EB – Exercises

Felipe B. Pinto 61387 – MIEQB

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Conteúdo

Questão 1

A $150\,\mathrm{m}^3$ reactor is operated at $35\,°\mathrm{C}$ to produce biomass from glucose. The O_2 consumption rate is $1.5\,\mathrm{kg\,m^{-3}\,h^{-1}}$. The stirrer dissipates heat at the speed of $1\,\mathrm{kW\,m^{-3}}$. The cooling water flows at a temperature of $10\,°\mathrm{C}$ and at a flow rate of $60\,\mathrm{m}^3/\mathrm{h}$, it passes inside a coil placed inside the reactor. If the system operates in steady state, determine the temperature of the cooling water leaving the reactor.

Data:

- $Q = 460\,\mathrm{kJ\,mol\,(O2)^{-1}}$
- $Cp_{H_2O} = 75.4\,\mathrm{J\,mol^{-1}\,°C^{-1}}$

Resposta

$T_1 = T_0 + \Delta T;$

$$\Delta H = M\,Cp\,\Delta T = (v * \rho_{H_2O})\left(75.4\,\mathrm{J\,mol^{-1}\,°C^{-1}}\,\frac{M_{w\,H_2O}\,\mathrm{g}}{\mathrm{mol}}\right)\Delta T =$$

$$= (60 * 1000\,\mathrm{kg/h})\left(\frac{75.4}{18}\,\mathrm{kJ\,kg^{-1}\,°C^{-1}}\right)\Delta T$$