Description and Operation

Unit air conditioners are manufactured in horizontal and vertical types and are thus adjustable to varying space requirements, being floor mounted or suspended. Water, steam and electrical connections are required to prepare them for operation. Electric power requirements generally range from 1 to 7 kw. Fan motors are from ⅛ to 5 hp. Water consumption varies from 40 to 200 gal per 12-hour period, according to the size of unit.

An air-conditioning unit may be so designed that it will draw in air from the room or enclosure in which it is placed or from the outside, or by the aid of mixing dampers, may draw any predetermined mixture of inside and outside air. This entering air passes through one or more spray or mist chambers, in which space moisture is either added to or removed from the air in accordance with the temperature of the air and of the spray water. At the same time the air is washed substantially free of dust and solid matter in this chamber. The air next travels between the customary labyrinth eliminator plates to lose its entrained water. A suitably located fan assembly causes the air to flow over a heating unit before being delivered to the room. A motor-driven centrifugal pump or other means is used to deliver water from the tank built into the base of the unit to the spray heads, mist nozzles or other atomizing apparatus. In some makes of unit air conditioners, other means than spray nozzles are used to produce the required water spray or mist for the transfer of heat from air to water or vice versa. Automatic instruments control the condition of the leaving air by regulating the temperature of the spray water and also by varying the amount of steam supplied to the air heater. Such instruments usually are placed in the path of the return air as it enters the unit to be conditioned, as the entering air is a sample of room air. The spray water can be heated by an ejector or by a closed type heater.

For dehumidifying work cold water may be supplied under automatic control as needed. It usually is found best where refrigeration is used to employ a separate water cooler located in close proximity to the compressors and condensers, rather than to use direct expansion coils or brine coils within the air conditioning units.

Evaporative Cooling

In certain buildings in which a considerable amount of heat is generated by power driven machinery or from other sources involved in the manufacturing operations or during hot seasons when heat is transmitted into the building, evaporative cooling of the air, which occurs in the spray chamber of the unit, is sufficient to reduce the temperature of the air in the conditioned room from 5 to 20 deg below the existing outdoor temperature. Though evaporative cooling is limited according to the relative humidity of the air entering the spray chamber of the unit cooling and dehumidifying type air conditioner, the general effectiveness contributes to the comfort of the workers and offers an efficient means of utilizing or disposing of the mechanical heat developed by machinery or of that given off from other sources.

Non-Evaporative Cooling

When it is desired to maintain conditions of temperature and humidity below those normally possible to obtain by evaporative cooling it is necessary to supply water to the unit at a temperature below the dew-point or saturation temperature of the entering air. The source of low temperature water may be a well, or the water may be cooled by refrigeration.

Water Required

In the usual practice of air washing, humidifying and evaporative cooling, the water in the tank of the unit is used over and over. It is necessary to replace or make up only that which has been evaporated by the air passing through the unit. A connection is made to the general water supply and by means of a float valve a constant water level is maintained. Under average operating conditions the water evaporated by one unit amounts to about 0.75 lb per minute or between 40 and 50 gal in 12 hours. It is, of course, necessary to drain and flush the water tank periodically according to the amount of dirt washed from the air.

Air Conditioning Capacity

Air conditioning capacity cannot, in general, be calculated on the basis of square feet of floor space or upon the cubical content of a room. It is based, rather, upon the heat to be supplied or absorbed. For instance, one room of 25,000 cu ft may contain machinery giving off 4240 Btu per minute while a room of like volume may contain machinery or heat sources dissipating twice this quantity. Such conditions control the calculation of air conditioning requirements.

Productiveness and Well-Being of Worker

Conditions of humidity and air movement properly adjusted in relation to the air temperature are now recognized by health authorities as of paramount importance to the productiveness and the well-being of workers. In many cases where air conditioning equipment has been installed primarily to control the effect upon materials or upon manufacturing operations, an improvement in the health and efficiency of the employees has been noted.

COOLING UNITS

Product cooling units are usually construed to mean a combination of a cooling coil and fan or blower, erected as a unit and having a common enclosure. A motor, float valve, surge drum, valves and other auxiliary fittings may or may not be a part of the unit, depending upon the type. The fans draw or force air over the cooling surface, and discharge it in selected directions. As a rule outlets are specially designed to accomplish air distribution without the use of ducts. These units are usually placed directly within the room to be cooled.

Functions of Cooling Units

Cooling units are designed to:

1. Circulate the air in the room at a rapid rate.