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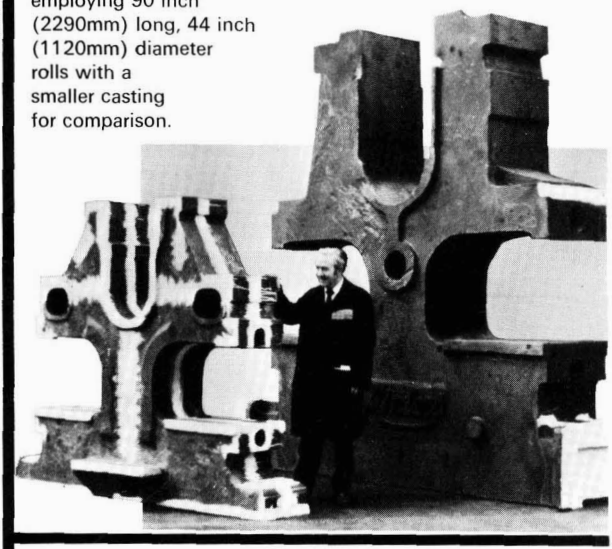

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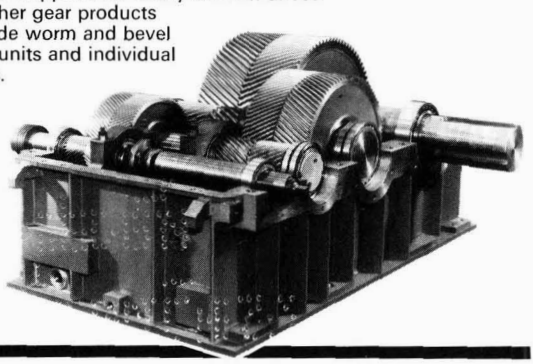

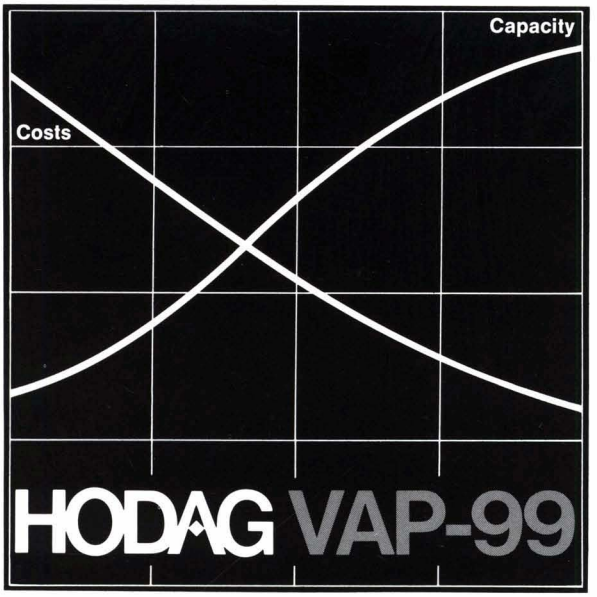

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FS

IN THE PHILIPPINES

Beyond the South China Sea lie the numerous islands which comprise the Philippine archipelago stretching some 1,150 miles in length with a land mass of over 116,000 square miles. In the agricultural economy of these islands sugar plays an important role and Fletcher and Stewart has long been actively engaged in supplying plant and equipment to the Philippine sugar industry.

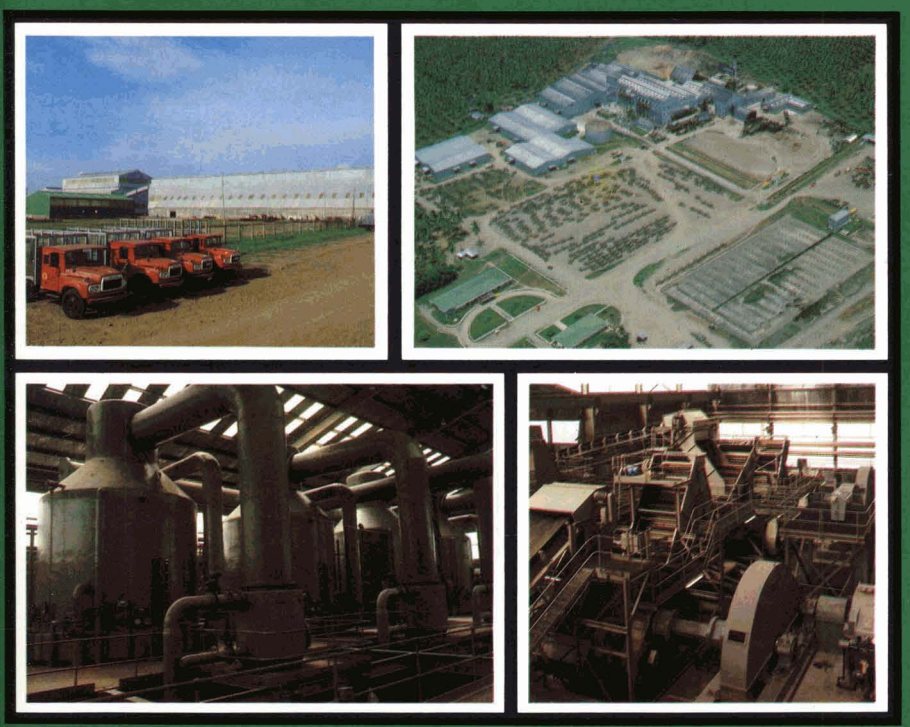
In 1972 FS completed a turnkey cane sugar factory located at Davao on the island of Mindanao. The factory which has a design capacity of 4,000 tonnes of cane per day also incorporates a refinery capable of processing 250 tons of refined sugar per day. In its short life Davao has withstood severe typhoons and earthquakes which have devastated

adjoining areas of the island, and despite the hazards has emerged with a first class record of operating efficiency.

Closely following the Davao factory FS was awarded a contract by the Bicolandia Sugar Development Corporation to build a 4,000 tonnes of cane per day raw sugar factory close to Naga City on the island of Luzon.

FS has recently completed a third turnkey project, the Northern Cotabato sugar factory sited on Mindanao island. Like the previous two factories Cotabato has a design capacity of 4,000 t.c.p.d. with provision for expansion to 5,500 t.c.p.d. at a later date.

This project, which is under the guidance of the Philippine Sugar Commission (Philsucom), is part of an extensive programme of rationalisation which is geared to increasing the efficiency of its existing plant and equipment in order to benefit both its home and export markets. Most recently FS has been awarded a contract to build a refinery at Batangas on the island of Luzon to produce 550 tons of high quality refined sugar per day. The Batangas refinery will play an important role in the strategy for improving the quality of sugar in the Philippines so as to promote the further development of local industries such as fruit canning and soft drinks without the need for importing the special grades required by these users.



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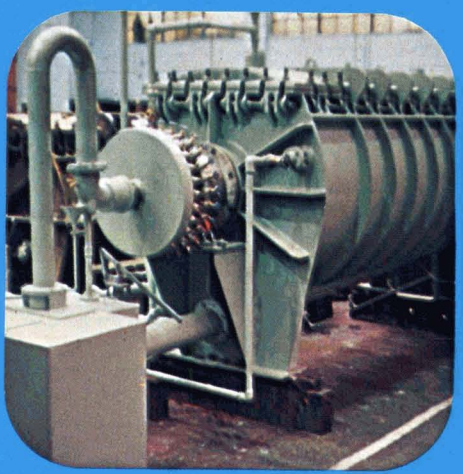

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ISJ 1

NOTES AND COMMENTS

World sugar prices

World prices for sugar have steadily improved over the month of August, the LDP rising from £94 to £107 and the LDP(W) from £101 to £115. Among factors responsible have been a number of indications of improvement likely next year in the statistical situation, healthy demand, especially for white sugar, and, towards the end of the month, anxiety about the damage caused to Caribbean and US crops by Hurricane David. Currency fluctuations causing variations in the dollar:pound sterling ratio have produced some effects but not sufficient to influence the general trend.

Results of European beet tests published in August have also contributed to optimism; with variations in individual countries they initially indicated a total sugar outturn of perhaps a million tonnes less than in 1978/79. Initial test results are, of course, poor criteria for judging a future campaign and, if good weather were to continue up to December, as in 1978, a very different picture would be presented. As further tests are made during the autumn, more data will provide a better basis for estimates of beet sugar production in Europe and their influence on sugar prices is to be awaited.

New London raw sugar contract

The London sugar futures market plans to introduce a new raw sugar contract later this year that will allow delivery from most ISA members. The need for a new contract arises from the declining exports by Tate & Lyle Ltd. who are therefore not able to guarantee acceptance of sugar tendered, and from EEC restrictions on sugar imports by the UK. The main difference proposed is that the contract will be on a f.o.b. basis with an adjustable element for freight and insurance, whereas the current contract is on a c.i.f. UK basis. The LDP Committee already publishes a standard Caribbean-UK freight plus insurance quotation, and would thus need to publish a table of such quotations each day for freight from other origins. If the draft rules of the new contract are passed by lawyers and members of the market, trading could begin in November for March 1980 delivery.

World sugar production estimates

F. O. Licht GmbH recently published their fourth estimate of world sugar production for the crop year May 1978/April 1979[1]. The total is now set at 92.7 million tonnes, raw value, 1% less than the 93.6 million tonnes of 1977/78 and slightly below the previous estimate[2] despite some substantial revisions for a number of countries. The estimates for West Europe are virtually the same as in the earlier estimate as final results had been available; minor revisions include 64,000 tonnes less for Spain and 7000 tonnes less for Turkey. In East Europe the estimates for Poland and Rumania were reduced (by 50,000 and 30,000 tonnes, respectively) while they were increased for East Germany (50,000 tonnes) and Czechoslovakia (35,000 tonnes). Final production figures for the USSR are not yet available and the estimate of 9.1 million tonnes may have to be amended later. Outside Europe the US beet sugar figure is set slightly higher than before but other countries are virtually unchanged.

Of cane sugar countries, the Cuban crop has been set at 7.75 million tonnes, an increase of 650,000 tonnes, whereas the Mexican figure is reduced by 380,000 tonnes and could turn out lower still. It is not known to what extent the Nicaraguan crop has been affected by the civil war in that country, nor the Jamaican crop by the recent floods. A drop of 10,000 tonnes in the Brazilian estimate is balanced by a rise in that for Colombia by 11,000 tonnes. Because of the inadequate returns, Venezuelan sugar producers are reducing output and the estimate is now set at 325,000 tonnes against 420,000 earlier. In Peru, drought in 1978 and late rainfall in 1979 have caused a disappointing performance and production is set at only 772,000 tonnes against 881,000 in 1978 and 926,000 tonnes in 1977. Guyana's spring crop has been poor and the 1978/79 estimate is set 50,000 tonnes lower than earlier, at 330,000 tonnes.

Only minor adjustments have been made to African crops, giving a net 1% reduction in the overall total. In Asia, however, there have been substantial changes, the Indian forecast being reduced from 6.9 to 6.4 million tonnes. In Pakistan also, pest and disease damage have caused a reduction in the estimate from 711,000 to 630,000 tonnes, against 907,000 tonnes in 1977/78. On the other hand, sugar production in the Philippines is set 110,000 tonnes higher and that of Thailand is raised by 145,000 tonnes.

Total cane sugar production is set at 56.4 million tonnes against 57.7 million in 1977/78, while world beet sugar production is set at 36.3 against 35.8 million tonnes. The upward trend in production is indicated to have come to a halt and Licht note, in regard to the future: "For 1979/80 a larger decline seems to be likely, above all in view of the fact that the Soviet crop is not progressing satisfactorily and the lower production estimates for Brazil, India and some other countries. The anticipated lower outturn can be attributed both to adverse weather and the export restrictions under the International Sugar Agreement."

World sugar production in the future[3]

A slowdown in the growth rate of world sugar production over the coming 12 years is forecast by economists at the World Bank, according to Reuter reports.

The average annual growth rate from 1960 to 1975 was 3.1% but in the years 1976 to 1990, this should fall to between 2.2% and 2.6%, with world output expected to reach 121-127 million tonnes by 1990. The slowdown will be due to diminished growth in developing countries, the economists said.

Under the influence of the International Sugar Agreement, world prices are expected to rise to 13.5 cents per lb by 1982, but without the ISA, it is thought that prices would rise to only 11.1 cents. Prices are expected to continue their upward trend after the ISA expires, to reach 17.3-18.0 cents per lb by 1985, the bank said, adding that, if a general commodity boom occurs, such as that in 1974, prices could reach 29.0-30.0 cents by 1984.

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[1] F. O. Licht, *International Sugar Rpt.*, 1979, **111**, 368.
[2] *I.S.J.*, 1979, **81**, 189.
[3] *Public Ledger*, July 28, 1979.

World sugar consumption is expected to rise by about 2.8% per year up to 1990. The increase is seen at 1.5% in developed countries, 4.1% in developing countries and 2.9% in centrally planned economies.

Production growth in developing countries will mainly be aimed at satisfying domestic usage and opportunities to export sugar are likely to decrease as both developed and centrally planned economies become more self-sufficient in sugar.

The ISA will decrease significantly the surplus of sugar overhanging the market, the World Bank said. It forecast that in 1990, the USSR will still be the world's largest producer, at 16-17 million tonnes, followed by Brazil, with 15-17 million, China at 8 million, India at 6-7 million, Cuba at 6 million, Australia at 4.8 million, the US at 4.8 million, S. Africa at 4.7-5.0 million, and France at 4.6-4.9 million.

World sugar balance

F. O. Licht GmbH recently published[1] their fourth assessment of the world sugar balance for the period September 1978/August 1979 as well as individual balances for individual countries. Licht drew attention to the fact that they have been able to include information from the Chinese State Statistical Bureau which corrects the previously over-estimated production and consumption figures included in earlier balances. The new figures for the past three crop years are:

	Production	Consumption
	tonnes, raw value	
1976/77	2,140,000	3,370,000
1977/78	2,520,000	3,880,000
1978/79	2,970,000	4,325,000

With adjustment of the previous years' balances the new world balance for 1978/79 represents a change in absolute figures but not of the overall statistical situation, with production still higher than consumption. The revised figures appear below:

	1978/79	1977/78	1976/77
	tonnes, raw value		
Initial stocks	30,050,000	24,856,000	20,585,000
Production	91,570,000	91,308,000	86,869,000
Imports	26,701,000	28,072,000	27,480,000
	148,321,000	144,236,000	134,934,000
Exports	27,093,000	28,255,000	28,290,000
Consumption	89,963,000	85,931,000	81,788,000
Final stocks	31,265,000	30,050,000	24,856,000

However, the increase of production over 1977/78 is set at only 262,000 tonnes, while consumption is more than 4 million tonnes higher. It is realistic to anticipate that in 1979/80 consumption will exceed production for the first time in five years, and that the resultant fall in excess stocks will strengthen sugar prices.

New York spot prices reintroduced

It was announced on August 17 that the New York Coffee & Sugar Exchange would resume publication of estimated spot prices of domestic and world raw sugar starting on August 20. The spot prices had been suspended after a writ had been issued by the Justice Department under anti-trust legislation[2]. The procedure to be employed in establishing the spot price follows the system described generally earlier[3] with expert opinions collected from five individuals selected at random from four rosters, the highest and lowest two eliminated and the remaining three averaged.

The ISO Daily Price was based on the London Daily Price and the former New York spot price until the latter was suspended. Subsequently it has been based on the LDP alone and it will have to be decided by the Council whether the new basis for the New York spot price is sufficiently valid for it to be used in computing the ISA price.

US sugar import fee

Following reintroduction of the New York spot price, the US Department of Agriculture announced that it would become the basis on which the import fee would be calculated in place of the LDP used previously. Up to the end of August the spot price had been lower than the corresponding ISA price based on the LDP but nevertheless, improved values had raised the level of the US delivered basis plus fee to more than 16 cents so that a reduction of 1 cent in the fee to 2.36 cents/lb was expected to be announced in early September.

US sugar legislation

Full discussion of the Ways & Means Committee Sugar Bill was due in the House of Representatives after Congress resumed in September but, in view of the heavy schedule of business, it was thought that the bill would not be taken up until October. At a press conference in August, the US Secretary of Agriculture said that the bill stood less than a 50% chance of being approved in its present form. However, he said that prospects were excellent for that part of the bill which provides for ratification of the ISA and for removal of the 50% *ad valorem* limitation in sugar import fees. Should the low priority of the bill mean that it is not discussed early in the new session, the International Sugar Council would be obliged to defer from October 1 to December 1 the starting date for payments into the fund for financing the special stocks held by exporting members of the Agreement.

Sales of forfeited US loan programme sugar

The US Department of Agriculture announced in August that it would seek public comment on its proposals to sell sugar from the stocks held by and forfeited to the Commodity Credit Corporation under the loan programme. About 200,000 short tons of 1977 crop sugar and 100,000 tons of 1978 crop sugar has been forfeited while, at the end of August, there was more than 1,500,000 tons on loan from cane and beet producers from the 1978 and 1979 crops.

Public comment is required since, under US law, sales by the CCC must not have an adverse effect on market prices or interfere with normal acquisition and inventories of sugar. The sugar sales programme is therefore designed to offer regular small amounts over a long period, with the intention of maintaining prices of at least 15 cents/lb, and the first tender was arranged for some time in September with between 20,000 and 40,000 tons made available.

Dominican Republic sugar factory study[4]. — The Government of the Dominican Republic has awarded a contract for a sugar factory feasibility study to Tate & Lyle.

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1 *International Sugar Rpt.*, 1979, **111**, 480-486.
2 *I.S.J.*, 1978, **80**, 1.
3 *ibid.*, 1979, **81**, 1.
4 *Bank of London & S. America Review*, 1979, **13**, 365.

Microbiological control in the milling station

By MARÍA T. HERNÁNDEZ NODARSE
(Central University of Las Villas, Cuba)

PART II

Table IV shows the difference (x—y) between crusher juice reduction time (x) and mixed juice reduction time (y) sampled at hourly intervals for each of the treatments studied. Average values of these differences are:

Without treatment. 0.86
Formalin every two hours. . −0.56
Formalin every four hours. . . 0.39
Heating juices at 70°C 0.04

Those treatments which effectively check the microbial contamination in the tandem result in values of this difference around O, with small positive and negative values; with an infected tandem, on the contrary, it is rare to encounter negative values.

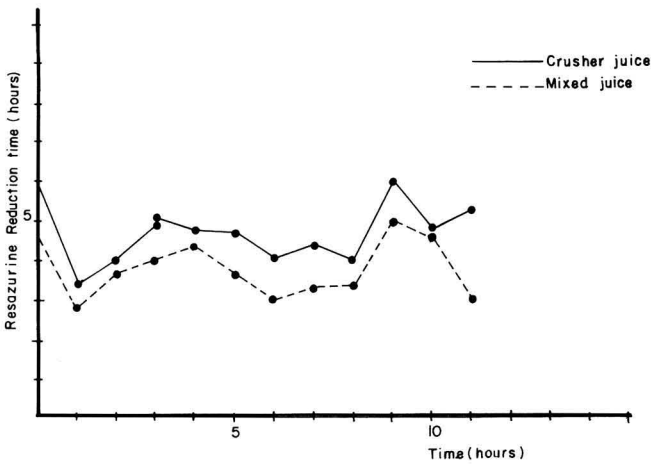


Fig. 9. Reduction time of crusher and mixed juice of an industrial tandem when no disinfectant was applied

Table IV. Parameters for the statistical comparison of the resazurine reduction time of crusher and mixed juice from a pilot plant

	Without treatment		Formalin every 2 hours		Formalin every 4 hours		Heating of maceration juices	
	CJ	MJ	CJ	MJ	CJ	MJ	CJ	MJ
Average	3.58	2.72	4.23	4.79	2.58	2.19	3.30	3.26
Dispersion	–	–	–	–	–	–	–	–
Number (n)	54	54	31	31	22	22	22	22
Hypotheses $\mu_c = \mu_m$	Hypotheses is accepted if $t \leq t_{\alpha,\nu}$							
t	3.23		1.25		2.29		0.13	
$t_{\alpha,\nu}$	$t_{0.01,106}$= 2.363		$t_{0.01,60}$= 2.390		$t_{0.01,42}$= 2.423		$t_{0.01,42}$= 2.423	
Results	$\mu_c > \mu_m$		$\mu_c = \mu_m$		$\mu_c = \mu_m$		$\mu_c = \mu_m$	

CJ: Crusher Juice MJ: Mixed juice

Response of the index in an industrial tandem

Fig. 9 corresponds to conditions in which no disinfectant treatment was applied. The behaviour shown in the graph is typical of a contaminated tandem, with higher values in the crusher juice. The response found is similar to that observed in the pilot plant under the same working conditions.

In Fig. 10 the behaviour of the index when an active disinfectant was added to the juice is shown. It may be observed that the resazurine reduction time for both juices oscillate around a common value, and the difference (x — y) oscillates around zero. This response also agrees with that found when disinfection agents were applied in the pilot plant (Figs. 6, 7 and 8) (Table V).

The graphical representation of the resazurine reduction time of both crusher and mixed juice, offers a reliable response, easy to utilize in the factory. These characteristics make the resazurine test suitable for the microbiological control of the milling station.

On this basis, this index was proposed as routine laboratory control. Central George Washington utilized this test throughout the 1976 campaign, with very good results.

CONCLUSIONS

(1) The resazurine reduction time of the crusher and mixed juice of a milling tandem shows a normal frequency distribution, regardless of the milling capacity of the tandem.

(2) The parameters which characterize the frequency distribution, its mean and dispersion, differ from one unit to another, depending upon the conditions of the raw material and the operational characteristics of the tandem.

(3) When the hygienic conditions of the milling station are inadequate, the resazurine reduction time of the crusher juice (x) is higher than that of the mixed juice (y).

(4) The application of a physical or chemical agent which checks the microbial development in the tandem results in values of (x — y) around 0. A confidence interval which limits the range of this difference may be calculated for each tandem and treatment.

(5) The microbiological control of the milling station may be established by plotting of graphs of (x — y) against time. The criteria which must be applied for the analysis of these graphs is contained in the conclusions 3 and 4 of this paper.

(6) The resazurine test, because of its relative simplicity and the objectivity and quickness of its response, may be incorporated into the normal operational control in the cane sugar factory.

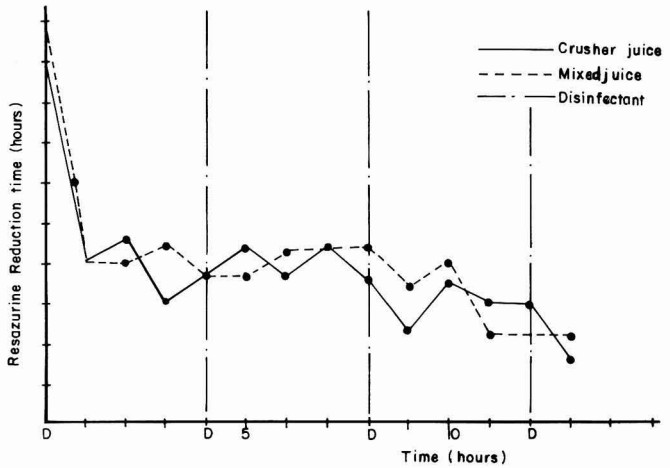


Fig. 10. Reduction time of crusher and mixed juice of an industrial tandem when disinfectant was applied

Table V. Values of (x–y) in a pilot plant

Without treatment		Formalin every 2 hours		Formalin every 4 hours		Heating of maceration juices	
1.13	0.50	-0.50	1.25	0.50	-1.00	-0.88	-0.67
1.62	1.50	-2.75	-0.12	1.50	2.38	-2.50	2.00
0.38	0.87	0.25	-1.50	-0.25	1.50	0.00	0.00
1.50	1.50	-0.37	-2.75	0.30	-0.50	1.50	-1.00
0.00	1.25	0.75	-0.13	-0.25	0.00	0.00	1.88
0.50	0.50	0.75	-4.25	-0.50	0.75	-1.25	1.00
1.00	1.00	-2.50	0.00	-0.12	0.00	0.00	0.38
1.00	1.50	-5.00	0.00	0.25	-0.13	0.00	0.75
1.00	1.00	1.25	-2.63	0.75	1.75	-0.75	0.75
4.87	2.13	0.00	-1.75	2.00	0.75	0.50	1.50
1.87	1.00	2.00	0.00	0.00	0.50	1.00	
2.13	0.87	-0.87	1.37				
0.50	0.00	0.75	0.00				
0.00	1.00	-1.00	2.13				
0.25	0.12						
1.00	0.25						
0.75	1.50						
0.58	0.75						
0.50	0.50						
-0.50	-0.13						
0.38	-0.75						
0.00	2.83						
0.12	0.00						
0.12	0.25						
1.00	1.12						
2.75	0.75						
1.75							

STATISTICAL APPENDIX

1. *Comparison of the means of two sets of data by means of the Student's distribution test.*

In order to test the hypothesis that $\mu_X = \mu_Y$ the statistic t is utilized. It is given by:

$$t = \frac{\bar{x} - \bar{y}}{\sqrt{\frac{1}{n_x} + \frac{1}{n_y}} \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2 + \sum_{i=1}^{n} (y_i - \bar{y})^2}{n_x + n_y - 2}}}$$

where:

x_i = individual values of the variable x

y_i = individual values of the variable y

$\bar{x}$ = mean or arithmetic average of x values

$\bar{x}$ = mean or arithmetic average of y values

n_x = number of individual observations of x

n_y = number of individual observations of y

The hypothesis $\mu x = \mu y$ is accepted if:

$$t \leqslant t_{\alpha;n_x + n_y - 2}$$

Values of $t_{\alpha;n_x + n_y - 2}$ are taken from the literature on statistics[6].

2. *Distribution of a set of data*

Fitting to a normal distribution and determination of the goodness of fit.
The expression "goodness of fit" is referred to the comparison between an observed sampling distribution and a theoretical frequency distribution. In our case, the comparison is established with a normal distribution[7].

If a sample composed of n observations with a mean $\bar{x}$ and a variance S^2 is assumed, the normal curve fitted to these data has the expression:

$$Y = \frac{n}{S\sqrt{2}} e^{-1/2 \left(\frac{x - \bar{x}}{S} \right)^2}$$

The area under the curve between two points may be calculated by means of the table A-4 on page 382 of Dixon & Massey's book[7]. Theoretical frequency (F_i) equals the area under the curve, while the observed frequency (f_i) equals the number of actual observations in the interval. The value of the comparison statistic χ^2 is:

$$\chi^2 = \sum_{i=1}^{n} \frac{(f_i - F_i)^2}{F_i}$$

If: $\chi^2 \leqslant \chi^2_{\alpha,\nu}$

the hypothesis about the normality of the curve which corresponds to the observed data is accepted.

