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TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY

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The Wolfson Department of Chemical Engineering

Wolfson Department of Chemical Engineering Seminar
Wolfson Department of Chemical Engineering,
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Online seminar via Zoom
https://technion.zoom.us/j/99611535781

Smart Process Operations: Closed-loop Planning and Scheduling

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Supply chain management is a complex, large-scale activity that involves the planning of production and logistics, and the scheduling of the operation of the facilities present in an enterprise. Planning and scheduling represent long-term (optimal) business decisions. Traditionally, the corresponding optimization problems are solved at the beginning of the time horizon of interest (which can span a few days in the case of scheduling to a few months in the case of planning), and the results are implemented in the physical layer. While transparent to practitioners, this approach does not easily accommodate recent market structure changes, where the economic circumstances (e.g., energy prices, quality of perishable products) can fluctuate over time scales comparable to (or faster than) the residence time of the supply chain. The aforementioned situation calls for increasing the agility of supply chain management strategies by incorporating real-time information regarding market, and process and product conditions, and updating operational decisions as necessary.

Motivated by the above, our group is developing novel concepts for closed-loop optimal planning and scheduling. Utilizing ideas from model predictive control, we define a framework whereby information on the system state and exogenous factors is used to update operational decisions on a rolling horizon. In this presentation, we will discuss the theoretical underpinnings of these developments (including problem formulations, stability proofs, and numerical solution techniques), analyzing their economic performance and computational benefits compared to the conventional approach. Two industrial case studies will be presented, the optimal scheduling of an air separation unit under time-varying electricity prices, product demand and ambient conditions, and optimal operational planning of a fresh food supply chain under product degradation constraints.