technische universität dortmund

Fakultät Bio-und Chemieingenieurwesen

LS für Systemdynamik und Prozessführung

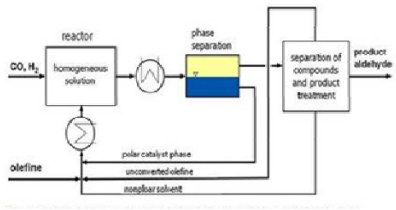
LS für Technische Chemie

Diplomarbeit / Masterarbeit

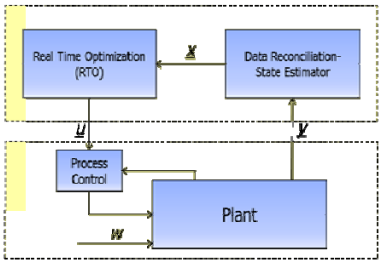
Implementation of a Real Time Optimization Scheme in a Continuously Operated Minipant with Thermomorphic Solvent System

Background and Motivation

The final goal in the operation of any chemical plant is to maximize the profit (optimal economical operation) in presence of disturbances, while safety, environmental and process constraints have to be satisfied. The issue of optimal economic operation has been traditionally addressed by means of a hierarchical approach: Real-Time Optimization (RTO) [1]. In this technology, an upper layer uses a rigorous static model in order to perform the optimization, while a lower layer performs the regulatory control. As a consequence of mismatch model-plant, the optimal operating point predicted by the model can be different to the actual plant optimum. Among other methodologies proposed, the use of on-line information in the so called *Modifier Adaptation* has proved to be successful addressing structural mismatch model-plant [2].



Thermomorphic Multicomponent Solvent System



Real Time Optimization

TMS Miniplant (Chair Technical Chemistry)

Objectives

In this thesis a RTO scheme will be implemented in an integrated chemical process that involves a liquid multiphase system with homogeneous catalysis. Theoretical evaluations of the modifier adaptation methodology to be developed as well as preliminary experiments are intended within the scope of this work, in collaboration with the Chair of Technical Chemistry. The system to be studied is the hydroformylation of 1-dodecen in a miniplant using a thermomorphic solvent system [3].

References

[1] Darby, M. Nikolaou, M. Jones, J. Nicholson, D. (2011) RTO: An overview and assessment of current practice. *Journal of Process Control*, 21: 874-884..

[2] Chachuat, B. Srinivasan, B. and Bonvin, D. (2009) Adaptation strategies for real-time optimization. *Computers and Chemical Engineering*, 33: 1557-1567.

[3] Zagajewski, M. Behr, A. Sasse, P. Wittman, J. (2014) Continuously operated miniplant for the rhodium catalysed hydroformylation of 1-dodecen in a thermomorphic multicomponent solvent system (TMS). *Chemical Engineering Science*, 15: 88-94.

Diplomarbeit / Masterarbeit

Steps

(a) Familiarization with the theoretical background

(b) Getting familiar with the model and tools available.

(c) Theoretical studies of the Adaptation methodology, considering measurement noise.

(d) Connection of the system to the LabVIEW environment

(e) Demonstration experiments using the methodology proposed

Prerequisites

Simulation and programming skills (Matlab and/or C++)

Interest in optimization methods

Start

March 2015.

Contact

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