ON THE ESTIMATION OF THE EXTRACTION IN SUGAR HOUSES.[1]

BY M. TRUBEK.

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ONE of the most important things to be considered in the control of the work in sugar houses is the exact determination of the extraction, that is, the weight of juice obtained from 100 parts of cane. This is calculated in different ways. The raw juice, as it comes from the mill, passes through measured vessels before entering the clarifiers. From the number of the vessels filled or emptied during a certain time, the quantity of juice yielded by a certain weight of cane is determined. When working with dilution, the amount of diluting material has to be subtracted. Or the bagasse, yielded by a certain quantity of cane, is ascertained, and the weight of the cane minus the weight of the bagasse, gives the extraction.

The juice is generally measured directly in the clarifiers, and after making a correction in the volume for the higher temperature the juice has when it reaches the mark in the clarifiers, the per cent. dilution, if there is any ; any other quantities added and reintroduced, as lime, syrup washings, etc., are deducted.

The determination of the extraction by this method offers some difficulties. Among others, some of the "quantities reintroduced" are hard to control; the mark in the clarifiers is often not easily seen on account of the foam on top of the juice. Moreover, the person in charge will have to take his figures, as quantity of lime in the different clarifiers, number of clarifiers filled during a certain period, amount of syrup settlings left in the syrup tanks and water used for washing them, etc., from the workingmen, who do not give them with the necessary exactness.

It would be of great value, therefore, if a method could be found to determine the extraction from data found in the laboratory only.

In case the juice was not diluted, the extraction can be figured from the fiber in the cane and that in the bagasse.

[1] Read at the Springfield meeting.

In 1865, E. Icery, in an article entitled "De quelques recherches sur le jus de la canne à sucre et sur les modifications qu'il subit pendant le travail d'extraction à l'île Maurice,"[1] admitting the inconveniences in the old method proposed to determine the extraction from the bagasse of the cane under operation; the fiber of the latter is either known or has to be found by analysis. He proceeds as follows:

Two hundred and fifty grams of the bagasse, (care being taken that the latter represent a good average sample), were quickly extracted with luke-warm water and then dried perfectly in a drying stove.

Let B = weight of the wet bagasse.
" B' = " " " dry "
" C = fiber in the cane.
" x = weight of juice extracted, then $\frac{100\ B'}{C}$ will represent the weight of cane yielding the amount of the wet bagasse B, and

$$1.\quad \frac{100\ B'}{C} - B = x.$$

The extraction y per 100 parts cane is then found according to

$$2.\quad \frac{100\ B'}{C} : x = 100 : y;\quad y = \frac{x\ C}{B'}.$$

If a determination of the fiber in the cane is not made, the author sets

$C = 10$ for: Belloughet (Java cane).
Diard.
and $C = 11.5$ " : white or Tahitian.
Batavian.
Guingham (violet ribboned).
Penang.

The equations cited above (1 and 2) become simpler when calculating during the previous procedure the amount of dry bagasse per 100 parts of wet bagasse = fiber per cent. of bagasse.

I^a. $F_B : C = 100 : x$; II^a. $100 - x = E$, where F_B = fiber in

[1] *Ann. chim. et. Phys.*, 5, 350-410.

bagasse; $C=$ fiber in cane; $x=$ bagasse yielded by 100 parts cane; $E=$ extraction. Very often, in order to effect a more thorough exhaustion of the sucrose in the cane, water is allowed to run in fine streams on the bagasse, coming from the first set of rollers, and the resulting bagasse contains therefore a certain amount of water not belonging to the cane. In this case I determine the extraction in the following way:

If $F_{B_1}=$ fiber in diluted bagasse,
B = original bagasse corresponding to 100 parts of diluted bagasse,
F_C = fiber in cane,
x = bagasse resulting from 100 parts of cane,
E = extraction,

we have the following equations:

$$1.\quad \frac{F_{B_1} \cdot 100}{B} : F_C = 100 : x.$$

$$2.\quad 100 - x = E.$$

The unknown figures are B, x, and E, as F_{B_1} and F_C are found by analysis of the cane and its bagasse.

In order to find a third equation we determine the sucrose in the cane, the extracted juice and the resulting diluted bagasse.

Let $s=$ sucrose in cane, $s_1=$ sucrose in juice.
$s_{B_1}=$ sucrose in diluted bagasse.

In $(100-E)$ bagasse there is left $\left(s - \frac{E\,s_1}{100}\right)$ sucrose, or in

$$100 \text{ bagasse } \frac{\left(s - \frac{E\,s_1}{100}\right)100.}{100 - E}$$

We have therefore as the third equation:

$$3.\quad \frac{\dfrac{\left(s - \frac{E\,s_1}{100}\right)100}{100-E}}{s_{B_1}} = \frac{100}{B}$$

After eliminating we have

$$E = \frac{a}{2} \pm \sqrt{b + \left(\frac{a}{2}\right)^2}, \text{ where}$$

$$a = \frac{100\ F_{B_1}\ (s + s_1) - 100\ s_{B_1}\ F_C}{s_1\ F_{B_1}}$$

$$b = \frac{10000\ (F_C\ s_{B_1} - F_{B_1}\ s)}{s_1\ F_{B_1}}$$

In the equation for E only the minus sign has to be taken.

Example :

	Nov. 29, 1894.	Dec. 1, 1894.
Tons ground..................	1105	1056

Regular feed on the carrier :

$F_{B_1} = 41.94$; $F_C = 10.64$; $s_1 = 10.95$; $s = 9.785$; $\dot{s}_{B_1} = 4.80$.

Substituting in the equation for E we have

$$E = 89.12 - \sqrt{-7824.05 + 7942.37}$$

$$= 78.25 \text{ per cent.}$$

It is obvious that in order to get good results extreme care must be taken to obtain an average sample of the cane and the bagasse, or the results will not represent the true facts. I will admit that it is not easy to obtain such an average sample and that exact methods for determination of the woody fiber and sucrose in cane and bagasse have not yet been found. In the future I will report more fully on this subject.

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ON SILICIDES OF IRON.

BY G. DE CHALMOT.

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IRON and silicon readily unite at a high temperature. Silicides of iron of a definite composition have been made by Hahn.[1] He obtained compounds of the formula : Fe_2Si, $FeSi$, and $FeSi_2$.

Since carbon readily reduces silica at the temperature of the electric arc, I expected to obtain silicides of iron with a large percentage of silicon by heating iron with silicon and carbon in an electric furnace. Iron filings, charcoal and sand were used and a silicide was obtained that contained from twenty-three to twenty-seven per cent. of silicon. In order to obtain this compound there must be an excess of sand and carbon. This com-

[1] *Ann. Chem.* (Liebig), 129. 57.