DEPARTMENT OF MECHANICAL ENGINEERING
WILLIAM MAXWELL REED SEMINAR SERIES

"Innovation and Design at the Climate-Water Nexus for Sustainable Manufacturing and Energy Systems"

Sarang Supekar, Ph.D.
Postdoctoral Appointee, Argonne National Laboratory

Abstract: As we pursue UN Sustainable Development Goals for responsible production and consumption, sustainable infrastructure, clean water and energy, and climate action, carbon dioxide (CO2) is poised to play an unequivocally critical role – both as an industrial resource with unique physical and chemical properties, and as a global pollutant that needs urgent remediation to prevent large-scale and irreversible damage to humanity. In this talk, I will discuss opportunities for significantly and profitably reducing the climate and water burdens of manufacturing through transformative technologies based on recovered CO2 as a process fluid in "dry" and energy-efficient factories of the future. Starting with an overview of the recovered CO2 supply chain and its environmental impacts, I will discuss results from experimental studies on supercritical CO2-based cutting fluids in metals manufacturing to improve process productivity compared to conventional water-based cutting fluids. Results from these studies will be used to motivate the exploration of new CO2-based industrial technologies with applications in manufacturing, electronics cooling, and waste recovery. Novel approaches for improving energy and material productivity of manufacturing processes using data-driven product and process life cycle design will also be briefly introduced. The talk will further discuss carbon abatement through carbon capture and sequestration (CCS) in coal and natural gas power plants, and introduce an analytical design framework for steam and electricity sourcing in CCS plants. I will conclude with an examination of carbon mitigation strategies in the broader context of CO2 prevention in the energy and automotive sectors. Least-cost pathways to cut CO2 emissions by 70% from the U.S. power plant and vehicle fleets by 2050 will be described along with the design optimization framework developed for the analysis. The ramifications of delays in initiating CO2 reduction measures on the private (as opposed to social) costs of CO2 mitigation will also be discussed

Bio: Sarang Supekar is a postdoctoral scholar in the Energy Systems Division at Argonne National Laboratory. Before joining Argonne, he was a research fellow and a lecturer at the University of Michigan. Dr. Supekar earned his Ph.D. from the University of Michigan, Master's degree from the University of Florida, and Bachelor's degree from the University of Pune, all in Mechanical Engineering. His research interests are in sustainable manufacturing and design, industrial ecology, CO2 capture and sequestration pathways, and the application of optimization and simulation methods for climate change mitigation and adaptation. Dr. Supekar has co-developed undergraduate and graduate courses in sustainable design and life cycle engineering. He is the recipient of the E. Wayne Kay Graduate Scholarship from the Society of Manufacturing Engineers for his research in manufacturing technology. He has also received the Martin Luther King Jr. Spirit award in 2012, and the College of Engineering Distinguished Leadership award in 2014 for his education, diversity, and inclusion initiatives at the University of Michigan.

Date: Monday, Feb. 12
Time: 3PM
Place: RMB 323
Contact: Dr. Alexandre Martin 257-4462

Meet the speaker and have refreshments
Attendance open to all interested persons

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