

5.2.1 Influence of waste water characteristics

The substrate of the PAO is generated in the anaerobic zone from the fermentation of the easily biodegradable organic material S_{bsi} in the influent into volatile fatty acids. Therefore the concentration of S_{bsi} in the influent is of crucial importance.

$$S_{bsi} = f_{sb} \cdot (1 - f_{ns} - f_{np}) \cdot S_{ti} \quad (3.3)$$

The effect of the S_{bsi} concentration on the performance of a bio-P removal process is twofold:

- (1) It influences the amount of phosphorus that can be released in the anaerobic zone;
- (2) It has an effect on the rate of phosphorus removal.

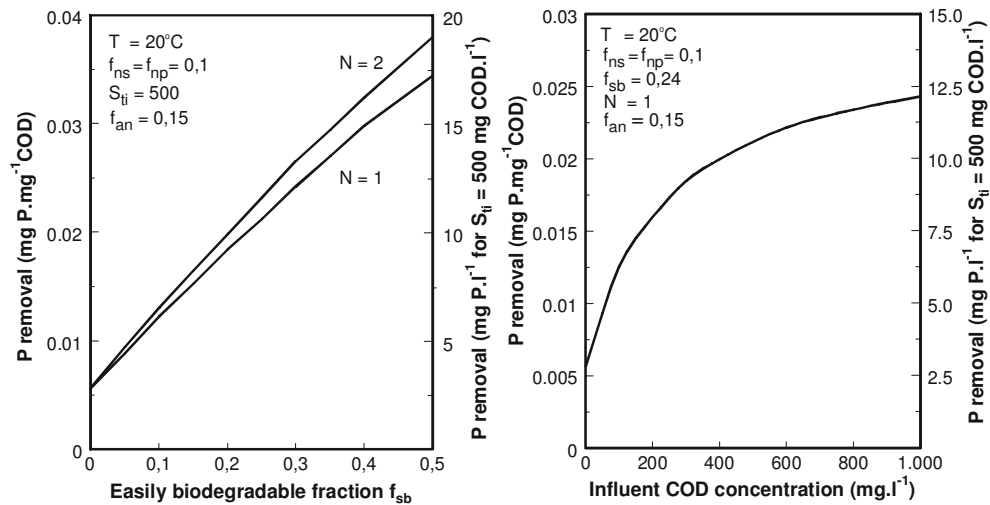


Figure 5.5 Influence of the influent COD concentration and composition on the degree and rate of biological phosphorus removal

In Fig. 5.5a the ratio between the concentration of phosphorus removed and COD in the influent is shown here as a function of the fraction f_{sb} . The phosphorus removal was evaluated for an anaerobic mass fraction f_{an} of 0.15, operated in two modes: (1) a single completely mixed reactor and (2) two completely mixed reactors in series. The second option allows a higher degree of phosphorus removal, as the conversion of S_{bsi} to VFA is more complete. As expected, an increase in f_{sb} results in higher phosphorus removal.

In Fig. 5.5b the ratio between the COD concentration in the influent and the amount of phosphorus removed is given. Fig 5.5b clearly shows that the extent of phosphorus removal is significantly higher when the concentration of COD in the influent is increased. This is caused by the fact that the fermentation process (in which VFA is generated from S_{bsi}) is a first order process and therefore will proceed more rapidly when the initial concentration of S_{bsi} is high. Therefore it is important to maintain a high COD concentration in the influent. Infiltration of rainwater into the sewer system should be minimised as this will lower the COD concentration (but it will not lower the COD/P ratio!). Phosphorus removal in combined sewer systems may therefore be problematic, especially if nitrogen removal is also envisaged in the same treatment plant. In such cases, biological phosphorus removal is often supplemented by chemical precipitation of phosphorus with metal salts.