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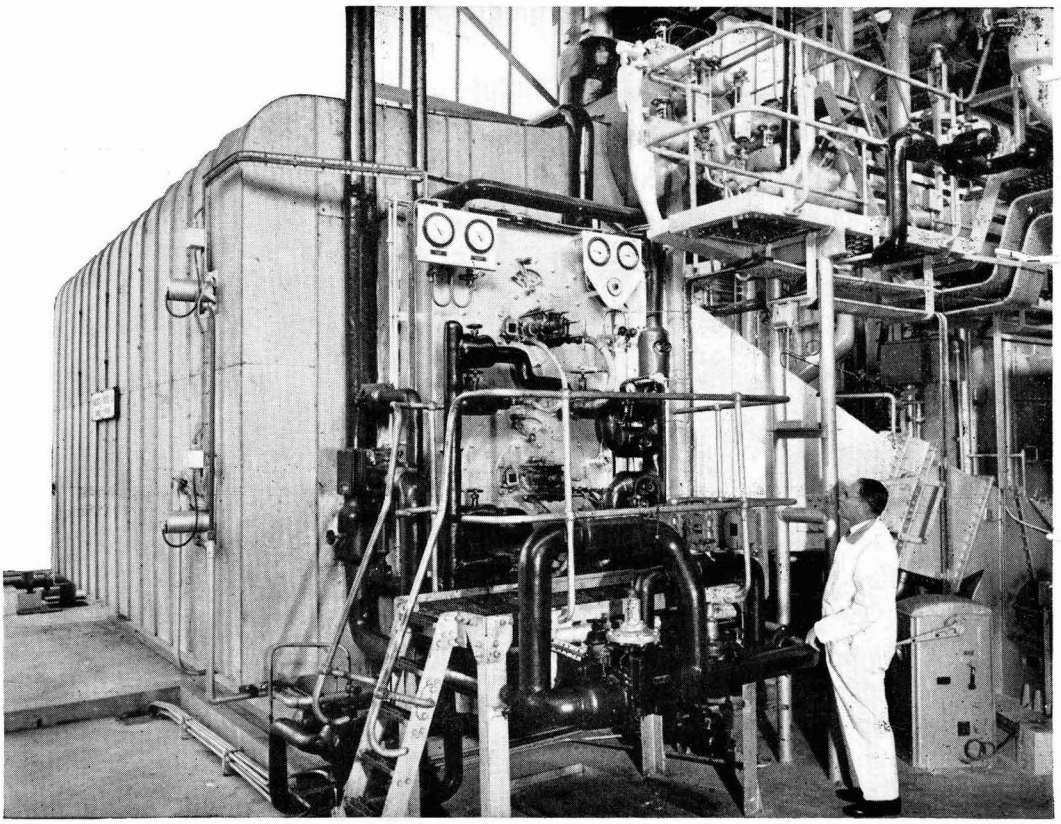

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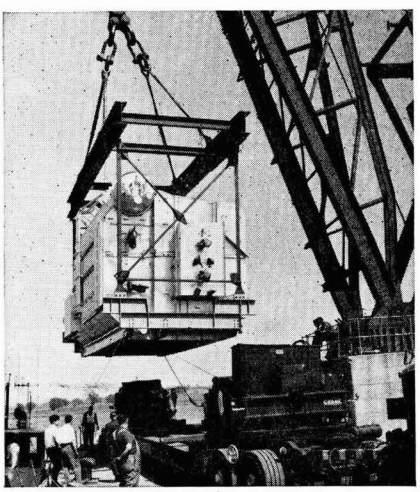

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THE
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CHANGE OF ADDRESS

The *International Sugar Journal* has moved to new offices outside Central London and correspondence should be sent to:

The International Sugar Journal Ltd.,
23A Easton Street,
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Our telephone number is now High Wycombe 2308 while our telegraphic address is "Sugaphilos, High Wycombe".

NOTES AND COMMENTS

International Sugar Conference.

In Geneva, delegates started meetings towards the end of July to discuss commodity problems, and to make recommendations for remedial actions to be taken where necessary. Although sugar is one commodity which was to be examined, the full-scale U.N. Sugar Conference which is to take place this month made for less detailed treatment than with other commodities. Nevertheless the views expressed will undoubtedly be receiving close examination by all parties concerned with this month's Conference.

As with other Conferences, all the producing countries will be eager to secure as large a share as possible in the total export availability and we can expect to see claims put forward by the spokesmen for the various regions as the Conference approaches. The first such claim appears to have been put forward by Sir ROBERT KIRKWOOD, Chairman of the B.W.I. and Jamaica Sugar Manufacturers' Associations, who is reported[1] as announcing in Jamaica recently that the Commonwealth Sugar Exporters will seek a quota of five million tons under a new International Sugar Agreement.

E. D. & F. MAN[2] make a comment which can be classified in terms of silver lining to clouds: "It must be admitted that the lower the (raw sugar price) level prevailing when the I.S.C. meets in Geneva in September, the better the chances of an effective agreement coming into being. At £20 per ton for sugar a 25% cut-back of exports should certainly result in a rise to above £25 in the market, which would result in a higher cash return to world market sellers."

U.S. sugar supplies.

Applications were invited, for submission on or after the 19th July, for the balance of foreign sugar quotas for the fourth quarter of 1965 and for set-aside quotas. The set-aside applications in respect of sugar from the Philippines will be approved only when the applications are supported with a certificate of the Philippines Sugar Quota Administration. It is certain that there will be no difficulty in obtaining foreign sugar to make up a deficiency in any country's quota. The Puerto Rican crop is smaller than last year and a quota shortfall of the order of 325,000 short tons is likely. Under the terms of the U.S. Sugar Act, this will have to be redistributed among the Philippines and foreign suppliers in the Western Hemisphere, but these should find it easy to meet the additional requirement from their stocks.

But it is not yet clear what will be the eventual total requirement for the U.S. The total supply quota for 1965 was set initially at 9,200,000 short tons but it is very likely that it will have to be increased above the 1964 figure of 9,671,000 since deliveries have been running at a rate greater than last year. Consequently more than half a million tons will probably be needed and, although this can undoubtedly be met, partly by the U.S. Mainland sugar producers, it does result in added uncertainty which does not help either the sugar market or the statisticians who will have to produce figures on which export

[1] *Public Ledger*, 31st July 1965.
[2] 31st July, 1965.

A proposal for a new International Sugar Agreement.

It is undoubtedly felt as a hardship among some sugar producers, particularly in countries of the Western Hemisphere, that they have greater problems because they are not parties to agreements such as the Commonwealth Sugar Agreement which guarantees an adequate price for a proportion of their sugar, nor are they able to claim a privileged market as a newly-independent colony of a former imperial power. Again, they often have small and poor populations, so that they have no large domestic consumption as a base for their industries. As a consequence, although they may have quotas for sale in the U.S.A., a rather high proportion of their crop is subject to the fluctuations of the world market which, as has been pointed out, is a residual market in which the prices are unrelated to production costs and to prices paid for most of the world's sugar.

A measure to avoid this undue dependence on the world market has been proposed by C. Czarnikow Ltd.[3] who write: "It occurs to us that if a new Agreement is to function effectively, some way must be found to incorporate these various agreements (the Commonwealth Sugar Agreement, supplies to the U.S., sugar movements within the E.E.C., exports from East Europe to the U.S.S.R. and sales by Cuba to the Communist countries) within the overall pattern while at the same time not interfering with their smooth functioning. Already all the major exporters are members of groups, as are, with a few important exceptions, the importing countries. If the few remaining major importers could be persuaded to adhere to existing arrangements or, failing this, to form groups of their own, the world market as we know it would diminish to very small proportions. Provided groups would undertake regional stock holding arrangements the requirements of marginal stocks to shelter the residual market from violent price swings would present less difficulty and, if it followed that importers within the groupings paid higher prices than those which had not joined, this would be no more than a realistic putting into effect of the UNCTAD resolutions.

"With this further splitting of the international market all major producers would be members of at least one team. Their outlets would be made quite clear as would possibilities for future expansion. Cases of particular hardship could be dealt with within the region or regions concerned. A further advantage might well be that countries, while subject to the stricter discipline of a region, would anticipate a more sympathetic hearing from their own groups in times of need than they could expect from an international concourse of varying political views.

"A scheme of this type would in no way diminish the rôle of the I.S.C. In addition to taking such action as it deemed necessary to regulate prices in the residuary market it would also have all its present functions and would need to operate with care and skill to co-ordinate the various individual agreements. It would also need to be sufficiently viable to cope with possible adjustments in the structure of the individual agreements."

* * *

Demerara Company Holdings Ltd. 1964 report.

The profits of Demerara Company Ltd. were less than a quarter of those of the previous year. The main factors causing this change were a reduction of 25% in the crop and the fall in world sugar prices.

The yields of sugar per acre were down, from 3·66 tons to 3·06 tons at Plantation Diamond and from 3·99 to 3·08 tons at Plantation Leonora, and sugar production fell from 63,102 tons in 1963 to 47,606 tons in 1964.

The Company received the negotiated price under the Commonwealth Sugar Agreement of £46 0s 10d for some two-thirds of its production. The usual tonnage, 9% of the total crop, was sold on the local market at a price yielding some £15 per ton less than the negotiated price. Of the remainder of the reduced crop rather more than half was sold to Canada at a preferential premium on world prices and the balance to the U.S.A. at some £7 below the negotiated price.

On the production side, 1964 was quite the most difficult year the Estates have experienced for very many years. The major trouble was the drought throughout the first six months. When the rains came they were too late to affect the stunted growth of the autumn crop. The spring crop for 1965 has also been affected so that although the acreage reaped is up to budget, yields are down. This means that the 1963 tonnage of sugar is unlikely to be reached in 1965.

The labour situation was most unstable owing to political and racial issues which were focused on arguments between the trade unions. Intimidation of loyal workers, arson and acts of violence against them and their families were rife throughout the greater part of 1964. During the whole of this time the loyal staff did its utmost under most adverse and very often dangerous conditions to keep the factories working and to make sugar. The fact that damage to life and property was strictly limited was due to the costly security measures that were instituted, costly both in effort and in cash. These measures aggravated the cost of production in a year when heavy fixed costs had to be carried by the extremely poor crop. As a result cost per ton rose alarmingly.

The new mill at Diamond was to be in operation when the autumn crop began in the middle of July. Owing to the inevitable teething troubles in such a large development, the Company has not budgeted for any economies of production in the current year but expects these to be reflected in the 1966 results.

[3] *Sugar Review*, 1965, (724), 137.

SUGAR CANE AGRONOMY IN THE PHILIPPINES

Proceedings of the Philippines Sugar Technologists 11th Annual Convention, Manila, August 1963.

IN his opening address the President referred to the progress that had been made in the industry in recent years but also stressed the urgent need for advances in some spheres such as irrigation and mechanical harvesting. Rat infested fields were another problem that still persisted.

Atomic Energy

Two speakers dealt with the subject of atomic energy and its bearing on the sugar industry or on sugar cane agronomy. The Philippine research reactor at Diliman was referred to and the fact that the Philippine Atomic Energy Commission proposes to place the reactor at the disposal of other bodies requiring facilities for research or developmental work. The actual operation of the reactor would of course remain in the hands of its own staff. Ways whereby the Philippine sugar industry might benefit from this are discussed. These include the use of radioisotopes in the study of fertilizers utilization by the cane plant, the origin of underground water and water movement in the soil, and the subject of sugar synthesis in the plant. Another speaker gave a good account of what has been done so far in these fields in other countries, notably Hawaii. He pointed out that the utilization of radioisotopes in agricultural research is twofold—(1) as tracer atoms in various physiological, nutritional, ecological and related studies and (2) as sources of radiation. The potential value of radioisotopes in tracing insect pests was emphasized, especially in studying white grubs and other soil-inhibiting insects affecting sugar cane.

Sugar Cane Varieties

Numerous varieties of sugar cane are in commercial cultivation throughout the Philippine islands. Five speakers dealt with varieties, mainly with varieties in their own particular areas or with experiments or trials with which they had been personally concerned. These speakers were from the Philippine Sugar Institute, the College of Agriculture of the University of the Philippines and the Victorias Milling Co. The need for varietal changes in many areas was stressed, these being due to any one of several different factors such as declining fertility of the soil, development of an unfavourable physical condition of the soil, the cumulative effect of diseases and pests and the existence of unidentified diseases.

F. T. TABAYOYONG described a field experiment (Victorias Milling Co.) in which 55 commercial cane varieties were entered, 8 being recommended for commercial planting in addition to the 4 already grown. The agronomic characters of these 8 recommended varieties are fully described, the varieties being—Phil 54-60, B 43-63, B 37-172, F 140, H 49-5, N:Co 310, H 38-2915 and Q 57.

Another variety selection programme described was one carried out in the Visayas and the Philippine Sugar Institute's two major stations in Negros Occidental, where a total of 85 varieties was tested. The experiments were conducted to select high yielding varieties recommendable for commercial planting. A list of varieties advocated for each of 13 mill districts is given. Notable among these is the variety Phil 53-33 with its quality and wide range of geographic adaptability. Yield tests of locally produced hybrids from the College of Agriculture Central Experiment Station, Laguna, are recorded and their characteristics described. A Victorias Milling Company experiment is described as "Production and quality of seven sugar cane varieties in relation to month of planting and harvesting age." The variety B 37172 gave the highest yield regardless of the planting month and harvesting age.

Fertilizers

A paper likely to be of interest to many is one by M. ROBENIOL on the volatilization of nitrogen from urea. Tests were carried out on two soils, a clay soil and a sandy loam, under different soil moisture levels. Highest losses were obtained when the sandy loam soil was at 20% moisture level and the clay at 25%. Volatilization of ammonia started earlier and also subsided earlier at higher soil moisture levels than at lower levels. Covering urea with one inch of soil minimized the losses in the sandy loam and completely prevented it on the clay soil.

An interesting account of distillery wastes for fertilizer and feed is given by R. A. CRUZ. By distillery waste is meant *slop* (spent lees) or the discharge from the distillery column and *lees* or the sludge residue at the bottom of the fermenting tank after drawing the beer. Slop had already been proved to be very beneficial for young coconuts, especially young palms in a moribund condition, and preliminary observations suggest it is equally beneficial for sugar cane. The lees or sludge was fed to young pigs which became drunk the first time they took it. Nevertheless they returned for more and it proved to be beneficial.

Bagasse as Compost

"The problem of composting sugar cane bagasse—a preliminary report" is the title of a paper by G. M. REYES of the Tarlac Development Corporation, which refers to experiments carried out in April and May 1963. It is pointed out that there has long been concern about the welfare of the soil on some Philippine sugar estates where it is predominantly of a sandy nature—a sandy or silty loam. On such soils part of the inorganic fertilizers leach out and go to waste owing to the lack of humus. Burning of cane trash is sometimes practised which accentuates the evil.

The experiments described were designed with a view to finding out the best or most practical method of converting sugar cane bagasse into compost before applying it to the soil. The humus thus provided acts as plant food to the cane, improves the soil structure, increases moisture holding capacity

and prevents leaching, especially of soluble inorganic nitrogen. Drawbacks to the work were considered to be the lack of a suitable mechanical device for the control of air and moisture and the fact that hand labour renders the operation expensive on a large scale. Municipal or city refuse is a better source of organic matter than sugar cane bagasse but must be properly safeguarded.

The bagasse was used coarse or fine after having been separated by means of a blower and mixed with animal manures (carabao, horse, poultry) and filter press mud. A 6-inch layer of bagasse would be followed by a 2-inch layer of manure, the heaps being a metre in height. Urea and other nitrogenous fertilizers were also used as stimulators. The fine bagasse decomposed much more readily than the coarse, as might be expected. A table showing the chemical analysis of the various composts produced (C, N, and C:N ratio) is given. That utilizing poultry manure registered the highest nitrogen content. Unfortunately times required for producing composts are not given.

Diseases

A paper on ratoon stunting disease in the Philippines includes the results on an extensive survey to ascertain the prevalence of the disease. It covered 19 sugar mill districts in the Philippines. The disease was found in only 3 of the 82 haciendas or estates surveyed, the varieties concerned being POJ 2883 and H37-1933. In each case infected stools were considered to represent less than 1%. It would seem therefore that the hold that this insidious disease has in the Philippines so far is only very slight. However the danger that may be involved is fully recognised.

The only serious or major diseases of sugar cane in the Tarlac Mill district are considered to be mosaic and Fiji disease, both caused by viruses. Control and preventive measures taken include use of disease-free planting material, planting of resistant varieties, testing for disease resistance and rogueing. Minor diseases, which cause little damage, include smut, pokkah-boeng, ring spot, yellow spot, banded sclerotial disease, root rot, red rot of leaf sheath and downy mildew on hybrid seedlings.

In experiments by the Philippine Sugar Institute the reaction of 5 of their varieties to root rot disease was tested. They were grown along with a standard susceptible variety. Root rot is described as "troubles mainly due to combined damage by *Pythium* species and nematodes". The varieties Phil 53-33, Phil 53-3, Phil 53-147 and Phil 53-200 appeared to be resistant.

Insect Pests

Propagation and field liberation of the Cuban fly in Victorias is the title of a paper by two scientists of the Philippine Sugar Institute. The Cuban fly (*Lixophaga diatraeae*) is an effective larval parasite of the borer *Diatraea saccharalis* in other cane growing countries. Some 20 generations of the Cuban fly were successfully raised under laboratory conditions. The results of preliminary field liberation seem successful although further observation and study are needed. Results indicated that *Chilo* was the most satisfactory laboratory host for the propagation of the fly, while *Chilotraea* was the least and *Sesamia* fairly adoptive. The white sugar cane borer (*Eucomsa schistaceana*) was also parasitized.

Another paper from the Philippine Sugar Institute deals with the effects of "Aldrin", "Lindrex", "Chlordane" and "Diazinon" on subterranean insects and yield of sugar cane. Some 17 species of insect are known to attack sugar cane underground in the Philippines, the more serious pests being white grubs, termites and pink mealy bugs. The results of the experiment, based on yield, indicated that "Lindrex" significantly outyielded control plots and "Aldrin" showed a smaller but a substantial increase.

Weeds

Some half dozen papers on weeds in sugar cane are concerned mainly with their control by chemical means. A detailed account of the weeds that occur in sugar cane fields in the La Granja Experiment Station area (La Carlota, Negros Occidental) is given by F. T. AALA of the Bureau of Plant Industry. The five worst sugar cane weeds are listed as—*Cyperus rotundus* (nut grass), *Commelina benghalensis* (spiderwort), *Ipomoea triloba*, *Ageratum conyzoides* and *Digitaria sanguinalis* (crab grass). Another author (B. C. RAFLORES) working in a different area and discussing common weeds in cane fields states "Two species topped all the others in abundance in cane fields, namely 'aguiñgay' (*Rottboellia exaltata*, a grass) and Centrosema (*Centrosema pubescens*)."

In a comprehensive series of experiments comparing six different weedkillers (CMU, TCA, 2,4-D, 2,4,5-T, "Simazine" and "Stam F_{34}") it was concluded that pre-emergence application proved advantageous over post-emergence in respect of sugar yield and control effect on prevailing weeds. CMU proved to be the most effective.

F.N.H.

Rising costs of cane production. N. J. KING. *Cane Growers' Quarterly Bull.*, 1965, **28,** (3), 4–6.—It is claimed that, in spite of the fall in world sugar prices, cane growing in Queensland can still be a stable and economical undertaking provided costs of growing and harvesting cane are not allowed to get out of hand. Increased attention might be paid to more intelligent fertilizing, better weed control, improved farm drainage and use of the best variety for the particular soil type.

* * *

Basal stem rot. C. E. GLOVER and D. R. L. STEINDL. *Cane Growers' Quarterly Bull.*, 1965, **28,** (3), 7–8. Basal stem, root and sheath rot is a fungus disease (*Marasmius*) that has become serious in Queensland only in recent years. A description of the disease, first recorded in Queensland in 1957, is given. The more susceptible varieties (e.g. Q 63, Q 67 and Trojan) are indicated.

SUGAR CANE GROWING IN QUEENSLAND

64th Annual Report of the Bureau of Sugar Experiment Stations.

IN his opening remarks the Director points out that a survey of the Queensland sugar cane industry's agricultural position suggests that "the best chances of progress in efficiency lie in the fields of cane breeding, agronomy, entomology and advisory services. The cane disease position is fairly satisfactory and requires, in the main, a constant vigilance on the part of Cane Pest and Disease Control Boards to ensure a progressive improvement. It is for these reasons that the Bureau's staff recruitment scheme carries a bias towards certain classes of professional men.

