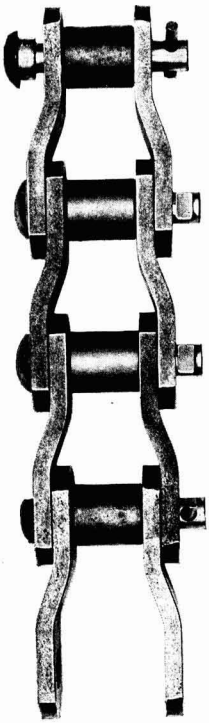
Salty soils and crop growth. ANON. *Producers' Rev.*, 1973, **63**, (8), 31–33.—The origin of saline soils is briefly discussed and their effect in reducing plant growth explained. Methods for reducing salinity are summarized.

* * *

Does it pay to keep stubble cane one more year? R. C. HODSON. *Sugar Bull.*, 1973, **51**, (24), 14–15.—A brief method is presented for estimating whether it is economical to allow cane to remain as a 3rd ratoon or to replant as indicated for Louisiana farmers.

* * *

Test tube approaches to bypass sex. L. G. NICKELL. *Hawaiian Planters' Record*, 1973, **58**, 293–314.—Genetic diversity has been achieved in plant breeding through the sexual cycle and by mutation. The development of the growing of isolated living cells from plant tissue, since its beginning in 1939, is described and an account given of work in this sphere carried out at the HSPA Experiment Station. Cells were isolated from callus tissue and grown, first in test tubes and later in soil, and it was found



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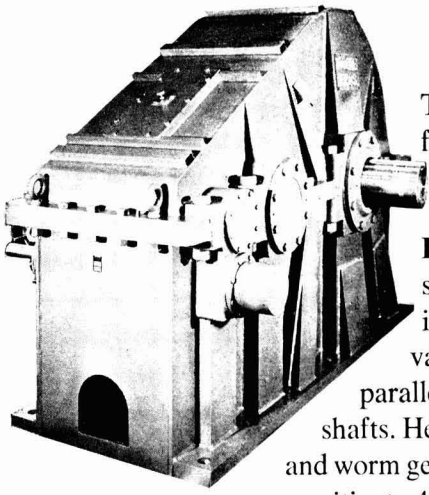

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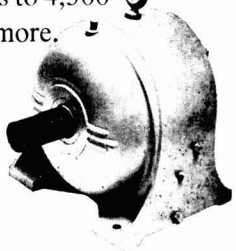

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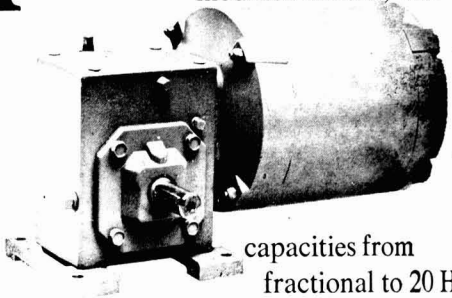

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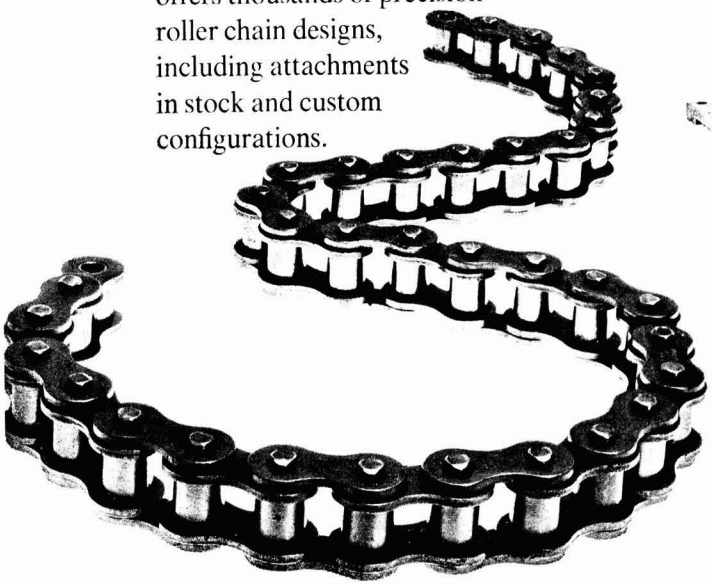

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that the main Hawaiian variety H 50-7209 produced five distinct clones which were genetically different, having different numbers of chromosomes; this was discovered to be the result of the variety itself being a "chromosomal mosaic" rather than a true single clone. Work has continued on the production of mutated plants by chemical treatment with colchicine which induces chromosome doubling. With production of a desirable mutant, it is now possible to isolate the altered cells and to develop these as above. Other techniques discussed include the development of haploid plants using pollen grain cultures *in vitro*, the fusion of protoplasts to give non-sexual progeny that are intra-specific, and perhaps inter-specific or even inter-generic. Another technique is "transformation" in the sense of introducing deoxyribonucleic acid, DNA (the chemical carrier of heredity), into the cell structure of one plant after isolation from another having a desired characteristic—say, resistance to a disease—and thereby producing a modification of the original plant with that added resistance.

* * *

Sugar cane: infra-red photography pinpoints need for field drainage. R. P. HUMBERT. *World Farming*, 1973, **15**, (10), 20–21.—Illustrations show the use of infra-red colour photography for examination of cane and other crops. The contrast between healthy and unhealthy cane is much more apparent than when using normal colour film sensitive to the whole of the visible spectrum, and infra-red photography from aircraft or from orbiting earth satellites can be used to show areas where drainage is inadequate, for example, or to identify and differentiate between nutritional and disease problems.

* * *

CEA agricultural and research operations. F. H. REDMAN. *Sugar J.*, 1973, **36**, (5), 21–24.—Aspects of sugar cane agriculture affecting the Consejo Estatal del Azúcar in the Dominican Republic are surveyed; these include climate, soils, land preparation, insects, diseases, weeds and weed control, varieties, fertilizers, irrigation and research.

* * *

Central Romana agricultural and research operations. R. E. PERDOMO *et al. Sugar J.*, 1973, **36**, (5), 25–30. Agricultural operations at Central Romana, Dominican Republic, are described, with information on yields and planting, harvesting, rainfall, soils and fertilizers, irrigation, varieties, weed control and diseases and pests.

* * *

Problems of sugar cane cultivation under the environmental conditions of Vidharba and Marathawada in Maharashtra. J. R. KAKDE. *Sugar News* (India), 1973, **5**, (3), 5–11.—The two areas of the title are new cane-growing regions where new sugar factories have been built or are under construction. Details are presented in regard to climate, temperature and humidity, water supply, light intensity and soil characteristics. There is such variability in these that general cultural recommendations cannot be formulated for the whole regions and research will be needed to determine optimum fertilizer, irrigation and cultivation practices for individual zones.

* * *

The sugar industry in Hawaii. V. GURUSWAMY. *Sugar News* (India), 1973, **5**, (3), 12–16.—A survey is presented which discusses climate, agricultural practices and research as well as factory operations in Hawaii.

* * *

The rôle of "Prometryne", "Ametryne" and "Desmetryne" as weedicides in the sugar cane crop. I. D. VERMA. *Sugar News* (India), 1973, **5**, (3), 17–22.—Experiments are reported on the use in 1967/68 and 1968/69 of the three herbicides as pre-and post-emergence treatments at 4·48 kg/ha, and pre- plus post-emergence at 4·48 and 2·24 kg/ha, by comparison with the normal method of weed control by cultivation (six hoeings) and an untreated control. The variety used was CoS 510. All treatments successfully controlled *Digitaria sanguinis*, *Trianthema monoglyma*, *Cassia tora* and *Portulaca oleracea*, and best control was achieved with "Prometryne" in the higher pre- plus post-emergence treatment. However, application of 4·48 kg/ha of "Ametryne" as post-emergence or in split pre- and post-emergence doses was more economical. "Ametryne" controlled *Dactyloctenium aegyptium*, but was not effective against *Cyperus rotundus* or *Cynodon dactylon* after the 2–3 leaf stage. Germination of cane was unaffected by pre-emergence treatment and the number of tillers per plant was only affected by post-emergence "Desmetryne" and in the untreated control. Millable cane and juice quality were unaffected, but yields were increased by use of "Ametryne" and "Prometryne".

* * *

Effect of time of manuring on the crop indices and yield of sugar cane. T. R. SRINIVASAN, Y. B. MORACHAN and M. R. IRUTHAYARAJ. *Indian Sugar*, 1973, **23**, 311–321.—Trials showed that delayed application of nitrogen reduced cane yield and that application of phosphorus and potash was beneficial, especially where N application was delayed. Leaf N and sheaf moisture were correlated as were leaf N and yield during early growth, although leaf N and yield were inversely correlated in later phases, as were sheath moisture and final yield.

