

6-90 An adiabatic open feedwater heater mixes steam with feedwater. The outlet mass flow rate and the outlet velocity are to be determined.

Assumptions Steady operating conditions exist.

Properties From a mass balance

$$\dot{m}_3 = \dot{m}_1 + \dot{m}_2 = 0.2 + 10 = \mathbf{10.2 \text{ kg/s}}$$

The specific volume at the exit is (Table A-4)

$$\left. \begin{array}{l} P_3 = 100 \text{ kPa} \\ T_3 = 60^\circ\text{C} \end{array} \right\} \nu_3 \cong \nu_{f@60^\circ\text{C}} = 0.001017 \text{ m}^3/\text{kg}$$

The exit velocity is then

$$\begin{aligned} V_3 &= \frac{\dot{m}_3 \nu_3}{A_3} = \frac{4\dot{m}_3 \nu_3}{\pi D^2} \\ &= \frac{4(10.2 \text{ kg/s})(0.001017 \text{ m}^3/\text{kg})}{\pi(0.03 \text{ m})^2} \\ &= \mathbf{14.68 \text{ m/s}} \end{aligned}$$