"The future productivity and profit margins of both old and newly assigned land will rely largely on a steady supply of new, improved cane varieties, and the cane breeding work must become, more and more, a priority department of the Bureau's activities. The general heading of agronomy covers fertilization, irrigation, weed control and cultural practices, etc. and it is logical to expect that, with some concentration of effort, appreciable advances can be made. The rat problem and the continuing depredations of some insect pests justify an increase in the work of the entomological division; and the growth of the extension and advisory staff will ensure that all of the research findings will be carried to both old and new growers."

The Varieties Position

With regard to the variety position in Queensland during the 1963 crushing season there were no spectacular changes. The well-known and well-tried variety N:Co 310 advanced from the 4th to the 2nd position in terms of tonnage, Pindar for the 6th consecutive year leading the field and providing 20% of the total crop. Over 1½ million tons of N:Co 310 was harvested, more than one third of it in the central district. The good yielding capacity and high sugar content of this variety would seem to offset its disadvantages with growers. These are free, early arrowing, side shooting and poor burning quality early in the season. This variety is widely cultivated throughout the world and has been of great importance to the sugar cane industry of Taiwan for many years. The variety Q 57 occupied 3rd place in Queensland, being grown mainly north of Townsville. It is thought it may now be eclipsed by the recently released Q 78, with its erect habit and good sugar content, especially in the wetter areas. The six main varieties accounted for 77% of the total crop.

The breeding programme in Queensland is likely to be influenced by the fact that drought in the south has emphasized the need for a greater choice of drought-resistant varieties. In the far north extensive lodging, brought about by a very wet season, has shown that greater resistance to lodging will be needed in new varieties if the mechanical harvesting programme is to attain full efficiency. An account is given of recent breeding work when 463 crosses were made, the 1st on the 14th May and the last on the 19th June. A new 30 cu.ft. refrigerator for the storage of sugar cane seed was installed.

Cowpea selection work was continued and several plantings of large populations resulted in progressive selections of the more promising varieties. Characters sought include resistance to wet weather wilts, long growth and cover period, good habit and suitability for seed production and harvesting. Two varieties named "Meringa" and "Mulgrave" have now been tested over a number of years.

Weed Control

Control of the Giant Sensitive Plant (*Mimosa invisa*) was reasonably successful during the year. Roadside infestations were cleared prior to the wet season with constant inspections and sprayings. With aerial spraying on cane the kill was about 95%, the remaining 5% lingering and eventually producing flowers and seeds.

Three trials were carried out on Para Grass (*Brachiaria mutica*) using various herbicides at different rates. DMA ("Methar 100") gave interesting results at a low cost per acre. To be effective it must be applied as split applications (3 applications of 4 lb/acre each). In treating the weed in farm drains the uracil compound "Hyvar X" (20 lb/acre) proved effective. Trials are proceeding with a view to finding the minimum effective dose. "Hyvar X" as a foliage spray also gave promising results with Johnson grass at rates of from 16 lb/acre upwards.

Pre-emergence trials against Guinea grass (*Panicum maximum*) again showed the efficiency of DCMU, at 4 lb/acre of the 80% product. With the Stinking Passion Flower (*Passiflora foetida*) the use of "Tordon" was promising but further trials are envisaged. With billygoat weed (*Ageratum houstonianum*), along the edges of cane blocks and in water furrows an application of "Paraquat" at ¾ pint per acre was the most economical treatment of those used. Severe drought prevented reliable assessment of trials set out against blue heliotrope (*Heliotropium amplexicaule*). Various experiments on the chemical control of nut grass (*Cyperus rotundus*) were carried out with 4 or 5 different herbicides. Of the herbicides tolerated by cane at reasonable concentrations the butoxyethanol ester and amine 2,4-D gave the most consistent results.

Pests

Pests were considered to be responsible for the loss of 1 ton of cane for each 204 harvested. Rats destroyed 0·23% of the crop, other animals including bird pests 0·07% and insect pests 0·19%. Individual pests affected some districts more than others. Loss due to rats was only 0·04% in cane grown south of Townsville, but 0·56% north of Townsville, which is the normal pattern. Among the insect pests, cane grubs or borers and the soldier fly (*Altermetoponia rubriceps*) were most in evidence causing approximately the same degree of damage.

Field trials against the soldier fly confirmed the efficacy of "Dieldrin", "Heptachlor" and crude BHC dust, broadcast and incorporated in the soil before planting. BHC also controlled cane grubs. Insecticides for grub control were applied during 1963 to 76,590 acres as against 59,937 acres the previous year. Broadcast applications of BHC controlled "Frenchi" (*Lepidiota frenchi*) as well as Greyback grubs (*Dermolepida albohirtum*). "Aldrin" and "Heptachlor" were ineffective against the Childer's grub (*Pseudholophylla furfuracea*) and appeared to have fostered the pest by destroying its natural enemies in 2 trials in which these chemicals and "Lindane" were applied at 8 lb/acre, broadcast and ploughed under.

Other investigations reported on were on funnel ants (*Aphaenogaster* spp.), wart eye (a malady affecting the eyes of cane setts) and earth pearls, found associated with poorly grown cane. Animals causing damage in some areas, apart from rats, included wallabies, wild pigs and foxes. Among bird pests coots were the most prominent. Cockatoos were occasionally a severe local pest (at Proserpine) as were starlings at Innisfail. The latter roosted on cane in such numbers as to break down the foliage on some 14 acres.

Diseases

Owing to the planting of contaminated material, ratoon stunting disease was the chief trouble among new plantings. Droopy top, due to copper deficiency, showed in new plantings on lighter and marginal soils in several districts. Pineapple disease (*Ceratocystis paradoxa*) also affected many plantings. A late epidemic of yellow spot (*Cercospora koepkei*) reduced the cane top and cover over wide areas and was largely responsible, along with May floods and storms, for the low sugar tests in the early weeks of crushing. There was widespread infection in the variety Pindar, which had shown some measure of resistance in previous years. Indications are that a race of the fungus capable of freely attacking this variety of cane has developed. Frequent floods were also responsible for an increase in chlorotic streak (a virus disease) and bacterial mottle.

In connexion with ratoon stunting disease the fact that identification on the basis of internal symptoms is not always straightforward or reliable is emphasized. Under Queensland conditions the pink blush of the younger nodes in small cane is not reliable and is usually only well-developed when the cane is growing rapidly and before more than one or two above-ground internodes are fully developed. The symptoms can disappear in a matter of days as the cane makes its main growth during the wet summer season. The pink blush is difficult to use in field inspections for the disease, since the affected shoots are not necessarily markedly stunted. Symptoms in mature cane are usually more reliable. Accounts are given of resistance trails with mosaic (virus), leaf scald (*Xanthomonas albilineans*) and red rot (*Glomerella tucumanensis*).

F.N.H.

AGRICULTURAL ABSTRACTS

Responses to nitrogen in the Central District (Queensland). G. C BIESKE. *Cane Growers' Quarterly Bull.*, 1965, **28,** (3), 9–10.—Trials with 3 levels of nitrogen have been carried out on plant cane and ratoons. The high yield increases with ratoon crops demonstrated the value of nitrogen (4 cwt sulphate of ammonia per acre) with this class of crop. Dressings above 6 cwt per acre were not recommended. The nitrogen fertilization had comparatively little effect on lowering c.c.s. or sucrose content.

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Fiji disease. ANON. *Cane Growers' Quarterly Bull.*, 1965, **28,** (3), 13.—Some new findings on Fiji disease (a virus) at Rocky Point in Queensland are briefly recorded. This persistent disease has occurred in the same area over a period of time and the difficulty of completely eradicating it is emphasized. Frequent inspections are necessary to prevent diseased stools providing a source of infection to leafhoppers which spread the disease.

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Soil erosion and contour farming. G. A. CHRISTIE. *Cane Growers' Quarterly Bull.*, 1965, **28,** (3), 14–16. The basic principles of contour planting and its advantages, especially with sugar cane in Queensland, are explained. Planting of cane without contours, under certain conditions, can lead to cultivation difficulties, as some sections of a row may remain excessively wet. Production may be affected because of water-logging.

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Eradication of nut-grass. G. C. BIESKE. *Cane Growers' Quarterly Bull.*, 1965, **28,** (3), 21–22.—Two successful methods of eradicating nut-grass (*Cyperus rotundus*) where it occurs in small infestations, in otherwise free areas, are outlined. They are not applicable to the large scale elimination of nut-grass on the grounds of expense. The method of fumigating with methyl bromide (a gas at atmospheric pressure) under a plastic sheet is described. Where it is not convenient to use methyl bromide a sterilizing treatment with 2,4-D is outlined, the rate being 2 lb per 100 sq.ft. using the sodium salt as a dust.

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Q 80, a new variety for the Burdekin. J. WESDORP. *Cane Growers' Quarterly Bull.*, 1965, **28,** (3), 24–25. Details of this variety, recommended for the Burdekin area of Queensland, are given. Notable characteristics are its resistance to lodging, its earliness and its ability to give high yielding ratoon crops.

Field scale control of soldier flies. R. B. MOLLER. *Cane Growers' Quarterly Bull.*, 1965, **28,** (3), 26–28. The soldier fly (*Altermetoponia rubriceps*), a troublesome cane pest in Queensland, may now be effectively controlled with crude BHC dust broadcast prior to planting. Advice on how and when to apply treatment is given and on correct cultural treatment. The importance of using suitable varieties is stressed.

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A simple piece of fire fighting equipment for machine harvesters. N. McD. SMITH. *Cane Growers' Quarterly Bull.*, 1965, **28,** (3), 29.—A constant worry to harvester operators is the risk of starting a fire in cane trash around the exhaust pipe. Details are given of a device invented by a Queensland firm which enables the water from within the rear tractor wheels, normally used as a traction and stabilizing aid, to be used in fighting a fire. This is in addition to the detachable foam fire extinguisher usually carried.

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Q 83, a promising new variety. G. H. WHITAKER. *Cane Growers' Quarterly Bull.*, 1965, **28,** (3), 30. Details are given of this new variety, raised at Meringa in 1958. It is considered promising as a general purpose variety in wet areas of Queensland. It ratoons well, is more erect than Q57 and better suited to mechanical harvesting.

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Approved fodder canes. N. J. KING. *Cane Growers' Quarterly Bull.*, 1965, **28,** (3), 32.—The varieties of sugar cane which may be grown for fodder purposes in the different sugar mill areas of Queensland are listed. They include: China, Uba, Co 290, "Improved Fodder Cane", Co 301, 90 Stalk, C.S.R.1 and Q 60.

* * *

Demand for still more new cane varieties. ANON. *Producers' Rev.*, 1964, **54,** (12), 29.—A recent drought in southern Queensland has drawn attention to the need for a greater choice of drought-resistant varieties. In the wetter north greater resistance to lodging is needed so that the mechanical harvesting programme may attain full efficiency.

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Land availability (is the) key to future sugar expansion (in Queensland). ANON. *Producers' Rev.*, 1964, **54,** (12), 41.—During recent applications for new or increased assignments it became obvious that several mill areas had reached the limit of available land within reasonable transport distance of the factory.

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Sugar beet seed processing. J. NIEDERER. *Sugar Beet J.*, 1964–65, **28,** (2), 6.—The various stages in the processing of sugar beet seed are described.

Organic matter in soils. C. R. VON STIEGLITZ. *Producers' Rev.*, 1964, **54,** (12), 43.—The heavy loss of organic matter with virgin soils when first cultivated is explained, also the need for retaining organic content. Attention is drawn to the large amount of root material with cane, also the trash.

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New chisel ploughs. ANON. *Producers' Rev.*, 1964, **54,** (12), 53.—A new tractor-drawn implement, the MF 228 chisel plough (released by Massey-Ferguson) is described. It is designed for breaking up soil or clay pan to a depth of 12 inches and is available in 5, 7, 9 and 11-tine models. It may be had with fixed tines or with "stump jump" units.

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Pests caused 56,315 tons of cane loss. ANON. *Producers' Rev.*, 1964, **54,** (12), 69–70.—In Queensland millable cane harvested in 1963 was roughly 11½ million tons. Losses from pests were estimated at 0·49%, i.e. 0·23% due to rats, 0·07% due to other animals and birds and 0·19% due to insect pests.

* * *

Leaf scorch of sugar cane in the Philippines. O. R. EXCONDE. *Sugar News*, 1964, **40,** 617–626.—This disease (*Stagonospora sacchari*) first observed in the Philippines in northern Negros Occidental in 1952, is here fully described, laboratory and field characteristics being given. The most practical and efficient method of control is considered to be the planting of resistant varieties. Some cane field weeds (grasses) may be infected.

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Sterilization of the germinating medium for sugar cane seedlings. A. M. GALVEZ and L. P. MEDEL. *Sugarland* (Philippines), 1964, **1,** 12–14.—At the Tarlac Sugar Cane Breeding Station, San Miguel, heat sterilization of the sowing medium for sugar cane seed or fuzz was satisfactory but expensive and time-consuming. Treatment with formaldehyde (1 part 40% commercial to 50 parts water) proved to be efficient and satisfactory. It controlled "damping-off" and had no harmful effect on the sugar cane seedlings.

* * *

Demonstration of three harvesters: requirements for successful cane mechanization. G. S. BARTLETT. *South African Sugar J.*, 1964, **48,** 1033–1039.—A public demonstration of the 3 makes of mechanical sugar cane harvester recently imported to Natal is described. Tonnages cut are given. The machines could not work to full advantage because of unsuitable field lay-out, e.g. short rows, difficult turning, uneven ground, wide or uneven stools, etc. Nevertheless performance was impressive.

Sugar cane germ plasm. II. Australian sugar canes. ANON. *Sugar Cane Varieties Quarterly Newsletter* (Coimbatore), 1964, **1**, (4), 3–6.—The behaviour, under Indian conditions, of well known Australian varieties, mainly notable for high sucrose content, is described. Most have proved disappointing but some may be useful in breeding. Varieties include Pindar, Q 50, Trojan, Q 57, and Q 58.

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Facts about Co 1007. ANON. *Sugar Cane Varieties Quarterly Newsletter* (Coimbatore), 1964, **1**, (4), 7–8. The main agronomic characteristics of this variety, recently released for commercial cultivation in western Uttar Pradesh, are given. It is a heavy yielding mid-season cane of good quality, resistant to red rot.

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World collection of sugar canes. ANON. *Sugar Cane Varieties Quarterly Newsletter* (Coimbatore), 1964, **1**, (4), 9–11.—The objects of this world collection, or bank of sugar cane germ plasm, at Cannanore in Kerala State are given, also the numbers of cane varieties established as at 31st December 1964.

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Planting recommendations for 1965. F. O. BRIEGER and V. E. ZUNCKELLER. *Bol. Informativo Copereste* (São Paulo), 1965, **4**, (2), 3 pp.—Information on varieties, with soil preferences, degree of earliness, disease resistance etc., is given in tabular form. It is pointed out that predominant varieties in São Paulo are subtropical, such as CB 41-76, CB 41-14, Co 421, Co 413, etc.

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Sugar cane diseases. ANON. *Bol. Informativo Copereste* (São Paulo), 1965, **4**, (3), 3 pp.—Some notes are given on local sugar cane diseases with emphasis on eye spot (*Helminthosporium sacchari*) and root rot (*Pythium arrhenomanes*).

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A cheap tractor. ANON. *Tropical Science.*, 1964, **6**, 169.—A £180 tractor, which may replace bullocks on Asian farms, is described. It was designed at the National Institute of Agricultural Engineering (near Bedford, England). It is a simply operated, 3-wheel tractor with a tough tubular steel frame, tiller steering, a simple gearbox and an 8 h.p. engine (petrol or diesel). So far 100 prototypes have been built.

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Agricultural value of dried poultry manure and bedding. S. J. TOTH. *Compost Science*, 1965, **5**, (3), 29–32. Tests in New Jersey, where some 25,000 tons of poultry manure and bedding are produced annually, are here described. The principal bedding used was bagasse. In the processed (dried) product there is much variation in N-P-K content, averaging 3-6-2. A ton has about the same effect (on beans and sweet-corn) as 1200 lb of a 5-10-10 fertilizer. Residual value was small but apparent in potato yields.

Experiments on the purification and concentration of the sugar beet mosaic virus. F. SCHNEIDER, U. BEISS and R. MARX. *Zucker*, 1964, **17**, 539–543.—A report is given of experimental work on the isolation and concentration of sugar beet mosaic virus. By precipitation with half-saturated ammonium sulphate solution it was possible to concentrate the beet mosaic virus from pre-clarified solutions without any loss of infectivity.

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Sugar beet breeding and results from some European beet sugar factories during the last 50 years. K. BONNE. *Zucker*, 1964, **17**, 543–546.—An analysis was made of figures from several European beet sugar factories on the basis of 10-year periods. Allowing for improvement in fertilizing and cultivation the author concluded there was definite evidence of improvement in the yield reliability of modern sugar beet varieties.

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Farm management conditions with sugar beet cultivation in Denmark and Sweden. G. STEFFEN and H. O. HAMANN. *Zucker*, 1964, **17**, 565–574.—The requirements of sugar beet cultivation in Denmark, Sweden and West Germany are compared. It is claimed that the increasing integration of the economy of European countries makes comparative studies of this kind desirable. Only the southern part of Sweden is climatically suitable for sugar beet.

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Stresses in sugar beet roots during mechanical harvesting. E. KLAPP. *Zeitsch. Zuckerind.*, 1964, **14**, 563–567—This study concerns losses sustained in sugar beet harvesting, which may reach 10%. Stresses on the roots and harvesting tines are estimated with a view to obtaining the best setting or adjustment of the latter.

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Decomposition of farm yard manure in different sugar cane soils of Bihar. A. P. GUPTA and S. C. SEN. *Indian Sugar*, 1964, **14**, 355–360.—Four soils were used—calcareous, non-calcareous, alluvial and clay. Analysis results of minerals for farm yard manure at 15-day intervals are given in tabular form. Availability of P was maintained in soils of high fixing capacity, viz. calcareous or heavy clay soils. Maximum mineralization of organic P was in alluvial soils.

* * *

Sprinkler demonstration at Victorias. ANON. *Sugarland* (Philippines) 1964, **1**, (7), 44–47.—An account is given of the first demonstration in the Philippines of the new "Target-Master" sprinklers, both "pipeline" and "self-contained" models. Pipelines need be no closer than 240–300 feet because of the wide throw of the jet. The "pipeline" unit delivers up to 1200 g.p.m. and the "self-contained" 1500 and 2400 g.p.m., two unit sizes being available.

POLARIZATION TEMPERATURE CORRECTIONS

By Dr. ROBERT A. M. WILSON

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PART II

Summation of Temperature Correction Equations for Individual Factors

(i) *Combined Equation for Specific Rotation of Sucrose and Reducing Sugars*

A combined equation for sugar solutions containing both sucrose and reducing sugars is obtained by adding the correction terms of equations (4) and (5):

$$P_{20} = P_T + [0{\cdot}000184 - 0{\cdot}0000063(T_r - 20) \; NS(T_r - 20)] - 0{\cdot}004NR(T_r - 20) \quad (18)$$

From the specific rotations of sucrose, glucose and fructose approximately:

$$P_{20} = NS - 0{\cdot}3\,NR \quad (19)$$

Eliminating the term NS from equation (18), for normal temperature ranges:

$$P_{20} = P_T + [0{\cdot}000184 - 0{\cdot}0000063(T_r - 20)] \; P_{20}(T_r - 20) - 0{\cdot}004NR(T_r - 20) \quad (20)$$

(ii) *Combined Substance Effect for Sugar Solutions*

A combined substance effect correction equation is obtained by adding the correction terms from equations (20), (6), and (7) or (8). The temperature dependent portion of the coefficient becomes negligible. For instruments using glass cells or tubes:

$$P_{20} = P_T + 0{\cdot}000466\,P_{20}(T_r - 20) - 0{\cdot}004\,NR(T_r - 20) \quad (21)$$

For instruments using stainless steel cells:

$$P_{20} = P_T + 0{\cdot}000457\,P_{20}(T_r - 20) - 0{\cdot}004NR(T_r - 20) \quad (22)$$

For most work one equation independent of cell type is sufficiently precise:

$$P_{20} = P_T + 0{\cdot}00046\,P_{20}(T_r - 20) - 0{\cdot}004NR(T_r - 20) \quad (23)$$

(iii) *Combined Instrument Effect*

A combined instrument effect correction equation is obtained by adding the correction terms from equations (10), (12) or (13), and (15). It is usually sufficiently precise to ignore the type of scale, taking an average value for the scale expansion and contraction coefficient. The combined equation is:

$$P_{20} = P_T + 0{\cdot}00014\,\eta\,P_{20}(T_p - 20) \quad (24)$$

For non-quartz-wedge instruments the correction is zero. In most cases the instrument temperature T_p is very close to the temperature of reading T_r in normal sugar analysis, and if T_p is replaced by T_r in equation (24) only a negligible error is incurred. Therefore equation (24) may be rewritten:

$$P_{20} = P_T + 0{\cdot}00014\,\eta\,P_{20}(T_r - 20) \quad (25)$$

(iv) *Combined Solution Preparation Correction*

A combined solution preparation correction is obtained by adding the correction terms from equations (16) and (17):

$$P_{20} = P_T - [0{\cdot}000265 + 0{\cdot}0000066(T_m - 20)]\;P_{20}(T_m - 20)$$
$$= P_T - 0{\cdot}000265\,P_{20}\,[1 + 0{\cdot}025(T_m - 20)]\;(T_m - 20) \quad (26)$$

Temperature Correction Equations for Practical Applications

Temperature correction equations for practical applications are obtained by addition of the correction terms from the equations for the appropriate substance effect—equation (3) or (23)—for the instrument effect—equation (25)— and for the solution preparation correction if necessary—equation (26).

