Chemical Process Design / Diseño de Procesos Químicos

Topic 4.11. Case study

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5.- Case Study: application of LMB algorithm and setting pressure and temperature levels on flowsheet

OBTENTION OF ETHANOL:

- **Establish levels of P, T in PFD.**

  Specify recoveries, splits key components. Fix the recycle rate (specify d.f.).

- **Determine coefficients of the linear models.**

  Calculate $a_{k/n}$, x_k, A_E, b, etc. Based on Antoine equation.

- **Set up linear equations and solve for flowrates of each component. Solving equations of PFD by sequential approach.**

- **Calculate P, T throughout the flowsheet.**

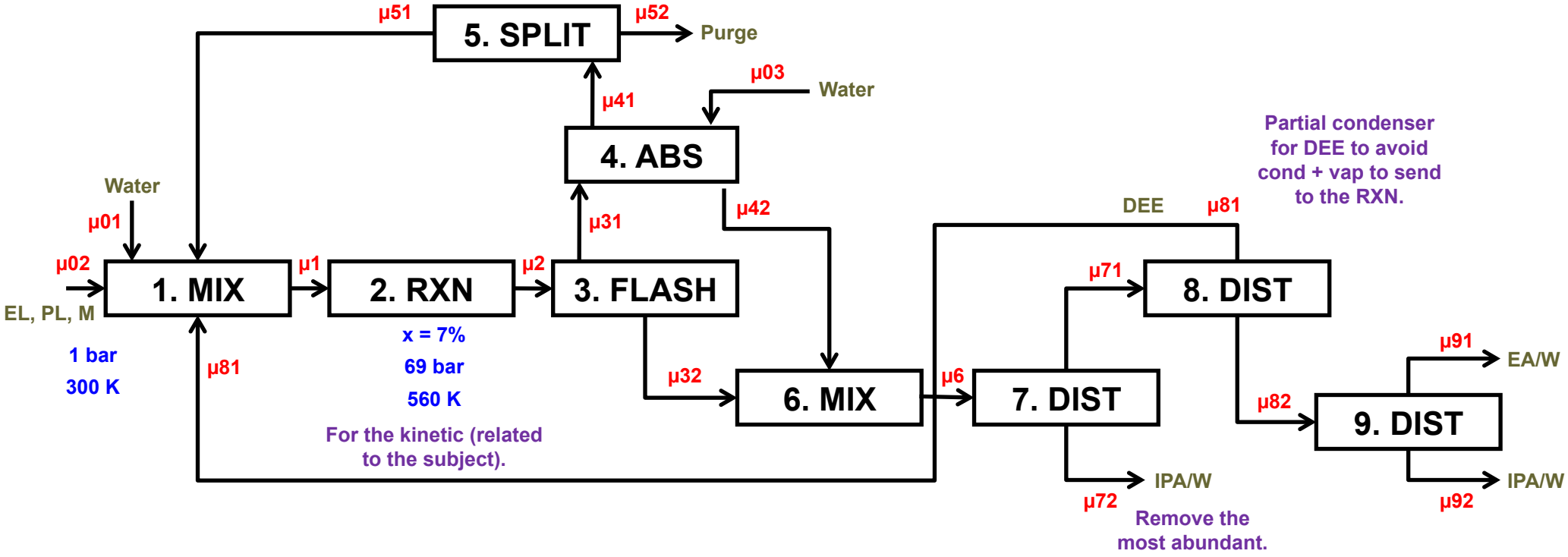
  If there is a big difference between the values obtained and the values guessed, new values must be guessed for the variables.

- **If the process does not meet specifications, either change recoveries (e.g. the recycle rate is too low) or modify the flowsheet (e.g. need a 2nd distillation unit or other separation unit to obtain the Ethanol purity required).**

- **Heat Balances (Heating – steam– and Cooling – water– utilities).**

Memo 2 is to calculate a mass and energy balance for a specified process flowsheet

Case Study: Manufacturing of ethanol



BASIS:

μ02 = 100 gmol/s; **k** = EL, PL, M, DEE, EA, IPA, W; Build the stream Table.

Case Study: Manufacturing of ethanol

SOLVING EQUATIONS:

a) Simultaneous systems equations.

b) Sequential approach:

1. Solve by components. Start with **EL** limiting reactant.
2. Use Tearing to solve one variable at a time. Apply simple graph theory algorithm → ANALYSIS LOOPS.