* * *

Nitrogen and sugar cane. III. Relation between leaf nitrogen and cane yield, sucrose content and purity coefficient of juice. U. S. SINGH. *Indian Sugar*, 1973, **23**, 323–328.—Nitrogen fertilization trials carried out over two years and analysed statistically with establishment of linear regression equations showed that leaf nitrogen was strongly positively correlated with cane yield but that there were strong negative correlations with sucrose content and juice purity. The equations may be of use in estimation of ultimate cane yield and calculation of nitrogen requirement by the crop.

Source of potassium in a foliar spray with "Endrin" as influencing the quality and yield of sugar cane. S. SITHANANTHAM and T. R. SRINIVASAN. *Indian Sugar*, 1973, **23**, 329–333.—Studies reported indicate a generally favourable effect of foliar application of "Endrin" and/or potassium on cane quality and yield. Sulphate ion accompanying the K is preferable to chloride. Application of "Endrin" together with potassium sulphate tended to maximize sugar yield per acre.

* * *

Early maturing varieties of sugar cane. C. N. BABU. *Indian Sugar*, 1973, **23**, 335–336.—Production of early-maturing varieties to yield higher sugar recoveries is discussed with mention of breeding of hybrid material for this purpose, adjustment of planting dates for late maturing varieties to give high sucrose early in the season, and the use of chemical ripeners.

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Studies on loss in yield of cane and juice quality due to sugar cane mosaic in India. G. R. SINGH. *Indian Sugar*, 1973, **23**, 339–341.—Losses due to mosaic were studied using 100% mosaic-infected seed cane of varieties Co 419 and Co 997 and comparing the results with those from healthy seed cane. Mosaic reduced cane yield by 27·7% in Co 419 and 13·3% in Co 997. Sucrose in cane juice was 0·1% and 0·9–1·4% lower, respectively, while juice extraction was reduced by 10·8% and 8–15·4%, respectively. Brix and juice purity were not affected with Co 419 but were reduced by 0·6–0·7° and 2·5–2·7% for Co 997. In general, cane height, stalk weight and juice content, number of millable canes and number of cane stalks per stool were reduced by mosaic.

* * *

Resistance of sugar cane varieties to frost injury in Rajasthan. D. S. OBEROI. *Indian Sugar*, 1973, **23**, 343–345.—Buds damaged by frost during trials with 10 varieties at Sri Ganganagar varied from 5·1% to 38·9%. The varieties least affected were Co 1223, Co 1243 and CoL 29, and the last is recommended for the area.

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A new record of *Aphelinus* sp., a parasite of *Longiunguis sacchari* Zehnt. J. S. SANDHU, S. K. SHARMA and M. S. DHURA. *Indian Sugar*, 1973, **23**, 347–349. *L. sacchari* is the aphid vector of grassy shoot virus disease of sugar cane. Observations on this aphid at Jullundur, Punjab, led to the discovery of its parasitization by *Aphelinus* sp., a natural enemy, which attained levels of 3–23% parasitization between mid-August and late October, with 32–100% emergence of adults.

* * *

Problem of green manuring sugar cane—intercropping as a solution. V. S. BHADAURIA and B. K. MATHUR. *Indian Sugar*, 1973, **23**, 351–358.—It was shown that planting of sunn hemp (*Crotolaria juncea*) as an intercrop between two rows of spring-planted cane, followed by uprooting at 1 metre high and laying beside the cane and then earthing-up, improved the cane crop and soil condition.

* * *

Effect of green manuring on yield and quality of sugar cane. K. KAR, S. K. OHJA and N. AHMAD. *Indian Sugar*, 1973, **23**, 359–368.—Green-manured cane, using intercropped sunn hemp with added N and P fertilizer, showed improvements in germination, tillering, cane yield and sucrose content of juice which are attributed to improvement in soil physical properties and availability of nutrients.

* * *

Sex attraction—a new approach to control of sugar cane stalk borer. A. N. KALRA. *Indian Sugar*, 1973, **23**, 449–451.—Studies were made to use sex attraction of female stalk borers in traps and in use of abdominal solvent extraction to isolate the pheromone involved. Large-scale breeding of the borers will be necessary to identify this material which may be suitable for use in controlling the borer, perhaps in combination with a chemosterilant.

* * *

Integrated control of the internode borer (*Proceras indicus* K.) in sugar cane. R. A. AGARWAL and S. KUMAR. *Indian Sugar*, 1973, **23**, 453–454.—An integrated system of control which is proposed includes seed treatment and growing of resistant varieties, release of egg parasites, release of parasites attacking larvae and pupae, stripping of the leaf sheaths, and spraying 5- to 6-month-old cane with gamma-BHC or "Telodrin".

* * *

Trend of sugar cane cultivation and consequent effect on sugar production in eastern U.P. during the last five years. B. K. MATHUR and V. S. BHADAURIA. *Indian Sugar*, 1973, **23**, 459–463.—The decline in cane area in the eastern U.P. is indicated and reasons for it suggested, as well as the consequences for the sugar industry. The significance of the proportion of ratoons and the neglect of ratoon crops are emphasized, and the rôle of cane varieties discussed. Characteristics of recently introduced varieties are described, and recommendations made for the recovery of the industry in the region.

* * *

Biological control of the sugar cane leafhopper. R. M. BULL. *Cane Growers' Quarterly Bull.*, 1973, **37**, 40–42.—The leafhopper *Perkinsiella saccharicida*, the vector of Fiji disease, has developed in large numbers in the Bundaberg area of Queensland although the same natural parasites and predators occur there as in the northern areas of the State where population is controlled. The difference results from the time differential between development of the leafhopper and of its principal parasites, two species of *Tytthus* black bugs, and from the effects of the latter on other parasites, *Paranagrus* sp. and *Ootetrastichus* sp. Possible control measures include the introduction

of a new parasite which would kill most of the leafhoppers in early summer or artificial breeding and release of *Tytthus* in early summer.

* * *

Factors affecting the irrigation requirements of sugar cane. G. KINGSTON. *Cane Growers' Quarterly Bull.*, 1973, **37**, 43–45.—Aspects discussed include the wastefulness of applying large and frequent amounts of water to young and ratoon cane which cannot utilize it, timing of irrigation in accordance with temperature and with need, i.e. reduction in cane growth—this produces a smaller cane tonnage than when irrigation is scheduled to maintain a constant growth rate but, since the sucrose content is always higher, the overall sugar yield is equivalent. Irrigation may also be based on measurement of soil moisture, and should be stopped near harvesting to allow the crop to ripen.

* * *

Cicadas damaging sugar cane in Queensland. K. J. CHANDLER. *Cane Growers' Quarterly Bull.*, 1973, **37**, 46–49.—Symptoms of ratoon cane damage by cicadas are described as are the three species responsible for most of the trouble in Queensland. The life cycles and how they are affected by cane cultivation procedures are explained and control measures are suggested.

* * *

Did farmers rogue? E. G. SPRY. *Cane Growers' Quarterly Bull.*, 1973, **37**, 50–52.—An incentive scheme introduced for control of Fiji disease included restriction of ploughing-out of cane fields to those with 12 or more Fiji disease-affected stools per hectare. Where infection was heavy farmers did this, but where it was light the affected stools were rogued. This gave an appreciable degree of control but the criterion of 12 stools should be reduced to ensure more complete elimination.

* * *

Some temperature-growth effects. R. B. MOLLER. *Cane Growers' Quarterly Bull.*, 1973, **37**, 57–58.—Cane growth rate depends on temperature and, under Queensland conditions, is maximum in November-March so that conditions ideal for growth should be ensured for this period by timing of planting and ratooning. This achieves maximum yield since any loss of potential growth cannot be recovered by extending the period before harvesting. As planting and ratooning dates become later, yield is inevitably reduced.

* * *

The importance of a headland. P. A. JONES. *Cane Growers' Quarterly Bull.*, 1973, **37**, 59–61.—The headland at the edge of a cane field should be wide enough to allow unimpeded travel and machinery movement. It should be grassed to prevent soil erosion, but grass should not be long enough to hide obstacles to movement. Waterways along the headlands should preferably be separated from the travel path, but where the headland acts as a waterway it should be capable of serving as a drain without soil erosion or gullying. Maintenance should include cutting the grass to prevent grasses and weeds from seeding and reduce build-up of insect population, ensuring levelling to permit drainage but also allowing spreading of water surface, thus reducing flow velocity and erosion.

