

in the cooling tower itself. Refer to the section on Cooling Towers in Chapter 37.

Shell and coil condensers are in general use for medium sized condensing units, and consist of a coil of tubing mounted inside a shell. The cooling water passes through the coil.

3. *Evaporative condensers.* Due to the high cost of city water for condenser purposes, and due to ordinances in some localities prohibiting the discharge of large quantities of such water into the sewage systems,

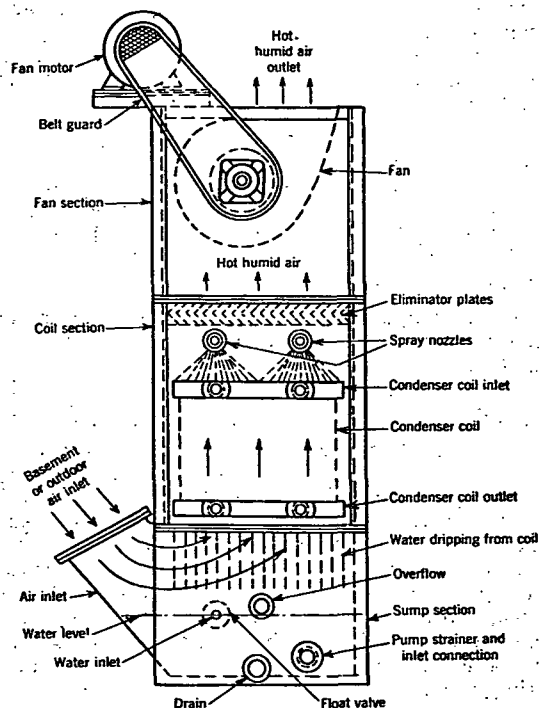


FIG. 9. SCHEMATIC VIEW OF AN EVAPORATIVE CONDENSER

there has been developed a condenser which uses a minimum amount of water on a finned surface, cooling it to approximately the wet-bulb temperature of the surrounding atmosphere.

The end view of a typical evaporative condenser is shown in Fig. 9. The fan draws the air over a finned tube condenser which is kept wet by a water spray. The discharge refrigerant gas from the compressor enters the top of the condenser coil and the liquid refrigerant is drained from the bottom of the coil into a liquid receiver and then circulates through the remaining portion of the system in the usual way.

The water is circulated through the spray nozzles and the level is maintained in the sump by means of a float valve. The eliminator plates are placed in the path of the water-air mixture so as to remove the

entrained water. The air leaving the unit is almost completely saturated, so that care must be taken in locating discharge ducts to prevent condensation.

Evaporative condensers are available in sizes up to 100 tons or more. These units use only a small portion of the water required for a water cooled condenser. The water is vaporized by the heat of the refrigerant so that each pound of water used extracts approximately 1000 Btu from the refrigerant, whereas under standard rating conditions where the water temperature rise is 20 F, each pound of water extracts only 20 Btu from the refrigerant. Including the water lost by entrainment in the discharge air, by overflow and stand-by evaporation, the water used is about 3 to 5 per cent of the amount that would be required for a water cooled condenser.

The evaporative condenser requires more maintenance, occupies greater space (must be located where air is available), and has a higher first cost than the water cooled condenser, but where the use of water is restricted

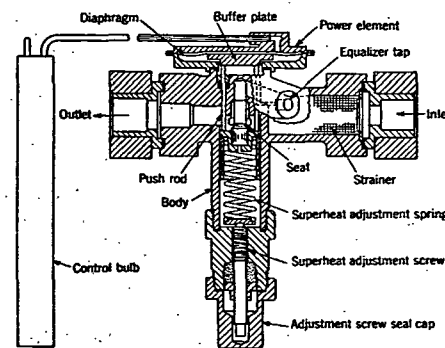


FIG. 10. TYPICAL THERMOSTATIC EXPANSION VALVE

or expensive, the evaporative condenser has become widely accepted. Compared with a water cooled condenser and cooling tower, which combination uses about the same quantity of water, the evaporative condenser has the advantage of lower cost and smaller space requirements.

Expansion Valves

The thermostatic expansion valve is a device to regulate the flow of liquid refrigerant so that the evaporator will always be used to best advantage. The evaporator coil must be kept as full as possible without any chance of liquid refrigerant entering the suction line. The expansion valve accomplishes this by regulating the supply of refrigerant, so that the temperature of the gas leaving the evaporator is always slightly higher than the temperature of the boiling refrigerant inside of it. This difference in temperature between the outgoing (suction) gas and the liquid refrigerant in the evaporator is called the superheat of the gas.

The operation of the thermostatic expansion valve can best be explained by means of a diagram, Fig. 10. A small refrigerant charge in the control bulb exerts a pressure through the tube to the upper side of the diaphragm, which tends to open the valve.