

8 • Do all unit ventilators introduce a constant amount of outdoor air?

Certain types employ full recirculation except when outdoor air is obtained by throttling the steam valve on the heating element so the proportion of outdoor air to room air is varied. This is a very economical type of unit ventilator but in some communities it cannot be used because of existing laws which require that some fixed amount of outdoor air be introduced whenever the room is occupied. Certain types of units are designed to always take in a minimum quantity of air from the outside and to automatically vary this with the weather.

9 • Why are metal surface cooling elements instead of liquid spray chambers used in the design of most air conditioning units and cooling units?

The first cost of the surface cooling type of unit is considerably less than the cost of spray type equipment. Further, the requirements of many industrial air conditioning jobs and of all comfort cooling jobs where unit equipment is applicable can often be effectively met with the use of surface type units, with a reduction in the space required for making the installation. Where space conditions are especially limited, the cross-sectional area of the surface cooler can be reduced because the resulting increase in velocity over the coil surface increases the effectiveness of the surface, whereas an increase in velocity through a liquid spray would reduce its effectiveness.

10 • Why are air conditioning units with metal cooling surfaces not desirable for all industrial jobs?

Wherever unusually close control of relative humidity is required, a spray type unit will prove to be more satisfactory. Relative humidity control and accurate temperature control, however, can be maintained without difficulty with the use of metal surface units.

11 • Why is accurate control of relative humidity with surface coolers more or less complicated?

A surface cooler cannot add moisture to the air, and moisture is removed only when the surface temperature is below the entering dew-point temperature. Any change in condition of the entering air will result in a change in the dry-bulb depression of the leaving air. This change in entering condition requires not only a readjustment of the air volume but also a change in the coil temperature, if accurate control over the relative humidity is to be maintained.

12 • What in general are the characteristics of operation of a unit using surface coils?

For a constant entering dry-bulb temperature and a constant refrigerant temperature any increase in the entering wet-bulb temperature will produce a rise in the leaving dry-bulb temperature with an accompanying reduction in the wet-bulb depression of the leaving air. The sensible heat removed by the unit decreases and the latent heat increases, while the total heat removed also increases. When the dry-bulb temperature of entering air is increased, with constant refrigerant temperature and constant wet-bulb temperature of entering air, the wet-bulb depression of the leaving air increases, and since it is this depression which determines the maintained relative humidity it must be carefully considered when selecting the unit.

Chapter 24

COOLING AND DEHUMIDIFICATION METHODS

Air Cooling Processes, Dehumidification Processes, Practical Combination Methods, Compression Systems, Mechanical Refrigeration, Steam Jet System, Condensers, Evaporators, Refrigerant Pipe Sizes, Operating Methods, Adsorption System, Absorption System, Evaporative Cooling, Reverse Cycle, Ice Systems

COOLING and dehumidifying are closely related in most air conditioning work. Usually a reduction in both temperature and humidity is necessary to produce comfort. Also, it should be borne in mind that: (1) there is a reduction in moisture content whenever air is cooled below its dew-point, and (2) there is a rise in temperature whenever moisture is removed from air by either adsorption or absorption. Consequently, cooling and dehumidification must in most cases be considered together, not as two separate problems, although each can be accomplished separately.

AIR COOLING PROCESSES

In air conditioning either of two arrangements, or a combination of them, is used to accomplish air cooling. The two arrangements are: (a) surface cooling, where the air is passed across a cold metal surface; and (b) spray cooling, where the air is passed through a cold liquid spray, usually water. In either case the surface or the spray liquid must be at a temperature sufficiently low so that heat may be removed from the air. Suitable temperatures for the purpose are obtained by the proper use of

1. Refrigeration; or
2. Water from a cold natural source such as a well, from melting ice, or from application of refrigeration; or
3. Evaporative cooling.

The choice of most suitable source of cooling in any specific case will depend on the accompanying circumstances and can be determined only by a thorough analysis made by a competent engineer.