



Class: 2nd Stage
Subject: air conditioning and refrigeration
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EXP. NO. 2

Sensible Heating



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Introduction

a psychrometric process that involves the increase or decrease in the temperature of air without changing its humidity ratio

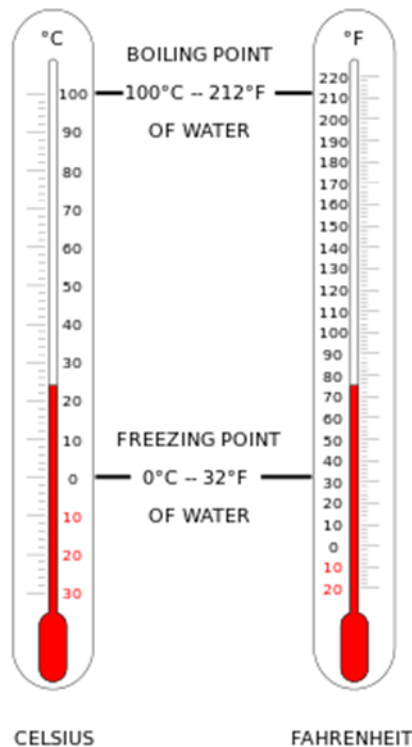
Example: passing moist air over a room space heater and of kiln air over the heating coils.

The term is used in contrast to a latent heat, which is the amount of heat exchanged that is hidden, meaning it occurs without change of temperature. For example, during a phase change such as the melting of ice, the temperature of the system containing the ice and the liquid is constant until all ice has melted. The terms latent and sensible are correlative.

The sensible heat of a thermodynamic process may be calculated as the product of the body's mass (m) with its specific heat capacity (c) and the change in temperature (ΔT):



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Joule described sensible heat as the energy measured by a thermometer

Sensible heat and latent heat are not special forms of energy. Rather, they describe exchanges of heat under conditions specified in terms of their effect on a material or a thermodynamic system.

In the writings of the early scientists who provided the foundations of thermodynamics, sensible heat had a clear meaning in calorimetry. James Prescott Joule characterized it in 1847 as an energy that was indicated by the thermometer .

Both sensible and latent heats are observed in many processes while transporting energy in nature. Latent heat is associated with changes of state, measured at constant temperature, especially the phase changes of atmospheric water vapor, mostly vaporization and condensation, whereas sensible heat directly affects the temperature of the atmosphere.

In meteorology, the term 'sensible heat flux' means the conductive heat flux from the Earth's surface to the atmosphere. It is an important component of Earth's



surface energy budget. Sensible heat flux is commonly measured with the eddy covariance method.

Procedure of Sensible Heating

Sensible heating process is opposite to sensible cooling process. In sensible heating process the temperature of air is increased without changing its moisture content. During this process the sensible heat, DB and WB temperature of the air increases while latent of air, and the DP point temperature of the air remains constant. Sensible heating of the air is important when the air conditioner is used as the heat pump to heat the air. In the heat pump the air is heated by passing it over the condenser coil or the heating coil that carry the high temperature refrigerant. In some cases the heating of air is also done to suit different industrial and comfort air-conditioning applications where large air conditioning systems are used.

