

Homework 5.

J-1 4000 m^3 132 m^2 surface area. $\times 16$
 250000 capita. $Q_{pw} = 1500\text{ L/s}$ $N_{tot, eff} = 15\text{ mg/L}$

$$N_{tot, in} = \frac{15}{0.45} = 33.3\text{ mg/L.}$$

pre-denitrification in biofilter system.

specific loads. nitrification $0.6 - 1.5\text{ kg N-NH}_4/\text{m}^3/\text{d.}$

pre-denitrification. $0.6 - 1.0\text{ kg N-NO}_3/\text{m}^3/\text{d.}$

a). $Q = 1.5 \times 60 \times 60 \times 24 = 129600\text{ m}^3/\text{d.}$

$$N_{tot} = \frac{15}{0.45} \times 129600 \times 10^{-3} = 4320\text{ kg/d}$$

$$N_{load} = 43\% \cdot N_{tot} = 1857.6\text{ kg/d.}$$

$$V = \frac{N_{tot}}{load}$$

nitrification 1298.4 m^3 or 3096 m^3
 de-nitrification 1857.6 m^3 or 3096 m^3

$$V_{tot} = 3096 \text{ or } 6192\text{ m}^3 \quad 50\% \sim 100\%$$

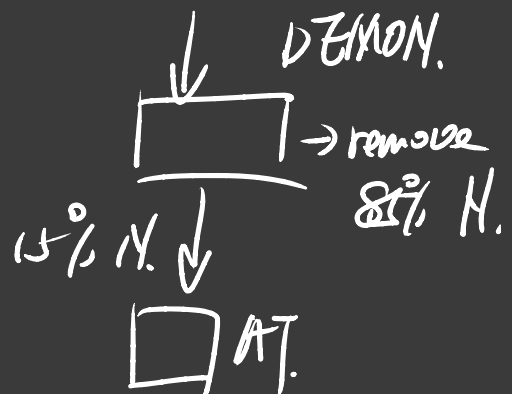
$$V_{current} = 16 \times 400 = 6400\text{ m}^3$$

b) substrate for denitrification, alkalinity for pH

J-2.  half as NH_4^+ in effluent,

Digester.

half N. in sludge.

