

KE-107.3100 Process Simulation

-write your name & student no:

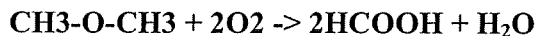
Exam: 29.10.2007; time: 13:00-16:00

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

1. Explain shortly:
 - a) kinetic reactor
 - b) flooding factor
 - c) critical temp.
2. For which purposes Flash operation can be used
3. What kind of complexities exist in simulation. How they effect the selection of simulator type?

Simulation part (2h): Save simulation file (*.prz) and report file (*.out) for each individual task. Write your answers in paper. Lecture materials can be used.

4. Pure dimethyl ether (DME) auto oxidizes in a storage tank to form formic acid and water:



- a) Check if this reaction is possible at 20 °C and atmospheric pressure.
 - b) If this reaction takes place so that the temperature rises from 20 °C to 30 °C in an adiabatic, atmospheric tank, how much of DME has reacted.
5. Design a distillation system to separate DME and formic acid to make 99 w-% DME. Column has 10 ideal trays at 5 bar. Feed flow rate is 10 t/h with 93 w-% DME, 6 w-% formic acid and 1 w-% water at 30 °C.

-Calculate the column reflux ratio (R/D) and the diameter with sieve trays

6. Acetic acid (HAc) is extracted by water from methyl-isobutylketone (MIBK) in a column with 10 trays. Feed is 90 w-% pure MIBK and 10 w-% technical HAc solution. Technical HAc solution contains 30 w-% water. HAc-MIBK solution feed rate is 10 t/h.

The column is at 1 bar and the temperature of the feeds is 20 °C. Study how much water is needed when 98 w-% MIBK is separated as a product.

Points:

theory 2p/each,

simulation: 4). 4p, 5). 3p, 6) 3p and exercise attendance (100%) 4p.

Total 20p