SLURRY SEPARATION WITH COANDA EFFECT SLURRY SEPARATOR

Abstract

Liquid slurry is separated using centrifugal forces and Coanda effect, and without using screens. Pre-pressurized slurry is released through radial nozzle openings, while being rotated at constant angular speed and then accelerated along a cone-shaped acceleration plate by the action of centrifugal forces. As the slurry is accelerated outwards from the nozzle openings, the increased radial velocity of the slurry and the increasing surface area of the cone-shaped acceleration plate reduces the liquid stream thickness and consequently forces the liquid to drain-out from solid particles due centrifugal forces. This is because the liquid must spread-out to cover a wider surface area while being forced onto the solid surface whereas solid particles retain their shape. The accelerated bodies are then released from the outer curved surface of the cone-shaped acceleration plate, from where the path of trajectory of the liquid is changed by Coanda effect and supplemented by centrifugal forces, while solid particles continue moving in their original path of motion due to inertia effects. Coanda effect is a fluid flow phenomenon whereby the moving fluid attaches itself to a nearby solid curved surface and remains attached even when the surface curves away from its original direction. Separated contents are then collected from their respective collection bins.

This solid-liquid separation technique is capable of removing solid particles >0.05 mm in size in order to reduce odor and retain nutrients in the solids fraction in swine and cattle manure with moisture content of less than 50%. This separation technique requires a simple, compact and inexpensive separator that consumes less energy (about 0.716kWh/m^3) compared to other centrifugal separators of the same particle size separation capability, and it does not use traditional screens for solid-liquid separation.