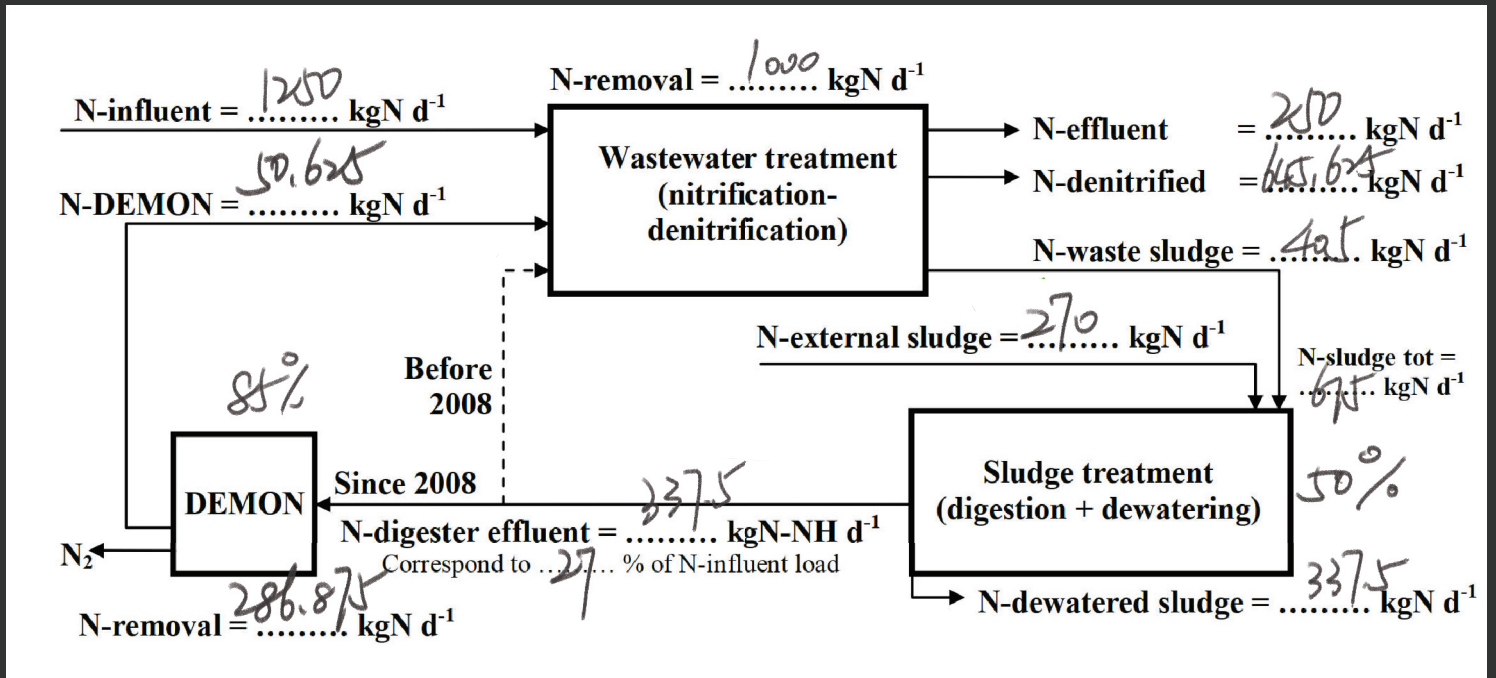


$$N_{\text{tot, eff}} = 5 \text{ g/m}^3$$

$$N_{\text{tot, in}} = \frac{5}{1-0.8} = 25 \text{ g/m}^3$$

$$Q_0 = 50000 \text{ m}^3/\text{d}$$

$$S_{\text{BOD}_{5,0}} = 180 \text{ g O}_2/\text{m}^3$$



$$N_{\text{-influent}} = 25 \times 50000 \times 10^{-3} = 1250 \text{ kg/d}$$

$$N_{\text{-effluent}} = 5 \times 50000 \times 10^{-3} = 250 \text{ kg/d}$$

$$N_{\text{-removal}} = N_{\text{-influent}} \times 80\% = 1000 \text{ kg/d}$$

$$N_{\text{-waste sludge}} = 180 \times 0.045 \times 50000 \times 10^{-3} = 405 \text{ kg/d}$$

$$N_{\text{-external sludge}} = \frac{405}{0.6} \times 0.4 = 270 \text{ kg/d}$$

$$N_{\text{-sludge tot}} = 405 + 270 = 675 \text{ kg/d}$$

$$N_{\text{-dewatered sludge}} = 675 \times 0.5 = 337.5 \text{ kg/d}$$

$$N_{\text{-digester effluent}} = 675 \times 0.5 = 337.5 \text{ kg/d}$$

$$337.5 / 1250 = 27\%$$

$$N_{\text{-DEMON removal}} = 337.5 \times 0.85 = 286.875 \text{ kg/d}$$

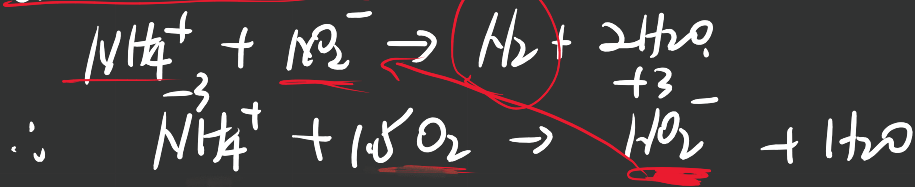
$$N_{\text{-DEMON}} = 337.5 \times 0.15 = 50.625 \text{ kg/d}$$

$$N_{\text{-denitrified}} = 1250 + 50.625 - 250 - 405 = 645.625 \text{ kg/d}$$

b) $0.25 \text{ CHF/kg O}_2 \rightarrow$



DGM ON nitrification.



halb. $\text{N}_2 \uparrow$

halb. NO_2^-

$$\therefore \Delta Q = 1.5 \text{ mol} / \text{mol NH}_4^+$$

$$\therefore 1.5 \times \frac{287}{14} \times 32 \times 265 \times 0.25 = 74825 \text{ kWh/a.}$$

28 kWh 28121.