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Working Screens and Operation of Continuous Sugar Centrifugal

The working screens are the most important part that can be changed on a regular bases in the continuous centrifugal. With a proper selection of working screens you can reduce the recycle load and save sugar in the molasses. A poor selection of working screens will cause poor capacity, high sugar loses in the molasses, high color sugar and poor operation. For these reasons it is important to understand working screens for continuous centrifugals.

A good working screen has hard chrome plating added to the working side of the screens to provide the maximum durability and abrasion resistance, and to extend the life of the screens. As an important note, it is important to always install the screens the working side, smaller slot side, away from the basket and towards the sugar.

Good housekeeping keeps welding slag, rod ends, loose bolts, nuts, etc. out of the massecuite. Foreign objects have damaged countless new and good working screens and backing screens. Stop rust scale in the tanks and pipes by sandblasting and painting rusty metal or replacing with stainless steel.

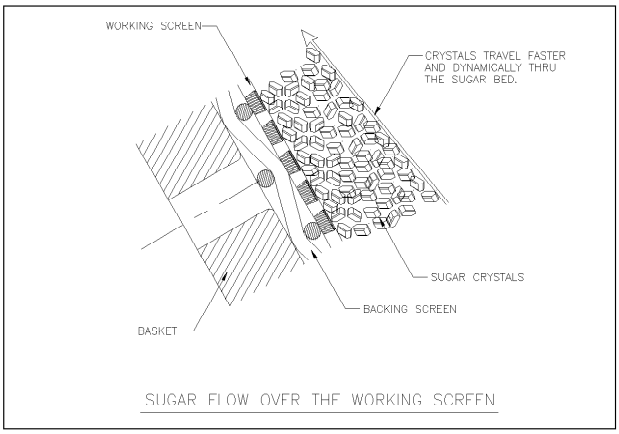
When running the centrifugal with a low grade massecuite load the basket should be as heavy as possible. Keep the color line no lower than one third to half of the lower basket. The color line is the point in the basket where the molasses has left the surface of the massecuite changing the brown color to a light color. The color line can be moved up by increasing the motor load or decreasing the amount of the wash water.

The main three ways to lower the color line are: 1.) Increase the steam and/or water to the Optimizer massecuite reheater; 2.) Increase the process wash water and/or steam; and 3.) Decrease the motor load.

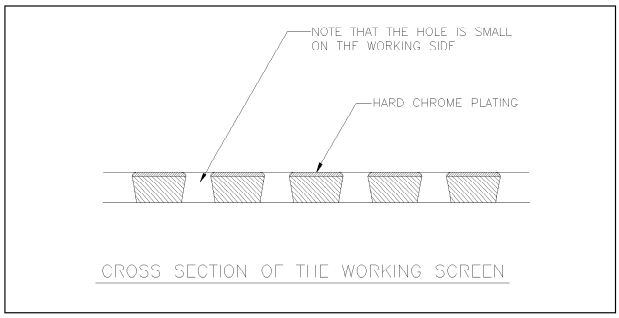
The treatment of massecuite in continuous centrifugals depends a thin layer of massecuite and/or sugar on the basket. It is important to get a uniform distribution of the massecuite onto the basket, done by the center-feed conditioner bell. There is two way the massecuite and sugar moves up the basket cone angle. While the centrifugal force separates the molasses from the sugar crystals a component of the basket angle called the pushing force causes the sugar crystals to move up the basket and be discharged from the top edge. There is a velocity profile within the sugar layer where the outer layer of crystals are moving faster than the crystals nearer the screen. The sugar is in a viscous fluid that is moving in a parabolic shape flow profile. This can allow the continuous centrifugals to process poor quality massecuite. For the best results the massecuite quality should be the same as required by a batch type centrifugal.

The second way sugar travels up the basket is by the sugar being pushed up the screen by the massecuite feed. The massecuite flow rate is controlled automatically by the motor load. The heaviest massecuite flow rate should be selected with process wash and steam heat in use. After a desired massecuite flow rate is selected allow the automatic control measures variations in the motor load and adjusts an automatic feed valve in the massecuite line to maintain this flow rate. In other words keep the sugar flowing. The automatic control operates the centrifugal at maximum efficiency with the best results for molasses purity and sugar color. A low massecuite feed rate should be avoided, to prevent over drying and making white sugar resulting in high molasses purity. When necessary to purge at a low feed rate shut off all wash water and steam.

