GENERAL PRINCIPLES

The Hydrocyclone uses centrifugal force to separate solids from liquid or to classify coarser or greater mass solids from finer or lesser mass solids. This force is generated by converting the delivery head of slurry (by pump or gravity) at the inlet volute into a spiralling passage through the cyclone. This centrifugal action effectively imparts a force to the solid particles many hundred times greater than gravity. The amount is dependent on such variables as the delivery head pressure and the diameter of the cyclone unit. This force impels solids outwards towards the shell of the cylinder and, once the conical section is reached, downwards towards the apex discharge.

The greater the mass of a given particle, the more easily it is encouraged to migrate to the apex and vice versa. Conversely, most of the liquid and the very fine particles are drawn to the middle of this rotating mass, where the centrifugal force is much less (reducing to a partial vacuum at the axis). The fine particles are forced upward to the overflow via the vortex finder. Thus cyclones can be used not only to dewater a slurry but also to classify or wash solids. When the slurry contains solids of one specific gravity, the larger (greater mass) particles are classified to the apex underflow with the finer (less mass) particles migrating to the overflow with the majority of the host liquid.

When solids of differing specific gravity are present, the effect of the cyclone can be to separate the heavier (greater mass) solids to the apex and the lighter solids to the overflow.

The effectiveness of this type of separation is dependent on the difference in specific gravity of the materials. In practice, there is always some carry-over of both products with some lower S.G. solids reporting in the apex and some higher S.G. solids in the overflow.

APPLICATIONS

The Hydrocyclone is used for:
- Dewatering - (efficiently to about 50% by volume)
- Desliming - (clays from sand)
- Degritting - (sands from clays)

SELECTION

The variables affecting the performance of a cyclone are as follows:

(i) The pressure difference available through the cyclone (normally the pressure in the inlet to the cyclone as both the underflow and the overflow should discharge to atmosphere). Normally in the range 10-30 PSIG
(ii) The diameter of the cyclone unit (the smaller the diameter, the greater the centrifugal force thus the finer the resultant separation - all other variables remaining equal).
(iii) The percentage of solids within the slurry (a cyclone works more efficiently with dilute, 10-15% w/v solids solids concentration).
(iv) The relative specific gravity of the solids (the higher the S.G., the finer the bottom size of recovery to underflow).
(v) The amount of clays or colloidal material. A high clay content (over 15%) will increase the apparent viscosity of the host liquid resulting in less efficient separation.
(vi) Relative sizes of the various component parts such as inlet and overflow spools, apex spigot and, most importantly, vortex finder. For example, a larger vortex finder will accommodate greater throughput and will allow coarser solids into the overflow stream - all other variables remaining equal.

Design

- The hydrocyclone is a simple but effective classifier with no moving parts, where the performance efficiency is maximised by ensuring:
  (i) Engineering accuracy
  (ii) Smooth internal surfaces
  (iii) Correct ratios of critical components such as vortex finder and apex spigot compared to the cyclone diameter;
  (iv) Constant feed volume, consistency and pressure.

MEP Cyclones

are manufactured from mild steel and lined with either hard wearing polyurethane, gum rubber or ceramic tile and / or one piece depending on the application.

Manifold clusters of cyclones can be provided for large throughputs.

Note: Classification cut size: 95% plus recovery to apex underflow; solids S.G.2.65; solids concentration <10% w/v; Capacity at 10-30 PSIG pressure drop.

www.ukmep.com