[6] Bowker & Liberman: "Engineering Statistics" 6th. Ed. (Prentice Hall Inc., N.J.) 1964, p.568 (Table III).

[7] Dixon & Massey: "Introduction to statistical analysis" (Ed.Rev., Havana) 1960.

Summary

A study has been made of the microbial population distribution in crusher juice and mixed juice from two industrial units and a pilot plant by means of the resazurine test. The agreement between the distribution characteristics on both scales led to pilot plant trials to learn the response of the resazurine test under the diverse hygienic conditions of a milling tandem. It was concluded that, when microbial development takes place in the milling tandem, the resazurine reduction times of the crusher juice are greater than those of mixed juice; on the other hand, when a physical or chemical agent checks the microbial activity, both times oscillate about a common value. These results were corroborated at an industrial unit. A method for microbiological control in the milling station, based on the behaviour of this parameter, followed graphically, is proposed. The relative simplicity of the method has permitted its incorporation as a normal laboratory control in a raw sugar factory.

Le contrôle microbiologique de la station de broyage

On a étudié la distribution de la population microbienne dans les jus de broyage et les jus mélangés provenant de deux unités industrielles et d'une installation-pilote au moyen du test à la résazurine. La concordance entre les caractéristiques de distribution des jus provenant de ces 2 types d'installation a conduit à des essais en installation-pilote pour étudier la réponse du test à la résazurine dans diverses conditions hygiéniques d'un tandem de moulins. On en conclut que, quand le développement microbien a lieu dans le tandem de broyage, les temps de réduction de la résazurine par le jus de broyage sont plus grands que ceux du jus mélangé; d'autre part, quand un agent chimique ou physique contrôle l'activité microbienne, les deux temps oscillent autour d'une valeur commune. Ces résultats ont été corroborés dans une unité industrielle. On propose une méthode de contrôle microbiologique de la station de broyage, basée sur le comportement de ce paramètre, suivi graphiquement. La relative simplicité de cette méthode a permit son introduction comme méthode de contrôle normale dans le laboratoire d'une sucrerie de brut.

Mikrobiologische Kontrolle der Mühlenstation

Eine Studie wurde über die Verteilung von Mikroorganismen im Vorbrecher- und Mischsaft aus zwei industriellen Anlagen und einer Versuchsanlage mit Hilfe des Resazurin-Tests durchgeführt. Die Übereinstimmung zwischen den Verteilungscharakteristiken auf beiden Maßstaben führten zu Untersuchungen mit der Versuchsanlage, um die Reaktion des Resazurin-Tests unter den verschiedenen hygienischen Bedingungen eines Mühlentandems festzustellen. Wenn eine mikrobielle Entwicklung im Mühlentandem stattfindet, sind die Zeiten für die Resazurin-Reduktion im Vorbrecher-Saft größer als die beim Mischsaft, andererseits schwanken die Ergebnisse bei Hemmung der mikrobiellen Tätigkeit durch physikalische oder chemische Mittel um einen gemeinsamen Wert. Diese Ergebnisse wurden in einer industriellen Anlage bestätigt. Man schlägt nun eine Methode für die mikrobiologische Kontrolle der Mühlenstation vor, die auf diesem Parameter basiert und graphisch dargestellt wird. Die relative Einfachheit dieser Methode erlaubt ihre Eingliederung in die normale Laboratoriumskontrolle einer Rohzuckerfabrik.

Control microbiológico en la estación de molida

Se realiza un estudio de la distribución de la población microbiana de jugos de desmenuzadora y mezclado de dos unidades de producción y una planta piloto, mediante la prueba de la resazurina. La concordancia observada entre las características de las distribuciones en las dos escalas posibilitó realizar en escala de planta piloto los ensayos encaminados a estudiar la respuesta de la prueba de la resazurina frente a condiciones higiénicas diversas en el tandem. Se concluye que cuando en un tandem existe desarrollo de microorganismos, el tiempo de reducción de la resazurina del jugo de desmenuzadora presenta valores más altos que el del mezclado, y que cuando un agente físico o químico frena la actividad microbiana, ambos valores oscilan alrededor de un valor común. Estos resultados fueron confirmados en una unidad industrial. Se propone un método de control microbiológico basado en el comportamiento de este parámetro, seguido mediante gráficos, cuya relativa sencillez ha permitido la incorporación del mismo a los índices que normalmente se controlan en una fábrica de azúcar crudo.

Continuous filtration of massecuite

BY YVES THIREL

Paper presented to the 2nd Congress ARTAS, 1978

Introduction

This filtration process is new and unique. It is not based on any existing system for sugar; it is not an adaptation or a transformation but is a new system which replaces the system of centrifugation which has been installed in sugar factories since 1830.

Centrifugals are driven by motors of 50 to 200 hp requiring electrical and mechanical assemblies which are at the same time robust, precise, well-balanced, expensive, and operated and maintained by high-grade technicians, involving very high costs for their acquisition and operation. Further, many centrifugals for commercial sugar also work in discontinuous fashion, thereby producing frequent stops, loss of time, wear of material, surges in the electrical system and high energy consumption.

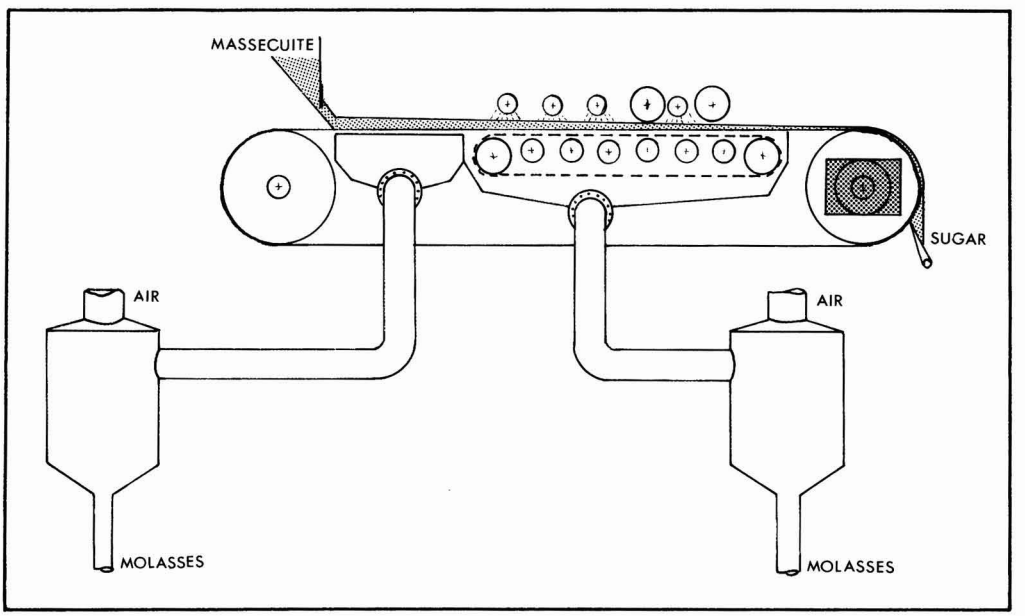
Sugar currently treated in centrifugals suffers crushing of grains, crystal wear, and is remelted; in the refinery it loses the brilliance which is indispensable for sugar loaves and sugar of the highest quality.

Continuous filtration under vacuum remedies the above defects while providing a process for obtaining continuously dry saleable sugar with a machine which is simple, slow, uses minimum power and produces 2-5

times more for a purchase and maintenance cost which is much lower than for centrifugals. The filter, because of its weight and the space it requires, can be installed at whatever level in the sugar factory.

Description of the equipment

The "Typhoon Filter" is constructed in the following manner: a filtering screen is mounted in a loop around two rotary rollers turning at low speed (1 - 2 rpm). The screen passes over a vessel in which is maintained a constant vacuum. Drive is by a variable-speed motor-reducer of 1 hp (1500 → 40 → 1 rpm) giving thereby a linear speed for the mat of 50 - 120 mm.sec^{-1}. The vessel is divided into two successive chambers with conical bottoms; the first is a small chamber 400 mm long which is held under high vacuum (60 - 65 cm Hg) while the second is longer — about 1 metre — which is under a lower vacuum (30 - 35 cm Hg).



The mother liquor is sucked into the first high-vacuum chamber while above the second, low-vacuum chamber, the sugar crystals are washed with water and dried with steam. The vacuum tightness of the vessel is ensured by a "Teflon" (polytetrafluoroethylene) sealing strip mounted on its edges, on which the screen slides continuously. Inside the larger chamber is a support screen mounted on free rollers which is intended to maintain the filter screen horizontal.

Feeding of massecuite to the filter is carried out using a small mixer located above, the flow being regulated by a gate valve. This permits deposition of the massecuite in a bed on the filter screen smoothly and in a thickness varying from 20 to 50 mm. This permits alteration of the throughput of the filter without touching the linear speed. By varying the massecuite thickness *and* the speed it is possible to reach a ten-fold range of production.

To produce sugar of excellent quality, above the screen are mounted freely-rotating rollers such that all their weight of 5 kg lies on the bed of dry sugar, closing up the cracks which form on the departure of the mother liquor. This permits better work and maintenance of the sub-atmospheric pressure within the large chamber. Perforated pipes with nozzles placed above permit washing with hot water and steam. The chambers are connected to separators of the cyclone type interposed between the chambers and the air pumps so that the air is sucked out at the top and the mother liquors go to the syrup pumps.

Operation

The continuous filtration process is characterized:

(a) by the fact that the massecuite is spread out on a filter screen which is displaced horizontally at a controlled speed.

(b) by maintenance under the screen of a vacuum to suck through the mother liquor which is collected, deaerated and returned to the next boiling.

(c) the displacement speed of the filter screen is between 5 and 12 cm.sec^{-1}.

(d) the crystals are very lightly washed and steam passed through them during their passage on the screen, and

(e) the vacuum maintained beneath the filter screen in the first chamber lies between 60 and 65 cm Hg, and in the second chamber between 30 and 35 cm Hg.

Test results

This idea came to me in a sugar factory where I was working. I first of all replaced the mud on a small area of an Oliver Campbell filter with a layer of massecuite and, as foreseen, the sugar stuck to it and became clean. From there on, I began a series of experiments with the ends of pipes of different lengths, the bottoms of which were closed with small pieces of centrifugal screen, on the evaporation vessels, with different vacua and different thicknesses of massecuite.

I obtained (1) the times for drawing off the mother liquors and the cleaning of the sugar grains, (2) the most efficient mean thickness, and (3) I drew up a table of all

these results. I then built a little continuous filter 700 mm long and began the first tests. I had a certain number of problems:

(1) I had to solder end-to-end the filtering screen from a centrifugal in order to make a loop.

(2) I was not able at first to obtain vacuum tightness in the vessel and made a large number of modifications, with joints of rubber, soft wood and other products.

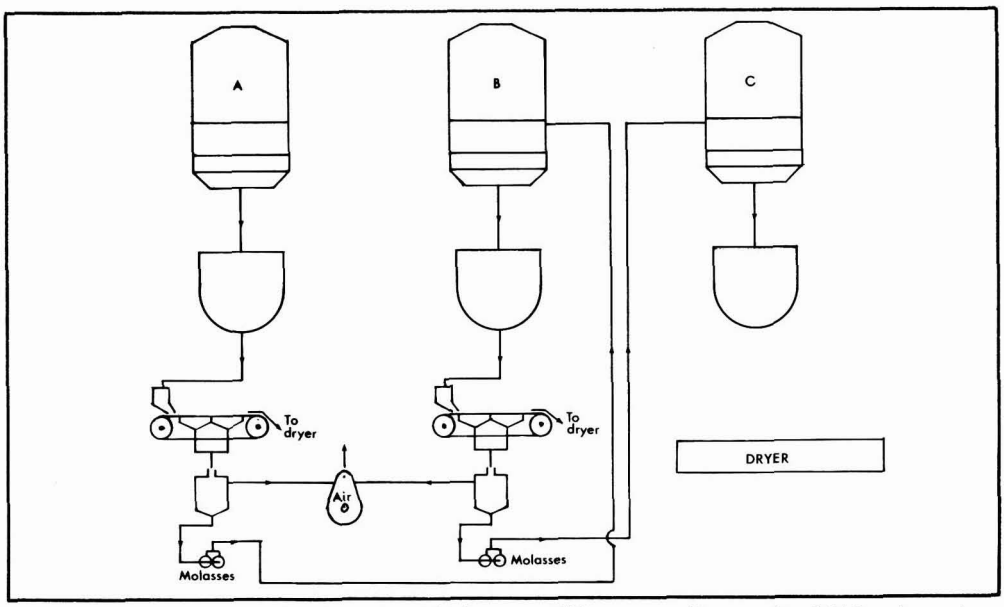
(3) the vacuum pipe, of which the cross-section was too small, had to be replaced and inclined so as to permit a better flow of mother liquor towards the syrup pump.

(4) it was necessary to lower the syrup separator to a level lower than the vessel under vacuum.

(5) not having sufficient free time during the day, I made the tests during the night and obtained raw sugar of poor quality, but I became convinced that it was possible to make the machine function and to obtain good results with it – but it was necessary to find a firm which would agree to put up capital to make a filter with good material.

(6) I then patented my machine.

(7) I had the luck to meet a Taiwanese firm which proposed to me that it should construct my machine and exploit my patent.



We worked at the study office for a fortnight in Taiwan, decided to build a model and to look for ways to eliminate the problems which I had met in the beginning. A filter was built and sent by air to the Honokaa sugar factory in Hawaii, for the first trials. Unfortunately, arriving on site too late (at the end of the season), it only operated for a day or two.

New trials were carried out in June 1978 and allowed us to obtain average results while throwing up some small mechanical problems. First of all, modifications were made to obtain better sugar: (A) Two chambers, the smaller one having to work under high vacuum, covered with a sheet of perforated "Teflon", (B) A large chamber having to work under low vacuum, with a support screen like the original. Good sugar was obtained thereby, but also another mechanical problem; the perforated screen would not stay on the driven roller;

After the trials of August 1978, two trapezoidal bands were fitted to the outside edges of the screen and four pulleys to the edges of the driven and support rollers. In the end was obtained a machine which operates very well and gives excellent results.

The trials and putting into operation at Honokaa sugar factory, Hawaii, were effected by M. Jean Bouvet, Engineer and Vice President, Sales Technology, of Wen Hsing Electronic Machinery Industry Corporation.

The model was designed to cover the requirements of a cane sugar factory of 3600 tcd capacity with one "Typhoon Filter" for *A*-massecuite and one for *B*-massecuite. The width of the vessel is 700 mm and it can be enlarged to 1 metre or 1400 mm thereby increasing filter capacity by 40% or even 100% without any other modification.

Results obtained in these last trials were:

With raw sugar *A*-massecuite of 87.5 purity at about 100 $hl.hr^{-1}$, sugar of 98.8 pol and 1.02% moisture, and mother liquor of 66.5 pol and 75.9° Brix.

With raw sugar *B*-massecuite of 74.8 purity at about 85 $hl.hr^{-1}$, sugar of 97.0 pol and 1.10% moisture, and mother liquor of 55.1 pol and 75° Brix.

Using a 1400 mm wide vessel it was possible to treat *A*-massecuite at a rate equivalent to 3500 hl per day and to separate massecuite of 88.5 purity into sugar of 99.0 pol and 0.30% moisture and mother liquor of 65.5 pol and 77.0° Brix.

The linear speed was 100 $mm.sec^{-1}$ and the thickness of the massecuite layer was about 40 mm for *A*-product and about 20 mm for *B*-product.

Conclusions and advantages

1. The "Typhoon Filter" is continuous.

2. It is an apparatus of small dimensions and high capacity, the latter variable over a 1:10 range.
3. Its operation is the simplest possible.
4. Power consumption is minimal.
5. The speed is very slow, variable and controllable at will.
6. It can be installed at any level.
7. Its cost is extremely low.
8. Spare parts are limited in number.
9. It can produce commercial dry sugar at whatever pol is required, 97 and higher.

Acknowledgements

I must thank those who have had confidence, authorized trials, worked and permitted the practical realization of this machine, the "Typhoon Filter", more especially:

Mr. T. Z. Sun, Vice-General Manager,

Mr. Jean Bouvet, Vice President, and

Mr. Daniel Lin, Factory Manager, of Wen Hsing Machinery Electronic Industry Corporation of Taiwan; the General Manager, the Factory Manager and technologists of the Honokaa sugar factory in Hawaii and M. Emile Hugot, Président-Directeur-Général, and M. François Langrenay, Technical Director, of Les Sucreries de Bourbon, Réunion.

Summary

A process and installation for continuous vacuum filtration is applied to the separation of sugar crystals from mother liquor coming from vacuum pans. The installation comprises a loop of filter screen around two rotary drums, means for maintaining a vacuum beneath the screen, means to drive and guide the screen and means to collect, deaerate and return the run-offs to other pans. The process and installation are applicable to the separation of sugar from massecuites from cane or beet; of raw, white or refined sugar; of first and second strike.

Filtration en continu de masse cuite

Procédé et installation pour la filtration en continu sous vide sont destinés à la séparation des cristaux de sucre de l'eau mère venant des appareils à cuire. L'installation comprend un tamis filtrant disposé en boucle autour de deux tambours rotatifs, des moyens pour maintenir une dépression atmosphérique sous le tamis, des moyens d'entraînement et de guidage du tamis et des moyens pour collecter, dégazer et refouler les égoûts vers les autres appareils à cuire. Le procédé et l'installation s'appliquent à l'extraction du sucre provenant des masses cuites de la canne ou de la betterave, en sucre roux, blanc ou raffiné, ler et 2ème jet.

Kontinuierliche Filtration von Füllmassen

Ein Verfahren und Apparat für die kontinuierliche Vakuum-filtration zur Trennung von Zuckerkristallen und Muttersirup aus Kochapparaten werden beschrieben. Der Apparat besteht aus einer Filtersieb-Schleife um zwei Drehtrommeln mit der Möglichkeit, unter dem Filtersieb ein Vakuum zu erzeugen und das Sieb anzutreiben und zu lenken, sowie den Ablauf zu sammeln, entgasen und anderen Kochapparaten zuzuführen. Dieses Verfahren und dieser Apparat können zur Abtrennung von Zucker aus Rohr- und Rübenzuckerfüllmassen, für Roh-, Weißzucker oder Raffinade sowie für 1. oder 2. Ablauf verwendet werden.

Filtración continua de masa cocida

Un proceso y instalación para filtración continua al vacío se aplica a la separación de cristales de azúcar de madre licor proveniente de tachos. La instalación consta de un tamiz filtrante en un gaza a la redonda de dos tambores rotativos, medios para mantener un vacío debajo del tamiz, medios para accionar y guiar el tamiz y medios para acumular, desaerear y devolver las mieles en otros tachos. El proceso y la instalación pueden aplicarse a la separación de azúcar de masas cocidas de la caña o la remolacha, para azúcar crudo, blanco o refinado; y de templas *A* y *B*.

Sugar cane burning in South Texas

By NORMAN ROZEFF

(Agriculturist, Rio Grande Valley Sugar Growers Inc.)

Introduction

The Lower Rio Grande Valley in South Texas encompasses an area of approximately 9300 square kilometres. In terms of world history it is a baby in that intense agriculture and population growth did not commence until the early 1900's. In comparison to mature cane sugar industries elsewhere, it is also a youngster, with recent commercial endeavours commencing only in 1972.

Because the cane sugar industry was new to the Valley it presented some interesting challenges for residents, environmentalists and regulatory agencies.

The early 1970's were years of acute public awareness and concern regarding the interaction of nearly any polluting source and the environment. The culmination of this concern was the establishment of the Environmental Protection Agency under the Executive Branch of the US Federal Government.

The tasks laid out for the agency were vast. One alternative to formulating its own complex regulations for the myriad of situations which were to arise was to allow each state to draw up acceptable programmes which best suited the factors unique to each state yet kept within federal guidelines.

Texas Air Quality Control Board

In Texas the State legislature passed the Texas Clean Air Act and established the Texas Air Quality Control Board to regulate the control of air pollution. The Board commenced its activities at the same time that the Rio Grande Valley Sugar Growers Inc., laid pencil to the drawing board for establishing a new cane sugar industry in the Valley.

When, under regulations issued by the Board, it became apparent that there was no practical alternative to pre-harvest burning of one year-old sugar cane fields, a variance in the form of a Board order was issued for the 1973 season. Prior to the issuance of this Board order, public hearings were held.

The map (Fig. 1) indicates the general location of

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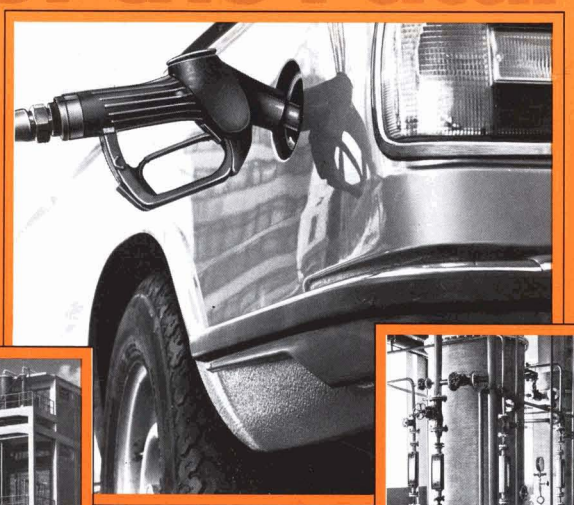

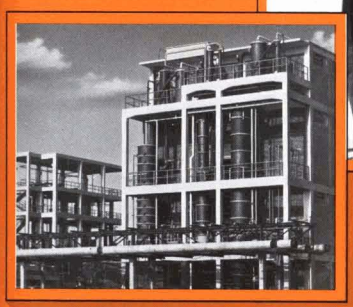

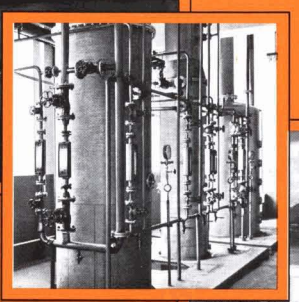

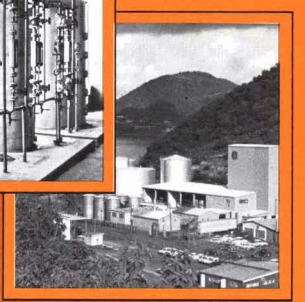

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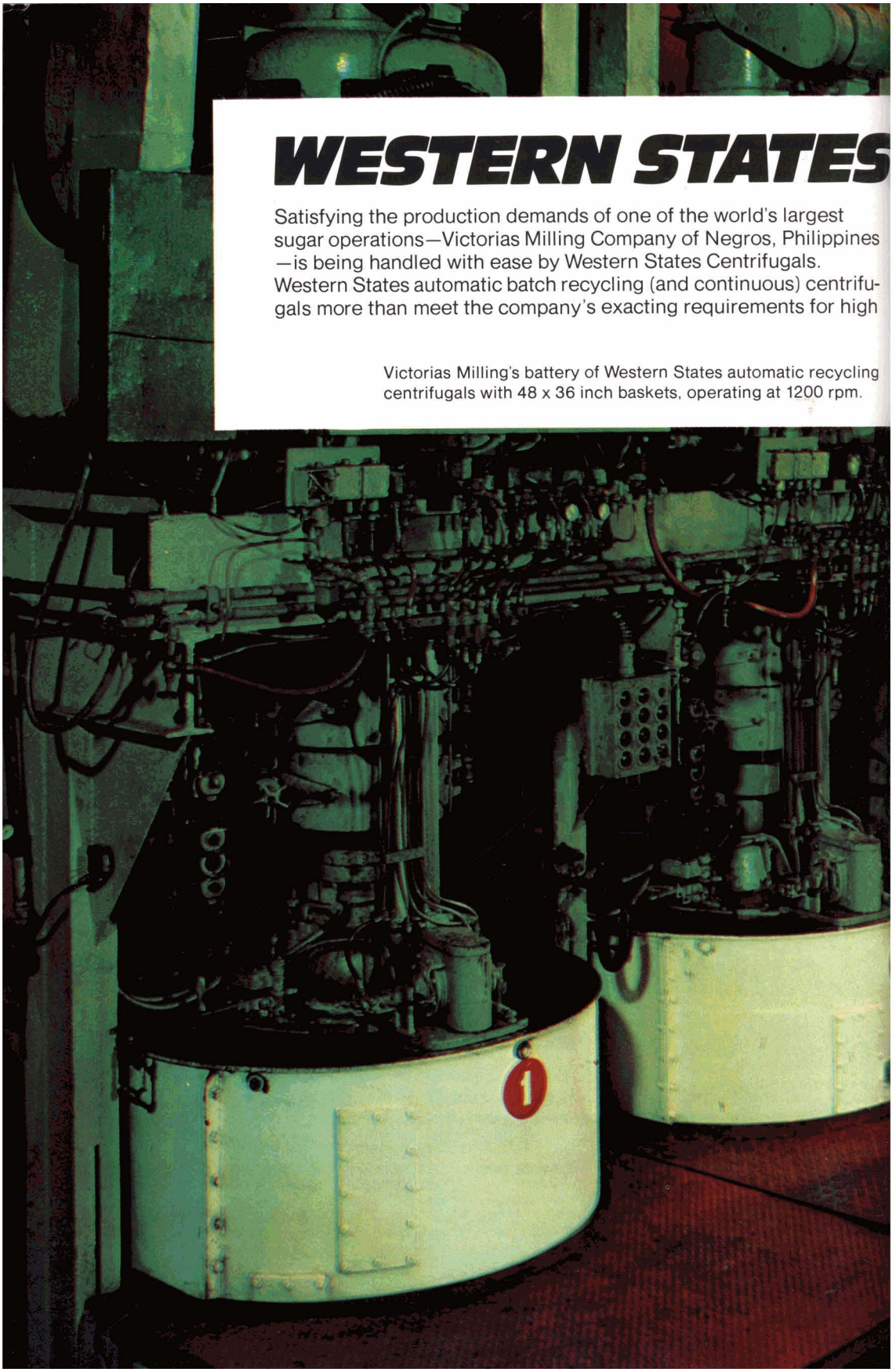

