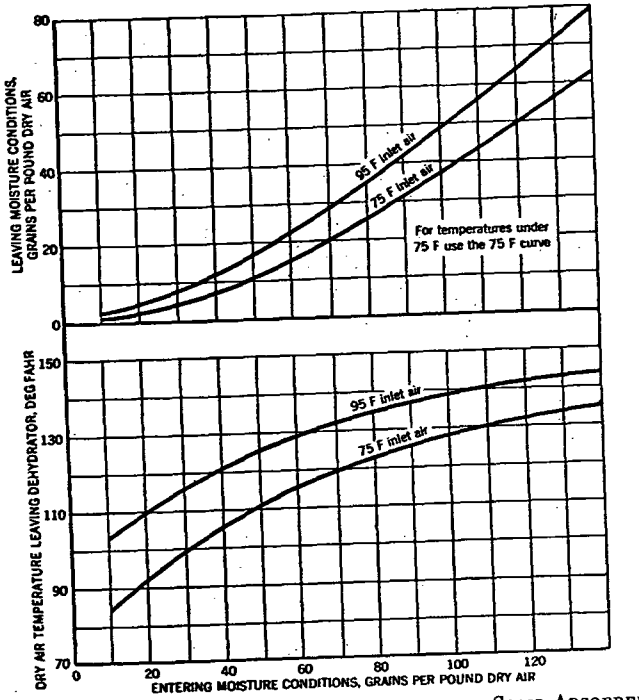

FIG. 6. PERFORMANCE DATA FOR TYPICAL COMMERCIAL SOLID ADSORBENT DEHUMIDIFIER

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 Chapter 10, Water Vapor and Condensation In Building Construction).

CHAPTER 39

AUTOMATIC CONTROL

Basic Types of Control, Types of Controllers, Actuating Devices, Indicating and Recording Equipment, Actuated Controls, Automatic Control Application, Residential Control Systems, Steam Heating Systems, Hot Water Heating Systems, Unit Heaters, Air Supply Ventilating Units, Unit Coolers, Refrigeration and Dehumidification Equipment, Central Fan Systems, Panel Heating Control, Individual Room Control, Zone Control, Design Coordination

THE function of *automatic control*, as applied to heating, cooling, ventilating and air conditioning, is to maintain *temperature*, *humidity*, and *pressure*, within pre-determined ranges. It coordinates the operation of the various controlled devices in proper sequence to produce the desired result.[1,2]

BASIC TYPES OF CONTROL

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

1. *A self-actuated regulator* is one in which all the energy necessary to actuate a valve or damper operator is supplied by the responsive element or bulb. Temperature changes at the bulb result in pressure or volume variations of the enclosed media which are transmitted directly to the operating device of the valve or damper. Instruments of this type are available either with a rigid bulb or with flexible tubing from the bulb to the operating bellows or diaphragm. 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 makes or breaks contacts to regulate the flow of the electric current, and (2) those wherein the primary measuring device is a resistance wire component of an electrical circuit.

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 energy is a suitable liquid at a pressure of 15 to 25 psig or higher, which may be regulated after 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 operator can assume only two positions, either open or closed.

2. *Proportional* or *gradual acting controllers* function to reposition the controlled device, by small increments to regulate the flow as the controller senses a slight change from the desired conditions. The valve or damper or other device may take any position, including open and closed.

3. *Automatic reset (or proportional plus reset) controllers* function to reposition a valve or damper as in a proportional controller. In addition, a device in the controller automatically resets the instrument whenever the controlled variable deviates from the desired value due to load changes. The rate of reset is manually adjustable and must be set to meet the load requirements of the individual system.

Controllers may also be designated by types as: a *non-indicating con-*