

KE-107.3100 Process Simulation

Exam: 25.10.2007 time: 13-16, comp.class

Theory (max. 1 h) Answer in Finnish, Swedish or English

1. Reactor models in simulator
2. How you select VLE methods
3. Explain shortly:
 - a) Rating
 - b) Critical temperature
 - c) UNIFAC

Simulation (max 2h): Save simulation file (*.prz) and report file (*.out) for each individual task

4. Dimethyl ether (DME) can potentially be manufactured by two routes:

- i) from methanol $2\text{CH}_3\text{OH} \rightarrow \text{CH}_3\text{OCH}_3 + \text{H}_2\text{O}$ or
- ii) from methanol and methane $\text{CH}_3\text{OH} + \text{CH}_4 \rightarrow \text{CH}_3\text{OCH}_3 + \text{H}_2$

- a) Study which is the more feasible route at 1500 kPa and 250 °C.
- b) Is the reaction taking place in vapour or liquid phase in this T and p?
- c) Calculate the adiabatic temperature rise for the reaction.

5. Sensory analysis (aistinvarainen analyysi) of ethanol product is performed by smelling. Odor threshold (hajuraja) of methanol in the air is 0.1 vol-%. What is the corresponding amount of methanol in liquid phase, when smelling is performed from a cognac glass at 20 °C. Assume that the gas phase is saturated and only a very small amount of liquid has vaporized. Composition of liquid ethanol product is: 96 vol-% ethanol and the rest is water and methanol.

6. A mixture of propane, n-butane, n-pentane and n-hexane is separated by distillation. 99% of the feed of n-butane ends with distillate and 95% of the feed of n-pentane goes to the bottom. Column has 10 ideal trays and 500 kPa pressure.

Feed to the column is 10000 kg/h and the composition is:

Propane	10 mole-%
n-butane	40 mole-%
n-pentane	40 mole-%
n-hexane	10 mole-%

- a) What is the column optimum feed tray?
- b) Calculate the column dimensions for Norton IMTP 1 inch metal packing for a).

Maximum points:

Theory:	1-3	2p/each
Simulation:	4	3p
	5	3p
	6	4p
Exercise		4p (100% attendance)
TOTAL		20p