

# Some Notes on Sugar Boiling Systems

By COLIN W. WADDELL

Probably the last word concerning the art of sugar boiling never will be written, because it is beset with so many variables. Some notes and conclusions are here recorded in the hope that they may prove of interest or value to boiling-house men who are faced with similar problems elsewhere.

At the beginning of the 1936-37 milling season many factories in the Philippine Islands were called upon to produce raw sugar of about 1 per cent. higher pol. than had been the practice formerly, without any additional equipment, and with a rather venerable array of past capacity and recovery records to be met or improved upon.

The increased load at pan and centrifugal stations sharply demonstrated the importance of selecting a "boiling system" best adapted to local conditions.

Weekly factory runs were made with the following:—

- (a) Three Masseccuite: in-boiled "A", Straight "B" and "C"  
 A: 15% Seed Magma, 70% Syrup, 15% A-Molasses.  
 B: 12% Seed Magma, 21% Syrup, 67% A-Molasses.  
 C: 9% Syrup, 91% B-Molasses.
- (b) Four Masseccuite : straight.—  
 A: 10% Seed Magma, 90% Syrup.  
 B: 10% Seed Magma, 63% Syrup, 27% A-Molasses.  
 C: 10% Seed Magma, 28% Syrup, 62% B-Molasses.  
 D: 9% Syrup, 91% C-Molasses.
- (c) Three Masseccuite : in-boiled "A" and "B", straight "C"  
 A: 10% Seed Magma, 76% Syrup, 14% A-Molasses.  
 B: 10% Seed Magma, 30% Syrup, 46% A-Molasses, 14% B-Molasses.  
 C: 9% Syrup, 91% B-Molasses.
- (d) Three Masseccuite : in-boiled all Masseccuites:  
 A: 10% Seed Magma, 76% Syrup, 14% A-Molasses.  
 B: 10% Seed Magma, 43% Syrup, 38% A-Molasses, 9% B-Molasses.  
 C: 8% Syrup, 79% B-Molasses, 13% C or Final Molasses.
- (e) Modified Two-boiling System:—  
 A: 10% Seed Magma, 90% Syrup (Only 4 strikes per day).  
 B: 10% Seed Magma, 44% Syrup, 10% A-Molasses, 36% B-Molasses.  
 C: 9% Syrup, 91% B-Molasses.
- (f) Three Masseccuite : straight:—  
 A: 10% Seed Magma, 90% Syrup.  
 B: 10% Seed Magma, 21% Syrup, 69% A-Molasses.  
 C: 9% Syrup, 91% B-Molasses.

A comparison of average factory results is shown in Graph No. 1, and equipment-production relationships at the Central under trial in Table I (in metric tons).

TABLE I.  
EQUIPMENT-PRODUCTION RELATIONSHIPS.

	Per ton Cane per hour boiling time.	Per ton Sugar per hour boiling time.	Per ton Fin. Mol. per hour boiling time.	Per ton Dry Non Suc. per hour boiling time.
Pans, H.S., sq. ft. . .	42.5	350	2275	1514
Crystallizers, cub. ft.	109.5	903	5868	3904
H.G. Centrifugals				
Screen area, sq. ft.	1.87	15.4	100	67
L.G. Centrifugals				
Screen area, sq. ft.	4.92	40.6	263	176

## CONCLUSION.

It will be observed that so-called "straight" boiling methods were compared with various "in-boiling" methods in a factory which was inclined to be short of pan and centrifugal capacity. Results point favourably towards system (c) Three Masseccuite, in-boiled "A" and "B", straight "C".

In operation, this system consists of "topping-off" both the "A" and the "B" Masseccuites with 14 per cent. of "A" and "B" Molasses respectively, regardless of initial syrup purity. Variations in syrup purity, and consequently the "A" Molasses purity, are taken care of by varying the proportion of these in the "B" Masseccuite, not by altering the amount of low purity molasses "in-boiled."

## COMMENTS.

In the analysis of data pertaining to factory scale comparisons like the above, many factors have to be considered, and we find it impossible to give each one its true value in relation to the problem as a whole; for example: "Tons sugar per Boiling Hour" may be increased at the expense of another like "Boiling House Recovery," regardless of the boiling system used. The best simple figure for comparing the merits of one boiling system with another is "Volume of Total Masseccuite Boiled per unit weight of Dry Non-Sucrose entering in Syrup."

In almost any cane sugar producing country we will find some staunch advocates of the so-called "straight" boiling system, while others produce equally sound evidence in favour of "in-boiling." The question of re-circulation of impurities can be calculated accurately and invariably favours "straight" boiling.

We may also reasonably expect that if we re-circulate impurities, as in the case of an "in-boiling" system, we will increase the volume of masseccuite boiled per ton sugar produced, ex-

posing the sucrose to more inversion, besides decomposing some of the impurities already present with a combined effect of increasing the "stickiness" of massecuites, which in turn will reduce capacity and increase steam consumption.

However no rule can ever be expected to fit all factories equally, due to differences in equipment-production relationships and variations in impurities present.