1. *Quartz Plates*

(i) *On Polarimeters and Saccharimeters other than Quartz-Wedge Saccharimeters*

$$P_{20} = P_T - 0{\cdot}000143\,P_{20}(T_r - 20) \quad (27)$$

(ii) *On Quartz-Wedge Saccharimeters*

The correction is almost zero, and for practical purposes:

$$P_{20} = P_T \quad (28)$$

2. *Sugar Products*

(a) *Solutions obtained by other than Volumetric means*

This refers to solutions of pure and raw sugars and other sugar products prepared by a weight/weight method, and cane and beet juices and other sugar products which are polarized directly.

(i) *On Polarimeters and Saccharimeters other than Quartz-Wedge Saccharimeters*

$$P_{20} = P_T + 0{\cdot}00046\,P_{20}(T_r - 20) - 0{\cdot}004NR\,(T_r - 20) \quad (29)$$

(ii) *On Quartz-Wedge Saccharimeters*

$$P_{20} = P_T + 0{\cdot}00060\,P_{20}(T_r - 20) - 0{\cdot}004NR\,(T_r - 20) \quad (30)$$

For pure sugars $R = 0$ in equations (29) and (30).

For juices polarized directly, the normality N is the weight of 100 ml of the juice expressed as a fraction of 26 g.

(b) *Solutions prepared by Volumetric means*

(i) *On Polarimeters and Saccharimeters other than Quartz-Wedge Saccharimeters*

$$P_{20} = P_T + 0{\cdot}00046\,P_{20}(T_r - 20) - 0{\cdot}004NR(T_r - 20) - 0{\cdot}000265\,P_{20}\,[1 + 0{\cdot}025(T_m - 20)]\,(T_m - 20) \quad (31)$$

(ii) *On Quartz-Wedge Saccharimeters*

$$P_{20} = P_T + 0{\cdot}00060\ P_{20}(T_r - 20) - 0{\cdot}004NR(T_r - 20) - 0{\cdot}000265P_{20}[1 + 0{\cdot}025(T_m - 20)]\ (T_m - 20) \quad (32)$$

In cases of dirty or contaminated sugars, liquors, syrups and molasses, the precision of polarization measurements and of the temperature corrections is relatively low. Therefore it is desirable to simplify equations (31) and (32). The temperature of making to the mark T_m is usually reasonably close to the temperature of reading T_r, and for relatively low purity sugars, we can replace T_m by T_r in equations (31) and (32), which become:

For polarimeters and saccharimeters other than quartz-wedge saccharimeters:

$$P_{20} = P_T + 0{\cdot}00020\ P_{20}\ [1 - 0{\cdot}033(T_r - 20)]\ (T_r - 20) - 0{\cdot}004NR(T_r - 20) \quad \ldots\ldots\ldots (33)$$

For quartz-wedge saccharimeters:

$$P_{20} = P_T + 0{\cdot}00034\ P_{20}\ [1 - 0{\cdot}018(T_r - 20)]\ (T_r - 20) - 0{\cdot}004NR(T_r - 20) \quad \ldots\ldots\ldots (34)$$

SOME EXPERIMENTAL SUBSTANTIATION OF EQUATIONS

Temperature corrections for quartz plates and quartz wedges are well known and so experimental substantiation has been limited to equation (29) for the polarization of sugar products on polarimeters and saccharimeters other than quartz-wedge saccharimeters and where solutions are obtained by other than volumetric means.

$$P_{20} = P_T + 0{\cdot}00046\ P_{20}(T_r - 20) - 0{\cdot}004NR(T_r - 20) \quad \ldots\ldots (29)$$

A Hilger & Watts visual polarimeter with a 200 mm cell and sodium light was used. A jacketed cell was used with a thermostatted water bath, controlling the temperature of the water in the jacket to $\pm$ 0·1°C. The temperature was read directly on a thermometer contacting the solution through a side arm in the tube.

Readings of rotations in °S of solutions of four types of sugar products were taken between 15°C and 30°C, which covers most practical applications. The four types of sugar products were:

(i) Pure sugar. $R = 0$

(ii) Raw sugar. $0{\cdot}1 < R < 1{\cdot}0$

(iii) Various liquors. $0{\cdot}1 < R < 3{\cdot}0$

(iv) Golden syrup, molasses, etc. $10 < R < 50$.

In all cases the normality $N = 1$. The results are shown in Tables I to IV.

In most cases results which are nearer to constants are obtained after applying the corrections than before. Where large trends in polarization with change in temperature are apparent before correcting, these are either greatly reduced or eliminated. In most cases the difference between results after correcting would appear to be only scatter.

Table I

Substantiation of Equation (29);
$P_{20} = P_T + 0{\cdot}00046\ P_{20}(T_r - 20) - 0{\cdot}004NR(T_r - 20)$
Pure Sugar $R = 0$

T_r (°C)	P_T (°S)	P_{20} (°S)
19·0	100·00	99·95
21·0	99·91	99·96
23·0	99·81	99·95
25·0	99·72	99·95
27·0	99·63	99·95
29·0	99·53	99·94

The scatter in the final results is often of comparable magnitude to the correction, reducing the apparent effectiveness of the correction. In saccharimetry of this type the standard deviation of a single measurement of polarization would be about 0·02°S for a pure sugar, 0·04°S for a raw sugar or a liquor, and as high as 0·1°S for a molasses. The necessity of making a temperature measurement and correction in practice is related to the desired or available accuracy of the polarization measurement.

The results in Table I for pure sugars substantiate the polarization correction term $0{\cdot}00046\ P_{20}(T_r - 20)$. This is the most important correction term because it appears in almost all corrections equations, and is the dominant term in some of the more important equations, e.g. raw sugar polarizations.

The results in Table II for raw sugars attempt to substantiate the reducing sugars term—$0{\cdot}004NR$ $(T_r - 20)$ as well as the polarization term. However the correction contributed by this term never exceeds 0·04°S [for $(T_r - 20) = 10$°C and $R = 1{\cdot}0\%$], and is usually much less. This is insignificant compared with a possible correction of 0·45°S for $(T_r - 20) = 10$°C from the polarization term. Therefore for most practical purposes the reducing sugar term need not be applied for raw sugars.

For liquors Table III shows that the reducing sugar correction term can be as high as 0·12°S for $(T_r - 20) = 10$°C and $R = 3\%$. So if a correction is being made the reducing sugar term needs to be included in practice. However the need for making a correction for liquors in practice is less than for raw sugars because the precision of the measurement is usually less.

Table II

Substantiation of Equation (29): $P_{20} = P_T + 0{\cdot}00046\ P_{20}(T_r - 20) - 0{\cdot}004NR(T_r - 20)$
Raw Sugar $0{\cdot}1 < R < 1{\cdot}0$

T_r (°C)	P_T (°S)	R (%)	P_{20} (°S)	T_r (°C)	P_T (°S)	R (%)	P_{20} (°S)	T_r (°C)	P_T (°S)	R (%)	P_{20} (°S)	T_r (°C)	P_T (°S)	R (%)	P_{20} (°S)
17·4	99·01	0·15	98·89	17·4	98·76	0·24	98·64	16·3	97·56	0·66	97·40	17·4	97·54	0·68	97·43
21·8	98·79		98·87	19·9	98·63		98·63	20·2	97·38		97·39	20·6	97·38		97·41
24·6	98·65		98·86	24·6	98·41		98·61	24·6	97·18		97·38	24·2	97·22		97·40
28·0	98·49		98·85	27·0	98·30		98·61	28·0	97·04		97·39	29·5	97·04		97·44

Table III

Substantiation of Equation (29): $P_{20} = P_T + 0{\cdot}00046\ P_{20}(T_r - 20) - 0{\cdot}004NR(T_r - 20)$

Various Liquors $0{\cdot}1 < R < 3{\cdot}0$

T_r (°C)	P_T (°S)	R (%)	P_{20} (°S)	T_r (°C)	P_T (°S)	R (%)	P_{20} (°S)	T_r (°C)	P_T (°S)	R (%)	P_{20} (°S)	T_r (°C)	P_T (°S)	R (%)	P_{20} (°S)
17·8	65·94	1·19	65·9	16·8	66·42	0·29	66·3	17·4	66·15	0·32	66·1	17·4	60·83	0·84	60·8
23·0	65·74		65·8	21·8	66·22		66·4	21·7	65·70		65·8	22·0	60·67		60·7
25·7	65·69		65·9	26·0	66·21		66·4	25·9	65·63		65·8	25·2	60·60		60·7
29·2	65·60		65·9	29·2	66·07		66·3	29·6	65·55		65·8	29·6	60·45		60·7

T_r (°C)	P_T (°S)	R (%)	P_{20} (°S)	T_r (°C)	P_T (°S)	R (%)	P_{20} (°S)	T_r (°C)	P_T (°S)	R (%)	P_{20} (°S)
16·3	64·12	1·6	64·0	17·3	64·18	1·7	64·1	15·3	63·30	2·3	63·2
22·8	64·02		64·1	22·2	64·10		64·2	20·0	63·21		63·2
26·0	63·94		64·1	25·4	63·95		64·1	24·9	63·11		63·2
30·2	63·88		64·1	29·0	63·97		64·2	30·2	63·03		63·2

In Table IV for syrups and molasses, where the reducing sugar content is less than 20%, the reducing sugar term is of comparable magnitude to the polarization term. Because of the approximate nature of the reducing sugar correction, especially at high values of $(T_r - 20)$, and because the sucrose content is less than the 90% limit set for accurate applications of the concentration correction, the corrected results sometimes appear less consistent than the uncorrected results. However they are still within normal precision limits for these substances.

For a reducing sugar content of about 40% to 50%, the reducing sugar term is the dominant one, and although it is only an approximate correction, it does considerably improve the results. The corrected results are not sufficiently in error to warrant changing the coefficient —0·004 to any other value.

There is a consequent saving in time and a reduction in the number of errors.

In many laboratories, where only moderate precision is required, adequate temperature control can be achieved by a simple window box air conditioning unit, an electric radiator and possibly a jacketed sample cell cooled by mains water. Where measurements on high precision automatic polarimeters are required to 0·01°S, the polarimeter should be placed in a constant temperature room or cupboard controlling to 20·0 ± 0·5°C, and a jacketed cell should be used in conjunction with a heating-refrigerating water bath controlling the water temperature to 20·0 ± 0·1°C and the sample temperature to better than 20·0 ± 0·2°C. The temperature effect on the polarization of a raw sugar for example would be then less than ± 0·01°S.

Table IV

Substantiation of Equation (29): $P_{20} = P_T + 0{\cdot}00046\ P_{20}(T_r - 20) - 0{\cdot}004NR\ (T_r - 20)$

Golden Syrup, Molasses, etc. $10 < R < 50$

T_r (°C)	P_T (°S)	R (%)	P_{20} (°S)	T_r (°C)	P_T (°S)	R (%)	P_{20} (°S)	T_r (°C)	P_T (°S)	R (%)	P_{20} (°S)	T_r (°C)	P_T (°S)	R (%)	P_{20} (°S)
15·2	19·2	14·4	19·5	16·0	13·3	15·6	13·6	17·6	12·5	16·2	12·6				
20·8	19·5		19·5	20·4	13·6		13·5	21·0	12·6		12·6				
25·0	19·6		19·3	25·2	13·4		13·1	24·2	12·7		12·6				
29·0	19·7		19·3	28·4	13·5		13·0	28·0	12·8		12·6				

T_r (°C)	P_T (°S)	R (%)	P_{20} (°S)	T_r (°C)	P_T (°S)	R (%)	P_{20} (°S)	T_r (°C)	P_T (°S)	R (%)	P_{20} (°S)	T_r (°C)	P_T (°S)	R (%)	P_{20} (°S)
16·6	22·7	45·2	23·2	15·0	18·1	48·0	19·0	14·8	17·9	49·3	18·9	17·5	16·6	49·3	17·1
20·3	22·9		22·8	21·6	18·4		18·1	20·1	18·5		18·5	21·5	18·2		17·9
24·0	23·2		22·5	24·5	18·9		18·1	24·8	18·6		17·7	26·1	19·6		18·4
29·2	23·5		22·0	28·0	19·6		18·1	28·8	19·4		17·8	29·0	20·0		18·3

Conclusions

(i) Polarization temperature correction equations developed in this paper appear satisfactory for practical applications. They are an improvement on equations which have been in use up to the present time because they correct a number of errors and they clarify the reasons and purposes for making the corrections.

(ii) Because of the approximate nature of the equations especially when the temperature differs widely from the desired level, best results are obtained only by temperature controlled conditions at the desired level. This reduces the corrections to zero. The necessity for making a correction is removed and only a check temperature measurement is required.

Nomenclature

- N Normality of solution. A normal solution contains 26 g of sample in 100 ml.
- P_T Polarization at T°C (°S).
- P_{20} Polarization at 20°C (°S).
- R Weight % reducing sugar in the sample.
- S Weight % sucrose in the sample.
- T_m Temperature of solution when making to the mark (°C).
- T_p Temperature of polarimeter (°C).
- T_r Temperature of solution or quartz plate when reading the polarization (°C).
- η Constant equal to 1 for quartz-wedge saccharimeters and equal to 0 for other types of polarimeters and saccharimeters.

SUMMARY

Polarization temperature corrections have been split into two parts: the "polarization reading correction" based on the temperature of the solution when taking a reading; and the "solution preparation correction" based on the temperature at which the solution is made to the mark. The latter is applicable only when the solution is prepared by a weight/volume method. The first correction gives the true polarization of the *solution* at the datum temperature (usually 20°C); the second correction, applied in addition to the first, gives the true polarization of the *original sample* at the datum temperature. The "polarization reading correction" has been split into the effects of temperature of the substance and of the instrument; the "instrument effect" is applicable only when using quartz-wedge saccharimeters. The "substance effect", the "instrument effect" and the "solution preparation effect" have been broken down into their component effects, and temperature correction equations have been written based on coefficients obtained from the literature. The equations have been combined by adding the correction terms for each effect, to obtain practical equations for specific substances and specific conditions, e.g. a raw sugar where the solution is prepared by a weight/weight method and polarized on a polarimeter using a rotating analyser for compensation. The "substance effect" equation has been substantiated experimentally for a wide range of sugar products, and shown to be satisfactory for practical purposes. However for accurate work, best results are obtained only by controlling the temperature of the solution at the desired level, thus eliminating the need for a correction and also for a measurement of temperature.

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DALTON—SOUTH AFRICA'S FIRST MILLING DIFFUSION SUGAR FACTORY

By W. R. BUCK

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PART II

A most important part of the process, properly realised by the makers, is the function of the two dewatering mills following the diffuser. A drag conveyor hauls the wet bagasse up to a vertical, deep feed chute supplying the first dewatering mill. The second such mill is similarly fed.

The press water expelled in these two mills (representing 65% on cane) is pumped through the press water heater, thence to an automatic liming plant and then to a BMA clarifier (approximately 20 ft diameter), of conventional design, at 95 to 97°C. For convenience this clarifier has been located alongside the usual clarifier and not in the milling diffusion house. Its effluent mud will not exceed 2% on cane or 1·2 tons/hr. The clarified press-water is returned to the diffuser in front of the point at which part of the imbibition water is added.

It may be thought that undue importance is attached to this press water, since it is only of an average 2° Brix, but it is the writer's opinion that the proper use of this press-water ensures that the total amount of imbibition water employed is kept within reasonable limits and at no time approaches that used in some factories already referred to which have conventional milling trains.

The diffusion juice is extracted at the head of the diffuser, passed through the juice heater and then directly on to the prepared cane as it enters. This is essentially a scalding treatment and maintains the temperature of the cane in process at a minimum of 70°C (158°F). This can hardly render the vicinity of the diffuser a "comfort zone" and it may be necessary to insulate it.

It was mentioned earlier that only part of the imbibition water enters the diffuser. The remainder is applied between the two dewatering mills. The designers are insistent that its temperature does not exceed 30°C (85°F), so that it cools the bagasse to some extent, to prevent slip at the dewatering mills.

The available condensate, being considerably hotter than this permissible figure is accordingly pumped through a heat exchanger in the quantity required, the heat exchanger being supplied with raw juice from the first mill (only). This will result in a heat saving on juice heating and will produce imbibition water of the desired temperature.

Steam Consumption

No steam is injected into the diffuser and no steam jackets are employed. The total steam consumption of the diffuser (at 60 t.c.h.) is 14,700 lb/hr of vapour at 4 p.s.i.g. which is supplied from the vapour cell first effect to the two heaters involved.

Final Bagasse

The bagasse is not expected to exceed 52% moisture content and 1·8% sucrose content when its L.C.V. will be 3,140 B.Th.U./lb. The two dewatering mills will require replacement when the throughput exceeds about 65 t.c.h. so that, until this figure is imminent, two secondhand, 30 in by 60 in turbine-driven Mirrlees Watson mills of modern design have been purchased. Their foundations are arranged so that subsequently two 36 in by 72 in mills can be readily installed.

Steam raising plant

It was only necessary to add one Combustion Engineering water-tube boiler to the existing range.

The Paterson Engineering Company Ltd.

The Candy Filter Company Ltd.

Paterson Candy International Ltd.

Announcement

In 1963, The Paterson Engineering Company Ltd. and The Candy Filter Company Ltd. joined forces in overseas work, with the object of strengthening the British export effort in the water treatment field. A joint company – Paterson Candy International Ltd. – was formed and almost all export work since then has been under that name. In the United Kingdom, however, the companies continued to operate independently.

The success of P.C.I. has shown the advantages that can be expected from combining all the operations of the two companies. Accordingly, Candy and Paterson will in future work as P.C.I. at home as well as abroad. This will not in any way disturb enquiries and contracts already in hand.

In future, enquiries from public water supply undertakings, river and sewage disposal authorities should preferably be addressed to the Ealing office, and those from industrial concerns to the Kingsway Office, but wherever sent they will quickly go to the right quarter.

The existing processes, systems, and equipment of the companies will continue to be available to prospective clients. Spare parts for existing plants will also continue to be obtainable.

The pre-coat or Stellar Filter Division will continue to operate from the Kingsway office.

Many will be sorry to see the individual names go. The Candy Filter Company since 1889 and The Paterson Engineering Company since 1902, are two of the pioneer water treatment specialist firms and are known throughout the world. Between them, they have supplied by far the greater proportion of all the treatment plants in the United Kingdom and they have been responsible for most of the inventions and developments, both in systems and equipment, that now form part of accepted current practice in water treatment. The combination of these powerful technical resources will now provide even better service to the water industry.

Simultaneously with this re-organisation, arrangements have been made for Bell Brothers (Manchester 1927) Ltd. to take over the responsibility for the swimming pool work of P.C.I. and they are in a position to offer an unrivalled range of filters and equipment for this work.

Bell Brothers have been engaged in water purification since 1890, and their name has always been well known in this field, especially with regard to the design of mechanically agitated pressure filters, which have been and will continue to be supplied to water undertakings throughout the world.

Paterson Candy International Ltd.