Continuous centrifugal working screens are thin and easily damaged by sugar lumps and foreign material. Slotted working screens are very precarious because small indentations can increase the dimensions of the slots. A coarse woven wire backing screen contributes to the screen denting and will cause large depressions and screen slot deformations. The flat topped Dovex backing screen does help with this problem. The picture above is a cross-section



SUGAR FLOW OVER THE WORKING SCREEN



CROSS SECTION OF THE WORKING SCREEN

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of the Dovex screen (the backing screen).

It is important every day to use a stroboscope light to inspect the screens, and at least once a week to stop the continuous centrifugal to look at the working screen for damage from foreign material or signs of wear. A small hole can be repaired using a low temperature silver solder, done on the back of the screen. The screen must be outside the centrifugal basket for this repair, the solder must be no more than .018 ounce (5 grams) to minimize balance problems of the basket.

When the continuous centrifugal is running well and the working screens are in good condition the final molasses purity can be within 1% of the mother liquor purity obtained by the massecuite having uniform crystal size. If a continuous centrifugal working screens are used too long there is sugar loss in the final molasses due to increasing hole size from wear. The molasses purity trends must be watched. A graph can help you see the relationship between the molasses purity and the molasses brix from a new screen and a worn screen. Additionally graph the amount of process wash water being used on the basket. Refer to the graph if the molasses purity is rising without the molasses brix lowering. When this occurs crystals are passing through the screen and you should check for crystal using a microscope. When the molasses purity is rising and molasses brix is falling it is possible too much water is being used, melting sugar. Check the amount of process wash used. Readjust the process wash water and check the molasses results again.

A continuous centrifugal has a maximum capacity according to the surface area of the basket. The open area of the screen has a direct influence on the capacity of the centrifugal. The purging capability of the molasses from the sugar crystals will have a definite effect on the capacity of the continuous centrifugal. All molasses must pass through the open area of the working screens. The power required is consumed by acceleration of the sugar and molasses to their discharge point. The more open area in the working screen, the less the molasses accelerated and the more capacity possible.

The purging capability of massecuite in low grade is greatly affected by these considerations: The size of crystal in the massecuite; Mean aperture (M.A.); Coefficient of variation (C.V.); Length of sugar crystal; Purity of mother liquor; Crystal/syrup ratio; and Viscosity of molasses. These considerations all affect the selection of proper working screens. To select the proper working screen the most important factor is the lowest possible molasses purity. Install a test set of working screens. Run a test to determine the smallest sugar crystal that will be required to hold on the sugar side of the screen. Obtain the analysis from the massecuite, sugar and molasses for purity and brix.

Using an air pressure filtration apparatus to extract a sample of the mother liquor from the massecuite run the same test for analysis of purity and brix. The molasses purity from the centrifugal should be no more than 1% higher purity than the mother liquor purity. If the molasses brix is low and the purity high too much wash water is being used. Use the minimum amount of process water and run the test again. If the molasses brix is as high as possible and the molasses purity is still too high inspect molasses for crystals. View sample using a microscope. This sample must be obtained near the centrifugal molasses discharge so as to have a minimum melt time of the small sugar crystals. The microscope should be equipped with a scale to measure the size of crystals that have passed through the test working screen. Determine if the small crystals can be caught on the screen or what size screen opening are required. These tests should be done several times to determine if the proper process considerations have been used or if a working screen with smaller holes must are needed. In a working screen selection there are trade offs balancing the lowest molasses purity attainable, sugar purity and capacity. You should see only a small number of sugar crystal in the molasses, if you see no crystal check to see if you are over washing and melting out all small crystals. If you see a small number of rounded crystal (not sharp crystals) you have larger crystal that have melted due to much wash water.

You do not want elongated crystals. The correlation of needle-shaped crystals affects the strength of the crystal and the purging capability of the massecuite. Elongated sugar crystals will pack tightly against the working screen, blocking the flow of molasses or syrup through the sugar bed. Massecuite with elongated sugar crystals requires a large amount of process wash water to reduce sugar color. Needle-shaped crystals break easily into very small pieces that pass through the holes in the screen. Molasses with elongated sugar crystals will have high purity of low brix and low centrifugal capacity. Massecuite with small crystals lowers the centrifugal capacity.

If the level of crystal concentration is too high the mobility of the massecuite will decrease sharply and feeding the continuous centrifugal will become a problem. To correct this problem add molasses to the massecuite to increase the mobility. In continuous centrifugals equipped with a syrup separation the last 10% of the washed molasses can be returned to the crystallizers to help with massecuite mobility.

The continuous centrifugals will run on poor quality massecuite, but for best results the massecuite quality should be the same as required by batch type centrifugals. Good Continuous Centrifugal operation start at the Vacuum Pan.

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