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Industrial Air Conditioning

Atmospheric Conditions Required, General Requirements, Classification of Problems, Control of Regain, Moisture Content and Regain, Conditioning and Drying, Control of Rate of Chemical Reaction, Control of Rate of Biochemical Reactions, Control Rate of Crystallization, Elimination of Static Electricity

INDUSTRIAL air conditioning is primarily concerned with the atmospheric conditions required for the manufacture, processing, and preservation of material, equipment and commodities. The fundamental factors, one or more of which may govern these conditions are: humidity, temperature, air motion and air purity. The term air purity may have reference to the quantity of dust, bacteria, odors, or toxic gases present.

The optimum atmospheric conditions have been established for a large variety of industrial processes, but when the requirements are unknown it may be necessary to determine them by laboratory tests or by research. When the requirements are not definitely specified it is advisable to design the equipment to be flexible and to provide for future increase of facilities and capacity. Air conditioning requirements for human comfort are defined in Chapter 2. If the atmospheric conditions required for the process are not within the range of human comfort, separate consideration must be given to the maintenance of conditions which will not have a detrimental effect upon the health of the occupants.

ATMOSPHERIC CONDITIONS REQUIRED

The most desirable relative humidity for processing depends upon the product and the nature of the process. As far as the behavior of the material and its desired final condition are concerned, each material and process presents a different problem. The desirable relative humidity may range from a low of 5 per cent, as in certain industrial applications, such as insulation winding processes, up to a condition approaching saturation, as in processes relating to textiles, tobacco and baking industries.

Similarly, the most favorable temperature will vary according to the specific material and particular process. Frequently a compromise between the known optimum condition for processing and that required for reasonable worker comfort is desirable. This is particularly true where unconfined processes are required in departments where people are working and their health, comfort and productive efficiency must be considered.

It is generally recognized that relative humidities of 50 per cent or less are on the dry side. Such conditions are conducive to low regains in hygroscopic materials, drying out, increased brittleness of fibrous materials, prevalence of increased static electricity and tendencies toward increased dust liberation from the product. Relative humidities higher than 50 per cent are considered to be on the damp side. These conditions are conducive to high regain, promote softness and pliability in materials, decrease static electricity and tendencies toward reduced generation of product dust which represents a loss in weight of the material in process.