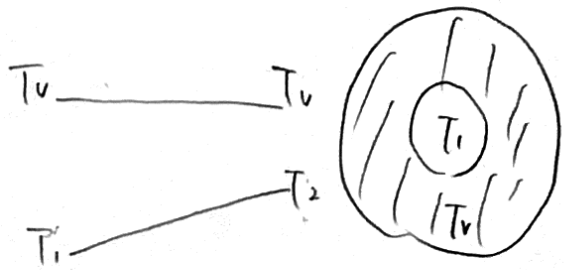
A6

(a) $$\Delta T_{lm} = \frac{(T_v - T_2) - (T_v - T_1)}{\ln \frac{(T_v - T_2)}{(T_v - T_1)}}$$

$$= \frac{T_2 - T_1}{\ln\left(\frac{T_v - T_1}{T_v - T_2}\right)}$$



(b) $$0 = w C_p (T_2 - T_1)$$

$$= UA \Delta T_{lm} = UA \frac{T_2 - T_1}{\ln\left(\frac{T_v - T_1}{T_v - T_2}\right)}$$

より $$\ln \frac{T_v - T_1}{T_v - T_2} = \frac{UA}{wC_p}$$

$$\ln \frac{T_v - T_2}{T_v - T_1} = -\frac{UA}{wC_p} \quad より \quad \frac{T_v - T_2}{T_v - T_1} = \exp\left(-\frac{UA}{wC_p}\right)$$

$$T_v - T_2 = (T_v - T_1) \exp\left(-\frac{UA}{wC_p}\right)$$

$$T_2 = T_v - (T_v - T_1) \exp\left(-\frac{UA}{wC_p}\right) \quad -①$$

(c) $T_v = 110^\circ C$, $T_1 = 20^\circ C$, $T_2 = 65^\circ C$ では

$$\frac{UA}{wC_p} = \ln \frac{110 - 20}{110 - 65} = 0.693$$

(d) ①より $$T_2 = T_v - (T_v - T_2) \exp(-0.693)$$

$$= 110 - (110 - 65) \exp(-0.693)$$

$$= \underline{87.5}\ ^\circ C$$

(e) これまでの条件より $\frac{UA}{wC_p} = 0.693$,

与えられた条件より $U \approx h = \alpha \cdot w^{0.8}$ とおける (α は定数)

すると $\frac{UA}{wC_p} \approx \frac{hA}{wC_p} = \frac{\alpha w^{0.8} A}{wC_p} = \frac{\alpha A}{w^{0.2} C_p}$ となり、等流量で分流すれば $w \to \frac{1}{2}w$ となるので

変更後: $\frac{UA}{wC_p} \approx \frac{\alpha A}{\left(\frac{w}{2}\right)^{0.2} C_p} = \frac{1}{\left(\frac{1}{2}\right)^{0.2}} \times \frac{\alpha A}{w^{0.2} C_p} = 2^{0.2} \times 0.693 = 0.796$

より $$T_2 = T_v - (T_v - T_1) \exp(-0.796) = \underline{69.4}\ ^\circ C$$