Chemical Process Design / Diseño de Procesos Químicos

Memo II. Guidelines Memo II

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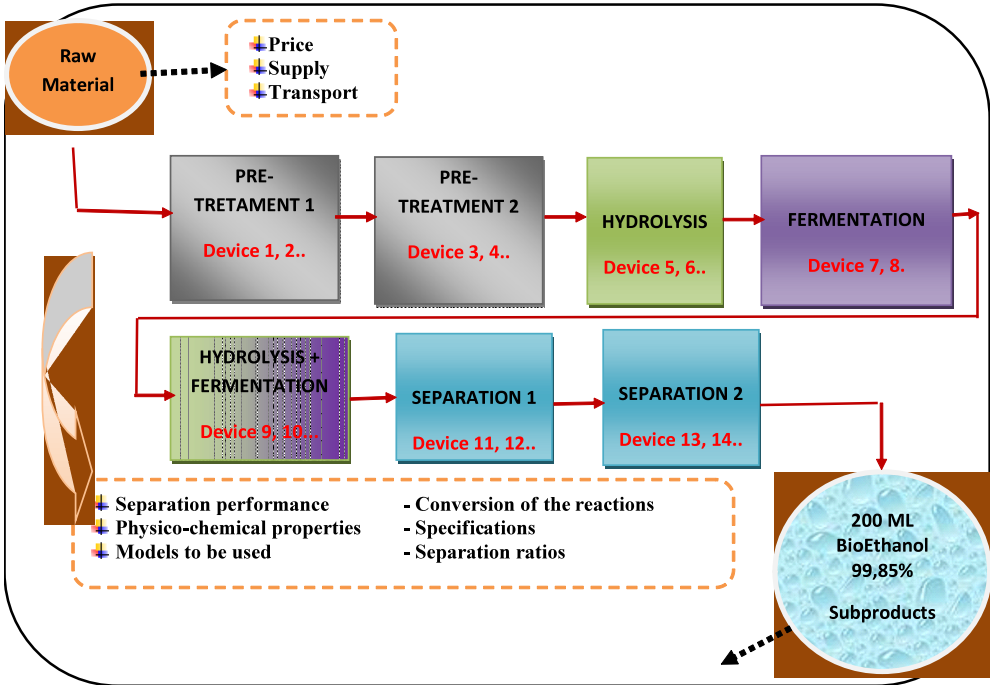
Guidelines for Memo 2: Heat and Material Balance

Objective: In MEMO 2, the design group must perform a heat and material balance to determine five quantities for each stream on the flowsheet: temperature, pressure, composition, total flowrate, and phase condition (fraction vapor).

To-do list:

1. From the literature review, **obtain all the specifications for the unit operations and/or equipment of the flowsheet selected:** Conversions, Yields, Specifications, Separation rates ... Collect common physical properties (critical properties, ΔHvap, MW, Antoine coefficients, heat capacity…) for the pure components.



2. **Label the streams** on your flowsheet and **produce a Stream Information Table (flowsheet and table on the same page)**. You do not need to label the streams with components as you did for the first memo, this is a **quantitative flowsheet**.

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3. Calculate **Material Balance.** For consistency we will use 100 gmol/s of glucose coming out of the hydrolysis reactor. Calculate the **Heat balance**. Show your work on deriving the mass and heat balance models and state the **assumptions** behind your calculations. **Illustrate each calculation with an example** from your flowsheet. For each calculation, give the algebraic formula, substitute numeric values, and finally, give the result.

   The Stream information table has as rows the components and as columns the stream numbers. The rows are flows of components, total flow, Pressure, Temperature, vaporization. These will be the results of your mass and heat balance. You also need to indicate heat loads in the exchangers.

4. When you finish, **look at your numbers**. Do the numbers balance and do they make sense? Which numbers are most suspicious? Accurate? Which assumptions or approximations should be more carefully examined in a detailed analysis? Did you find enough data to do the shortcut analysis? What data are required for a more detailed analysis? Does your process meet the specifications? If not, is it technically infeasible or are shortcut calculations incapable of modelling the process with sufficient accuracy; or did you run out of time?

5. Preparation and delivery of Memo 2.

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Memo 1 must contain:

- **Cover letter (1 page).**
- **Main Text (place figures and tables in appendix):**
  - **a)** LMB equations with one detailed calculation for each type of equipment.
  - **b)** Total mass balance for at least one component.
  - **c)** Establishing P, T levels.
  - **d)** Heat balance for each different type equipment.
- **References: articles, patents, encyclopedias, web.**
- **Appendix: flowsheet and stream information table. Other figures and tables.**