

DRYING AND MOISTURE CONTROL

In the manufacturing and processing of many hygroscopic materials there are one or more stages in the process where moisture has to be removed from the material. In the case of products not themselves soluble in water, this is usually accomplished by air drying. In order to avoid injury to the products the rate of moisture removal must be controlled with accuracy in certain stages, while at the end of the drying it may be extremely important to control accurately the final moisture content of the material.

This is true in the manufacture of the various tobacco products, textiles, certain gelatin products including photographic films, lumber, paper, flour and macaroni. In many of these products it is not only necessary to control this final moisture content to insure the desirable qualities of the product itself but to standardize its moisture content from the standpoint of sales value.

COMFORT VERSUS PRODUCTION

In many instances air conditioning is commercially desirable from the standpoint of human comfort rather than primarily for the effect upon the products themselves. Not only is air conditioning for comfort desirable from a humanitarian standpoint, but it is commercially expedient because the worker's skill and efficiency are influenced by his physical well-being. In many cases the output of the worker is greatly increased by the proper control of atmospheric conditions, when normally they would be so unsatisfactory as to reduce to a marked degree the rate and quality of work.

In such industries as the printing and lithographing the quality of the product and the personal comfort of the employees assume almost equal importance. In order to obtain proper register with the application of colors in different processes, a moderate and exact humidity is necessary. In hot, moist weather, and in the absence of machinery for dehumidification and refrigeration, such a condition can be secured only by the use of heat at considerable human discomfort.

In other industries the product is affected by both relative humidity and temperature as in the manufacture of chocolates, chewing gum, cigarettes and machine-made cigars. Here it is necessary to humidify during some parts of the year and to dehumidify and refrigerate at other seasons in order to maintain a uniform condition both of temperature and humidity within the limits permissible by the products. It happens in these instances as in many others that the atmospheric conditions best suited to the products and processes are almost ideal for the health, comfort and efficiency of the workers.

Chapter 30

AIR CONDITIONING APPARATUS

Humidifiers; Air Washers; Dehumidifiers; Refrigerating Machines; Temperature and Humidity Control; Unit Conditioners.

AIR conditioning equipment includes apparatus for providing the necessary heat and moisture exchanges within the room to be conditioned and of the air supplied to the room for ventilation, and automatic devices for governing such apparatus so that temperature and humidity may be controlled within the limits desired. The latter are referred to as controls. Those for controlling temperature are known as thermostats, and those for controlling humidity are known variously as hygrometers, psychrometers, or humidostats.

Apparatus for effecting humidity changes may be divided into two distinct groups:

1. The humidifiers used for the purpose of increasing the moisture content of the air and to produce cooling by evaporation.
2. The dehumidifiers used for the removal of moisture from the air and to produce cooling by contact with water or surfaces at a lower temperature than the air.

HUMIDIFIERS

Humidifiers may be divided into the following general types, according to the method of operation:

1. *Direct:* Spraying into the room.
2. *Indirect:* Introduction of moistened air.
3. *Combined:* Direct and indirect.

INDUSTRIAL TYPE DIRECT HUMIDIFIERS

The industrial type direct humidifier is essentially an apparatus designed to inject a finely divided spray of moisture or water vapor into an enclosure for the purpose of increasing the humidity of the air.

Most industrial humidifying systems consist of locally-distributed units which deliver spray to the room atmosphere to be absorbed by evaporation. The success of such humidifiers depends upon their ability to generate a spray of such a quality and to distribute it in such a manner that evaporation will take place continuously and thoroughly without precipitation upon surrounding objects. Once the spray has been evaporated the resulting vapor diffuses itself uniformly and with great rapidity. The most important consideration therefore is the complete evaporation of the spray.