technische universität dortmund

Fakultät Bio- und Chemieingenieurwesen
LS für Systemdynamik und Prozessführung

Diplomarbeit / Masterarbeit

Optimal Control of Reactive Distillation Column

Abstract:

Reactive distillation (RD) represents a very good option for producing chemicals which are born in the reactions an equilibrium of which does not allow for high conversion (or selectivity) of the reactants. It stands for a combination of reaction and separation process in a single vessel. This setup then possesses an advantage of reaching high conversion and selectivity opposed to classical reactor-separator setup. On the other hand, reactive distillation represents a relatively complex process from modeling, simulation, and control viewpoint. As a result, the dynamic models of different complexity can be constructed; different ways of approaching the problem of finding an optimal operation of RD processes may be pursued.

Objectives:

An objective of the proposed master thesis is the simulation and dynamic optimization of reactive distillation column, a case study of trans-esterification of dimethyl carbonate with ethanol will be studied. More concretely, optimal start-up and optimal changeover policies will be studied with respect to economic side of the process.

Steps:

- Selection of appropriate model depth and subsequent model verification by means of numerical simulation
- Selection of a control structure and identification of degrees of freedom available for subsequent optimization
- Dynamic optimization of the selected degrees of freedom of the RD column model for different objective formulations

Begin and duration:

Immediately, 6 months full time

Diplomarbeit / Masterarbeit

Prerequisites:

- Programming skills (MATLAB or gPROMS)
- Good knowledge of modeling of chemical processes
- Interest in modeling and optimal control of complex chemical processes

Literature:

- Keller, T., Holtbruegge, J., Górak, A., Transesterification of dimethyl carbonate with ethanol in a pilot-scale reactive distillation column, Chemical Engineering Journal, vol. 180, 2012, Pages 309-322
- Srinivasan, B., Palanki, S., Bonvin, D., Dynamic optimization of batch processes: I. Characterization of the nominal solution, Computers & Chemical Engineering, vol. 27 (1), 2003, Pages 1–26

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