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Assignment

Waste water Engg.

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 parameters.

Ans: Solid retention time (SRT):

The solid retention time (SRT) is the average time the activated sludge solid 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 system. A higher SRT contributes to a higher bacterial concentration in the reactor which gives rise to

- ① Smaller reactor size
- ② Larger specific size
- ③ Reduced sludge production
- ④ Higher aeration requirements due to the extra oxygen required for endogenous respiration

clearly an optimum SRT exists, resulting from a trade-off b/w the gains and losses in various cost terms. For municipal sewage treatment plant normally 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) is a critical activated sludge design and operating parameter. The selection of SRT has many consequences related to process performance, 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 (F/M) ratio or mixed liquor suspended solid (MLSS) concentration. The objective of closed-loop of SRT has been demonstrated in many locations. In addition to reducing variability in actual SRT, other benefits cited include reduced foaming, improved sludge settling characteristics, improved sludge of downstream sludge thickening and even laboratory process control.

HYDRAULIC RETENTION TIME (HRT)

measures the average length of time that a soluble compound remains in a constructed bioreactor.

The volume of aeration tank divided by the influent flow rate is τ , the hydraulic retention time (HRT) is defined as the ratio b/w 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 and methane production in continuous mode. Very low HRT prompts 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. The parameter is linked to the specific and different growth rate of hydrogen and methane-producing bacteria. Low HRT favors the washout of methanogen, impacting 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 fermentation pattern may shift the methanogenic one when HRT is increased

The choice of optimal (HRT) is clearly influenced by complexity of the organic molecules. Complex substrate require

greater (HRT) to generate an adequate time to decompose them. In CSTR vessel the typical HRT applied treating

solid organic waste is in the range of 2-3 days while

with other reactor configuration of easily biodegradable substrate it is possible to use lower HRT (down to hours)

there is not however a general criterion to determine the (HRT) as fermentation is also influenced by other boundary conditions

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

The HRT in waste water treatment plant is a measure of an average length of time holding the waste water in tank. It is also known as hydraulic residence time. The waste water treatment plant is normally designed to handle the waste water at normal load & also during shock load.

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

Ans. Method used for decoupling SRT from HRT.

1) Anaerobic reactor Designs

2) Recuperative Thickening

3) Integrated waste management.

4) Distilled Growth

1) Anaerobic reactor Design:

Approaches that decouple the SRT from the HRT can be used via separating and recirculating a portion of the microbe/solids or immobilizing the biomass. (2) Such approaches allow a high SRT to be maintained thus preventing washout of slow-growing anaerobes. Yet allow reduction in reactor size. Anaerobic reactor designs which decouple SRT from HRT. The design concept was improved from classic reactor like septic tank and anaerobic ponds to modern high rate reactor configurations like anaerobic filters.

(2) Recuperative Thickening:

Recuperative thickening increase the solid retention time (SRT) independently of the hydraulic retention time (HRT) by thickening a portion of digester to remove waste and then returning the thickened sludge back to the digester.

③ INTEGRATED WASTE MANAGEMENT:

The functions elements of integrated waste water management system are generation and composition, collection, treatment (including sludge treatment and disposal) and reuse.

④ DISTILLER GRAINS:

The distiller grains waste water treatment and recycling biomass energy using up-flow solid reactor (USR) was carried out. USR reactor was operated under thermophilic biometation conditions at 51°C.