

being condensed out of, the conditioned air stream. This requires dilution of the brine externally to the contactor, rather than concentration.

Another type of liquid dehydrator utilizes an integral interchanger which employs the same type of solution concentrator as described for the system with the external interchanger. However, the dehydration contactor and solution cooler are combined by placing a cooling coil directly in the wet air stream. This coil provides the contacting surface between air and the warm concentrated solution which is sprayed over the cooling surface. By circulating a cooling medium through this coil, control of solution temperature (hence its vapor pressure) is accomplished directly in the air stream.

ESTIMATING OF LOADS

Where equipment is used which removes sensible and latent heat simultaneously such as a chilled water or direct expansion dehumidifier, the basis of selection is usually the *maximum total heat load*. The operating characteristics of such equipment normally produce satisfactory dew-points with adequate capacity at other loads, including the maximum latent load which occurs at a less-than-maximum total load. With dehydration equipment in which moisture removal is achieved independently of sensible cooling, it is necessary that equipment be chosen for the maximum load of each functional element. The sensible cooler should be selected for the maximum sensible load; the dehydrator for the maximum latent load. These loads need not occur simultaneously, and in fact, rarely do.

In estimating the maximum latent heat load for comfort applications, it is considered good practice to select an outside design dew-point for the locality which is exceeded on not more than 5 per cent of the days during the season. A smaller percentage, or even the maximum dew-point recorded, may be advisable for rigorous industrial applications.

Special consideration should also be given to moisture seepage through building materials and vapor infiltration through openings which appears to be a more serious factor than would be anticipated from consideration of infiltration in the normal manner. These items become important at dew-points below 50 F and have an extreme effect upon load and equipment selection at dew-points below 35 F.

LOCATION AND USE OF EQUIPMENT

Since dehydration equipment is chiefly effective in removing moisture from the air it is frequently employed in conjunction with other equipment installed with the primary purpose of caring for sensible heat removal requirements. It may thus be superimposed upon extensive air conditioning and circulation systems designed to care for independent cooling.

When used in this manner, dehydration equipment may be located to treat outside air only. It is well adapted to this service as it is capable of delivering outside air for ventilation purposes at dry-bulb temperatures close to the normally desired inside temperature, while maintaining a

satisfactory humidity condition during those periods when internal sensible heat loads are reduced to a point where no cooling is required.

Because the delivered moisture content of air from all dehydrating devices is materially reduced when the entering air temperature and humidity are lowered, these devices are also frequently applied to the independent dehumidification of mixtures of outside and recirculated air. This practice is advantageous where the moisture removal requirement cannot economically be met by the dehydration of only the ventilation air component of the total air circulation.

In cases where extremely low dew-point temperatures are required, dehydration equipment may be located so as to handle air pre-cooled and dehumidified by cooling devices or pre-dehydrated and cooled by dehydration equipment and pre-coolers in cascade. Solid adsorbent dehydration equipment is generally favored for such applications as there is no fixed lower limit of operation, as may be inherently set by the freezing or crystallization temperature of the solution in the absorption dehydration system.

In summing up considerations in the location of dehydrating equipment it should be borne in mind that dehydration devices will remove the greatest quantity of moisture from air supplied at the highest working moisture level, but will produce the lowest leaving moisture condition when supplied with air from the lowest working moisture level.

EQUIPMENT AUXILIARIES

Precoolers. When cold water is available, it is generally economical to use this water in a precooling coil in the outside air stream. The dehumidifying accomplished by this coil reduces the load on the dehydrator; and moreover, lowering the temperature of the inlet air to the dehydrator results in a higher dehydrator moisture removal efficiency.

Dry Air Coolers. Particularly with the solid adsorbent process, and to a lesser extent with liquid absorbents, a dry air cooler is employed to remove sensible heat from the dehydrated air whenever it leaves the dehydrator at an elevated temperature. A cooling coil using city water is usual practice, and is considered economical whenever the difference between effluent air and entering water temperatures is greater than 15 F.

Sensible Heat Coolers. Since the normal conditioning system requires sensible heat removal, auxiliary equipment may be needed for this function. This is almost always in the form of cooling surface using water, brine or direct expansion refrigerant. It is located on the leaving side of the dehydrator, but frequently treats in addition a large volume of room air which is not circulated through the dehydrator for moisture reduction.

CONTROLS

The use of dehydration equipment makes possible the use of a relatively simple control system with a humidistat or, alternatively, a wet-bulb controller, to regulate the operation of the dehydrator, and a thermostat