# Committee on Standardization of Chemical Control.

## Report for Year Ending March, 1929

### RECORD OF PROCEEDINGS.

Mr. H. H. DODDS (President) in the Chair.

**FIRST DAY, MARCH 26, 1929, at 10.30 a.m.**

The following Report was read by the Chairman, namely:—

As last year, this has been a period of steady development of chemical control in factories without any striking changes to record.

There have been six meetings of the committee during the period under review—on April 24th, September 6th, February 14th, February 26th, March 9th and March 23rd.

**Weighing of Bagasse.**

A sub-committee consisting of Messrs. Dymond, Jacobs and Moberly was appointed to study and report upon the weighing of bagasse. Their report is as follows:—

### REPORT OF SUB-COMMITTEE ON BAGASSE WEIGHING.

It is pointed out that the present method of estimating the weight of bagasse is subject to the following errors.

1. Changes in the weight of cane between weighing and crushing due to evaporation and wetting.
2. Error due to weight of poles in trucks.
3. Evaporation during crushing especially when using hot maceration.
4. Errors due to unweighed water being used for washing down mills.
5. Errors due to the use of steam injectors for pumping juice.

The above errors would be eliminated by the use of bagasse scales. There would then be no objections to the use of hot water maceration or the use of steam injectors, and water under pressure could be used for washing down mills.

The Sub-committee are therefore of the opinion that the weighing of bagasse should be made compulsory if suitable apparatus for this purpose can be provided.

The Sub-committee were also asked to consider any changes in definitions that might be rendered necessary by the proposed removal of part of the field refuse from cane prior to crushing.

The following recommendations are made:—

1. The definition of cane remains unchanged.
2. New definition.

   **Cane-chaff.**—This is that portion of the field refuse which is removed from the cane and weighed between weighing and crushing.

3. The definition of weight of bagasse then becomes weight of cane plus weight of maceration water less weight of mixed juice less weight of cane-chaff where weighed.

The definition of fibre % cane then becomes:—

$$\text{fibre \% cane} = \frac{\text{weight of fibre in bagasse} + \text{dry stuff in cane-chaff}}{\text{weight of cane.}} \times 100$$

Other definitions remain unchanged.

### STANDARD LABORATORY METHODS.

The uniform methods recommended by the committee two years ago continue to prove a useful standard for local use. Experience has shown one or two further minor points in which they might be usefully modified and the committee are of the opinion that the time has now arrived when the probationary period may be considered over, and that the methods should be revised in accordance with the experience of the past two seasons and published in printed form.

The following changes in definitions and procedure are recommended for our standard methods:—

### New Definitions.

**Last Pre-maceration Juice.**—This is the last juice expressed from the mills before the application of maceration. Care must be taken that the sample is representative of the juice expressed over the whole breadth of the rollers and represents the same cane as the sample of first crusher juice when used in calculation of "Natal" sucrose.

**"Natal" Sucrose.**—This is a factor calculated as follows:—

$$\frac{\text{Purity of First Crusher Juice} \times \text{Brix of Last Pre-maceration Juice}}{100}$$

**"Natal" Ratio.**—This is the ratio of the sucrose per cent. of cane to the "Natal" sucrose.

$$\text{Natal Ratio} = \frac{\text{Sucrose \% cane}}{\text{Natal sucrose}} \times 100$$

The reasons leading to the adoption of the above new calculations arise from an attempt to avoid the inaccuracies resulting in wet cane from the estimation of the sucrose per cent. cane from the sucrose in the first crusher juice and Java ratio for the period including the test. This forms the subject of a separate report by one of the members of the committee (Mr. G. S. Moberly).

**Trash.**—Defined as the dead leaves of the cane, whether separate or adhering.

**Field Refuse.**—The tops, dead or withered stalks, trash, soil, etc., delivered with the clean cane.

**Cane Juice.**—The juice as it exists in the cane; that is, all the soluble solids present and the total water of the cane. This term best expresses the conception of juice in the cane without making any assumption regarding its distribution in the plant or its determination.In other words, this is the cane less fibre and is identical with the definition of normal juice in certain other countries.

**Recording of Decimal Fractions.**—The Brix of materials shall be recorded to the nearest first decimal place.

Sucrose percentages shall be recorded to the nearest second decimal place.

Purities shall be recorded to the nearest first decimal place.

The temperature correction for Brix shall be calculated to the second place, and applied to the direct reading of the Brix observed to the nearest 0.05° Brix, the second decimal place of the resultant figure being discarded:

Wherever a decimal palce to be discarded is represented by a number less than 5, the preceding digit (that is, the last to be recorded) shall remain as it stands, but where the number to be discarded is greater than 5, one shall be added to the preceding digit.

Where the number to be discarded is exactly 5, the preceding digit shall be unaltered if it is an even number; if it is an odd number one shall be added to it.

| Examples | Reading after temperature correction. | Reading to be recorded. |
|---|---|---|
| Brix | 10.02 | 10.0 |
| ,, | 10.06 | 10.1 |
| ,, | 10.15 | 10.2 |
| ,, | 10.25 | 10.2 |
| Sucrose | 15.001 | 15.00 |
| ,, | 15.007 | 15.01 |
| ,, | 15.025 | 15.02 |
| ,, | 15.035 | 15.04 |
| Purity | 89.04 | 89.0 |
| ,, | 89.09 | 89.1 |
| ,, | 89.55 | 89.6 |
| ,, | 89.65 | 89.6 |

**Available Lime Test.**—It was decided to recommend the adoption of the method of the Association of Hawaiian Sugar Technologists, which is specified as follows:—

"Weigh quickly 5 grams of the finely ground sample, transfer to a small casserole containing 25 to 50 c.c. of distilled water and boil to complete the slaking. Transfer to a 250 c.c. flask containing 75 c.c. of 50 Brix solution of white sugar neutral to phenolphthalein and about 100 c.c. of distilled water, mixing rapidly. If this is quickly done, the lime will all go into solution at once. Fill to the mark, mix, filter, and titrate 25 c.c. of the filtrate diluted to about 200 c.c., with standard N/2.8 acid, using phenolphthalein as indicator. The number of c.c. required multiplied by 2 equals the percentage of available CaO in the lime."

**Determination of Calcium Salts.**—It was decided to recommend the adoption of this test for clarified juice, the procedure being detailed as follows:—

10 c.c. of clarified juice is placed in a 250 c.c. Erlenmeyer flask or glass stoppered bottle and 90 c.c. of **distilled** water added so as to bring the total volume to 100 c.c.

Standard Soap solution is run in from a burette at the rate of 0.5 c.c. at a time, and the flask closed with the hand, or stoppered bottle, is shaken violently after each addition of soap until a fine foam is formed that persists for five minutes when the flask is left at rest in an inclined position.

1 c.c of soap solution is equivalent to 0.001 gram of CaO.

Example:—Found 7.5 c.c. soap solution against 10 c.c. carbonatation clear juice = 750 milligrams CaO per litre.
Found 12.5 c.c. soap solution against 10 c.c. sulphitation clear juice = 1,250 milligrams of CaO per litre.

**Preparation of standard soap solution.**—Prepare approximately a 1½% solution in 60 per cent. alcohol by scraping 15 grams of shavings from pure Castile or Marseilles soap and dissolving them in 1 litre of hot dilute alcohol (2 parts of rectified alcohol + 1 part of water).

The solution on cooling and standing will deposit a mucilage and it is better to allow a week's rest before filtering and adjusting to standard strength against lime solution.

The lime solution for standardising the soap solution should contain 1 gram CaO per litre or its equivalent as $CaCO_3$.

Weigh exactly 1.786 grams pure $CaCO_3$ = (1.000 grams CaO) and dissolve in the least necessary quantity of dilute hydrochloric acid. Cautiously add dilute ammonia in sufficient quantity to neutralise the excess of acid and make up the solution to 1,000 c.c.

To standardise the soap solution, pipette 10 c.c. of standard lime solution into the flask that is to be used for the clarified juice titration and determine the amount of soap solution necessary to produce a permanent foam. Adjust the soap solution until 10 c.c. of soap produces the desired effect.

N.B.—100 c.c. of distilled water free from lime salts will require the addition of a few tenths of 1 c.c. soap solution for formation of foam so that this volume should be deducted from the volume of soap solution found.

In practice, the blank soap test on 100 c.c. distilled water is about .5 to .8 c.c., and the easiest way to compensate this error is to mark the burette above the zero mark with an equivalent volume and fill the burette to that mark.