* * *

The significant rôle of micro-organisms in some soil processes. J. WRIGHT. *Cane Growers' Quarterly Bull.*, 1973, **37**, 62–64.—Four kinds of micro-organisms are discussed: fungi, algae, protozoa and bacteria, and their activity in the soil described, in particular the last in respect of nitrogen fixation.

* * *

Frenchi grub control in the Central District. A. W. FORD. *Cane Growers' Quarterly Bull.*, 1973, **37**, 65–68.—In contrast to the greyback grub, which is controlled by a number of chemicals, the Frenchi grub (*Lepidiota frenchi*) is susceptible only to BHC dust, 100 kg.ha^{-1} being needed for control to second ratoons and 130 kg.ha^{-1} to 3rd ratoons. Equipment and techniques for applying the BHC are described.

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Land levelling in the Burdekin. H. L. BOYLE. *Cane Growers' Quarterly Bull.*, 1973, **37**, 69–71.—The levelling of land, though expensive, can be worthwhile since it obviates difficulties in irrigation which is extensively practised in the Lower Burdekin area of Queensland. Methods of filling depressions, improving local patches of sandy soil which are subject to early moisture stress, etc. are discussed.

* * *

Top rot in Q 63—a problem? W. A. C. WEBB. *Cane Growers' Quarterly Bull.*, 1973, **37**, 72.—Top rot is a bacterial disease spread by wind and rain and encouraged by hot humid conditions which follow periods of high atmospheric humidity. The variability of occurrence of such favourable conditions for the disease means that its incidence is also variable although it can cause losses of 10–40 metric tons.ha^{-1}. Incidence was high in 1971–72 but low in 1972–73, and Q 63 cane was attacked. However, the disease is not considered a constant problem, nor is Q 63 to be taken from the approved varieties list for the Burdekin area.

* * *

The reclamation of abandoned sugar cane land. A new technique from Africa. G. A. CLARKE. *Span* (Shell International Chemical Co. Ltd.), 1973, **16**, 116–118.—With the present high demand for sugar, attention has turned to the return to cane production of lands which had been abandoned because of exhaustion, salinity, etc. Techniques for restoring soil health are described, a new method being the reduction of salinity using rice cultivation under flood irrigation so that the expense of salt removal with water is partly recouped by the value of the rice crop. Drainage and the use of new slotted PVC piping, perhaps with a root growth inhibitor incor-

porated in the material to prevent choking of the slots, are described as is the improvement of soil by incorporation of filter cake, bagasse, molasses and green manure crops. Use of infra-red colour photography from the air can locate areas of waterlogging, etc. so that drainage can be improved to raise yields[1].

* * *

Sequential sampling of adult sugar cane froghoppers (*Aeneolamia varia saccharina* Dist.). D. E. EVANS. *Trop. Agric.* (Trinidad), 1974, **51**, 57–62.—Decisions as to whether or not to spray with insecticide, based on sequential sampling schemes using the Poisson distribution principle, were shown to agree closely with those based on random sampling even when the number of cane stalks samples sequentially was arbitrarily limited to half those sampled randomly. Sequential sampling therefore appears to be a promising supplement or alternative to the currently-used random sampling system.

* * *

Crane load indicators improve campaign profits for Caroni Ltd. in Trinidad. ANON. *Sugar y Azúcar*, 1973, **68**, (10), 25.—Spring-type hook scales used on the cranes handling harvested cane had failed and gave inaccurate measures; they have been replaced by Martin-Decker units incorporating hydraulic load cells which permit easier and more accurate recording of the cane weights.

* * *

The importance of sterilization. ANON. *Producers' Rev.*, 1973, **63**, (9), 17–19.—The importance is emphasized of proper sterilization of cane harvesters by flame or disinfectants so as to prevent the spread of disease, especially ratoon stunting disease.

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Crossing and development of basic sugar cane breeding lines to improve varieties for US mainland production. P. H. DUNCKELMAN. *Sugar Bull.*, 1973, **52**, (2), 7–8. The new crossing greenhouse at Houma was completed in late 1972 and an account is given of the programme, objectives and methods used in developing improved cane varieties for use in Louisiana and Florida.

* * *

The Louisiana sugar cane variety census for 1973. R. J. MATHERNE and D. T. LOUPE. *Sugar Bull.*, 1973, **52**, (2), 10, 12.—Tabulated data show the relative popularity of cane varieties in terms of % areas of the total for the individual parishes of Louisiana and as a whole. The first four were almost equally popular: L 60-25 (21%), CP 61-37 (20%), CP 52-68 (19%) and L 62-96 (19%) although the first and third of these have reduced areas compared with 1972/73 and the others increased.

* * *

Nutria damage to sugar cane—a 5-year appraisal. G. F. LAVOIE and F. SCHITOSKEY. *Sugar Bull.*, 1973, **52**, (2), 13–14.—A survey has shown that damage by nutria, once a severe pest, is now insignificant.

Sugar cane fertilization. J. G. DAVIDE. *Sugarland* (Philippines), 1973, **10**, (7), 6, 22, 26.—The amount of plant nutrient removed from a field with the harvested cane crop is calculated and the need for its replacement in the form of fertilizer indicated. The function of each of the three main nutrients—N, P and K—is described and the determination of fertilizer requirements briefly discussed.

* * *

Cane agriculture is transformed to multiply production. R. OVIANO. *ATAC*, 1973, **32**, (4), 2–19.—In order to increase production in Cuba, new lands are being brought into cane cultivation. Aspects of the process are discussed including the removal of trees, roots, rocks, etc., and establishment in blocks, each 1 km² in area, comprising 12 fields separated by roads. Such standard or typical blocks assist the other aspects of planned cane growing and industrial organization.

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Notes for a history of mechanized cane harvesting in Cuba. L. E. ABREU. *ATAC*, 1973, **32**, (4), 32–39.—An account is given, with a number of illustrations, of equipment developed between 1866 and 1959 for cane harvesting, and brief mention is made of subsequent developments, to be treated more fully in another article.

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Sugar cane genetics and improvement in the region of Campos, R.J. A. A. PEIXOTO and C. A. BARBOSA Z. *Brasil Açuc.*, 1973, **82**, 336–341.—A brief history of cane growing in the area is given, the need for varieties suited to local conditions having been met by the establishment of a cane research station at Campos in 1910. The station has bred more than 80 commercial varieties which occupy between 65 and 90% of the cane cultivated in the various states of Brazil. Notes are provided on the most important varieties grown in Brazil and the current state of the country's cane industry is summarized. The Planalsucar programme[2] is described and projects listed in respect of cane breeding and the establishment of sub-stations.

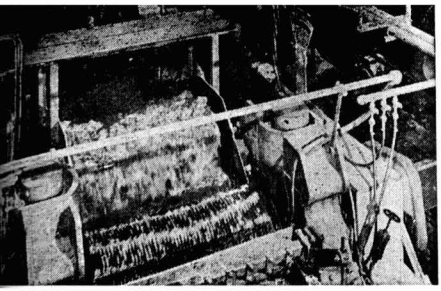
* * *

What does sugar cane cost? L. C. CAMPOS C. *Brasil Açuc.*, 1973, **82**, 342–345.—The need for a budgetary system is indicated and examples given of records needed so that direct and indirect costs can be assessed so as to give the true cost of cane production, as practised at Usina São José in Campos, Rio de Janeiro.

* * *

The army worm in the lowlands of Bahia. H. D. SOUZA. *Brasil Açuc.*, 1973, **82**, 353–355.—An account is given of the incidence, damage caused by and control of this pest, *Mocis latipes*. Trials with six insecticides are reported, all of which were successful; these included "Enderex 20", "Gusation A", "Diazinon 40M", "Inivin 85PM", "Dipterex" and BHC.

[1] *See also* HUMBERT: *I.S.J.*, 1974, **76**, 309.
[2] *ibid.*, 185.



Cane sugar manufacture

Casa Vicini—100 years of sugar production. L. J. CABRAL. *Sugar J.*, 1973, **36**, (5), 13–15.—The Vicini Group owns three sugar factories in the Dominican Republic, established between 1876 and 1883. An account is given of improvements made to the plants at Ingenios Caei, Angelina and Cristóbal Colón as well as agricultural developments in the cane supplying areas. Cane, sugar and molasses production data are tabulated for each factory for the seasons 1969/70–1972/73.

