Farshid Nazemi

Contact Information

1717 S Dorsey Ln
Tempe, AZ 85281

Email: fnazemi@asu.edu

Areas of Specialization

Process Systems Engineering, Sustainable Engineering

Skills

Software/Programming: Python, R, Julia, LaTeX, Linux, Pandas, NumPy, Plotly, Matplotlib, Pyomo, JuMP, Dash, Streamlit, Git, JupyterLab, SQL, Server, OpenLCA, Brightway, Aspen Plus/HYSYS

Mathematical Modeling: Multi-objective Optimization, Mixed-integer (Non-)linear Programming, Static and Dynamic Systems Modeling, Uncertainty and Sensitivity Analysis, Stochastic Optimization, Machine Learning, Statistical Analysis, Network Analysis, Information Theory

Technical: Life Cycle Assessment (LCA), Carbon Footprint Assessment, Techno-economic Analysis (TEA), Material Flow Analysis (MFA), Energy and Exergy Analysis, Circular Economy, Net-zero Economy, Process Design and Simulation, Supply Chain Resilience

Education

Arizona State University, Tempe, AZ — Aug '21 - Present
Ph.D., Chemical Engineering — (Expected Graduation: December '25)

Ohio State University, Columbus, OH — Aug '21 - Aug '23
M.S., Chemical Engineering

Isfahan University of Technology, Isfahan, Iran — Aug '17 - Aug '20
M.S., Process Engineering

Isfahan University of Technology, Isfahan, Iran — Aug '12 - Aug '17
B.S., Chemical Engineering

Experience

Arizona State University, Ohio State University
Graduate Research Fellow — Aug. '21 - Present

Zist Faravardeh Sepahan Co., Research and Development, Process Simulation and Design Group
Intern — Sep. '18 - Sep '19

Teaching Experiences

Ohio State University, Department of Chemical and Biomolecular Engineering
Graduate Teaching Assistant - Process Design and Development — Jan. '23 - May '23

Isfahan University of Technology, Department of Chemical Engineering
Graduate Teaching Assistant - Process Control Laboratory — Aug. '19 - Dec. '19

Projects

Energy Systems and Carbon Capture & Utilization (CCU) [7-10],

- Performed process simulation using Aspen Plus and performed techno-economic, life cycle, and exergy analysis of biofuel production utilizing first, second, and third-generation biomass.
- Conducted preliminary TEA\LCA of CCU as a part of an National Energy Technology Laboratory (NETL) proposal in collaboration with the Center for Negative Carbon Emissions. Worked with a multidisciplinary team to calculate the cost of CO2 capture using DAC membrane system, followed by its conversion into biomass and biofuels. The project successfully secured funding.

Multi-objective Optimization Framework and Decision Support Tool [1],

- Developed a multi-objective optimization framework for enhancing profitability, resilience, and environmental sustainability in the chemicals and plastics industry, with preliminary version tailored to supply chains of plastic films, in collaboration with Kohler and Berry Global Co.
- Created an intuitive software tool to visualize trade-offs between objectives, with a demo available upon request.

Cost-effective Roadmaps for Decarbonization [2],

- Designed a framework integrating operations research techniques to create net-zero carbon roadmaps for plastic packaging, leveraging Pyomo for mixed integer linear programming (MILP) modeling and multi-objective optimization to minimize emissions and costs.

- Employed stochastic optimization for multi-period planning under uncertainty and used machine learning for predictive modeling of emissions and costs to support roadmap development toward 2050 targets.

Customized Large Language Model (LLM) for Literature Data Acquisition [4],

- Developed a customized Large Language Model (LLM) for data acquisition from literature related to supply chain design, life cycle assessment (LCA), and techno-economic analysis (TEA).
- Enabled the LLM to respond to LCA and TEA data inquiries.

