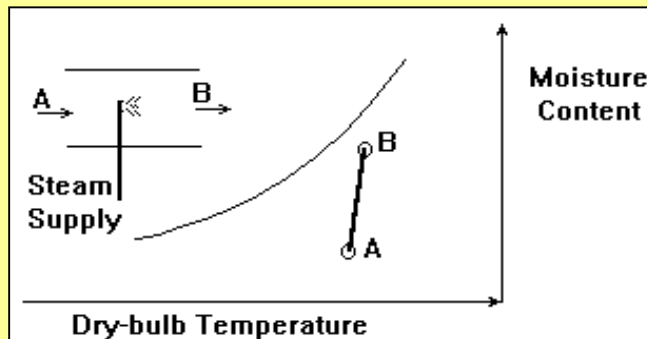


Direct steam injection

This document shows how **Thermo Utilities, MS Excel Add-ins** can be used for calculation of steam humidifiers.

In an air conditioning plant, air flow rate of 2 kg/s passes through a steam humidifier. Determine the load on the humidifier and the steam supplied.

The dry and wet-bulb temperature of the inlet air are 9 C and 3 C respectively. Air leaves the humidifier with a moisture content of 0.008



Inputs		Units
Inlet air, DBT	9.00	C
Inlet air, WBT	3.00	C
Inlet air, mass flow rate	2.00	kg/s
Outlet air, moisture content	0.008	
Atmospheric pressure	1.01	bar

Steam can be directly injected to air stream for air conditioning purposes. In this process, all the latent heat necessary for evaporation of water is added outside the air stream. The supply of water vapor increases the enthalpy of the air. The temperature increase in this process is negligible and it can be assumed as an isothermal process with good approximation. Load on humidifier is:

$$Q = m_A * (h_B - h_A)$$

and the steam supplied by humidifier is:

$$m_{\text{Steam}} = m_A * (m_{cB} - m_{cA})$$

Output		
moisture content of inlet air	0.0022	
Outlet air, DBT	9.0000	
Spec. enthalpy at inlet	14.5	kJ/kg
Spec. enthalpy at outlet	29.2	kJ/kg
Load on the humidifier	29.4102	kW
steam supplied	0.0117	kg/s

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If you want to know more about "Taftan Data" or other software developed by this company please visit our website:

<http://www.taftan.com>