# WASTEWATER ENGINEERING


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## Question:

Two basic design parameters of wastewater Treatment System are Hydraulic Retention Time (HRT) and Solid Retention Time (SRT).

A. Briefly describe each one of these parameters.

B. What are methods used for decoupling SRT from HRT.

C. What are the advantages of decoupling SRT from HRT.

## Answer:

## A. Brief Description:

### Hydraulic Retention Time (HRT):

The Hydraulic Retention Time (HRT) also known as hydraulic residence time. The hydraulic retention time (HRT) in wastewater treatment plant is a measure at an average length of time holding the wastewater in a tank.

It is the relation b/w volume and flow rate

$$HRT = V / \text{Flow rate}$$

HRT is an important parameter in wastewater treatment, which directly affects the design, operational/investment cost and energy requirements and in general, higher HRT will lead greater investment costs. Therefore, varying HRT also has a significant effect on the power generation and wastewater treatment characteristics of the MFC and MEC.

## Solids Retention Time (SRT):

The solids retention time (SRT) is the time the solid fractions of the wastewater spends in a treatment unit. The SRT is an important design and operating parameter for the activated-sludge process and is usually expressed in days.

It is the quantity of Solids maintained in the reactor divided by the quantity of Solids comming out the reactor each day;

$$SRT = V \times \frac{C_d}{Q_{out} \times C_{out}}$$

Here;

- V = Digester Volume
- $C_d$ = Solid Concentration
- $Q_{out}$ = Volume wasted each day
- $C_{out}$ = Solid Concentration of the effluent.

The Solid retention time controls the concentrations of bacteria throughout the treatment system. A higher SRT contributes to a higher bacterial concentration in the reactor, which gives rise to;

- Smaller reactor size
- Larger separator size
- Reduce Sludge production
- Higher areation requirments due to the extra oxygen required for endogenous respiration.

## B. Methods used for decoupling SRT from HRT:

The methods which are used for decoupling SRT from HRT are;

- Repeperative Thickening
- Anaerobic Muncipal Wastewater Treatment
- Integrated waste Management
- Distillers Grains

## C. Advantages of decoupling SRT from HRT:

Following are the advantages of decoupling SRT from HRT;

- To proclue the solids free better quality effluents while the use of anaeobic biomass.
- The main advantages of decoupling SRT from HRT is that it will be separated and be easily classified.
- To investigate the effect of Hydraulic Retention Time.
- By decoupling SRT from HRT the liquid wastewater can be processed faster.
- Energy can be recovered, thus providing ecological and economical benefits.