TABLE 9. TYPICAL OPERATING CONDITIONS FOR TWO TYPES OF LOAD

Type of Enclosure	Load, Btu per Hour			Ratio Sensible to Total	Air Entering Coil		Operating Balance Point		
	Sensible	Latent	Total		F Deg	Per Cent R.H.	Evaporator Temp F Deg	Condenser Pressure Lb per Sq In.	Per Cent Sensible Heat
Restaurant....	103,000	45,000	148,000	0.695	82	45	34.4	123	69.9
Office..........	121,000	27,000	148,000	0.820	82	45	42.2	100	82.1

ture is lowered to 34.4 F as shown in point *B* of Fig. 16. In order to obtain the same capacity, a larger condensing unit is used. This illustration assumes zero pressure drop through the suction line. The pressure drop can be taken into account by shifting the compressor performance curves by the amount of pressure drop expressed in Fahrenheit degrees.

REFERENCES

[1] Air Cycle Refrigeration, by Paul C. Scofield (*Refrigerating Engineering*, Vol. 57, No. 6, June 1949, p. 558).

[2] Application and Economy of Steam Jet Refrigeration to Air Conditioning, by A. R. Mumford and A. A. Markson (A.S.H.V.E. TRANSACTIONS, Vol. 44, 1938, p. 33).

[3] A New Development in Absorption Refrigeration, by A. A. Berestneff (*Refrigerating Engineering*, Vol. 57, No. 6, June 1949, p. 553).

[4] The Application of Storage Refrigeration to Air Conditioning, by C. F. Boester (A.S.H.V.E. TRANSACTIONS, Vol. 45, 1939, p. 675).

[5] Use of Cold Accumulators in the Air Conditioning Field, by R. W. Evans and C. J. Otterholm (A.S.H.V.E. TRANSACTIONS, Vol. 48, 1942, p. 123).

BIBLIOGRAPHY

Refrigerating Data Book, Vol. 1 (*American Society of Refrigerating Engineers*).

Refrigeration Engineering, by H. J. Macintire (John Wiley & Sons).

Theory of Mechanical Refrigeration, by N. R. Sparks (McGraw-Hill Book Co.).

Refrigeration and Air Conditioning Engineering, by B. F. Raber and F. W. Hutchinson (John Wiley & Sons, 1945).

Refrigeration, by J. A. Moyer and R. U. Fittz (McGraw-Hill Book Co.).

Refrigerants and Absorbents, by W. R. Hainsworth (*Refrigerating Engineering*, August and September, 1944).

Air Conditioning and Refrigeration, by B. H. Jennings and S. R. Lewis (International Textbook Company, 1944).

Refrigeration and Air Conditioning, by Jordan and Priester (Prentice-Hall, Inc., 1948).

Heat Pumps, by P. Sporn, E. R. Ambrose and T. Baumeister (John Wiley and Sons, 1947).

Heat Pump Applications, by E. N. Kemler and S. Oglesby, Jr. (McGraw Hill Book Co., 1950).

CHAPTER 38

DEHUMIDIFICATION BY SORBENT MATERIALS

Definitions and Principles, Adsorbents, Dehumidification by Solid Adsorbents, Dehumidification Equipment Using Solid Adsorbents, Absorbents, Dehumidification by Liquid Absorbents, Dehumidification Equipment Using Liquid Absorbents, Calculation of Moisture Load, Vapor Transfer to Dehumidified Space

DEHUMIDIFICATION as used herein is the reduction of the water vapor content of a given volume of air or other gas. The term thus describes a special case of dehydration which covers the removal of moisture in any form from matter. The degree of dehumidification required varies greatly with different applications, and is one of the prime considerations influencing the choice of a method. Dehumidification may be accomplished by latent heat removal, together with sensible heat removal, as described in Chapters 30, 35, and 36, or by the use of sorbents.

Sorbents are substances which have the property of extracting and holding other substances (usually gases or vapors, *e.g.*, water vapor), brought into contact with them. All materials are sorbents to a greater or lesser degree. The weight of water held by a substance will increase or decrease, depending upon whether the vapor pressure of the water held by the substance is less or greater, respectively, than the partial pressure of water vapor in the surrounding atmosphere. As generally used, however, the term sorbents refers to those materials having a capacity for moisture which is large compared to their volume and weight. Such materials are divided into two general classifications:

1. *Adsorbent*—A sorbent which does not change physically or chemically during the sorption process. Certain solid materials, such as activated alumina, silica gel, activated bauxites, and activated charcoal have this property. The action of adsorbents, most of which adsorb some gases and condensible vapors besides water vapor, is selective. Thus, in the case of a mixture containing both water and organic vapors, silica gel would remove the water vapor in preference to the organic vapors, while the reverse would be true in the case of activated carbon. The selective property of adsorbents is made use of in some instances for the removal of objectionable and contaminating vapors from an air or gas mixture. (See Chapter 8.)

2. *Absorbent*—A sorbent which changes either physically, chemically, or both, during the sorption process. Calcium chloride is an example of a solid absorbent, while liquid absorbents include solutions of lithium chloride, calcium chloride, lithium bromide, and the ethylene glycols.

ADSORBENTS

The ability of an adsorbent to remove water vapor from a gas is explained by the fact that the vapor pressure of the water in the adsorbent (when in the reactivated condition) is less than the partial pressure of the water vapor in the surrounding atmosphere. For instance, when an active adsorbent is brought into contact with a gas of high humidity, there is a tendency for the vapor pressure of the water in the adsorbent to reach equilibrium with the partial pressure of the water in the surrounding gas, with