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level 6

THERMO

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f) Baffles are used to direct flow in a desired pattern to maximise heat exchange whilst also creating a turbulent flow which makes the heat exchanger more efficient.

Two

a)

$$L = 10 \text{ m}$$

$$d = 50 \text{ mm} = 0.05 \text{ m}$$

$$D = 200 \text{ mm} = 0.2 \text{ m}$$

$$T_{H_i} = 150^\circ \text{C}$$

$$\dot{V}_H = 130 \text{ l/min}$$

$$\dot{V}_C = 450 \text{ l/min}$$

$$T_{C_i} = 8^\circ \text{C}$$

$$U = \frac{1}{RA}$$

$$R = \frac{1}{h_H A} + \frac{1}{h_C A}$$

$$h_H = 2600 \text{ W/m}^2 \text{K}$$

$$h_C = 8.5 \text{ W/m}^2 \text{K}$$

$$A = 0.05 \text{ m} \times 10 = 0.5 \text{ m}^2$$

$$R = \frac{1}{2600 \times 0.5} + \frac{1}{8.5 \times 0.5} = 0.075$$

$$U = \frac{1}{0.075 \times 0.5} = \underline{\underline{8.47 \text{ W/m}^2 \text{K}}}$$

due to the thinness of the tube and high conductivity the heat transfer by conduction is so small it can be ignored.