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Assignment # 02.

waste water Engg.

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Two basic design parameters of waste water treatment systems are hydraulic Retention Time (HRT) and Solid Retention time (SRT).

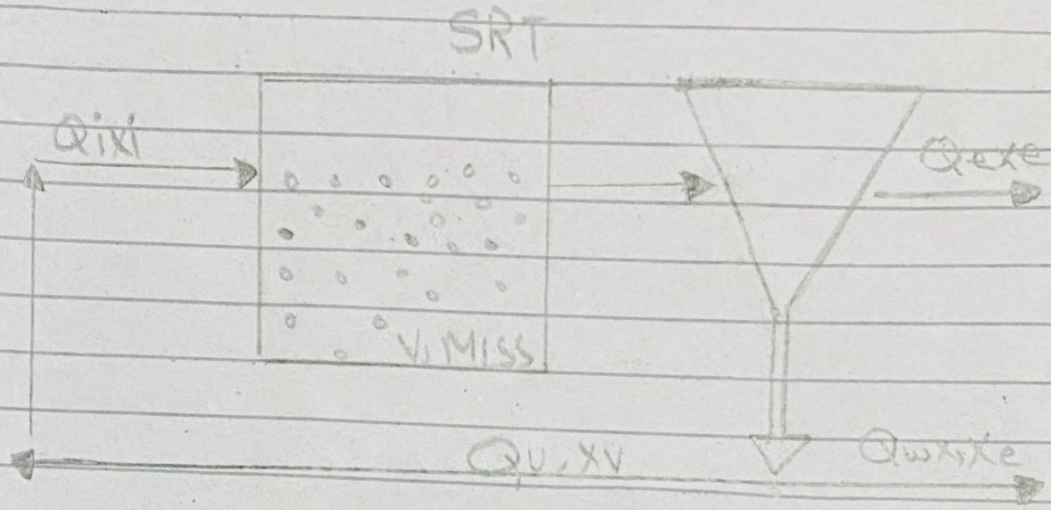
1) Briefly describe each one of these parameter?

Ans Solid Retention Time =

The solid retention time (SRT) is an average time the activated sludge solids are in the system. The SRT is an important design and operating parameter for the activated sludge process and is usually expressed in days. The (SRT) controls the concentration of bacteria throughout the treatment area/system. A higher (SRT) contributes to a higher bacterial concentration in the reactor which give rise to.

- 1) Smaller reactor size.
- 2) Larger separator size
- 3) Reduced sludge production
- 4) Higher aeration requirements due to the extra oxygen required for undergenous respiration on the ~~contaminant~~<sup>clearly</sup>, an optimum SRT exist, resulting from a trade-off between the gains and losses in various cost terms. For municipal sewage treatment plants performing combined nitrification, denitrification, typical wasting ratios generally fall in the range 0.025-0.10 for a

hydraulic retention time of 12-24 hours.



$$SRT = \frac{\text{Inventory}}{\text{wastage}} = \frac{(V) \times (MLSS)}{(Q_w \times X) + (Q_e \times X_e)}$$

Solid Retention time (SRT) is a critical activated sludge process design and operating parameter. The selection of SRT has many consequences related to process performance, sludge production, and oxygen requirement. The traditional method for controlling SRT is to manually adjust the sludge wasting rate based on the food to micro-organism (F/M) ratio or mixed liquor suspended solid (MLSS) concentration.

The effectiveness of closed-loop of SRT has been ~~now~~ demonstrated in many locations.

In addition to reducing variability actual SRT, ~~the~~ either benefits sited includes reduced

foaming, improved sludge settling characteristics, improved performance of downstream sludge thickening and fewer laboratory/process control measurements.

Automated SRT control is likely to be of great benefit for overloaded or nutrient facilities, however a big reason that automated SRT control is likely to be of great benefit for overloaded or nutrient facilities, however a big reason that automated SRT control is not more widely practiced is that understanding of the proper application of SRT control is needed.

## a) HYDRAULIC Retention Time (HRT)

The hydraulic retention time (HRT) is a measure of average length of time that a soluble compound remain in a constructed bioreactor.

The volume of aeration tank divided by the influent flow rate is the hydraulic retention time.

HRT is defined as the ratio b/w the reactor's volume and the feed flow rate represent the average time the cell and substrate stay inside the reactor. HRT is very important parameter for the hydrogen and methane production in continuous method. Very low HRT compares the washout of the reactor, which means all the active microorganisms.

Escape out from the reactor on the contrary, an adequate HRT results in abundant hydrogen and methane yields. This parameter is linked to the specific and different growth rate of hydrogen and methane producing bacteria. Low HRT favored the washout of methanogens, guaranteeing the survival of hydrogen producers. Thus low HRT and slight acid pH (6.0-6.5) represent the best condition for hydrogen production. On the contrary, the hydrogen production pattern may shift the methanogenic one when HRT is increased. The choice of optimal HRT is clearly influenced by complex ~~structure~~ substrate. As well as greater HRT to generate an adequate time to decompose them.

In CSTR vessels the typical HRT applied treating solid organic waste is in the range of 2-3 days, while with other reactor configuration or easily biodegradable substrate it is possible to use lower HRT (down to 1-hour). There is not, however a general criterion to determine the HRT, as fermentation is also influenced by other boundary conditions. Any ways the literature data shows that the maximum hydrogen production rate can be obtained for HRT, 3 days.

The HRT in waste water treatment plant is a measure at an

length of a time holding the waste-water in a tank. It is also known as hydraulic residence time. The waste water treatment plant is mainly designed to handle the waste water at normal load and also during shock loads. The waste water is retained in different treatment units at a particular time to achieve the desired parameters. The HRT followed the Homogenization tank is 12 to 24 hours, 24 to 48 hours in aeration tank, 72 to 120 days in Anaerobic reactor 5 to 12 hours in Secondary clarifiers, 3 to 5 hours in primary clarifiers 30 minute in chlorine contact tank 5 to 10 minutes in deep media filters etc. During the design stage itself the HRT of waste water in various stage are calculated in order to achieve the outlet parameters. If HRT is not properly maintained at a various stage we may not get the desired parameters for discharge/reuse.



Q) What are methods used for decoupling SRT from HRT?

Ans) The methods which are used for decoupling SRT from HRT-

- 1) Anaerobic Reactor Designs.
- 2) Recuperative Thickening.
- 3) Integrated waste management.
- 4) Distilled Grains.

### Anaerobic Reactor Designs =

Approaches that decouple the HRT from SRT can be used via separating and recirculating a portion of the microbes/solids or immobilizing the biomass. Such approaches allow a high SRT to be maintained, thus preventing washout of slow growing anaerobes, yet allow reduction in reactor size.

Anaerobic reactor designed which decouple SRT from HRT. The design concept were improved from classic reactor like septic tanks and anaerobic ponds, to modern high rate reactor configuration like anaerobic filters.

### Recuperative Thickening =

Recuperative thickening increase the solid Retention time (SRT) independently of the hydraulic retention time (HRT) by thickening a proportion of digestate.

to remove water and then returning thickened sludge back to the digester

### Integrate Waste Management=

The function element of integrate waste water management system are generation and composition, collection, treatment (including sludge treatment) and disposal and reuse.

### Destiler Grains=

The Destiler grains waste water treatment and recycling biomass energy using up flow solid reactor (USR) was carried out. USR reactor was operated under thermophilic treatment condition at 52°C.