* * *

Continuous centrifugal machine for use on *C*-fore-worker. J. P. MUKHERJI, A. C. CHATTERJEE and S. S. GANGAVATI. *Sugar News* (India), 1973, **5**, (2), 19–24. Use of continuous centrifugals for *C*-sugar has not been widespread in India because of factors which are discussed. In regard to breakage of sugar crystals, this is not of significance where the sugar is to be remelted and, where it is to be used as seed, experience has shown that smaller grains are dissolved when making the magma, and the damaged crystals are rapidly repaired in boiling. A number of factors affect the final molasses purity, e.g. screen aperture, feed rate, etc., and Australian experience is contrary to the impression in India that molasses purity will be 0·5–2 units higher than with a batch machine. To achieve maximum exhaustibility the crystal content should be as high as possible consistent with capacity of the centrifugal to handle the massecuite, and this is promoted by smaller crystals; such massecuite is cured more easily in a continuous than a batch centrifugal.

* * *

Application of continuous centrifugal machines in the sugar industry. K. S. NARAYANA. *Sugar News* (India), 1973, **5**, (2), 25–32.—Factors affecting the capacity of a continuous centrifugal are summarized and a description is given of the Buckau-Wolf machine. Applications of continuous centrifugals in new sugar factories and for replacement of batch machines in existing factories are listed and typical working results of the Buckau-Wolf machines described and tabulated.

* * *

Use of continuous centrifugal machines. B. B. PAWAR. *Sugar News* (India), 1973, **5**, (2), 35–36.—Operation of continuous centrifugals has shown two important effects: crystal damage and rapid wear of the screens. The first is significant only if the crystals are used for seed magma and, if required, a batch machine could be used for such seed crystals and continuous machines for the *C*-sugar to be remelted. Damage to the screens should be minimized by avoiding the presence in massecuite of foreign material such as nuts, bolts, etc.; this may be achieved by using a perforated plate or mesh in the massecuite feed line. Further study is required to extend screen life and also to permit indigenous manufacture.

* * *

Observations on the working of the continuous centrifugal machine. J. W. KHANOLKAR and K. RAMANATHAN. *Sugar News* (India), 1973, **5**, (2), 37–38. Experience with a Buckau-Wolf continuous centrifugal at Madurakantam Coop. Sugar Mills Ltd., Padalam, is discussed and advantages and disadvantages listed.

* * *

Whether batch or continuous centrifugals. V. V. SUBBARAO. *Sugar News* (India), 1973, **5**, (2), 39–43. The development of push-type and conical-screen centrifugals is summarized and aspects of the performance of the latter discussed, including crystal damage, molasses purity, screen blinding, screen damage, capacity and use for low-grade and *A*-massecuite. There are 19 references to the literature.

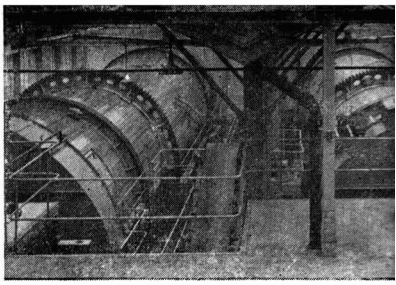
* * *

Report on the trials conducted on the Wal-Konti ("Konti-8") continuous centrifugal. J. P. MUKHERJI, S. S. GANGAVATI, B. L. KAPUR and K. K. GUPTA. *Sugar News* (India), 1973, **5**, (2), 44–63.—Details are given of the mechanical characteristics of the "Konti-8" centrifugals installed at Mawana Sugar Works, Mawana, with comparative data for performance of these and "Konti-6" and Buckau-Wolf continuous machines. As a consequence of higher capacity, lower power consumption, etc., continuous machines are replacing the existing batch units.

* * *

Illovo introduces new mill yard bulk cane handling system. F. WALLIS. *S. African Sugar J.*, 1973, **57**, 497–499.—The new cane handling system at Illovo is described and an account is given of its development from the original tramway reception system. Now, ex-South African Railway cars, modified for cane unloading onto the carrier, are used only for growers' cane, while cane supplied from Illovo fields and some growers' cane is delivered by road and unloaded by a Hilo off-loader using a chain-net system. The cane is spilled into a new cane yard and stockpiled by a 5-ton capacity Cameco cane stacker which is also used to carry the cane from the pile to the cane carrier.

Beet sugar manufacture



Occurrence of *Leuconostoc mesenteroides* bacteria at Janikowo sugar factory. H. KALKA. *Gaz. Cukr.*, 1973, **81**, 275–276.—Brief reference is made to the occurrence and considerable development of *L. mesenteroides* in the preliming tank at Janikowo beet sugar factory in Poland. The difficulties caused are reported and the recommendation given to carry out preliming at a temperature above 40°C and to adjust the juice pH in the 1st compartment to 8·5 by liming.

* * *

The effect of the evaporator station on the size of heating surface and steam and coal consumption. S. ZAGRODZKI. *Zeitsch. Zuckerind.*, 1973, **98**, 560–563. Research work carried out in Poland on evaporator operation is summarized and recommendations given regarding reduction in steam and fuel consumption as a function of evaporator arrangement and particularly as affected by the size of heating surface in the individual effects. Means of optimizing heat transfer and juice concentration are also indicated. (See also ZAGRODZKI: *I.S.J.*, 1971, **73**, 86, 117, 150.)

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The Enviro-Clear rapid clarifier at Lehrte sugar factory. O. V. BONNEY and A. H. K. F. RAAB. *Zeitsch. Zuckerind.*, 1973, **98**, 618–619.—The performance of the Enviro-Clear clarifier, designed to handle juice from 5000 tons of beet per day at this West German factory, is reported. At a daily slice of 3600–3800 tons of beet and a juice throughput of 250–270 $m^3.hr^{-1}$ the clear juice, constituting 79–83% of the feed, was brilliant; the mud was easily handled by the rotary filter. Clear juice insolubles varied between 5 and 45 ppm. Retention time was 10 min, and "Tetrol 2935/74" was used as flocculation aid, preparation of which is carried out by automatic means. Cost advantages of the clarifier are briefly discussed.

* * *

Tests on withdrawal, storage and processing of thick juice at Mironovsk sugar factory. T. P. KHVALKOVSKII *et al. Sakhar. Prom.*, 1973, (10), 18–23.—Details are given of tests in which 2398 tons of thick juice were stored for about 128 days before processing. Despite slight deterioration in the juice, the white sugar produced from it was as good as that produced by conventional means; moreover, although a loss of 0·04% on weight of beet was incurred during storage, the final sugar yield was higher than in the period immediately preceding thick juice processing as a result of reduced molasses sugar and reduced beet storage losses (through curtailment of the storage period).

* * *

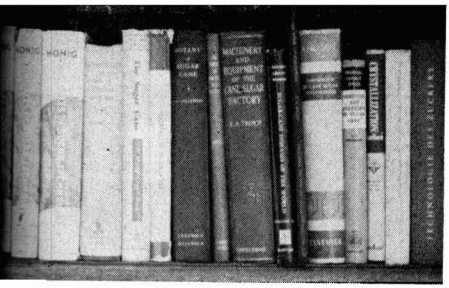
Test on mechanized storage of beet at Salivonkovsk sugar factory. M. Z. KHELEMSKII *et al. Sakhar Prom.*, 1973, (10), 33–39.—Details are given of the system which comprises two rows of concrete pits separated by a roadway for pilers, with the individual pits separated by transverse ventilation ducts and a flume running down the centre of each row. Despite inadequate ventilation and a number of defects in the ventilation system, daily losses over a period of up to 75 days were below those set by norm.

* * *

Comparative tests on methods of automatic control of boiling in discontinuous vacuum pans. B. A. EREMENKO, A. F. KRAVCHUK and V. I. ZABLOTSKII. *Sakhar. Prom.*, 1973, (10), 39–44.—Four boiling control methods were tested under factory conditions: (i) manual control; (ii) control based on boiling point rise; (iii) control based on the ratio between massecuite feed and heat steam consumption; and (iv) as (iii) but with correction for BPR deviation. The most suitable proved to be (iv), which shortened the boiling time by 16·7% compared with manual operation, increased molasses exhaustion by 2 units and the massecuite crystal content by 4·7%, improved crystal size distribution and reduced the sugar colour by 0·2°St. Details are given of the individual control components.

* * *

Increase in the extractible material in beet sugar factories. Technico-economic study of the ion exchange process applied to second carbonatation juice and to the calcium saccharate process for molasses. R. F. ALTOBELLI, G. ASSALINI and G. BRANDOLI. *Ind. Sacc. Ital.*, 1973, **66**, 107–110.—A new factory with a slice of 3500 tons per day of beet of 15° pol and 91 purity in 2nd carbonatation juice is considered as a basis for comparison of processing costs, returns and investment costs for a demineralization process and a plant for recovery of calcium saccharate from molasses. Process costs are lower for demineralization up to 127 days' campaign length and are then higher; the return from demineralization is greater (e.g. 264 million lire over a 100-day campaign as against 232 million lire for a saccharate process), while the investment gain is higher, the difference becoming smaller with increasing campaign length up to 250 days.



