

$$\lambda := 0.001$$

$$\#pipesincircuit := 9$$

$$\rho := 10.747 \frac{lb}{ft^3}$$

$$Q_c := 18000 \frac{Btu}{hr}$$

$$lengthofpipe := 139 \text{ in}$$

$$\Delta P := 2 \text{ psi}$$

$$\#ofcircuit := 9$$

$$h_2 := 239.01 \frac{Btu}{lb \cdot min}$$

$$h_3 := 120.17 \frac{Btu}{lb \cdot min}$$

$$l := \#pipesincircuit \cdot lengthofpipe \cdot \#ofcircuit = (1.126 \cdot 10^4) \text{ in}$$

$$\Delta h := h_2 - h_3 = 118.84 \frac{Btu}{lb \cdot min}$$

$$a(d) := \frac{1}{4} \cdot \pi \cdot d^2$$

$$\dot{m} := \frac{Q_c}{\Delta h} \quad \dot{m} = 2.524 \text{ lb}$$

$$v(d) := \frac{\dot{m}}{a(d) \cdot \rho}$$

Constraint&guess Values

$$d := 1 \text{ in}$$

$$\Delta P \text{ s}^2 = \lambda \cdot \left( \frac{\rho \cdot v(d)^2}{2} \right) \cdot \left( \frac{l}{d} \right)$$

Solver

$$d\_solution := \text{find}(d) = 0.137 \text{ ft}$$

$$d\_solution = 1.647 \text{ in}$$