A factory with ample and efficient pan and centrifugal capacity, or where the nature of impurities does not seriously retard crystallization rates, as a rule will find "straight" boiling best; on the other hand, a factory which is forced to keep pans boiling under full steam pressure throughout the entire cycle may materially benefit from a little "topping-off" with low purity molasses.

An explanation for this may be based upon two facts: (1) A crystal of sucrose grows faster in a high purity mother-liquor than in a low one, other conditions being the same; (2) the rate of crystal growth is approximately proportional to the crystal surface area exposed to the mother-liquor.

At a factory which is short of pan capacity and has to force evaporation rates to the maximum throughout, by selecting an "in-boiling" system we can build up a greater proportion of the strike on high purity material with its fast crystallizing rate, and thus avoid false grain formation in spite of the fast evaporation rate. Then, towards the end of the strike, when it is necessary to take on the low purity molasses in order to finish at the required massecuite purity, we have already established a large crystal surface area which compensates, to some extent, the reducing rate of crystal growth and enables the rapid evaporation rate to be continued without danger of false grain.

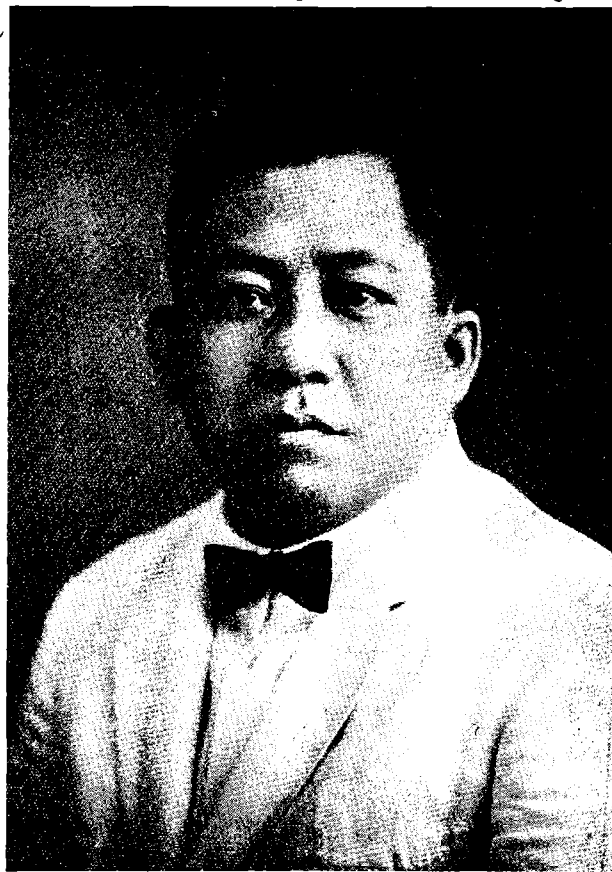
#### SUMMARY.

(1) A comparison of average weekly results from the operation of six different boiling systems in a factory which was rather short of pan and centrifugal equipment for the quantity and nature of impurities handled, resulted in the conclusion that faster and better work was done when commercial sugar massecuites were "topped-off" with 10 to 15 per cent. of molasses of the same grade of massecuite, than when any of the so-called "straight" methods were used.

(2) Attention is drawn to the importance of taking numerous factors into consideration before passing judgment upon any particular system, and support given to the importance of "volume of total massecuite boiled per unit weight of dry non-sucrose entering in syrup." The system which under existing conditions at any factory, reduces this figure most will almost invariably give the best overall results, regardless of whether this is achieved by "straight or by "in-boiling" systems.

(3) An explanation is submitted for the poorer recoveries obtained at a factory where pans had to be forced to maximum evaporation rates, when massecuites were boiled "straight" than when a little "in-boiling" was practised.—(*The International Sugar Journal*).

## AZUCAREROS PREEMINENTES



Don MANUEL URQUICO

Distinguido azucarero de Tarlac y una de las columnas más sólidas de la industria del azúcar en Luzon, nació en Tárlac, Tárlac el 28 de abril de 1883.

Cursó sus primeros estudios en el Colegio de Letrán, tomando luego algunos principios de derecho en la Escuela de Derecho de Manila.

Es actualmente director de la Central Azucarrera de Tarlac, al mismo tiempo que plantador progresivo y Presidente de la Asociación de Plantadores de Tárlac.

Como plantador y azucarero activo abriga temores por el futuro de la industria ante la perspectiva de una vida independiente atada, sin embargo, con fuertes cordeles de limitaciones e impuestos; pero cree que tal vez se pueda salvarla de un destino nebuloso con los esfuerzos de un sólido frente de los azucareros que con enérgica batalla logre para ella mejor porvenir.

Sobre el jornal mínimo opina que la clase obrera también necesita del Nuevo Trato, pero, que el tipo de jornal necesariamente varíe según las circunstancias. Las plantaciones y fábricas en la provincia de Tárlac están dispuestas a elevar los jornales hasta donde sea menester siempre y cuando sea razonable.

Como plantador y centralista el Sr. Urquico es un colaborador activo en todas las empresas y movimientos que tiendan no sólo a desarrollar la industria azucarera sino más aún a contrarrestar los obstáculos que, puedan salir al paso, en forma de legislaciones onerosas para su futuro.