New books

Sugar in Mauritius. ANON. 114 pp; 14·5 × 20 cm. (Public Relations Office of the Sugar Industry, Mauritius Chamber of Agriculture, Port Louis, Mauritius.) 1972.

This little volume is a guide to the Mauritius sugar industry and to its importance for the Mauritian economy. The opening chapter surveys the geography, history and climate of the island as a setting for the remainder of the contents which deal with the organization and structure of the industry; agricultural and factory operations and research (including by-products utilization); sugar marketing and export; employment and welfare; supplies, equipment and transport; agricultural diversification on cane lands; and sugar and the economy of Mauritius. The book concludes with some sugar statistical tables and a bibliography. There are many illustrations and the print is easily readable, and for those interested in Mauritius this will be a very useful publication.

* * *

Memoria Anual 1972. 338 pp; 21·3 × 26·2 cm. (Estación Experimental Agrícola de Tucumán, Casilla de Correo 71, San Miguel de Tucumán, Argentina.) 1973.

Approximately half of the work covered by this report, issued in November 1973, was carried out by the Sugar Cane Department of the Station, and relates to fertilizers and irrigation; phytotechnology and flowering; mechanization and its costs; herbicides and varietal selection. Other important sections concerning sugar cane deal with entomology, phytopathology, agricultural microbiology, soils, etc.

* * *

Molecular structure and function of food carbohydrate. ED. G. G. BIRCH and L. F. GREEN. 308 pp; 14×22·5 cm. (Applied Science Publishers Ltd., 22 Rippleside Commercial Estate, Barking, Essex, England.) 1973. Price: £10.00.

This is the printed record of an industry-university cooperation symposium organized under the auspices of the National College of Food Technology of the University of Reading, England. Seventeen papers were read and these and the discussions which followed are recorded. Since sucrose is only one of many carbohydrates in food, albeit one of the most common and important, much of the work presented deals with aspects of wider significance relating the conformation and stereochemistry of carbohydrates to their properties such as absorption, metabolism and intolerance. Separate treatment is given to fructose, honey, lactose and starch, while chemists among our readers will probably find much interest in two papers on non-enzymic browning and sucrose halogeno-derivatives.

* * *

Australian sugar year book, Volume 33, 1974. 375 pp; 18 × 25 cm. (Strand Press Publishing Pty. Ltd., 236 Elizabeth St., Brisbane, Queensland, Australia.) 1974. Price: $Aust.6.50.

It is to be hoped that the general layout of this by now familiar sugar year book never changes, since the seemingly haphazard arrangement makes for a publication that is really interesting. As its predecessors, the latest volume includes various reports, articles reprinted from the *Producers' Review* and *Australian Sugar Journal* as well as papers presented at the 1973 Annual Conference of the Queensland Society of Sugar Cane Technologists, of which a full report is also given. The statistics on Australian sugar production (mostly for 1972) are followed by surveys of the different sugar factories and the tourist attractions and geography of the areas. Illustrations abound, and the overall effect is an absorbing account of the Australian sugar industry.

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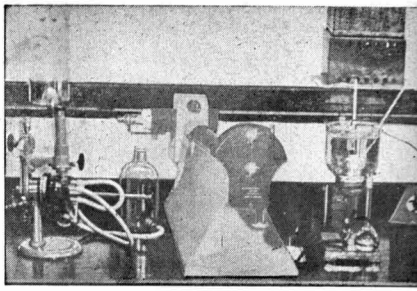
Mixing and dispersion 74. Ed. L. H. FORD. 256 pp; 20·8 × 29·7 cm. (A4 Publications Ltd., Press House, 25 High St., Edenbridge, Kent, England.) 1974. Price: £4.30.

This is the first to be published in the Process Plant Specifiers' Guide Series of reference annuals and is designed to help those engaged in the chemical and process industries to appraise current trends and practices in the field of mixing as well as provide them with a guide to plant and equipment currently being manufactured in the UK or being imported.

The first half of the book covers theory, design and application of mixing systems and equipment, while the second half contains tabulated details of manufacturers and suppliers of mixers, homogenizers, mills, etc. It also contains a list of trade names, surface-active agent manufacturers, makers of mixing accessories, and laboratory equipment manufacturers. A review of UK patent specifications issued between November 1972 and November 1973 on relevant topics is also included.

Laboratory methods & Chemical reports



Studies on the candy test. K. AMAKO, Y. MATSUDA and T. KOMODA. *Proc. Research Soc. Japan Sugar Refineries' Tech.*, 1973, **24**, 36–41.—The "barley candy" test of the US National Bureau of Standards has been recommended by ICUMSA for assaying the resistance of sugar to inversion on heating, but this requires special equipment. A simpler and more convenient procedure has been devised for refined cane sugar: a 250 g sample with 100 ml of water ($1{\cdot}2 \times 10^5\ \Omega\ cm^{-1}$) in a flask are immersed to a pre-set depth in an oil bath at 227 ± 2°C and a thermometer used as a stirring rod to give a homogeneous suspension. When the temperature reaches 30°C a stopwatch is started and the stirring continued until the temperature reaches 70°C (90–100 sec). The flask is then covered and stirring stopped, while the thermometer is hung about 1 cm from the bottom of the flask. In reaching 120°C the flask lid is removed and the syrup stirred again with the thermometer (at 90–110 rpm). On reaching precisely 160°C (total elapsed time 23 ± ½ min), the flask contents are dumped on a cooling plate and, after cooling for 5 min, the candy is removed from the plate and cooled to room temperature in a desiccator. The limit of 160°C is chosen because inversion and caramelization increase remarkably at about this temperature with cane sugar while with refined beet sugar these processes become rapid beyond 170°C. The pH value of the sugar sample affects the results of the test which, however, gives better reproducibility than the ICUMSA method.

* * *

A colorimetric method for the determination of imidazoles contained in caramel colours and cola drinks. M. KOMOTO. *Proc. Research Soc. Japan Sugar Refineries' Tech.*, 1973, **24**, 50–66.—The method involves passing 100 ml of solution containing about 1 g caramel (or 150 ml of decarbonated cola drink) through 20 ml of IRC-50H or LR-120H resin. The effluent is discarded, the resin washed and the adsorbed matter removed by treatment with 60 ml of N NaOH solution followed by washing with 30 ml water. The eluant and washings are neutralized with N HCl and made up to 100 ml, and a 5 ml aliquot treated with 1 ml of a 1% solution of sulphanilic acid in N HCl, followed by 1 ml of 5% aqueous $NaNO_2$ solution. After standing for 5 minutes, the solution is treated with 6 ml of 10% aqueous Na_2CO_3 solution, 40 ml of 20% ethanol and the volume made up to 100 ml. The deep red colour is measured within 20 minutes and the imidazole content expressed in terms of optical density at 505 nm.

Colour measurement in the sugar industry. G. W. VANE. *Sucr. Belge*, 1973, **92**, 379–385.—Various aspects of colour measurement by ICUMSA methods 1, 2 and 4 are discussed in relation to measurements made with eighteen sugars of varying purity, using light scattering and transmission measurements. The experimental results confirm the non-validity of method 1 and unreliability of method 2. Method 4 works well for impure sugars but less well for refined sugars. The imprecision resulting from the effect of a number of factors is discussed and the necessity of achieving an acceptable compromise in procedure and instrument design explained.

* * *

Seasonal variation in microbial contamination of crystal sugar and microbial survival during its storage. F. T. B. PESSINE and F. YOKOYA. *Rev. Brasil. Tecnol.*, 1972, **3**, (1), 1–7; through *S.I.A.*, 1973, **35**, Abs. 73–1225.—Samples of white cane sugar from factories in São Paulo state were analysed microbiologically by methods recommended by the American Public Health Association. Results are tabulated and compared with standard limits. The higher content of thermophilic bacteria in the middle of the season was probably due to poor cleaning of heavily loaded plant; contamination with moulds and yeasts tended to be higher at the beginning and end of the season, when there was an irregular supply of poorer quality cane. Sugar was stored for 1, 3 or 6 months at 28°C and 50% relative humidity, and for 6 months in a factory storehouse; no great changes in the numbers of micro-organisms were observed.

* * *

Simple and sensitive detection of sucrose on paper chromatograms. K. K. SCHLENDER and J. A. LEVIN. *Anal. Biochem.*, 1973, **52**, (2), 630–632; through *Anal. Abs.*, 1973, **25**, Abs. 3249.—In this method, sucrose is hydrolysed to dextrose and levulose. After development in an acid, neutral or alkaline solvent system, the chromatogram is dried at room temperature and then sprayed lightly with aqueous invertase ($2\ mg.ml^{-1}$). After drying the chromatogram at room temperature, the sucrose zone is detected with alkaline silver nitrate reagent[1]. Treatment with the enzyme does not affect the sensitivity of dextrose and levulose to detection by silver nitrate. The lower limit of detection is between 0·5 and 1 μg for dextrose, levulose and sucrose.

