

**47.26**  $1000 \frac{Btu}{lb}$  of heat is added to  $70^\circ F$ ,  $14.7 psia$  air. What is the temperature after heating?

- A.  $3665^\circ F$
- B.  $3815^\circ F$
- C.  $3965^\circ F$
- D.  $4125^\circ F$

Consider the condition of the air before heating as State 1 and the condition of air after heating as State 2. Use the **Air at Low Pressure** tables to look up the enthalpy of air at  $70^\circ F$ . For low pressure air, enthalpy may be reasonably approximated as a function of temperature only.

$$h_1 \approx 126 \frac{Btu}{lb}$$

Calculate the enthalpy after heating.

$$h_2 = 126 \frac{Btu}{lb} + 1000 \frac{Btu}{lb} = 1126 \frac{Btu}{lb}$$

Return to the low pressure air table to look up the corresponding temperature for State 2. Without interpolating, notice  $h_2$  is about halfway between two values, making the temperature straightforward to obtain.

$$T_2 \approx 3665^\circ F$$

**Answer A**

**47.27**  $400 \frac{lbm}{hr}$  of  $62^\circ F$ , **60%** relative humidity air is heated to  $96^\circ F$  without changing the moisture content. How much heat is needed?

- A.  $3300 \frac{Btu}{hr}$
- B.  $6700 \frac{Btu}{hr}$
- C.  $10,100 \frac{Btu}{hr}$
- D.  $13,600 \frac{Btu}{hr}$

Since the moisture content is not changing, the heat transfer depends on the the mass flow rate, specific heat capacity of air, and the dry bulb temperature differential only. There is no need to account for humidity ratio or enthalpy.

$$\dot{Q} = \dot{m} c_p \Delta T$$

$$\dot{Q} = \left(400 \frac{lb}{hr}\right) \left(0.24 \frac{Btu}{lb^\circ F}\right) (96^\circ F - 62^\circ F) = 3624 \frac{Btu}{hr}$$

**Answer A**