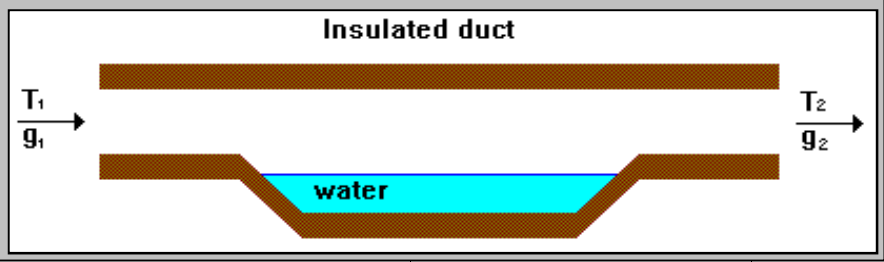
This worksheet shows how Thermo Utilities, MS Excel Add-ins can be used to calculate the adiabatic saturation temperature of humid air.
Determine the adiabatic saturation temperature of air at the following conditions:
dry-bulb temperature 22 degC
wet-bulb temperature (sling) 14 degC
atmospheric pressure 1.013 bar

An adiabatic process is defined as a process in which no external heat enters or leaves the system under consideration.
Adiabatic humidification process: Air is flowing through a perfectly insulated duct with an open water tank in the bottom of it. If the tank is infinitely long, the air at the outlet will be 100% saturated.
Inlet: dry-bulb temperature T1 and moisture content g1
Outlet: dry-bulb temperature T2 and moisture content g2
We may write: **h1 = h2** or **Sensible heat loss = Latent heat gain** i.e.

Cp * (T1 - T2) = Hfg * (g2 - g1)



Inputs		Units	Error ?	
Dry-bulb temperature = T1 = Td	22.0	C		
Wet-bulb temperatrure	14.0	C		
Atmospheric pressure	1.013	C		
Outputs				
Moisture content = g1 = InletMC	0.0066	kg/kg		
Spec. heat capacity at inlet = Cp	1.0102	kJ/(kg.K)		
Spec. enthalpy at inlet = InletH	38.7042	kJ/kg		
Assume that adiabatic saturation				
temperature Tsat, is 30 degC	13.7920	C		Assumed
Saturated air has the same temp.				
for dry and wet bulb which results				
into the following				
moisture content at outlet=OutletMC	0.0098	kg/kg		
Now the enthalpy at outlet can be				
calculated. OutletH is:	38.7043	kJ/kg		
We know that in an adiabatic				
process diff = OutletH - InletH = 0	0.0001			Goal
Now, use the solver to adjust cell				
Tsat, until the goal cell				
diff is zero.				
Adiabatic Saturation Temp. =Tsat =	13.7918	C		

Taftan Data
Email: support@taftan.com
If you wish to know more about "Taftan Data" or other software

developed by this company please visit our website:				
http://www.taftan.com				