ChemE MIT Chemical Engineering

Seminar Series
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Advances, Challenges and Opportunities in Process Electrification

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66-110

Electrification aims to change the way energy is supplied and used in chemical and manufacturing processes. Electrifying process heat is especially important because heating accounts for a large share of industrial energy use and emissions. At the level of individual units, electric technologies can operate more efficiently, start up much faster, and offer better control than conventional fired equipment. These features enable new opportunities for process integration and more flexible plant operation. Beyond the plant, electrification also affects the power grid. As more industrial processes rely on electricity, their operating patterns influence overall electricity demand and its variability. This presentation reviews recent results that probe these effects. We quantify efficiency gains at the unit level, introduce new processing architectures with fast startup /shut down cycles, discuss the impact of electrification on heat integration at the plant level, and study new electricity market mechanisms such as demand bidding at the grid scale. Together, these results provide a clearer picture of how process electrification performs in practice, and what challenges lie ahead for broad adoption.

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