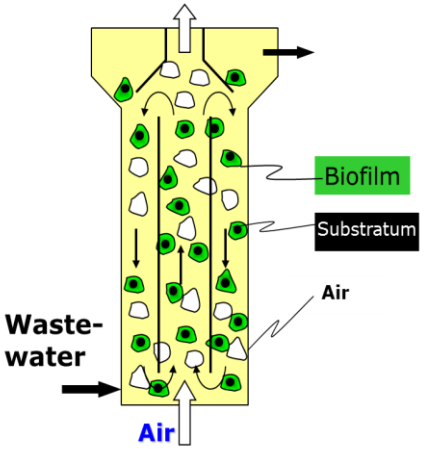
Biofilm processes

Biomass immobilization

Fixed biofilm →Trickling filter
→Rotating disk
→Membrane reactors

Moving biofilm → Fluidized bed
→ Air lift



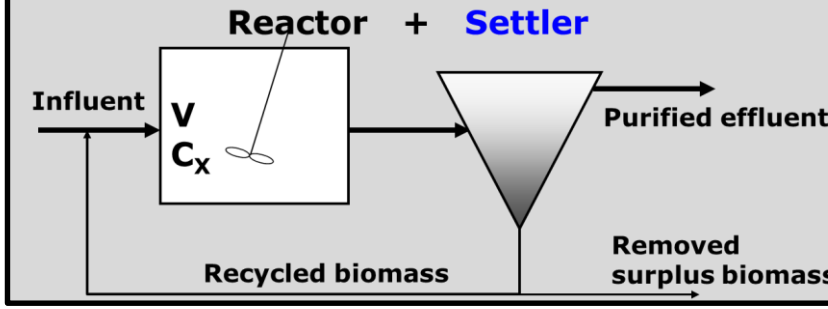
MULTIPHASIC BIOREACTORS

Prevention of biomass wash-out !

$D > \mu^{max}$ or $(SRT = HRT) > \frac{1}{\mu^{max}}$

Biomass retention

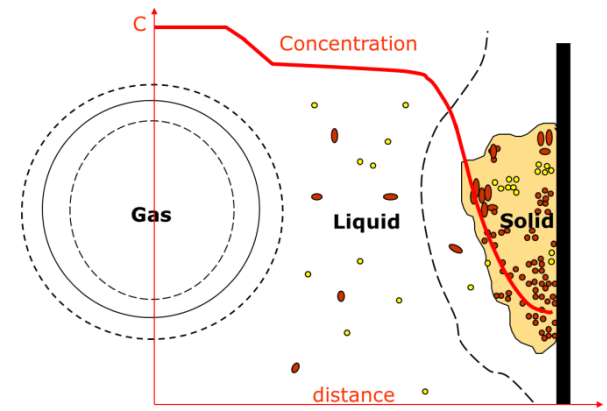
$SRT = \frac{V\,C_x}{\text{removed biomass}}$ $\frac{(\text{kg biomass})}{(\text{kg biomass / h})}$



Advantages & Benefit

- **Higher biomass** concentration
- **Higher volumetric conversion capac**ity
- **Less sludge** is produced
- **High settling velocity**
- Load and toxic **choc resistance**
  C, N and P removal (in same reactor/granule)

<u>One major drawback?</u>
Transport/Transfer in compact biofilm is more difficult than in suspended biomass…



If $D < \mu_{max}$ → Suspended cells growth
If $D > \mu_{max}$ → Biofilm growth

Biofilm geometrical heterogeneity
- Growth behavior (bulk medium, substrate diffusion)
- Shear stresses (biofilm detachment)