CEN416
PROCESS DESIGN II

Multicomponent Distillation

Introduction

With a multicomponent mixture, fixing one component composition does not uniquely determine the other component compositions and the stage temperature.

Also when the feed contains more than two components it is not possible to specify the complete composition of the top and bottom products independently.

The separation between the top and bottom products is usually specified by setting limits on two **"key components"**, between which it is desired to make the separation.

Calculation Procedure

The normal procedure for a typical problem is to solve the **MESH** (Material   balance,   Equilibrium,   Summation   and Heat) balance equations stage-by-stage, from the top and bottom of the column toward the feed point.

For such a calculation to be exact, the compositions obtained from both the bottom-up and top-down calculations must mesh at the feed point and mesh the feed composition.

The calculated compositions will depend on the compositions assumed for the top and bottom products at the commencement of the calculations.

Though it is possible to match the key components, the other components will not match unless the designer was particularly fortunate in choosing the trial top and bottom compositions.

For a completely rigorous solution the compositions must be adjusted and the calculations repeated until a satisfactory match at the feed point is obtained by iterative **trial-and-error calculations**.

Clearly, the greater the number of components, the more difficult the problem.

If more than a few stages are required, stage-by-stage calculations are complex and tedious.

REFERENCES

1. Sinnot, R.K. 1999, Coulson's & Richardson's Chemical Engineering, Volume 6, Chemical Engineering Design, ButterWorth Heinemann, Oxford.

2. Turton R., Bailie R.C., Whitin W.C., Shaeiwitz J.A. 1998, Analysis, Synthesis and Design of Chemical Processes, Prentice Hall, New Jersey.