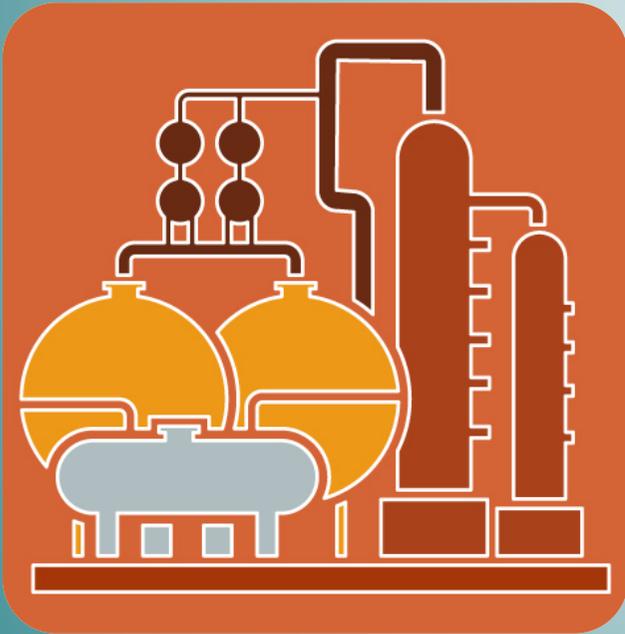


Chemical Process Design / Diseño de Procesos Químicos

Memo III. Guidelines Memo III



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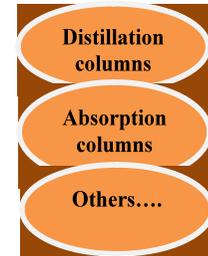
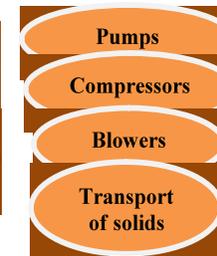
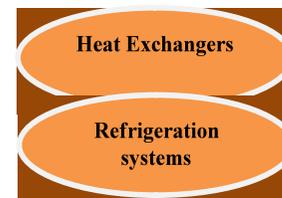
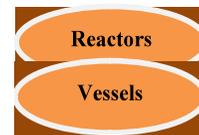
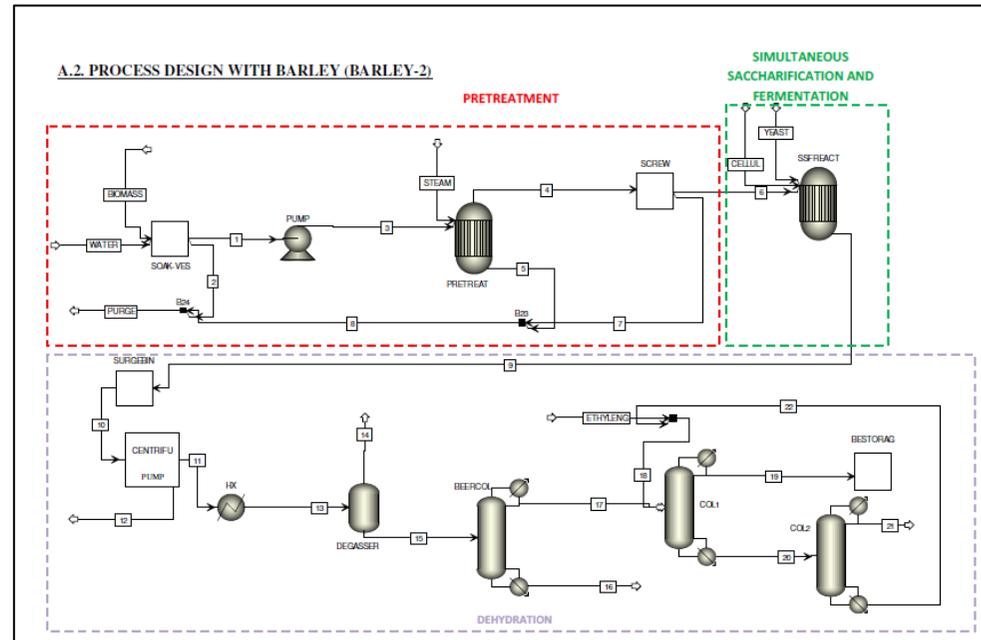
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Guidelines for Memo 3: Sizing and Economic Evaluation

Objective: In MEMO 3, the design group has to size the equipment of the flowsheet you presented in MEMO 2, perform heat integration, and an economic evaluation.

