CE-441-ENVIRONMENTAL ENGINEERING II

Lecture 15 –Secondary Clarifier

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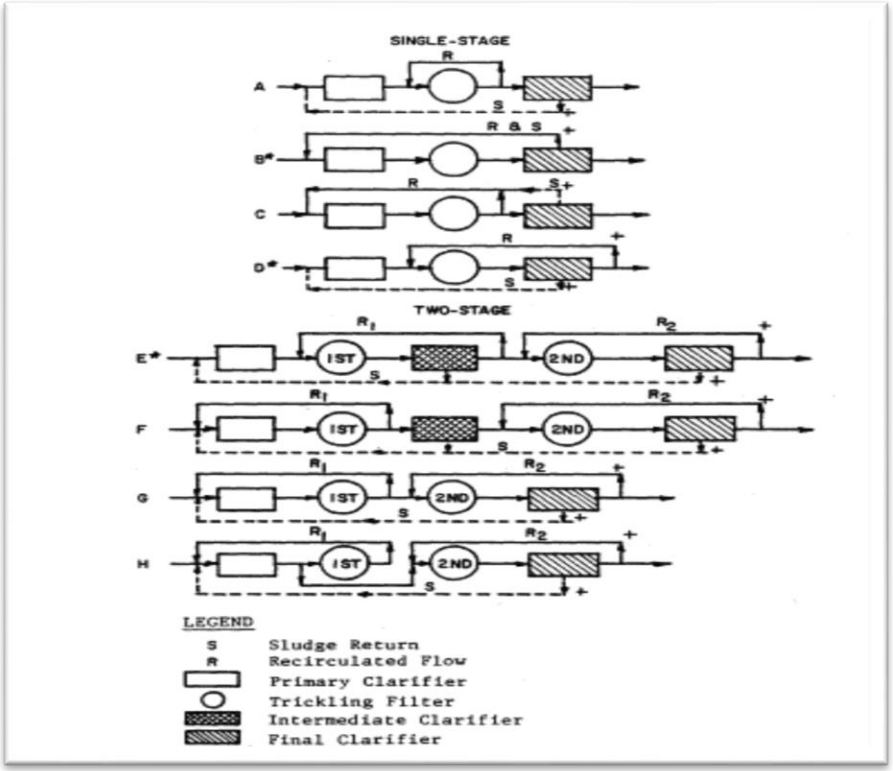
Clarifier Design for Attached Growth Process

- Clarifiers following ordinary trickling filters are design to remove large particles of **sloughed bacterial slime** .
- No hindered settling occurs, hence design criteria are based on particle size and density.
- Surface overflow rates are **25-33 m/day** at average flow and should not exceed **50 m/day** at peak flow.
- Weir loading rates and retention times are similar to those used in primary clarifiers.
- Recirculated flow is included when the clarifier is sized, if it actually passes through the basins.

Clarifier Design for Attached Growth Process

Sludge return is generally neglected in such calculations, since it is relatively small in trickling filter systems.



Clarifier Design for Suspended Growth Process

- Design of secondary clarifier is critically important to the operation of a suspended growth process.
- Designer must consider the peak flow rate which is likely to enter the clarifier and its affect on SOR, weir loading rate , and solid loading rate.
- Clarifier may be circular or rectangular , the length of rectangular basins and the diameter of circular basins ordinarily does not exceed ten times the depth .
- The most important consideration is that the sludge collection system is of high capacity to ensure rapid removal in ordinary operation, high flow rates, and capability to remove dense sludge which may accumulate during clarifier shut down.

Clarifier Design for Suspended Growth Process

DESIGN BASIS:

- **Solids loading** is an important in secondary clarifiers following suspended growth processes since,

- Hindered settling is likely to occur, and the settling velocity of discrete particles may not govern the basin design.

- **Solids loading** is expressed in Kg/m^2-h of suspended solids.

$$Solids\ Loading\ rate = \frac{MLSS \times (Q + Q_r)}{A}$$

Clarifier Design for Suspended Growth Process

- Typical solids loading rates vary from **2.5 to 6.2 Kg/m^2-h**, at average and peak loading conditions respectively.
- SOR should not exceed **57 m/d**.
- Weir loading rates should not exceed **250 m^2/d.**

Design

Design a secondary clarifier for an activated sludge process with a recycle rate of 30 %, an MLSS concentration of 3000 mg/L, an anticipated peak flow of 10,000 m^3/d and an average flow of 3500 m^3/d. The basin is to be circular .