

Andrew J. Fix

Assistant Professor

Maseeh Department of Civil, Architectural, and Environmental Engineering

University of Texas at Austin

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EDUCATION

Doctor of Philosophy in Mechanical Engineering

College of Engineering, Purdue University

Dec. 2023

Bachelor of Science in Mechanical Engineering, Minor in Music

College of Engineering and Natural Sciences, The University of Tulsa

May 2019

EMPLOYMENT

Assistant Professor

Jan. 2025 – Present

Maseeh Department of Civil, Architectural, and Environmental Engineering

Walker Department of Mechanical Engineering (GSC Member)

University of Texas at Austin

Postdoctoral Research Faculty

Jan. – Dec. 2024

Center for Environmental Energy Engineering, Department of Mechanical Engineering

University of Maryland – College Park

Graduate Research Intern

Jun. – Aug. 2023

Advanced Building Equipment Research Group

National Renewable Energy Laboratory

Graduate Research Assistant and Fellow

Aug. 2019 – Dec. 2023

Herrick Labs and Birck Nanotechnology Center, School of Mechanical Engineering

Purdue University

HONORS AND AWARDS

- Purdue College of Engineering Dean's Teaching Fellowship 2023
Course Taught: ME 200 – Thermodynamics I
- U.S. Department of Energy JUMP into STEM Competition Winner 2023
Proposal: *MyHP+: A User-Friendly Software to Encourage Residential Transition to Heat Pumps*
- U.S. Department of Energy Innovation in Buildings (IBUILD) Graduate Research Fellowship 2022
Proposal: *Hybrid Membrane Energy Exchanger for Efficient Passive and Active Air Conditioning*
- International Refrigeration and Air Conditioning Conference – Student Paper Competition Award 2022
Paper: *Enhancing Membrane-Based Air Dehumidification Through Non-Isothermal Operation*
- Purdue Summer Undergraduate Research Fellowship Program – Outstanding Graduate Mentor 2021
Mentee Project: *Managing Humidity in Electronics Using Water Vapor-Selective Membranes*
- International Refrigeration and Air Conditioning Conference – Student Paper Competition Award 2021
Paper: *Impact of Mechanical Ventilation and Indoor Air Recirculation Rates on the Performance of an Active Membrane Energy Exchanger System*
- Laura Winkelman-Davidson Graduate Research Fellowship 2019 – 2021
School of Mechanical Engineering, Purdue University

RESEARCH EXPERIENCE

Center for Environmental Energy Engineering, University of Maryland College Park 2024

Co-Advisors: Professor Yunho Hwang, Professor Vikrant Aute, and Professor Reinhard Radermacher

Development of low-GWP heat pump technologies for commercial and industrial applications, including system-level simulations, heat exchanger design, and experimental facility development for the following projects:

- Efficient saturation high-temperature heat pump for industrial waste heat recovery
- Cold-climate heat pump with refrigerant injection capabilities and thermal energy storage
- Multi-effect heat pump wood dryer for highly efficient, environmentally friendly wood drying

National Renewable Energy Laboratory

Jun. – Aug. 2023

Advisor: Dr. Jason Woods

Investigation of a system that uses liquid desiccant for both air dehumidification and building load-shifting (energy storage) including developing/augmenting MATLAB simulation code to account for TOU utility pricing and enhancing desiccant distribution/regeneration in the experimental prototype.

Center for High Performance Buildings, Purdue University

2019 – 2023

Co-Advisors: Professor Jim Braun and Professor David Warsinger

Broadly interested in the comparative modeling analysis and experimental demonstration for next-generation HVAC technologies, including membrane and desiccant dehumidification, magnetocaloric cooling, evaporative cooling, and others. Projects and topics within the scope of the CHPB included:

- Thermo-fluid model development for the conceptual Active Membrane Energy Exchanger (non-isothermal vacuum membrane dehumidification) and dual-module humidity pump
- Experimental test facility and prototype development for proof-of-concept for the above-mentioned technologies
- Derivation of a new, generalized $\varepsilon - NTU$ modeling framework for membrane separations
- Applications of vapor-selective membranes for humidity recovery in cold climate buildings
- Comparative analysis of a broad range of next-generation cooling and dehumidification technologies

Warsinger Water Lab, Purdue University

2019 – 2023

Advisor: Professor David Warsinger

Collaborated on a breadth of topics in the broader space of energy efficiency, water sustainability, and air quality. Some of these projects included:

- Global modeling analysis of cutting-edge atmospheric water harvesting technologies using peta-scale super computing resource with NASA weather data to compare fundamental energy efficiency across the globe (published in *Energy and Environmental Science*, impact factor: 39.7)
- Modeling and prototype demonstration of humidity management in electronics enclosures
- Particle deposition and photon penetration modeling for photocatalytic oxidation air purifiers
- Field-study of air conditioner condensate water quality and reuse feasibility (with EPA)

PUBLICATIONS, PRESENTATIONS, PATENTS, AND PRESS RELEASES

Peer-Reviewed Journal Papers

- [1] A. J. Fix, D. Kang, M. Siam, Y. Hwang, and R. Radermacher, "Multi-stage heat pump with two-phase injection for cold climate applications implementing natural refrigerants," *Appl. Therm. Eng.*, vol. 264, p. 125474, 2025.

- [2] J. Oh, **A. J. Fix**, M. Rahman, D. Ziviani, J. E. Braun, and D. M. Warsinger, "Dual-Module humidity pump with hollow fiber membranes for isothermal dehumidification in industrial drying," *Appl. Therm. Eng.*, vol. 261, p. 125062, 2025.
- [3] L. Gao, **A. J. Fix**⁺, T. Seabourne, Y. Pei, P. Adegbaye, Y. Hwang, B. Yang, and R. Radermacher, "A comprehensive review of heat pump wood drying technologies," *Energy*, p. 133241, 2024.
- [4] S. Anandan, **A. J. Fix**, A. Freeman, L. Miller, D. P. Scheg, X. Morgan, J. H. Park, W. T. Horton, E. R. Blatchley, and D. M. Warsinger, "Framework for assessing collection-based photocatalytic oxidation systems in HVAC applications for bioaerosol control," *Build. Environ.*, vol. 261, p. 111593, 2024.
- [5] **A. J. Fix**, J. E. Braun, and D. M. Warsinger, "Dual-module humidity pump for efficient air dehumidification: demonstration and performance limitations," *Appl. Energy*, vol. 360, p. 122771, 2024.
- [6] J. Oh, **A. J. Fix**, D. Ziviani, J. E. Braun, and D. M. Warsinger, "Design optimization of hollow fiber membranes for passive air dehumidification in drying applications," *Energy Convers. Manag.*, vol. 302, p. 118097, 2024.
- [7] Z. Lu, **A. J. Fix**, D. M. Warsinger, J. E. Braun, and D. Ziviani, "Generalization of second law efficiency for next-generation cooling and dehumidification systems," *Energy Convers. Manag.*, vol. 300, p. 117972, 2024.
- [8] **A. J. Fix**, J. E. Braun, and D. M. Warsinger, "A general effectiveness-NTU modeling framework for membrane dehumidification systems," *Appl. Therm. Eng.*, vol. 236, p. 121514, 2023.
- [9] M. Mumtaz, B. C. Pamintuan, **A. J. Fix**, J. E. Braun, and D. M. Warsinger, "Hybrid membrane dehumidification and dewpoint evaporative cooling for sustainable air conditioning," *Energy Convers. Manag.*, vol. 294, p. 117547, 2023.
- [10] **A. J. Fix**, S. Gupta, J.E. Braun, and D.M. Warsinger, "Demonstrating non-isothermal vacuum membrane air dehumidification for efficient next-generation air conditioning," *Energy Convers. Manag.*, vol. 276, p. 116491, 2023.
- [11] A. Rao, **A. J. Fix**, Y. Yang, and D. M. Warsinger, "Thermodynamic limits of atmospheric water harvesting," *Environ. Energy Sci.*, 2022. **Impact Factor = 39.7.**
- [12] A. S. Chandrasekaran, **A. J. Fix**, and D. M. Warsinger, "Combined membrane dehumidification with heat exchangers optimized using CFD for high efficiency HVAC systems," *Membranes*, vol. 12, p. 348, 2022.
- [13] **A. J. Fix**, B. C. Pamintuan, J. E. Braun, and D. M. Warsinger, "Vapor-selective active membrane energy exchanger with mechanical ventilation and indoor air recirculation," *Appl. Energy*, vol. 312, p. 118768, 2022.
- [14] **A. J. Fix**, J. E. Braun, and D. M. Warsinger, "Vapor-selective active membrane energy exchanger for high efficiency outdoor air treatment," *Appl. Energy*, vol. 295, p. 116950, 2021.

