

# Sessional Assignment 1



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## 1 Solid Retention time (SRT)

The solid retention time (SRT) is the 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 through out the treatment system. A higher SRT contributes to a higher bacterial concentration in the reactor, which gives rise to;

- ★ Reduced sludge production.
- ★ Smaller reactor size.
- ★ Larger separator size.
- ★ Higher aeration requirements due to the extra oxygen required for endogenous respiration.

An optimum SRT exists resulting from a trade-off between the gains and losses in various cost terms. For municipal sewage treatment plant performing combine nitrification, denitrification, typical wasting ratios generally fall in the range 0.025-0.10 for hydraulic retention time of 12-24 hours.

Solid ~~ret.~~ retention time is a critical activated sludge design and operating parameter. The selection of SRT has many consequences related to process performances, sludge production and oxygen requirements. The traditional method for controlling SRT is to manually adjust the sludge wasting rate based on the food to microorganism ratio or mixed liquor suspended solids concentration. The

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

In addition to reducing variability in actual solid retention time, other benefits cited include reduced foaming, improved sludge settling characteristics, improved performance of downstream sludge thickening and fewer laboratory process control measurements. Automated solid retention time control is likely to be of great benefit for overloaded 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.

## \* Hydraulic retention time (HRT):-

The hydraulic retention time (HRT) is a measure of average length of time that a soluble compound remains in a constructed bio reactor.

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

HRT is defined as the ratio between the reactor volume and the feed flow rate, represents the average time the cells and substrates stay inside the reactor. HRT is very important parameter for the hydrogen is very important parameter and methane production is continuous mode very low HRT Comports the washout of the reactor, which means all the active microorganism.

escape out from the reactor. on the contrary an adequate HRT result in abundant hydrogen and methane yields. This parameter is linked to the specific and different growth rates of hydrogen and methane producing bacteria. low HRT favored the washout of methogens, guarantying 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 formation pattern may shift the methogenic one when HRT is increased.

The choice of optimal HRT is clearly influenced by complexity of the organic molecules. Complex substrate required 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 other reactor configurations or easily biodegradable substrates it is possible to use lower HRT. There is not, lower a general criterion to determine the HRT as fermentation is also influenced by the other boundary conditions.

Anyway the literature data show that the maximum hydrogen production rate can be obtained for HRT < 3 days.

The ~~is~~ HRT in wastewater treatment plant is a measure at an average length of time holding the wastewater in a tank. It is also known as hydraulic residence time. The waste water treatment plant is mainly designed to handle the wastewater at

normal load and also during shock loads. The wastewater is retained in different treatment units at a particular time to achieved the desired parameters. ~~The~~ ~~are~~ HRT of wastewater in various stages are calculated in order to achieve the outlet parameters. If HRT is not properly maintained at various stages, we may not get the desired parameters for discharge/reuse.



## Methods used for decoupling SRT from HRT :-

The following methods which are used for decoupling SRT from HRT.

- ★ Anaerobic Reactor Designs.
- ★ Recuperative Thickening
- ★ Integrated waste Management.
- ★ Distiller Grains.

## Anaerobic reactor designs:-

Approaches that decouples the SRT from HRT can be used via separating and recirculating a portion of the microbe/solids or immobilizing the biomass.

Such approaches allow a high ~~SP~~ SRT to be maintained thus preventing washout of slow-growing anaerobic, yet allow reduction in reactor size.

Anaerobic reactor design which decoupling SRT from HRT.

The design concepts were improved from classic reactors 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 digesters to remove water and then returning the thickened sludge back to the digester.

### Integrated waste Management:-

The function elements of integrated wastewater management system are generation and composition, collection, treatment (including sludge treatment) and disposal

and reuse.

### Distiller grains:-

The distiller grains wastewater treatment and recycling biomass energy using up-flow solid reactor (USR) was carried out. USR reactor was operated under thermophilic fermentation condition at  $52^{\circ}\text{C}$ .

### \* Advantages of decoupling SRT from HRT:-

The advantages of decoupling of SRT from HRT are the following

- To produce the solids free better quality effluents while the use of anaerobic biomass.

- Relative decoupling is a positive sign, the real aim is to achieve absolute decoupling, where the economy can continue to grow and waste generation reduces.
- The main advantages of decoupling SRT from HRT is that it will be separated and be easily classified.
- Energy can be recovered, thus providing ecological and economical benefits.
- Decoupling implies less resources and generating less waste per unit of economic activity.
- To investigate the effect of hydraulic retention time.