WATERWORKS DIVISION: 21 The Mall, Ealing, London, W.5. Tel: Ealing 6733
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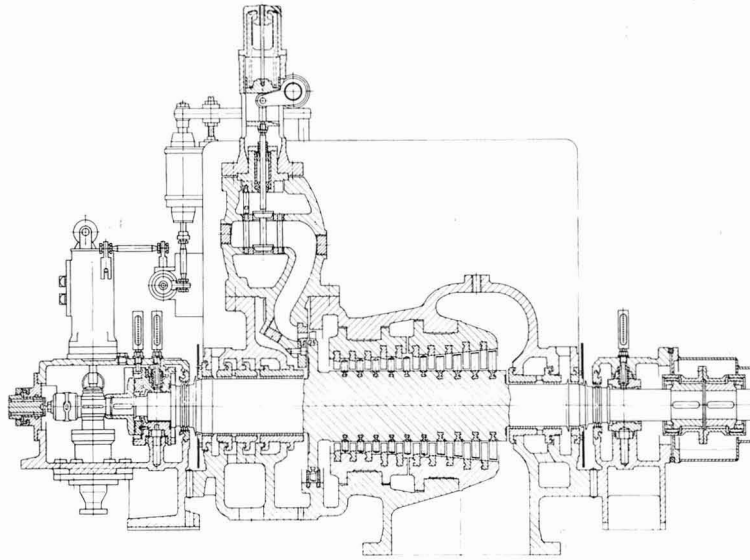
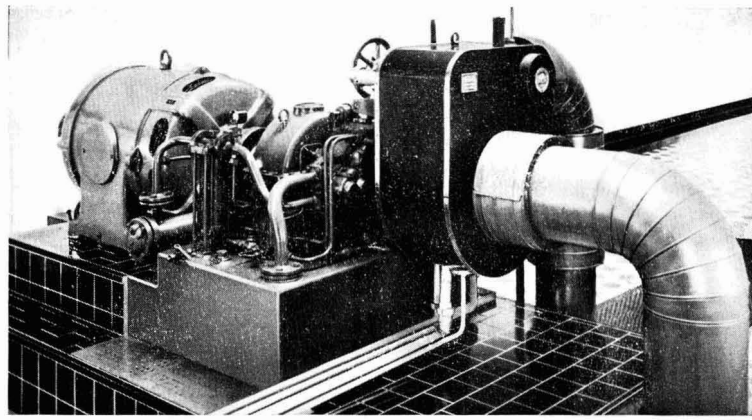




Steam Turbines for the Sugar Industry

Backed by the experience gained in the course of a great many years we equip sugar mills with complete steam power plants, but also cover any requirement of steam boilers and furnaces for all fuels, industrial steam turbines, and of high-pressure piping and accessories.

The illustrations show
the sectional view of a back-pressure turbine to drive a generator in a sugar mill in Iran – terminal output 1800 kW, live steam 28 atm abs (400 psia), 385° C (725° F), back pressure 3.5 atm abs (50 psia), 10000/1500 rpm
as well as the photo of a single-wheel turbine to drive a generator in Mexico – terminal output 760 kW, live steam 10 atm abs 140 psia) saturated steam, back pressure 2 atm abs (28 psia), 9000/1800 rpm.

65 055 48 Te

BORSIG AKTIENGESELLSCHAFT · BERLIN-TEGEL
(West Sector) Germany

The new unit is 60,000 lb/hr m.c.r., the steam conditions being 250 p.s.i.g. at 538°F. A de-aerator and feed water treatment plant are included, all in an extension of the existing boiler house. The position of this boiler house largely determined the siting of the factory buildings, already referred to.

Power Plant

A 1500 kW back pressure Siemens turbo-alternator, taking steam at 235 p.s.i.g. and 535°F has been added, in the existing power station building. Generating voltage is 380 at 3 phase 50 cycles, to suit the existing power supply, no long runs of cable being involved and no transformers therefore employed.

Arrangements have been made to synchronize the present turbo-alternator in case the throughput of cane increases before a second set can be installed, but normally the load will not exceed 1,100 kW at 60 t.c.h. crushing rate so that the existing set will not be required. The back pressure is 10 p.s.i.g., that being the limit of the turbines driving the dewatering mills. It can be readily increased to 15 p.s.i.g. if desired, when the larger mills and turbines are installed.

Factory Details

The process house is located parallel to and alongside the mill house, between it and the existing wattle extract factory buildings. It is 84 ft wide by 165 ft long. 60 ft of this length comprises the clarification and evaporation house which is 70 ft high to the eaves, the pan house section accounting for the other 105 ft which is 90 ft high to the eaves. There is one common ground floor level to all sugar factory buildings.

The buildings are of the normal steel-framed type, sized and designed so that the whole of the process plant can be readily duplicated or expanded in capacity. Ventilation is assisted by extractor fans in the roofs.

The cladding, both for roofs and walls, is of fluted sheeting. Dalton is in a hail area and it was decided to dispense with ordinary windows, fitting instead continuous strip translucent sheeting, thus achieving considerably more daylight than the legal minimum laid down. Below this a continuous range of vertically hinged, louvre type glazing is fitted.

Process

The diffuser juice passes over vibratory screens before joining the first mill juice from its heat exchanger, both then being pumped to the usual automatic juice scale. Automatic liming is employed, using temper lime supplied in pockets, in preference to preparing it at the factory. Although technically "cold" liming is intended, in practice the juice leaving the scales will be at 135°–140°F, i.e. similar to that in some factories, which lime after the primary heating.

The primary heater uses vapour at 5 p.s.i.g. from the first effect, exhaust steam being used for the secondary heater, each being of 1000 sq.ft. h.s. The primary heater raises the juice temperature from about 145°F to 205°F and the secondary to 215°F, while an evaporator pre-heater was found necessary using exhaust steam and heating the juice to 230°F.

Evaporator

This has been redesigned, following the decision to remelt certain sugars and to produce export quality final product. Hence the first vessel, which is also a vapour cell, is now of 9000 sq.ft. h.s. and takes the form of a semi-Kestner vessel. 76,000 lb/hr exhaust steam will be required and 66,000 lb/hr goes to this vessel, so that 49,500 lb/hr vapour can be bled off to supply pans, diffuser heaters, primary heater, steaming out, etc.

The other three vessels of the evaporator are each of 3000 sq.ft. h.s. giving a total of 18,000 sq.ft. h.s., an evaporation ratio of 0·764 or 76·4%, 5·68 lb/sq.ft. h.s. or 108,000 lb water per hour from 141,200 lb juice/hr. This will result in a syrup of 63·7°Brix, which figure for various reasons is considered satisfactory, although 70·0° would be possible. (The Natal average to date is 58·6° and for last season 58·06°, the highest being 62·9°Bx.)

Vacuum Filter

An 8 ft diameter by 16 ft Eimco rotary vacuum filter is installed with stainless steel screens, etc. Its capacity is sufficient to include the muds from the diffuser press-water clarifier. The filter occupies a 12 ft high staging in the evaporator and clarifier house, sited for ease of mud disposal and subsequent duplication.

Boiling House

The vacuum pans are all at the 60 ft level. Originally, it was hoped to market all sugar produced as "golden brown" (or equivalent) and two alternative heat balances with 3-boiling systems were produced. Each involved only 3 pans of 900 cu.ft. capacity. (Subsequently all the factory's production was switched to export quality sugar and a new heat balance and boiling system became necessary with increased use of vapour bleeding.)

The "C" sugar and part of the "B" sugar are to be remelted, the remainder of the "B" sugar forming seed for the A pans of which there are now two. Hence four pans were required and they are all of 900 cu.ft. capacity, somewhat greater than was called for. This was unavoidable, however, since the first three were already under construction. The pan ratio is 1·75 in order that all pans can be heated with vapour.

The pans are 12 ft 6 in in diameter, 23 ft high and of welded construction. Hydraulically-operated discharge valves and electrically-operated, rotatory massecuite discharge gutters, with selective push-button control for the respective crystallizers, are installed.

The crystallizers, numbering 10 in the first instance, are all of the familiar "U" type, of 900 cu.ft. capacity. Five are air-cooled, five are water-cooled and all are located at the 30 ft level.

The centrifugal station, immediately below, consists of five 42 in by 30 in semi-automatic Broadbent machines for the A and B massecuites, selective as to a speed of 1000 or 1500 r.p.m. and operating at 25 cycles per hour. All of the factory's commercial sugar output emanates from the "A" machines only. The installation provides for a further three machines.

For the "C" machines, Allis-Chalmers continuous centrifugals have been selected, arranged for double-curing, with the two foreworkers located over the single afterworker. All are on one independent staging, with provision for future extension.

Massecuite quantities are expected to average:

A	319·5 cu.ft./hr	Total 515 cu.ft./hr
B	123·8 cu.ft./hr	or 8·6 cu.ft./t.c.h.
C	71·8 cu.ft./hr	and 12,363 cu.ft./24 hr

Raw sugar will be shipped in bulk by rail to the Durban terminal for export.

Economics of the Milling-Diffusion Process

If owing to a series of adverse circumstances the extraction and sucrose % bagasse of an installation of this type were not superior to those of a normal milling train, those results would still be achieved at considerably lower capital cost.

For example, the diffusion unit described, including imported cane preparation, mills, clarifier, heaters and all auxiliaries, costs about R646,700 (£323,350) delivered to Durban. Obviously, the total could be somewhat less if most of these items were of local manufacture.

A 36 in by 72 in milling tandem, comprising 6 mills, shredder, all turbine driven, gearing and all accessories is quoted at R760,000 (£380,000) Durban and most of it is locally manufactured. The saving here is R113,300 (£56,650), using the most conservative figures.

However, with the saving thus achieved and the extra profits accruing from successful milling-diffusion, it has been calculated that an efficient factory would be able to write off the cost of the diffuser in about three years.

In addition, installation costs are considerably lower as are the differences in maintenance costs and the value of the stock of spare parts required to be kept is less than for the mills and shredder which the diffuser replaces.

Steam Consumption

The three mills will require an average of 22,000 lb/hr live steam and the diffuser, 14,700 lb/hr of vapour, making a total, including radiation losses, of 36,700 lb/hr. The maker's information regarding the same size milling train of 6 mills and a shredder, crushing the same tonnage of fibre/hr, is 52,000 lb/hr live steam.

There is also a sizeable saving in weight. The milling train referred to weighs 732 tons complete, whereas the corresponding milling-diffusion installation weighs 542 tons complete.

Power required

The diffuser requires only a fraction of the power consumed to drive two or three mills.

Conclusions

It cannot yet be said that milling-diffusion has reached its peak of perfection and undoubtedly there will be startling innovations and improvements to the types of plant employed. It also has to be proved conclusively that the percolation type of diffuser is superior to the immersion type (or vice versa).

On the other hand it cannot be denied that there have been no major or significant changes and advances in mill design and construction over the last twenty years or so. Moreover, the most superior extraction figures are those achieved by milling tandems, consisting of a shredder and six mills, or quite often seven mills. They are expensive to purchase, install and maintain and are heavy power consumers. Yet, in a seven mill tandem, four of the intermediate mills only achieve dilution—a poor return on the capital invested surely?

An obvious conclusion is that diffusers can efficiently replace two, three or even four mills in some cases, in a cheaper, more efficient and profitable manner than the conventional milling tandem.

Tremendous interest has been aroused by the fact that two full-sized milling-diffusion plants are being installed in South Africa, one of the companies concerned having sufficient confidence to design and build their factory around a diffusion plant.

Batch type diffusion had been successfully practised in Egyptian factories for many years. A refinement was employed following the extraction of the juice, whereby it was limed, recirculated under the Naudet system and clarified within the diffuser cells.

The limed juice, pumped upward through the tall column of bagasse, emerged perfectly bright and clear and required no further treatment other than a fine screening before going direct to the evaporators. For further information on this interesting process, there is a full account in an earlier issue of this *Journal*[1].

Although very rewarding, the process was messy and entailed far too much labour, apart from the complexity of valves and piping, so that considerable research was undertaken in the attempt to perfect a simple but efficient continuous process. This has culminated in the type of diffuser selected for Dalton.

The road is obviously open not only for comparison of the results of both South African installations, but for research and improvement. The ultimate goal should be, I suggest, a continuous diffuser wherein the liming and clarification of the juice can be carried out, as it was in the batch type diffuser employed in Egypt.

Acknowledgment

The author wishes to thank the Board and Managing Director of Union Co-operative Bark and Sugar Co. Ltd. for permission to publish this paper.

[1] BUCK: *I.S.J.*, 1950, **52**, 369–370, 397–399.

THE NEW FINAL MOLASSES EXHAUSTION SCHEMES at Monymusk (Jamaica) and Brechin Castle (Trinidad)

By A. M. JAMES and R. E. LAWRENCE

(Tate & Lyle Technical Services Ltd.)

Paper presented to the 12th Congress I.S.S.C.T., 1965.

PART I

Introduction

MONYMUSK factory, in Jamaica, grinds about 210 long tons of cane per hour with one tandem of six 35 × 78-inch mills. Brechin Castle, in Trinidad, grinds about 325 tons of cane per hour with two tandems each of five 35 × 78-inch mills.

The rate of milling at both factories has, over the years, increased more quickly than has the boiling house capacity, particularly at the *C*-massecuite crystallization stations.

However, before any detailed plans were prepared for bringing this plant back into balance with the milling capacity, careful consideration was given to the requirements of the *C*-massecuite station. During the 1961 crop, trials were carried out at Reform factory in Trinidad, near Brechin Castle.

In these trials *C*-massecuites were cooled for 18 hours instead of the usual 12 hours. Cooling curves were plotted of time and temperature against apparent purity, sucrose, invert, ash and unestimated solids of the molasses. As inversion of sucrose and destruction of invert might be occurring during crystallization, it was not possible to follow the exhaustion of the molasses by studying only the analysis of the molasses at various times during cooling. However, it was thought that the amount of ash present would remain constant and that the molasses exhaustion could be followed by examining the weights of sucrose, invert and unestimated solids associated with a constant amount of ash. It was hoped to discover the point at which crystallization of sucrose became too slow to be economical, or the point where chemical decomposition of the sugars present outweighed the crystallization of sucrose.

Unfortunately, there was considerable variation in the results of these trials and it was necessary to average them to show trends. However, the probability was that by increasing the time in the crystallizers from 12 to 18 hours in order to cool to about 42°C, the sucrose content of the final molasses would be reduced by 2%. The effect of sugar destruction was fairly small.

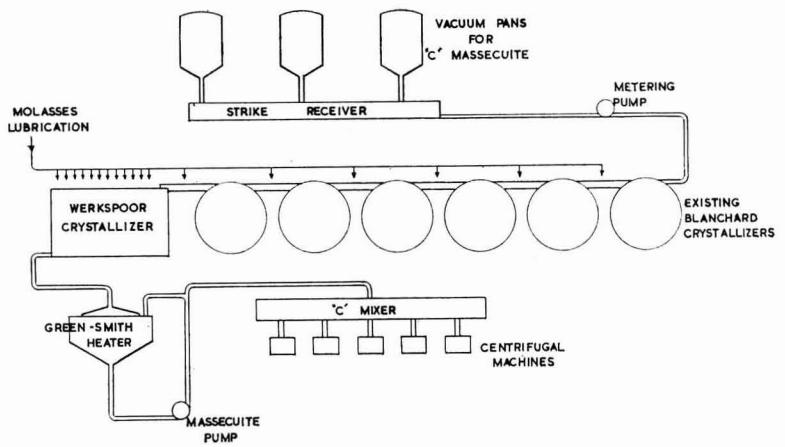


Fig. 1

The results of these trials were applied to Brechin Castle production figures. Calculations showed that if plant was installed to cool the massecuite so that the sucrose content of the final molasses was reduced by 1·75% on solids, then it would have been equivalent to an extra extraction of 850 tons of raw sugar during the 1961 crop.

Unfortunately to do this at Brechin Castle would have required the number of Blanchard crystallizers to be increased from the existing ten to fifteen, and this would have required a new building to house them. Because of this it was decided to connect

up the existing crystallizers in series to provide continuous operation and so to utilize to the maximum the cooling surface area. To provide the additional final cooling a single Rapid type crystallizer was selected and no extra building was necessary.

As a result of the massecuite being cooled to the low temperature it was necessary to reheat it in order to get good purging efficiency at the centrifugals, and it was decided that a specialized heater should be installed.

Similar reasoning to that for Brechin Castle was applied to Monymusk and as a result the reorganization and expansion of the molasses exhaustion equipment at the two factories took place during the 1963 off-season, and the plant began operation early in the 1964 crop.

Objects

The primary aim of each scheme is to cool the *C*-massecuite from a pan striking temperature of 65–68°C to 40–45°C in the minimum reasonable time. By more rapid cooling a high degree of supersaturation in the mother syrup is maintained throughout the period and thus the rate of crystallization is speeded up. Consequently the overall massecuite retention time can be reduced and the amount of sugar loss by destruction is lessened.

In order to get efficient purging the massecuite is reheated to 50–55°C. At this temperature the viscosity of the molasses is considerably reduced and yet its saturation temperature is not exceeded. It is an accepted fact that if the saturation temperature is exceeded, even locally, re-dissolving of crystallized sucrose will occur and a loss will result.

New plant had to be of a design which would stand the high massecuite viscosities envisaged without risk of water leaks. The heater had to have a large heating surface area so that a low temperature difference between massecuite leaving and water entering could be employed.

It was also required that the pipework for the vacuum pan discharges should be simplified so that heavier massecuites could be struck without loss of valuable boiling time.

Plant

The following description applies specifically to Monymusk.

A strike receiver was installed directly under the vacuum pans used for *C*-massecuite (Fig. 1). This receiver contains no cooling element and is used simply as a buffer vessel to feed the rest of the system. The massecuite flow from the strike receiver is metered by a variable speed pump.

In order to keep all cooling surfaces covered with massecuite at all times, the existing six Blanchard crystallizers were connected up to operate continuously. Massecuite troughs were fitted at alternate ends and the massecuite flows through the full length of each vessel in turn. A baffle plate was fitted at the centre of the crystallizers reaching from the top of the shell down to the stirrer shaft. The baffle prevents the massecuite travelling along the top of the crystallizer and ensures that it comes into contact with the cooling elements as it flows.

To supplement the available cooling capacity a Werkspoor Rapid crystallizer, made under licence in Britain, was added to the same continuous flow system. The massecuite overflows from the sixth Blanchard crystallizer straight into the Werkspoor crystallizer. This type of crystallizer was selected because the available cooling surface per unit volume was considered to be the highest practicable and the requirements of rapid cooling in the minimum factory space were fulfilled. Also the hollow disc design of cooling element was considered to be less liable to damage from the high viscosity massecuites to be handled at the coolest part of the system where the Werkspoor was positioned. Difficulties experienced in the early models of Werkspoor have been overcome by improved general design, better welding techniques, and the use of flexible water unions between cooling discs. The main shaft is also stronger.

The heater used is a Green-Smith static element heater. This type was selected because of the high heating surface area it provides. Relatively low temperature water can be used to achieve the necessary massecuite temperature, and the risk of local overheating is eliminated.

The use of the Green-Smith massecuite reheater was developed and patented a few years ago by the Tate & Lyle Group, and is used in all their English refineries and in most of their overseas refineries and factories. A number of improvements have been made since the early application, and the type now marketed by A. & W. Smith & Co. Ltd. is considered by the Tate & Lyle Group to be very satisfactory.

The heater is usually made as a rectangular tank, fabricated in mild steel, and filled with banks of finned heating elements as shown in the accompanying illustrations (Figs. 2 – 7). Each heater is tailored to the particular job, since the elements used are simply built up to any length and with any number of banks.

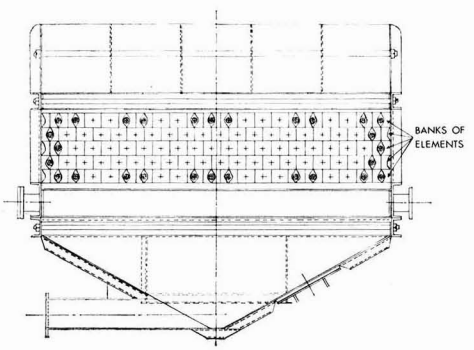


Fig. 2. Section through a Green-Smith reheater

The elements can also be arranged in a centrifugals mixer trough to replace the traditional rotating element. Since there are no moving parts in a Green-Smith unit, the normal risk of damage to the elements, with consequent water leakage, is virtually eliminated.