To-do list:

1. Based on the mass and energy balance in MEMO 2, or a modification of it, include a **complete calculation for the sizing and costing of every major piece of equipment.** For minor or frequently-occurring, similar equipment such as heat exchangers and compressors, a single representative calculation is sufficient. **Each calculation must refer to specific equipment on the flowsheet and must represent the values, which appear on the flowsheet.**



Guidelines for Memo 3: Sizing and Economic Evaluation

2. Draw up an **equipment list** with the results of the calculations made: Size and cost of each individual piece of equipment.
3. Calculate the total **equipment costs, capital cost estimation, manufacturing cost, and utility costs**. Represent the results using pie charts.
4. **Economic evaluation.** Discounted and non-discounted criteria must be applied for the economic evaluation.
You can use the following:
 - Capital investment.
 - Utilities summary.
 - Manufacturing cost.
 - Estimate of Annual Earnings and Return.
 - Net Present Value (NPV).

APPENDIX C.1. Equipment list and cost

EQUIPMENT LIST				
TYPE (UNIT)	COST (UBMC) (€)	SIZE	UTILITY COST (€/YEAR)	OTHER SPECIFICATIONS
REACTORS				
Q (Hydrolysis)	8306858.51	3606.94 m ³	946000	Jacketed, 9 units, Stainless Steel (SS)
S (Fermentation)	9239423.27	4462.26 m ³	95000	Jacketed, 3 units, (SS)
COMPRESSORS				
H	13677609.16	8553.32 kW (2 stages)	5240000	Centrifugal, motor driven
TANKS				
STORAGE 1	208316.56	9.28 m Length 2.32 m Diameter	---	Pressure vessel, Stainless steel
STORAGE 6	4709415.46	8924.53 m ³	---	Stainless steel
STORAGE 8	9936509.50	36593.23 m ³	---	Stainless steel
HEAT EXCHANGERS				
C	151038.51	74.30 m ²	3388383.56	Fixed tube sheet, Pressure vessel, Stainless steel
K	823712.56	549.74 m ²	192792.25	Fixed tube sheet, Pressure vessel, Stainless steel
COLUMNS				
Ammonia Recovery column	60546.70	0.45 m Diameter 10.8 m Length 9 Trays	---	Steve trays, Stainless steel
Low pressure column	197186.6	0.83 m Diameter 22.2 m Length 28 Trays	---	Steve trays, Stainless steel
High pressure column	642880.32	2.33 m Diameter 23.4 m Length 30 Trays	---	Steve trays, Stainless steel
PUMPS				
F	227692.08	Wb _{B1} = 128.6 kW Wb _{B2} =109.36 Kw	146000	Centrifugal, Stainless steel
V	17693.41	3.78 kW	2330	Centrifugal, Stainless steel
AD	9111.30	0.21 kW	128.8	Centrifugal, Stainless steel
PERVAPORATION				
AI	93546.98	QA ₁₁ = 154.41 kW QA ₁₇ = 1002 kW	171696.13	Stainless steel

5. Perform a **sensitivity analysis on key parameters** (e.g., cost of raw materials, cost of energy, operating capacity, product price, interest rate).
6. Offer a **recommendation on the economic viability** of the process.
7. Preparation and delivery of Memo 3.

Memo 3 must contain:

- **Cover letter** (A clear, concise statement of essential findings and results (e.g. NPV, investment, operating costs), along with conclusions and recommendations. A single page should suffice).
- **Main Text (place figures and tables in appendix):**
 - a) Sizing calculations with one detailed calculation for each type of equipment.
 - b) Costing calculation with one detailed calculation for each type of equipment.
 - c) Economic evaluation.
 - d) Sensitivity analysis.
 - e) Recommendation of economic viability.
- **References: articles, patents, encyclopedias, web.**
- **Appendix: flowsheet and stream information table. Equipment list and cost. Other figures and tables**