[1] TREVELYAN *et al.*: *Nature*, 1950, **166**, 444.

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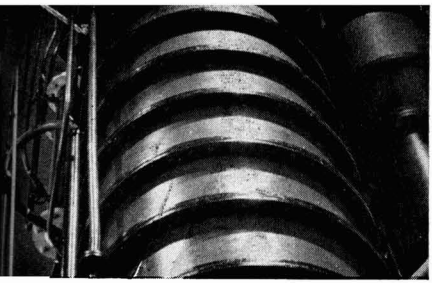


By-products

Feasibility of producing newsprint from groundwood-type pulp of sugar cane bagasse. H. A. NAQVI, R. SAMANIEGO, J. O. ESCOLANO, J. M. SEMANA and V. LASMARIAS. *Sugar News* (Philippines), 1973, **49**, 72–76. Experiments on bagasse pulp production for mixing with long-fibred chemical pulp for use in the manufacture of newsprint are reported. The newsprint obtained from a 50:50 blend was as good as 11 commercial newsprints from the US and Canada except for opacity and density. The economics of bagasse usage are briefly considered.

* * *

Experimental determination of the critical humidity of bagasse. F. GROBART. *Sobre los derivados de la caña de azúcar*, 1973, **7**, (1), 24–29.—Studies have been made of the kinetics of the drying of bagasse and the critical humidity established as 80·7 ± 0·7%.

* * *

Method of determining the texture of dried (beet) pulp. R. VANSTALLEN. *Publ. Trimest. Inst. Belge Amél. Betterave*, 1973, 53–62.—Details are given of a method for determining the texture (granulometry) of dried beet pulp (which plays an important part in rumen activity). Results for samples from various sugar factories showed that while differences in pellet colour had no effect on texture they were indicative of differences in hardness and swelling capacity. Pelleting did reduce the pulp particle size, but sharpest reduction was caused by pressing, although drying also contributed to size reduction; marked differences were found in the samples from the different factories.

* * *

Recovery of aconitic acid from molasses. M. S. SOLAIMAN and R. SAMANIEGO. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 219–224.—Two samples of Canlubang molasses were found to contain 2·87% and 3·25% aconitic acid, while one from Don Pedro contained 2·50%. Approximately 62% of the acid was recovered by precipitation using $CaCl_2$ added in equimolecular proportion; the recovery was raised only to 63–64% by adding a 60% excess.

* * *

Studies on the preparation of phenolic resin bagasse particle board. W. C. HSIEH and M. S. CHEN. *Rpt. Taiwan Sugar Expt. Sta.*, 1972, (57), 95–107.—Details are given of methods for preparation of phenol-formaldehyde, phenol-*m*-cresol-formaldehyde and phenol-resorcinol-formaldehyde resins for use in bagasse particle board manufacture. Pressure, time and temperature conditions are summarized for each type of board. The boards conform to various official requirements in Taiwan and the USA; in weather resistance tests all three types were excellent, and in accelerated ageing tests the boards had a flexural strength 70–85% of that of the original boards. The phenol-resorcinol-formaldehyde resin was found to be the best for board manufacture.

* * *

Some factors affecting protein content in fodder yeast. S. F. LIN, C. S. WU and K. C. SU. *Rpt. Taiwan Sugar Expt. Sta.*, 1972, (57), 109–120.—For maximum fodder yeast protein content it is recommended to keep the molasses at 65°Bx during de-ashing, to control the feed rate of the medium in order to ensure maximum rate of growth during continuous fermentation, to maintain an optimum temperature (the higher the temperature the lower will be the protein content) and to provide a mash nitrogen:phosphorus ratio of 5:3, whereby a 45% protein content will be obtainable.

* * *

The chemistry and uses of furfural. R. H. PEASE. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 157—A summary is presented of the chemistry and uses of furfural and its derivatives, and various sources of furfural, including bagasse, are listed.

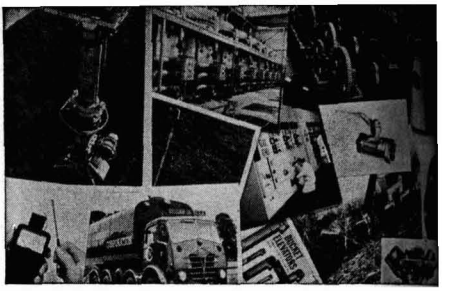
* * *

Molasses comes of age. H. T. VAUGHN. *Sugar J.*, 1973, **36**, (2), 49–50.—In 1972, of 825 million gal of molasses used for various purposes in the US, three-quarters was utilized as animal fodder. Advantages of molasses as fodder are discussed and definitions given of blackstrap and cane molasses as used in the feed industry.

* * *

Manufacture of cane bagasse pellets as cattle fodder for production of meat and milk. P. E. SEQUERA T. *Azúcar y Productividad*, 1973, (7), 6–9.—An account is given of the production of bagasse pellets as cattle fodder by U.S. Sugar Corporation at Clewiston, Fla. The pellets are compressed cylinders 4 cm long by 9 cm in diameter and contain 13% final molasses. They have a moisture content of 6·75–8% and contain 3·7% protein, 0·75% fat, 2·70% ash and 33·30% fibre. To the product is added molasses fortified with urea, vegetable oil, and phenothiacin, the last an anti-helminthic agent. The product is acceptable to cattle and has been fed at rates up to 30% of the total feed. Costs of production in Florida and in Venezuela are compared and manufacturing problems briefly discussed. Brief mention is made of a plant for production of pelleted feed from cane tops.

Trade notices



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PUBLICATIONS RECEIVED

"LIQUATEX" SEPARATORS. Locker Industries Ltd., P.O. Box 161, Warrington, WA1 2SU England.

Details are announced of the new Locker "Liquatex" liquid-solid separation units which are specifically designed for waste water and effluent treatment as well as solids recovery and other industrial applications. The equipment comprises a square screen provided with a foot-mounted motor and V-rope drive to impart vibratory motion; Catalogue 307 gives full information.

* * *

DUST FILTERS. Dust Control Equipment Ltd., Humberstone Lane, Thurmaston, Leicester, LE4 8HP England.

Publication 226 describes the new DCE "Drytube" Mk. 3 filter which has been developed to provide efficient and economical filtration of dusts from a wide variety of industries. It presents a significant improvement on conventional tubular sleeve filters and is available in three types: with mechanical cleaning and intermittent or continuous fan operation, and with reverse air flow and mechanical cleaning with continuous fan operation. Each module has a filtration area of 75 m^2, and the requisite overall capacity is given by adding modules together.

* * *

McCONNEL SUGAR CANE HARVESTER. F. W. McConnel Ltd., Ludlow, Shropshire, SY8 1JL England.

Bulletin No. 3b describes the McConnel whole-stick harvester which was developed in collaboration with the Barbados Sugar Producers' Association and can handle green or burnt cane. Stalks are separated from the stools by snapping instead of cutting, and rubber flails are used for topping. The cane and trash are left behind the harvester as a continuous row from which the stalks for milling are easily separated by hand. The harvester is tractor-mounted and is simple and versatile in operation.

* * *

THE DON SYSTEM OF MECHANIZED SUGAR CANE FARMING. Metcon (Australasia) Pty. Ltd., P.O. Box 104, Glen Waverley, Victoria 3150, Australia.

A 20-page brochure describes and illustrates the various pieces of Don agricultural equipment available from Metcon for all processes from cane land preparation to chopped-cane harvesting.

* * *

PAPER FROM BAGASSE FIBRE. Krauss-Maffei AG, Process Engineering Division, 8000 München 50, Tannenweg 4, Germany.

Two well-illustrated brochures describe the application of Krauss Maffei equipment for bagasse paper manufacture and particularly at the new mill next to Haft Tappeh sugar factory in Iran, while a third gives information on the North Bengal paper mill in Bangladesh, which is also equipped with Krauss Maffei machinery.

DUST COLLECTION. Apparatebau Rothemühle, Brand & Kritzler, D 5961 Rothemühle über Olpe i.W., Germany.

Brief descriptions and illustrations are given of the UK-Multicell dust collector in which the collecting cell assembly comprises a spinner, collecting cell and a clean gas outlet tube. One of the illustrations shows a system with induced draft plant at a sugar factory, where the dust disposal is by means of rotary valves and screw conveyors.

