Process performance of high capacity centrifugals.
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The key features of large modern batch and high grade continuous centrifugal are considered together with their financial implications.

Batch Centrifugals

Power consumption.
Modern batch centrifugals drives are energy efficient using around 0.9kWh/ton of massecuite. Such efficiency will save between $3,600 and $7,100 per campaign over 2 speed pole changing designs.

Wash water consumption.
Wash water consumption has a bigger impact on overall energy consumption than the centrifugal drive system. The best machines operate with 2% total wash water including screen and chute wash. Evaporating this quantity of wash required 11kWh per ton of massecuite - around 12 times more than the electrical drive requirement.

Plough performance.
The goal is to remove all the sugar from the screen during ploughing without damaging the screen - which is achieved by the floating Broadbent plough. Non floating systems leave sugar on the screen. A residual layer of as little as 1mm means around 64cwt per day of sugar has to washed out and be recrystallised.

Yield.
A key overall batch performance indicator is yield. Figures of 95% are achievable in real installations by clean screen ploughing and optimised washing. Many centrifugal installations have yields in the region of 85% - with attendant large financial penalties.

Capacity and cycle Rate.
The important criteria is overall throughput, requiring a large drive system to minimise unproductive time within the process cycle. The Broadbent drive system gives rates in excess of 20 charges/hr with drying times between 50-60 seconds and final moistures below 0.5%. Such a machine with a capacity of 1850kgs will equal the output of a 2200kg machine operating at 16 charges/hr.

Summary - batch centrifugals.
The benefits outlined can make the replacement of older smaller centrifugals justifiable on the basis of return on investment, using operational savings to justify the capital expenditure.
A number of design features are employed to provide high capacity, good washing without crystal damage allowing the HGCC to be employed in the production of final product sugar.

Machine capacity.
The capacity of the HGCC is large with massécuite throughputs up to 55 tons/h to be produced from a single machine with a footprint similar to that of a 48" standard diameter batch machine. The drive motor for such a throughput is 45kW giving an overall power consumption of 0.7 - 0.8kWh/ton of massécuite.

Separation efficiency.
The HGCC can produce VHP raw sugar with a purity of 99.4 which is equivalent to a separation efficiency of 97.5% and the HGCC can match batch machines performance.

Product moisture.
The HGCC is not able to meet the drying performance of the batch machine. Typical moistures are 0.8 - 2.5% against 0.3 - 1.0% for a batch machine. Dryer capacity is important when considering the use of an HGCC.

Crystal damage.
The HGCC design is successful in avoiding crystal damage. In applications with large sugar crystals (>0.5mms) the MA and CV of batch and HGCC machines running in parallel are practically the same.

Wash water.
In the HGCC the limited time the sugar is exposed to the wash means that higher wash ratios are required. Limited dissolution of the sugar occurs as the sugar layer is thin reducing the contact time between wash and crystals.

Summary - high grade continuous centrifugals.
Broadbent HGCC's are currently successful in refinery affination applications, cane A raw sugar and selected beet applications. Developments are continuing and further improvements are expected.