

AN AID TO PAN BOILING

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It would appear that the use of instruments to control vacuum pan operation in South Africa, has not developed to the degree that it has in certain other sugar producing countries. Many mills still rely entirely on the sense of sight and touch of their pan boilers for the sugar they produce.

The author suggests the following as possible reasons for this state of affairs:—

1. The doubt that exists as to the possibilities and limitations of such pan control instruments, i.e. will the instrument faithfully indicate the condition of the massecuite in the pan, and, if so, will this result in a better sugar recovery?

2. The cost of these instruments is fairly high.

3. In case of breakdown, the repairs required are often beyond the capabilities of the mill staffs. This leads to delay while repairs are being carried out in Durban.

4. Most pan boilers and sometimes factory staff as well, do not understand the operation of the instrument. This causes lack of interest and the instrument is not used to the best advantage.

Most of the above points have been overcome by a new type of boiling control instrument, developed at Renishaw over the past few years.

It is very simple, robust and inexpensive, and would appear to give a high degree of uniformity between strikes.

In principle the instrument is merely an application of the galvanic primary cell. The cell, in this case, being made up of an electrode of one metal as anode, the massecuite (which contains ionized salts) as the electrolyte, and another electrode, of different metal to the first, as cathode.

In practice, the two electrodes, which are insulated from each other, are bolted through the pan wall into the massecuite space. The set-up is much the same as that of the normal conductivity electrodes; except that they are of different metals. At this stage it should be mentioned, that the pan wall can be used as one electrode, in which case it is necessary to insert only one electrode into the massecuite.

When using this cell as a boiling control instrument, the two electrodes are connected through a milliammeter, so that the current generated by the cell may be measured.

This current varies with conditions in the pan for two major reasons. Firstly the cell potential varies with the conditions, roughly, the higher the concentration, the lower the potential and hence the lower the current; and secondly the higher the concentration, the greater the resistance of the massecuite and hence the lower the current.

Hence, by boiling a number of test strikes using the pan boiler's judgement and noting the current readings throughout each strike, it is possible to set up a control chart which may be followed for future strikes. This procedure is identical to that followed when installing a conventional conductivity instrument.

The graph shows a typical control chart for the boiling of a third massecuite from developed seed. In this case, the seed is drawn into the pan and boiling started at 0.57 V. and 4.0 mA. No feed is applied until the massecuite has heaved up to 0.51 V. and 3.0 mA. At this point molasses feed is started, the massecuite being lightened to 0.58 V. and 4.45 mA., then heaved up again fairly slowly to 0.45 V. and 2.2 mA., after which boiling is continued as indicated by the chart.

Under the conditions employed by the author, a massecuite boiled to this chart would be struck at a brix of $100 \pm$ with a purity of $57 \pm$.

From the graph it will be seen that the current is of the order of one tenth of that normally encountered with conventional conductivity instruments. Unfortunately there is no D.C. recording instrument available at present for such small currents, so that the instrument can only be used as an indicator. However, it is possible that such a recorder will become available at a future date.

The major advantage claimed for the instrument in its present stage, is that it is wholly independent of any external source of current and therefore fluctuations in factory voltage cannot possibly effect it. This in turn means that the indicator part of the instrument needs no transformer or voltage regulator, and therefore is much less expensive to construct, and it is less liable to mechanical failure.

(For discussion on this paper see page 119.)

BOILING CONTROL CHART FOR A THIRD
MASSECUITE BOILED FROM DEVELOPED SEED

116