Conference Papers

- [15] **A. J. Fix**, L. Gao, T. Seabourne, J. Yang, J. Muehlbauer, Y. Hwang, and R. Radermacher, "A saturation heat pump system for cold climate conditions," in IIR Gustav Lorentzen Conference on Natural Refrigerants, 2024.
- [16] **A. J. Fix**, Y. Pei, T. Seabourne, L. Gao, J. Muehlbauer, Y. Hwang, R. Radermacher, B. Yang, "An energy-efficient multi-drying-chamber-based heat pump wood drying system," in IIR Gustav Lorentzen Conference on Natural Refrigerants, 2024.
- [17] J. Oh, **A. J. Fix**, D. Ziviani, J. E. Braun, and D. M. Warsinger, "Performance Analysis of a Dual-Module Humidity Pump for Efficient Drying and Dehumidification," in International Refrigeration and Air Conditioning Conference, 2024.
- [18] S. Wu, A. Balaraman, **A. J. Fix**, J. Oh, J. E. Braun, and D. M. Warsinger, "Energy-Saving Potential of a Dual-Module Humidity Pump for Residential and Commercial Air Conditioning," in International Refrigeration and Air Conditioning Conference, 2024.
- [19] M. A. Rahman, **A. J. Fix**, J. Oh, J. E. Braun, and D. M. Warsinger, "A Comprehensive Sizing Analysis Using an Effectiveness-NTU Framework for Vacuum Membrane Dehumidification Systems," in International Refrigeration and Air Conditioning Conference, 2024.
- [20] **A. J. Fix**, J. E. Braun, and D. M. Warsinger, "Employing water vapor-selective membranes for sustainable humidification of ventilation air," in ASHRAE Winter Conference, 2023.

- [21] **A. J. Fix**, J. E. Braun, and D. M. Warsinger, “High efficiency heat pump industrial drying with water vapor-selective membranes,” in IEA Heat Pump Conference, 2023.
- [22] **A. J. Fix**, J. E. Braun, and D. M. Warsinger, “Enhancing membrane-based air dehumidification through non-isothermal operation,” in International Refrigeration and Air Conditioning Conference, 2022, pp. 1–12.
- [23] **A. J. Fix**, J. E. Braun, and D. M. Warsinger, “Impact of mechanical ventilation and indoor air recirculation rates on the performance of an active membrane energy exchanger system,” in International Refrigeration and Air Conditioning Conference, 2021, pp. 1–11.

Pending Patent Applications and Provisional Patents

- [1] **A. J. Fix**, J. E. Braun, and D. M. Warsinger, “Vapor-selective nanostructured membrane heat exchangers for cooling and dehumidification,” PCT/US2021/019314, 2021.
- [2] **A. J. Fix**, J. E. Braun, D. Ziviani, and D. M. Warsinger, “MemDry: vapor-selective membrane heat exchanger cycle for efficient passive and active convective drying,” Provisional Patent Application, 2023-WARS-70063-01, 2023.

Invited Talks/Presentations

- [1] A.J. Fix, “High-Efficiency Membrane-Based Dehumidification: State-of-the-Art Systems and Materials,” ASHRAE Annual Conference - Phoenix (Invited Seminar Talk, sponsored by TC 1.1), 2025.
- [2] **A. J. Fix**, “The Intersection of Energy Efficient Buildings and Water Sustainability,” Faculty Candidate Seminar, University of Texas at Austin, 2024.
- [3] **A. J. Fix**, “The Intersection of Energy Efficient Buildings and Water Sustainability,” Faculty Candidate Seminar, University of Wisconsin Madison, 2024.
- [4] **A. J. Fix**, “The Intersection of Energy Efficient Buildings and Water Sustainability,” ME Graduate Student Seminar Series, Washington University St. Louis, 2024.
- [5] **A. J. Fix**, “The Intersection of Energy Efficient Buildings and Water Sustainability,” Faculty Candidate Seminar, Missouri University of Science and Technology, 2024.
- [6] **A. J. Fix**, “Membrane technologies for an efficient and sustainable future,” Physics/Engineering Colloquium at Wabash College, 2023.
- [7] **A. J. Fix**, J. E. Braun, and D. M. Warsinger, “Air dehumidification with vacuum-driven vapor selective membranes for efficient separate latent cooling,” DOE Building Technologies Office Annual Peer Review, 2023.

TEACHING AND MENTORING

Dean’s Teaching Fellow, College of Engineering, Purdue University 2023
 Instructor of Record: ME 200 – Thermodynamics I

Undergraduate Research Mentor, Purdue University 2019 – 2023

- Total of 16 undergraduates mentored, resulting in the follow awards
- Purdue College of Engineering Undergraduate Research Conference Best Virtual Presentation, Songhao Wu (2022)
- SURF Outstanding Graduate Mentor (2021)
- Senior design teams (2) nominated for Mallot Awards (school-wide competition for top senior design projects)
- SURF Outstanding Presentation, Bryan Pamintuan (2020)

RESEARCH FUNDING

H2O Now (Industry Funder), University of Texas 2025 – present
Primary Investigator
 “Field Testing of DC-Powered Refrigeration-Based Atmospheric Water Harvesting Systems”

Department of Energy Advanced Manufacturing Office , Purdue University <i>Co-Author under PIs Warsinger, Ziviani, and Braun</i> “MemDry: Hybrid Vapor-Selective MemDry Cycle for Efficient Passive and Active Convective Drying”	2022 – 2025
Carrier Global (Industry Funder), Purdue University <i>Co-Author under PIs Warsinger and Braun</i> “Modeling Investigation of Vapor Selective Membranes for DOAS Applications”	2022 – 2023
Carrier Global (Industry Funder), Purdue University <i>Co-Author under PIs Warsinger and Braun</i> “Vapor Selective Membranes for Humidity Management in Electronics and Sensor Enclosures”	2021 – 2022
Center for High Performance Buildings , Purdue University <i>Co-Author under PIs Warsinger and Braun</i> “Active Membrane Energy Exchanger for Non-Isothermal Vacuum Membrane Dehumidification”	2020 – 2023
SURF and DURI Undergraduate Research Programs , Purdue University Successful proposals to support 5 undergraduates for paid summer research involvement	2020 – 2023

INDUSTRY EXPERIENCE

Mechanical Engineering Intern , Honeywell UOP (Tulsa, OK) Mechanical design of piping and instrumentation, VBA programming, final product quality checks	Jun. – Aug. 2018
Mechanical Engineering Intern , Hussmann Corporation – Panasonic (St. Louis, MO) New product development CAD design of refrigerated cases, prototype manufacturing	May – Aug., 2017

ACADEMIC SERVICE

American Society of Heating, Refrigeration, and Air Conditioning Engineers	2020 – Present
▪ <i>Provisional Corresponding Member</i> , TC 6.09 (Thermal Storage)	2023 – Present
▪ <i>Corresponding Member</i> , TC 8.10 (Mechanical and Desiccant Dehumidification)	2023 – Present
▪ <i>Corresponding Member</i> , TC 1.1 (Thermodynamics and Psychrometrics)	2025 – Present
▪ <i>Vice President</i> , Purdue University Chapter	2022 – 2023

Technical Conferences

▪ <i>Technical Paper Reviewer</i> , ASHRAE Conferences	2023 – Present
▪ <i>Session Chair</i> , International Refrigeration and Air Conditioning Conference	2024
▪ <i>Session Vice Chair</i> , International Refrigeration and Air Conditioning Conference	2021 – 2022
▪ <i>Poster Judge</i> , Summer Undergraduate Research Fellowship Symposium (Purdue)	2020 – 2022

PRESS RELEASES

- “Winners of 2022-2023 JUMP into STEM’s Final Competition,” February 2, 2023 [[Online](#)].
- “Four Engineering graduate students selected as 2023 Dean's Teaching Fellows,” *Purdue College of Engineering News*, January, 2023 [[Online](#)].
- “David Warsinger receives \$2.4 million to improve industrial drying with membranes,” *Purdue ME News*, January, 2023 [[Online](#)].
- “Atmospheric water harvesting: can we get water out of thin air?,” *Purdue ME News*, December, 2022 [[Online](#)].
- “HVAC System Uses Only Outside Air,” *ASME Online* and *Mechanical Engineering Magazine*, May 4, 2022 [[Online](#)].
- “Bring the outdoors in: The energy-efficient method for using 100% outdoor air in buildings,” *Purdue News*, June 16, 2021 [[Online](#)].