* * *

DUST CONTROL. The Ducon Co. Inc., 147 East 2nd St., Mineola, Long Island, N.Y., 11501 USA.

Ducon equipment for dust control includes "Duclone" collectors, wet scrubbers (cyclonic, dynamic and venturi type) and pneumatic conveyor systems. Information on these is given in Bulletin No. A-9171.

* * *

SAME TRACTORS. SAME S.p.A., 24047 Treviglio, Italy.

Literature from SAME S.p.A. describes their "Minitauro" 60-hp, "Corsaro" 70-hp, "Saturno" 80-hp and "Drago" 100-hp tractors, as well as the "Delfino" all-implement, 35-hp tractor.

* * *

SUGAR CANE WEED AND PEST CONTROL. Ciba-Geigy AG, Basel, Switzerland.

Details are given of "Gesapax combi", "Gesaprim" and "Gesatop" pre-emergence herbicides, "Gesapax combi", "Gesatop Z" and "Gesapax multi" early post-emergence and "Gesapax" and "Gesapax H" post-emergence herbicides as well as "Dimecron" and "Nuvacron" pesticides effective against borers, froghoppers and leafhoppers. Advantages of the "flowables"—ready-for-use liquid formulations which permit greater cover with very fine particles—are also briefly discussed.

* * *

CANE LOADER. Santal Equipamentos S/A, Av. dos Bandeirantes 384, Caixa Postal 58, Ribeirão Preto (SP), Brazil.

A leaflet is available which illustrates the Santal Model CMP-7 cane loader which uses a servo system to permit easy, precise operation with up to a 100° angle of turn. The operator is comfortably seated with maximum visibility, and maintenance is minimal.

* * *

MONSANTO "POLARIS" CANE RIPENER. Monsanto Co., Agricultural Division, Polaris C3NC, 800 North Lindbergh Blvd., St. Louis, Mo., 63166 USA.

Recent results of trials with "Polaris" are presented, showing the increase in cane sugar yields in plantations in Louisiana, Florida, Hawaii, Dominican Republic, Jamaica and Guyana; rate of usage ranged from 3 to 4·4 lb.acre^{-1} and improvements were as high as 27·9% in Louisiana with N:Co 310 cane.

* * *

FEED CANE EQUIPMENT. Canadian Cane Equipment Ltd., Newham, 1st Avenue, Belleville, St. Michael, Barbados.

Whole stalks of cane fed into the C-4 separator are accelerated to 20 ft.sec^{-1} and split into two lengths which are then passed between two sets of rollers, one operating at a lower speed than the other so as to separate the pith, which provides a readily available animal fodder, with or without addition of cheap supplementary nitrogen. Details of the equipment are given in literature which is obtainable from the makers.

US sugar supply quotas 1974

	Previous quotas	*Shortfalls/ Redistributions*	*Quotas in effect*
	short tons, raw value		
Domestic Beet	3,300,000	—	3,300,000
Mainland cane ..	1,764,333	—	1,764,333
Texas cane	60,000	—	60,000
Puerto Rico	100,000	—	100,000
Philippines	1,599,081	—	1,599,081
Argentina	97,007	+8,632	105,639
Australia	213,670	—	213,670
Belize	48,897	+3,836	52,733
Bolivia	8,242	+734	8,976
Brazil	872,251	—	872,251
Colombia	86,229	+7,672	93,901
Costa Rica	103,3 1	—	103,351
Dominican Republic	846,560	+30,000	876,560
Ecuador	103,347	—34,000	69,347
Fiji	46,821	—	46,821
Guatemala	74,815	+4,500	69,315
Haiti	39,310	—33,584	5,726
Honduras	15,216	—10,216	5,000
India	85,553	—	85,553
Ireland	1,107	—	1,107
Malagasy Republic	12,769	—	12,769
Malawi	15,748	—	15,748
Mauritius	44,122	—	44,122
Mexico	717,724	—	717,724
Nicaragua	81,789	—10,000	71,789
Panama	81,789	—16,789	65,000
Paraguay	8,242	—	8,242
Peru	464,835	+20,500	485,335
Salvador	54,527	+5,473	60,000
South Africa.....	60,440	—	60,440
Swaziland	36,153	—	36,153
Taiwan	88,959	—	88,959
Thailand	25,201	—	25,201
West Indies	231,912	+23,242	255,154
	12,500,000	—	12,500,000

CSR Ltd. Annual Report, 1974.—The seven CSR raw sugar factories made 465,000 metric tons in 1973, about 100,000 tons below early estimates and 43,000 tons less than in 1972. Persistently wet conditions seriously disrupted harvesting and almost 500,000 tons of cane, equivalent to about 60,000 tons of sugar, were left unharvested. The sugar content of the cane was the lowest recorded since the current system of analysing cane began in 1939. The effects of lower production and higher costs per ton arising from the difficult season were more than offset by higher prices realized from export sugar sales. Capital expenditure of more than A$6,000,000 was approved during the year for factory improvements and expansion. Conversion to mechanical harvesting in New South Wales, where shortages of manual cane cutters affect cane supply, is being accelerated. Refined products sales of 689,000 tons were 2·2% above the previous year. The wholly-owned New Zealand Sugar Co. Ltd. sold about 165,000 tons or 1200 tons more than in 1972.

* * *

New HSPA research facilities.—Ground was broken for the new office and laboratory facility of the Hawaiian Sugar Planters' Association in Aiea, Oahu, Hawaii, adjacent to the C & H sugar refinery, on the 19th August. The present Experiment Station in Honolulu is to form part of a park, and building of the new Station will provide an opportunity to provide planned, efficient laboratory and office facilities for experimental and other programmes. The new 4-storey structure will have 80,000 square feet of which 50,000 square feet will be allotted to research laboratories, and it will house the HSPA library of some 80,000 volumes. The original Station was started in 1895 and research activities now cost close to $2,200,000 a year.

Brevities

Verenigde HVA-Mij N.V. Annual Report 1973.—As a result of smoothly running plants, good labour relations and favourable climatic conditions, production of the Shoa and Wonji factories in Ethiopia rose from 70,479 tons in 1972 to 74,533 tons in 1973. The increased crushing capacity of the Metahara mill permitted production of 57,249 tons as against 46,164 tons in 1972. Capacity is to be raised from 2450 to 3000 t.c.d. and production raised to about 75,000 tons of sugar from the 1975/76 season. The Kilombero estate in Tanzania managed by HVA produced 39,100 tons as compared with 35,500 tons in 1972 and a project study for a second mill was completed in 1973, the new project to be under HVA management. Work is commencing on the modernization of agricultural methods and technical rehabilitation of the mills of the Asutsuare and Komenda estates. Further consultancy work is being undertaken in Sudan, Indonesia, Peru, Jamaica, Trinidad and El Salvador in connexion with plant modernization and expansion as well as new projects.

* * *

250th BMA diffusion tower.—Braunschweigische Maschinenbauanstalt, which introduced the continuous tower diffuser for beet sugar extraction in 1949, is erecting the 250th to be made by the company. It will be installed at the Schladen factory of Nordharzer Zucker A.G. and will process 3000 tons of beet per day. Towers of 1000–6500 tons capacity are operating successfully in 26 countries.

* * *

New sugar factory for Sudan.—Fletcher and Stewart Ltd. announced in August that they had been awarded their second contract within a year for the supply and construction of a complete new sugar factory in the Sudan. It will be built at Hagar El Asalaya in the White Nile Province, which is located roughly 60 miles distant from the site of the Sennar sugar factory for which they secured their first major contract in the Sudan in January 1974. Although they differ in certain respects, each factory will be capable of processing 6500 tons of sugar cane per day and will between them have the capacity to produce 250,000 tons per year of refined sugar. The new factory is scheduled for completion in March 1977.

* * *

St. Kitts sugar production 1974.—Crop ended on the 19th July 1974 with 217,220 tons of cane crushed to produce 25,469 tons of sugar. This compares with 210,501 tons of cane crushed in the 1973 crop which produced 23,364 tons of sugar. The recovery was thus improved from 8·83 tons cane per ton sugar in 1973 to 8·32 in 1974. The continuation of drought conditions in 1974 indicates that, failing adequate rain in the reasonably near future, the 1975 crop may not exceed 25,000 tons, although the hurricane season can produce conditions conducive to good rains.

* * *

Nigeria sugar projects[1].—The Federal Government of Nigeria and Tate & Lyle Ltd. have recently agreed on formation of the Sunti Sugar Company in the Bida Emirate of the country's North-Western State. It is understood that three sugar projects will be involved, with plantations, factories and refineries having a minimum capacity of 40,000 tons per annum. The Government of the North Central State plans the erection of a sugar refinery to have a designed capacity of 10,000 tons per year.

