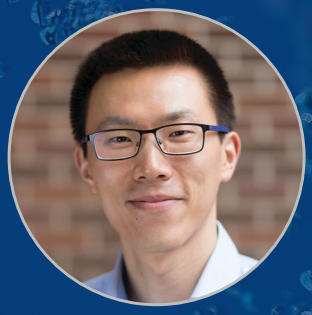
DEPARTMENT OF CHEMICAL AND BIOMOLECULAR ENGINEERING

UNIVERSITY OF DELAWARE
ENGINEERING

2023 SEMINAR SERIES

Attend virtually: https://udel.zoom.us/j/91386404306

TOWARD THE EFFICIENT OPERATION OF AN ELECTRIFIED CHEMICAL INDUSTRY



DEC 1 | 10:00 AM | 102 COLBURN LAB

QI ZHANG

UNIVERSITY OF MINNESOTA

Assistant Professor

Electrification is increasingly being recognized as a key strategy for decarbonizing the chemical industry. As electrification efforts intensify in the coming years, we will see a significant increase in the number of chemical processes that consume large amounts of, preferably renewable, electricity. Given the intermittency in the availability and pricing of electricity, to remain cost-competitive, the chemical industry will require a paradigm shift from mostly steady-state toward highly dynamic process operation. To this end, we develop computational decision-support tools that can help chemical processes fully leverage their operational flexibility and take advantage of new demand response opportunities.

In the first part of this talk, we discuss how a power-intensive chemical process can be scheduled to optimally participate in both the energy and reserve markets. The key challenge lies the uncertainty that one does not know in advance when load reduction will be requested by the grid operator; we propose to address this problem using a robust optimization approach. In the second part, we consider a network of chemical processes that are owned and operated by different companies or stakeholders. We apply a distributed optimization framework that enables coordination while respecting local objectives and sharing minimum amount of information among the stakeholders. Results from our case studies indicate substantial improvements in overall and individual performances, and further demonstrate the ability of coordinated demand response to benefit the chemical industry as a whole, not only those processes that are large electricity consumers.

ABOUT THE SPEAKER

Qi Zhang is an Assistant Professor in the Department of Chemical Engineering and Materials Science at the University of Minnesota. He received his Ph.D. in Chemical Engineering from Carnegie Mellon University and worked at BASF prior to joining the University of Minnesota. His research in the broad area of process systems engineering focuses on mixed-integer optimization, decision making under uncertainty, and data analytics, with applications in sustainable process systems, smart manufacturing, supply chain management, and metabolic engineering. He is a recipient of the AIChE CAST W. David Smith Jr. Graduate Publication Award, the NSF CAREER Award, and the McKnight Land-Grant Professorship.