The elements are designed so that the disposition of metal is suited to the conduction of low grade heat. The maximum heat path from metal to massecuite is about half an inch. An extremely high ratio of heating surface to massecuite volume is achieved, and thus the residence time for reheating is minimized. Successive banks of elements are carefully arranged to give intimate contact between massecuite and heating surface and yet they provide low resistance to massecuite flow. Gravity flow is normal although upward forced flow has been used. It is quite simple to pump the hot massecuite from the heater to the centrifugals if height is lacking.

The heating water is pumped up through the elements, counter-current to the massecuite. The heating water circuit is normally closed but continuous condensate make-up can be employed as a heat economy measure. With this heater it has been found possible to heat massecuite using water only 2–3°C hotter than the required massecuite temperature. Using this small terminal temperature difference, the massecuite can be heated close to the saturation temperature without local over-heating, and therefore without redissolving crystal sucrose. As mentioned in this paper, there is evidence that a reduction in molasses purity across the heater can be achieved. With conventional rotating coil heaters a terminal temperature difference of as much as 20°C is necessary, and thus a certain amount of sucrose is redissolved and lost. This can easily amount to more than a degree rise in molasses purity.

The Green-Smith massecuite reheater installation is, duty for duty, of similar cost to conventional coil heaters. However, the greatly improved performance, lack of moving parts and thus elimination of periodic

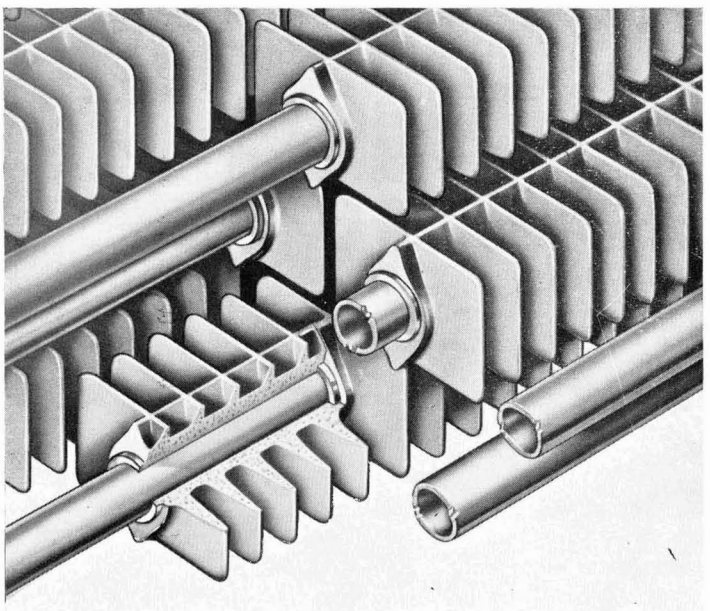


Fig. 3. The heating elements

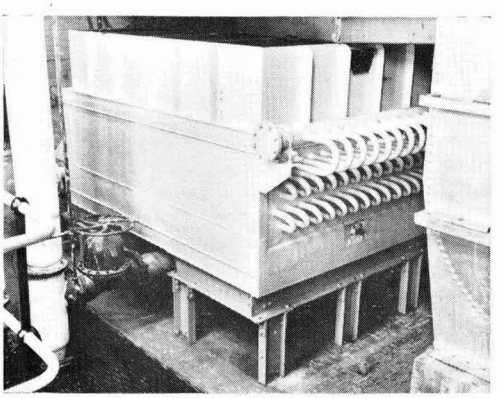


Fig. 4. Green-Smith reheater installed in a beet sugar factory

leaks and power requirement, together with absolute minimum maintenance requirements, makes it, in Tate & Lyle's opinion and experience, a better investment.

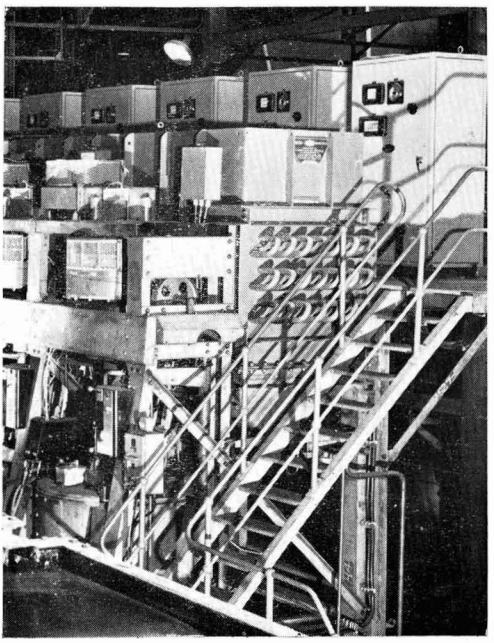


Fig. 5. Reheaters mounted above the centrifugals at a South African Sugar factory

At Monymusk both the Werkspoor crystallizer and the Green-Smith heater were served by closed circuit water systems to facilitate careful control of temperature and to minimize internal corrosion of the elements. Laval heat exchangers were used on both duties.

Facility was provided for lubrication of the massecuite with final molasses at each trough between Blanchards and to each element of the Werkspoor.

The original connexions for batch operation have been retained on the Blanchard crystallizers to allow liquidation at the end of crop. Liquidating facilities have been added to all other items.

At Brechin Castle there were eleven existing Blanchard crystallizers. These were split into two convenient continuous systems, one of five and one of six vessels. Each system has a strike receiver feeding it via a metering pump. The two strike receivers can be levelled, and may soon be joined completely. Both systems of crystallizers feed a common Werkspoor for final cooling and this feeds a single Green-Smith heater. In every important aspect the plant is the same as that at Monymusk, which has just been described.

Controls

Levels adjust themselves to some extent as a result of the regulated input of massecuite to the system. Where necessary automatic devices control levels by restricting flow or recirculating massecuite. High level alarms and overflow lines are provided where necessary.

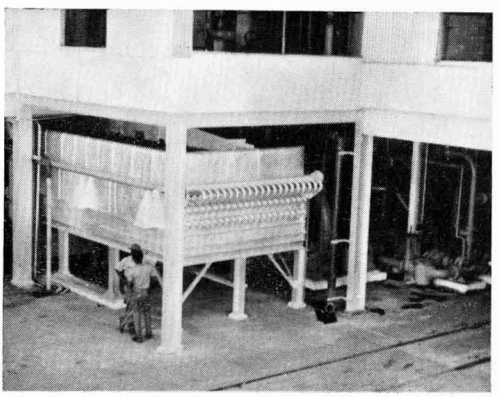


Fig. 6. The Green-Smith reheater at Brechin Castle

A multi-point temperature recorder gives a picture of conditions throughout the system. All instruments, controls and alarms are positioned on a central panel, except for the initial metering pump which is controlled from the vacuum pan floor.

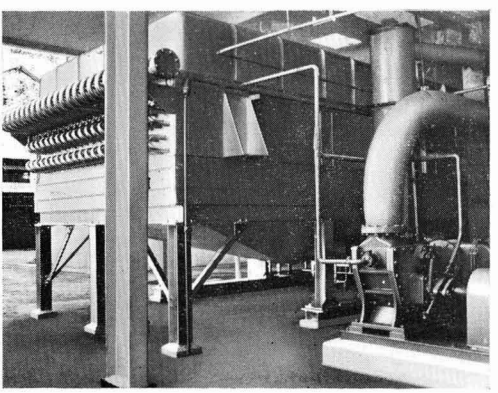
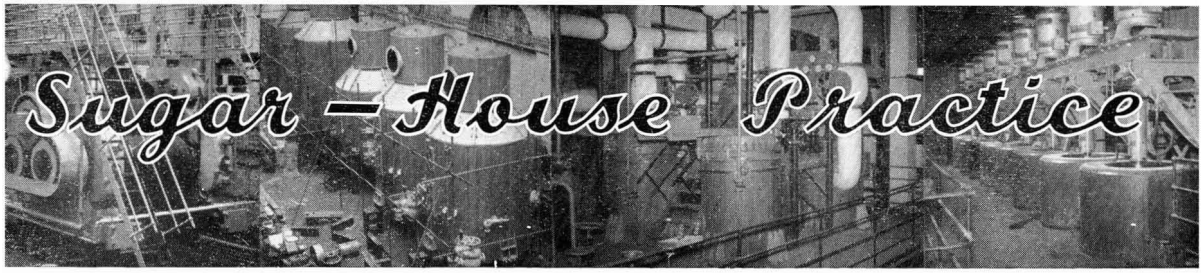


Fig. 7. Typical installation in a West Indian Sugar Factory

(To be continued)



Cane sugar plant. ANON. *Trade & Industry of Japan*, 1963, (5), 20–22; through *S.I.A.*, 1964, **26**, Abs. 1092. The process and plant used in modern double carbonatation factories of Japanese design are briefly described. The main features are turbine-driven 4-mill tandems, heat economy through utilization of 1st, 2nd and last effect vapours, packed towers for thin juice and syrup sulphitation, and double curing of all sugars with the use of continuous centrifugals for *C*-sugar fore-workers.

* * *

Steam requirement and steam pressure control with raw sugar processing. M. ATHENSTEDT. *Zeitsch. Zuckerind.*, 1965, **90**, 79–81.—When raw sugar is refined in a white sugar factory simultaneously with beet processing, the normally adequate amount of vapour bled for pan heating from the 3rd effect of the evaporator (in the case quoted equivalent to 18 kg/100 kg of beet) must be supplemented. Three possible means of increasing the feed are presented and illustrated by a flow diagram. The preferred method is that adopted at Lippe-Weser sugar factory in which exhaust steam is added to the 3rd effect vapour for pan heating. Middle- and after-product massecuite together with raw sugar are melted in the "middle juice" from one 3rd effect vessel, the melt filtered and returned to the other 3rd effect vessel. A description is given of the Dreyer, Rosenkranz & Droop proportional action control system used for regulating the pressure in the vapour line to the pan station, in which any deviation in the pressure is corrected in proportion to the time integral of the deviations, i.e. the correcting element is adjusted at a speed proportional to the deviation until equilibrium is re-established. Operation of the system over a campaign has shown that maintenance of a constant pressure in the vapour line considerably increases pan station throughput while reduction in fluctuations in thick or middle juice concentration also leads to better boiling conditions.

* * *

Some topics of milling. U. C. UPADHIAYA. *Indian Sugar*, 1964, **14**, 479–486, 541–549, 613–617.—Topics discussed briefly include mill capacity, slippage, feeding devices, roller surface, grooving, scrapers, the dirty top roller, roller speed ratio, cane preparation, mill openings, trash plate setting, juice extraction, maceration, juice scheme, hydraulic load, reabsorption, control by extraction tests, roller grouping and alignment, mill sanitation, lubrication, power requirements, regulation of mill speed and hydraulic load, mill drives, and engine and turbine speed control, and a comparison is made between turbines and steam engines as prime movers.

Hydrochloric acid rinsing as restoration treatment for decolorizing resin. K. KIMURA, T. KAWAMURA and H. HASHIMOTO. *Proc. Research Soc. Japan Sugar Refineries Tech.*, 1965, **15**, 1–12.—The anion exchange resins used in chloride form for decolorization are regenerated with 10% NaCl, and with 0·5% NaOCl after every 40–50 cycles. This treatment does not remove inorganic material such as iron rust. The use of hydrochloric acid for rinsing was tested and found to remove 58% of the ash and 92% of the ferric substances, as well as much colouring matter. Comparative laboratory tests were made using N HCl and 0·5% NaOCl solution for resin treatment; over 20 cycles the resins had equal decolorizing power. Plant-scale tests with acid rinsing showed that 80% of the adsorbed ferric substances were removed, decolorizing power of the resin was 84% of that with NaOCl treatment, and that the cost of acid treatment was only two-thirds of that using NaOCl, while the same equipment could be used for both materials. It is concluded that the resin should be treated alternately with N HCl and 0·5% NaOCl to achieve maximum decolorization and long resin life.

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Improvement of (a) deaerator and economical recovery of evaporator drain. K. INAGAKI. *Proc. Research Soc. Japan Sugar Refineries Tech.*, 1965, **15**, 38–42.—Condensate from the evaporator first vessel and vacuum pan condensate are used at the author's sugar factory for boiler feed. It had been insufficient in the past and deionized water was used as make-up, cooling the condensate in the drain condenser where they were mixed before passing to the deaerator en route to the boiler feed supply tank. Heat loss was made up by using steam during aeration. With improved condensate recovery the make-up was reduced and the condensate drain temperature was higher in consequence, leading to vapour escaping into the boiler room and electrical failure, etc. To counter this, the hotter evaporator condensate is sent direct to the deaerator, while the cooler pan condensate goes to the drain condenser. Vapour in the boiler room is almost eliminated and less steam is needed in the deaerator.

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Tests of a BMA fully automatic centrifugal, type 621-F. K. OHTU. *Proc. Research Soc. Japan Sugar Refineries Tech.*, 1965, **15**, 43–46.—Test runs were made using the BMA continuous centrifugal for soft sugar and granulated sugar massecuites. The 87–89°Bx consistency caused some vibration at 240 r.p.m. and the speed was therefore reduced using a speed controller for 80–120 r.p.m., which gave satisfactory results. The Soft White Superior massecuite

residence time was about 200 seconds, and the layer thickness about 100 mm. The capacity of the machine was equal to that of three ordinary 40 × 24 in 1200 r.p.m. machines.

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What affects the efficiency and function of vacuum pans? O. BÖHM. *Listy Cukr.*, 1965, **81**, 37–40.—The prerequisites for automatic control of pan boiling are considered with 14 references to the literature. The most important requirements are found to be: optimal massecuite circulation, maintenance of constant vacuum and heating steam pressure, continuous condensate removal and maintenance of a clean heating surface. The massecuite should be kept at a suitable level and an effective catch-all installed (or the liquor kept separate from the vapour). Control can be conductimetric, ebullioscopic or viscometric. Three suggested pan control schemes mentioned in the literature are described.

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Cleaning of evaporator calandrias in some Mexican factories. R. TOLEDANO. *Bol. Azuc. Mex.*, 1964, (186), 24–31.—Causes of and assessment of scale formation are discussed and information tabulated on Mexican sugar factory evaporator stations and their scale cleaning methods.

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Progress report of TSC test mill. C. F. TSENG, Y. C. CHAO and Y. K. LI. *Taiwan Sugar Quarterly*, 1964, **11**, (4), 9–15.—A 3-roller 24 × 24 in test cane mill was installed at Chi-Lu sugar factory in 1961 and was used to crush cane from the main carrier under variable conditions. Grooving was similar to the factory rollers and the mill drive was from a 150 h.p. 580 r.p.m. motor through a gearbox with a 36·06:1 ratio. A forced feeder was fitted and an Edwards accumulator with top-roller lift indicators. Tests were carried out using different roller speeds and mill settings, and the results are tabulated and discussed. Highest capacity combined with highest extraction can be obtained by regulating the speed to some extent when mill settings are constant. If the capacity is obtained by operating with a thicker bagasse blanket without increasing speed, extraction falls. Optimum capacity can be increased by increasing mill openings when the speed is kept constant, but if the blanket is too thin extraction falls sharply. Series of parabolic curves can be drawn for the relationship between juice extraction and mill throughput for varying roll speeds and settings, indicating that, for each value of the two latter variables, extraction rises with throughput to the maximum, decreasing thereafter because of reabsorption.

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TSC factory modernization programme makes headway. H. S. WU. *Taiwan Sugar Quarterly*, 1964, **11**, (4), 21–25.—An account is given of the programme for modernization and raising capacities of the Taiwan sugar factories, with equipment installed in recent years.

The current campaign sets new records. R. H. TSENG. *Taiwan Sugar Quarterly*, 1964, **11**, (4), 26–28.—A preliminary report is presented on some aspects of the 1964/65 crop in Taiwan, including some tables of data from previous seasons.

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Performance of Silver and BMA continuous centrifugals on C-massecuites. G. R. SERBIA. *Sugarland* (Philippines), 1964, **1**, (11), 24–28.—Tests were made to compare the work of a Silver (Hein, Lehmann) continuous centrifugal with a BMA continuous machine and Western States batch machines. The Silver machine treated a higher throughput than the others [39·0 cu.ft./hr *vs.* 24·0 cu.ft./hr (BMA) and 34·9 cu.ft./hr (Western States)] while purity of sugar is about the same as with the BMA machine (91·7 *vs.* 92·4), both being higher than for the Western States machine (84·7). The molasses purity is higher [35·7 *vs.* 34·1 (BMA) and 34·0 (Western States)] and this was found to be due to passage through the screen of tiny crystals.

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Continuous centrifugals for low grade at La Carlota. J. R. GOMERI and G. LONTOC. *Proc. 10th Conv. Philippines Sugar Tech.*, 1962, 87–93.—Nine BMA continuous centrifugals replaced the battery of 20 batch units for *C*-massecuites at La Carlota in 1961. The new machines minimized supervision and produced high purity sugar even with poor quality massecuite, but steam spraying was necessary for this and to increase the capacity. Within limits, this steam spraying did not affect molasses purity. There were some fine crystals in the molasses and this could be reduced when using 0·06 mm screen openings instead of 0·09 mm openings; however, this reduced the throughput of the machine. High non-pol separation in producing high purity sugar reduced the recirculation of impurities, and *C*-massecuite volume is calculated to be 27% less, total massecuite volume on raw sugar produced being reduced by 8%. To make a fine-grained *C*-sugar suitable for the machine requires longer pan time, which offsets the saving in massecuite to be boiled.

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The Pulupandan bulk sugar terminal C. ALINCASTRE. *Proc. 10th Conv. Philippines Sugar Tech.*, 1962, 128–138.—An illustrated description is given of the terminal, which includes a 27,000 long ton warehouse and can receive sugar at 150 short tons/hr and discharge at 560 short tons/hr.

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Automatic cane feeder control at Victorias Milling Co. E. F. GAMBOA. *Proc. 10th Conv. Philippines Sugar Tech.*, 1962, 139–145.—See *I.S.J.*, 1963, **65**, 115.

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Instrumentations and control systems for the sugar factory. R. MANALOTO. *Proc. 10th Conv. Philippines Sugar Tech.*, 1962, 294–303.—Typical control installations are illustrated and briefly discussed, the applications being for a cane mill, juice weighing, juice heating, multiple-effect evaporator, vacuum pan and crystallizer.

Cane sugar refining. P. GORZANOWSKY. *Zucker*, 1965, **18**, 150–152.—In the proposed refining scheme, the raw sugar is mingled with hot affination syrup, washed with cold water and melted to 65°Bx at a temperature not exceeding 75°C. The melt is simultaneously limed with 0·3–0·35% CaO and carbonatated to pH 7·5, preferably in two vessels, at about 60°C. Flue gas for saturation is passed through a 100:5 water:carbonatation mud mixture to wash the gas whereby its SO_2 content is exchanged for the CO_2 and its corrosive properties reduced. The CO_2 content in the gas should be no lower than 8%. The liquor is heated to 75–80°C and filtered; the sweetwater is used to dissolve the affination sugar, and the resultant remelt liquor (so-called "unit" liquor) decolorized in the conventional manner before pan boiling. The prerequisites for the scheme are: no destruction of reducing sugars—this happens when liming and gassing are separate and results in juice coloration, higher lime salts content, and higher molasses yield and purity; and boiling under high vacuum at low temperature, with low temperature steam. It is also important to reduce the number of re-boilings to a minimum and to decolorize or at least filter all run-offs, maintaining a high white sugar massecuite and white sugar syrup Brix. The amount of final white sugar syrup should be as low as possible to avoid re-boiling. Possible boiling schemes are suggested, one being the system used in some German factories and refineries, but an optimal scheme can only be worked out by the individual refinery.

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Kinetics of granulated sugar drying in a batch fluidized bed dryer. A. I. CHERNYAVSKII and V. D. KARMAZIN. *Sakhar. Prom.*, 1965, **39**, 176–180.—The relationship between the rate of sugar drying in a fluidized bed dryer is expressed in terms of a number of factors:

$$-\frac{dW}{d\tau} = k\,(1-\psi_0)e^{-\frac{\rho k H}{v\,\gamma_s.100}}\ \%/\text{sec}$$

where W = moisture content (%), τ = time (sec), k = constant, ψ_0 = relative moisture content of drying medium before entry into the drying chamber (%), ρ = density of sugar bed (kg/cu.m.), H = initial height of bed (m), v = velocity of drying medium in the free space of the drying chamber (m/sec), and γ_s = density of saturated steam (kg/cu.m.). Tests were carried out with a laboratory unit in which sugar of moisture content in the range 0·5–2·0% was dried at a temperature in the range 60–140°C at a hot air velocity of 0·8–2·0 m/sec. The bed heights were in the range 50–300 mm, and drying lasted 60–120 sec. At a moisture content of 0·7% and above, lumping of the sugar occurred with channelling and normal fluidization took place only when the moisture content had fallen to 0·3%. At a moisture content above 0·36% there was a period of constant drying rate, the rate falling initially. At constant temperature and velocity of the drying agent there was an exponential relationship between drying rate and the initial bed height, this being expressed by a straight line in a semi-log graph. The relationships between drying rate and velocity of the drying agent and between the drying rate and temperature of the drying agent are expressed in the form of empirical formulae.