* * *

US sugar refinery closure[2].—Pepsico Inc. has ceased refining operations at its Long Island City plant in New York from the end of May. The company's needs will be met by purchasing sugar from other refiners in the area.

[1] F. O. Licht, *International Sugar Rpt.*, 1974, **106**, (23), 8.
[2] *Sugar y Azúcar*, 1974, **69**, (6), 72.

Brevities

US futures trading legislation[1].—According to reports from Washington, the Senate Agriculture Committee has decided that the proposed new US Commodity Futures Trading Commission should be entirely independent of the Agriculture Department. The Committee's approach would give full-time status to members of the new Commission, intended to exercise tightened Federal regulation of all futures markets. These proposals are different from the House version of the bill, which would maintain a link with the Agriculture Department, with the Secretary automatically serving as one of its five members. The House also projected Commission service as a part-time job. Approval of the bill, in either version, would bring the greatest changes in the field since the adoption of the Commodity Exchange Act some 40 years ago; it would bring under regulation, for the first time, several commodities including sugar.

* * *

South African cane harvester.—The "Gobbler" whole-stalk cane harvester has been designed by the South African Sugar Association Experiment Station on the chopper-harvester principle because of the highly efficient manner in which this type of harvester can pick up badly sprawled cane. The machine tops the cane, then pushes it forward in the row, cuts the cane at its base and then conveys the whole stalks horizontally to the rear, butt-end first. Instead of being chopped into billets the stalks are gripped by the butt-end by special ejector rolls and thrown into a bin. This has a capacity of about 200 kg and a manually-operated hydraulic release to eject the loose bundle on to the ground. The bundle is placed so that it will be straddled by the tractor when the next row is harvested. The harvester is designed to fit on any standard agricultural tractor with a minimum time required for hitching and unhitching. The centre of gravity is low to give good stability on hillsides. Only burnt cane can be handled as no provision is made for trash removal from green cane. Output should be 50-100 tons per day.

* * *

Caribbean cane diversification research agreement[2].—Government officials from Mexico, Dominican Republic, Jamaica, Trinidad and Barbados met in Bridgetown and have agreed to pool their research efforts in projects seeking new uses of sugar cane other than production of sugar, molasses and rum. Two observers from the Organization of American States were present; the OAS has set aside Bd $400,000 to finance special schemes under an overall project for making alcohol and proteins. Pilot plants in animal nutritives are to be established in Barbados, Jamaica and the Dominican Republic with pilot schemes in Mexico and Trinidad.

* * *

Barbados sugar production, 1974[3].—The 1974 crop in Barbados reached 110,000 tons, 3000 tons less than in 1973 but still about 10,000 tons more than the most optimistic forecast made in December 1973. The recovery was partly the result of new varieties, the cutting of more green cane than in 1973, the addition of 12 mechanical harvesters to the 3 locally adapted models, reduction in the number of imported workers and a new type of field job tried experimentally last year which involves paying a special price for cutting and piling green cane. Sugar officials are hopeful of a better output in 1975.

* * *

USDA Agriculture Handbooks.—Loose-leaf handbooks have been issued by the US Dept. of Agriculture under the titles "Guidelines for the chemical control of plant diseases and nematodes" (AH 378), "Guidelines for weed control" (AH 447) and "Guidelines for the use of insecticides to control insects affecting crops, etc." (AH 452). Prepared by USDA specialists, the handbooks cost $13.00 + $3.25 for foreign mailing, $8.00 + $2·00 for foreign mailing and $12.50 + $3.50 for foreign mailing, respectively, and are available from the Superintendent of Documents, Government Printing Office, Washington, D.C., 20402 USA.

West German sugar exports[4]

	1973	1972
	(*metric tons*)	
Raw sugar		
Switzerland	644	550
Other countries	17	33
	661	583
White sugar		
Austria	44	2,546
Belgium/Luxembourg	135	114
Burundi	500	2,000
Chile	899	1,046
Cyprus	0	670
Dahomey	400	103
Denmark	7,192	5,201
Dubai	1,000	0
French Polynesia	914	383
Gambia	475	604
Ghana	1,530	100
Greece	200	6,678
Holland	1,554	17,188
Hungary	76,768	65,871
Iceland	530	1,315
Iran	22	0
Israel	0	15,875
Italy	87,687	89,153
Ivory Coast	198	250
Kenya	800	0
Lebanon	3,650	0
Liberia	149	400
Malta	1,140	0
Morocco	101	0
New Caledonia	355	200
New Guinea	50	509
Niger	500	0
Nigeria	2,642	8,960
Norway	2,117	6,610
Oman	350	300
Pakistan	85	0
Rwanda	0	200
Saudi Arabia	0	150
Sierra Leone	3,365	5,305
Sweden	601	3,300
Switzerland	9,862	26,215
Tanzania	1,500	1,500
Tunisia	83	0
UK	40	0
Yemen	110	0
Yugoslavia	14,165	8,594
Other countries	202	155
	221,916	271,495
Total, raw value	247,234	302,244

Disease resistance cane breeding experiments in Hawaii.—A four year cooperative agreement, involving $122,500 costs, will result in research conducted by the Hawaiian Sugar Planters' Association Experiment Station for the US Department of Agriculture. The object is production of cane varieties having a high degree of resistance to smut and Fiji disease. As a result of finding the former disease in Hawaii, the clonal breeding material available has been cut by 75%, the proportion which has had to be discarded because of susceptibility. Fiji disease is not present in Hawaii but its introduction is thought of as being a case of "when" rather than "if". To speed up development of resistant clones, HSPA scientists led by Dr. D. J. HEINZ will use tissue culture techniques and induction of small genetic changes through the application of X-rays and chemical mutagens, with testing of the young plants in areas where Fiji disease exists.

[1] F. O. Licht, *International Sugar Rpt.*, 1974, **106**, (22), 8.
[2] *W. Indies Chron.*, 1974, **89**, 227–228.
[3] *Public Ledger*, 6th July 1974.
[4] F. O. Licht, *International Sugar Rpt.*, 1974, **106**, (21), iii.

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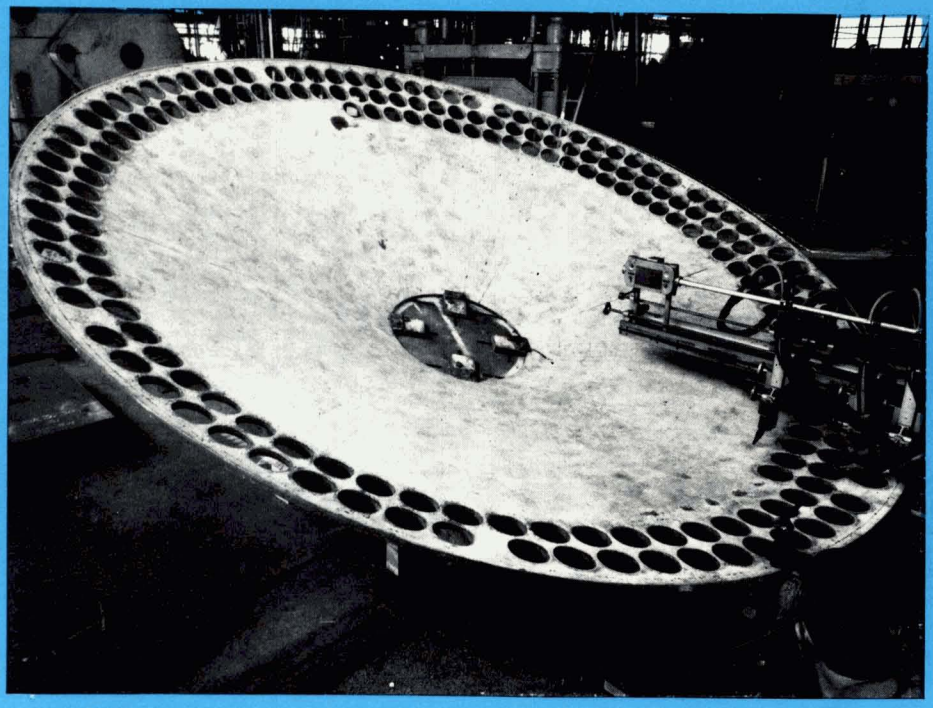

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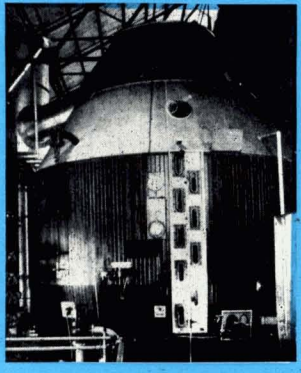

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