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**Increase sugar house throughput by measurement and automation.**

### **ABSTRACT**

The recent increase in on-line measurements in the sugar house has shown that the process in most sugar factories is much more volatile than previously anticipated. First of all, the performance of the centrifugals is not uniform. It varies with the quality of the massecuite, it varies between the centrifugals, and it varies within each single charge. Further, the massecuite varies from batch to batch from the same crystallizer, it varies between the crystallizers, and it varies with the quality of the juice. Measurements show, that deviations of + and - 50% in the colour of the sugar leaving the centrifugals happens quite frequently and sometimes within 10 seconds. Many of the larger variations are averaged out in the drier and thereby hidden for the operators - unless an instrument displays the variations. With the right instrumentation, the operators can see what happens and adjust the equipment causing many of the variations. As a result, sugar with a much lower colour is produced - with the same effort. Naturally, the immediate reaction to this is to start a process of cost reductions, where the colour is gradually increased toward the upper limit, but still at a safe margin. The paper explains how an on-line colorimeter can display the process variations and assist in obtaining significant cost reductions.

All measurements reported have been made with Neltec ColourQ instruments installed in sugar factories. For the application in the sugar house, the instrument has been shown to be more accurate than the laboratory.

In addition to the good accuracy, the instrument has some other outstanding features. It is not affected by light from the surroundings, the measurements are not influenced by a varying distance to the sugar, and the initial calibration is stable for many years. It does not need to be updated at short intervals.

The results show, that the instrument immediately detects all problems in the centrifugals. Any variation in the crystallisation or the quality of the juice is detected as soon as the sugar leaves the centrifugals. Consequently, the colour safety margin can be greatly reduced, while at the same time eliminating the risk of manufacturing bad sugar. Should sugar with too high colour leave the centrifugals, it can immediately be sent to remelt.

For the operators and the persons responsible for the production, the instrument makes the difference between controlling the process and running after the process, while trying to compensate for errors detected hours after they started.

Most errors in the crystallizers and centrifugals highlighted by the instrument would never have been detected, if the instrument had not been installed.

The instrument pays for itself by highlighting the problems. Through active use of the results to tune the process, the payback is greatly enhanced. In factories making full use of the results, the instrument pays itself back several times per year. An installation in the Aarberg sugar factory shows that even a minor change in the process may give benefits that are worth hundreds of thousands of Euro per year. The change in the process was so small it could not be controlled by laboratory measurements, due to the time delay and the lower precision in the lab results. No other method or instrument has been reported to give an accuracy or stability in the process as seen in Aarberg.

The British Sugar factory, in Cantley, was able to reduce unnecessary remelt in the centrifugals by 24000 metric tons per year.

The largest benefits are obtained in factories that first optimise the adjustment of the centrifugals by rectifying the evident errors. As next step the amount of wash water must be optimised, and finally the consumption of lime and other chemicals may be reduced.

The meaning of the term "Colour problem" should be redefined. It has usually meant that the sugar had too high colour. Now it must include manufacture of sugar with too low colour, because the overachievement on colour has a very large cost attached. In future, shipment of sugar with a colour far below the customer's specification should be considered Bad Manufacturing Practice.

To get the benefits from the instrument the management of the factory must be committed, involved and promote the use of the instrument. Basically it is a tool and does absolutely nothing by itself. A person with power to change the process parameters must take ownership and use the results to adjust the process and the centrifugals.