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The effect of sucrose on the wear of metals. N. A. SOLOGUB. *Sakhar. Prom.*, 1965, **39**, 180–182.—Comparative tests were carried out to determine the durability of metals in distilled water and 15% sugar solution. Pairs of hollow cylindrical samples were subjected to friction at room temperature, a pressure of 20 kg/sq.cm. and rates of slip of 0·05–1 m/sec. In distilled water (which has properties very similar to those of condensate from steam engines) the most durable was a pair comprising St.5 steel and SCh 15–32 cast iron, while a pair containing St.5 steel and Br.AZh 9–4 bronze was the least durable. Oxidation caused most wear in steel and cast iron. With increase in the speed of slip, the coefficient of friction of this pair fell from 0·38 to 0·02. Pairs consisting of steel and bronze tended to seize, in some cases the extent of this falling with increase in the rate of slip. Babbitt metal was subject to considerable oxidation and to seizing with increase in the speed of slip. In sugar solution the degree of wear of the same pairs was lower than in distilled water. The most durable pair consisted of St.5 steel and Br.OTsS 5-5-5 bronze. With steel and cast iron, oxidation was again the primary cause of wear, although the coefficients of friction were much lower as a result of denser, glass-like oxide layers formed. Seizing either did not occur or did so to a lesser extent than in distilled water.

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Economical power from process steam. A. C. VALENTINE. *Sugar y Azúcar*, 1963, **60**, (3), 37–39.—The pattern of steam requirements in sugar factories has changed in line with the changes in process techniques, less heat being needed on the process side but more electric power being required for drives and other devices. Hence there is greater need for schemes incorporating boilers and back-pressure turbo-alternators. The basic thermodynamics applicable to back-pressure turbines are discussed and information is given on their constructional features.

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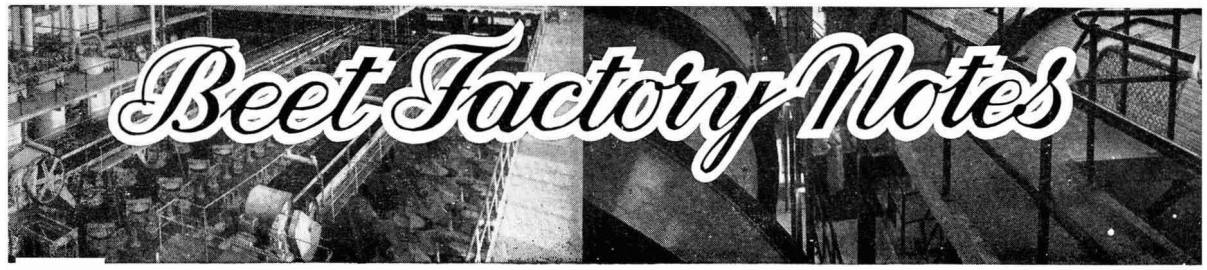
Effect of magnesium on clarification and phosphate content of raw sugars. P. HIDI. *Austr. J. Appl. Sci.*, 1964, **15**, 35–40; through *J. Sci. Food Agric. Abs.*, 1965, **16**, i–151.—From conductimetric measurements made of $Mg^{++} + HPO_4^{--} = MgHPO_4$ at different temperatures and in different amounts of dissolved sugar, Mg ions at a concentration of approx. 4·5 mmoles in the clarified juice gave approx. fourfold increase in the soluble PO_4^{---} level. Presence of Mg in the precipitated phosphate inhibits the rate of transformation to the more stable form, giving an apparent increase in solubility.



The use of boiler flue gas in pulp drying. H. HUBER. *Zucker*, 1965, **18**, 85–90.—The author shows, by sample calculations, that the use of boiler flue gas for pulp drying can result in a 8–15% increase in the thermal efficiency (approx. the ratio of temperature difference in the gas across the dryer to the initial gas temperature). The replacement of secondary air by boiler flue gas at the drum entrance and exit (and at the feed chute) would also be of advantage; in any case, attention must be paid to the insulation at these two points when using boiler flue gas. If possible the boiler house should be near the dryer to avoid long pipelines, and in any case it is preferable to install a blower to convey the waste gas to the dryer. Brief descriptions are given of furnaces that could be used to supply the waste gas.

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Considerations on mountings in settling vessels. K. KOLLMANN. *Zucker*, 1965, **18**, 90–93.—Calculations are presented relating to the effect of the form of the mountings, their radii and mass on sedimentation. Optimal measurements are obtained and the question discussed of replacement of one settler by two smaller ones whereby this optimal basis is lost. The influence of juice properties on sedimentation is not considered.

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Purification of beet juices by means of (the) "Asahi-type" continuous ion exchange process. K. ADACHI, S. NAGASAWA and O. KAGEYAMA. *Proc. Research Soc. Japan Sugar Refineries Tech.*, 1965, **15**, 69–89. Pilot plant tests of the Asahi process (used in fibre production), as adapted to sugar manufacture, were carried out at Oita factory in the 1961/62 campaign. Second carbonatation juice was treated at a rate of 1½ cu.m./hr, first with 595 litres of type II strongly basic anion exchange resin (OH^- form) and then with 455 litres of weakly acidic cation exchange resin (H^+ form) at 30–35°C. The two tests were discontinued after 6 and 4 days because of the microbial contamination in the tower. However, it was noted that the volume of resin required was only 30–50% of that for the fixed bed and that the process raised recovery of sucrose from 11% to 13·5% on beet. In order to prevent bacterial contamination it is necessary to treat the juice in the sequence: cooling—strong cation exchanger—weak-base anion exchanger. The strong-base anion exchanger at the first stage and at 30–35°C is unsuitable, not only because of the bacterial contamination, but also because it becomes contaminated with colouring matter. Purity and colour of treated juice were affected by the original values.

Construction of Frauenfeld sugar factory, Switzerland. H. SCHICK and H. MATHEIS. *Zucker*, 1965, 18, 111–121.—An illustrated account is given of the processes and equipment at the Frauenfeld white sugar factory. Of the beet supplied, 80–85% is transported by rail and there are storage facilities for 5000 tons. The beet is conveyed from the wash house to the main factory building by a bridge which runs from ground level to the top of the end wall of the factory. The 2200–2500 tons/day capacity of the Buckau Wolf tower diffuser can be raised to 3000 tons/day by increasing its height. Conventional carbonatation is used with the Brieghel-Müller pre-liming system. The evaporator is a quadruple-effect and a three-boiling system is applied with recycling of the wash syrups. Fully automatic Buckau Wolf batch centrifugals are used for *A*- and *C*-products while Escher Wyss push-type continuous machines are used for *B*- and affination products. Total storage capacity of the two Lucks white sugar silos is 20,000 tons. Most of the pulp is pressed to 17% dry solids and returned to the beet suppliers.

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Problems of corrosion in steam boilers. H. ANDERS. *Zucker*, 1965, **18**, 124–126.—The conditions under which corrosion of iron occurs are considered and the particular case of steam boilers examined, whereby the additional danger of corrosion from sulphur compounds is discussed.

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Alkalinity and peptization in beet juice defecation. V. TIBENSKÝ. *Listy Cukr.*, 1965, **81**, 25–30.—When calcium hydroxide is added progressively to raw juice, the natural alkalinity eventually reaches a maximum value which is lower than the equivalent amount of anions precipitated. The amount of $Ca(OH)_2$ required to precipitate low molecular anions is three to four times that required to coagulate the colloids. A single addition of an "over-optimal" quantity of calcium hydroxide will precipitate lime salts and form lime-sucrose complexes. Hence, while the hydroxide and sucrose may cause considerable peptization of the coagulated colloids, their effect on lime salts precipitation is only slight. Tests showed that the optimal alkalinity for defecation expressed as the sum of the alkali hydroxide (natural alkalinity) and calcium hydroxide is not a general characteristic of precipitation and coagulation. From the viewpoint of coagulation, natural alkalinity is an inert part of optimal alkalinity, i.e. only calcium hydroxide is the deciding factor in optimal coagulation and precipitation.

Sensitivity of dried pulp to atmospheric humidity. M. ROCHE. *Sucr. Franç.*, 1965, **106**, 61–63.—Pulp samples from three sources each in the form of bulk pulp, granules and pellets were submitted to controlled atmospheres of 70, 80 and 100 R.H. at a temperature of 19° ± 1°C, and the increase in moisture measured and recorded in graph form. In addition the physical changes occurring in the samples are described. While the pellets can be seen to have changed, the volume of bulk pulp does not alter with moisture absorption, so that accidental exposure to moisture cannot be detected by observation. The rapidity of moisture absorption by dry pulp samples causes some difficulty in weighing and this is discussed together with the significance of such absorption where the store is not ventilated and where it is open to the air.

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The "wet" method of sugar recovery from molasses. P. V. NIKOLAEV. *Sakhar. Prom.*, 1965, **39**, 183–184. The normal Steffen process at Kupyranskii sugar factory, using powdered line, was replaced by a "wet" method using lump lime. Apart from the excessive lime consumption (26·5% of the initial amount was in the form of free lime and was removed from the saccharate suspension by the classifier and a further 12·5% remained in the saccharate as free lime), the sugar losses in the discard alkali were also higher compared with the conventional process. The free lime remaining in the suspension passed to the vacuum filters where it was slaked, causing a rise in the temperature of the saccharate suspension and partial decomposition of the tricalcium saccharate. Only when at least 175–180% active lime was added was there no foaming of the suspension and the cake structure was normal. Other disadvantages of the "wet" method included the much longer time (3–4 times that with the normal method).

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Calculation norms for heat equipment in beet sugar factories. M. L. VAISMAN and A. A. KNYAZEV. *Sakhar. Prom.*, 1965, **39**, 188–194.—Tests with juice heaters have shown that whereas calculated values of ψ (coefficient of heat surface utilization) decrease with increase in juice velocity, true values may increase, decrease or remain constant in the presence of a given layer of scale. In the case of evaporators, increase in the hydrostatic pressure does not necessarily cause a decrease in ψ, but again the latter may increase, decrease or remain constant. The discrepancy between calculated and experimental values is explained by the fact that $\psi = \frac{k}{k_o}$ (k = calculated heat transfer coefficient with a layer of scale and k_o = calculated heat transfer coefficient with clean surface); while values of k and k_o increase with juice velocity and hydrostatic pressure, they may do so at a different rate. Although more intensive scale formation and greater thermal resistance accompany increase in hydrostatic pressure, at the same time increase in the latter at a given scale thickness increases the heat transfer coefficient; hence, the requirement is to find an optimal value of hydrostatic pressure at which k is greatest.

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Further regarding the new concept of alkalinity[1]. P. M. SILIN. *Sakhar. Prom.*, 1965, **39**, 195–196.—The author maintains that natural alkalinity is not (K + Na) and that the OH^- ions do not depend on (K + Na) but on the number of anions giving a precipitate with Ca^{--}. Moreover, the optimal alkalinity for 2nd carbonatation is only approximately equivalent to half of the natural alkalinity when the beet are fresh and the lime salts content low, since when the beet are rotten the Ca^{++} ion uses part of the alkalinity (as CO_3^{--}) for its precipitation. Determination of the extent of lime salts separation at 2nd carbonatation is considered valueless and determination of the quantities of Na_2CO_3 and Na_3PO_4 required for lime salts precipitation in 2nd carbonatation is not valid where sodium carbonate or phosphate are added during the processing of sub-standard beet.

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VNIISP experimental sugar factory. N. V. KHEIZE. *Sakhar. Prom.*, 1965, **39**, 203–208.—The experimental factory, situated about 100 km from Kiev, is intended solely for research work and operates two separate process lines from beet reception to sugar packing, each line having a daily slice of 200 tons of beet. One line uses a 3-boiling system, the other a 4-boiling scheme. Full details are given of the equipment and processes used.

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Separator for beet tails and other impurities in flume-wash waters. A. N. OSTAPENKO and B. M. SHAKHNOVICH. *Sakhar. Prom.*, 1965, **39**, 209–210.—The device comprises an electrically-driven wheel rotating at 4 r.p.m. with about ¼ of the overall height immersed in the water. The impurities are lifted by the wheel and dropped onto a chute feeding them to a screw or belt conveyor.

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Effective alkalinity as a standard of juice purification. B. NOWAKOWSKI. *Gaz. Cukr.*, 1965, **73**, 25–27.—The 1st and 2nd carbonatation juices at seven Polish beet sugar factories were analysed during the period from the end of November to the start of January, particular attention being paid to the minimum and maximum lime salts contents and effective alkalinity (difference between 1st carbonatation juice alkalinity at pH 9·25 and its lime salts content). The values for each factory are discussed in turn. The 1st carbonatation alkalinity at pH 9·25 was higher the lower was the content of buffer substances in the juice, while the lime salts content was lower if the juice was oversaturated and had a low organic acid and colloid content. The effective alkalinity is easily determined and is considered a reliable guide to juice purification efficiency and to the lime salts content in 2nd carbonatation juice. Means of reducing the lime salts content are considered.

[1] *See I.S.J.*, 1964, **66**, 265; 1965, **67**, 247.

NEW BOOKS AND BULLETINS

Atlas of Sugar Crystals. G. VAVRINECZ. 58 pp; 8 × 8¼ in. (Verlag Dr. Albert Bartens, 1 Berlin 38, Lückhoffstrasse 16, Germany.) 1965. Price: DM. 23.60; £2 2s.

The name of the compiler of this "Atlas", GABRIEL VAVRINECZ, has long been familiar to sugar men, for his descriptions and diagrams of sugar crystal "habit" or form have been appearing intermittently in our journals since about 1930. The accumulated evidence is now presented in a reference booklet of some 58 pp. inclusive. Herein are 152 clearly reproduced figures of crystal habit, together with evidence of origin and morphological details. A short section is devoted to the explanation of crystal symmetry and accepted classification, this being essential to the understanding of later descriptions.

The author records that it has been his experience to find that the crystals comprising any one sample of sugar will exhibit slight differences of habit. The reviewer has been emphasizing this "individualism" of crystal for some time, and is glad to note this agreement of evidence from two different approaches. Now that we have increasing knowledge of the mechanism of crystal growth, such variations are seen to be logical and almost inevitable. Nevertheless quite emphatic differences of habit are met with in industry, and Dr. VAVRINECZ has recorded many of these, together with such detail of sugar origin as was available. Included also are some results obtained by the deliberate introduction of specific impurities. This is an encouraging beginning, but it will be evident that this subject is so complex and relatively unexplored as to call for a great deal of further study.

The list of origins covers quite a wide range of sugar producing areas of the world, to which the reviewer would like to have added two well-publicized extreme aberrations which recur regularly in their respective areas, i.e. acicular or elongated grain, in certain parts of Hawaii; and triangular grain, in parts of Queensland, both from cane. Indian sugars, also cane, in general show a remarkably "compact" habit, i.e. axis ratios approaching 1:1:1, this giving a superficial cubic appearance to the crystals. Elongated grain has widely been reported from beet areas, and the addition of raffinose to a sucrose solution does increasingly tend towards a lengthened axis in the crystals grown therefrom.

It is unfortunate for the "up-to-dateness" of this admirable booklet that only the earlier dimensions of the unit cell, obtained by BEEVERS *et al.*, are given. The more recent and even more accurate and illuminating figures, obtained by BROWN *et al.*, were reported in this *Journal* last year[1], together with a diagram indicating the relative positions of the C,O and H atoms in the crystal.

Few in industry have much time or energy to spare for devoting much personal attention to the finer aspects of the sucrose crystal form. Hence, when by such a lifetime of patient devotion a volume such as this becomes available, it should be welcomed by many. Appreciative thanks are due both to the author, GABRIEL VAVRINECZ, also to Verlag Dr. Albert Bartens, whose interest therein has made the publication possible.

H. E. C. POWERS.

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Welcome to the New York Coffee and Sugar Exchange. (New York Coffee and Sugar Exchange Inc., 79 Pine Street, New York 10005, U.S.A.) 1965.

This stiff card brochure gives a brief description of the function and workings of the Exchange and includes a brief history of the organization, a simple explanation of future trading and hedging, and a list of organizations enjoying membership privileges. Copies of the brochure are available from the Executive Secretary of the Exchange.

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Factors affecting Crystallization in Boiled Sweets, Fondants and other Confectionery. R. LEES. 63 pp.; 6 × 9½ in. (The British Food Manufacturing Industries Research Association, Randalls Road, Leatherhead, Surrey.) 1965. Price: 15s 0d.

While this publication, No. 42 in the series of Scientific and Technical Surveys produced by the Association, is intended for confectionery technologists, it does have a certain amount of material of interest to sugar technologists. It is divided into two sections, "Crystallization" and "Crystallization in Sugar Confectionery Products". The first part particularly refers to the sucrose crystal and includes crystal photomicrographs taken by H. E. C. POWERS, who has also given advice on crystallography. Part II is mainly concerned with crystallization in fondants and creams, although it also covers crystallization in boiled sweets, fudge, jellies, toffees and caramels. The 158 references to the literature are given at the end, together with a list of earlier publications of the Association on sugars solubility and crystallization and a list of terms used in crystallography.

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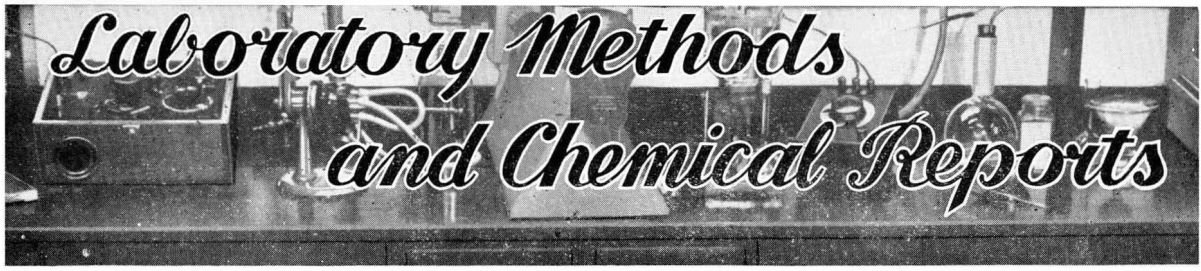
Water Treatment. G. C. JAMES. 307 pp.; 6 × 10 in. (Technical Press Ltd., 112 Westbourne Grove, London W.2.) 1965. Price: 63s 0d.

This is the third edition, revised and enlarged, of a book first published 25 years ago which covers all phases of water and sewage treatment. It is intended to give a general introduction to the subject and describes and comments on the various ways in which water can and/or must be treated before being used in industry or for human consumption. The subject is considered under three headings—domestic supplies, industrial supplies and effluents, and domestic sewage. Of possible interest to the sugar technologist are the sections dealing with water softening, boiler feed water and treatment, classification and effects of contamination due to effluents, sugar factory influent and effluent treatment, and various sections on effluent treatment and sludge disposal. The book contains a number of illustrations and an author and a subject index.

[1] *I.S.J.*, 1964, **66**, 117.



Determination and expression of turbidity. H. OIKAWA and T. MAKINO. *Proc. Research Soc. Japan Sugar Refineries Tech.*, 1965, **15,** 13–22.—A photo-electric turbidity meter was used to investigate measurement of sugar liquor turbidity, and it was found that turbidity, expressed as scattered light % total light, was not influenced by colouring matter in solution. The readings of a standard kaolin/water suspension could be converted to those of the Japan Industrial Standard Method for turbidity measurement of industrial water using graphs which are presented.

