Class: 4th Stage
Subject: air conditioning systems lab
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EXP. NO. 4

Air mixing operations

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Object:

The main purpose is to understand the air mixing process and how we represented it on psychrometric chart.

Air mixing process

Air supply to a building is generally performed by an air handling unit. The process may include for filtering, heating, cooling, humidification, or dehumidification, all of which processes consume energy. Since the fresh air demand for the building occupants may be less than that is required for air conditioning purposes, it would be wasteful if 100% fresh air were used, with wholesome treated air rejected to the atmosphere in its place. Therefore, mixing is used to balance the needs between the occupant requirements for fresh air and the air conditioning process for the building.
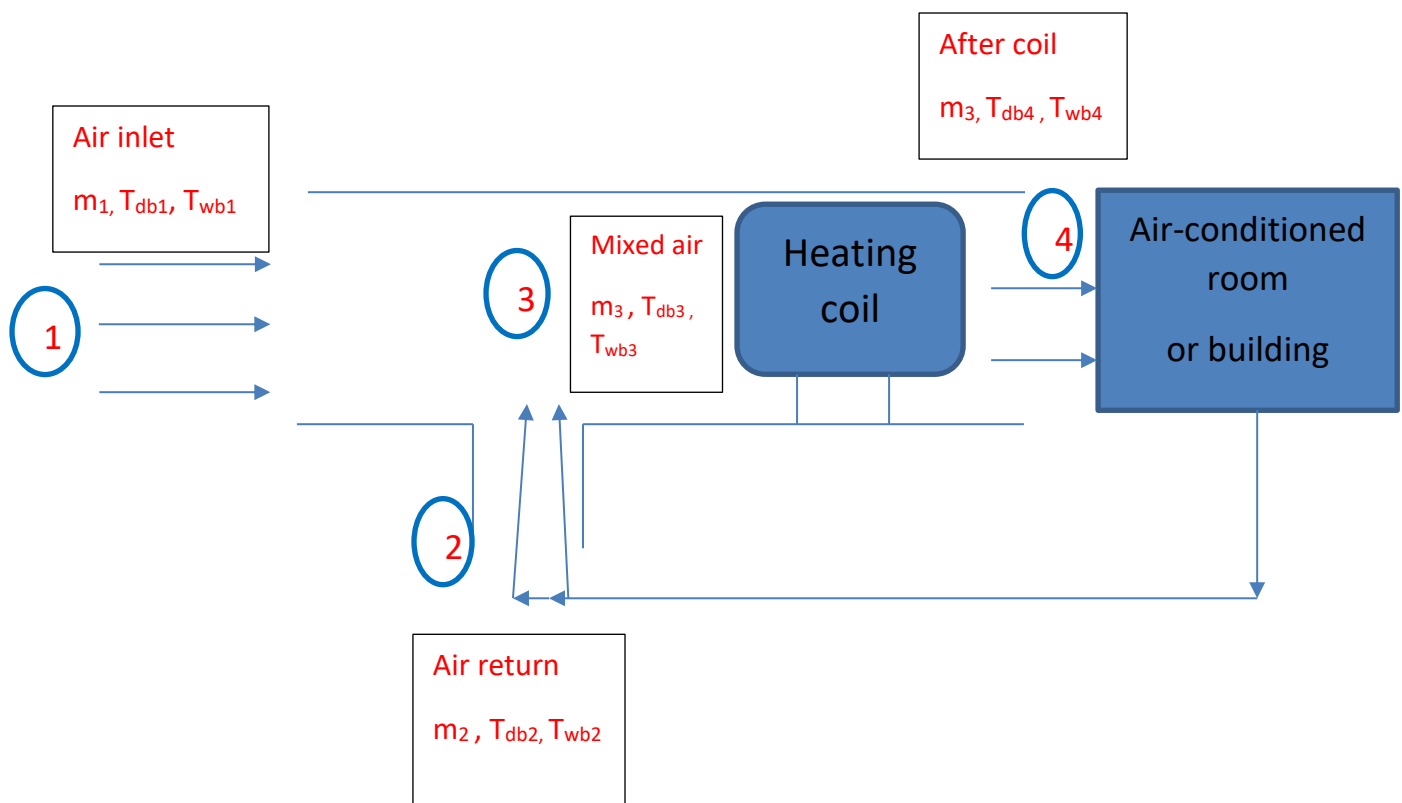
Enhanced controls systems may monitor the return air quality or carbon dioxide concentration in order to automatically modulate the air mix for optimum energy efficiency whilst maintaining desired fresh air requirements. Such systems work very well in buildings where the occupancy rate can vary greatly throughout the day, or seasonally. Additionally, when outside air conditions are such, typically mid-season weather conditions, it may be that ambient temperatures are suitable for free cooling purposes. In such conditions the mixing damper will be set to close and the system use full fresh air for optimum energy efficiency. Where fresh air is not required, such as early morning pre-heat or pre-conditioning periods, the mixing damper can be automatically set to full recirculation, again for optimum energy efficiency.