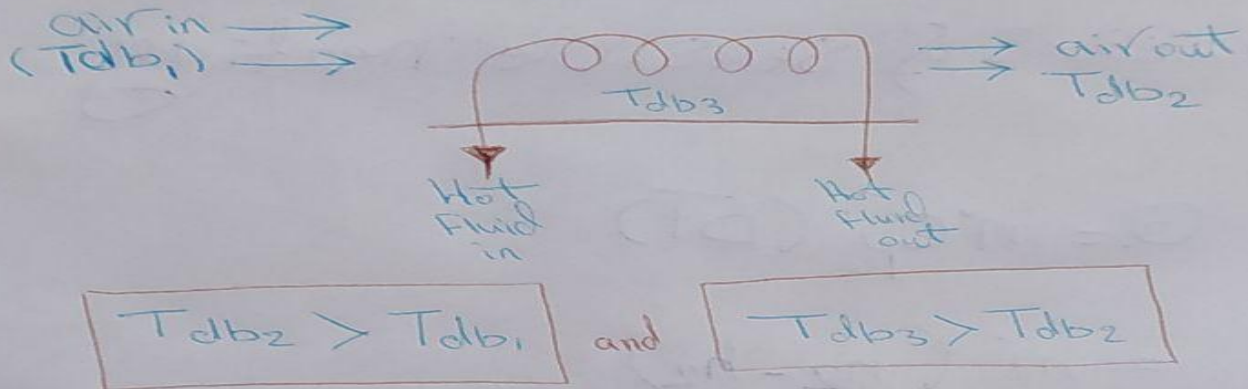
In general the sensible heating process is carried out by passing the air over the heating coil. This coil may be heated by passing the refrigerant, the hot water, the steam or by electric resistance heating coil. The hot water and steam are used for the industrial applications.

Like the sensible cooling, the sensible heating process is also represented by a straight horizontal line on the psychrometric chart. The line starts from the initial DB temperature of air and ends at the final temperature extending towards the right (see the figure). The sensible heating line is also the constant DP temperature line.

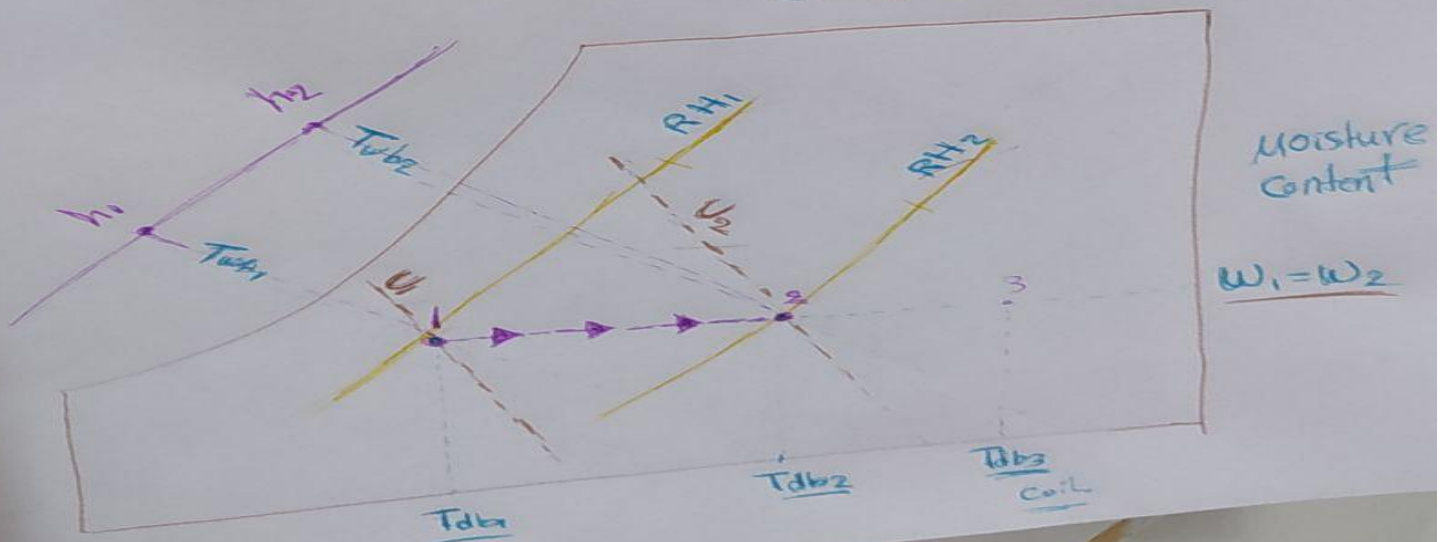


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Sensible heating



represented on psy-chart





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amount of heat added through the
processes of sensible heating

$$Q = \dot{m} c_{p_a} (\Delta T)$$

$$= \dot{m} (h_2 - h_1)$$

Change of enthalpy
through process 1-2
(sensible heating)