Techno-economic and Life Cycle Assessment of Plastic Packaging [3,5],

- Conducted life cycle assessment (LCA) and techno-Economic analysis (TEA) for process alternatives and technologies targeting the production and treatment of multi-layer plastic film waste.
- Performed uncertainty analysis to evaluate the influence of variability in LCA and TEA data, highlighting significant variability in profitability and environmental impacts due to differing operating conditions and modeling assumptions.

Chemical Supply Chain Resilience [6],

- Conducted network analysis and applied information theory principles to predict the resilience of an industrial sector under perturbations.
- Identified trade-offs between system efficiency and robustness, as well as between short-term and long-term economic objectives.

Publications & Proceedings

[1] **Nazemi, F.**; Sen, A., Stephanopoulos, G., & Bakshi, B..; *Netz-CMI: A User-Friendly Tool for Achieving Net-Zero Transition for the Chemical and Material Industries." 2024 AIChE Annual Meeting.* AIChE, 2024.

[2] **Nazemi, F.**; Sen, A., Sporchia, F., Stephanopoulos, G., Pulselli, F., & Bakshi, B.. *"Cost-Effective Strategies Towards Net-Zero Plastic Packaging Based on a Resilient and Sustainable Circular Economy." 2024 AIChE Annual Meeting.* AIChE, 2024.

[3] **Nazemi, F.**; Hanes, A.; Bakshi, B.; *"A Life Cycle and Techno-economic Assessment of Multilayer Plastic Films with a Focus on End-of-Life Treatment and Multiple Recovery Cycles"*; Sustainable Materials and Technologies (Under Review)

[4] **Nazemi, F.**; Kumar, A.; Bakshi, B.; *Developing a Life Cycle Inventory Database for Plastic Packaging End of Life Technologies Using Customized Large Language Models (LLM)*; 2024 American Center for Life Cycle Assessment (ACLCA).

[5] **Nazemi, F.**, et al. ; *Analysis and Design for Sustainable Circularity of Barrier Films Used in Sheet Molding Composites Production.*; Technology Innovation for the Circular Economy: Recycling, Remanufacturing, Design, Systems Analysis and Logistics (2024): 365-377.

[6] **Nazemi, F.**; Fath, B.D.; Bakshi, B.R.; *Ecologically Inspired Metrics for Transitioning to a Sustainable and Resilient Circular Economy with Application to Multilayer Plastic Films*; Sustainable Production and Consumption (2024).

[7] **Nazemi, F.**; Karimi, K.; Denayer, J. F.; Shafiei, M.; *Techno-economic aspects of different process approaches based on brown macroalgae feedstock: A step toward commercialization of seaweed-based biorefineries.* Algal Research, 2021, 58, 102366.

[8] (Co-first Author) Hosseinzadeh-Bandbafha, H.; **Nazemi, F.**; Khounani, Z.; Ghanavati, H.; Shafiei, M.; Karimi, K.; Aghbashlo, M.; Tabatabaei, M.; *Safflower-based Biorefinery Producing a Broad Spectrum of Biofuels and Biochemicals: A Life Cycle Assessment Perspective;* Science of The Total Environment 802 (2022): 149842.

[9] Khounani, Z.; **Nazemi, F.**; Shafiei, M.; Aghbashlo, M.; Tabatabaei, M.; *Techno-economic Aspects of a Safflower-based Biorefinery Plant Co-producing Bioethanol and Biodiesel*; Energy Convers. Manag., vol. 201, p. 112184 (2019).

[10] Khounani, Z.; Hosseinzadeh-Bandbafha, H.; **Nazemi, F.**; Shafiei, M.; Karimi, K.; Lam, S.S.; Tabatabaei, M.; Aghbashlo, M.; *Exergy Analysis of a Whole-crop Safflower Biorefinery: A Step Towards Reducing Agricultural Wastes in a Sustainable Manner;* Journal of environmental management 279 (2021): 111822.

Intellectual Properties

Systems and Methods for Analysis and Design Software to Enable a Sustainable Circular Economy of Multilayer Barrier Films, US Patent (Under Review).