impair performance, a timer-controller causes the dampers to rotate to the opposite side. Thus the beds which on the previous cycle were adsorbing have activation air circulated through them, and vice versa. Activation air is heated in the same manner as with continuous equipment.

DEHUMIDIFICATION WITH LIQUID SORBENTS

One type of system utilizing liquid sorbents includes an external interchanger having essential parts consisting of a liquid contactor, a solution concentrator, a solution heater and a cooling coil all as shown in Fig. 6.

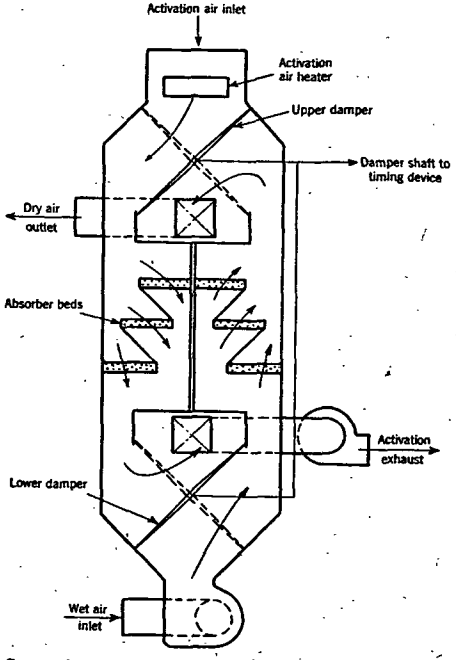

FIG. 5. SOLID ADSORBENT DEHUMIDIFIER—STATIONARY BED TYPE

The contactor and cooling coil are located in the wet air stream. The air to be conditioned is brought into contact with an aqueous brine solution having a vapor pressure below that of the entering air, resulting in a transfer of moisture (latent heat). As previously described, this results in a conversion of latent heat to sensible heat which raises the solution temperature and consequently the air temperature. The temperature change of the air being processed is determined by the cooling water temperature and the amount of moisture removed in the equipment. Control of leaving air temperature may be obtained by precooling the absorbent solution in a suitable surface cooler, by tap, well, or artificially chilled water.

The excess water of condensation, which dilutes the brine, is removed in the solution concentrator. This is a low pressure steam heat exchanger which over-concentrates a portion of the weak liquor and returns it to

the main brine reservoir for re-pumping. The concentrator operates in the manner of an evaporative condenser, whereby moisture is evaporated from the brine, by the heating coils, into a stream of regeneration air taken from and rejected to the outside atmosphere. Low pressure steam is normally used for heating the brine. When it is desirable or necessary to use gas or electricity, an auxiliary low pressure steam boiler is usually added to the equipment. Concentrators operating on a simple boiler principle have not as yet been commercially practical.

It should be noted that the solution concentration phase is the reverse of the absorption process. During concentration the aqueous vapor pressure of the solution is greater than that of the surrounding air, while during dehumidification, the reverse is the case. Utilization of this principle permits winter humidification, by heating (instead of cooling) the solution pumped to the contactor. Water is thereby evaporated

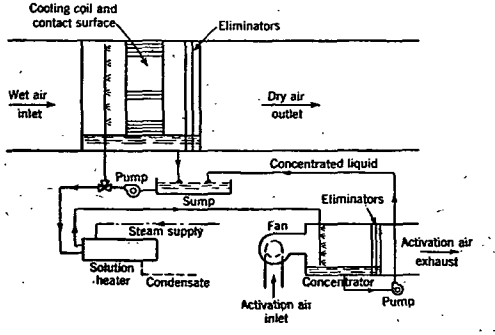

FIG. 6. LIQUID ABSORBENT EQUIPMENT IN WHICH SOLUTION COOLER AND CONTACTOR ARE COMBINED

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

EQUIPMENT AUXILIARIES AND CONTROLS

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

Dry Air Coolers. Particularly with the solid adsorbent process, and to a lesser extent with liquid absorbents, a dry air cooler may be employed to remove sensible heat from the dehumidified air whenever it leaves the apparatus 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.

Controls. The use of direct or chemical dehumidifying 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 machine, and a thermostat to control the sensible cooling apparatus. Functionally, the relative humidity control may consist of one of the following: