

values on C axis by mass air velocity and by heat transfer efficiency of the given coil which depends upon coil design and refrigerant used.

6. Parallel to the Q scale is also shown what is commonly referred to as the Δt scale. This scale gives the difference between the average effective coil (external surface) temperature and the average temperature of refrigerant within the coil. As shown in Fig. 14, the Δt scale applies only to a direct expansion coil of one definite physical design. Any change in coil design usually results in change of Δt values.

Coils with Water as the Cooling Medium

All that has been brought out in discussion of the coil capacity chart in Fig. 14, with the exception of the Δt scale, holds equally well for coils employing either vapor refrigerant or water as the cooling medium.

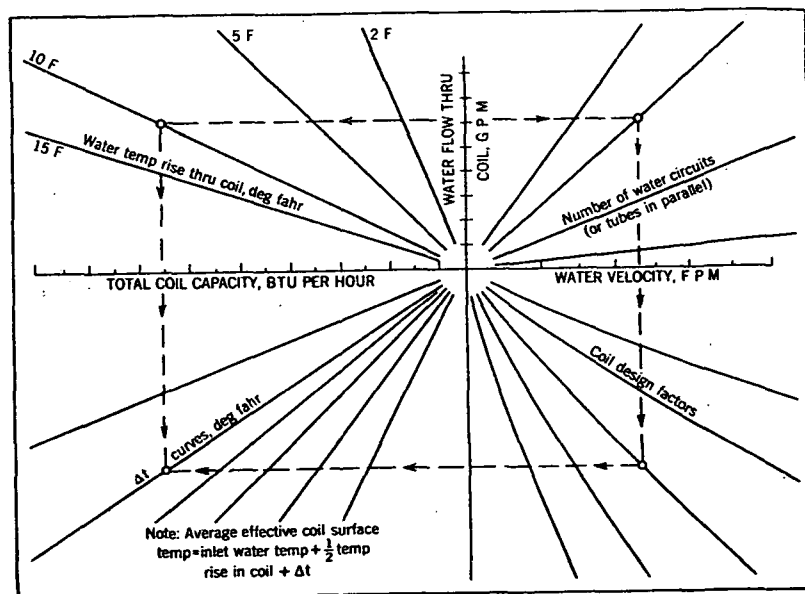


FIG. 15. WATER COIL PERFORMANCE CHART

However, the Δt scale as shown is applicable only to direct expansion coils, i.e. coils employing some volatile refrigerant as the cooling medium. Determination of the difference between the average effective coil (external surface) temperature and the average water temperature within the coil, necessary to transfer the heat from the coil surface to the water, calls for a graphical solution similar to that shown on Fig. 15. When this chart is used in conjunction with Fig. 14 a simple and rapid means is provided for determining the cooling and dehumidification capacity of coils employing water (or brine) as the cooling medium.

Factors affecting the performance of coils employing water as the cooling medium besides those shown on Fig. 14 are:

1. Quantity of water flow through the coil, usually in gpm or lb per hour.

2. Water velocity in tubes, usually in fpm. (This depends on internal tube diameter as well as the number of water circuits).

3. Coil design factor which represents the ratio of external fin and tube surface to internal tube surface.

4. The water temperature rise through the coil, degrees Fahrenheit.

Performance of Coils and Refrigeration Compressor

Practically all data published by various makers of direct expansion cooling coils are based upon maintaining a predetermined refrigerant temperature within the coils. While it is often possible to maintain a definite refrigerant temperature within a given cooling coil, for the greater part it is either impossible or impractical. This is due to the fact that the capacity of standard refrigeration compressors is usually fixed and in

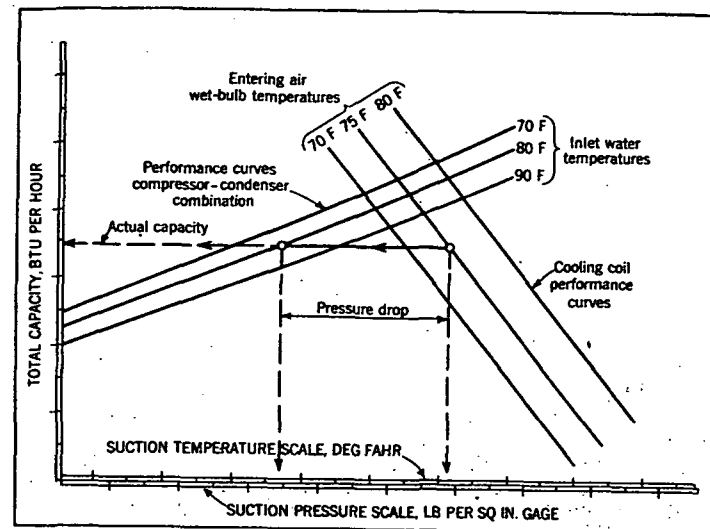


FIG. 16. GRAPHICAL ANALYSIS OF COIL-COMPRESSOR PERFORMANCE

matching a given cooling coil with a standard compressor the capacity of the latter is often somewhat smaller or greater than that of the former. Consequently, very often the refrigerant temperature resulting within a cooling coil and correspondingly the capacity of the coil-compressor combination are not what they were originally calculated to be.

In order to determine the actual performance of a given coil-compressor combination under varying conditions of operation, a graphical solution of the balance or "break-even" point is highly desirable. A typical method of graphical analysis of a coil-compressor combination performance is shown in Fig. 16, which is constructed in a manner described herewith:

1. On a piece of graph paper (with a uniform scale), the equipment capacity scale, total Btu per hour, is laid out along the vertical axis while the refrigerant suction temperature scale is laid out along the horizontal axis.