lenses, temperature variations may cause expansion and contraction of material to an extent that will seriously affect the quality of the work. This type of work usually requires close temperature control to assure accuracy and uniformity of the product.

Usually the temperature level with respect to the product is not as important as controlling the temperature within close limits. For this reason, conditions are usually selected within the comfort range.

Control of Dew-Point for Protection of Polished Surfaces

In the manufacture of certain metal articles, the presence of finger prints, tarnish, or *etching* can not be tolerated in the finished article. If these articles are manufactured under conditions of effective temperatures that will cause the hands to perspire, an unsatisfactory product will result. The salt and acid contained in body perspiration, when deposited on the highly polished article, can show corrosion and rust within a few hours if examined under a microscope.

It is therefore important to maintain temperatures and relative humidities (dew-point) low enough to prevent sweating of the hands. In addition, the manufacture of polished surfaces usually requires a better-than-average job of air filtering to avoid abrasion of the surfaces.

Control of Humidity for Reduction of Static Electricity

The presence of static electricity is often detrimental to the satisfactory and economical processing of many light materials, such as textile fibers, paper, etc. It is also extremely dangerous where explosive atmospheres or materials are present. Fortunately, this hazard is minimized by increasing the relative humidity to at least 55 percent, if the material being processed is not damaged thereby.

It must be borne in mind that for successful elimination, the air that actually comes in contact with the material in the machine must be at a relative humidity of 55 percent or more. As some machines consume a great deal of power, which is converted directly into heat, the temperature in the machine may be considerably higher than the temperature adjacent to the machine where the relative humidity is normally measured. In such cases, the relative humidity in the machine will be appreciably lower than that elsewhere in the room, and it may therefore be necessary to maintain a room relative humidity of 65 percent, or even more, to maintain the desired humidity.

Control of Conditions for Material Test Laboratories

Laboratories having controlled conditions of temperature and humidity, are becoming more common, not only for the purposes of scientific research, but also for routine testing and for quality production control. A control of temperature and humidity within fairly close plus or minus limits is usually required. Laboratories designed for scientific research may require control of conditions over a wide range, whereas the routine testing laboratory or quality control laboratory will usually be designed to maintain the *A.S.T.M.* Standard Conditions of 50 percent relative humidity and 23 C (73.4 F) temperature.

CALCULATIONS

The methods for determining the heating and cooling loads for the various industrial processes are similar to those outlined in Chapters 12 and 13. Some factors affecting heating or cooling requirements are given

in Table 1. Because of the large number of motors and heat producing units usually found in an industrial application, it is particularly important that operating allowances, for the latent and sensible heat loads, be definitely ascertained and used in the calculations to determine the total design load.

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