**Alterations to Existing Definitions and Procedure.**—The following alterations are recommended.

**Method of sampling Bagasse.**—The second paragraph in the official methods dealing with this matter to be amended and read as follows:—

"As an alternative method a composite or automatic sample may be collected in air-tight receiver and made up for sucrose determination every hour, with a catch sample for moisture test every two hours."

**Testing of Bagasse.**—The following clause to be added to the first paragraph of the description of the test.

"To obtain a direct reading in a 600 m.m. tube use 5,740 grammes of hot water with 520 grammes of bagasse.

Basic lead acetate solution may be used if desired in place of solid lead acetate to clarify the bagasse extract.

In this case the following weights of water should be used with 520 grammes of bagasse so that the polarization shows direct the percentage of sucrose in the bagasse after 100 c.c. of the extract have been made up to 110 c.c. with basic lead acetate solution and water.

For 400 m.m. tube use 3,376 grammes of hot water.

For 600 m.m. tube use 5,195 grammes of hot water."

**Method of Sampling First Crusher Juice.**—The following method is recommended:—

A row of small holes is drilled right across the breadth of the juice chute under the carrier. Beneath the chute and below these holes is a triangular chute leading into a trough, which in turn leads back under the crusher so that the excess of juice joins the rest of the expressed juice. In this latter trough is a small hole into which can be screwed a tapered bolt, which allows for an adjustment of the quantity of juice which can escape from the hole. Two of these holes with adjusting screws can be placed in the trough, one for the planter's sample and one for the mill sample. These holes can easily be cleared if they become stopped by screwing out the tapered bolt and then screwing it back to its former position.

**Normal Juice.**—The definition to read:—"the juice expressed from the cane—it is assumed to have the Brix of the last pre-maceration juice." The clause regarding purity to be deleted.

**Brix of Total Solids.**—"The percentage of solids in solution indicated by the Brix hydrometer." The term Brix is used as a measure of a substance in solution or suspension in addition to its strict definition as a hydrometric scale.

**Refractive Solids.**—"The percentage of solids in solution as sugar indicated by the refractometer."

In view of the great convenience and relative accuracy of refractometric readings, their wider application is recommended.

**Mixed Juice.**—"The mixed juice, including dilution water, finally leaving the milling plant. No deduction is made for the suspended matter."

**Massecuites.**—"The mixture of crystals and mother liquor produced by vacuum pans and discharged therefrom."

**Molasses or Run-offs.**—"The liquor thrown off from the massecuite by the centrifugals."

**Raw Sugar.**—"Sugar which is intended for refining."

**Dilution Water.**—The portion of water used during milling that unites with the juice.

**Clerget Sucrose.**—The sucrose content determined by the Clerget or double polarization method. Apparent sucrose, that is sucrose determined by single polarization is considered equivalent to Clerget sucrose when the difference is less than the experimental error, as in bagasse and filter press cake analyses, and in Natal raw sugars having a polarization of over 96° V.

The valuation of the "Tonnage Ratio" is under review by another committee to determine whether this or some other formula would give us better information on the relative performance of different crushing plants.

The committee also point out that with one factory at least getting consistently boiling house efficiencies of over 100, it appears that our application of Noel Deer's s-j-m formula for "available sugar" ought to be revised. The following definitions are therefore suggested:—

**Recovery on Mixed Juice.**—(Formerly termed "Boiling House Recovery.") The sucrose in sugar per cent. of sucrose in mixed juice.

**Boiling House Recovery.**—This shall now read: "The sucrose in sugar per cent. of sucrose in syrup. Where the syrup is not weighed the sucrose in the syrup will be assumed to be the sucrose in the mixed juice less the sucrose in the filter press cake."

**Recovery Efficiency.**—The sucrose in sugar per cent. of available sucrose in mixed juice.

**Boiling House Efficiency.**—The sucrose in sugar per cent. of available sucrose in syrup.

$$\text{Available Sucrose \% Sucrose in Syrup} = \frac{\text{Purity of sugar (Purity of syrup} - 45) \times 100}{\text{Purity of syrup (Purity of sugar} - 45)}.$$

N.B.—Gravity purity of sugar and Clerget purity of syrup should be used.

