Energy balance

\[ m_c C_p\left(T_{c2} - T_{c1}\right) = m_R \left( \frac{h_{fg}}{p} \right) \]

\[ T_{c2} \]

LMTD = \[ \frac{\left( T_{SAT} - T_{c2} \right) - \left( T_{SAT} - T_{c1} \right)}{\ln \left( \frac{T_{SAT} - T_{c2}}{T_{SAT} - T_{c1}} \right)} \]

Energy balance

\[ m_c C_p\left(T_{c3} - T_{c2}\right) = m_R \left( h_{in} - h_{fg} \right) \]
Overall for the heat exchanger \[ \frac{M_{c}}{P_{e}} \left( T_{e3} - T_{e1} \right) = \dot{m}_{r} \left( h_{in} - h_{f} \right) \]

For each section \[ UA \Delta T_{LM} = \dot{m}_{R} \left( \Delta h_{R} \right) \]

Area for heat transfer = \( \pi DL \)

\[ \text{C} \text{p water} = 1.0 \text{ Btu} \frac{1}{\text{lbm R}} \]

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Chapter 4: Psychrometers

Moisture in air is a factor in human comfort.

Moisture characterized by

- Relative humidity - RH
- Humidity ratio - W \( (\omega) \)
- Wet bulb temperature \( T_{wb} \)
- Dew Point temperature \( T_{d} \)

\[ W = \frac{\text{mass of moisture}}{\text{mass of dry air}} \frac{\text{Hw} \ or \ \text{Kgw}}{\text{Kga}} \]
W is most useful for engineering calculations.

\[ RH \rightarrow RH = \frac{P_w}{P_{sat}} \]

\[ P_w = \text{partial pressure of water} \]

\[ P = P_a + P_w \]

Overall pressure

Dew point temperature: \( T_{sat} \mid P_w = T_d \)

Wet bulb temperature - approximation to the adiabatic saturation temperature.

\[ \phi_2 = 100\% \]

\[ T_2 = T_{wb} \]

Saturated with a sock

Adiabatic Saturator.
\[ T_{wb} = T_z \quad \Rightarrow \text{can deduce RH from that.} \]

Use psychrometric chart to find conditions (properties) at 80F and 80% RH

\[ W = 0.0177 \frac{\text{lbm}}{T_b a} \]

\[ h = 38.8 \frac{\text{Btu}}{T_b a} \]

\[ T_{wb} \approx 75 \text{F} \]