

SPI's Equaflow Clarifier increases the clarity of equalised throughput and the consistency of the underflow solids



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SPI's Equaflow Clarifier rectifies the industry's feasibility goals with the new designed feed system, which would help to increase the clarity of the equalised throughput as well as increase the consistency of the underflow solids.

Equaflow clarifiers are used where the inlet feed has extreme flow variations and a high concentration of total suspended solids. It is a system of compact sedimentation and dewatering. It uses the principles of both flow equalisation and gravity settling to enhance the efficiency of the system. The system is capable of

removing total suspended solids (TSS), undissolved inorganics, and insoluble COD to a large extent. Equaflow Clarifier may achieve insoluble COD removal of at least 30% to 70% and TSS removal of up to 70% to 95%, depending upon the inlet effluent characteristics.

To enhance the settling, the addition of coagulant and polyelectrolyte is done. The coagulant neutralises the charges and agglomerates the suspended solids to form floc. The polyelectrolyte brings together these flocs, binding them to make a heavy floc that easily settles down.

The equalised throughput from the system is of good clarity and underflows with maximum density. By holding high flow variations, these are designed to deliver a consistent, equalised flow to downstream processes.

The benefit of using this system over other traditional systems is that insoluble COD that is present in suspended form doesn't get dissolved in the water due to the lower retention time for suspended solids, and it is removed in the early stages so it reduces the overall COD load in further process steps.

SPI EQUAFLOW CLARIFIER

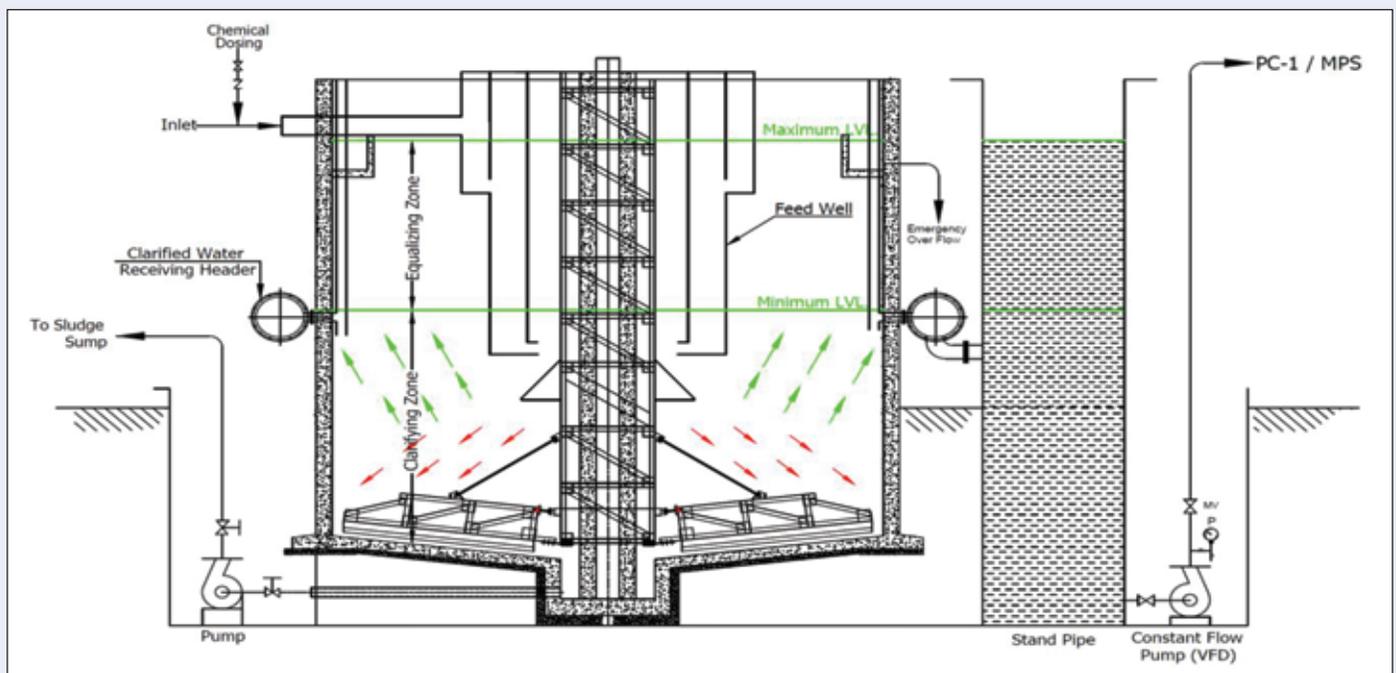


Fig. No.-1

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Another important benefit of this system is that it doesn't get jammed by solids, as there is continuous removal of solids from the bottom, whereas in traditional equalisation tanks, the solids get settled at the bottom of the tank, and the removal of solids from those tanks is a tedious task that may take several days or weeks. Hence, this cost-effective system provides a maximum return on investment.

