ASSIGNMENT 1

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Section : B

Subject : Waste water Engg.

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QUESTION :-

Ans :- part (a):

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* Hydraulic Retention Time (HRT) :-

The Hydraulic retension time (HRT) in waste-water treatment plant is a measure at an average time length of 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 in the Homogenization tank is 12 to 24 hours, 24 to 48 hours in aeration tanks, 72 to 120 days in Anaerobic reactors, 5 to 12 hours in secondary clarifiers, 3 to 5 hours in primary clarifiers, 30 minutes

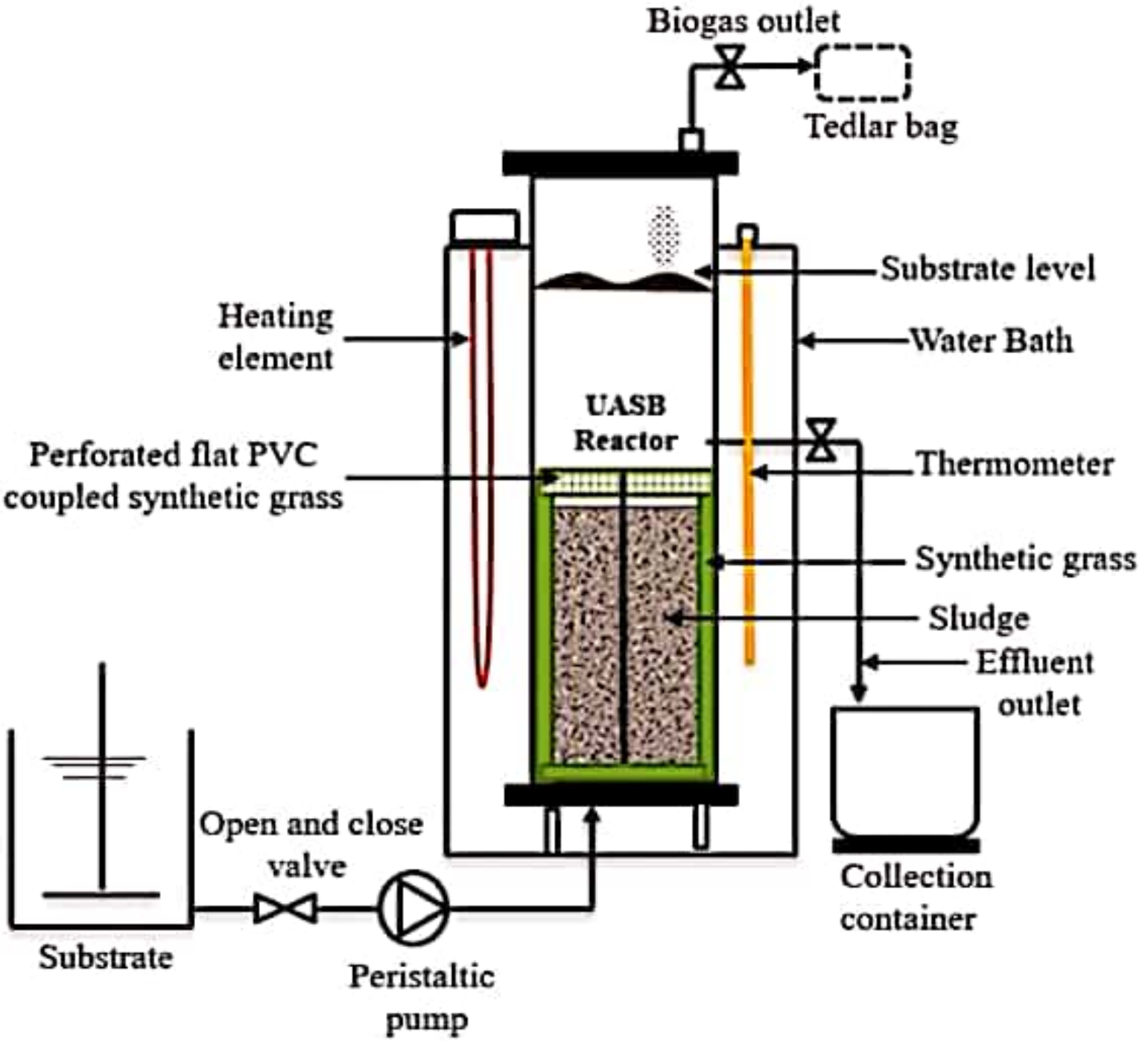
in chlorine contact tanks, 5 to 10 minutes in deep media filters etc. During the design stage itself the HRT of waste water in various stages are calculated in order to achieve the outlet parameters. If HRT is not properly maintained at various stages, we may not get the desired parameters for discharge / reuse.

→ For example if we assume the HRT is 5 days and the total volume of the reactor is 500 MLD, Then the per day influent feeding amount is 100 MLD.