## DATES OF CLOSING REPORTS FOR THE 1929 SEASON.

| | | | |
|---|---|---|---|
| June | 1st. | September | 28th. |
| June | 29th. | November | 2nd. |
| July | 27th. | November | 30th. |
| August | 31st. | December | 28th. |

February 1st, 1930.

## INTERNATIONAL SOCIETY OF SUGAR CANE TECHNOLOGISTS.'

The special committee on uniformity in reporting factory data of this Society have issued two reports during the year giving the definitions and usages of important terms applied in the chemical control of sugar factories in Cuba, Java, Porto Rico, Hawaii and Natal, and calling for suggestions and recommendations for international use. These reports have been carefully considered by our local committee and our suggestions have been forwarded to the international committee as desired.

Now that information and instructive statistics are more and more freely circulated between different sugar growing countries and in the world's sugar press, it is of greatest importance that the scientific and technical terms in use should carry the same meaning everywhere and the local committee desire to co-operate with the international society as fully as possible. We recognise how important it is for us to have information in sugar technological matters from the more highly developed manufacturing countries overseas, and we also realize how much our sugar industry has benefitted in accurate and efficient chemical control from our local scheme of standardization.

## METHODS OF TESTING FOR SULPHUR DIOXIDE IN SUGARS.

A considerable amount of work in the study of alternative methods has been carried out for the committee at the Experiment Station. Each of the published methods have their disadvantages and do not give concordant results when compared with each other. Before recommending the adoption of any one method the committee are awaiting the return of one of their number (Mr. L. Blacklock) from overseas who, no doubt, has recent information in this matter from European refineries.

## FURTHER INFORMATION CONSIDERED DESIRABLE IN FACTORY LABORATORY REPORTS.

**Lime Used.**—To be reported as pounds of available lime (see specified method).

**Clarified Juice.**—Calcium salts (see specified method), ash, and turbidity (Hawaiian standard using Kopke turbidimeter).

**Mixed (Sulphited) Juice.**—Sulphur dioxide to be expressed in parts per million, instead of milligrams per litre as heretofore.

**Massecuites.**—Quantity to be reported in cubic feet per ton of sugar made in each class of massecuite; also temperature of purging final massecuite to be reported.

This information, it is believed, will tend towards attaining increased efficiency in boiling house work.

**Syrup.**—Sulphur dioxide in parts per million, and ash.

**Sugar.**—Sulphur dioxide in parts per million, turbidity (Hawaiian standard using Kopke turbidimeter).

The new information called for under the above headings (except in the case of massecuites) is required in connection with the problem of maintaining the sulphur dioxide in our sugar as low as possible.

## GENERAL REMARKS.

The committee is of the opinion that the term "sugar factory" instead of "sugar mill" should be used for the manufacturing plant as a whole, reserving the term "mill" for the crushing plant only.

Attention is called to the necessity of all factories adhering as strictly as possible, both to the letter and to the spirit, to the standards and definitions which have been accepted for specifications for apparatus, and for procedure of methods of sampling and analysis.

Committee:—H. M. JACOBS, Chairman.
L. BLACKLOCK.
P. L. DRAEGER.
G. C. DYMOND.
D. McRAE.
G. S. MOBERLY.
B. E. D. PEARCE.
J. RAULT.
M. VIGER.
H. H. DODDS, Convenor.

Mr. Moberley: I would like to mention one or two points, dealing with the recording of decimal fractions. When the number expressed is less than unity it is always a good thing to put the nought in front of the decimal point, making it perfectly clear that it is an amount less than unity. The other point is that enough digits should be used after the decimal point to show the degree of accuracy to which it has been carried out, that is to say if you express sucrose to two places of decimals and it comes out to exactly 15.1, express that as 15.10 to show you were expressing it to two places of decimals.

Mr. Bechard asked if it was well recognised that 520 grammes of bagasse should be used in the testing of bagasse, and the Chairman replied that it was adopted as the standard method.

Mr. Bechard: Could not a sub-committee be appointed to investigate thoroughly the sampling of bagasse? I was under the impression that it had been done.

Chairman: I was under a similar impression. I understood that the committee was going to deal with the question of sampling also, but evidently that was not so. That might be a subject for recommendation for next season.

You might possibly like to have an opportunity of discussing this report at a later stage, in which case we may postpone discussion until later.