

36.26 $200 \frac{lb}{hr}$ of $5psig$ saturated steam enters a heating coil which supplies $100MBH$. What percent of the exiting steam is in a liquid phase?

- A. 44%
- B. 48%
- C. 54%
- D. 59%

Consider the saturated steam entering the coil as State 1 and the saturated mixture leaving the coil as State 2.

Use the **Properties of Saturated Water and Steam** table to obtain the enthalpy at State 1.

$$P_1 = 5psig \approx 20psia$$

$$h_1 = h_g = 1156.19 \frac{Btu}{lb}$$

The total heat transfer and mass flow rate are given. Determine the enthalpy at State 2.

$$\dot{Q} = \dot{m}\Delta h = \dot{m}(h_1 - h_2)$$

$$h_2 = h_1 - \frac{\dot{Q}}{\dot{m}} = 1156.19 \frac{Btu}{lb} - \frac{100,000 \frac{Btu}{hr}}{200 \frac{lb}{hr}} = 656.19 \frac{Btu}{lb}$$

Determine the quality at State 2. Use the steam table to obtain enthalpy values h_f and h_{fg} . The quality is the fraction of the saturated mixture that is in a liquid phase.

$$h_f = 196.25 \frac{Btu}{lb}$$

$$h_{fg} = 959.94 \frac{Btu}{lb}$$

$$x_2 = \frac{h_2 - h_f}{h_{fg}} = \frac{656.19 \frac{Btu}{lb} - 196.25 \frac{Btu}{lb}}{959.94 \frac{Btu}{lb}} = 0.479$$

Answer B