

Horizontal Vacuum Belt Filter

The VBF uses a heavy conveyor-like rubber drainage belt to collect filtrate separated from the feed slurry into a vacuum box. The driving force for separating the solids from the filtrate is a pressure difference created by a vacuum pump. A heavy polyester filter cloth retains the solids while allowing the filtrate to pass into the grooves of the drainage belt. The parameters for the filtration is the particle size distribution of the suspended solids, concentration of the slurry, uniform feed distribution of the feed slurry across the filter width and maintaining a pressure differential for the filtration.

The duration of the filtration cycle is a function of the speed at which the drainage belt travels. The feed distribution system ensure uniform cake formation (i.e. solids distribution) across the width of the VBF. The filter feed box is a reverse fishtail type which spreads the feed slurry onto the filter opposite to the direction of the belt advancement. The slurry is fed onto the filter cloth before vacuum is applied, and a slurry dam helps puddle the slurry, thus facilitating uniform cake distribution.

The filtration cycle begins when vacuum is applied to the slurry that has been distributed on the filter by the feed box. There are two distinct operations in the filtration cycle; cake formation and cake de-watering. Cake formation occurs as the free water is removed from the slurry. The end of the cake formation portion of the cycle is visually noted by the free water disappearing from the surface of the cake. The cake formation occurs very quickly after vacuum is applied; only three to six seconds are typically required to form a 30mm thick cake.

After cake formation, cake de-watering begins and continues through the remainder of the filtration cycle. In this portion of the cycle, water is removed from between the particles, to get a free moisture rate which should normally be as low as possible (< 12% in maximum load feed conditions).

The filtration cycle is ended when the vacuum is released. The filter cloth and de-watered cake are separated from the drainage belt and pas over a small radius discharge roll which separates the de-watered cake from the cloth. The cake falls from the filter cloth into the discharge chute which directs it onto the cake conveyor.

The filter speed controls the duration of the filtration cycle and, for a given solids loading, the cake thickness. Filter speed is automatically controlled by a sensor which uses a cake thickness transmitter feedback to control the VBF variable frequency drive. The transmitter measures the distance to the cake surface and produces an output proportional signal to the cake thickness.

Thinner cake will generally result in slightly lower cake moisture but cake thickness is limited on the low side by the ability of the discharge mechanism to separate the cake from the cloth. This lower limit for cake thickness is approx. 5mm.
The upper limit of cake thickness is a physical limitation of the drainage belt to contain feed slurry and is approximately 60mm. Also capillary forces in the cake reduce the efficiency of de-watering.

After discharging the de-watered filter cake, the filter cloth is cleaned with high pressure (6 bar) water spray. The wash bars shall be provided with flat type spray nozzles with overlapping spray patterns such that if one nozzle is plugged the adjacent nozzle will provide sufficient wash to remove solids.