In order to determine the dew point temperature at 6, we need to know at least two properties at that point. Right now, we don't know much about 6 except that all the water that is removed from 2 ends up at 6.

The moisture that is removed from 2 is the difference in moisture from 2 and 3:

$$\Delta \dot{m}_w = \dot{m}_{da,2} \cdot (W_2 - W_3) \tag{1}$$

where $\dot{m}_{da,2}$ is the mass flow rate (in lbs/hr) of dry air at state 2.

Since the moisture removed at 2 is added to the air at 5 resulting in 6, we can write:

$$\Delta \dot{m}_w = \dot{m}_{da,5} \cdot (W_6 - W_5) \tag{2}$$

So, equating (1) and (2) we obtain an expression we can use to solve for W_6 :

$$W_6 = W_5 + \frac{\dot{m}_{da,2}}{\dot{m}_{da,5}} \cdot (W_2 - W_3) \tag{3}$$

Since we are given the flow rate in standard CFM, and denoting the density of air at standard conditions with ρ_{STD} , we can write:

$$\dot{m}_{da,2} = SCFM_2 \cdot |60\,min/1\,hr| \cdot \rho_{STD}$$
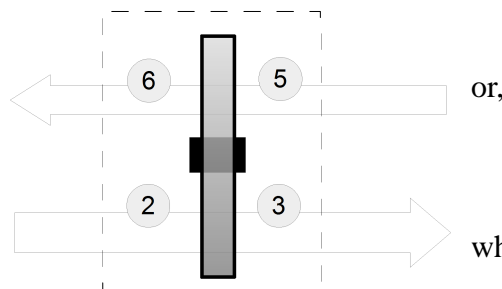
and

$$\dot{m}_{da,5} = SCFM_5 \cdot |60\,min/1\,hr| \cdot \rho_{STD}$$

hence $\dot{m}_{da,2}/\dot{m}_{da,5} = SCFM_2/SCFM_5$. Insert this in (3) and substitute numerical values:

$$W_6 = 100\,\frac{gr}{lb} + \frac{6{,}000}{4{,}000} \cdot (56 - 34)\frac{gr}{lb} = 133\,\frac{gr}{lb}$$

The other property from (6) we can determine from the information given is the enthalpy. Perform an energy balance on the wheel, using the control volume shown here with dashed lines:

$$\dot{m}_{da,2} h_2 + \dot{m}_{da,5} h_5 = \dot{m}_{da,2} h_3 + \dot{m}_{da,5} h_6$$

or,

$$h_6 = h_5 + \frac{\dot{m}_{da,2}}{\dot{m}_{da,5}} (h_2 - h_3)$$

which is the same as

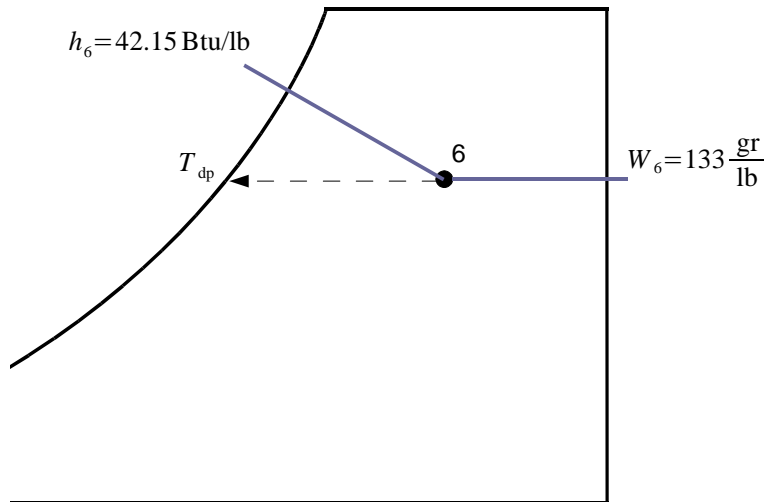$$h_6 = h_5 + \frac{SCFM_2}{SCFM_5} (h_2 - h_3) \tag{4}$$

The enthalpy at states 2, 3, and 5 can be obtained from a psychrometric chart:

$h_2 \approx 20.9 \, \text{Btu/lb}$, $h_3 \approx 21.8 \, \text{Btu/lb}$, and $h_5 \approx 43.5 \, \text{Btu/lb}$

So now, insert known values in (4)

$$h_6 = 43.5 + \frac{6,000}{4,000}(20.9 - 21.8) = 42.15 \, \text{Btu/lb}$$

Now, we can locate state 6 on the psychrometric chart and find the dew point temperature:

From this process we obtain $T_{dp,6} \approx 75 \, ^\circ F$

The correct answer is (D)