Electronic Supplementary Material (ESI) for Environmental Science: Water Research & Technology.

SUPPLEMENTAL INFORMATION

Table of stochiometric values used in mass balance calculations. These values are taken from the open source SUMO2 two-step nitrification model.

Parameter	Symbol	Value	Units
Heterotrophic Yield, Aerobic	Y_{OHO}	0.67	$\frac{\text{g } X_{OHO} \text{ - COD}}{\text{g } S_B \text{ - COD}}$
Heterotrophic Yield, Anoxic	$Y_{OHO,Ax}$	0.54	$\frac{\text{g } X_{OHO} \text{ - COD}}{\text{g } S_B \text{ - COD}}$
AOB Yield	Y_{AOB}	0.15	$\frac{\text{g } X_{AOB} \text{ - COD}}{\text{g } S_{NHx} \text{ - N}}$
NOB Yield	Y_{NOB}	0.09	$\frac{\text{g } X_{NOB} \text{ - COD}}{\text{g } S_{NO2} \text{ - N}}$
Nitrogen content of Biomass	$i_{N,B}$	0.07	$\frac{\text{g N}}{\text{g COD}}$

Process factor derivation for anammox (PNA and PdNA) processes. Calculations are shown using NO_X which is assumed to be all NO_2 for PNA or NO_3 for PdNA.

The effluent TIN of the first 2 steps of the process (nitrification and denitrification with influent COD) is:

$$TIN = NH_X + NO_X = 1 - TIN_{RO} \tag{1}$$

By definition:

$$AVN = \frac{NH_X}{NO_X} \tag{2}$$

$$NH_X = AVN \cdot NO_X \tag{3}$$

Combining (1) and (3):

$$NO_X + AVN \cdot NO_X = 1 - TIN_{RO}$$
$$NO_X(1 + AVN) = 1 - TIN_{RO}$$

Rearranging, the NOx to be removed via partial denitrification an/or anammox is then:

$$NO_X = \frac{1 - TIN_{RO}}{1 + AVN}$$

The NO_3 produced by anammox that needs to be denitrified is a stochiometric ratio of this, ie:

$$\frac{1 - TIN_{Ro}}{1 + AvN} \upsilon_{5,5}$$

Finally, the amount of NH_X that must be undergo nitritation or nitrification, is equivalent to the effluent TIN plus the TIN removed with influent COD (TIN_{RO}), or:

$$\frac{1 - TIN_{Ro}}{1 + AvN} + TIN_{Ro}$$