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usage

The most common application for an air-mixing plenum is the mixing of return air (or extract air) with fresh air to provide a supply air mixture for onward distribution to the building or area which the ventilation system is serving. The air transferred from the return air stream to the supply air stream is termed recirculated air. All air not mixed is rejected to the atmosphere as exhaust air. Air streams are mixed to save energy and improve energy efficiency.
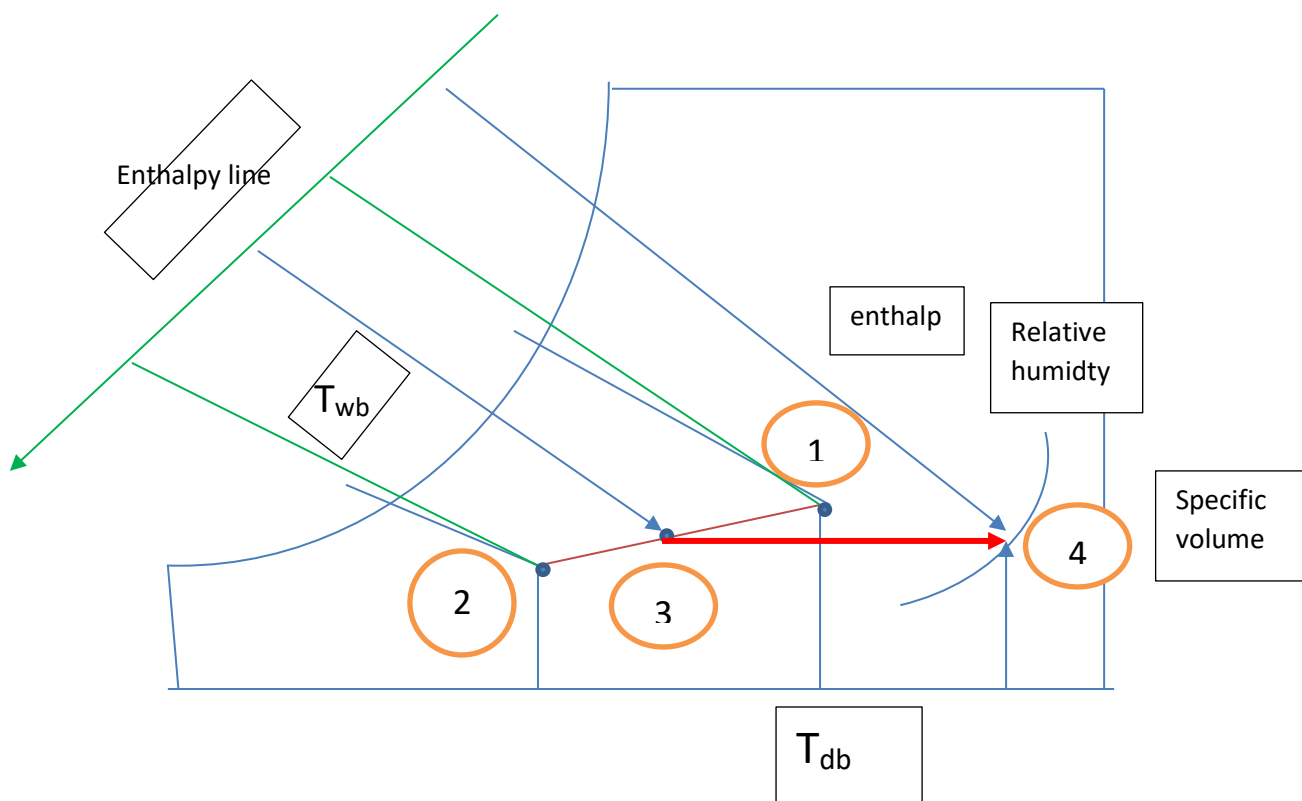
Procedure of air mixing

