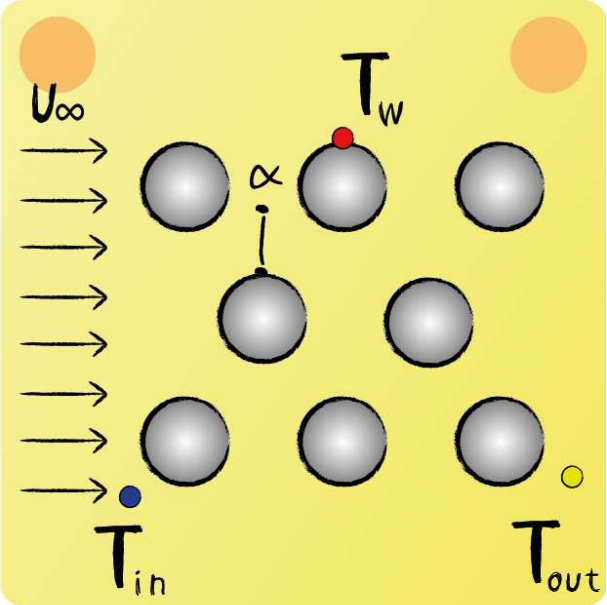
Lecture 6 - Question 4



An ideal liquid is passing a bundle of smooth tubes. The tubes have a surface area $A = 20$ m^2. The liquid is heated from $T_{\text{in}} = 10$ °C to $T_{\text{out}} = 60$ °C with an average heat transfer coefficient $\bar{\alpha} = 100$ W/m^{2}K. The smooth tubes are maintained at a constant temperature of $T_{\text{w}} = 100$ °C. Determine the rate of heat transfer towards the liquid.

$$\Delta T_{\text{m}} = \frac{\Delta T_{\text{inlet}} - \Delta T_{\text{outlet}}}{\ln\left(\frac{\Delta T_{\text{inlet}}}{\Delta T_{\text{outlet}}}\right)} = \frac{(T_{\text{w}} - T_{\text{in}}) \; - \; (T_{\text{w}} - T_{\text{out}})}{ln\left(\frac{(T_{\text{w}} - T_{\text{in}})}{(T_{\text{w}} - T_{\text{out}})}\right)} = 61.66\,^{\circ}\text{C}$$

$$\dot{Q} = \overline{\alpha} A \Delta T_{\text{m}} = 123.31 \text{ W}$$