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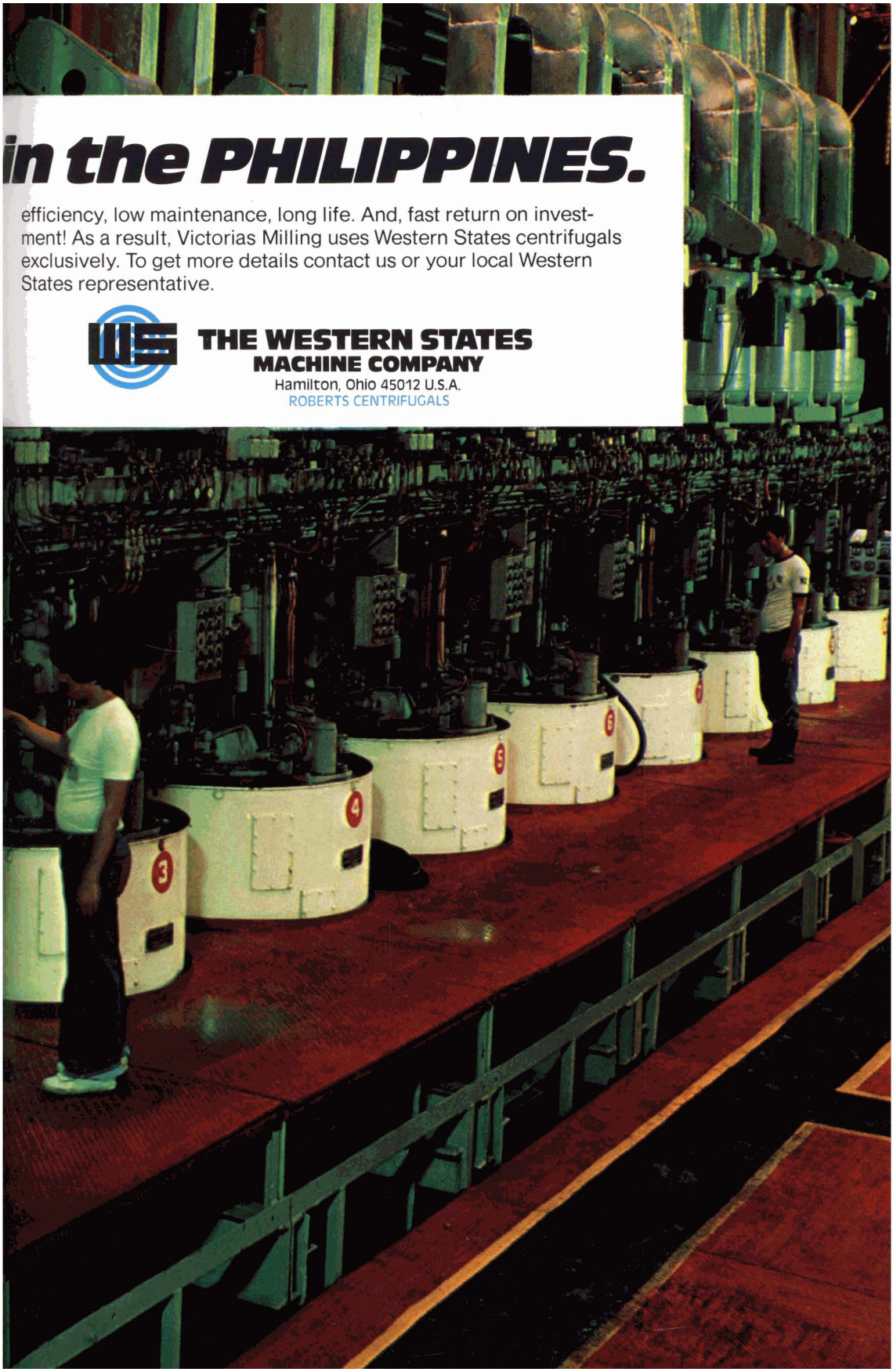
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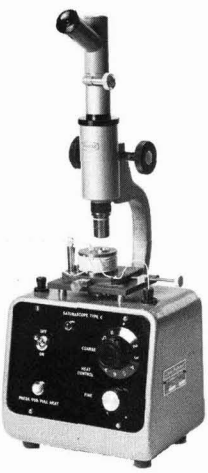

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sugar cane fields on 13,700 hectares and the areas of urban development. It is readily apparent that the situation in the Valley is unique in two respects. First is that the sugar cane growing areas are not contiguous as they are in most cane plantations but are widely dispersed among other crops, commercial and residential sites. The second is that urban areas are growing rapidly, coalescing and creating an urban belt along the Route 83 express highway which runs east to west along the middle of the valley. The valley population is nearly 500,000 individuals.

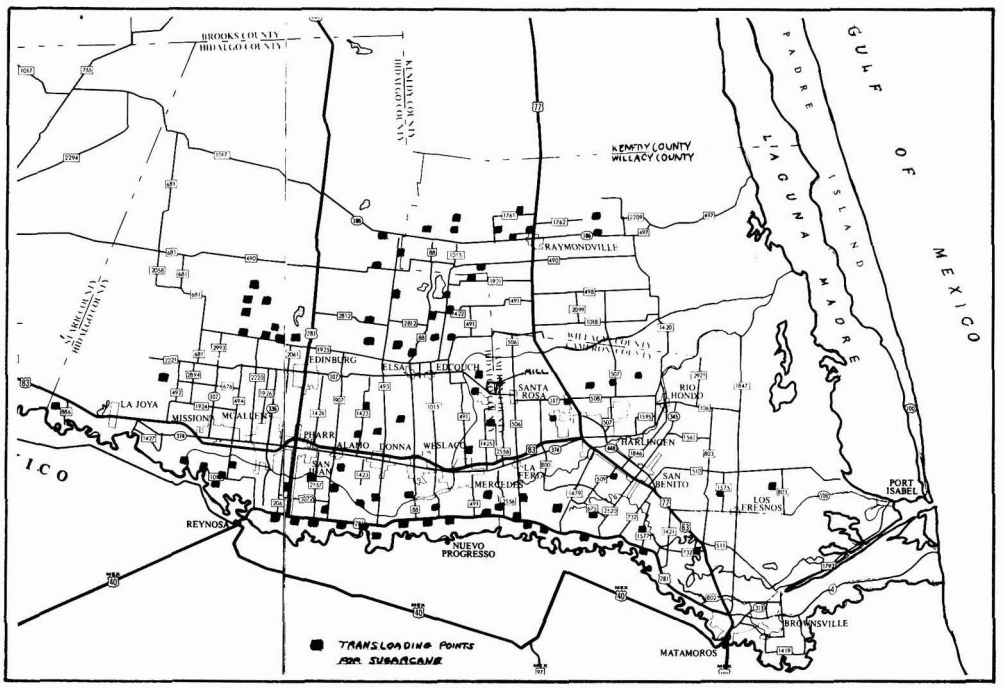

Fig. 1.

Outside of some minor petrochemical operations there are, at present, no heavy industrial polluters in the valley, i.e. those industries expelling 100 tons or more carbon monoxide, nitrogen oxides or hydrocarbon emissions in a year.

Opposition to sugar cane burning was minor at the hearings. In truth, neither the cane growers nor the general public was knowledgeable about cane burning under valley conditions. In fact, the chief source of opposition lay in objections made by farm worker unionists who mistakenly believed the employment of hand cutters rather than machines would obviate the need for burning.

The Board issued the variance in the form of a specific order because there was no practical alternative to outdoor "and ... such burning will not cause or contribute to a violation of any primary or secondary ambient air standard". In summary the Board made the following finding of fact:

(1) At this time, there is no technologically practicable or economically feasible alternative to outdoor burning in connection with harvesting of sugar cane. The only option available to the corporation is whether outdoor burning occurs prior to or after the harvesting, regardless of whether machine or hand labour is used as the method of harvesting.

(2) There is a necessity, both from the standpoint of protecting the ambient air standards and to minimize possible nuisance conditions affecting the residents in the area where the sugar cane crop is being harvested, to require restrictions on the burning of sugar cane.

(3) The quantity of emissions from a burned sugar cane field indicate that, during certain meteorological conditions, the uncontrolled burning of sugar cane could cause or contribute to a violation of the federal primary or secondary particulate ambient air standards.

(4) Residents of areas surrounding sugar cane fields will experience nuisance conditions during the uncontrolled burning of sugar cane.

(5) Visibility is reduced significantly by the great quantities of smoke emitted as a result of the outdoor burning of sugar cane.

(6) Technology is not presently available to harvest green cane by machine because of the serious mechanical and operational problems which result from crop density and the volume of foliage. Furthermore, even if a machine could harvest green cane, there is not available at this time a technologically practicable method of removing trash remaining in the fields after the harvesting is complete. Such removal is necessary in order for a new crop to grow on the land.

(7) Meteorological conditions at the time and place of the burning of sugar cane will have a direct bearing on the effect of the emissions on people and property located in the area of the burn. By restricting the time, place, and conditions when burning can occur, these potential harmful effects can be controlled and

minimized.

(8) Because of the quantity of emissions which are contributed to the atmosphere from burning sugar cane, the number of individuals residing near sugar cane fields and the variability in meteorological conditions, it is impossible to eliminate, even under controlled burning, all potential nuisance conditions from developing due to outdoor burning of sugar cane. Therefore, such outdoor burning should be phased out or eliminated as soon as alternative methods of harvesting are technologically practicable and economically feasible.

(9) ....the authority to engage in outdoor burning.... is restricted to the amount of cane which the sugar cane mill can at this time process."

The corporation was then granted authority to burn provided it complied with all other provisions of the order. These provisions constitute what may be some of the most stringent burning regulations for any cane growing area.

The order is conservatively developed from the best available technology and knowledge. It is drawn up to be defensible from the Board's point of view, not necessarily to ease corporative activites either financially or in the realm of operations.

The highlights of the order require the following:

(1) Thirty days prior to each harvesting season provision of a comprehensive map which divides the area planted to cane into four quadrants plus supplemental maps showing the following:

(a) each tract which is to be burned and its acreage;
(b) land use characteristics of property immediately adjacent to the burn sites; and
(c) all state roads, federal highways and airports within 8 kilometres of the perimeter of the tract to be burned.

(2) The corporation will conduct the actual burning in the following manner:

(a) Burning shall not commence until after 9:00 a.m. and all burned areas must be extinguished one hour before sunset;
(b) No more than 61 hectares in each of the four quadrants may be burned per day;
(c) A fire truck equipped with adequate fire-fighting equipment and quantities of water shall be stationed adjacent to each tract to be burned during burning and until the fire is totally extinguished;
(d) Flagmen shall be provided to assist traffic along any public road within 3.2 kilometres of a burning field in the event that visibility along such road is impaired due to smoke;
(e) The tract of land to be burned must be separated from all contiguous property by an adequate fire break; and
(f) The corporation burn crew shall initially begin burning a sugar cane tract by back firing and shall continue the back firing technique of burning until any potential danger to property adjoining the tract being burned has been eliminated.

(3) Within twenty-four hours prior to burning a field, the corporation shall personally notify all persons residing within one hundred metres of the perimeter of the tract to be burned of the approximate time and duration of the proposed burn. Such notice may be either verbal or written to an adult resident. Written notification shall be given in both the English and Spanish languages.

(4) There shall be no burning prior to harvesting on any day unless the following meteorological conditions are met at the tract to be burned.

(a) There is not an air stagnation advisory issued by the National Weather Bureau Service in effect for the area;
(b) Average surface wind speed is less than or equal to 37 kilometres per hour during the burn period;
(c) Average surface wind is greater than or equal to 9.26 kilometres per hour during the burn period and is expected to be greater than or equal to 9.26 kilometres/hour for a two-hour period after the burn period;
(d) Wind directions are such as not to carry smoke toward populated areas within 2.3 kilometres of the burn site;
(e) No significant atmosphere temperature inversion exists below 914 metres and the expected surface temperature minus the 914 metres temperature is greater than 6° Celsius during the two hours after the burn period; and
(f) Wind speed at 914 metres is greater than or equal to 14.8 kilometres/hour.

(5) The corporation shall obtain reliable weather data by means of a teletype system and maintain records of data for inspection for at least one year. In addition a weather forecast for the area shall be obtained daily from the National Weather Service.

(6) Using the above data the corporation will determine if conditions are right as set forth in paragraph 4.

(7) Weekly the corporation shall provide the regional office with the following information on fields burned the preceding week:

(a) field number, owner, and acreage,
(b) exact time and duration of burn,
(c) daily weather forecast for the area and teletype copy of weather at time each field was burned.

This report must be sufficient in detail to enable the staff to determine the exact rationale followed by the corporation in making its determination to burn.

(8) The Executive Director may make exceptions if he believes dispersion conditions have changed for the better from that originally forecast. Certain isolated fields may also be burned with winds above 37 kilometres/hour (but not in excess of 55 kilometres/hour) if express permission is granted.

(9) Trash left in fields may be burned only if absolutely necessary and then only with express written permission from the Executive Director.

(10) By no later than June 15 of each year, the corporation shall submit to the Board a written report with regard to its programme to stimulate the development of harvesting methods in the Rio Grande Valley which would eliminate the necessity for outdoor burning. The Board may then hold a public hearing to inquire into the report and the advisibility of permitting any further burning.

(11) If the Board concludes that continued burning of sugar cane in the Rio Grande Valley is either causing or contributing to a violation of any federal ambient air standard or is causing a nuisance to residents, it reserves the right to suspend or revoke the authority to engage in outdoor burning granted under the order.

The heart of these guidelines is that burning takes place only when conditions are met for adequate dispersion of smoke and ash in a non-injurious manner. Each burn front is conceived as an open ended box with

approximate dimensions 61 kilometres long, 34 kilometres wide and a minimum of 914 metres in height. Winds within this box must be adequate both on the surface and up to 914 metres elevation in order to disperse the pollutants. Too strong surface winds will not allow the smoke to rise high enough for adequate dispersal and also present jump fire and property damage possibilities. Most of the foregoing requirements are necessary, but several are arbitrary.

SUGAR CANE FORECAST

DATE 2/1/79

SURFACE WINDS ARE Becoming East South East 10-15 Knots

INVERSION is at the surface but will break by 10:00 AM

TEMPERATURE AT 3000 FEET IS 42° F AND IS BECOMING 45° F BY 1:00 PM

SURFACE TEMPERATURE IS BECOMING 10 DEGREES MORE BY 10:00 AM

WINDS AT 3000 FEET ARE East 20 Knots becoming ESE 15 Knots by 1:00 PM

BURNING OUTLOOK FOR TOMORROW IS Good

FIVE DAY FORECAST OUTLOOK

FRONTS: A weak cold front now in New Mexico will reach here late Friday. The major thrust of cold air is not expected to reach the valley.

HIGH PRESSURE: Off the Texas coast will move eastward therefore wind will shift to the southeast as it moves away.

LOW PRESSURE:

RAIN PROBABILITY: 20% today, 30% tonight & Friday AMT: < ¼ inch

SUNSHINE None today; 20-30% on Friday HIGH TEMP. TODAY Mid to upper 50's

	MORNING	AFTERNOON	NIGHT	TOMORROW
WIND:	NE 10-15	Light & Variable	ESE 5-10	SE 10-15

DRYING POTENTIAL: Low with afternoon humidities remaining above 70%

LONG RANGE: Saturday - Monday: Partly cloudy to cloudy thru the period; Getting cooler but no rain is expected following the frontal passage.

	MILL	WES	HARL	McALLEN	RAY	EDB	BRO
RAINFALL PREVIOUS MONTH	.78	.60	.85	.68	.68	.58	1.46
TOTAL RAINFALL MONTH TO DATE							
RAINFALL RECORDED TODAY							

Fig. 2.

Valley Weather

To understand how the order affects operations some information regarding Rio Grande Valley weather and harvesting procedures is needed. The Company is a cooperative venture owned by nearly 110 cane growers. The growers raise the sugar cane and the corporation schedules harvesting, burns, cuts, transports and mills it.

During the harvesting campaign which generally runs from October 15 until April 15, the predominant winds are maritime breezes from the south-east. These are periodically interrupted by northerly, mostly north-west, winds when Pacific and Arctic cold fronts or

northers pass through the area. These commence in September, peak in frequency in December and taper off sharply by mid-March. At their height they may blow about one-third of the time in a month.

The passage of these fronts may or may not be accompanied by rain showers. This depends upon the steepness of the front as it lifts warm, moisture-laden air above the cold air mass flowing toward the Gulf of Mexico.

Two other situations are also responsible for precipitation during the harvest period. In October and April thermal updrafts caused by heating of air by the ground surface produces cumulo-nimbus clouds and thunder showers. These may be isolated but very intense.

Secondly there is a moisture-laden jet stream flowing from the Pacific Ocean over Mexico toward the south-east United States. This stream moves north and south depending upon high pressure systems present in the Pacific. If it moves north it flows over the Valley and South Texas creating low-level cloudiness, lowering temperatures, producing drizzle and reducing evaporation rates.

Inversions, a situation in which a layer (or layers) of warm air rests over cold air at the surface, are nearly daily occurrences during the harvest period. Minimum daily low temperatures at night of between 10° and 21° Centigrade rapidly cool the area and lift the daytime heated air to create an inversion. Depending upon cloud cover and whether the surface winds are blowing warm maritime air into the area or cold frontal air is being pumped into the Valley, the daytime heating of surface air and the subsequent dispersion of the inversion may not occur until the afternoon, and sometimes it does not break at all.

An inversion holds the warm smoky air from a burn beneath it where it may disperse at a low elevation and without adequate mixing.

It is readily apparent that burning operations are highly dependent upon daily and hourly data provided by the National Weather Service, a division of the National Oceanic and Atmospheric Administration of the US Department of Commerce. There is a local office in Brownsvilole which collects, compiles, and interprets data inputs from their own observations, from valley airport sources at McAllen, Harlingen, and Brownsville and from other national and Mexican cities.

Information for inversion predictions are collected at 6.00 a.m. daily from released balloon-carried-radio transmissions above Brownsville. The instruments transmit temperature, humidity, wind velocity and direction data at ascending altitudes. The predictions are rarely subject to revision although actual valley conditions may change rapidly. The San Antonio National Weather Service office is the final authority for the region although it is located over 400 kilometres from the valley. While forecasts from Brownsville would be more appropriate the present set-up reflects organizational matters within the weather service.

A typical weather forecast from which guidance for burn scheduling is derived is shown in Fig. 2. The hourly weather information is provided by a teletype located in the company's main office. The teletype transmits an aviation circuit giving documentation for burning conditions. A sample of the teletype data is shown as Fig. 3.

Weather forecasts on a public service broadcasting channel or a recorded message on the telephone are updated by the Brownsville office at 5.30 and 11.30 a.m.; 5.30 and 11.30 p.m. The accuracy of these forecasts is an important matter. The mill must know about frontal situations, rain probabilities and wind shifts in order to adjust burning plans swiftly as needed. As worthwhile as the forecasts are, they are blanket forecasts for the whole valley and often do not reflect local divergencies.

The meteorologist employed by the Texas Air Quality Control Board works in the state capital, Austin, and he closely follows the state weather situation. He may take into account changing conditions and issue variances based upon the latest information and his interpretation of it. Unfortunately he is not available for consultation on Saturday, Sunday, vacations or during periods of sick leave. Because the mill operates and burns cane seven days a week, this may leave a gap at times when borderline situations exist, and his expertise is sorely needed.

Harvesting

The general theory of harvesting is as follows. Three harvest fronts move from one transloading pad to the next in an orderly progression which is intended to minimize excess equipment movement. The plan of progression is based on two major factors, truck transportation balance and variety maturity.

The starting location and pad progression direction of each front is made to minimize the number of trucks needed to haul cane to the mill. This is accomplished by keeping one front close to the mill, the second front at a middle distance and the third with a long haul.

Varieties in Texas fall into one of three groups, maturing either early, mid-season or late. Not only is sugar content influenced by the date of harvest for each variety, but certain varieties are more susceptible to freeze damage and must be harvested before occurrence of frosts is probable, i.e. as early as mid-December and always by the end of January.

Three passes of the harvest fronts through each transloading pad are planned for each pad having varieties of all three maturity groups. Nearly 1000 fields are involved.

Because certain fields are located on the south sides of cities and towns, nearby houses, gas and oil wells, and other potentially dangerous or complaint-creating situations, they must be scheduled with northerly winds only. They are put into a second pass status even if they are late-maturing simply because the frequency of north winds is greatest at mid-season. A System 3 Model 12 I.B.M. computer is used to assist in the scheduling process.

Burning

The actual burns are conducted by zone harvesting supervisors. At the disposal of each is a four-wheel-drive 3785-litre military truck tanker and pumper which serves for fire fighting. An alternative is a removable 3785-litre tank and pump secured to a platform mounted upon a tractor-pulled chassis.

The supervisors are in radio contact with the agricultural clerk located in the Central Office. He monitors the teletype for compliance factors and relays current conditions.

The ignition of the fields is made from a regular cane haulage tractor unit which has been fitted with a flame-throwing torch fed with diesel fuel from the tractor's fuel tank by two small pumps. In seasons past, pickup trucks with diesel storage tanks, small pumps, oversized battery and rear mounted torches have been utilized.

In areas where preparation of the field periphery is lacking, ignition is conducted manually by a labourer carrying a pressurized butane dispersing burner. The

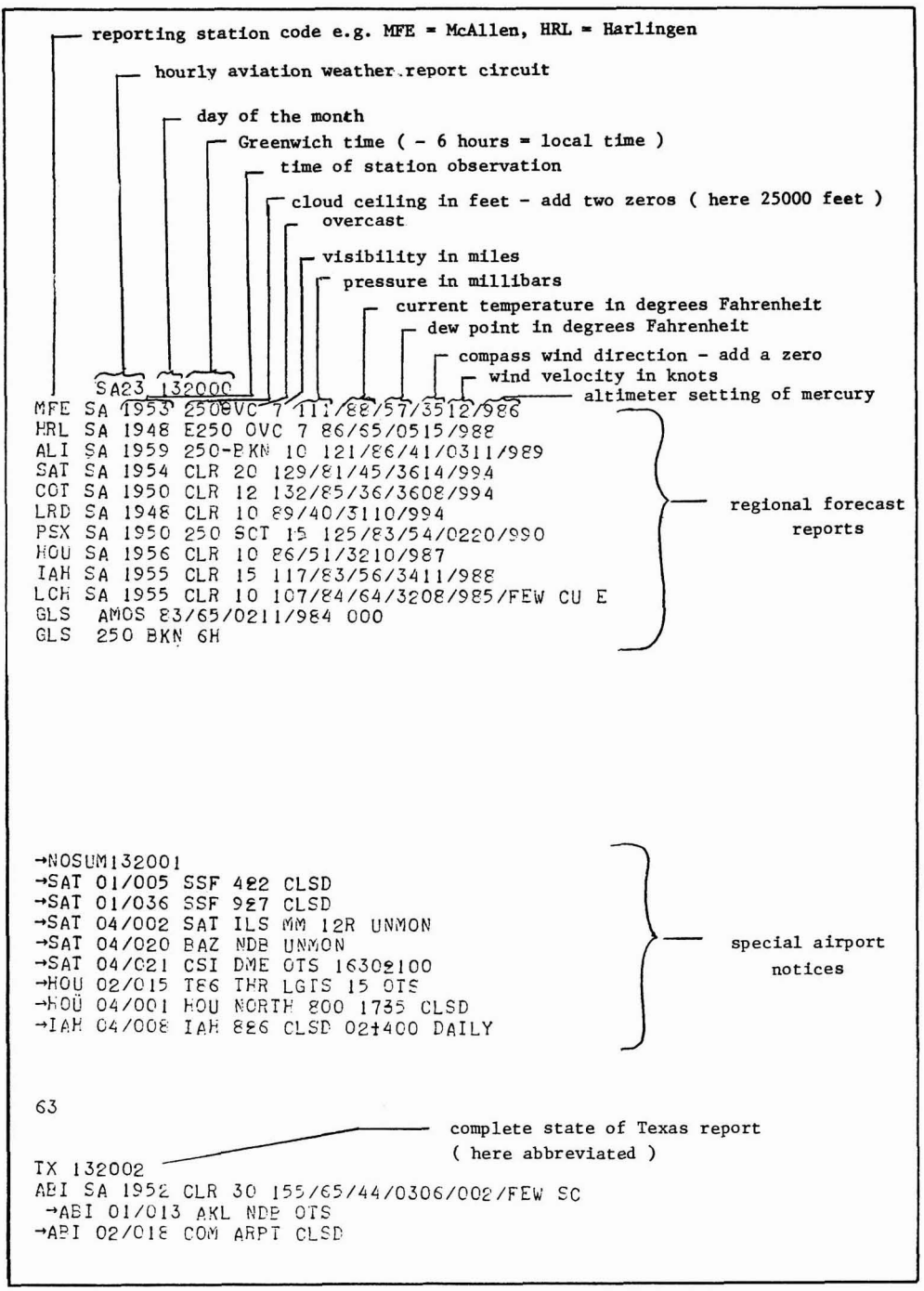

Fig. 3. An example of the weather teletype

benefits of machine-mounted burners are chiefly speed of travel and safety. Many fields are broken into terraces which require several miles of circumnavigation. When time limitations exist, swift burning is an important consideration.

After the backburning has reached the point where there is no longer any danger to downwind property or of jump fires the equipment may move quickly around the remainder of the block, the object being to create a strong thermal updraft or fire storm in order to obtain a thorough burn and to lift the particulates high into the atmosphere where dispersion conditions lead to less undesirable results.

At the beginning of the season the cane may be very green. In addition, certain varieties with adhering leaf-sheaths often have less ground trash in which the fire can carry. To rectify this situation a chemical desiccant, "Paraquat" ("Gramoxone"), may be applied aerially at 1.2 litres per hectare seven to ten days prior to burning. While the desiccant may reduce the trash percentage at the mill by 3 to 4 percentage points it has the disadvantage of locking one into a fixed schedule and bringing the possibility of cane deterioration if rains prevent harvest within a month after application. The danger of drifting chemical onto adjacent vegetation also exists. In Texas, therefore, the selection of self-trashing varieties has become a consideration in the variety testing programme.