Components and design of Equaflow clarifier

- SPIL's Equaflow Clarifier is designed on the basis of flow equalisation and gravity settling techniques.
- The Equaflow Clarifier is divided into two parts i.e. clarifying zone and equalizing zone as shown in Fig. No.-1.
- The MOC of the Equaflow Clarifier tank is RCC.
- The MOC of the feed pipe, feed well, baffles, cones, outlet pipes, and scraper is SS-304/Mild Steel.
- The feed pipe is installed tangentially, is equipped with a TSS sensor, and is followed by the feed well, which consists of a feed channel, baffles, and a cone giving direction to the inflow.
- The cone is attached to the shaft of the agitator just above the scraper to evenly distribute the feed inflow.
- The scraper revolves at a fixed RPM to remove solids from the bottom of the system.
- The solids outlet pipe is given at the bottom of the system. This pipe is connected to the solids transfer pump, preferably a screw pump, which will discharge the solids at a rate according to the inlet flow condition. The provision of a VFD in the solids pump is necessary for the smooth operation of the system.
- A ring-like structure is provided at the outer periphery of the system where all the outlet pipes will meet in this header, and then the clarified throughput is taken out of the header.

- The Equa Flow clarifier is partially underground up to the minimum level, and the rest of it is above ground level up to the maximum level, or it can be constructed above ground level as well.
- The reason for the vertical height of the system is that whenever there are high inflow fluctuations, it will be handled properly as well as reduce the footprint area of the plant.

Working of the Equaflow Clarifier

- SPIL's Equaflow Clarifier works on the principle of flow equalisation and gravity settling.
- Coagulant or polyelectrolyte dosing may be done to increase the settling rate.
- Feed enters the system tangentially through the feed pipe.
- Feed Well is also known as an energy dissipating well, as it is equipped with a system consisting of a feed channel, baffles, and a cone to reduce the velocity of inflow feed and distribute the feed flow evenly throughout the system so as to limit the direct load of feed over the scraper.
- The variation in flow is equalised in the upper part of the system, and the clarification is done in the lower part of the system.
- The heavier suspended solids settle down due to the quiescent conditions provided in the clarification zone of the system.
- The clarified water is collected from the outlet pipe of the clarified water receiving header. This header is provided at the specific level, i.e., the outer periphery of the Equaflow Clarifier.
- A scraper is used to drag higher-density solids to the centre, from where they are discharged out of the system and can be reused for various purposes. A screw pump is used to transfer the solids from

the bottom of the tank.

- The RPM of the screw pump should be adjusted according to the inflow conditions, i.e., if TSS is high in the feed, then the screw pump's RPM will also increase, and vice versa.
- If in any rare situation the flow is below the minimum value of the system, then the screw pump is used as the feed pump for the next equipment, i.e., only equalisation will be done in the system and clarification is done in the next equipment, i.e., the MPS.
- SPIL provides an economical Equaflow clarifier as compared to an equalisation tank and clarifier system.

Why Equaflow Clarifier?

- In the early stages of treatment, it is critical to dampen extreme variations in flow and throughput quality to providing regular flow and loading to a biological process in order to ensure effective treatment. Therefore, Equaflow clarifiers are used to have an equalised throughput with good clarity.
- It removes TSS, undissolved inorganics, and insoluble COD to ensure smooth processing.
- In conventional equalisation systems, coarse diffusers are used to maintain homogeneity and get damaged regularly due to solids settlement at the bottom of the equalisation tank. It is a tedious task to remove such solids, as it may take several days or weeks, and to replace the diffusers. But Equaflow clarifiers have a scraper system to continuously remove the solids from the system. Thus saving the cost of every air diffuser replacement and blower power.
- SPIL's Equaflow Clarifier requires less space than a conventional equalisation tank because it is built vertically. One thing worth noticing is that, besides its vertical height, the distance that a particle has to

travel for settling is less than in a conventional clarifier, so the separation of solids will be faster than in a normal conventional clarifier.

- Also, there is a saving of land space as SPIL does both equalisation and clarification in the same equipment, and most importantly, the cost of making a separate equalisation tank is also saved.
- Hence, this cost-effective system provides a maximum return on investment.

Advantages

- Excellent performance and can tackle feed flow disturbances
- discharge even flow
- reduced plant footprint
- Easy installation
- Lower environmental impact
- Lower operating and capital costs
- Simple Maintenance
- Less power consumption as compared to a conventional equalisation tank
- More consistent loading, equalisation of surge flow, and removal of excess solids improve the operation of further downstream processes.
- Good efficiency

Applications

- Raw/Canal water clarification
- Effluent Treatment Plant
- Paper Mill Effluent
- Sewage treatment plant

Recommendations

- It is recommended that before designing the Equaflow Clarifier, data collection regarding the inflow and its other parameters should be proper to ensure functioning of the system.
- A proper routine inspection should be done.

- The RPM of the screw pump should vary according to the inflow conditions.

Conclusion

- SPIL highly recommends the installation of the Equaflow Clarifier in industries where it is difficult to dampen the variation in the feed flow of the treatment plant.
- This system is best for the removal of high TSS and insoluble COD.
- Equaflow clarifiers are used to get a constant flow with good clarity from a fluctuating feed.
- It is a highly cost-effective system.
- It requires less space, which is a major concern for most industries.

Thus, reducing the cost and space while equalising the throughput with good clarity.

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