⇒ HRT FORMULA:-

$$hr = \frac{(\text{Tank volume, cuft})(7.48\ \text{gal/cu ft})(24\ \text{hr/d})}{\text{Flow, gal/d}}$$

$$h = \frac{(\text{Tank volume, } m^3)(0.001\ \text{L/m}^3)}{(\text{Flow, L/s})(60\ \text{s/min})(60\ \text{m/h})}$$



★ Solid Retention Time (SRT):-

SRT controls the concentration of bacteria throughout the treatment system. A higher SRT contributes to a higher bacterial concentration in the reactor, which give rise to;

→ Smaller reactor size.

→ Larger reactor size.

→ Reduce Sludge production.

→ Higher aeration requirements due to the extra oxygen required for endogenous respiration.

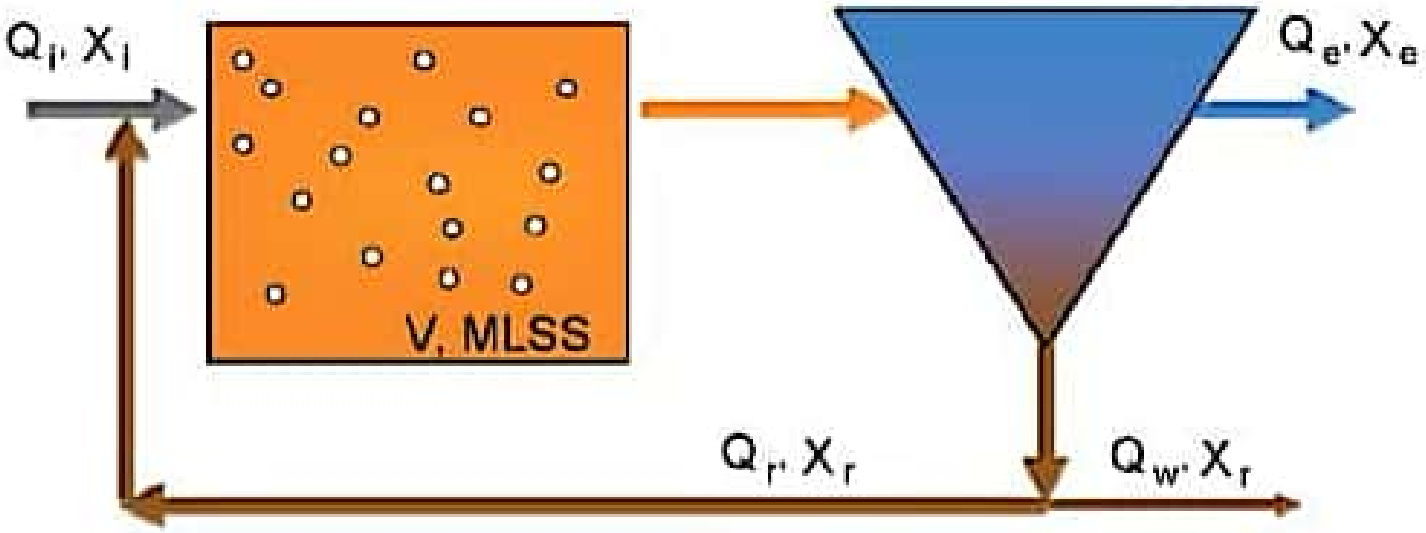
Clearly an optimum SRT exists, resulting from a trade-off between the gains and losses in the various cost terms.

For muncipal 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 hrs.

* SRT FORMULA :-

$$SRT = \frac{\text{Inventory}}{\text{Wastage}}$$

$$SRT = \frac{(V) \times (MLSS)}{(Q_w \times X_r) + (Q_e \times X_e)}$$



$$SRT = \frac{Inventory}{Wastage} = \frac{(V) \times (MLSS)}{(Q_w \times X_r) + (Q_e \times X_e)}$$

PART (B)

* METHODS USED FOR SRT FROM HRT :-

Following are the methods used for SRT from HRT;-

→ Waste water pH.

→ Chemical oxygen demand (COD).

→ Sludge volumetric index (SVI).

→ Mixed liquor volatile suspended solids (MLVSS).

→ Dissolved oxygen (DO).

→ Specific oxygen utilization rate (SOUR).

Part ©

★ ADVANTAGES :-

Following are the advantages of decoupling SRT from HRT;

→ Very high effluent quality in which most nutrients remain and removal of pathogens and a small print foot print.

→ Efficient biogas production.

→ They propose to discharge the effluent of a high-pH anaerobic digester to an algal culture pond.

→ In the organic reduction performances, the smaller the accumulation inside the reactor and undissolved nutrient content in the out flow, the higher the mineralisation performance & so the dissolved nutrient recovered in the effluent.