CYCLONIC SAND FLUIDISATION NOZZLE

Description

Historically sand fluidisation was carried out using multiple fine jets to force solids to the bottom of the vessel where they would drop out through vessel drain nozzles. These older systems caused several problems such as high turbulence in the vessel, poor coverage and a high rate of blockage of the drain nozzles. As a result, they were not always used and sand would quickly build up within the vessels. The Enhydra cyclonic sand fluidisation nozzle eliminates these issues. It is designed to act locally, jetting water in a targeted area. It can also suck the solid slurry from the vessel in an upward flow direction rather than relying on gravity to force the solids down towards a drain nozzle. These factors prevent blockage, avoid re-entrainment of the solids and reduce turbulence, thereby avoiding disturbance of the main vessel process.

As with all Enhydra technologies the advanced jetting nozzle and the nozzle manifolds can be adapted to suit each individual application and project requirements.

Figures 1 & 2: Unflanged and flanged versions of a cyclonic nozzle. Both with sand jetting and sand slurry removal facility.

Figure 3: Localised jetting nozzle installed above vessel drain points.

Testing

The sand fluidisation nozzles have undergone extensive research and development and have demonstrated their ability to remove very high volumes of sand in a short time. For a standard nozzle the jetting rate and sand slurry removal rate is $4m^3/hr$.

Figures 5 & 6: Before and after images of testing of the fluidisation nozzle.

Operation and Performance

The Enhydra cyclonic sand fluidisation nozzle is designed to operate automatically with the vessel operating online to avoid any downtime. With a pressure drop across the nozzle of less than 0.5 Bar (7.25psi) the standard nozzle covers a circular area of 1m.

The solid slurry extraction port on the standard nozzle is located on the base of the unit. This has the massive advantage that the jetting water and solids are drawn down into the middle of the nozzle rather than being jetted outwards. This means that the solids are not re-entrained into the process and the process fluids are not disturbed.

Figure 7: Early testing of the cyclonic effect on the zone of influence.

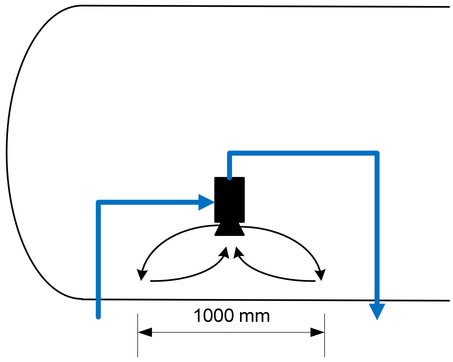


Figure 8: Indication of Zone of Influence & localised fluidisation

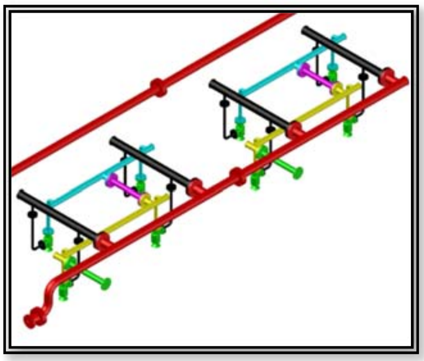
Installation & Materials

Nozzles are arranged within a vessel either individually or grouped together in banks. It is typical for larger vessels to have a bank of 4 to 8 nozzles for each main section. This can be adjusted to suit the availability of jetting water. For all slurry outlet lines we recommend that the velocity in the pipe is kept between 2m/s to 3m/s. This minimises erosion and prevents solids settling in the pipe.

As a project customised product the Enhydra Sand Fluidisation Nozzle can be manufactured from any materials specified including 316L, Duplex, Super Duplex, Stellite, or Inconel Alloys.

Figure 9: Single nozzle for jetting a solids collection boot under a CPI Plate pack.

Figure 10: Paired nozzles located above drain nozzles in a degasser vessel.



Figures 11 & 12: 8 nozzles, arranged as 2 banks of 4, to prevent solids deposition across a 4-cell Induced Gas Flotation Vessel. The internals were designed and built as a retrofit to be installed between existing equipment.