Department of Chemical and Biological Engineering
UNIVERSITY OF WISCONSIN–MADISON

2020 Fall CBE Seminar Series

presents:

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Computer-aided Process Intensification for Sustainable Process Design and Discovery

Increased competition, environmental regulations, rise of unconventional feedstocks, and volatile markets have contributed to renewed interest in intensification methods for the chemical process industry. Process intensification synergistically combines multiple phenomena, such as separation and conversion, within a single equipment. This drastically reduces the size, cost, energy consumption, and environmental footprint of a chemical process. However, it is not always clear under which conditions intensification becomes synergistic or desirable in a complex system considering multiple competing phenomena, trade-offs, and dynamic interactions. Another long-standing design problem is to be able to systemically obtain out-of-the-box solutions. To resolve these challenges, we depart from the classic unit operation-based representation of chemical processes and propose a new representation using design building blocks. An assembly of blocks of the same type obtains a classic unit operation, while an assembly of blocks of different types results in an intensified operation. This provides a seamless transition from the phenomena-scale to the task/equipment-scale to the flowsheet-scale, and allows model-based screening and optimization of potentially advantageous intensification pathways that current designs do not yet support. In this talk, I will also discuss the development of SPICE (Synthesis and Process Intensification of Chemical Enterprises), which is a process design software prototype based on the building block representation. SPICE enables "systematic innovation", which is to say that a process designer now can systematically discover out-of-the-box process configurations without exhaustively enumerating all plausible alternatives.

Tuesday, Oct. 27, 2020

Lecture at 4:00 p.m.

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