

with respect to quantity and quality of dirt content. The determination of the cleaning efficiency may be made according to some standard method such as that described by A. M. Goodloe, member, A. S. H. & V. E. in the February 1924, JOURNAL. The percentage of dust removal as determined by the method of testing for all commercial air cleaning devices should lie between 80 and 95 per cent and the minimum removal under such conditions should be specified and guaranteed by the manufacturer.

The efficiency of dust removal may be expressed by the following formula:

$$E = 1 - \frac{\text{Weight any sample leaving}}{\text{Weight any sample entering}}$$

In case the resistance method is used in accordance with the Anderson-Armstrong method of dust determination, the formula will become

$$E = \frac{\text{Time required to give a definite resistance increment with entering sample}}{\text{Time required to give the same increment with leaving sample}}$$

or, if the same time be used in obtaining both samples, which is preferable then

$$E = 1 - \frac{\text{The resistance increment of outgoing sample}}{\text{The resistance increment of ingoing sample}}$$

RATING OF AIR WASHERS AND FILTERS

Air washers and filters are rated as follows:

- 1.—Capacity in cubic feet of air handled per minute.
- 2.—Resistance in inches of water which the washer or filter offers to the flow of air at its rated capacity.
- 3.—Percentage of dust removal at its rated capacity.
- 4.—Percentage of entrained moisture remaining in the air after passing through the washer while operated at its rated capacity.
- 5.—If considered as a humidifying agent, the humidifying efficiency, or the percentage of reduction in the initial wet bulb depression without external alteration of heating the circulating water.

CHAPTER XXI

AIR CONDITIONING AND COOLING

THE temperature and humidity of the air that surrounds people has an important bearing on their comfort and general efficiency while in the industrial field hundreds of manufacturing operations are dependent for their success upon the atmospheric conditions maintained. Geographical location has a bearing on climatic conditions and an intensive study of temperature and humidity variations in different localities shows that the places having a 56 deg. fahr. wet bulb temperature are favored with best health conditions, the greatest progress in science, art and mechanical development.

Scientists have always been seeking a way to produce the same ideal conditions indoors that prevail outside at certain seasons of the year. Many studies have been made, numerous theories have been advanced and discarded. From the latest studies of human comfort (see Chapter XVII) it has been concluded that there is a definite relation between a person's feelings and the degrees of heat, humidity and air motion.

Air conditioning as it is practiced today means to obtain predetermined effects upon material or persons within an enclosure by controlling the air purity, temperature, humidity, distribution and movement.

The development of effective devices for producing and maintaining the ideal atmospheric conditions desired, has made tremendous strides in the workroom and factory, school, theatre and hotel while but little effort has been made to reproduce these conditions in dwellings.

The manufacturer has adopted air conditioning as it has become an exact science and the results are measurable in dollars and cents, in a more perfect product, an increased production, elimination of waste or some equally important factor. Varying degrees of moisture are required in manufacturing processes and the nature of the product will indicate whether a high or low relative humidity is to be maintained. Heating as well as cooling must be considered in air conditioning work and textile mills, printing plants, bakeries, candy kitchens, laundries, etc., all present definite problems. For example in spinning rooms 75 deg. fahr. and 65 per cent humidity have been found best for the operations; in match factories 68 deg. dry bulb and 55 deg. wet bulb permit continuous operation and reduce fire hazards; in candy dipping rooms 66 deg. dry bulb and 50 per cent relative humidity give a high quality product. In some cases humidity must be supplied in others dehumidifying is necessary.

Air has certain definite properties and obeys certain well known laws, therefore to handle problems in air conditioning the relation between the wet and dry bulb temperature and the dewpoint should be thoroughly understood by the engineer. Briefly, the dewpoint is the temperature at which saturation is obtained for a given amount of water vapor. With air at the dew point the wet and dry bulb temperatures are the same. If