Design and Performance

Greater application and use of commercial refrigeration have resulted from the development of the unit air cooler. Flexibility of design has permitted almost any condition to be met. By varying such physical features as the method of introducing the refrigerant into the coils, the depth of coil rows and area of their surfaces, and the air volume over the coils, the designer is able to produce a wide range of performances and to offer many desirable features not obtainable with the coil and bunker method. More uniform temperatures, high relative humidity, moderate first cost and a minimum of installation expense are likewise factors in their development.

New uses have appeared for unit air cooler application in industrial and commercial processes involving both the raw materials and finished product, where the maintenance of low temperatures is a necessary part of these processes. Of particular interest is the new field of extreme low

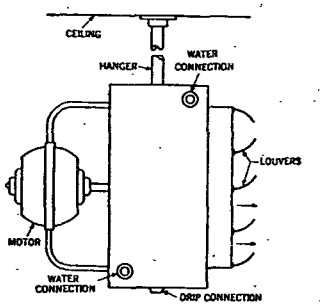

FIG. 8. CEILING TYPE UNIT AIR COOLER

temperature application where many new uses for refrigeration are being found.

Types of Units

The two standard types are the suspended or ceiling type, and the vertical or floor mounted type. There are variations of this such as the panel type which is wall mounted and arranged to take in air from the lower section and discharge it from the upper section.

The ceiling type has the appearance of a unit heater, with its propeller type fan blowing air through a bank of coils as shown in Fig. 8. Singly or in combination, they are easily installed and occupy little or no useful space. Alterations may be accomplished with little cost by relocating units or adding additional ones for increased capacity.

The floor mounted types employ blower type fans, as their air deliveries are higher and their locations may be remote from the space to be refrigerated. This type of unit is illustrated by Fig. 9. Air velocities and volumes must be designed for the individual application. This type of unit may employ a pump to spray a eutectic solution over the coils for the purpose of avoiding frosting as shown in Fig. 10.

Ratings

In order to rate and test equipment of this kind which normally operates below the frost line, a proposed code, Standard Methods of Rating and

Testing Forced-Circulation Air Coolers for Commercial and Industrial Refrigeration[8], has been issued. This proposed standard covers only the modifications of the Standard Method of Rating and Testing Air Conditioning Equipment[9], as it is related to the different applications of unit air coolers. In this standard, the gross cooling effects are taken since the motor power input equivalent is to be computed as part of the load.

From this code Table 2 is abstracted to show standard rating conditions for forced-circulation air coolers. Other modifications take into consideration the effect of frost formation on the coils and the change in length of test runs required to meet such conditions.

Defrosting

Unit air coolers are often required to operate in rooms where air and

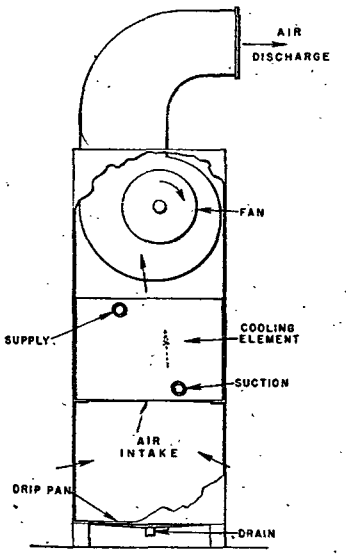

FIG. 9. SURFACE TYPE COOLING UNIT

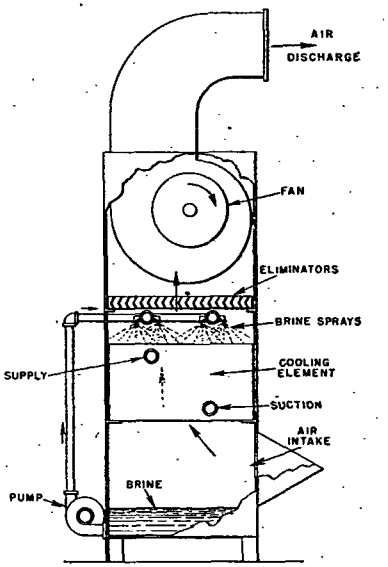

FIG. 10. BRINE SPRAY TYPE COOLING UNIT

refrigerant temperatures are below the freezing point. This results in the freezing of the condensation on the coils and this accumulation of frost builds up to such an extent that there is a loss of capacity. This deposit is removed from the coils by the process known as defrosting which may be accomplished by several methods:

1. Where the room temperature is above the freezing point, the flow of refrigeration to the coils is halted and the fan continued in operation until the coils are defrosted.

2. The hot gas defrosting method is accomplished by a valving arrangement whereby hot compressed gases from the compressor are pumped directly into the evaporator. This operation is continued until defrosting is complete, when the system is returned to normal operation.

3. Where brine is used as a refrigerant, hot brine may be circulated through the coils.

[8]Loc. Cit. Note 3.
[9]Loc. Cit. Note 1.