Differential Equations

Parameters:

D=dilution rate

u_1 =concentration of ammonia feed into fermenter

u_2 =concentration of glucose feed into fermenter

Nt=population at time t

K=carrying capacity

Ammonia

$$\frac{dc_1}{dt} = Du_1 - Dc_1 - yN_1\left(\frac{c_1}{c_1+K_1}\right)\left(\frac{c_2}{c_2+K_2}\right)$$

Glucose

$$\frac{dc_2}{dt} = Du_2 - Dc_2 - yN_2\left(\frac{c_1}{c_1+K_1}\right)\left(\frac{c_2}{c_2+K_2}\right)$$

Yeast

$$\frac{dy}{dt} = yR\left(\frac{c_1}{c_1+K_1}\right)\left(\frac{c_2}{c_2+K_2}\right) - Dy$$