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Thin-layer chromatography in sugar analysis. Y. TAKAMISAWA. *Proc. Research Soc. Japan Sugar Refineries Tech.*, 1965, **15,** 23–29.—Methods are presented for quantitative determination of raffinose and invert sugar in beet molasses. Glass plates were coated with a 380 μ-thick layer of a slurry of "Filter-Cel" containing 5% gypsum and 0·02M sodium acetate buffer. The plate was dried at 100°C for 30 min and spotted with 5 μl of a 2% solution of beet molasses in water. This was then developed by an ascending solvent mixture, 10:2:5:2·5 *iso*-propanol : toluene:ethyl acetate:water, for 90 min during which the development distance was 10 cm. Spraying with 0·2% naphthoresorcinol in acetone plus 9% phosphoric acid, followed by heating at 100°C for 5 min, revealed raffinose as a red-purple spot (R_f 0·27), sucrose also being found at R_f 0·62. Quantitative estimation may be done by visual comparison with spots of known raffinose content. Good results were not obtained by colorimetry after eluting the spots. For invert sugar a 200 μ layer of "Kieselguhr-G" (Merck) was prepared and a test sample containing 0·5–1 γ of invert sugar applied and developed for 30 min with 35:65 *iso*-propanol:ethyl acetate. Naphthoresorcinol and heating at 100°C for 5 min revealed fructose (R_f 0·45) and sucrose as red-purple spots and glucose (R_f 0·38) as a pale blue spot. Quantitative estimation was by visual comparison with spots of known content; invert sugar contents of less than 0·5% gave too light a colour for good results.

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Measurement of density of sugar solution by means of (a) gamma-ray density meter. A. KAGAYA. *Proc. Research Soc. Japan Sugar Refineries Tech.*, 1965, **15,** 30–37.—A gamma-ray meter using ^{137}Cs as source was used for laboratory testing of density measurement of sugar solution flowing through a pipeline. For factory-scale tests the source used was ^{60}Co. Quite accurate measurements were obtained by comparison with spindle Brix measurements. Final molasses addition scarcely affected the measurements, but diatomaceous earth increased them. Fine bubbles did not affect measurements in the factory tests where the maximum difference between meter and Brix spindle measurements was 0·5°Bx using a 10-mc source and a 3- or 4-in pipe; using a 100-mc source and 6-in pipe the accuracy is improved to within 0·1°Bx. Chemical decomposition in the irradiated sugar solution is negligible.

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Factory-scale tests on qualities of South African raw sugars. TECHNICAL COMMITTEE, JAPAN SUGAR REFINERS ASSOCIATION. *Proc. Research Soc. Japan Sugar Refineries Tech.*, 1965, **15,** 105–106.—In comparison with Taiwan raws, South African sugar was almost identical in several respects, but had a higher and widely fluctuating colour value both before and after affination. This resulted in greater wash volume in the centrifugals and increased load and costs in the purification station as well as causing handling difficulty in the refineries.

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The odour of molasses. I. Volatile organic acids and phenols in refinery molasses. H. ITO, K. KAGABU and M. KAMODA. *Proc. Research Soc. Japan Sugar Refineries Tech.*, 1965, **15,** 56–61.—Refinery molasses, diluted to 60°Bx, was steam-distilled and the distillate extracted with ether. The ether extract was extracted with 5% $NaHCO_3$ solution and the alkaline extract acidified with HCl. The acidified solution was extracted with ether and this extract dried over anhydrous Na_2SO_4. The organic acids it contained were separated and identified by (1) gas chromatography after esterification with diazomethane, and (ii) thin layer chromatography on silica gel after conversion to hydroxamic acid derivatives. Formic, acetic, propionic, *iso*-butyric and valeric acids were identified by this means. The ether solution remaining after the $NaHCO_3$ extraction was extracted with 5% NaOH solution to recover the phenols content; this alkaline extract was acidified with HCl, re-extracted with ether and then examined by thin-layer chromatography on silica gel-G, when vanillin, syringealdehyde, vanillic acid and guaiacol were identified.

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The inhibitory effect of sulphitation on colour development. I. Sugar beet thin juice. S. FUCHI. *Proc. Research Soc. Japan Sugar Refineries Tech.*, 1965, **15,** 62–68.—Sulphited beet juice was heated for 2–5 hr at 100°C. Colour formation was found to depend greatly on the purity of the original thin juice before sulphitation, colour decreasing with higher purity, even with lower SO_2 content. Colour formation was lower with shorter heating time and higher SO_2

content. For a juice of 96 purity and original pH of 9·0–9·5, 20–30 p.p.m. of SO_2 was enough to inhibit colour formation.

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Quantitative determination of small amounts of sucrose in condenser water by the citric acid method. M. ANDO and R. KIUCHI. *Proc. Research Soc. Japan Sugar Refineries Tech.*, 1965, **15**, 91–97.—The determination of sucrose in condensate using citric acid and sulphuric acid [1 ml sucrose solution (≯20μg/ml) is added slowly to 5 ml reagent in a tube with a glass stopper, the tube shaken vigorously for 5 sec, heated in a boiling water bath for 10 min and cooled in an ice-water bath to room temperature, when the absorbancy is measured at 420 mμ and compared with a calibrated curve] was studied and compared with the anthrone method. It was found that the reagent (prepared by mixing 5 ml of 60% citric acid solution with 250 ml H_2SO_4, heating 1½ hr at 70°C with occasional vigorous shaking and cooling to room temperature) could be kept at room temperature (15°C) for up to 7 weeks, whereas the anthrone reagent could only be used for 6 days. The coloured solution obtained is stable for 1½ hours, sufficient for effective use. Standard deviation of the results was 0·3. Maximum amount of sucrose for effective content determination is 20 μg/ml. The citric acid reagent is much more stable against NaCl than the anthrone reagent.

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Quantitative changes in 5-hydroxymethylfurfural in the refining process and during the storage of soft sugar. M. MIZUSHIMA. *Proc. Research Soc. Japan Sugar Refineries Tech.*, 1965, **15**, 99–104.—A method was developed for determining hydroxymethylfurfuraldehyde (HMF) in sugar by extracting with *n*-butanol, followed by colorimetric determination with 2-thiobarbituric acid. The method was used to investigate changes in HMF contents in the refining process; affination removes about 42% of the 5 p.p.m. in raw sugar but more is produced by the heating and recycling of remelt sugar in production of raw liquor, which contains 3–6 p.p.m. Carbonatation and active carbon remove HMF, the latter by as much as 40%. The fine liquor contains 2–3 p.p.m. HMF while the soft white sugar contains 0·3–1·8 p.p.m., granulated sugar 0·8–1·0 p.p.m., crystal sugar 0·2–0·4 p.p.m., and brown sugars 2·2–8·5 p.p.m. Samples of soft white sugar were stored for 35 days at 40°C and also at 15°C and 65% R.H. for 38 days, and HMF contents and absorbancy measured at intervals. The absorbancy increased steadily, but the HMF content increased for 9 days and then decreased. Addition of HMF to samples was found to increase colour more rapidly than with the control samples, indicating that HMF is a factor in browning.

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A statistical approach for determination of final molasses exhaustion index from its chemical composition. R. J. GUILLERMO. *Proc. 10th Conv. Philippines Sugar Tech.*, 1962, 67–78.—Chemical analyses data of 34 weekly composite samples from Victorias Milling Co. were subjected to statistical analysis for a possible exhaustion index. It was found that a linear equation could relate the minimum target true purity (y) with the organic non-sugar % non-sucrose (x), viz. $y = 45{\cdot}9271 - 0{\cdot}2195\,x$. An exhaustion index would be the ratio of the actual true purity to this minimum target true purity, a value of unity or less indicating good exhaustion and over unity indicating poor exhaustion.

* * *

A critical analysis of available sugar formulas. D. SUERTE. *Proc. 10th Conv. Philippines Sugar Tech.*, 1962, 79–86.—The various formulae for available sugar in a juice of given purity are discussed. The NÖEL DEERR *s-j-m* formula is based on loss only in molasses where the Queensland c.c.s. formula and that of FOLLETT-SMITH[1] are empirical and come close to the actual amount which can be obtained in commercial practice. The *s-j-m* formula cannot be used for raw sugar equivalence calculation because it provides different values depending on the molasses purity and boiling house efficiency. The International Sugar Agreement conversion formula is recommended for general use.

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The relation between the clarity and the P_2O_5 content of Canlubang cane juices. D. I. BALAGSO. *Proc. 10th Conv. Philippines Sugar Tech.*, 1962, 94–98. Examination of the P_2O_5 content and clarity ("Luximeter" reading) of clear juices showed that lowest clarity was found with P_2O_5 contents below 301 p.p.m. and highest clarity with over 350 p.p.m. However, statistical analysis of the relationship indicated that of the variance in clarity only 13·24% could be accounted for by P_2O_5 content, other factors being responsible for the bulk (86·76%) of the variation.

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Viscosities, densities and related properties of solutions of some sugars in dimethyl sulphoxide. P. G. SEARS, W. D. SIEGFRIED and D. E. SANDS. *J. Chem. Eng. Data*, 1964, **9**, 261–263; through *S.I.A.*, 1965, **27**, Abs. 64.—The densities and viscosities of solutions containing 0–40% of sucrose, D-glucose or D-fructose were determined at 25–55°C by means of pycnometers and Cannon-Fenske viscometers respectively. The results are tabulated, and are expressed as equations with tabulated constants for finding the density at constant temperature and the viscosity at constant concentration. The limiting apparent molal volume of sucrose in solution (mol.wt./apparent molecular density, at infinite dilution) is 207·4–208·3 ml/mole, compared with 215·6 ml/mole for solid sucrose; the relative differences for glucose and fructose are respectively greater and smaller than for sucrose. No shear effects were observed with concentrated solutions. The viscosity of a 38·8% solution of sucrose in DMSO at 25°C is > 40 times the corresponding value for an aqueous solution.

[1] *I.S.J.*, 1961, **63**, 145.

BY-PRODUCTS

Some chemical aspects of base board production for waxed cartons. N. D. MISRA. *Indian Pulp & Paper*, 1962, **17**, 383–386; through *S.I.A.*, 1964, **26**, Abs. 1050.—Bleached bagasse soda pulp, bleached bamboo kraft pulp or a mixture of the two were suitable for making supercalendered cardboards for waxing. In order to prevent loss of opacity on waxing the pulp was sized with 4% of rosin size and 8% of alum on dry weight, and filled with 2·5% of TiO_2 (anatase). Waxed board from bagasse pulp had the better opacity owing to the presence of short fibres.

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Considerations and characteristics of bagasse fibre particle boards. J. ACOSTA C. *Bol. Azuc. Mex.*, 1964, (186), 10–12.—Advantages and properties of bagasse board are listed and tabulated.

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Some non-food uses of sugar. F. A. SOLIVEN. *Proc. 10th Conv. Philippines Sugar Tech.*, 1962, 99–104. Products obtainable from sugar which are discussed are: sorbitol, glutamic acid and citric acid, of which the properties, manufacture and uses are mentioned.

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Use of acid and alkali in the production of alcohol from final molasses. L. V. VALERA and I. R. BOBON. *Proc. 10th Conv. Philippines Sugar Tech.*, 1962, 105–109.—Ammonium sulphate was added to molasses wort and NaOH or H_2SO_4 added to adjust the initial pH (5·65) to various levels between 4·52 and 7·07. Other samples received acid or alkali without the $(NH_4)_2SO_4$. The alcohol yield resulting from fermentation was determined in each case as well as from a sample to which only $(NH_4)_2SO_4$ had been added and another which was completely untreated. It was concluded that it is only the use of the $(NH_4)_2SO_4$ which gives consistently higher alcohol yield; acid or alkali alone showed no significant effect on yield.

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Studies on alcohol fermentation. I. The effect of *Ceriops tagal* (Perr.) C. B. ROB on the alcohol fermentation of cane juice, molasses and sugar solutions. L. J. VILLANUEVA and J. O. JULIANO. *Proc. 10th Conv. Philippines Sugar Tech.*, 1962, 110–127.—Powdered bark of tañgal, a common mangrove swamp tree found in the Visayan Islands, was added to fermentations of juice, molasses and raw sugar solution and the effects reported in tabular and graph form. It increased the alcohol content of the mash from juice and molasses and sometimes the raw sugar solution, and increased the % utilization of reducing sugars. Fermentation started earlier in its presence, and it may be suitable as a clarifying agent for fermentation media.

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Pulping of sugar cane bagasse. M. SAGARBARRIA and M. GLORIA. *Proc. 10th Conv. Philippines Sugar Tech.*, 1962, 273–284.—Possibilities for pulp production in the Philippines is reviewed as are the characteristics of bagasse pulp, depithing and pulping processes, with especial reference to the Celdecor-Pomilio process, black liquor recovery and choice of the most suitable pulping process.

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Properties of hardboard from sugar cane bagasse. B. O. DE LUMEN, L. J. VILLANUEVA and P. BAWAGAN. *Proc. 10th Conv. Philippines Sugar Tech.*, 1962, 285–293.—Hardboard mats were prepared from depithed bagasse pulp and their physical properties measured and discussed.

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Distillery wastes for fertilizer and feed. R. A. CRUZ. *Sugar News*, 1965, **41**, 24–27.—See *I.S.J.*, 1965, **67**, 156.

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Problems in sucrochemical research. J. L. HICKSON. *Sugar y Azúcar*, 1965, **60**, (3), 40–42.—The failure of sucrose detergents to attract sufficient attention from local authorities, etc., who are nevertheless interested in preventing the spread of river pollution, is deplored but hopes are held out for an improvement in the situation. Other problems that have been encountered by the Sugar Research Foundation include the failure of a plywood phenolic adhesive in which half of the phenol was replaced by sucrose but in which significant amounts of unreacted sugar remained in the resin matrix, and the loss of the race to patent a melamine. Other non-food uses of sucrose discussed include surface coatings, fibres, paper, pesticides and plasticizers. Animal feedstuffs incorporating sugar by-products are also considered.

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Urea addition to (beet) pulp. W. STANKIEWICZ. *Gaz. Cukr.*, 1965, **73**, 34–38.—Details are given of the scheme at Szamotuly sugar factory (Poland) for production of M1 and M2 ureated pulp. Both contain 2% urea, 1% "Micro B" mash and 0·5% sodium sulphite, but M2 also contains 10% molasses. "Micro B" mash is a powder containing 65·5% bone flour, 30·0% chalk, 4·0% $MgSO_4$, 0·32% $FeSO_4$, 0·10% $CuSO_4$, 0·06% $MnSO_4$ and 0·02% $CoSO_4$. Data are tabulated showing the average analyses of the two types of treated pulp, flue gas temperature in the dryer and the initial and final pulp temperatures as well as breakdown of the costs.

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Fermentation of cane sugar molasses. A. SÁNCHEZ-MARROQUIN. *Rev. Soc. Quím. Mex.*, 1964, **8**, 61–67; through *J. Sci. Food Agric. Abs.*, 1965, **16**, i–151. The effects of different media for the production of citric acid from molasses with *Aspergillus niger* in submerged culture with shaking has been studied. An optimum medium is molasses (10% sugar) treated with K ferrocyanide, with addition of NH_4NO_3 (0·15%), $ZnSO_4$ (0·0044%), KH_2PO_4 (0·02%) and cornsteep liquor (0·02%), and ethanol (3·5%) or methanol (3%). Yields up to 68% were obtained at pH (initial) of 6·5 to 7 and fermentation temperature 30 to 32°, with a suitable vegetative inoculum (1·5%).

TRADE NOTICES

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

"Accelerator A". Fabcon Inc., P.O. Box 187, Chagrin Falls, Ohio, 44022 U.S.A.

"Accelerator A" is a powdered chemical formulation developed to accelerate the removal of hard scale from sugar juice evaporators in the presence of muriatic or sulphamic acids. It is particularly valuable for use to remove heavy deposits of scale that could not be thoroughly removed by one acid wash.

Use in Louisiana and Florida has shown that from 0·5 to 1·5 lb. per 100 sq. ft. of evaporator heating surface added to the normal acid wash solution will remove scale up to twice as fast as normal. More important, it will penetrate and remove scales that could not previously be removed by a single acid wash. Of course, boiling with caustic soda and sometimes soda ash was done in all cases prior to washing with acid. Indications are that it reduces metal corrosion despite (or perhaps because of) its faster cleaning action.

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Bagasse briquetting. Swiss Precision Machinery Corp., Star Route No. 2, Box 17, Bayamon, Puerto Rico.

A leaflet has recently been issued which reprints an article appearing in the organ of the American Society of Tool and Manufacturing Engineers. The article, entitled "Bagasse: A New Fibre—A New Industry" is by the President of Swiss Precision Machinery and includes mention of the company's "Glomera" briquetting press. The production of bagasse briquettes and their uses are discussed and illustrations are given of the Type 1004 briquettor.

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New quick opening ball check valve. Dorr-Oliver Incorporated, Stamford, Conn., U.S.A.

This new gravity type valve is available in 2-in, 3-in and 4-in sizes and is applicable where corrosion or clogging is a problem or where slurries and fluids are difficult to handle.

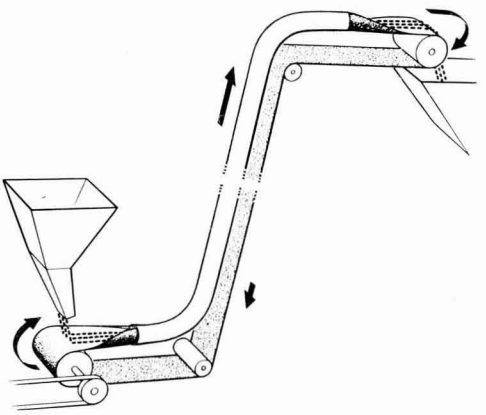
It is a matter of seconds to open the valve for easy cleaning and inspection of ball, seat and the elastomer lining. The last is $\frac{3}{16}$—$\frac{1}{4}$ in thick and is compressed onto a heavy duty cast-iron body.

When the valve is in the open position, the ball rides on top of the liquid stream. Each time the valve closes, the ball seats in a different position. Localized wear and friction are greatly reduced, increasing the life of the ball and seat. Both of these components are replaceable.

* * *

New smooth-running conveyor-elevator. The Thomas Hill Engineering Co. (Hull) Ltd., Hull, Yorks.

The "Flexitube" conveyor-elevator conveys powders, shredded materials and granular products to almost any required height without the use of complicated augers or buckets. It will convey products, completely enclosed, from floor to floor, around bends and over obstructions. No suction takes place; simple, ingenious use of natural compression of the product as the conveyor wraps gently around it allows the product to be elevated. The product is fed onto a flat part of the continuous conveyor. On entering the tube, the sides of the conveyor wrap around the product and carry it to the required height. Emerging from the tube, the conveyor unwraps flat again and empties itself.



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New meter for storage tanks. Metrol Ltd., Heath Green, Leighton Buzzard, Beds.

A unique design of tank meter is now available which will provide the input, contents and consumption of any liquid. Known as the "Metrol" storage meter, the unit is easy to fit, low in cost, and can be supplied for any size or shape of tank.

The unit contains two counters, and rises only of a float actuate an input counter, whereas both rises and falls of the float actuate the contents counter. Consumption is, therefore, easy to calculate. A "bag-isolator" version is available for corrosive, viscous or polymerizing liquids.

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Electrical weighing equipment. Girling Limited, Grange Works, Cwmbran, Monmouthshire.

The equipment uses electrical transducers which obviate the need for pivots or moving parts. This provides an extremely reliable machine which is very suitable for applications where dust or dirt contamination is prevalent. Owing to the electrical nature of the system, there is no need to limit the siting of the instrument in relation to the weigh unit, and it is quite easy to design the equipment into a control panel system.

Two main categories of equipment have been developed, the first being weighbridges designed as complete machines for either pit or above ground construction. The weight is presented in digital form, so that it is not possible for two people to differ in reading the indicator. A ticket printer which prints the same reading as the digital indicator is also a standard provision. Signals are available from this system which can be used to operate remote indicators, printers, totalizers and provide information direct into fully automated systems. It is also quite easy for dispensing controls to be added into this system, if required.

The second category, batch weighers, is custom-built to suit application requirements but, in general, the weights are set into the equipment by simple selective switching, and this provides an electrical signal which is balanced by the signal from the weighing unit. At the point of balance, an electronic system provides control signals to operate the batch dispensing equipment. This method offers a system of weight control which is completely static, both with respect to the weigh unit and the instrumentation. This factor makes it ideal for situations where dust and dirt hazards are excessive. The equipment is very suitable for us in combination with complete plant control systems.

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Brooks MPT transmitters. Brooks Instrument N.V., Veenendaal, Holland.

A completely new line of interchangeable variable area flowmeter transmitters, available with either pneumatic or electrical mechanisms, has just been announced by Brooks Instrument N.V. Specifically designed to transmit signals precisely linear with flow rate, the new transmitters greatly simplify spare parts inventory by permitting interchangeability between transmitting functions as well as different types of meters. For example, they can perform the following functions: signalling, electric or pneumatic transmitting, and integrating. These instruments also provide easily visible indicating scales, which are independent of transmitted signal, and which will operate even after failure of electrical power or air supply. Their output signals are compatible with virtually any type of exhibiting or controlling instrument.

