

Symbol	Description	Units
Y_A	Autotrophic yield	$\text{g } X_{BA} \text{ COD formed} \cdot (\text{g } N \text{ oxidised})^{-1}$
Y_H	Heterotrophic yield	$\text{g } X_{BH} \text{ COD formed} \cdot (\text{g COD utilized})^{-1}$
f_P	Fraction of biomass to particulate products	$\text{g } X_P \text{ COD formed} \cdot (\text{g } N \text{ decayed})^{-1}$
i_{XB}	Fraction nitrogen in biomass	$\text{g } N \cdot (\text{g COD})^{-1} \text{ in biomass}$
i_{XP}	Fraction nitrogen in particulate products	$\text{g } N \cdot (\text{g COD})^{-1} \text{ in } X_P$
μ_H	Maximum heterotrophic growth rate	d^{-1}
K_S	Half-saturation (heterotrophic growth)	$\text{g COD } m^{-3}$
K_{OH}	Half-saturation (heterotrophic oxygen)	$\text{g } O_2 \text{ } m^{-3}$
K_{NO}	Half-saturation (nitrate)	$\text{g } NO_{3-N} \text{ } m^{-3}$
b_H	Heterotrophic decay rate	d^{-1}
ν_g	Anoxic growth rate correction factor	-
ν_h	Anoxic hydrolysis rate correction factor	-
k_h	Maximum specific hydrolysis rate	$\text{g } X_S (\text{g } X_{BH} \text{ COD d})^{-1}$
K_X	Half-saturation (hydrolysis)	$\text{g } X_S (\text{g } X_{BH} \text{ COD})^{-1}$
μ_A	Maximum autotrophic growth rate	d^{-1}
K_{NH}	Half-saturation (autotrophic growth)	$\text{g } NH_{4-N} \text{ } m^{-3}$
b_A	Autotrophic decay rate	d^{-1}
K_{OA}	Half-saturation (autotrophic oxygen)	$\text{g } O_2 \text{ } m^{-3}$
k_a	Ammonification rate	$\text{g } X_S (\text{g COD d})^{-1}$

Symbol	Description	Units
S_I	Soluble inert organic matter	$g \text{ COD} \cdot m^{-3}$
S_S	Readily biodegradable substrate	$g \text{ COD} \cdot m^{-3}$
X_I	Particulate inert organic matter	$g \text{ COD} \cdot m^{-3}$
X_S	Slowly biodegradable substrate	$g \text{ COD} \cdot m^{-3}$
X_{BH}	Active heterotrophic biomass	$g \text{ COD} \cdot m^{-3}$
X_{BA}	Active autotrophic biomass	$g \text{ COD} \cdot m^{-3}$
X_P	Particulate products arising from biomass decay	$g \text{ COD} \cdot m^{-3}$
S_O	Dissolved oxygen	$g O_2 \cdot m^{-3}$
S_{NO}	Nitrate and nitrite nitrogen	$g N \cdot m^{-3}$
S_{NH}	$NH_4^+ + NH_3$ nitrogen	$g N \cdot m^{-3}$
S_{ND}	Soluble biodegradable organic nitrogen	$g N \cdot m^{-3}$
X_{ND}	Particulate biodegradable organic nitrogen	$g N \cdot m^{-3}$
S_{ALK}	Alkalinity	$\text{mol } HCO_3^- \cdot m^{-3}$

$$\frac{S_S}{dt} = \frac{Q}{V} [S_S^{IN} - S_S] - \frac{\mu_H}{Y_H} \frac{S_S}{K_S + S_S} \left[\frac{S_O}{K_{OH} + S_O} + \eta_g \frac{K_{OH}}{K_{OH} + S_O} \frac{S_{NO}}{K_{NO} + S_{NO}} \right] X_{BH} +$$

$$k_h \frac{X_S}{K_X X_{BH} + X_S} \left[\frac{S_O}{K_{OH} + S_O} + \eta_h \frac{K_{OH}}{K_{OH} + S_O} \frac{S_{NO}}{K_{NO} + S_{NO}} \right] X_{BH}$$