After coil
m_3, T_{db4}, T_{wb4}

Air inlet
m_1, T_{db1}, T_{wb1}

1

Mixed air
m_3, T_{db3}, T_{wb3}

3

Heating coil

4

Air-conditioned room
or building

2

Air return
m_2, T_{db2}, T_{wb2}

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$m_3 = m_1 + m_2$

$m_3 h_3 = m_1 h_1 + m_2 h_2$ balance

$$h_3 = \frac{m_1 h_1 + m_2 h_2}{m_3}$$

h_1 and h_2 from psychrometric chat

heat supply at 3 to 4 process

$Q_H = m_3 (h_4 - h_3)$

Enthalpy line

T_{wb}

enthalp

Relative humidty

Specific volume

1

2

3

4

T_{db}

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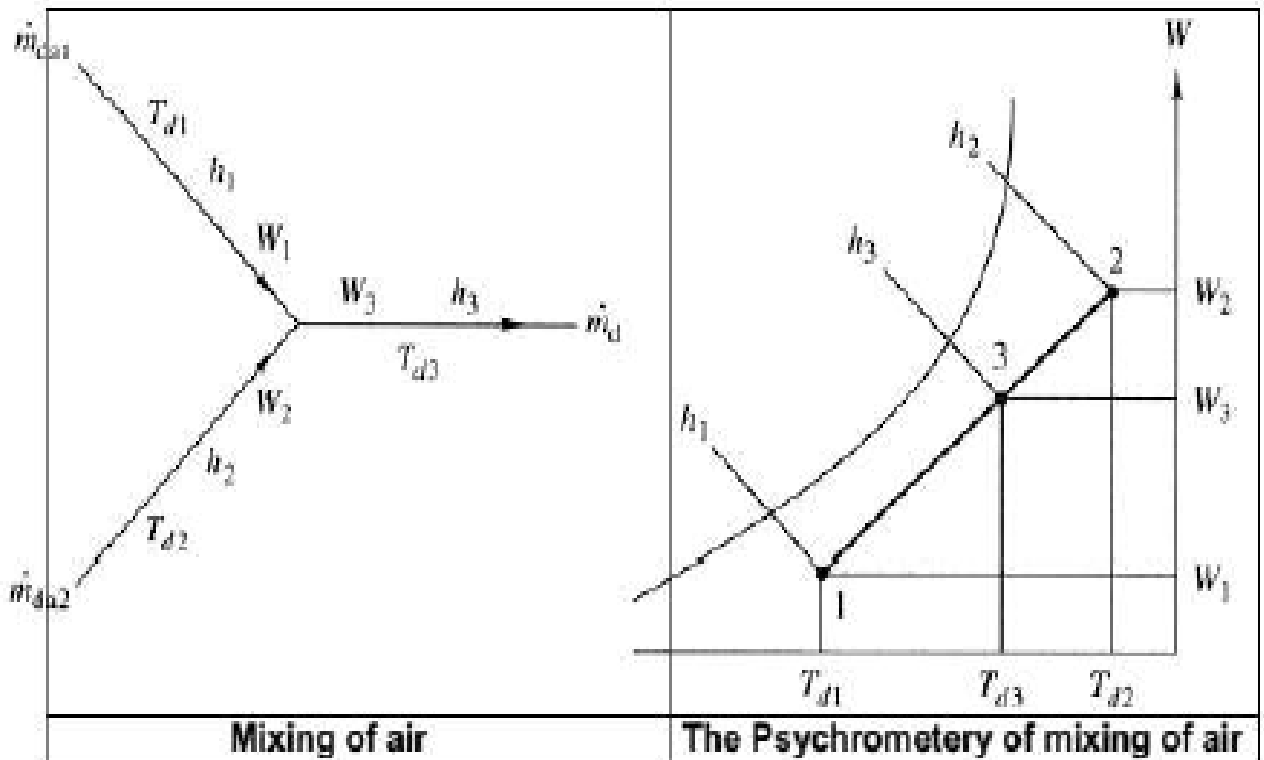
making use of conservation of energy:

$$h_1 . m_{a1} + h_2 m_{a2} = h_3 . m_{a3} \qquad associated \ water \ vapour$$

$$\frac{m_{a2}}{m_{a1}} = \frac{h_1 - h_2}{h_3 - h_2}$$

or

$$h_3 = \frac{h_1 . m_{a1} + h_2 m_{a2}}{m_{a1} + m_{a2}}$$

from this it follows that the three points must be lie on a straight line in a mass - energy co-ordinate system

Mixing of air   The Psychrometery of mixing of air

Discussion :

1- Discuss Result

2- What is advantage from mixing air?