



Introduction

What is airconditioning?

Airconditioning is defined as a process which cools (or heats), cleans, circulates and freshens air, and controls its moisture content simultaneously.

Most of the airconditioning, particularly in India and such other countries, is about cooling: *i.e.* removal of heat from an enclosed space.

Heat is of two types: 'Sensible Heat' and 'Latent Heat'.

Sensible Heat is any heat that raises the temperature but not the moisture content of the substance. This is our regular and familiar everyday experience of heat. Because it raises the temperature it is felt by the senses, and this in fact, is why it is called Sensible Heat.

Latent Heat is the tricky one. When we talk of Latent Heat we mean 'Latent Heat of Vaporisation'. It is the heat *required to transform a liquid into vapour*. Take water for example. Water can be heated to its boiling point of 100°C. If more heat is added at this point the temperature of the water does not increase. The water continues to boil and becomes steam. So where does all the heat go? Well, the heat goes into changing the water into steam. The latent heat of vaporisation in this instance is the heat required to change water from liquid at 100°C to vapour at the same temperature.

Latent heat plays an important part in Refrigeration and Airconditioning. It explains the principle of refrigeration and also is a component of **Heat Load**, of which we will learn more a little later. **Human beings generate Latent Heat** by way of



moisture (perspiration) on their skin. This perspiration requires to be dried and therefore, a change of its state from liquid to vapour is required. Fresh air, which is added into the air system, very often brings in plenty of moisture with it. Removal of this additional moisture also involves latent heat removal.

A portion of the airconditioning heat load is therefore in the form of latent heat. For example, in an office 10% of the airconditioning heat load could be in the form of latent heat. This goes up to around 25% in a restaurant and around 33% in a movie theatre.

What is a 'ton'?

In airconditioning parlance, a 'ton' is a unit indicating a certain quantity of heat.

The quantity of heat contained in a substance is measured in British Thermal Units (BTUs) or in kilo Calories (kCal).

One BTU is the quantity of heat required to raise the temperature of 1 lb of water by 1°F.

1 Ton = 12,000 BTU = 3024 kCal

Throughout this booklet, we will use the abbreviation 'T' when referring to the ton.

What is airconditioning load?

Any heat generated within the space to be airconditioned forms a 'load' on the airconditioning system.

Examples of 'heat-generators' within a space are:

- People
- Lights and fans
- Voltage stabilisers
- Computers
- Photocopiers
- TVs and so on

Heat also enters the enclosed space from outside. Such heat is also a significant load on the airconditioning system. Heat from outside can be through:

- Walls
- Roof
- Glass (windows/glazing)
- Open doors and so on

When an airconditioning system is planned, the planning engineer takes into consideration all possible sources of heat in the space, and calculates the required capacity (tonnage) of the airconditioner.