

599c Non-Isothermal Reactor Network Synthesis through Ideas

Wen Zhou and Vasilios I. Manousiouthakis

The economic and environmental performance of process networks often depends critically on the behavior and properties of its reactor subnetwork. As a result, the analysis and design of reactor networks has been the subject of intense research efforts. The Infinite Dimensional State-space (IDEAS) was first published in 2000 and applied to several problems since then including isothermal reactor network synthesis problems.

Previous work deals with isothermal operations to simplify the process and the computational effort. When temperature is considered to change in the reactor, more complexity (nonlinearity) is brought to the problem. However, the IDEAS approach still maintains the advantage of generating convex (linear) programming problems. Indeed, we are going to show that IDEAS is applicable to non-isothermal reactors under both constant density assumption and variable density condition. Furthermore, Shrink-wrap algorithm will be shown to be applicable to the attainable region construction problem of non-isothermal reactor networks after certain modifications with a new design parameter being introduced. Not only pre-heating before the reactor network but also pre-heating and inter-heating within the reactor network will be investigated and compared. Examples from the literature will be presented and solved, and the results will be compared to those from the literature.

Keywords: Non-isothermal reaction, Reactor Network Synthesis, IDEAS