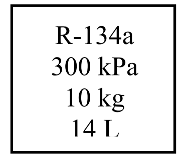
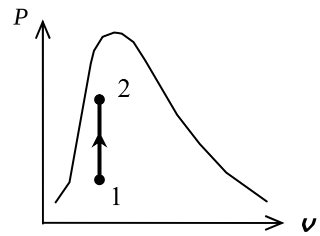
4-41 A rigid container that is filled with R-134a is heated. The temperature and total enthalpy are to be determined at the initial and final states.



Analysis This is a constant volume process. The specific volume is

$$\boldsymbol{v}_1 = \boldsymbol{v}_2 = \frac{\boldsymbol{V}}{m} = \frac{0.014\ \text{m}^3}{10\ \text{kg}} = 0.0014\ \text{m}^3/\text{kg}$$

The initial state is determined to be a mixture, and thus the temperature is the saturation temperature at the given pressure. From Table A-12 by interpolation



$$T_1 = T_{\text{sat @ 300 kPa}} = \mathbf{0.61°C}$$

and

$$x_1 = \frac{\boldsymbol{v}_1 - \boldsymbol{v}_f}{\boldsymbol{v}_{fg}} = \frac{(0.0014 - 0.0007736)\ \text{m}^3/\text{kg}}{(0.067978 - 0.0007736)\ \text{m}^3/\text{kg}} = 0.009321$$

$$h_1 = h_f + x_1 h_{fg} = 52.67 + (0.009321)(198.13) = 54.52\ \text{kJ/kg}$$

The total enthalpy is then

$$H_1 = mh_1 = (10\ \text{kg})(54.52\ \text{kJ/kg}) = \mathbf{545.2\ kJ}$$

The final state is also saturated mixture. Repeating the calculations at this state,

$$T_2 = T_{\text{sat @ 600 kPa}} = \mathbf{21.55°C}$$

$$x_2 = \frac{\boldsymbol{v}_2 - \boldsymbol{v}_f}{\boldsymbol{v}_{fg}} = \frac{(0.0014 - 0.0008199)\ \text{m}^3/\text{kg}}{(0.034295 - 0.0008199)\ \text{m}^3/\text{kg}} = 0.01733$$

$$h_2 = h_f + x_2 h_{fg} = 81.51 + (0.01733)(180.90) = 84.64\ \text{kJ/kg}$$

$$H_2 = mh_2 = (10\ \text{kg})(84.64\ \text{kJ/kg}) = \mathbf{846.4\ kJ}$$