9th Asian Symposium on Process Systems Engineering

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This special issue is dedicated to the 9th Asian Symposium on Process Systems Engineering (PSE Asia 2020), which was held in Taipei on 4–6 November 2020. The themes of this special issue are “Process Integration and Optimization” and “Process Modelling and Simulation.” A call for papers for the special section was announced after the event, on 25 November 2020. A total of four papers were accepted for publication after the peer review process. These papers come from outstanding research groups in Asia (India, Malaysia, Philippines, and Thailand), covering process design, resource conservation, reliability assessment, and production planning problems. A brief review of these papers is as follows.

Process Integration and Optimization

Choptumdee et al. (2021) studied the production process of alpha methyl ester sulfonate from biodiesel. This process is energy-intensive involving several high-temperature chemical reactions. The objectives of their study are to improve the heat recovery in the process and to determine the optimal process conditions that meet the product specifications. Unit operation models in Aspen Plus and the Aspen Energy Analyzer were used to evaluate the efficiency of the heat recovery system. A heat exchanger network was then synthesized to reduce the energy consumption. The authors also performed sensitivity analysis to examine the effects of the coolant condition, the sulfur flowrate, and the airflow ratio.

Kamat and Bandyopadhyay (2021) developed a hybrid algorithm to optimize the water consumption and the regeneration flowrate, with the objective of minimizing the total annualized cost. In their algorithm, the interaction between water and regeneration and their effects on energy consumption are established using a nonlinear programming model; the heat exchanger requirements for thermal integration are targeted using pinch analysis. In addition, heuristics were developed based on pinch analysis to reduce the energy requirements by enforcing non-isothermal mixing of the water streams. The authors solved two examples to demonstrate their algorithm.

Process Modelling and Simulation

Integrated bioenergy systems play an important role in minimizing biomass waste and reducing the reliance on imported fuels. However, such interconnected systems would suffer from the ripple and amplification effect of disruption when a component fails. Benjamin et al. (2021) developed a risk analysis and Monte Carlo simulation-based framework to assess and determine the reliability of integrated bioenergy systems against variable capacity disruptions, which can cause partial system inoperability or even network failure. The Monte Carlo simulation method is used to determine failure rates by introducing a probabilistic input to a model. The authors presented two case studies to illustrate the applicability of their model to a range of integrated bioenergy networks.

Agricultural production planning faces the challenge of handling the demand dynamics with minimum allocation of land resources and maximum profit. Rajakal et al. (2021) developed an automated targeting model to determine an optimal agricultural production plan that requires the minimum new land and achieves the maximum profit in satisfying the targeted demand. Their work explored the impact of optimal storage sizing on new land allocation, greenhouse gas emissions, and profit. The authors presented an oil palm

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case study with three scenarios (no storage, full storage, and partial storage) to demonstrate their model.

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