

Exercise 2: 3-stage evaporation of MeOH/H₂O

Model the separation of a mixture of methanol and water in a 3-stage evaporation process. The objective is the purification of water.

Feed Stream data: Flow rate: 100 kmol/h
 Process pressure: $p = 1$ bar
 Inlet temperature_Feed: $T = 20$ °C
 Composition_Feed: $x_F = 70$ mol% an MeOH
 Properties: UNIFAC

Task 1

Consider a procedure for solving the separation problem:

1. In which diagram can the process be visualized?
2. Which input data are required?
3. Which apparatus is required?
4. Why is the choice of the vapor fraction in the apparatus always a compromise between operating and capital costs.

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Task 2

1. Determine the costs for the amount of heating steam used.

Data: Operating hours = 8000 h/a
 Price_{HS} = 8,40 €/t
 $\Delta H_v = 525,4$ kcal/kg

2. Optimize the process to reduce the costs for heating steam and to ensure that as few waste streams as possible are generated. Calculate the costs for the optimized version analogously to step 1.