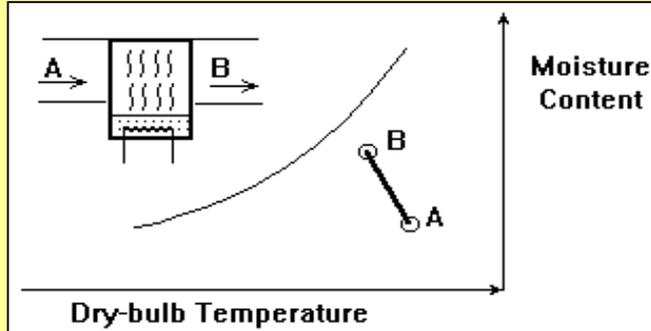


Pan steam humidifier

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 pan 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

A pan steam humidifier uses a heating element inside a water tank. The tank is mounted at the bottom of the air duct. The air flowing over the water surface will cause some evaporative cooling which results in drop of air dry-bulb temperature. The ratio of sensible heat to total heat is approximately 0.2
 Load on the humidifier is:
 $Q = mA * (hB - hA)$
 and the steam supplied by humidifier is:
 $m_{\text{Steam}} = mA * (mcB - mcA)$

Output		
moisture content of inlet air	0.0022	
Outlet air, DBT	12.66	C Assumed
Spec. enthalpy at inlet	14.5	kJ/kg
Spec. enthalpy at outlet	32.9	kJ/kg
Load on the humidifier = total heat	36.8061	kW
Sensible heat	7.3591	kJ/kg
Qs / Q = 0.2	0.1999	Goal
Use the solver to reach the goal		
steam supplied	0.0117	kg/s

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