Height Equivalent to a Theoretical Plate (HETP)

Concept

If we knew the column height that was equivalent to an equilibrium stage, we could multiply that height by the number of equilibrium stages and get the height for the column. **HETP and HTU are different, as are N_{eq} and NTU.** They can be related to each other under some circumstances as shown in Section 16.2 of your text.

$$h = HETP \times N_{eq}$$

Estimating HETP

1. Measurement of HETP- Use a distillation column at infinite reflux, measure the top and bottom compositions, and divide by N_{min} (excluding partial reboiler).
2. Vendors will be perhaps the best source of data.
3. In the absence of data (for preliminary designs)
    a. Small columns (diameter of tower < 2ft), choose the most conservative (largest) of:

$$HETP = 1.5\ d_p$$

$$HETP = diameter\ of\ column$$

    b. Normal industrial range is 1 – 4 ft
    c. Random packings and low viscosity liquids: HETP = 1.5 – 2 ft (see Kister, *Distillation Design*, McGraw-Hill, 1992 for more detailed rules)
    d. Absorption using viscous liquid: HETP = 5 – 6 ft
    e. Structured packing (Eq. 10-37c in your text):

$$HETP(m) = \frac{100}{a_p} + 0.10$$

    where a_p is in m^2/m^3 for the structured packing, and HETP is in m.

Example Problem

You have a column with a packed height of 2.0 m that you operate at infinite reflux in order to determine HETP. The measured top and bottom compositions are 0.92 and 0.04 respectively. Using the diagram below, determine HETP. Then, using the same diagram, determine the column height that would be required to obtain this same separation with the operating conditions reflected in the operating lines shown.