Table 7 .... Approximate Suction-line Capacity Factors for Equal Pressure Drop of CCl_2F_2 (Refrigerant 12)

Saturated Suction Temperature, F.	50	40	30	20	10	0	−10	−20
Factor	1.09	1.00	0.92	0.86	0.80	0.74	0.66	0.56

and discharge CCl_2F_2 lines. Table 7 presents suction-line capacity factors for equal pressure drop.

ACCESSORIES

Dehydrators, oil separators, strainers, vibration eliminators, sight glasses, and various types of valves are accessories frequently needed for the proper installation and operation of refrigeration systems. Refrigerant-line dehydrators or dryers usually consist of copper containers fitted with tubing connections at either end, and contain a desiccant such as silica gel, activated alumina, or calcium chloride. The liquid refrigerant is circulated through the dryer during operation of the system, and the moisture content of the refrigerant charge is thus kept to a minimum.

Oil separators are installed between the compressor and condenser to prevent excessive oil removal from the compressor crankcase and its passage into the condenser and evaporator. The oil is separated from the gaseous refrigerant by gravity during its passage through a chamber of sufficient size to reduce the velocity. A float-operated valve maintains a maximum oil level in the separator, and additional oil is forced by pressure difference through a line back to the crankcase.

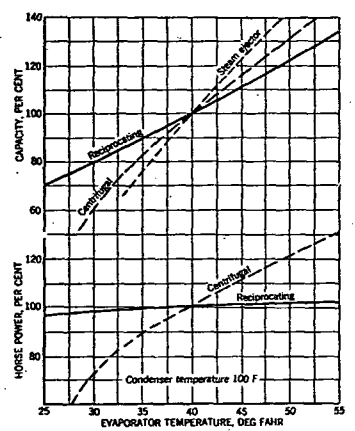

Fig. 16 .... Performance Characteristics of Compression Refrigeration Machines at Constant Speed

Screen strainers are frequently installed in the liquid line piping before solenoid valves and expansion valves, as well as before regulating valves in water lines leading to water cooled condensers. Sight glasses that permit visual inspection of the condition of the refrigerant are sometimes installed on factory-assembled commercial unit systems. It is particularly advisable to place such a fitting before the expansion valve, if the evaporator is located above the condenser.

Flexible vibration eliminators, usually consisting of a bellows design covered with woven copper wire, are sometimes installed in copper lines where units such as compressors are installed on flexible mountings, or where vibration is otherwise a problem. Packed or packless shut-off valves are necessary where it may be required to isolate portions of a system.

EQUIPMENT CHARACTERISTICS AND SELECTION

The various types of compression systems have quite different characteristics of capacity and power with varying evaporator and condenser temperatures, as may be noted from curves in Figs. 16 and 17.

From Fig. 16 it may be observed that power requirements for the centrifugal compressor increase much more rapidly than for the reciprocating compressor, with increase in evaporator temperature. Similarly, the capacities of the steam ejector and centrifugal compressors increase more rapidly than those of the reciprocating compressor with increase in evaporator temperature. Thus, both the steam-jet and centrifugal machines tend to be more self-regulating than the reciprocating. It is also evident from Fig. 16 that the steam-jet equipment is best suited for operation at high evaporator temperatures.

The effect of condenser temperature upon the power and capacity of the different types of compressors is shown in Fig. 17. It may be noted that the power required by the

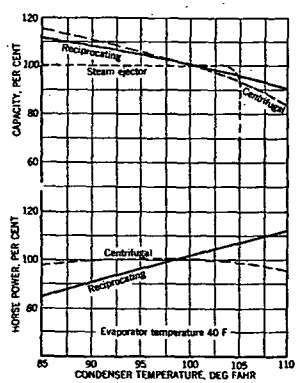

Fig. 17 .... Performance Characteristics of Compression Refrigeration Machines at Constant Speed

Table 8 .... Basis of Equipment Selection

Capacity Tons	Majority Used	Some Used	Few Used
0 to 10	Unit systems in conditioned space.	Unit central systems using duct distribution.	Built-up central systems.
10 to 25	Unit central systems using duct distribution.	Unit systems in conditioned space.	Built-up central systems using reciprocating compressors, adsorption, and absorption systems.
25 to 100	Built-up central systems using reciprocating compressors.	Unit central systems using duct distribution.	Central systems using adsorption systems or centrifugal refrigeration.
100 to 200	Built-up central systems using reciprocating compressors.	Built-up central systems using absorption and centrifugal compressors.	Built-up central systems using steam jet.
200 and Over	Built-up central systems using centrifugal compressors.	Built-up central systems using steam jet or absorption systems.	Built-up central systems using reciprocating compressors.

reciprocating compressor increases rapidly with increase in condenser temperature, while the power curve for the centrifugal compressor is relatively flat. It is also evident that the capacity of the steam-jet compressor is independent of condenser temperature until a certain point is reached, where it drops to zero. As previously stated, steam-jet equipment requires more condensing water than other types of compression systems. Consequently, steam-jet systems are well suited to those applications where condensing water is cheap, or where condensing water is rather high in temperature.

The selection of proper refrigeration equipment for any air-conditioning job is of utmost importance for satisfactory results. The most important factors in the selection of the equipment are:

1. Loads (as determined by the conditions of the space to be cooled).
2. Economics (both initial and operating costs).
3. Codes (local safety codes must be adhered to and influence the type of system to be used).

A broad division of equipment to be used for a particular installation or application may be made on the basis of the magnitude of the load. Current general practice is outlined in Table 8.

Unit or *packaged* systems, consisting of a reciprocating compressor, condenser, evaporator, and fans, are generally used in the smaller sized jobs where electric power is available, as they are manufactured complete, ready to install, and are the most economical (See Chapter 16).

The reciprocating compressor in the built-up central system (see Chapter 19) covers the widest range of application since it is applicable to either the direct-expansion or indirect systems, and can be driven by steam or gas engines, or by electric motors. The quantity of condensing cooling medium required is also less than for any other system, with the exception of the centrifugal compressor, which uses the same amount.

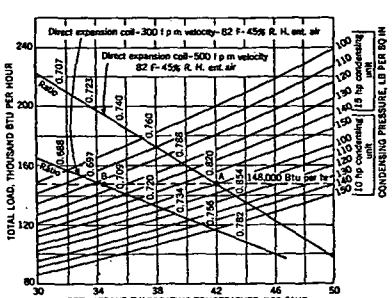

Fig. 18 .... Compressor and Coil Performance

Table 9 .... Typical Operating Conditions for Two Types of Load

Type of Enclosure	Load Btu per Hr.	Ratio Sensible to Total Heat	Air Entering Coil		Operating Balance Point		
			Temp. F	Rel. Hum. %	Evaporator Temp. F	Condenser Pressure Psi	Sensible Heat %
Restaurant							
Sensible	103,000						
Latent	45,000						
Total	148,000	0.695	82	45	34.4	123	69.9
Office							
Sensible	121,000						
Latent	27,000						
Total	148,000	0.820	82	45	42.2	100	82.1