While the combination of cane ripener plus desiccant does even better than each alone in reducing trash levels the Cooperative finds that cane ripener alone may provide satisfactory results which obviate the need for the desiccant. One or more freeze periods are expected in the valley each season. They may occur as early as December but more often in January and February. A freeze of moderate duration kills the cane tops which subsequently dehydrate. Burning no longer becomes difficult to accomplish; it does in fact become hazardous to accomplish. Accidental burns, jump fires and damage to adjacent property escalate in freeze-damaged fields. Utmost care and discretion in burning become the order of the day.

The manning of the burn crew consists of: one man to operate the burner, one fire engine driver, one fire engine crewman and two flagmen if smoke is going to blow across a highway. Additional crewmen may be added as the situation dictates. These personnel are drawn from the regular harvesting crew at the front. Depending upon block size, the number of irrigation terraces, water supply ditchbreaks, distance between fields, backburning requirements, etc., the burning operations may require from a minimum of two hours up to six hours per day per front.

Dangers

Because of the intense land use for agriculture in the valley, burning hazards exist in part owing to the poor site selection for cane plantings. Every effort is being made to phase out difficult-to-burn fields. The most common dangers lie in houses within or in close proximity to field edges, freeze-desiccated vegetation along canal banks, drainage ditches and pastures, wooden boundary fence posts, electrical and telephone transmission lines and creosote-coated poles in and alongside fields, adjacent crops such as citrus, cabbage, cotton, tomatoes, lettuce, grain sorghum, onions, corn, peppers and beans which may be subject to scorching, gas and oil wells situated in and near fields, standpipes and plastic water lines, electric drainage pumps, packing sheds downwind of fields to be burned and waste and wildlife refuge areas subject to accidental ignition.

More often than not property subject to damage does not belong to the grower. The corporations carries liability insurance for direct damage. In rare instances where soot may fall into a swimming pool, onto newly painted surfaces, or onto a crop such as lettuce just ready to harvest the insurance does not cover claims. Such claims are handled directly by the firm's Personnel and Public Relations Department.

The Rio Grande Valley is home in the winter season to many transplanted northerners. The term used for them is "Winter Texans". They are drawn to the cane fires out of curiosity and as a visual experience unknown to them. Frequently they interfere with the burn crews who must caution them to stand clear and keep fire lanes free from traffic.

Burn order limitations

While the burn order deals effectively with minimizing pollution and nuisance factors, it does not have the flexibility to deal with rapidly changing harvesting conditions. When it is not legal to burn in one or more fronts for a period of several days the Cooperative may run out of burned cane to harvest. This has occurred when, owing to overcast conditions, inversions do not break, when the 6°C temperature differential between surface and 914 metres elevation does not occur, when winds above 37 kilometres/hour prevail all day, and when combinations of rain and any of the preceding factors combine over a period of time.

During the 1978-79 harvesting period of 149 days there were 40 days or 26.8% of the time when burn order conditions were not met. The breakdown was:

(1) inversion not breaking – 18 days
(2) 6° differential not obtained – 18 days
(3) wind speed at 914 metres below 14.8 kilometres/hour – 2 days
(4) surface winds above 37 kilometres/hour – 2 days

Wet field conditions and inability to burn in a particular area may necessitate relocating two harvesting fronts, and occasionally even three, within one burn quadrant. At such time it is nearly impossible to burn enough acreage to sustain all fronts. A combination of light field tonnage and high crushing rate (up to 5000 tonnes/day) may also lead to burn acreage requirements above that allowable.

There are times when two harvesting fronts operating no more than one kilometre from one another but located on either side of a burn zone quadrant boundary may be burning fields. On other occasions it would not be legal to burn fields as widely separated as 60 kilometres but lying within the same burn quadrant if their total exceeded 61 hectares. The order concerning this situation appears spurious. A rule stipulating minimum distances between burns of certain acreages would also be unworkable.

No leeway is given for distinction between immediate dangers of property damage and the more remote prospects of particulate fallout. Certain fields presenting chances for property damage would best be burned at night when the wind is negligible or at daylight or sunset when it is greatly diminished. The order at present does not allow for this option.

What is needed is an amendment to the order which would allow exceptions for operating condition changes influenced by inclement weather and for property dangers inherent in certain fields.

In one thirty-day period of the 1978-79 campaign it was not legal for the Cooperative to burn on 17 days. Had not "accidental burns" or "burns of unknown origin" occurred in remote areas the mill would have been shut down for lack of cane.

Prior to the freeze the Cooperative was able to harvest some fields in a green state. A total of 941 hectares or 7.2% of the cane area was harvested green. The price paid for green cane harvesting is increased production cost (approximately 9.3% for reduced harvester, infield transport, trucking and milling efficiences), greater sugar recovery losses (7.4%) and 2.77 times the vegetative matter (by weight) normally left behind in the field.

There have been times when the Cooperative is locked into the sugar cane forecast but knows that local conditions have changed enough to generate a reassessment. A small plane is then dispatched from the Harlingen Airport to obtain a new 914 metre temperature which is then reported to the Brownsville Weather Bureau Office as an aerial observation and put onto the teletype for documentation purposes.

Enforcement

Since 1974 the Cooperative has privately monitored particulates with a permanent ambient air network having stations in four valley locations. The purpose of the network is to measure the concentration of total suspended particulate matter in the area where sugar cane growing, harvesting and milling is conducted seasonally.

Samples from a 24-hour period are collected once every six days. The network geometric mean for all sites has averaged near 53 $g.m^{-3}$ which is well below the 75 $g.m^{-3}$ annual standard for particulates set by the U.S. Environmental Protection Agency. There is enough confidence in these results that the network will be discontinued after the 1978-79 season.

Officials of the Texas Air Quality Control Board office in Harlingen make periodical scheduled and unscheduled inspections of Cooperative operations. Several citations have been issued for minor infractions such as failure to post flagmen along roads. Otherwise no problems have arisen.

This is not to say that the Harlingen office has not received complaints concerning falling soot but that, when this has occurred, burning had been conducted within the parameters of the Board order.

In attempting to comply with the Board's provision concerning finding alternatives to cane burning the Cooperative has conducted annual tests with cane harvesters of nearly all major manufacturers. These tests have also helped the Cooperative to evaluate harvester performance and form a basis for harvester purchases.

At this time no economically feasible harvesting alternative has been found. Harvesters have been found which will cut green cane but not with profitable performance.

Grants have been made by the Cooperative to the Texas Agriculture and Mechanical University to help develop mechanical alternatives. Success has not been met.

The Future

The future presents problems mainly in regard to increased urbanization of towns downwind of cane fields and homebuilding in close proximity to fields.

In presenting planting guidelines to the growers, emphasis is placed on locating fields where they will not create nuisances nor offer dangers to adjacent property. The concentration of fields close to the mill where there is minor population growth at present is desired both for burning as well as for a transportation cost reduction.

Planting recommendations also emphasize large (20 hectares or more) unbroken blocks of the same variety, 10 metres wide turnrows, no cane planted under or around transmission lines; 7 metres clearance around infield objects such as standpipes and valves, 300 metres distance from rural homes, and contiguous cane fields not interspersed with other crops.

Because the ambient air in the Rio Grande Valley is of such high quality more and more petrochemical businesses are being attracted here. Conceivably this could lead to a future tightening of allowable gross levels and limit the expansion of cane sugar industry growth. Any expansion of the current plant and acreage would require a review by the Board and a public hearing.

Conclusion

The physical conditions for burning cane in South Texas are difficult ones. The stringent regulations for open field burning are burdensome, yet the Coop. is able to operate efficiently through the combined factors of alert supervision and detailed planning. Success has been achieved, but it does not come cheaply. The cost for burning activities is US$0.05 per tonne of cane exclusive of cane ripeners or desiccants, insurance and liability payments.

Summary

An account is given of the legal requirements governing the pre-harvest burning of sugar cane in the Rio Grande Valley of Texas, and the measures taken by the Growers' Cooperative in achieving optimum harvesting sequence while complying with the regulations.

Le brûlage de la canne à sucre dans le sud du Texas

On présente un rapport concernant les exigences légales en matière de brûlage avant récolte de la canne à sucre dans la vallée du Rio Grande (Texas) et les mesures prises par la Coopérative des Planteurs pour réaliser un planning optimum de la récolte tout en respectant la législation.

Das Brennen von Zuckerrohr in Süd-Texas

Es wird eine Übersicht über die gesetzlichen Bestimmungen für das Brennen von Zuckerrohr vor der Ernte im Rio Grande Valley, Texas, gegeben und die Maßnahmen berichtet, die von der Farmer-Genossenschaft getroffen worden sind, um ein optimales Erntereihenfolge zu erzielen bei gleichzeitiger Einhaltung der Vorschriften.

Quema de caña de azúcar en Sud-Texas

Se presenta un informe sobre los requerimientos legales que gobiernan la quema de caña de azúcar antes de la cosecha en el Valle del Río Grande en Texas, y las medidas tomado por la Cooperativa Cañera para acabar la óptima secuencia de cosecha mientras accediendo a las regulaciones.

SUGAR CANE AGRONOMY

Drip irrigation — an assessment. L. S. Chapman. *Producers' Rev.*, 1978, **68**, (5), 35-40. — A survey is presented of drip irrigation trials conducted since 1973 at various sites in Queensland. While the cane and sugar yield data from drip-irrigated crops have been well above district averages, it is suggested that much of the improvement may have been due to good farm management, while there is no conclusive evidence of superiority of drip irrigation over other forms of irrigation, although high yields can be obtained with drip irrigation. While the cost of automation of drip irrigation systems is only a small proportion of the total costs, and automatic control with hydraulically and electrically operated valves controlled by timers has proved successful, the price of installing drip irrigation systems is greater than for other forms of irrigation, although the running costs would be lower as a result of reduced pumping costs and reduced labour cost; however, acceptance of drip irrigation would depend on its ability to increase production rather than reduce costs. The areas which would benefit most are those difficult to irrigate by travelling irrigation. Aspects of drip irrigation also discussed include form of layout; lateral type, durability and placement; water treatment with chlorine to prevent plugging of orifices by algae; lateral damage by rats and ants; orifice orientation to prevent plugging (even when high-quality water is used) and flushing of laterals; use of the system to apply fertilizers and insecticides; and irrigation scheduling and water economy.

Diagnosis and correction of potassium deficiency in sugar cane. R. P. Humbert, *Sugarland* (Philippines), 1978, **15**, (1), 30-32, 45. — After discussing the role of potassium in cane growth and translocation of sugars, the author examines the effects of K deficiency (loss of turgor pressure which closes the stomata, reducing the transpiration rate and CO_2 assimilation and thus impairing growth, as well as reduction in the ability of cane to utilize water, sunlight and applied N fertilizer) and briefly describes its symptoms. The value of soil and cane analyses in diagnosing K deficiency is mentioned, and recommendations are given on the relative quantities of K to apply (in most cane-growing countries it should be equal to or greater than the quantities of N and P applied). Tables are presented which demonstrate the effect of N and K on cane and sugar yield.

Creative botany — opportunities for the future. A. J. Vlitos. *Paper presented at Ann. Meeting, British Assoc. for Advancement of Science*, 1978, 9 pp. — The question of the amount of energy used to produce a crop and the quantity of energy recoverable from the crop is discussed generally, and the importance of cassava and sugar cane as efficient means of collecting solar energy and converting it to chemical energy via photosynthesis stressed. However, while sucrose offers itself as a viable alternative to certain petrochemicals as industrial feedstock based either on alcohol fermentation or on reaction with animal fats or vegetable oils, there is substantial room for improvement as regards cane and beet yields if more sugar is to be used in the chemical and fermentation industries. More research will be needed on plant breeding and specific treatments to increase CO_2 fixation and/or prevent the utilization and breakdown of the carbohydrate in the plant after it has been formed. While cane ripeners can prevent metabolization of stored sucrose, at present there is little incentive to use them if the cost of treatment exceeds the value of the sugar recovered. Reference is made to the production of alcohol from cane in Brazil, and to the potentials of algae as substrates for fermentation.

Sugar cane plantations in Cuba. H. Gruszecka. *Gaz. Cukr.*, 1978, **86**, 111-113 *(Polish)*. — Cane agriculture in Cuba is briefly described, incuding planting systems and fertilization.

Seasonal variations, age at harvest and quality of sugar. K. C. Rao. *Indian Sugar Crops J.*, 1977, **4**, 59-63. — A survey is presented of planting times, varieties and harvest times in the different cane-growing states of India, references being made to various trials reported in the literature.

Response of Azotobacter inoculation on sugar cane yield. M. L. Agarwal, O. P. S. Shishodia, Z. A. Khan and R. Dayal. *Indian Sugar Crops J.*, 1977, **4**, 66-68. An Azotobacter culture was split into three equal fractions (the total amounting to about 2.5 $kg.ha^{-1}$) and one-third broadcast in furrows just prior to sett placement, one-third applied after completion of germination, and the remainder broadcast over the germinated shoots after tiller formation. The trial plots measured approx. 1/33 ha. Comparison was made between yield parameters where only the culture was applied after a basal dressing of farmyard manure or 2:1:1 N:P:K, where phosphate was applied at 80 $kg.ha^{-1}$ after or instead of the first culture application and where no P or culture was applied. Results showed that Azotobacter culture + phosphate increased yield by comparison with the control, although the culture on its own was almost as effective.

Manuring in sugar cane under Haryana conditions. K. Singh, N. L. Bhatia and K. L. Behl. *Indian Sugar Crops J.*, 1977, **4**, 71-72. — Advice is given on fertilization of plant and ratoon cane in the state of Haryana.

The role of soil and plant analysis in cane farming. G. Price. *Producers' Rev.*, 1978, **68**, (6), 31-32. — The author stresses the importance of soil and plant analysis as a means of determining where and if a problem exists as well as the quantity and type of nutrients to apply, where necessary. By carrying out routine soil tests in each field before planting, the farmer can establish economically optimum requirements and optimize long-term planning and budgeting. However, results of soil and plant analysis need to be coupled with the farmer's own field information, past fertilizer history, yield levels and knowledge of local conditions.

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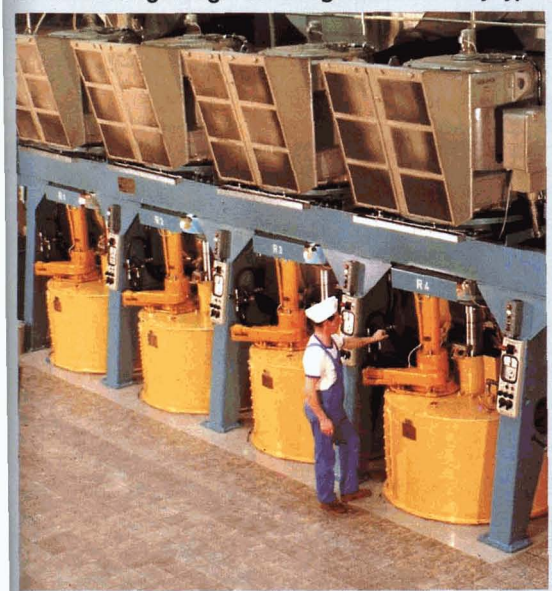
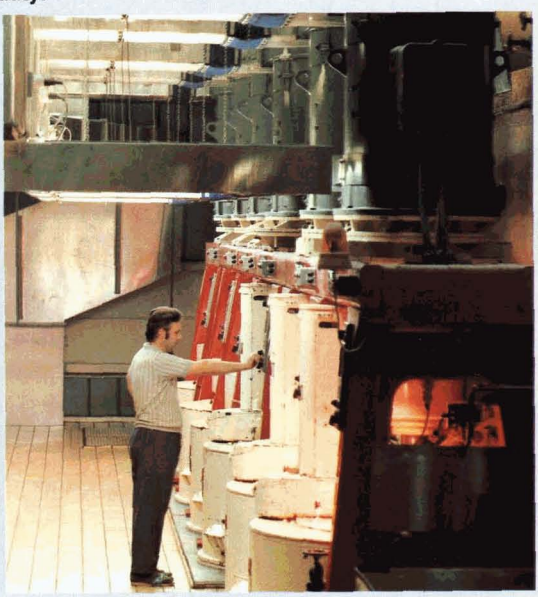


1SH 5 three-phase pole-changing drive



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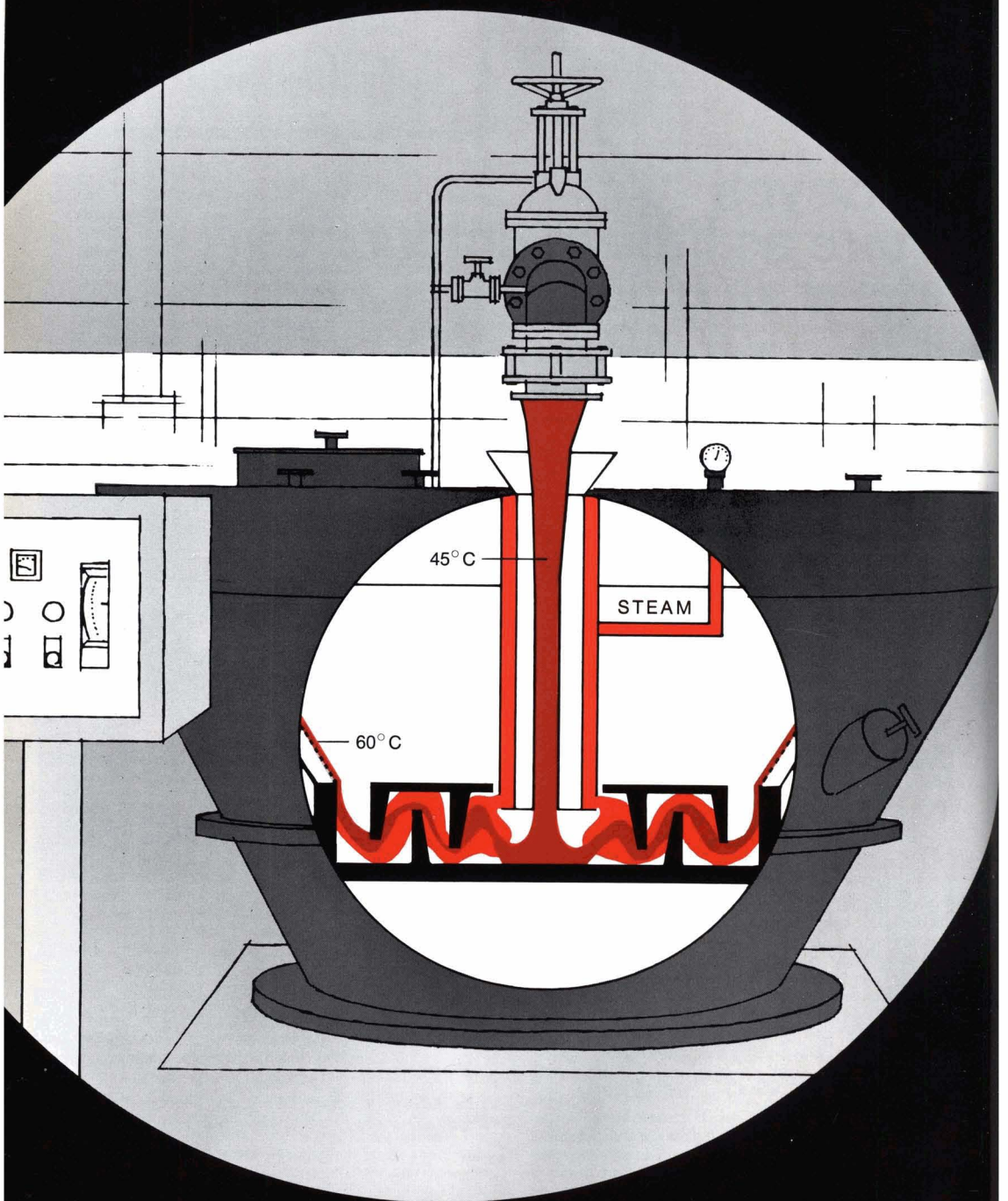

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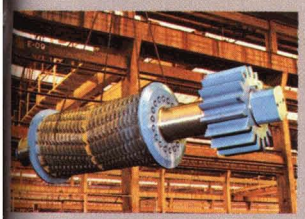

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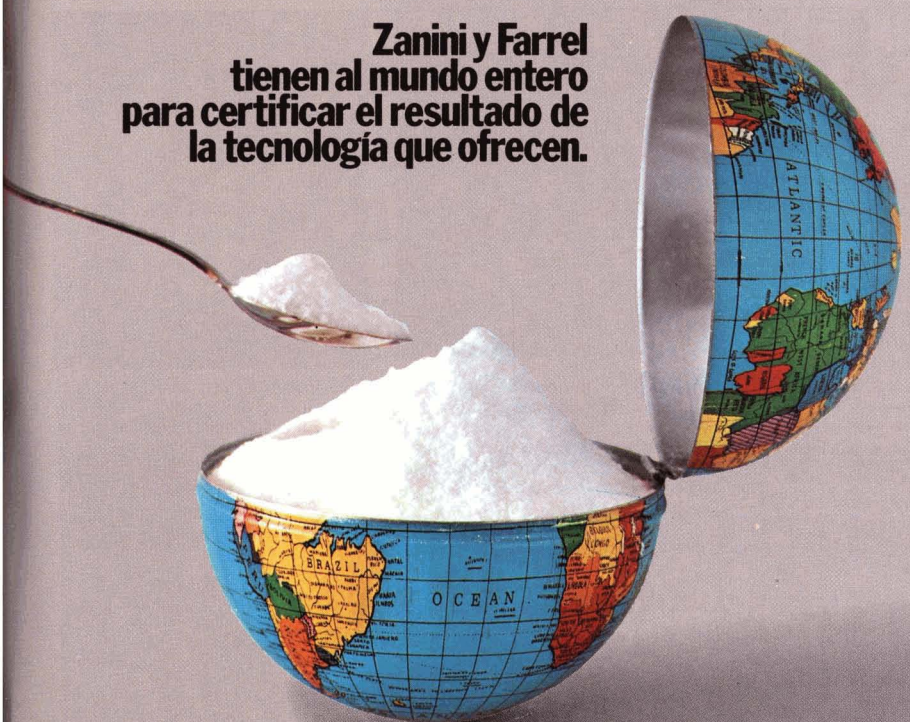

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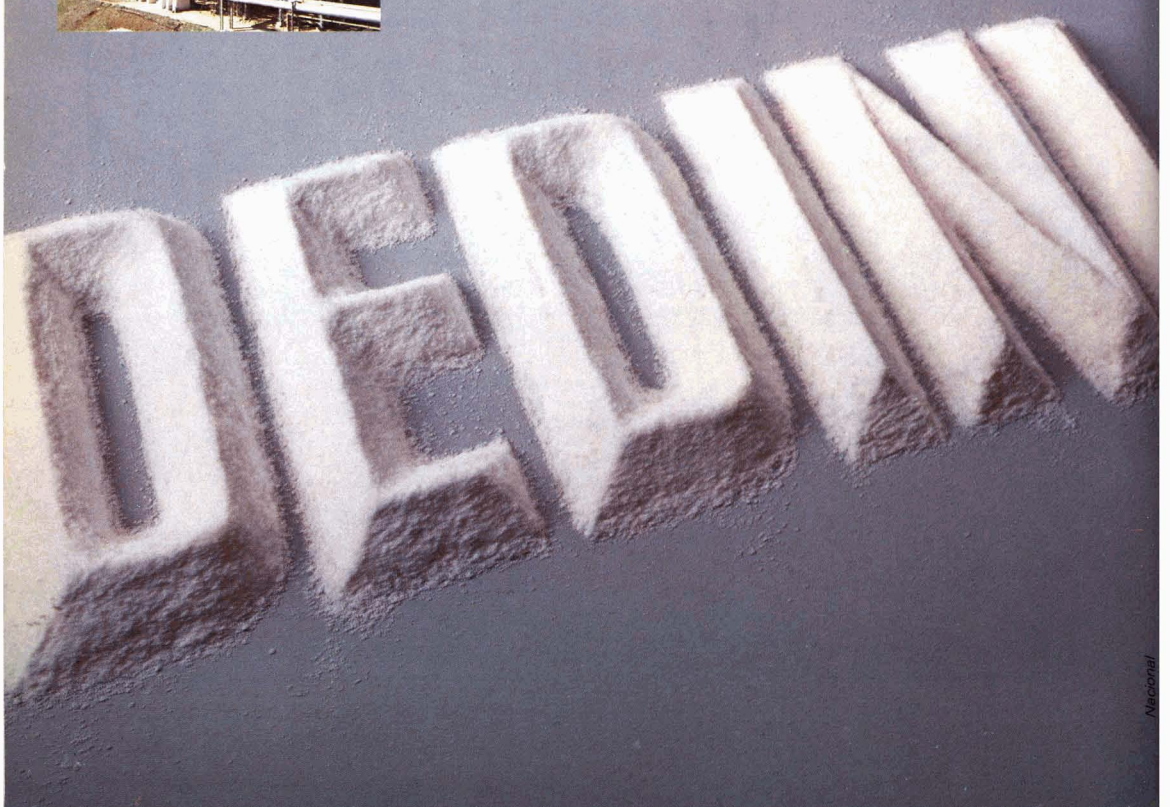

Nacional

SUGAR CANE MECHANIZATION

MF releases new cane planter. Anon. *Australian Sugar J.*, 1978, **69**, 584. — An illustrated description is given of the new Massey-Ferguson MF50 cane planter which is operated by one man and can work at up to 8 km.hr^{-1}. The machine opens the furrow, applies fungicide to the billet, fertilizes, plants, closes the furrow and compresses the soil automatically.

Mizzi green cane harvester. Anon. *Australian Sugar J.*, 1978, **69**, 612-613. — Details are given of the Mizzi green cane harvester, of which the primary cleaning device (comprising three counter-rotating cleaning rollers) removed 85% of the extraneous matter; a secondary cleaner consists of six toothed rollers over which the chopped cane passes on its way to the elevator. Air is blown onto the roller teeth and, in conjunction with an extractor fan below the rollers which creates a vacuum, allows the remaining trash to be sucked out. The dual extractors at the top of the conventional elevator are so positioned as to take advantage of the shorter trajectory of falling trash by comparison with cane billets. The 3-bladed chopper of the harvester works in conjunction with a hexagonal roller and has a service life of about 100,000 tonnes. The harvester is provided with dual adjustable spirals on each side; they lift and untangle the cane and allow a uniform throughput. The inner spiral lifts half way and then reverses, while the outer spiral lifts through the full distance.