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"Unilok" combined road-rail shunting locomotive. Hugo Aeckerle, 2 Hamburg-Ohlstedt, Bredenbekstrasse 12, Germany.

The newly-developed "Unilok" system represents an entirely new departure. Its basis is the "Unilok" combination shunting locomotive, which operates on rails and also on roads.

On rails the standard 32 h.p. unit has an effective tractive effort of 3325 kg or with a 45 h.p. motor 4500 kg. With the standard model, loads up to 300 tons can be handled at speeds up to 12 k.p.h. With the larger Unilok, loads in excess of 450 tons can be moved.

Off the rails, the "Unilok" is an excellent road vehicle which can be used for towing of trailers, moving of pallets, or handling loads with an attached hydraulic crane or fork-lift. For the loading and unloading of rail-cars, the machines can be fitted also with additional equipment, including screw conveyors, power shovels, fans and pumps, etc.

It is claimed by the makers that the machine operates as a locomotive at $\frac{1}{8}$ of the costs of a conventional shunting locomotive and has a performance superior to a 100 h.p. rail-bound machine. This is achieved by the fact that the "Unilok" works independently of switches and the position of cars on the track by being able to get on and off the rails at will.

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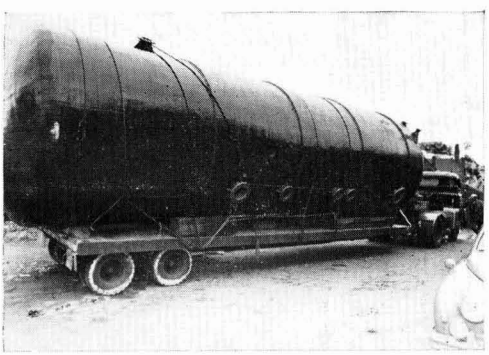
Plastic tanks. Tough Plastics Ltd., Culcheth, Nr. Warrington, Lancs.

The photograph shows a giant "Tufplas" neutralizing tank, one of two recently manufactured for Imperial Chemical Industries Limited. The tanks, wholly of plastic construction, are designed to work



at 100°C continuously and have been tested at that temperature. They have internal baffle weirs fabricated in "Tufplas". The dimensions of the vessel shown are 10 ft diameter × 33 ft overall length, yet its weight is less than two tons.

New steam trap. Clam Steam Traps Ltd., Livingstone Street, Clydebank, Glasgow.

The "Clam" thermodynamic steam trap is of extremely robust but simple construction, steel forgings being employed for top and bottom covers as well as the body. A stainless steel strainer is fitted as standard. One of the main virtues of the trap is that it can be completely serviced without removing it from the line, thereby reducing maintenance costs. Both valve seat and disc can be replaced in a matter of minutes, these units being made from heat-treated stainless steel. Walker "Metaflex" gaskets are used throughout. Four tie rods clamp the end mounts and body together and if lengthy service in the open leads to thread seizing problems, the "Clam" trap has the advantage that the tie rods can be cut and replaced quickly and at low cost.

Three sizes of valve seats are available enabling the user to match his trap to the conditions merely by switching valve sets. The Mark 7–C trap will handle pressures from 5 to 450 p.s.i. and temperatures up to 750°F. Capacity at 200 p.s.i. varies according to the seat fitted between 3000 and 5300 lb/hr and the sizes available are $\frac{1}{2}$ in, $\frac{3}{4}$ in and 1 in B.S.P. or A.P.I.; flanged models are also available in similar sizes. The larger Mark 10–B trap is constructed on exactly the same lines and will handle capacities of 20,000 lb/hr at 200 p.s.i.

The Mark 1 version available in $\frac{1}{2}$ in and $\frac{3}{4}$ in B.S.P. or A.P.I. threads has the same unique feature of replaceable valve and seat. It is inexpensive and has a capacity of 1200 lb/hr at a differential pressure of 100 p.s.i. Maximum pressure is 200 p.s.i. and maximum temperature 390°F.

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"Minertia" servo-motors. British Brown-Boveri Ltd., Glen House, Stag Place, London S.W.1; Yaskawa Manufacturing Company Ltd., Tokyo.

British Brown-Boveri Ltd. announce the introduction of a fast-response D.C. power servo-motor. This machine has a unique slotless rotor construction which effectively reduces the inertia to one-tenth the value of the conventional D.C. motor, hence permitting momentary torques of 10 times the usual value. Apart from this basic quality, it has several other interesting features which add to its overall performance. It is ideally suited for quick response copying and positioning drives, and servo systems. The standard range covers output torques varying from 31·2 to 2090 lb-ft.

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Endecotts micromesh sieves. Endecotts (Test Sieves) Ltd., Lombard Road, London S.W.19.

These are a new range of 3 in diameter sieves with stainless steel frame and nickel mesh. The mesh has a nickel support frame to provide the rigidity necessary for use.

The sieves can be nested with Endecotts standard 3 in sieves to provide continuity of sieving. The nominal sizes are 31, 22, 15·6, 11, 7·8 and 5·5 μ.

PUBLICATIONS RECEIVED

ABEX PRODUCTS BROCHURE. American Brake Shoe Company, 530 Fifth Avenue, New York, N.Y., 10036 U.S.A.

American Brake Shoe Company has published a well-illustrated, 40-page brochure describing its ten divisions and the products they make. Products include castings and forgings in a wide range of ferrous and non-ferrous alloys, hydraulic equipment and friction products for all types of brake and clutch applications.

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VIBRATING SCREENS. Link-Belt Company, Prudential Plaza, Chicago, Ill., 60601 U.S.A.

New book 2877 describes Link-Belt Company's 11 types of vibrating screens, including a new electromagnetic model for high-speed separation of extremely fine, dry materials. Larger and heavier screens have been added in four of the types, increasing widths to 8 ft and lengths up to 20 ft. Design improvements include a new cartridge bearing and new vibrator mounting for three types of screens (NRM, VC and UP). Tests show the new design increases rigidity and transfers maximum power from vibrator to screening decks. All of the screens can be built to dimensions that suit requirements. Most of them are available with single, double or triple decks, with and without dust enclosures.

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SURVEY OF KENT PRODUCTS. George Kent Ltd., Luton, Beds.

This 12-page, 2-colour brochure gives a brief description of each product in the extensive range manufactured by the company, and is an enlarged edition of a publication of the same title published early in 1964.

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HODAG SILICONE ANTIFOAMS. Hodag Chemical Corporation, 7247 Central Park, Skokie, Ill., 60076 U.S.A.

A new comprehensive 4-page brochure desrcibes the properties and uses of Hodag silicone antifoams. A simple table gives properties, descriptions, directions for use, etc. of the antifoams, which may be used at prescribed levels in food processing and packaging. The brochure covers selection and use of antifoams and details small batch processes, continuous metered addition, and non-aqueous systems.

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STEAM TURBINE GENERATING SETS. W. H. Allen Sons & Co. Ltd., Queens Engineering Works, Bedford.

Publication AP.4000, entitled "The Economic Production of Industrial Power and Process Heat" contains a number of articles on the use of steam turbine generating sets.

The 34-page book has four sections covering basic thermodynamics and types of power units, the selection of steam conditions and assessment of power obtainable, economics governing the choice of new power plant, and running in parallel with the public power supply system.

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NEW RENOLD DATA SHEETS. Renold Chains Ltd., Wythenshawe, Manchester.

A new set of nine data sheets (T11–T19) gives full dimensional and applicational details of the company's range of standardized design chain drives for powers up to 4250 h.p. at 300 r.p.m. as well as details of chaincases and drive lubrication.

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CONTINUOUS CENTRIFUGALS. The Western States Machine Co., Hamilton, Ohio, 45012 U.S.A.

After comparative tests on three continuous machines supplied by three different manufacturers for *C*-massecuite processing, an order for the complete requirement of five centrifugals was placed with The Western States Machine Co. Further information on the tests and a catalogue describing the continuous machines are available from Western States.

BREVITIES

Food research in the U.S.—American Sugar Company have completed a new Food Technology Centre at their Central Research & Development Laboratory in Brooklyn, N.Y. The Centre consists of food technology and field application laboratories and will conduct research into a number of fields including baking, canning, freezing, candy, ice cream, preserve and tablet manufacture and will also concentrate on the further development of special purpose sugars. The bacteriology, biochemistry and physical departments of the laboratory have been expanded.

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Puerto Rico sugar production, 1965[1].—Sugar production in Puerto Rico in the last season amounted to 886,676 short tons which was obtained from 8,806,972 short tons of cane. This compares with 978,128 tons produced during the 1963/64 campaign.

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Flooding in Queensland[2].—While the recent drought in parts of Queensland persisted, rainfalls of up to seven inches in two days at the beginning of July brought chaos to the crushing of the cane crop in some areas of the northern part of the State. Fields were flooded, rendering the harvesting of the cane impossible.

Cuba sugar exports[3]

	(*metric tons, raw value*)		
Countries of Destination:	1962	1963	1964
Aden	0	15,340	0
Albania	10,700	6,419	10,810
Algeria	0	5,389	37,696
Bahrein	0	3,316	0
Belgium	18,622	20,386	0
Bulgaria	117,796	56,177	87,248
Canada	19,880	70,068	3,268
Ceylon	0	0	21,596
Chile	80,867	4,585	0
China, Mainland	937,893	500,928	386,352
Czechoslovakia	155,680	150,105	52,071
Finland	5,881	0	0
Germany, East	179,343	244,490	81,054
Germany, West	3,800	0	0
Greece	49,658	15,483	0
Iceland	749	0	0
Iran	0	10,431	31,466
Iraq	17,991	36,711	0
Italy	2,167	157,904	149,455
Japan	431,482	160,771	345,582
Jordan	10,907	0	0
Kuwait	0	4,280	10,417
Lebanon	1,795	10,437	10,591
Morocco	265,124	285,028	323,259
Netherlands	15,104	123,545	10,387
Netherlands Antilles	2,122	0	0
North Korea	14,038	20,000	21,051
North Vietnam	10,490	13,373	10,542
Norway	36,138	22,636	0
Oman	0	1,124	0
Poland	151,285	103,895	32,148
Qatar	0	4,494	0
Saudi Arabia	0	7,651	0
Somalia	0	0	11,477
Spain	58,312	102,737	275,704
Sudan	0	8,988	0
Sweden	28,232	15,243	10,721
Switzerland	16,814	61,502	42,573
Tunisia	90,057	0	0
U.A.R. (Egypt)	105,112	78,115	95,284
Syria	50,478	20,666	30,961
United Kingdom	76,143	173,698	94,144
U.S.S.R.	2,112,245	973,423	1,936,798
Uruguay	0	20,467	10,599
Yugoslavia	54,002	10,700	42,797
Other Countries	33	0	0
TOTAL	5,130,940	3,520,505	4,176,051

New U.S. sugar factory[4].—The Drayton, North Dakota, sugar factory of the Northern Sugar Corporation, a subsidiary of American Crystal Sugar Co., is due to be completed and placed in operation this month, in time to process 1965 crop beets. Supervisory staff will be transferred from the Company's other plants, including the closed Grand Island, Nebraska, factory. The Drayton factory will have a rated slicing capacity of 5000 tons of beet per 24-hour day and was designed to take maximum advantage of the latest advances in instrumentation and sugar-making equipment.

* * *

Japanese refinery output cuts[5].—Formation of a "recession cartel" of 41 sugar refineries has been approved by the Japanese Government's Fair Trade Commission. The Commission announced that the cartel is designed to help the Japanese sugar refining industry out of the recession by restoring demand/supply equilibrium. Under the move, to be effective until 30th November, the refineries will cut their working month from the 23 days normally worked to 18, with a leeway of three days either side of the new figure. Meanwhile the Japan Sugar Refining Industry Association had already decided to cut the number of working days in July to 16. Refining of domestically-produced beet sugar and production of refined sugar for export are excluded from the cartel restrictions.

* * *

New sugar refinery in Mali[6].—Industrial development is progressing under Mali's Five-Year Development Plan (1961–66), supported by foreign grants and loans equivalent to $24 million in 1964 and probably a like amount in 1965. Sugar cane grown in Mali is being processed at a small plant, belonging to the Office du Niger, in Niono. The plant, which was established in April 1964 with technical and financial aid from Mainland China, has a capacity of 15 tons of cane a day. A refinery, to produce some 8000 tons of refined sugar a year, is under construction in Markala.

* * *

Polish sugar crop, 1964/65[7].—A total of 12,430,000 tons of beets were worked by the 77 sugar factories of Poland during the 1964/65 campaign, producing 1,653,900 tons of white sugar. The beet area was 443,000 ha, giving a yield of 28·3 tons/ha and a white sugar recovery of 13·32%. In the previous campaign, 10,440,000 tons of beets, from 372,000 ha (28·7 tons/ha), were processed to give 1,309,800 tons of white sugar, a recovery of 12·54%. Average campaign length in 1964/65 was 102 days.

* * *

Senegal sugar industry plans[8].—The authorities of the Republic of Senegal have recently published details of the development of a cane sugar industry on the Senegal river. Sugar production is scheduled to begin in 1969, when 15,000 tons of sugar are to be produced from 150,000 tons of cane, grown on an area of 1500 hectares. The cane area is to be increased to 4500 ha by 1975, from which 400,000 tons of cane are to be harvested, and sugar production is scheduled to reach 40,000 tons in 1975. Construction of a sugar factory is to begin in 1967 and the plant will be put into operation in December 1969, with an initial capacity of 1500 tons of cane per day.

* * *

Italian sugar factory for Pakistan.—A contract worth about £1,000,000 was signed recently in Milan between an Italian firm, Società Reggiane Officine Macchine Italiane S.p.A., and a milling company in Pakistan, Pasrur Sugar Mills Ltd. The former is to supply a cane sugar factory to Pakistan; it is understood that the contract provides for deferred payment terms.

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[1] C. Czarnikow Ltd., *Sugar Review*, 1965, (722), 131.
[2] *Commonwealth Producer*, 1965, (408), 115.
[3] *I.S.C. Stat. Bull.*, 1965, **24** (7), 34.
[4] *Willett & Gray*, 1965, **89**, 275.
[5] *Public Ledger*, 9th July 1965.
[6] *International Financial News Survey*, 18th June 1965.
[7] *Zeitsch. Zuckerind.*, 1965, **90**, 410.
[8] F. O. Licht, *International Sugar Rpt.*, 1965, **97**, (19), 17.

Beet sugar in Afghanistan[1].—The establishment of a beet sugar industry in the River Helmand valley is at present being considered by the Government. About 20,000 hectares would be planted to beet and a sugar factory would have to be established.

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Argentina cane area[2].—The cane area in Argentina for 1965 is estimated by the Ministry of Agriculture and Livestock at 256,000 hectares, an increase of 8·1% over the area in 1964. The province of Tucumán accounts for 73·6% of the area planted in Argentina.

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Franc-zone sugar production targets[3].—The French Government has fixed franc-zone refined sugar production objectives for the 1965/66 season as unchanged from a year ago. A decree published in the *Journal Officiel* gives the breakdown (in metric tons, white value) as follows: France 1,569,058, Martinique 93,131, Réunion 192,336, Guadeloupe 131,075. The French Minister of Agriculture explained that the return to production quotas (objectives) for the 1965/66 sugar season was necessitated by large carry-over stocks and extremely low world prices. It was also due to the foreseeable development of outlets for French sugar in the absence of a common E.E.C. sugar policy.

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French beet area[4].—The area planted to beet for 1965 is 392,736 hectares or 7·75% less than the 423,362 ha planted in 1964. Some 40% have been sown and singled late and rendered susceptible to drought.

* * *

Panama sugar production increase[5].—According to local press reports, sugar production increased by 10% in the current season as compared with 1964.

Stock Exchange Quotations

CLOSING MIDDLE

London Stocks (*at 17th August* 1965)	s d
Anglo-Ceylon (5s)	6/–
Antigua Sugar Factory (£1)	11/–
Booker Bros. (10s)	19/6
British Sugar Corp. Ltd. (£1)	19/10½
Caroni Ord. (2s)	2/5¼
Caroni 6% Cum. Pref. (£1)	15/9
Demerara Co. (Holdings) Ltd.	3/7½
Distillers Co. Ltd. (10s units)	24/7½
Gledhow Chaka's Kraal (R1)	16/–
Hulett & Sons (R1)	20/–
Jamaica Sugar Estates Ltd. (5s units)	3/8¼
Leach's Argentine (10s units)	16/–
Manbré & Garton Ltd. (10s)	28/9
Reynolds Bros. (R1)	16/–
St. Kitts (London) Ltd. (£1)	12/3
Sena Sugar Estates Ltd. (5s)	8/3
Tate & Lyle Ltd. (£1)	32/6
Trinidad Sugar (5s stock units)	2/9¾
West Indies Sugar Co. Ltd. (£1)	9/–

CLOSING MIDDLE

New York Stocks (*at 16th August* 1965)	$
American Crystal ($5)	19⅝
Amer. Sugar Ref. Co. ($12.50)	24⅜
Central Aguirre ($5)	28
Great Western Sugar Co.	40
North American Ind. ($10)	13⅞
South P.R. Sugar Co.	20⅝
United Fruit Co.	20¼

British West Indies sugar data[6]

(*long tons*)

	Production 1963	*Production* 1964	*Estimate* 1965
Antigua	26,269	21,074	13,500
Barbados*	190,697	161,499	195,974
British Guiana	317,137	258,378	335,000
Jamaica	484,147	474,366	506,000
St. Kitts	39,566	43,135	40,000
St. Lucia†	2,516	—	—
Trinidad	227,346	226,531	247,200
	1,287,678	1,184,983	1,337,674

	Local and Neighbouring Consumption 1963	1964	*Estimate* 1965	*Estimated available for export* 1965
Antigua	1,645	2,159	2,000	11,500
Barbados*	11,553	11,856	12,000	186,093
British Guiana	22,612	24,251	22,500	313,843‡
Jamaica	66,805	71,849	76,000	441,902‡
St. Kitts	4,398	4,029	4,400	35,600
St. Lucia†	2,206	—	—	—
Trinidad	37,826	40,258	43,800	203,400
	147,045	154,402	160,700	1,192,338

* Production and export figures include fancy molasses.
‡ Includes stock at end of 1964.
† Sugar production ceased in St. Lucia at end of 1963 crop and St. Lucia is now an importer.

South African sugar production estimate improvement[7]. Excellent and widespread rains towards the middle of June caused the formerly drought-stricken cane to green-up considerably and will no doubt benefit next year's crop, though unusually cold weather restricted the immediate growth of the cane. Nevertheless the improved conditions caused the estimate of sugar produced up to 13th July to be revised upwards by 12,150 tons to a total of 1,083,800 short tons and there are now hopes that the industry's first assessment of 1,100,000 short tons will be realised by the end of the season.

* * *

Mexican sugar mills[8].—Three new mills are under construction for the Fondo Nacional de Fomento Ejidal. They are the Hermenegildo Galeana mill at Chontalpa, Tabasco, of 1500 tons cane per day capacity, the Adolfo López Mateos mill at Tuxtepec, Oaxaca, (4000 tons) and Melchor Ocampo mill at Iberica, Michoacan (1500 tons). The mill in Tabasco replaces one announced previously for the state of Quintana Roo, and is being financed by a Dutch-German loan. The other two mills are being financed by a loan granted jointly by the French Government and French banking and industrial interests.

* * *

U.S.S.R. sugar production forecast[9].—Soviet sugar production in 1965/66 will exceed the outturn in the 1964/65 campaign by 2,300,000 metric tons, the Soviet Council of National Economy declared at a meeting held in Moscow on the 2nd August. According to official Soviet statistics last year's production was 8,200,000 tons, including 7,032,000 tons of beet sugar. A total of 299 sugar factories will operate in the new campaign, including 19 new plants, according to the Council.

[1] *Zeitsch. Zuckerind.*, 1965, **90**, 410.
[2] C. Czarnikow Ltd., *Sugar Review*, 1965, (723), 135.
[3] *Public Ledger*, 31st July 1965.
[4] *Sucr. Franc.*, 1965, **106**, 195.
[5] *Fortnightly Review* (Bank of London & S. America Ltd.), 1965, **30**, 718.
[6] *Willett & Gray*, 1965, **89**, 281.
[7] *Commonwealth Producer*, 1965, (408), 115.
[8] *Sugar y Azúcar*, 1965, **60**, (8), 41.
[9] *Public Ledger*, 14th August 1965.