

Figure 12-16 A Wilson plot to determine the individual heat-transfer coefficients of a condenser.

12-13 Wilson plots Constructing a Wilson plot is a technique of processing heat-transfer data to determine the individual heat-transfer coefficients in a heat exchanger. The concept was introduced by Wilson¹³ and is often applied to condensers and evaporators to determine the condensing or evaporating heat-transfer coefficient along with the air- or water-side coefficient.

If it is a water-cooled condenser that is being analyzed, for example, a series of heat-transfer tests is run and the U value determined for various flow rates of cooling water. If the condenser tubes are clean, Eq. (12-8) applies and h_o is the condensing-side coefficient and h_i the water-side coefficient.

$$\frac{1}{U_o} = \frac{1}{h_o} + \frac{x A_o}{k A_m} + \frac{A_o}{h_i A_i} \quad (12-27)$$

The properties of the cooling water are primarily a function of temperature, and if the temperature range throughout the tests is not large, the properties may be assumed constant. Equation (12-9) can then be simplified to

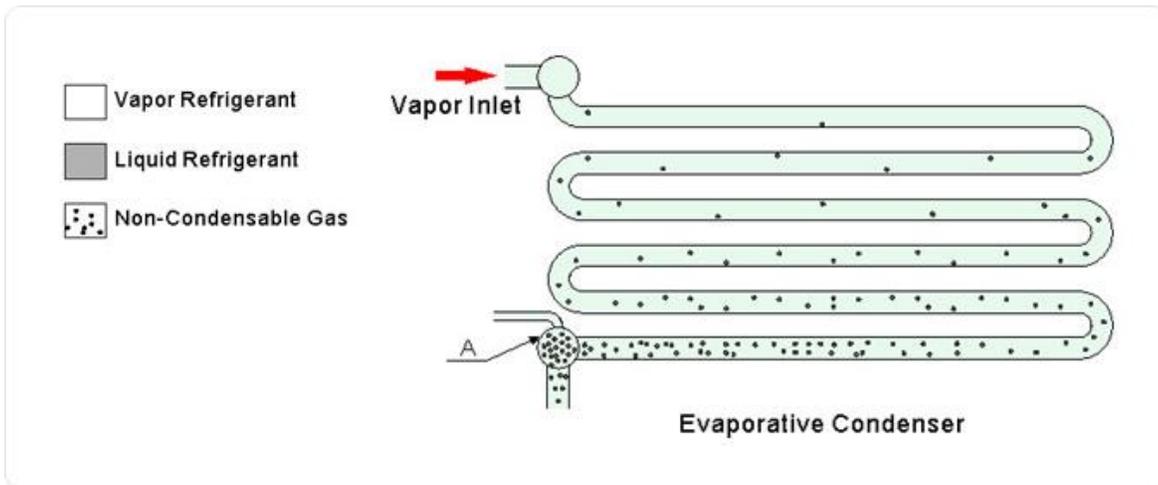
$$h_i = (\text{const}) (V^{0.8}) \quad (12-28)$$

Q11) What is the effects on non-condensable gases (foreign gases) entering the refrigeration system collect in the condenser and what is the method of removing it from the system.

Ans:-

- 1- elevating the total pressure in the condenser which requires more power for the compression process.
- 2- The non-condensable gases cling to the condenser tubes which reducing the condensing surface and increasing the condensing pressure and compression power.

**** The method of removing the non-condensable gasses from condenser by purging it from the system.**



Non- condensable gases

Q12) Explain the effects of frost on evaporator performance and what is the method of defrosting.

Ans:-

- 1- Thick layers of frost act as insulations.
- 2- In forced convection coil the frost reduce the air flow rate which drops the coil U value,.

** The method of removing the frost forming at evaporator surface is.

- 1- Hot gas defrost system, discharged gas from compressor is sent directly to the coil until the frost melt.
- 2- Electrical defrost system by using electrical heaters.

Frost over evaporator coil