Tyres and tracks in sugar cane. W. W. Brixius. *Sugar y Azúcar*, 1978, **73**, (6), 72-79.—After sales data had indicated that 4-wheel-drive tractors had been displacing track-mounted tractors since the mid-1960's, reasons for the preference were analysed; it was found that the productivity of the tyred tractor was up to 50% greater than that of the track type in tillage operations and that, for tractors of similar weight, the owning and operating costs per ha were 37% lower for the tyred than for the tracked type, whilst no significant differences were found between the two as regards soil compaction in field experiments.

Effect of mechanization on extraneous matter in cane. *Sugarland* (Philippines), 1977, **14**, (6), 12-13, 17-18. See *I.S.J.* 1978, **80**, 307.

Operational results of sugar cane combine harvesters. N. Tambosco, J. P. B. Teixeira, L. Geraldi, J. L. de P. Henrique, O. Alonso and G. E. Serra. *Brasil Açuc.*, 1978, **91**, 73-76 *(Portuguese)*. — Trials with four machines (Claas Libertadora 1400, Massey-Ferguson 201, Santal and Toft Robot 300) in 1976/77 showed that the maximum effective operation time was 41-43%, the yield varied from 32.9 to 39.3 tonnes.ha^{-1}, the cane left in the field varied from 10.0 to 17.1 tonnes.ha^{-1}, and the average cost of harvesting was US$2.14 per tonne of cane. The conditions of cultivation and harvesting which would result in better performance are discussed.

Impurities in loading of sugar cane. A. C. Fernandes and E. R. de Oliveira. *Boletim Técnico Copersucar* (São Paulo), 1977, (5), 5-8; through *S.I.A.*, 1978, **40**, Abs.78-649. — The quantity and composition of trash in cane deliveries was studied in relation to systems of harvesting and loading. In August-December 1974, with a semi-mechanized system, *i.e.* manual cutting and mechanized loading, the trash content in 120 deliveries to eighteen São Paulo factories varied from 1.2 to 19%, averaging 4.6%. During wetter weather in September-November 1976, 512 deliveries to four factories by the same system had total trash contents of 1-20 (6.2) %, comprising 0.7-16 (3.7) % vegetal and 0-10.5 (2.7) % mineral debris; a purely manual system gave 4.6% trash, of which only 0.1% was soil. Using four types of mechanical harvester, the total trash was 11-20.6 (16.7) %, comprising 10.5-20.1 (15.9) % vegetal and 0.2-3 (0.8) % mineral material.

Narrow-row spacing. W. Jackson. *Sugar Bull.*, 1978, **56**, (15), 6. — In addition to some difficulties associated with planting and covering of cane grown in rows 2 ft apart, there are harvesting problems. Conventional harvesters, designed to straddle normal cane rows, will roll over uncut cane where the inter-row spacing is inadequate to take the wheels so that there is need for cutting blades in front of at least one of the front wheels. Since it is not planned to cultivate after harvesting (an operation which, in the following spring, is normally used to fill in ruts created by harvesters), there is need for harvesters which make as few ruts as possible — the possibility that track-mounted equipment may be the answer is suggested. Even with its drawbacks, the Claas chopper-harvester is considered suitable for narrow-spaced cane.

New sugar cane planter is now being produced in the country. L. G. Mialhe. *Brasil Açuc.*, 1978, **91**, 119-126 *(Portuguese)*.—The Don cane planter from Australia is being built in Brazil and an illustrated account is given of the machine and its operation. Other equipment built by the licensee is listed and briefly described.

Cane transport and its rationalization. A. B. Santos. *Brasil Açuc.*, 1978, **91**, 196-200 *(Portuguese)*.—Because of the various distances of fields from a sugar factory and the different yields of cane, it is very difficult to plan for uniform delivery of the required amounts of cane using a fixed fleet of transport units, and a number of units chosen to be adequate under all conditions will require higher investment which will not be productive when a smaller number is required under easier conditions. Three systems are examined on economic grounds: one using tractors hauling 10-tonne trailers, a second using 10-tonne trucks, and a third using a tractor hauling 40-tonne road trucks loaded from 8-tonne field transport units. The systems were employed where distances to be travelled ranged from 1 to 15 km, 1 to 30 km and 15 to 50 km, respectively; data obtained on times and costs are tabulated. For a distance of 5 km, the second system was more economical than the first, while for a 30 km distance the third system was more economical than the second. A method for calculating the number of transport units required is described.

CANE PESTS AND DISEASES

Moulding of arrows during crossing. A. M. Whittle. *Sugarcane Pathologists' Newsletter*, 1978, (20), 19-21. Mould formation on arrows in crossing lanterns has occurred for several years at the West Indies Central Sugarcane Breeding Station in Barbados, but it has only recently caused concern. It takes the form of a thick layer of white-to-pink mycelium extending from the base of the arrow and covering up to half of its external surface; it also develops in between the florets and, in some cases, sporulates on the sheath below the arrow, being isolated from rotting nodes within the sheaths as far as 1.3 m below the base of the inflorescence, probably being the cause of premature separation of the rachis from the cane stalk during arrow maturation. The growth on the arrow is so thick that it presents a physical barrier to pollen. The fungus has been identified as *Fusarium sporotrichioides*; conidial germination has been found by Schneider[1] to require a relative humidity of at least 89%, while mycelial growth needed a R.H. of almost 100% – a marked reduction in growth of the fungus resulted with a fall in R.H. even just to 98%. Hence, it is thought that the spores are present on arrows in the field, but that development takes place only at the high R.H. presumably existing behind the sheaths and among the branchlets of an arrow in still air. Fungicidal sprays have not given conclusive results because of the difficulty of obtaining an even cover caused by the hairy nature of the arrow. Tests with fungicidal smokes are proposed for the next crossing season.

Use of sugar cane uprights in the diagnosis of RSD. D. S. Teakle, R. G. Birch and J. M. Appleton. *Sugarcane Pathologists' Newsletter*, 1978, (20), 21. – It is reported that uprights of Q 28 cane can be used as an alternative to uprights of elephant grass or bana grass for rapid diagnosis of ratoon stunting disease. The uprights develop a characteristic orange discoloration in the vascular bundles at the base of the shoot 2-3 weeks after inoculation of the cut spindle leaves with juice from infected stalks. Although bana grass grows more vigorously and uniformly than the cane and develops more vascular discoloration, sensitivity of the two plants to diluted RSD inoculum appears to be similar. Moreover, the cane produces more specific symptoms of the disease as well as the potentially interfering bacterial mottle, red stripe and leaf scald bacteria.

A useful method for diagnosis and isolation of *Xanthomonas albilineans* (Ashby) Dowson, causal agent of leaf scald in sugar cane. Y. Masuda and H. Tokeshi. *Sugarcane Pathologists' Newsletter*, 1978, (20), 22-23. Since leaf symptoms of leaf scald may be confused with those caused by the herbicide "Roundup", while internal node symptoms are similar to those of chlorotic streak and ratoon stunting disease, bacterial isolation is necessary. A method which is briefly described makes use of a stereoscopic microscope with a light source so arranged that the light passing through a drop of water is refracted by the bacterial cells exuding from the vessels in a leaf section. Details are given of the stages in preparation of the material. The method requires a magnification of only x 30-60.

Pathogenicity of *Fusarium tricinctum* to sugar cane: a first report. H. Koike. *Sugarcane Pathologists' Newsletter*, 1978, (20), 24-26. – Frost-affected cane stalks were split lengthwise and examined. Extensive reddening of the internal stalk tissue was found to be caused by *Fusarium moniliforme* (causal agent of Fusarium sett or stem rot) and by *F. tricinctum*, causal agent of diseases of several species of Gramineae, but not hitherto recorded as infecting sugar cane. Experiments showed that *F.moniliforme* caused more extensive reddish-purple discoloration than did *F. tricinctum* in cuttings of five cane varieties inoculated with the pathogens, and reduced germination of one particular variety by a far greater degree than did *F.tricinctum*. Both agents appeared to be mildly pathogenic to sugar cane, but *F.tricinctum* less pathogenic than *F.moniliforme*.

Further notes on Fiji disease in South Queensland. B. T. Egan. *Sugarcane Pathologists' Newsletter*, 1978, (20), 27. – The situation regarding Fiji disease in South Queensland, as previously reported by a number of authors, is briefly reviewed, and the point made that the solution to the problem is replacement of N:Co 310 cane, at present the major variety grown in Queensland.

Screening latex from some plants for their suitability as sugar cane mosaic virus inhibitor. R. D. Joshi and J. Prakash. *Sugarcane Pathologists' Newsletter*, 1978, (20), 28-30. – Freshly collected latex from ten different plant species was diluted with distilled water and mixed with an equal quantity of inoculum prepared by macerating cane leaves infected with strains A and F of cane mosaic virus. The mixture was incubated for 5 min at 20°C and then inoculated into maize seedlings, samples of which were also exposed to the effect of inoculum plus water. Results showed that *Euphorbia hirta* latex had the highest inhibitory effect on the mosaic virus, reducing infectivity by 78.5% in the case of strain A and by 80% in the case of strain F.

A supplement to the weed reservoirs of sugar cane mosaic virus. K. S. Bhargava, R. D. Joshi and K. R. Sarkar. *Sugarcane Pathologists' Newsletter*, 1978, (20), 30-31. *Brachiaria ramose*, a wild grass which commonly grows in and around cane fields in Uttar Pradesh, has been established as an alternative host of cane mosaic. Symptoms in young leaves start at light green spots which later tend to fuse to form longer streaks. Juice from the weed was inoculated into cane and produced clear mosaic symptoms 45 days later.

First record of false floral smut from Maharashtra, India. M. B. Bachchhav. *Sugarcane Pathologists' Newsletter*, 1978, (20), 32-33. – An ovaricolous smut observed on cane of varieties Co 740 and Co 62175 at the Sugarcane Research Station, Padegaon, was identified as *Sphacelotheca schweinfurthiana*. A description is given of the fungus, earlier found by Goyal & Tyagi on Co 312 cane in Rajasthan[2].

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[1] *Phytopath. Zeitsch.*, 1953, **21**, 63-78.

[2] *I.S.J.*, 1976, **78**, 273.

SUGAR BEET AGRONOMY

Influence of planting date, nitrogen rate, and harvest date on yield and sucrose concentration of fall-planted sugar beets in central Arizona. J. M. Nelson. *J. Amer. Soc. Sugar Beet Tech.*, 1978, **20**, 25-32. – Trials carried out during three seasons showed that, while delaying planting from early to late September did not significantly affect beet yield or sucrose content, it did result in reduced bolting. Planting in early October generally gave yields and sucrose contents which were similar to those obtained with September planting provided harvesting was carried out in June or July, but not in May; however, yields and sucrose contents from late October plantings were lower than those from September plantings, irrespective of harvest date. While the difference in nitrogen application rate (20 or 100 lb. $acre^{-1}$) significantly affected root yield and sucrose content, in only one of the seasons did it significantly affect sugar yield (as a result of a low residual N content in the soil), when the higher rate increased it.

Effect of low and fluctuating temperatures on the storage life of sugar beets. R. E. Wyse. *J. Amer. Soc. Sugar Beet Tech.*, 1978, **20**, 33-42. – The effect of temperature fluctuation on beet respiration rate, sucrose loss and reducing sugars accumulation was studied in forced-ventilation piles over a 140-day period. While the lowest respiration rate occurred at about +1°C, a reduction in temperature to -1°C caused a sharp rise in respiration which, however, rapidly fell almost to the minimum and remained constant while there was no fluctuation in the temperature. A temperature rise to 5°C was accompanied by an extremely sharp increase in respiration rate which fell as the temperature was maintained constant at the level, but the rate was still very high. Even where the rate dropped almost to zero at -18°C and the roots were frozen solid, increase in temperature was accompanied by an increase in respiration rate, the increase becoming rapid as the roots quickly deteriorated after thawing. Fluctuations in temperature within the range 1.5-5°C were tolerable, the sucrose losses being the same as those at a constant 1.5° or 5°C. Roots stored at these temperatures were also able to tolerate brief exposure to higher temperatures with only moderate damage. It is recommended that outside air at below -2°C should not be introduced into a pile intended for prolonged storage unless the beets are to be frozen or unless the pile temperatures are so high that the potential losses caused by the high temperature outweigh the reduction in storage life induced by the excessive cooling.

Effect of seed stalk removal on sucrose production in bolting sugar beets. C. F. Ehlig, R. W. Hagemann and R. Y. Reynoso. *J. Amer. Soc. Sugar Beet Tech.*, 1978, **20**, 43-47. – The effect on weight and sucrose content of seed stalk removal from bolting beets was determined in experiments carried out in two successive years. Results showed that removal did cause a slight drop in sucrose content, while root weight was greater in topped than in non-topped bolted beets, except in one out of five fields investigated, so that the sucrose yield per root was unaffected. Between 43 and 83% of the seeds from the non-topped beets germinated. The seed stalks did not re-grow in any of the fields.

Critical tissue levels for predicting nitrogen needs of sugar beets at Mesa, Arizona. G. V. Johnson, J. L. Stroehlein and J. L. Abbott. *J. Amer. Soc. Sugar Beet Tech.*, 1978, **20**, 65-72. – Indigenous soil N level in Arizona has often been insufficient for even one crop, so that N is generally applied at planting followed by a side-dressing at thinning or later in the season, which extends from autumn to early summer. However, recent surveys have revealed excessively high available soil N and petiole nitrate-N in many cases, possibly a major cause of poor yields or low sugar contents. Results of tests, intended to establish beet response to residual and applied N and relationships between yield parameters and tissue N during the growing season, showed marked differences, between the two years of the investigations, in sugar yield response to N application above 200 $lb.acre^{-1}$, with November petiole nitrate-N in 1971/72 being about double that in the previous season. A November petiole nitrate-N level greater than 10,000 ppm indicated adequate soil N for the remainder of the season; it should be at least 5000 ppm from November to end-February for maximum sugar yield. When the available soil N at planting is below 10 ppm, 40-80 lb N per acre should be applied at thinning.

Sugar beet yield and seasonal growth characteristics as affected by hail damage and nitrogen level. J. N. Carter, D. J. Traveller and S. M. Bosma. *J. Amer. Soc. Sugar Beet Tech.*, 1978, **20**, 73-83. – Four N application rates and four fertilization dates were tested in investigations to establish the effect of a severe hailstorm (causing 75% defoliation of the beets) on beet growth characteristics, yield and quality. Plant growth ceased for one week after the hailstorm, but then proceeded at a reduced rate, so that yields were 17% lower than expected. Leaf area index recovery rates were increased by increasing the N application rates and delaying fertilization, but they did not return to the pre-defoliation levels. Defoliation did not affect sucrose content, which was reduced by increased N application or by delayed application. Sucrose accumulation did fall by 90% during the first week after defoliation, but returned to normal within five weeks. Stored sucrose was not used to support regrowth. Hence, losses in yield caused by hailstorm defoliation were far lower than expected from the degree of leaf destruction.

Effect of steckling size on seed yield of sugar beet. S. S. Saini, K. B. Rastogi and P. P. Sharma. *Indian Sugar Crops J.*, 1977, **4**, 69-70. – Of four sizes of stecklings transplanted for beet seed production, the largest gave significantly more seed than the others, although seed maturity, weight per 1000 seeds and seed germination were not affected by steckling size.

Sugar beet topping with rotary and sliding feeler toppers. M. Umari and W. Brinkmann. *Zuckerind.*, 1978, **103**, 665-675 *(German)*. – Investigations of beet topping, with the aim of optimizing the operation so that losses are minimized, are reported. Improvements in topping depend on: (1) reduction in the weight of the feeler systems, in order to minimize the forces of contact with

the beets and so prevent their displacement; (2) establishment of a minimum speed at which beets leaning towards the topper can be returned to an upright position and held firm for correct topping; (3) automatic adjustment of the knife speed and of the distance between the feeler and the knife as a function of beet height; (4) continuous contact between beet crown and feeler until the knife makes contact with the beet (this being brought about through springs which also effect an additional and necessary acceleration of the feeler in its upward movement); (5) increase in the rate of field emergence, so that more uniform stands and more regular sizes of beet are possible and the heights of the crowns above the soil level practically identical; and (6) adequate spaces between the beets in a row for precise sensing of the crown height of adjacent beets and hence accurate guiding of the knife.

Sugar beet irrigation, a highly effective agrotechnical practice. G. Rizescu. *Cereale si Plante Tech.*, 1978, **30**, (7), 3-9 *(Rumanian)*. — The effects of irrigation and N-P-K fertilization on sugar beet under Rumanian conditions are discussed. While the water requirement of beet is 500-600 $cm.ha^{-1}$, the question of number of irrigations to give adequate moisture down to 80 cm of soil will naturally be dependent on rainfall; however, under normal conditions in Rumania, the number applied when soil moisture depletion is 50% of the requirement will be 6-7 in the steppe region, 5-6 in wooded steppe and 4-5 where fields are edged with trees. Trials showed that under optimum moisture conditions, addition of 200 kg N and 80 kg P per ha gave maximum sugar yield.

Mechanical harvesting of sugar beet seed. E. Nicsulescu and A. Stefanescu. *Cereale si Plante Tech.*, 1978, **30**, (7), 23-26 *(Rumanian)*. — Details are given of practices and equipment used in beet seed harvesting in Rumania.

The status and tasks of sugar beet agriculture. P. Pintér. *Cukoripar*, 1978, **31**, 41-44 *(Hungarian)*. — With increased consumption and decrease in available manpower in the Hungarian sugar industry, the need arose for replacement of manual labour in beet agriculture with mechanization and greater use of herbicides. A technology developed in the early 1970's was already demonstrating its benefits by 1977; more beet of higher sugar content were delivered in that year, despite unfavourable weather conditions, the weed populations in the fields being very much reduced. There is need for herbicides which are effective throughout the entire growing season, while improvement in harvester performance is also of prime importance as regards the need to reduce beet losses.

Results of chemical weed control in sugar beet. A. Kádár. *Cukoripar*, 1978, **31**, 45-46 *(Hungarian)*. — Results of chemical weed control in Hungary in 1969/70 are reported. Under dry conditions, combinations with "Ro-Neet" as pre-emergence herbicide gave best results; "Betanal" on its own or with other herbicides proved the best post-emergence treatment.

Sugar beet drilling experiments in 1976. L. Lukács. *Cukoripar*, 1977, **30**, 203-206; 1978, **31**, 1-6, 54-58 *(Hungarian)*. — Results are reported of drilling x variety x fertilizer trials at four sites in Hungary. The effects of two types of drill and of seed spacings of 8, 10.5 and 16 cm on the yield and quality of each of the 10 varieties tested are given in graph and table form. While Hungarian and imported West European coated seed performed similarly with regard to planting technique, there were statistically significant differences between varieties as regards the various factors investigated, and only a few attained a final plant population of 70-90,000 per ha at a seed spacing of 16 cm. Location affected the reaction of the plants to fertilization.

Sugar beet. Anon. *Maharashtra Sugar*, 1978, **3**, (11), 21-24.—A summary is presented of beet research conducted at the Indian Institute of Sugarcane Research, Lucknow, covering breeding, seed production, diseases, pests, fertilization and equipment developed at the Institute, including drills, seed polisher and core sampler.

Mineral fertilization of sugar beet. R. Vanstallen and A. Jardin. *Le Betteravier*, 1978, **12**, (123), 10-11 *(French)*. The need for judicious fertilization of the beet crop is stressed, and the importance of accurate determination of fertilizer requirements discussed. Caution is particularly called for where farmyard manure is applied, since soils regularly receiving such fertilizer quickly attain a critical level in certain elements without this being necessarily evident to the farmer. A table is presented which indicates the levels of N, P, K and Mg per 1000 litres of specific forms of liquid manure.

Mechanization and sugar beet harvesting. C. Zolnierczyk. *Gaz. Cukr.*, 1978, **86**, 205–206 *(Polish)*.—Aspects of mechanical harvesting in Poland are discussed, particularly in reference to the 6-row Matrot machines (of French origin) used on many state farms. Recommendations are given on means by which best use may be made of the harvesters, especially regarding topping and associated root size, and reduction of losses in the form of beets left on the soil surface.

Soil preparation and fertilization affect sugar beet harvesting and quality. W. C. von Kessel. *Die Zuckerrübe*, 1978, **27**, (5), 7–9 *(German)*.—Straw incorporation in the soil from a previous crop, with or without basal dressing and/or farmyard manure, is of benefit to the soil and beet crop. However, the work must be done correctly if it is to have the required effect. This also applies to other forms of fertilization as well as liming, as discussed by the author. The advantages of dry carbonation mud are indicated, and a typical analysis given. The trace element requirements of soils are also discussed. The considerable effect that ploughing has on beet growing is examined, and advice is given on preparation of specific types of soil.

Working widths and tractor widths a continuing problem? J. von Alten. *Die Zuckerrübe*, 1978, **27**, (5), 10 *(German)*.—The author briefly discusses the problem posed by discrepancies between tractor widths, working widths of tractor-drawn machinery (drills, sprayers and harvesters) and number and widths of beet rows. Whereas earlier tractors had a width of 1·35 m and drills were of working widths which were multiples of 45 cm (this being the row spacing), so that there was no risk of row damage by the tractor, while implement widths also ensured no beet row damage, modern tractors may be wider (1·8 m is quoted as a typical width). One solution to the problem is the lane system as used in cereal crops. Possible width combinations are indicated.

BEET BREEDING AND VARIETIES

Results of sugar beet varietal trials (in Belgium). N. Roussel, W. Roelants, and T. Vreven. *Le Betteravier, 1978,* **12,** (116), 14-16 *(French).* – Details are given of beet varietal trials and their results at six locations in Belgium in 1977; mean values of root and sugar yield and sugar content are also given for the three-year period 1975-77, covering 20 varieties. Indications are also given of bolting percentages, and recommendations are given regarding early- and late-maturing varieties.

New sugar beet varieties introduced in cultivation. Z. Stanescu, E. Pop, V. Codrescu, P. Stefanescu and G. Stefan. *Prod. Veget., Cereale si Plante Tehn.,* 1977, **29,** (2), 13-16 *(Rumanian).* – The varieties in question are Polirom multigerm and Monorom monogerm polyploids and Brasov multigerm diploid. Characteristics of each variety are discussed and field trial and commercial performances are reported.

The present-day performance of sugar beet varieties. A. von Müller. *Die Zuckerrübe,* 1978, **27,** (1), 14-15 *(German).* – The performances of five multi- and eleven monogerm varieties in 1976 and 1977 were evaluated in a total of 28 trials in West Germany. The results are summarized in the form of beet and sugar yield, sugar content, concentrations of (K + Na) and amino-N on beet and on ash, percentage of bolters and financial return as the average of 17 trials in 1977 and as the average of all 28 trials in 1976/77. It is emphasized that varietal selection is only one of a number of factors affecting crop performance.

Varietal trials with sugar beet seed in 1977. L. Schmidt, L. Jelínková, J. Jaroš and J. Očenášková. *Listy Cukr.,* 1978, **94,** 25-32 *(Czech).* – Trials at five locations in Czechoslovakia are reported. Favourable weather led to higher root yields and sugar contents, and hence greater sugar yields, than in the previous year. Tabulated results show that of the 12 varieties tested, Dobrovicka A as segmented, uncoated seed was best in terms of white sugar yield per ha, followed by two West German and one Polish variety, after which came Dobrovicka A as rubbed seed (in which form it is the variety most planted in Czechoslovakia, being sown on 33.6% of the total beet area, whereas as segmented, uncoated seed it is sown on only 11.1% of the area).

Testing hybrid blends to determine general combining ability of parental lines. A. W. Erichsen, R. K. Oldemeyer and A. Suzuki. *J.Amer.Soc.Sugar Beet Tech.,* 1977, **19,** 316-323. – A method for identifying superior inbred lines of sugar beets was tested, in which inbred lines that had been extensively tested and found to differ considerably in combining ability were used as parents. For each inbred a general blend was made up of seed from all crosses available that involved the inbred; in addition, hybrids within each seed production year were blended to determine the effects of different sets of parents on the performances of the blends. The blended seeds were then sown in experimental plots, and root and sugar yield, sugar content and juice purity determined after harvest. From the relatively low coefficients of variation, the test is regarded as of high reliability, the performances of most of the blends characterizing the inbreds they were intended to test. The method is not suitable for initial screening but could be of value where the supply of test seed was low, where resources for testing were limited and possibly where some screening of inferior lines had already been carried out.

Trials of commercial varieties of sugar beet. D. Kimber and S. McCullagh. *British Sugar Beet Rev.,* 1978, **46,** (2), 44-46. – Trials of nine commercial varieties carried out by the National Institute of Agricultural Botany are reported and the results given in the form of tables, showing plant populations, root and sugar yields, sugar contents, average impurity contents in clarified juices, bolter percentages and emergence percentages. The data refer to 1975-77.

Results of comparative trials of sugar beet varieties in Belgium 1975-1977. N. Roussel, R. Vanstallen, W. Roelants and T. Vreven. *Publ.Trimest.Inst.Belge Amel. Betterave,* 1978, **46,** 7-57 *(French, Dutch).* Trials involving 52 varieties were carried out at six locations in 1977, and results are tabulated and discussed in detail. A table is also given of the average root and sugar yields for each variety over the 3-year period 1975-77.

Comparative trials with genetic monogerm sugar beet varieties in 1976. L. Lukács and J. Zana. *Cukoripar,* 1978, **31,** 13-16 *(Hungarian).* – Trials with 25 monogerm varieties grown at three sites in Hungary are reported; the tabulated data presented cover root and sugar yields, sugar, conductimetric ash and noxious N contents, and *Cercospora beticola* incidence.

Evaluation of Czechoslovakian and foreign sugar beet varieties in 1971-1975. L. Schmidt, J. Očenášková and V. Kec. *Listy Cukr.,* 1978, **94,** 169-174 *(Czech).*—Trials conducted by the Sugar Industry Research Institute are reported. Tabulated results are given for 18 varieties, showing yields, composition and disease incidence as well as rainfall. Of the varieties tested, Dobrovická A as rubbed seed proved the best.

Genetic variability, correlation and path analysis studies in sugar beet, *Beta vulgaris.* H. L. Sharma, D. S. Deol and B. S. Bains, *Sugar News* (India), 1978, **10,** (1), 40-43. A randomized block design experiment was carried out at Jullundur, Punjab, in which 16 promising sugar beet genotypes from Denmark, West Germany and the USA were grown, using three repetitions, in order to study heritability, genetic advance, phenotypic and genotypic correlations and path analysis. Root yield and top yield showed high heritability while average root weight and sucrose content showed moderate and low heritability, respectively. Genetic advance in percentage of means was found to be maximum for top yield, followed by root yield. Average root weight and top yield had a high positive correlation with root yield. An examination of path coefficients showed average root weight to have the maximum direct effect on root yield, while sucrose is negatively correlated with root yield. Maximum emphasis should be laid on average root weight and top yield when selecting high yielding genotypes in sugar beet.

CANE SUGAR MANUFACTURE

Sugar cane and Cuba. H.Gruszecka. *Gaz.Cukr.*, 1978, **86**, 38-39 *(Polish)*. – A brief survey is presented of the history of the Cuban sugar industry and of the basic processes used in sugar manufacture.

Study of a cane sugar factory with pressure evaporation. T.Wardhana. *Zuckerind.*, 1978, **103**, 467-476 *(German)*. The use of pressure evaporators in cane sugar factories is considered an effective means of reducing fuel consumption; however, while the practice has been widely adopted in beet sugar factories, where thin juice is thermostable, so that no noticeable sucrose destruction occurs even at 125-128°C in a 1st evaporator effect, in the cane sugar factory the juice is thermolabile and hence liable to considerable sucrose degradation in pressure evaporation. However, since sugar decomposition in the evaporator is governed by both temperature and time, it is to be expected that the temperature could be raised under conditions of a very short residence times such as in falling-film evaporators. A white sugar factory heat scheme is examined in which a quintuple-effect evaporator has, as 1st effect, a falling-film evaporator in which the thin juice is exposed to a temperature of 125°C. Since there is almost no condenser loss, steam consumption is calculated to be 32.1 kg per 100 kg of cane, while the correspondingly low fuel consumption permits a 46% saving in bagasse. The use of high-pressure steam permits generation of enough electricity to cover the needs of the factory as well as provide surplus for sale to the public grid, thus reducing sugar production costs. The factory crushes 4000 tcd and is provided with a DDS diffuser-cum-mill system. A detailed exergy analysis of the scheme shows that the greatest losses occur in the boiler house (63.4%), after which come the losses in the sugar house (11.7%). Greater exergy losses in juice extraction than in a beet sugar factory are attributed to the use of mills; for this reason, the amount of current available for the public grid is also smaller than in a beet sugar factory of comparable size.

Importance of lubrication in the sugar industry. T. M. Karne. *Maharashtra Sugar*, 1978, **3**, (6), 17-19. The importance of lubrication, manufacture of lubricants, types of additives used, desirable properties of lubricants, lubrication methods, handling and storage of lubricants, lubricant testing and analyses are explained.

Associations as electrical energy sources for sugar factories and alcohol distilleries. L.G.de Souza, C.Piedade, W.Forastieri and S.H.Benez. *Brasil Acuc.*, 1978, **92**, 63-67 *(Portuguese)*. – The main problems concerning provision of electric power to sugar factories and distilleries by external generating associations are discussed, and it is concluded that the price paid for such bought power may be high as a consequence of the inconvenience of demand.

Potential for productivity gains in sugar manufacture. J.H.Payne. *Boletim Técnico Copersucar* (São Paulo), 1976, (1), 8-11; through *S.I.A.* 1978, **40**, Abs.78-646. A policy for increasing the efficiency of cane sugar manufacture in Brazil is outlined, notes being made about the possibilities for improvement at each main process stage. Emphasis is put on instrumentation and improved operating technique in the short term, and on the introduction of modern equipment and methods in the long term.

Separation of sand from mixed juice. P.Chenu, F.Zarpelon, A.V.Viotti and S.Brunelli. *Boletim Técnico Copersucar* (São Paulo), 1977, (5), 14-15; through *S.I.A.*, 1978, **40**, Abs.78-651. – A separator, designed by Copersucar for rapid removal of coarse solids from juice, is outlined with photographs, and results of its testing at Cooperada factory in 1976 are summarized. Although its overall soil removal was only 19.5%, it removed all solids larger than 0.5 mm and approx. 40% of those between 0.15 and 0.5 mm, with a residence time of 5 min.

Upright vacuum pan designed by Copersucar gives good results at São José factory, Rio das Pedras. Divisão Industrial do Departamento Técnico da Copersucar. *Boletim Técnico Copersucar* (São Paulo), 1976, (2), 10-11; through *S.I.A.*, 1978, **40**, Abs.78-654. – The structure of the pan is outlined with a diagram, and results of its testing in October 1975 are reported. Steam enters the calandria at one point, where a dividing plate generates peripheral flow; below the lower tube sheet, four perforated spirals allow incondensable gases from the calandria to enter the massecuite and thus improve its circulation. Circulation remained intense throughout the test period, allowing 1st massecuite to be boiled in approx. 2 hours; using steam at a gauge pressure of 0-1lb.in^{-2}, a boiling time of 4.5 hr gave normal massecuite. The purities of massecuite and run-off syrup averaged 72.5 and 46.7 units, respectively, with a crystal content of 48.4%. Thermometers on opposite sides of the calandria showed that the steam temperature varied by $\gtrsim$ 1°C; massecuite temperature near the steam inlet was initially 2°C lower, and eventually 3°C higher, than that on the opposite side, with no difference during tightening. The pan is expected to be suitable for boiling 3rd massecuite using 2nd effect vapour.

Milling roller in new material. R.P.de Ramalho. *Boletim Técnico Copersucar* (São Paulo), 1977, (5), 4; through *S.I.A.*, 1978, **40**, Abs.78-777. – Cast steel (SAE 1030 + 0.5% Ni) has much higher resistance to traction than cast irons, and accepts hard facing much better. Cast iron and cast steel rollers faced with an alloy containing 35% Cr were examined after crushing 165,000 tonnes of cane; facings on the steel rollers had no cracks, maximum wear being 0.3 mm, while those on the iron rollers were almost all cracked, with up to 32 mm of wear.

Cane diffusion process. B.St.C.Moor. *S.African Sugar J.*, 1978, **62**, 210-213. – A brief history is presented of cane diffusion, and details are given of the operation of the BMA diffuser installed at Tongaat. The mechanism of juice extraction by diffusion is explained, and the advantages and disadvantages of diffusion by comparison with milling are examined.

Factory research in Jamaica. *Ann. Rpt. Sugar Ind. Research Inst.*, 1974, 7-8.–Two types of dextrans formed by *Leuconostoc mesenteroides* were isolated from cane juice and found to be chemically very similar,

the major difference appearing to be one of molecular weight. Both had a pronounced effect on viscosity, raising it by 500–1000% even when present in such small concentrations as 0·1–0·5% (w/v). Preliminary results from an investigation of final molasses exhaustibility showed an apparent correlation between the sucrose content and Ca^{++} ion content. Values of pol % bagasse reported by nine out of twelve factories were slightly lower than predicted by the residual factors, while at another three the values were much lower. Problems have been experienced in measurement of imbibition water; at six factories, water adhering to the cane from washing plants affects the 1st expressed juice Brix. Water additional to the metered quantity may have emanated from cooling bearings or from the washing down of trash in the mill bed or may have been a result of faulty metering equipment. It has led to under-estimation of the amount of bagasse produced and hence to errors in calculation of fibre % cane, pol % cane and pol extraction. Lack of standardization in the methods used to calculate and report factory balances is mentioned; this lack extended to the equipment and methods used for bagasse pol determination.

The choice of A-shaped sugar silos for Mauritius. G. Beaubois. *Rev. Agric. Sucr. Maurice*, 1977, **56**, 193-198. Types of vertical and horizontal silos used for bulk sugar storage are described, and their advantages and disadvantages indicated. The consulting engineers appointed by the Mauritian Government for the future bulk terminal on the island have chosen the A-shaped horizontal silo (as erected in a number of countries). Because one silo having a capacity of 350,000 tonnes of sugar (the amount stipulated in the plans) would have to be about 728 m long and insurance companies would probably be unwilling to cover that amount of sugar in one building, two identical silos are to be built, each 364 m long and 45 m wide and having a capacity of 175,000 tonnes.

New concept in cane preparation. L. B. Rodriguez, E. G. Garcia and A. C. Alba. *Sugarland* (Philippines), 1978, **15**, (1), 12–14, 35.—See *I.S.J.*, 1979, **81**, 52.

The water economy in a sugar factory. V. G. Bahulekar. *Maharashtra Sugar*, 1978, **3**, (8), 9–13.—For a factory producing 1250 tonnes of sugar daily, the author calculates the amount of water consumed, and indicates how the re-use of condensate can permit a saving of 19·8% on cane, or about 55,000 gal.day^{-1}.

Improvement of the technical efficiency in sugar factories—fuel efficiency. P. J. M. Rao. *Maharashtra Sugar*, 1978, **3**, (8), 19–28.—Recommendations are given on means of improving fuel utilization and reducing steam consumption in sugar factories.

Exhaustion of final molasses—an investigation. A. P. Chinnaswamy. *Sugar News* (India), 1978, **10**, (1), 35–39.—A study was carried out at Madurantakam Sugars to determine the reasons for and to correct the high loss of sugar to final molasses. Steps taken were to ensure the preservation of reducing sugars in the juice by avoidance of high liming and maintenance of clear juice pH at 6·9–7·0, replacement of dilute rectified spirit by coconut oil in preparation of seeding slurry for the pans, installation of conductivity meters, pressure, temperature and vacuum gauges at the pans, adoption of new *C*-massecuite graining and boiling techniques, conversion of the crystallizer station from batch to continuous operation, and fitting of new tips to the *C*-centrifugal ploughs to ensure more complete removal of all the sugar. As a consequence of these measures, the average final molasses purity fell from 35·40 to 31·78.

Studies on the effect of temperature on the viscosity of poly-component saccharine systems for designing a resistance heater for improving the fluidity of *C*-massecuite in sugar factories. R. C. Sharma. *Sugar News* (India), 1978, **10**, (1), 53–57.—Using a Koch ball viscometer, the viscosities of "numerous" samples of syrup, final molasses and *C*-massecuite were measured at different temperatures and the effects of temperature and time illustrated by means of graphs. The viscosities of syrups and molasses decrease steadily with rise in temperature; in the case of massecuite, the decrease is more abrupt as crystals dissolve. When heated at constant temperature, about 53°–54°C, the viscosity of syrup increases with time while that of molasses decreases, and that of massecuite decreases considerably.

Operation of the Inkerman diffuser. P. S. Kelly and R. G. Porter. *Proc. 45th Conf. Queensland Soc. Sugar Cane Tech.*, 1978, 19–25.—Details are given of the milling-cum-diffusion system at Inkerman, which is provided with an "A" train of shredder and five mills, and a "B" train of shredder, three mills and a BMA diffuser (of 250 tch capacity) installed between the first and second mills. Over a 20-week period in the 1977 season, the "B" train crushed an average of 214 tch at 241% imbibition on fibre, giving a reduced extraction of 97·3% and a bagasse moisture content of 47·6%. This contrasted with an extraction of 95·7% by the "A" train at 260 tch and an imbibition rate of 164% on fibre.

An investigation of the new Tully crystallizer station. R. J. Swindells, E. J. Stewart and G. A. Brotherton. *Proc. 45th Conf. Queensland Soc. Sugar Cane Tech.*, 1978, 59–68.—The low-grade station at Tully is equipped with two sets of Sargeants-A.N.I. crystallizers, three in each set, which can be operated continuously or as batch machines. The cooling system is so designed that water enters the main pipe via a central distribution pipe, flows through a curved pipe into a connecting pipe and returns via a radial pipe to a channel whence it is discharged; these loops are so arranged over the length of the crystallizer, that the cross-section view is of three loops with the radial pipes at 120° relative to each other. It is possible to bypass any crystallizer in either set, to empty each one individually and to add dilution molasses at given points. Massecuite is dropped from the pans into four air-cooled Burnett crystallizers which act as receivers and from which the massecuite is pumped to an elevated splitting box; this box divides the flow between the two sets of crystallizers. Investigations of crystallizer performance showed no significant difference between continuous and batch operation as regards exhaustion. The receivers contributed considerably to the overall purity drop when the crystallizers operated continuously while, in the batch tests, temperature variations in the crystallizer were accompanied by corresponding variations in mother liquor purity. While addition of dilution molasses proved effective in reducing massecuite viscosity, the need for caution in using this measure is stressed, since otherwise there is risk of substantial mother liquor purity rise. One cause for concern was a purity rise observed in the massecuite after discharge from the crystallizers; this was to be investigated further during the subsequent crushing season.

BEET SUGAR MANUFACTURE

Apparatus for investigation of the quality of evaporator condensate. H. Zaorska, S. Zagrodzki, M. Ludwicki and S. M. Zagrodzki. *Gaz. Cukr.*, 1978, **86**, 73-76 *(Polish)*. Tests on the determination of ammonia and sugar in evaporator condensate used as boiler feed are reported. The inductometer system previously described[1] was found to be highly sensitive to changes in sugar contents when 15°Bx thin juice was added to condensate in quantities of 0.1-20 cm^3 juice per 100 dm^3 pure condensate. Comparison was made between the inductometer scale reading and the results of the α-naphthol reaction. At up to 0.75 ppm sugar, there was no reaction with α-naphthol, while there was a gradual rise in the inductometer reading. Chart samples are reproduced to show the recording of condensate ammonia content when juice contained moderate, high and fluctuating levels of nitrogen. Observations at a number of factories have shown that the apparatus facilitates operations and prevents boiler breakdown resulting from sugar-contaminated feedwater.

The process computer at Tulln sugar factory. J. Dober. *Ernährung*, 1978, **2**, 157-161, 261-262, 354-355 *(German)*. — Details are given of the computerized control system used for diffusion and juice purification at Tulln, and performance of the scheme is discussed with the aid of charts. Teething problems were encountered with the diffusion control system, but were not associated with the hardware but with the programming of the newly installed tower of 6100 tonnes daily beet throughput. A programme was devised, however, and is briefly described. Further control loops to be incorporated are mentioned. The system used at Tulln includes a Siemens 4004 central computer and a 330 process reporter. The 304 process computer originally used[2] had a magnetic core memory with a storage capacity of only 16 k-words with 24 bits each, whereas the 330 with which it was replaced has a capacity of 64 words with 16 bits each.

Treatment of first carbonatation muddy juice. G. Giordano. *Ind. Sacc. Ital.*, 1978, **71**, 76-77 *(Italian)*. It is stressed that the aim of 1st carbonatation juice treatment is to obtain as clear a juice as is possible and recover the highest possible quantity of sugar from the precipitated mud. While there have been many different juice purification schemes developed in order to increase efficiency, they are all based on three fundamental operations, *viz.* progressive preliming, continuous carbonatation and recycling of some of the 1st carbonatation mud to raw juice. Examples are cited of variants of individual stages in juice purification which, in fact, involve difficulties and risks to juice quality. Modern trends in carbonatation are indicated by examples of three factories, having daily beet slices of 9000, 12,000 and 15,000 tonnes. The merits and demerits of various practices such as use of filter-thickeners and flocculants, mud centrifuging and partial juice purification by recycling are considered, and the question of mud density and non-sugars: CaO ratio examined. The idea is suggested that in the future conventional juice purification could be replaced by raw juice ion exchange.

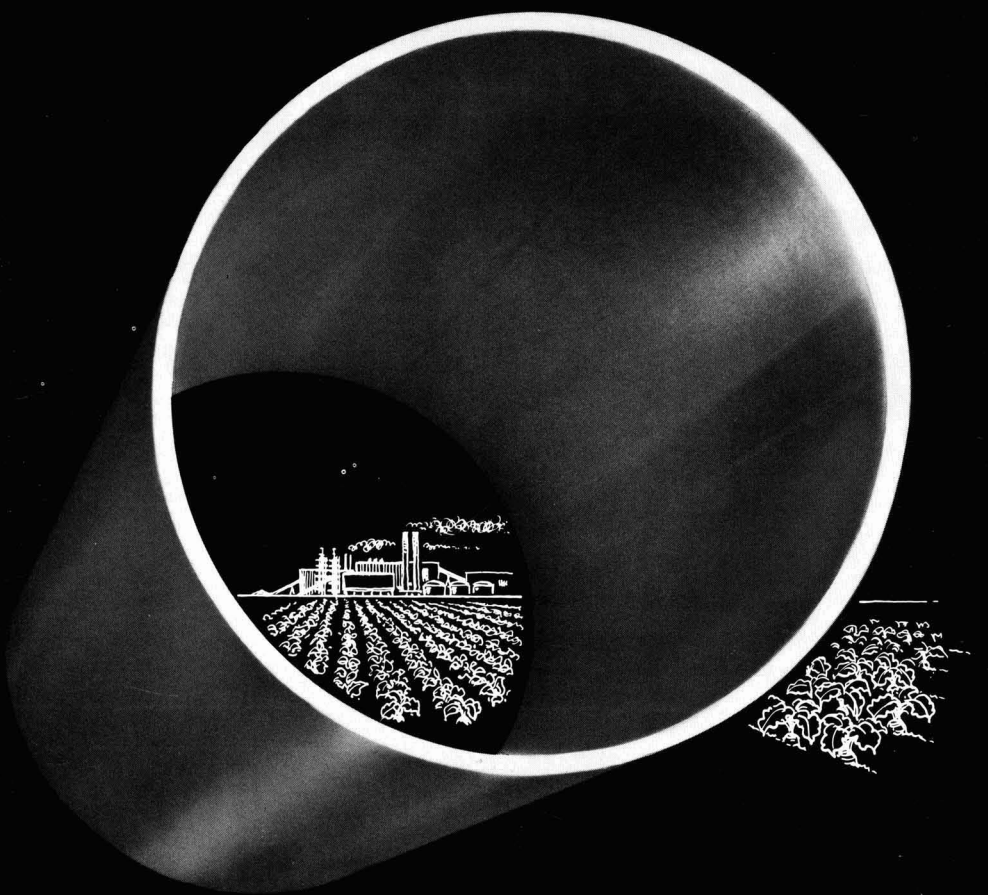
The treatment of 1st carbonatation muddy juice at Minerbio sugar factory of Co.Pro.B. (Cooperativa Produttori Bieticoli). F. Buia. *Ind. Sacc. Ital.*, 1978, **71**, 78-79 *(Italian)*. — First carbonatation juice is split into three fractions and treated by three different means before being combined for 2nd carbonatation. One fraction is treated by two mechanical clarifiers in parallel (both having three trays, but one having 16 m^2 settling surface while the other has 21 m^2) followed by two vacuum filters. Under normal settling conditions, 3 ppm flocculant is added, equivalent to 1200-1500 tonnes of beet per day. The second fraction is handled by two static settlers in parallel, each having nine trays and a capacity equivalent to 1500-2000 tonnes of beet per day, followed by two filter presses, each of which can yield an average of 6 tonnes of 60% dry solids mud per hr from juice equivalent to 60 tonnes of beet per hr. The third fraction is treated by a Gaudfrin universal filter having a throughput equivalent to 1500-1700 tonnes of beet per day. The use of the three different stations allows for great flexibility according to the processing conditions and state of the beet. The advantage of flocculant addition in terms of the filtration coefficient F_k is indicated.

New type series of juice heater. K. Urbaniec and M. Kulig. *Gaz. Cukr.*, 1978, **86**, 102-105 *(Polish)*. — Information is given on a new type series of vertical juice heater manufactured by Chemadex having six and twelve tube runs, respectively, and heating surfaces ranging from 40 to 300 m^2.

Equipment for conveying undiluted carbonatation mud. Z. Kemblowski, M. Dziubiński and J. Sek. *Gaz. Cukr.*, 1978, **86**, 123-124 *(Polish)*. — Disadvantages of 1:1 dilution of carbonatation mud for conveying purposes are listed. Since carbonatation mud is thixotropic, its viscosity can be reduced by 50-63% by rapid shearing to allow it to be transferred undiluted by centrifugal pump along a pipeline. Such a system, the subject of Polish Patent 185998, was tested on laboratory and pilot-plant scale; a prototype was installed at Leśmierz sugar factory for the 1977/78 campaign. The filter cake from the carbonatation juice filters drops onto a screw conveyor and passes down a hopper to a disintegrator, which takes the form of a horizontal tank with a mixer rotating at 600 rpm. A centrifugal pump installed at the end of the tank away from the feed point compresses the cake (of 51% average dry solids) before transferring it to a large centrifugal pump which feeds the cake into a 220-m, 80-mm i.d. pipeline. Throughput of the system is 8 tonnes.hr^{-1}; performance has been satisfactory, giving required values of parameters.

Tests on recovery of ammonium carbonate from delimed thin juice in a packed column. S. Zagrodzki, S. Wawro and K. Lisik. *Gaz. Cukr.*, 1978, **86**, 127-129 *(Polish)*. Tests on recovery of ammonium carbonate from delimed juice[3] are reported. The system used incorporated a rectifying column, packed with Bialecki rings, with a

[1] *I.S.J.*, 1974, **76**, 199-200.
[2] See Dober: *ibid.*, 1975, **77**, 314.
[3] Zagrodzki & Zaorska: *ibid.*, 1973, **75**, 254.



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This is used to reduce cane samples into a fine condition to facilitate determination of fibre content, etc. The ground cane is retained in a receiving bin which is sealed to minimise wind-age and resultant moisture loss. The juice is evenly spread throughout the product.

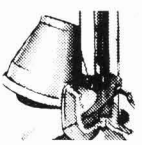
Above left Model 265B will grind prepared cane or that which has come from a pre-breaker. It will also take full stalks in-cluding the tops and roots. The opening through which the cane is fed is 6" dia. (152 mm). Power by 10 h.p. motor.

Above centre Model 265 B.M. is identical to the Model 265B except that it has two smaller inlet funnels and will only han-dle stalks. Inlet diameter 2½" (63 mm). It is fast in operation. It has a water inlet on top so that the machine can be flushed out at the end of tests while still running. This shows machine with receiving bin.

Above right Illustration of internal cutting arrangement. The cutters which are mounted on a vertical spindle perform a scissors action with the four blocks in the head of the ma-chine. Screen plates with holes of various sizes are available. DIMENSIONS: Cutter grinder. (Packed 29" x 51" x 53") = 45.5 c.ft. (1.285 m³) Weight 1100 lb. (499 kg.)

The JEFFCO model 291 Wet Disintegrator

The "Jeffco" Wet Disintegrator Model 291 (at left) converts a measured quantity of cane and water to a well-nigh liquid con-dition. It operates with a 3 h.p. motor, has a 9 litre capacity bowl which has a water jacket to enable temperature control. Bowl tilts for easy emptying. It has a timer which cuts the machine off automatically at preselected time.



Bowl in emptying position

Bowl in operating position

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plate column and partial condenser above and a steam generator below. Thin juice containing just less than 17 meq.litre^{-1} NH_3 was fed to the top of the condenser at 93°C, while the exhausted juice left the base of the rectifying column at 103°C. Two series of tests were carried out, one at a flow rate of 20 litres.hr^{-1} and the other at 30 litres.hr^{-1}. At the lower flow rate, all the ammonia added to the juice for deliming was removed in 2.3% of the distillate, at which the NH_3 concentration was 438 meq.litre^{-1}. At the higher flow rate 2.84% of the distillate had to be collected for complete removal of the added ammonia.

Experience in operation of the juice purification station at Sambor sugar factory. K. P. Zakharov, N. I. Zharinov, A. Ya. Limanskaya, V. F. Malyuk, M. I. Zhenchuk and F. F. Zabuga. *Sakhar Prom.*, 1978, (8), 21-27 *(Russian)*. Details are given of the juice purification scheme at Sambor, where juice from a tower diffuser and a DDS diffuser is subjected to progressive preliming in a Brieghel-Müller trough followed by fractional cold and hot liming in three vessels. Advantages of the system over the standard scheme are indicated by the results of tests, showing the effects on 1st carbonatation juice settling and filtration, thin and thick juice purity, lime salts and reducing sugars contents and thick juice colour.

Experience in operation of No.2 "Petrovskii" sugar factory with reduced consumption of limestone. Yu. F. Tsyukalo *et al. Sakhar. Prom.*, 1978, (8), 27-31 *(Russian)*. — Details are given of the juice purification system used at this Soviet factory, including the use of a Brieghel-Müller progressive prelimer, spray-type 1st carbonatation vessel and filter-thickeners for 1st carbonatation mud. Fractional cold and hot liming is incorporated. The system has permitted improvements in juice quality, with reduced losses, and cut limestone consumption in the 1977/78 campaign to 5.1% on weight of beet, compared with an average of 7.99% for other factories in the region.

Experience in installing and operating FiLS filters at Zhashkov sugar factory. N. A. Kavun. *Sakhar. Prom.*, 1978, (8), 31-34 *(Russian)*. — The advantages of the FiLS-60 filter-thickener are discussed in an account of the results achieved with a battery of eight installed at the author's factory in 1977. Advice is given on their operation, and particular stress is laid on the fact that their performance can be impaired by processing of juice from unhealthy beets. During their first campaign, their throughput was, at best, half of the nominal.

A cyclone for trapping sugar dust. G. A. Abazyan. *Sakhar. Prom.*, 1978, (8), 45-46 *(Russian)*. — Details are given of a wet separator installed at the author's factory. When the solution formed from the sugar dust reaches 50% dry solids, it is discharged under gravity to the low-grade melter.

Our conclusions and suggestions on payment for beet on the basis of sugar content. G. I. Bereschuk. *Sakhar. Prom.*, 1978,(8), 55-57 *(Russian)*. — Means by which the beet payment system based on sucrose content and the quality of beet can be improved in the USSR are suggested on the basis of experience at the author's factory.

Beet payment on sugar content. M. N. Kozlenko. *Sakhar. Prom.*, 1978, (8), 60-62 *(Russian)*. — Experience with the beet payment system is described, and the need for greater attention to beet quality emphasized.

The expediency of processing beet pieces and tails. N. A. Arkhipovich, V. A. Lagoda and E. A. Grivtseva. *Sakhar. Prom.*, 1978, (8), 62-64 *(Russian)*. — On the basis of sugar content, the authors consider that beet fragments and tails should be processed rather than merely used as animal fodder, although it is admitted that the quality of juice from them may be sufficiently low as to have an adverse effect on factory performance.

