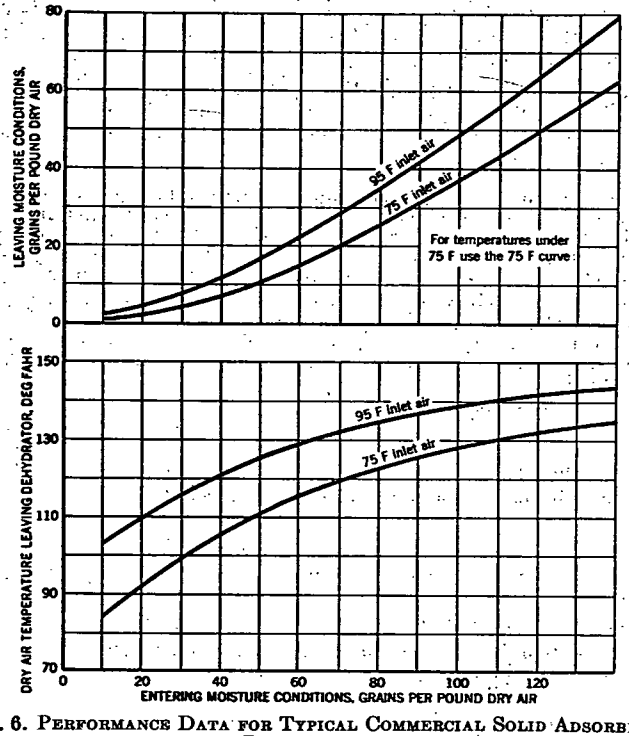

FIG. 6. PERFORMANCE DATA FOR TYPICAL COMMERCIAL SOLID ADSORBENT DEHUMIDIFIER

Then $q = \frac{1085 \text{ grains per minute}}{17.6 \text{ grains per pound}} = 61.6$ lb air per minute *minimum* that must be supplied to the room to maintain 30 F dew-point.

Note that this figure represents the minimum requirement for the arbitrary conditions set forth and that in practice, safety margins should be added to the outside air percentage figure and to the calculated internal moisture gain.

VAPOR TRANSFER TO DEHUMIDIFIED SPACE

The walls enclosing a dehumidified space are subjected to a vapor pressure differential. The pressure of the vapor outside the walls tends to force moisture through the walls into the dehumidified zone of relatively low vapor pressure. As this process can be an unnecessary load on the dehumidifying equipment, provisions should be made for keeping the vapor transfer to a minimum. Also, if the space is cooled below the ambient dew-point, there is a possibility that condensation may occur within the walls, unless vapor transfer is controlled. For these reasons a vapor barrier should be located within the wall construction as near to the high vapor pressure side as feasible. To be effective, a barrier must be continuous and should be so located within the structure that it will be protected from rupture. (See section on Water Vapor and Condensation, Chapter 9.)

CHAPTER 38

AUTOMATIC CONTROL

Basic Types of Control, Types of Controllers, Actuating Devices, Actuated Controls, Residential Control Systems, Zone Control, Automatic Control Application, Control for Central Fan Systems, District Heating Control, Panel Heating Control, Indicating and Recording Equipment

THE function of *automatic control*, as applied to the heating, ventilating and air conditioning industry, may be broadly subdivided into the maintenance of *temperature*, *humidity*, and *pressure*, within pre-determined ranges. It automatically coordinates the operation of the various controlled devices in proper sequence to produce the desired result.

BASIC TYPES OF CONTROL

Available automatic control equipment may be divided into four main groups depending on the primary source of power:

1. *A self-actuated regulator* is one in which all the energy necessary to operate a valve or damper motor is supplied by the responsive element or bulb. Temperature changes at the bulb result in pressure changes of an enclosed fluid which transmits them directly to the valve or damper motor. Instruments of this type are available either with a rigid bulb or with flexible tubing from the bulb to the operating motor. The flexible tubing may be furnished in varying lengths, and is generally protected by a flexible metal armor.

2. *Electrically operated* equipment utilizes electric current as a primary source of energy, its flow being regulated as required to operate motors, relays, or other controlled items.

Electrical controls may be divided into two classes: (1) those wherein the primary measuring device utilizes contacts to regulate the flow of the electric current, and (2) those wherein the primary measuring device is a resistance wire component of an electronic circuit; these are known as *electronic controls*.

3. In *pneumatically operated* equipment the primary source of energy is compressed air usually at a pressure of 15 to 25 psig. The flow of this air is proportioned as required to operate valves, dampers, relays, or other controlled devices.

4. In *hydraulically operated* equipment the primary source of power is a suitable liquid at a pressure of 15 to 25 psig or higher, which is handled in the same manner as compressed air.

TYPES OF CONTROLLERS

The basic types of controllers and their operations are:

1. *Two-position* or *on-off controllers* are the simplest type and are clearly described by the name. With controllers of this type the valve or damper motor can assume only two positions, either open or shut.

2. *Proportional* or *gradual acting controllers* function to re-position the controlled device, by small increments of travel, to regulate the flow as the controller senses a slight change in the controller condition.

3. *Floating controllers* act to produce valve or damper movement whenever there is a deviation from the control point. Whenever the condition to be controlled is above the control point, the valve closes at a constant rate, and continues to close until the temperature returns to the control point. Below the control point the valve reverses its action and moves in the other direction until the control point is again reached.

4. *Automatic reset (or proportional plus reset) controllers* function to reposition a valve or damper by small increments of travel, as in a proportioning controller. In addition, a mechanical device in the controller automatically and constantly resets the instrument to offset the normal drift (inherent in a proportional controller) be-