

Deep Shaft Process Technology

Deep Shaft Advanced Biological Treatment Process

High intensity aerobic liquid effluent treatment process. With oxygen transfer rate typically 10 times higher than conventional process.

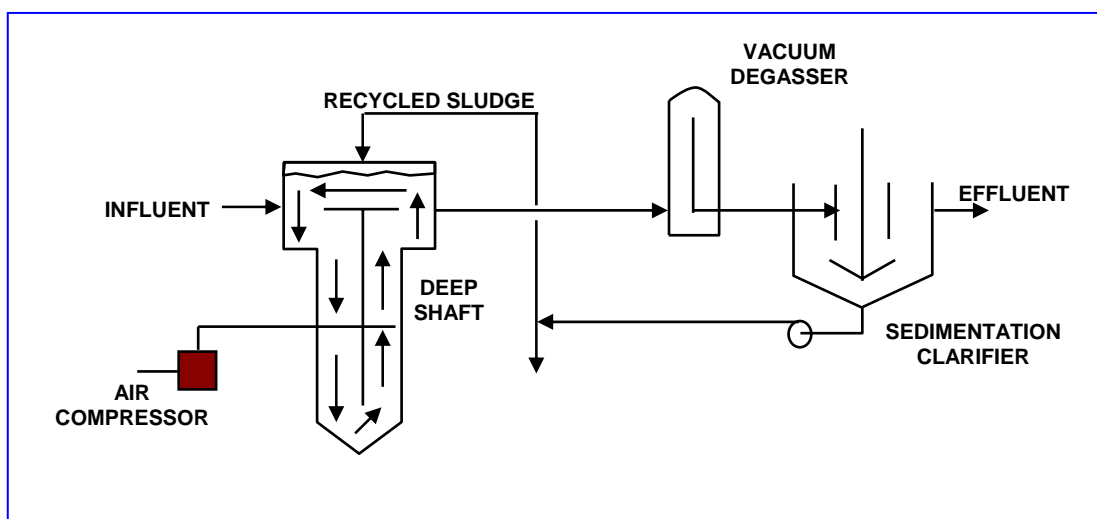
Well suited for treatment of high strengths wastes with low footprint operating and capital cost



Description

The Deep Shaft, a high intensity aerobic liquid effluent treatment process, comprises a single, vertical shaft which is divided into up-flow and down-flow sections known respectively as the riser and downcomer.

The effluent circulates rapidly in the shaft driven by the injection of compressed air which provides a differential density in the riser and downcomer. The resultant turbulent flow provides intense mixing of gas, liquid and biomass. The liquor typically takes between two and six minutes to circulate once around the shaft and head tank and on average it circulates 20 to 40 times before discharge. In this way the oxygen and the effluent flow concurrently and are maintained in contact for two to four minutes per cycle thus ensuring efficient oxygen transfer. The low ratio of the feed to the re-circulation flow means that the feed is rapidly diluted and mixed with the entire mass of activated sludge in the system, thereby ensuring maximum resistance to shock loads.

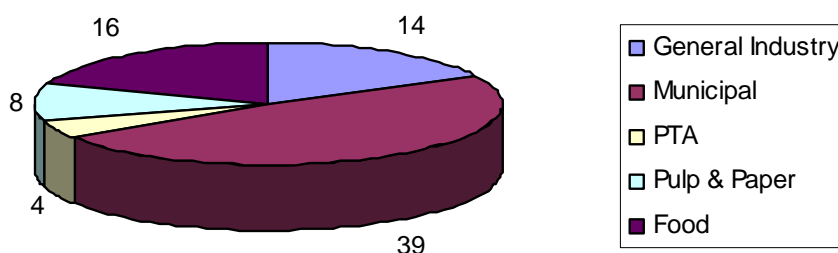


The choice of methods for separating the treated effluent from the activated sludge solids lies between sedimentation and flotation.

Typically the shaft, is between one and eight metres in diameter and 40 to 100 metres deep. Surmounting the shaft is a gas disengagement head tank. The air serves to supply the micro-organisms with the oxygen they need for COD (Chemical Oxygen Demand) and BOD (Biological Oxygen Demand) reduction. Oxygen transfer rates are typically ten times higher than for conventional processes because of the combination of the intense mixing and the depth of the liquid in the shaft and the resultant higher dissolved oxygen concentrations.

General advantages of Deep Shaft:

- Proven technology with more than 80 plants in operation
- Mechanical simplicity.
- Low capital and operating costs.
- Low land area requirements.
- Low environmental impact (low odour, mist and noise). Also largely underground.
- High energy efficiency of 1-4Kg BOD/kWhr.
- Primary treatment not required.
- High oxygen intensity (up to 2.5 Kg/M³/hr compared to 0.1 to 0.3 for conventional processes).
- High efficiency of oxygen utilisation.
- High BOD removal rates.
- Process is unaffected by climatic changes.



Operational advantages of Deep Shaft:

- Full automation possible with minimal instrumentation.
- Resistance to changes in flowrates, BOD loadings and toxins results in robust and reliable performance.
- Capable of treating a wider range of liquor strengths (typically 1 - 30 kg BOD/m³ day compared with 0.4 -1.3 for conventional plants).
- Can operate at higher MLSS concentration (3-10 g/l compared to 2-5 g/l) for conventional plants.
- Design sludge loading (kg BOD per day/kg of MLSS) is higher, (0.7 to 3.5 compared with 0.1 to 0.5), and this reduces reactor size.
- Limited growth of filamentous organisms means improved sludge settling and smaller clarifiers.
- Less sludge produced per kg BOD removed.
- No moving parts with low maintenance costs.
- Overall cost effective high performance.

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