Application of a computer for data logging and processing in factory monitoring at CSM. C . C . Bleyenberg, P. W. van der Poel, N. H. M. de Visser and J. Konings. *Zuckerind.*, 1978, **103**, 651-654 *(German)*. — See *I.S.J.*, 1979, **81**, 168-173.

Application of a process computer for data logging and processing in factory monitoring. Experience from the factory laboratory of the Enns factory of Sugana Zucker Ges.m.b.H. H. Rudolf, E. Steinbauer and P. Wagner. *Zuckerind.*, 1978, **103**, 654-659 *(German)*. Descriptions are given of the computerized system at Enns sugar factory laboratory and of its operation. Information is given on the individual components, including the Data General "Nova 2/10" process computer for which programmes are coded in BASIC language, and on the automatic sampling procedure. A logic diagram is presented, and results obtained with the system and future plans are discussed.

Double endless belt screen presses for carbonatation mud dewatering. H. Zoidl. *Zuckerind.*, 1978, **103**, 664-665 *(German)*. — Pilot-plant tests conducted at Enns sugar factory on carbonatation mud dewatering are reported. The principle on which the system works is the pressing of the mud between two perforated endless belts. Results with a belt having an effective width of 32 cm included a final dry solids content of up to 80% at a specific throughput of 2000 kg dry solids per hr.m^{-1} working width. Energy consumption was 1.2 kW per tonne of dry solids.

Analysis of a combined extraction process relative to rotary diffusers. N. V. Pogorelova and V. M. Lysyanskii. *Izv. Vuzov., Pishch Tekh.*, 1978, (3), 119-121 *(Russian)*. The theory of diffusion is examined, whereby the counter-current process throughout the length of the diffuser is combined with direct flow as in the individual sections of a rotary diffuser. The change in losses brought about by replacement of one or more stages in the counter-current process by an equal number of stages in the direct flow process, with counter-current flow between each pair of stages, is calculated, as is the effect of substitution of stages in the combined process for the direct flow process. The optimum number of stages at which losses in pulp are minimal is calculated, and the number (28) in Soviet-built rotary diffusers shown to be too small.

Calculation of the optimum length of cossettes. Yu. A. Terent'ev, A. A. Machkovskii and V. N. Trubenko. *Izv. Vuzov., Pishch Tekh.*, 1978, (3), 168-170 *(Russian)*. Investigations of optimum cossette length at which the sugar extraction rate is maximum are reported. Results of tests at 70°C showed that optimum for a DDS diffuser was a cossette length of 10.35 m/100 g.

SUGAR REFINING

Removal of some polysaccharides in refineries. E. J. Roberts, M. A. Clarke, M. A. Godshall and F. G. Carpenter. *Sugar J.*, 1978, **40**, (8), 21-23. – Samples of intermediate products from two refineries were analysed for their polysaccharide contents in order to evaluate the effectiveness of processes in removal of these impurities. One refinery used phosphatation, while the other used carbonatation. At both, most polysaccharides were removed in affination and boiling, while carbonatation was more effective than phosphatation; bone char treatment after carbonatation was better than after phosphatation. Much of the impurity removed by affination was reintroduced in the form of re-cycled sweet-water to the melter and for remelt liquor mingling.

Influence of a liquor concentrator on the heat balance of the boiler house of a central refinery. R. de los Rios. *Centro Azúcar*, 1978, **5**, (1), 107-118 *(Spanish)*. – In Cuban refineries annexed to raw sugar factories, the filtered liquor, of 50-55°Bx, is sent to the pans for boiling of three strikes of refined sugar. Calculations are presented for the pre-concentration of the liquor to 68°Bx in a double-effect concentrator to examine the effect on the heat balance of the combined plant and the economic value of the steam saved.

Modern instrumentation and control of the sugar production process. T. Ozeki and M. Ishida. *Hitachi Hyoron*, 1976, **58**, (3), 28-32; through *S.I.A.*, 1978, **40**, Abs. 78-463. – The direct digital control of the sugar refining process by the Hitachi "Unitrol Σ Series" system is described. Each part of the process may be closely controlled and process information may be communicated efficiently to the operator by a cathode ray tube; a saving in labour is thereby achieved. Using this system, the process may be carried out in greater safety as deviations may be detected and corrected easily. Productivity is improved and more uniform since variations between individual operators are eliminated; the consumption of steam and electric power by the vacuum pans is decreased. The system requires little maintenance since highly reliable and long-lasting semiconductor components are used instead of contact relays. The microcomputer software may be changed readily.

Effect of adsorption of reactants by oxidized carbons on the kinetic characteristics of the sucrose inversion process. A. A. Larina and V. G. Aleinikov. *Ukr. Khim. Zhurn.*, 1978, **44**, 498-502 *(Russian)*. – Investigations are reported on the use of oxidized carbons as catalysts for sucrose inversion, wherein it was found that the results of catalysis were masked by sucrose losses by adsorption on the carbons[1]. Adsorption, as indicated by deviations in the angle of rotation of the optically active sugars, sucrose, dextrose and levulose, from that obtained without carbon at temperatures of 25°, 50° and 75°, was greater when the degree of inversion was low (the sucrose concentration then being much greater than that of the reaction products) and became negligible by the end of the process for all carbons tested. In the absence of sucrose, adsorption of the invert sugars alone caused little change in the angle of rotation. Adsorption of dextrose fell markedly with rise in temperature, whereas a marked fall in sucrose adsorption occurred only with rise in temperature from 50° to 75°C; with standard technical carbons, temperatures in the range 25°-50°C had practically no effect. The adsorptive properties of the carbons had little effect on inversion itself.

On the demineralization of molasses by electrodialysis. T. Hiramoto. *Proc. Research Soc. Japan Sugar Refineries' Tech.*, 1978, **28**, 15-21 *(Japanese)*. – Electrodialysis of low-grade refinery molasses was investigated. It was found that, as demineralization proceeded, the voltage at the liming current density fell; when a dialyser is operated at constant voltage, the voltage should be set lower than that at the limiting current density in the final demineralization stage. Both the limiting current density and corresponding voltage rose with increase in the treatment temperature, leading to an increase in the dialyser throughput. However, the temperature was limited by the heat stability of both membrane and chamber frame. The optimum molasses Brix was about 35°, at which the ash content was reduced from 1.0-2.1% to 0.09-0.16% (a removal efficiency of 160-200 $g.m^{-2}.hr^{-1}$); sugar losses in the effluent were 0.1-0.5% of the initial content, and no inversion was observed during dialysis, despite a slight fall in pH. After one month's operation, the capacity of the anion exchange membrane fell slightly, while that of the cation exchange membrane remained unchanged.

Drying and calcining test on waste lime cake. K. Saiga, M. Sugawara, K. Kakiya, R. Takeda, Y. Senba, M. Sakaki and M. Kugo. *Proc. Research Soc. Japan Sugar Refineries' Tech.*, 1978, **28**, 22-32 *(Japanese)*. Investigations are reported in which carbonatation mud was dried and recalcined in a pilot-scale, multi-stage, spouted-bed calciner designed to treat 420 kg of lime cake per hr. Optimum hourly capacity was 310 kg of lime cake (as dry matter), a maximum of 208 kg of limestone per hour being used as make-up. At a calcining ratio of 90.3-93.4%, a gas CO_2 content of 18.1-18.3% was obtained. It was found necessary to mix the lime cake with fluidized particles of, *e.g.*, sand, since the lime cake became viscous and adhered to the furnace wall at 500-600°C. The pressure drop across the calciner was lower than with other fluidized bed or spouted bed systems. The calcined lime slaked very rapidly, and its reaction rate was about five times greater than that of powdered lime prepared from limestone. The oil consumption as fuel was 0.216-0.300 kg per kg of calcined lime.

A vertical kiln for electrothermal regeneration of powered active carbon. S. Zagrodzki, J. Kubiak and S. M. Zagrodzki. *Gaz. Cukr.*, 1978, **86**, 97-101 *(Polish)*. Details are given of a pilot-scale electrically heated regeneration kiln in which the active carbon was exposed to a temperature of 560° for 3 hours, being carried on saucers fixed to an endless chain travelling at 6.6 $m.hr^{-1}$. The results of tests with 500 g of carbon showed that the liquor decolorizing effect of the regenerated carbon was the same as, or even slightly better than, that of fresh carbon.

[1] See also Gross & Coombs: *I.S.J.*, 1974, **76**, 187.

LABORATORY STUDIES

Determination of inorganic non-sugars by atomic absorption spectrophotometry. K. Tomobe and T. Nagasaka. *Proc. Research Soc. Japan Sugar Refineries' Tech.*, 1978, **28**, 1-8 *(Japanese)*. – Fifteen trace metals were determined in raw sugar samples from five countries by atomic absorption spectrophotometry. In all cases, both dry and wet ashing were used; details are given of the sample preparation procedures used, and values obtained for recovery of the various metals after addition of known quantities to granulated sugar and of the metal contents in raw sugar as found after the two preparation methods are tabulated. Detection and determination limits for each metal are given. The accuracy and reproducibility of the wet ashing method were found to be acceptable. Nitric acid proved more effective than hydrochloric or sulphuric acid in dissolving the ash before analysis. Its concentration should be below 1N, and 0.6N HNO_3 was used in the experiments.

Determination of fructose using hypoiodite. M. Shibosato. *Proc. Research Soc. Japan Sugar Refineries' Tech.*, 1978, **28**, 33-38 *(Japanese)*. – Tests were conducted on a method of determining levulose in the presence of dextrose, which is oxidized by hypoiodite. The technique used involves pipetting 10 - 40 cm^3 (20 cm^3) of sugar solution, containing about 250 mg of levulose and 0 - 250 mg of dextrose, into a 100-cm^3 flask which is then pre-cooled in a refrigerator at about 3°C; 10 cm^3 of 1N iodine and 5 cm^3 of 2.5N NaOH are then added with vigorous mixing, and the flask then returned to the refrigerator for 30 min. 5 cm^3 of 2.5N H_2SO_4 is then added, and the iodine removed with 1M Na_2SO_3; a few drops of 0.1% methyl orange are added, and the solution neutralized with 2.5N NaOH. After making up to 100 cm^3, the levulose is determined by the Lane & Eynon method. Levulose recovery was 99 ± 1%. The method used for calculation of the % levulose and dextrose is described. Both sugars can be found within an error of ± 1%.

On the coloured substances in affined Cuban raw sugars. T. Yamane, H. Asai, M. Sakakida and M. Kumagai. *Proc. Research Soc. Japan Sugar Refineries' Tech.*, 1978, **28**, 94-100. – Colouring matter was isolated from affined Cuban raw sugar by ion exchange, desorbed from the resin with NaCl and then liberated from the NaCl by passage through a column of "Sephadex G-25". After elution with water, the fraction corresponding to the first peak on the absorbancy curve was hydrolysed with dilute sulphuric acid and the hydrolysate examined by paper chromatography, which revealed two spots near the dextrose spot. A paper chromatogram for hydrolysed caramel showed that the spot obtained did not coincide with the spots obtained for the affined sugar colorants, which also differed from those obtained by heating invert sugar in an alkaline medium. The colorants were not of the melanoidin type, since they did not contain any nitrogen, but were formed from dehydrated and polymerized sugars.

FAO/WHO Codex Alimentarius methods of analysis for sugar. Anon. *Sugar News (Philippines)*, 1978, **54**, 7-11, 52-56. – Methods of analysis adopted by the Codex Alimentarius Commission as international referee methods are described. They include determination of sugar total solids, loss on drying at 120°C for 16 hours and at 105°C for 3 hours and sulphur dioxide, sugar products colour, raw sugar polarization and sugar conductivity ash.

Influence of a centrifugal field on sugar crystallization. A. Voilley, M. Sers and M. Loncin. *Ind. Alim. Agric.*, 1978, **95**, 493-496 *(French)*. – While an aqueous dextrose solution poured onto a watch glass and stood at 25°C showed a marked tendency to crystallize after 3 hours and formed a dense mass after 24 hours, the same solution submitted to centrifugation at 20,000 *g* had formed the same continuous mass of crystals within 3 hours at 25°C, and after 21 hours' standing at 25°C took the form of a solid granular mass. However, after the initial 3 hours, the dimensions of the crystals in both solutions were almost identical. While centrifuging was thus shown to have a marked effect on nucleation of dextrose crystals, it had little effect on sucrose crystallization because, it is suggested, of the higher viscosity of the sucrose than that of the dextrose solution at identical concentrations and because of the much greater difference in mass volume between the supersaturated dextrose solution and the solution in equilibrium than in the case of sucrose.

The specific heat of sugar solutions. J. Dobrzycki. *Gaz. Cukr.*, 1978, **86**, 121-122 *(Polish)*. – The formula of Janowski & Archangielski defining specific heat of sugar solutions in terms of Brix, temperature and purity has been modified to incorporate non-sugars and takes the form $c_T = 0.01\ [\ 4.187W + Ck\ (0.00754T - 0.3838) + Nc\ (0.00754T - 0.844)\ ]$ $kJ.kg^{-1}.°K^{-1}$, where c_T = specific heat, W = water content (%), Ck = sugar content (%), T = temperature, and Nc = non-sugars (%). At temperatures up to 90°C, calculated values agreed with experimental values to within ± 0.3%, but the relative error rose to ± 1.4% with rise in temperature up to 120°C. Equations are given for the specific heat of sugar and of heat content of juices. The equations given are suitable for computerized calculations.

Possibilities of using gel filtration for separation of colouring matter in sugar solutions. M. Wachowicz. *Gaz. Cukr.*, 1978, **86**, 125-127 *(Polish)*. – The fundamentals of gel filtration for separation of compounds according to their molecular weights are explained, and experiments reported in which the colouring matter in molasses and thick juice was fractionated by passing through a column of "Sephadex G-25", colour standards being used as a guide to separation. Five fractions were obtained from each solution, and details are given in graph and tabular form.

Venema beet testing equipment. O. Krieger. *Cukoripar*, 1978, **31**, 61-64 *(Hungarian)*. – Beet tarehouse equipment manufactured by Venema Automation B.V. of Holland is described and illustrated.

PATENTS

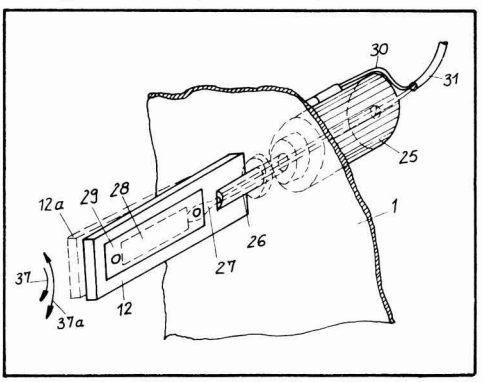
UNITED KINGDOM

Continuous centrifugal. Maschinenfabrik Buckau R. Wolf AG, of Grevenbroich, Germany. **1,446,923.** September 10, 1973; August 18, 1976. – See US Patent 3,860,165[1].

Production of levulose-containing syrups. CPC International Inc., of Englewood Cliffs, NJ, USA. **1,447,246.** October 2, 1973; August 25, 1976. – A continuous stream of dextrose solution (a starch hydrolysate) is passed into contact [at pH $\geqslant$ 7 (7.5 - 8.5)] with a preparation of xylose isomerase (otherwise known as glucose isomerase) (derived from a *Streptomyces* micro-organism) at a temperature of $\lessdot$ 50°C (but $\gtrdot$ 70°C) (50-65°C) and the effluent solution collected and levulose recovered from it, until a decrease in enzyme activity becomes apparent. The temperature is then raised by 5°C (by at least 10°C) (to $\gtrdot$ 80°C) when activity is enhanced, and treatment is continued at the higher temperature. The enzyme may be immobilized by sorption onto basic $MgCO_3$ and held in a column.

Beet diffuser. Braunschweigische Maschinenbauanstalt, of Braunschweig, Germany. **1,449,785.** February 25, 1975; September 15, 1976.

The diffusion tower is provided with a vertical transport mechanism in the form of spaced sets of paddle wheels which lift cossettes fed to the bottom of the tower against a downward stream of water. Between each set of paddle wheels are sets of baffles or guide plates 12 projecting inwardly from the wall 1 of the tower which help to raise the cossettes toward the discharge duct at the top of the tower.

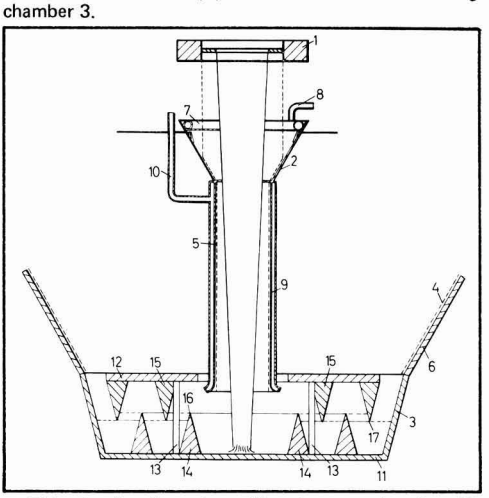


Each guide plate 12 is provided with a motor 25 coupled to the plate by a hollow shaft 26 which passes through a sealed aperture in wall 1. Measuring conductors 27 pass within shaft 26 to a strain gauge 28 retained in a recess in plate 12 by means of a removable lid 29. If there is a choking of the gap in the region of the guide plate the plate is moved by the pressure of the cossettes to e.g. position 12a. This is detected by the strain gauge and a signal sent by conductors 27 which cause the motor 25 to turn shaft 26 by a suitable amount to alter the baffle effect of the plate and so free the choke. The signal may also be used to govern the supply of cossettes to the tower, and the detection device may be an inductive measuring transducer other than a strain gauge which serves the same function.

Beet harvester. Ransomes Sims & Jefferies Ltd., of Ipswich, Suffolk. **1,449,822.** November 2, 1972; September 15, 1976.

Continuous centrifugal. Hein Lehmann AG, of Düsseldorf, Germany. **1,450,112.** October 1, 1973; September 22, 1976.

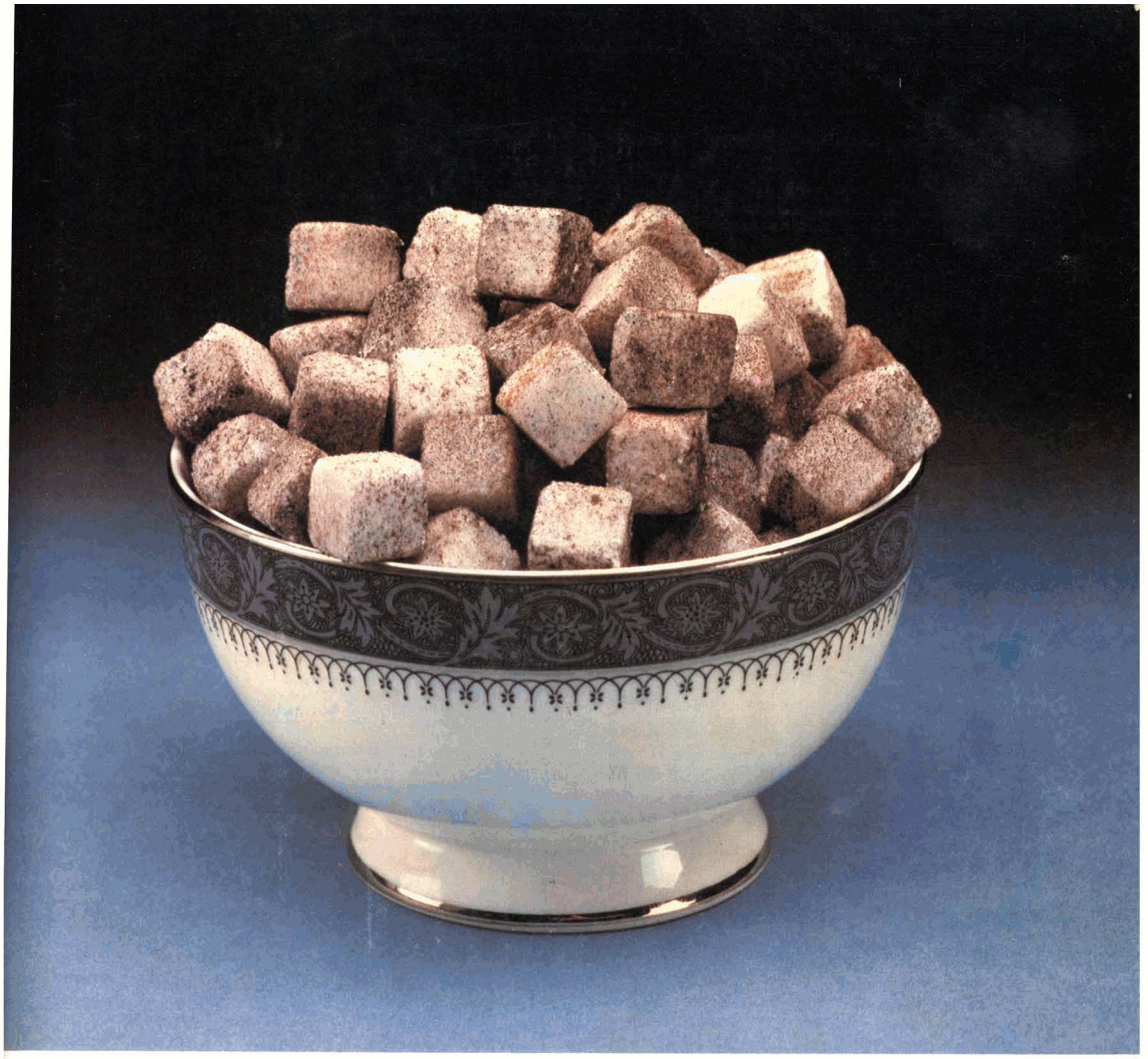
Uniform feed and addition of water or steam to a viscous low-grade massecuite is achieved in the continuous centrifugal by its supply via slide valve 1 and delivery pipe 2 to accelerating chamber 3, from which it passes onto the screen 4 on frustro-conical drum 6. To avoid caking on the inside wall 5 of pipe 2 a small supply of water from valve 1 wets wall 5 and, if the supply is insufficient, more may be provided from conduit 8 by means of annular pipe 7 which has perforations delivering onto the upper part of pipe 2. Steam may be supplied through pipe 10 and passes down the annular sleeve 9 of pipe 2 and enters the accelerating chamber 3.



This chamber has a base 11 and an annular plate 12 above it, held in place by rods 13 and rotating with the base 11 and drum 6. Projecting upwards from the base 11 are rings 14 while alternate rings 15 project downwardly from plate 12 into the chamber 3. The uppermost parts of rings 14 overlap the lowermost parts of rings 15 so that massecuite and steam and water take an alternating path as they move outwards to the gap between the edge of plate 12 and the screen 4.

[1] *I.S.J.*, 1978, **80**, 124.

Copies of specifications of United Kingdom patents can be obtained on application to The Patent Office Sale Branch, Block C, Station Square House, St. Mary Cray, Orpington, Kent, England (price 95p each). United States patent specifications are obtainable from: The Commissioner of Patents, Washington, D.C., USA 20231 (price 50 cents each).



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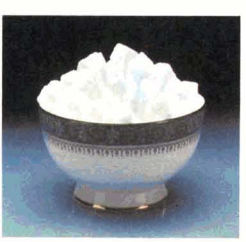

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Selective weedkiller for use in beet. Bayer AG, of Leverkusen, Germany. (A) **1,450,365.** (B) **1,450,515.** March 19, 1975; September 22, 1976.

(A) Weeds in beet are combated by application of 0.5 - 1.0 (0.5 - 5.0) kg.ha^{-1} a.i. of a herbicidal composition containing (I) 3-methyl-4-amino-6-phenyl-1,2,4-triazin-5-one and (II) 5-amino-4-chloro-2-phenyl-3-pyridazone or 3-cyclohexyl-5,6-trimethylene uracil or N-methyl-N-(2-benzothiazolyl) urea or imidazolidin-2-one-1-carboxylic acid *iso*-butylamide, and 3-cyclohexyl-5,6-trimethylene uracil or 3-methoxycarbonyl amino-phenyl-(3'-methylphenyl)-carbamate or 2-ethoxy-2,3-dihydro-3, 3-dimethyl-5-benzofuranylmethane sulphonate alone or mixed with a solid or liquid carrier, the ratio of components I and II being 1:0.1 - 1:5 (1:0.1 - 1:3) by weight.

(B) The herbicide comprises (I) 3-methyl-4-amino-6-phenyl-1,2,4-triazin-5-one and (II) a carbamic acid (thiol) ester of general formula $R_1R_2N\text{-}CO\text{-}Y\text{-}R_3$, where R_1 is a C_1-C_4 alkyl, cyclo-alkyl, phenyl or halogen-substituted phenyl group, R_2 is H or C_1-C_4 alkyl, R_3 is alkyl, alkenyl (which may be chloro-substituted) or alkynyl and Y is O or S. Alternatively II may be a compound of general formula $R_4R_5R_6C\text{-}COOR_7$, where R_4 is Cl, F, CH_3, CF_2H or C_2H_5, R_5 and R_6 are each Cl or F and R_7 is H or Na. Constitutents I and II are in a proportion of 1:0.1 - 1:10 by weight (1:0.1 - 1:5) and the herbicide is applied in a composition having 0.5 - 90% active ingredient by weight at a rate of 1 - 15 (2 - 25) kg.ha^{-1} a.i.

Continuous centrifugal. Braunschweigische Maschinenbauanstalt, of Braunschweig, Germany. **1,450,634.** June 18, 1974; September 22, 1976. — See US Patent 3,955,754[1].

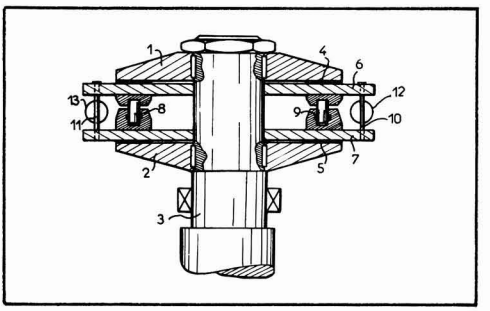
(Beet sugar) Extraction process. Great Western Sugar Co., of Denver, CO, USA. **1,450,638.** September 10, 1974; September 22, 1976. — See US Patent 3,925,097[2].

Animal fodder. Raffinerie Tirlemontoise, of Brussels, Belgium. **1,451,393.** January 11, 1974; September 29, 1976. — 15 - 45% of beet pulp, alone or mixed with hay, straw, etc., is mixed with 55 - 85% of a residual liquid or vinasse, i.e. a beet molasses from which the sugar has been removed, to give a concentrate with a content of at least 20% (30%) of total crude protein (total N x 6.25). Other additives may be included in the feed.

(Massecuite mixer) Drive mechanism. Soc. d'Exploitation d'Usines Metallurgiques, of Corbehem, France. **1,451,653.** December 11, 1973; October 6, 1976.

The shaft 3 of a mixer is required to turn at slow speed but the drive has to transmit considerable torque because of the nature of the massecuite. The drive mechanism includes two annular plates 1,2 keyed to the shaft, each having an annular disc 4,5 attached which is made of high-friction material. Between the plates are two discs 6,7 which can slide along the shaft and are not connected to it. The discs are held apart by double-acting intermediate strut jacks 8,9 and are also connected by sliding spindles 10,11, each of which is connected to a double-acting manoeuvring jack 12,13.

Pressure is supplied to the strut jacks 8,9 and this forces their large surfaces against the discs 6,7, holding them firmly against the annular friction discs 4,5 and so against plates 1,2. Pressure is then applied from the manoeuvring jacks 12,13 and this turns the whole assembly, which turns the shaft 3 through an angle. The pressure on the strut jacks 8,9 is released and the discs 6,7 moved away from plates 1 and 2 so that, when the manoeuvring jacks are reversed, the discs return to their



original position while the plates 1,2 and shaft 3 are not moved. The cycle is then repeated, when the shaft is turned through another angular increment.

Beet harvester. Comhlucht Siuicre Eireann Teo., of Dublin, Ireland. **1,451,700.** November 13, 1974; October 6, 1976.

Continuous centrifugal. Maschinefabrik Buckau R. Wolf AG, of Grevenbroich, Germany. **1,453,684.** February 4, 1974; October 27, 1976. — See US Patent 3,926,661[3].

Molasses treatment (to give a solid food ingredient). Food Technology Inc., of Chicago, IL, USA. **1,454,123.** April 3, 1974; October 27, 1976. — Beet or cane molasses is intimately mixed with at least 0.25% [20 - 40% (30%) (35%)] of an at least partially defatted soya protein flour containing 20-90% (45%) of water-soluble protein to form a slurry, and this subjected as a thin film to a heated surface for sufficient time to dehydrate the slurry. An ungelatinized starch (wheat starch) (to the extent of 0.25 - 34.75% on total weight), having a gelatinization temperature of at least 150°F may be added to the slurry before placing it on the heated surface.

Enzymatic isomerization of dextrose to levulose. Rhone-Poulenc S.A., of Paris, France. **1,454,850.** September 26, 1974; November 3, 1976. — A sulphonic or carboxylic type cation exchanger having Mg^{++} or Mg^{++} and Co^{++} cations fixed to it is brought into contact with a glucose isomerase so that this enzyme becomes combined with the cations. A dextrose solution (of not more than 60% by weight concentration) which may contain (2 - 200 ppm of) Mg^{++} and (1 - 100 ppm of) Co^{++} ions, is treated with the cation exchanger at 50 - 75°C.

Beet seed sowing machine. E. A. H. Ribouleau, of Largeasse, France. **1,455,785.** January 18, 1974; November 17, 1976.

Prevention of turbidity and/or deposits in non-alcoholic beverages containing sucrose. Naarden International N.V., of Naarden, Holland. **1,456,264.** January 30, 1974; November 24, 1976. — Soft drinks including sucrose as the main or only sweetening agent are treated with at most 0.25% (0.1%) of gum arabic on weight of sucrose.

[1] *I.S.J.*, 1979, **81**, 61.

[2] *ibid.*, 1978, **80**, 380.

[3] *ibid.*, 381.

TRADE NOTICES

Cocksedge centenary. Cocksedge & Co. Ltd., P.O.Box 41, Ipswich, Suffolk, IP1 1UW, England.

A supplement to the "East Anglian Daily Times" of July 26 is devoted to the history of Cocksedge & Co. Ltd. from its establishment, by James Samuel Cocksedge, in 1879. Very early in the development of the business there were two main fields of activity: mechanical engineering, including ferrous and non-ferrous castings, and structural engineering. Considerable strides were made in the design and manufacture of special-purpose plant, particularly sugar factory plant such as lime kilns, milk-of-lime preparation plant, diffusers, beet samplers, beet washers and beet yard equipment. Illustrations show tower diffusers built for the British Sugar Corporation at Bury St. Edmunds factory and lime plant for Ipswich factory, as well as a 40,000-tonne raw sugar silo erected for Tate & Lyle Ltd.

Stord Bartz Review 79. Stord Bartz A/S, Post Box 5001, Bergen, Norway.

Among the features in this review is a mention of the company's activities in the field of beet pulp presses, about 70 of which were sold in eleven different countries in 1978. The British Sugar Corporation is the largest single customer of Stord Bartz, having already bought 78 of their presses, including five of the latest TS-80. An article on beet pulp pressing and drying analyses the costs with the aim of answering the question as to the dry solids content at which pressing should be stopped and drying started in order to obtain minimum energy costs.

"BMA Information". Braunschweigische Maschinenbauanstalt, Postfach 3225, D-3300 Braunschweig, Germany.

Issue No.17, 1979, of "BMA Information" contains a number of very interesting items, including details of Numan cane sugar factory in Nigeria, an article concerning the technology and construction of vacuum pans, results achieved with BMA vertical cooling crystallizers, the role played by electronic data processing in engineering development and improvement, and a description of the BMA K 850 M and K 1100 M affination centrifugals. Two pages of news items include references to Schladen white sugar factory, Babbini beet pulp presses (sold by BMA under licence from the Italian company), BMA wet-type dust separators, BMA tubular bridges to house conveyors linking *e.g.* a sugar dryer to a sifter building and the latter to a sugar silo elevator tower, and the BMA polar type of beet silo at Aarberg factory in Switzerland. Activities of Starcosa GmbH and Trocknungsnlagen-GmbH (TAG), GMA subsidiaries, are also mentioned. Starcosa GmbH is concerned in the manufacture of plant for the starch and food industries and is responsible for manufacture of plant for production of alcohol from various raw materials, including molasses; TAG manufactures dryers for various products.

Brotherhood turbines and compressors. Peter Brotherhood Ltd., Lincoln Rd, Peterborough PE4 6AB, England.

A new brochure, PNS/79, has been produced which acts as a guide to the products and services of Peter Brotherhood in the field of steam turbines and compressors. The publication is in English, German and Spanish and contains many colour photographs well illustrating the company's activities.

"From strength to strength with APV evaporators". The A.P.V. Co. Ltd., P.O.Box 4, Crawley, West Sussex RH10 2QB, England.

A colourful brochure illustrates and describes various applications of APV evaporators, 1500 of which have been sold by the company and its associates during the last 20 years, each evaporator having been designed individually to customer requirements.

A complete package in fermentation alcohol. Tate & Lyle Process Technology Ltd., 55 Liddon Road, Bromley, Kent, England.

Called "PROTECH presents the complete package in Fermentation Alcohol", a new leaflet has been specially designed with a chart showing inputs, and the primary and derivative outputs resulting from the chemical and physical process. The purpose of this leaflet is to show that PROTECH can offer the whole fermentation/alcohol process package which includes inputs not only of raw materials but also economic studies, land preparation, process and financial control, engineering, energy conservation, waste control and many others. Among the primary and derivative outputs are industrial, power and potable alcohols, pharmaceuticals, polystyrene and chloroform. PROTECH can arrange the marketing, trading, handling, storage, transport and shipping of these products.

Mohno-Pumps in the sugar industry. Netzsch Mohno-Pumpen GmbH, Liebigstrasse 28, D-8264 Waldkraiburg, Germany.

Leaflet NM 41/2 illustrates and describes the Mohno or Mono pump, which employs a hardened or corrosion-resistant spiral rotor inside a spiral stator of an elastic material. The space between the two, developed as a single start thread moving continuously from the suction to the pressure side, permits the application of the pump to a wide variety of fluids in sugar factories, with a capacity up to 200 $m^3.hr^{-1}$ at a pressure head of up to 24 bar. The pump is self-priming, wear-resistant, and can be used for juices and run-offs, waste sludge, carbonatation mud, massecuite, etc.

Sugar and the chemical industry. Humphreys & Glasgow Ltd., 22 Carlisle Place, London SW1P 1JA., England.

This new brochure briefly describes the emergence of sugar as a feedstock for the organic chemicals industry. Chemicals manufactured to suit a particular local requirement may be selectively produced from sugar-based alcohol in quantities which would not be economical in a petroleum or natural gas-based chemicals complex. Process and Energy Consultants, a division of the international Humphreys & Glasgow Group, offer experienced consultancy services and can make informed and reliable feasibility studies on which sound decisions as to investment in a chemicals-from-sugar plant may be made.

Chemap equipment for fermentation, filtration, agitation. Chemap AG, Alte Landstrasse 415, CH-8708 Mannedorf, Switzerland.

This new catalogue is an assembly of brochures, some in English only but others in German and French in addition, featuring the equipment offered by Chemap AG, which includes the range of "Funda" filters, fermentation equipment and ancillaries, which include filter bags and candles, instrumentation and automatic controls. The catalogue is well illustrated and very comprehensive.

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

Energy from renewable sources

The first Inter-American Conference on Renewable Sources of Energy is to be held in New Orleans, LA, USA, during November 25-29 under the Chairmanship of Mr. de Lesseps S. Morrison, Representative for Louisiana. Sponsored jointly by the State of Louisiana, the US Agency for International Development, the American Sugar Cane League of USA Inc., Louisiana State University, Nicholls State University, Tulane University, the Central American Institute for Technological Investigation, the Permanent Secretariat for Central American Economic Integration, the Central American Bank for Economic Integration, the Latin American Chamber of Commerce, South Eastern University of Louisiana, the United Nations Development Programme and the Comisión Nacional de la Industria Azucarera de México, the Conference will take place at the Hyatt Regency Hotel.

Participants will be welcomed by the Mayor of New Orleans and the President of the Cordell Hull Foundation and will be addressed by the Governor of Louisiana on his State's commitment and by the Secretary-General of the O.A.S. on energy interdependdence in the Western Hemisphere. An independent consultant, Dr. Pincus Jawetz, will present a paper on the politico-economic realities of alcohol fuel and the Hon. Mrs. Hale Boggs will speak on establishing a renewable fuels strategy for the United States. On Monday evening participants will attend an Official State Banquet at which they will be addressed by Senator Russell B. Long of Louisiana.

On November 27 a visual presentation will be made by Construtora de Distilarias Dedini S.A. on the Brazilian experience and developing technology in that country in respect of alcohol fuel from sugar cane, while appropriate rural technology will be described in a joint paper by the US Dept. of Energy and the Central American Research Institute for Industry. Mr. A. L. Valdez of the Agency for International Development will discuss US policy and financing alternatives for renewable sources of energy in Latin America, while representatives of the various countries will describe the approaches in Central America, Austria, India, the Caribbean, Cuba and the US private sector.

The morning of November 28 will be taken up by a symposium on the state of technology in the concentration and purification of alcohol, while another in the afternoon will be concerned with the cost-effectiveness of alcohol fuel production. On the last morning of the conference, representatives of participating countries, members of the US Congress and members of official State and Regional organizations will provide a forum to consider Government action in implementation of Conference objectives, while in the afternoon, the closing plenary session will draw conclusions from its activities of the past few days and prepare a call for action.

Interested readers who wish to participate should write to Marguerite Ricks, Administrative Assistant to the Conference Coordinator, at the Cordell Hull Foundation, 1102 6th Street, New Orleans, LA 70115, U.S.A. [*Telephone* (504) 895-2626; *Telex* 6821 186 DLSM UW].

French sugar factory closure[1]. — Générale Sucrière is to close its factory at Montereau, Seine et Marne, as part of a rationalization plan which has already seen the closure of the factory at Fismes and that of the loaf sugar packing station in Marseille.

Chile sugar statistics[2]

	1978		1977		1976	
			tonnes, raw value			
Initial stocks		269,163		71,102		62,767*
Production		131,338		262,000 *		265,000*
Imports						
Argentina	36,337		194,538		39,089	
Belgium	46,761		18,485		0	
Bolivia	56,888		22,800		14,443	
Colombia	0		0		12,177	
France	21,445		7,609		0	
Peru	0		87,706		32,785	
UK	2,383		0		0	
Other countries	66,717		9		0	
		297,843		341,973		98,494
		698,344		675,075		426,261
Exports		30,839 +		26,393		0
Consumption		406,655		379,159		355,159
Final stocks		260, 850		269,163		71,102

* Calculated
\+ All to Iran

Kenya sugar production[3]. — The Chairman of Kenya Sugar Manufacturers' Association announced record production of 237,529 tonnes of white sugar in 1978; this realized more than 720 million shillings. Unfortunately, there was a cane surplus beyond the capacity of the factories.

Venezuela sugar expansion plans[4]. — The Minister of Agriculture has announced a plan to develop 50,000 hectares for sugar cane at a cost of 400 million bolivares ($93 million) to enable Venezuela to reach self-sufficiency in four years.

Turkey beet sugar campaign results, 1978/79[5]. — From an area of 276,971.8 ha, a crop of 8,836,818 tonnes of beet was produced which yielded 1,008,497 tonnes of white sugar. The total capacity of the factories was 45,600 tonnes of beet per day; six factories have a daily capacity below 2000 tonnes, eight between 2000 and 5000 tonnes and four more than 5000 tonnes.

Philippines-China trade agreement[6]. — It has been reported that the Philippines and China have concluded a long-term agreement under which the Philippines will supply China with up to one million tonnes of sugar over the next seven years in exchange for oil.

Indonesia sugar projections[7]. — It is estimated that per caput sugar consumption will increase by around 0.6 kg a year to reach 12.56 kg in 1979/80. Projected consumption, production and imports of sugar during the period to 1983 are as follows:

	Consumption	Production	Imports
		tonnes	
1979	1,610,000	1,237,000	373,000
1980	1,723,000	1,342,000	381,000
1981	1,936,000	1,448,000	488,000
1982	2,071,000	1,554,000	517,000
1983	2,220,000	1,660,000	560,000

Spanish sugar production, 1978/79[8]. — The tonnage of beets produced for the 1978/79 campaign has been given as 8,297,000 tonnes, from which the estimated outturn of white sugar is 1,040,000 tonnes, equivalent to 1,130,000 tonnes, raw value. Cane sugar production amounted to only 4500 tonnes, a substantial decrease against the previous year's 14,000 tonnes. Domestic sugar consumption rose from 980,000 tonnes in 1977/78 to 1,000,000 tonnes in 1978/79, the government agency FORPA buying the surplus production. Beet production for the 1979/80 campaign is estimated at 5,850,000 tonnes or 1,360,000 tonnes less than originally planned, owing to cutbacks in the area sown to beet. Some sources are of the opinion that the beet crop could be even lower than this. The lower area should yield some 760,000 tonnes of sugar, white value, which would mean a deficit of some 200,000 tonnes; such a shortfall would help to reduce the surplus stocks.

1 *Sucr. Belge*, 1979, **98**, 193.
2 *I.S.O. Stat. Bull.*, 1979, **38**, (6), 25.
3 *Standard Chartered Review*, June 1979, 13.
4 *Bank of London & S. America Review*, 1979, **13**, 382.
5 *Zuckerind.*, 1979, **104**, 652.
6 C. Czarnikow Ltd., *Sugar Review*, 1979, (1448), 135.
7 *Standard Chartered Review*, June 1979, 27.
8 F.O. Licht, *International Sugar Rpt.*, 1979, **111**, 396-397.

Conference on the future of sugar

A Conference sponsored by World Commodity Publishing Inc., publishers of *World Sugar Journal*, is to take place in London next year which will consider a number of factors of significance in relation to sugar supply and demand over the next several years. It will be presided over by Sir George Bishop, former Chairman of the Booker Group, and will be held at the Grosvenor Hotel during April 1-3.

A joint contribution will be made by Tate & Lyle Engineering Ltd. and Fletcher and Stewart Ltd. on the economics of production capacity expansion, while developments in regard to high fructose corn syrup in the USA, Europe and Japan will be surveyed by Tom Early of the US President's Council of Economic Advisors.

The EEC's sugar regime is due for renegotiation to take effect on July 1 and should be agreed by the Nine by the end of this year; the impact of this regime on the world market will be discussed by Simon A. Harris of S. & W. Berisford Ltd. Mr. William K. Miller, Executive Director of the International Sugar Organization, will describe the influence of the ISA on the stability of the sugar market, while a representative of the USDA is to review sugar legislation in the United States.

A representative of GEPLACEA will indicate the producers' requirements from the market, while a trade view of the market will be given by representatives of sugar dealers. Aspects of shipping, freight and insurance rates in the future will be considered by a Baltic Exchange representative, and the impact of foreign exchange fluctuations on sugar will also be discussed.

The potential for natural and low-calorie sweeteners will be considered by Dr. Wilson M. Nicol of Tate & Lyle Ltd., while his country's experience in the production of alcohol from sugar cane will be described by a Brazilian representative. Prof. A. J. Vlitos, Chief Executive of Tate & Lyle Group Research & Development, will give an account of the potential for sugar as a chemical feedstock, while an oil company representative will provide details of the marketing of alcohols as petroleum additives or substitutes. Dr. A. Yates of Booker Agriculture International will survey the alternative renewable raw materials to determine the best for alcohol production. Finally, Nick Osman, Editor of *World Sugar Journal*, will review the prospects for sugar supply and demand over the next five years.

Details of participation in the Conference may be obtained from N. G. Osman & Associates Ltd., Hamilton Road, Slough, Berkshire, England SL1 4QY.

Sri Lanka sugar situation[1]. — Sugar production in Sri Lanka has been almost static over the past three years, with 1978 sugar outturn at 25,892 tonnes, tel quel, against 23,316 tonnes, raw value in 1977 and 23,521 tonnes, raw value in 1976. On the other hand, consumption has leapt markedly, from 71,706 tonnes, raw value in 1976 to an estimated 130,000 tonnes in 1977 and 190,000 tonnes in 1978. This has required a large expansion in imports which, from 46,791 tonnes, raw value, in 1976 rose to 100,072 tonnes in 1977 and 176,162 tonnes in 1978.

Egypt sugar expansion plans[2]. — In 1979/80 Egypt plans to produce 870,000 tonnes of cane sugar, compared with 675,000 tonnes in 1978/79. Increased production is expected to be achieved mainly from the utilization of increased production capacity. The 1978 harvest was considered satisfactory, although yields have been declining as a result of increasing water salinity, which has been a problem for some time.

Philippines sugar statistics[3]

	1978	1977	1976
	tonnes, raw value		
Initial stocks	817,529	1,736,852	1,108,186
Production	2,272,929	2,623,705	2,983,982
	3,090,458	4,360,557	4,092,168
Consumption	1,086,646	968,203	840,743
Exports			
Algeria	0	33,696	37,939
China	204,923	277,418	81,104
Indonesia	10,869	13,125	0
Iraq	107,684	0	0
Japan	52,617	250,352	93,446
Korea, South	85,984	5,886	0
Malaysia	44,811	37,064	0
New Zealand	0	0	13,011
Rumania	0	0	31,907
Singapore	8,173	0	0
UK	0	0	33,521
USA	626,865	1,301,570	992,415
	1,141,926	2,574,825	1,514,573
Final stocks	861,886	817,529	1,736,852

Burma sugar production[4]. — Sugar production in Burma in the 1978/79 season totalled 48,000 tonnes as against 39,180 tonnes in the previous season.

ISO country sugar economy studies. — The latest in the series of studies on the sugar economies of individual countries, prepared by the International Sugar Organization as Volume 4 of "The World Sugar Economy: Structure and Policies", covers two countries — Canada and the United States. The study reviews developments in production, consumption and trade of the countries concerned since 1960. It is available in English but translations into French, Russian and Spanish are in preparation. Copies are available from the ISO (28 Haymarket, London SW1 Y 4SP, England) at £1.50 plus postage.

UK refinery closure[5]. — Tate & Lyle Ltd., the UK sugar refiner, is to close its 110,000 tonnes capacity plant at Greenock, in Scotland. A spokesman for the company said the need to gradually run down the refinery — formerly John Walker & Sons Ltd. — has largely arisen from a decline in UK sugar consumption and increasing competition from supplies arriving from other EEC countries. According to Tate & Lyle, UK sugar consumption has fallen from 2,660,000 tonnes in 1972 to an estimated 2,400,000 tonnes in 1979 and a forecast 2,370,000 tonnes in 1980. EEC imports have risen from 98,000 tonnes in 1973/74 to 200,000 tonnes this year, while exports from the UK have fallen from over 200,000 tonnes in 1976 to 55,000 tonnes in 1979. Tate & Lyle said it expects to make a loss of some £1,500,000 on exports this year owing to the depressed state of the world market.

Irish sugar imports and exports[6]. — Imports of sugar into Ireland fell from 52,184 tonnes, tel quel, in 1977 to 25,890 tonnes in 1978. As before, the major supplier was Barbados (15,000 tonnes in 1978 *vs.* 40,503 tonnes in 1977) while the UK also provided about the same amount in each year (2604 *vs.* 2768 tonnes). Jamaica provided 7660 tonnes in 1978 but none in 1977 while France and Mauritius provided 3546 and 4877 tonnes in 1977 but none in 1978. The UK received almost all of the sugar exports from Ireland in 1978 (25,387 tonnes out of 25,390) and was the major destination in 1977 (47,802 tonnes out of 60,322), when other 1977 exports included 4800 tonnes to Israel and 7700 tonnes to the USSR.

Taiwan sugar production[7]. — The Taiwan Sugar Corporation has announced that in 1978/79 sugar production reached 845,138 tonnes, tel quel, against about 727,000 tonnes in the previous campaign. About half is to be exported, principally to the USA, South Korea and Japan.

PERSONAL NOTES

It is with regret that we report the death on August 3 of **W. A. B. Boast**, Technical Director of the British Sugar Corporation Ltd. from 1964 to 1968, following the retirement of the late J. Campbell Macdonald. Mr. Boast had had a distinguished career in the technical management of the Corporation over many years.

[1] *I.S.O. Stat. Bull.*, 1979, **38**, (6), 81.
[2] *World Sugar J.*, 1979, **2**, (2), 40.
[3] C. Czarnikow Ltd., *Sugar Review*, 1979, (1438), 86.
[4] *Zuckerind,*, 1979, **104**, 652.
[5] F.O. Licht, *International Sugar Rpt.*, 1979, **111**, 469.
[6] C. Czarnikow Ltd., *Sugar Review*, 1979, (1451), 149.
[7] *. Zuckerind.*, 1979, **104**, 652.

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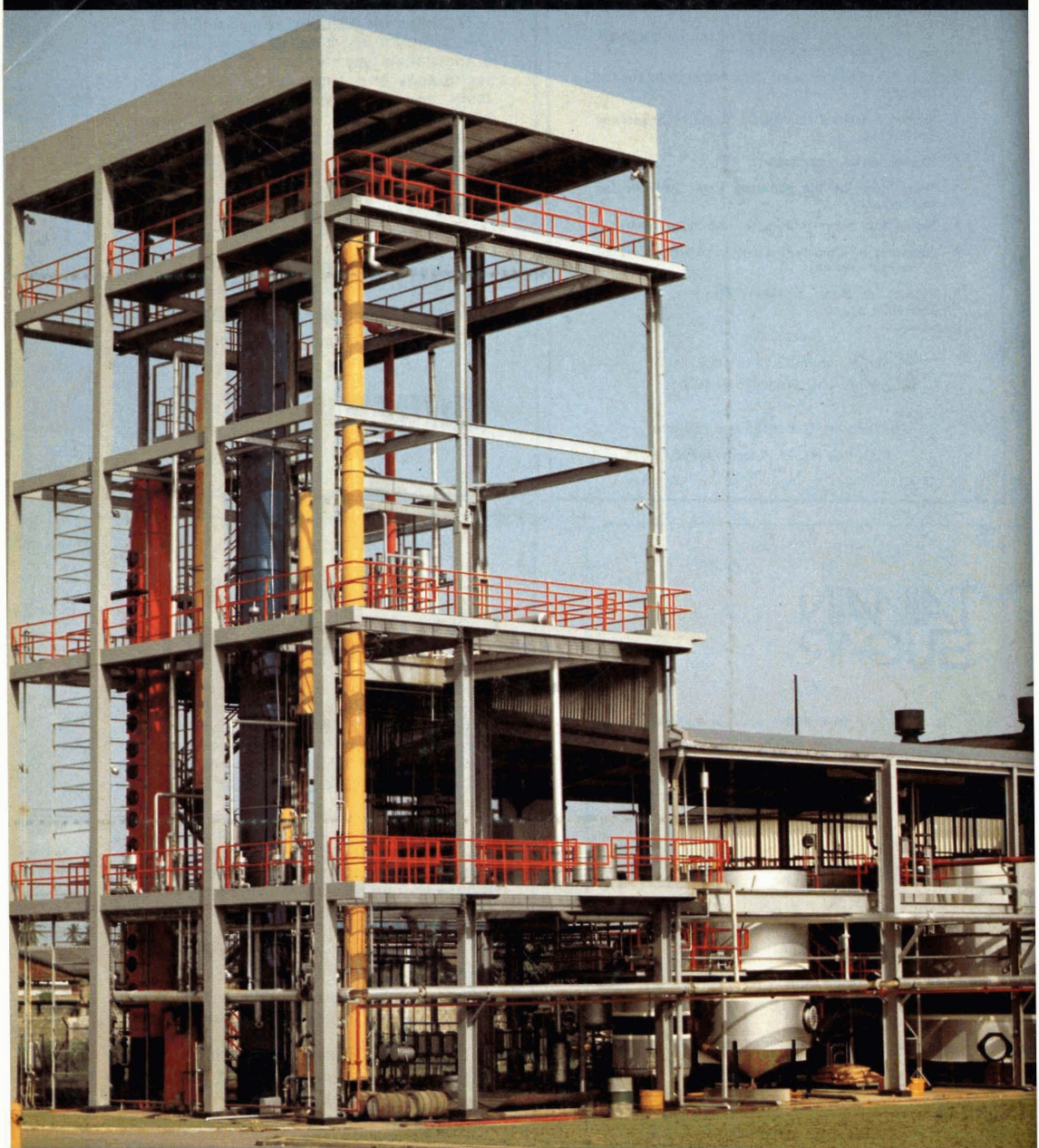

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