

HARSHARAJ BIRENDRASINGH PARMAR

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EDUCATION

Purdue University

Master of Science, Mechanical Engineering
Cumulative GPA: 3.86/4.0

West Lafayette, IN
2019-Present

Indian Institute of Technology Guwahati

Bachelor of Technology, Mechanical Engineering
Cumulative GPA: 8.89/10

Guwahati, India
2015-2019
Major GPA: 9.49/10

RESEARCH INTERESTS

Transport Phenomena in Energy Systems, Numerical Heat Transfer and Fluid Flow

RESEARCH EXPERIENCE

Graduate Researcher, Warsinger Water Lab, Purdue University

Aug 2019-Present

Advisor: Dr. David Warsinger, Dept. of Mechanical Engineering

Computational enhancements in membrane distillation desalination systems

- Achieved a maximal 18% improvement in energy efficiency of membrane distillation after using a novel nanofluid working medium. Experimentally determined the optimal nanofluid concentration and preparation conditions.
- Modelled novel condensation regimes in SLIPS enabled air gap membrane distillation systems operating at a maximum first law efficiency of 95%.
- Currently investigating porous copper condensers for enhanced efficiency and flooding mitigation.

Computation of Heat and Fluid Flow using Domain Decomposition

Jul 2018-May 2019

Advisor: Dr. G. Madhusudhana, Mechanical Engineering, IIT Guwahati

Bachelor's Thesis

- Formulated high accuracy Chebyshev spectral codes for fluid flow and heat transfer problems. Maximum deviation of 0.05% from benchmark results for a lid-driven square cavity problem.
- Implemented domain decomposition on heat conduction and channel flow problems with a maximum computational speed-up of 2.83 for four subdomains.

Undergraduate Researcher, MEMS Lab, Hanyang University

May-Jul 2017

Advisor: Dr. Yoomin Ahn, Dept. of Mechanical Engineering

Development of Membrane-less Microfluidic Microbial Fuel cells

Performed microfluidic simulations in ANSYS Fluent to study the effect of varying flow conditions on the performance of a microfluidic microbial fuel cell. Achieved an improvement of 12.5 % in maximum power density and presented the work in IIT Guwahati's research conclave.

A list of independent projects can be found on my personal website: harsharajp.github.io

Authoring a total of **7 journal publications** (including both first author and co-author titles) and delivered 2 conference poster presentations.

SKILLS

Software Packages and Languages: SolidWorks, EES, ANSYS Fluent, FreeFEM, Python, C++, MATLAB/Octave, Fortran

Technical writing and Graphics: Latex, Tecplot, Adobe Illustrator, Origin

ACHIEVEMENTS

- Quarterfinalists in the ongoing US Department of Energy's \$9 million Solar Desalination Prize - NoAir team member. Oct 2020
- \$1000 FIITJEE reward and a silver medal for securing an All India Rank of 2567 (top 1.7% in the country) in the Joint Entrance Exam (Advanced). Aug 2015

EXTRACURRICULARS

- Instructed workshops on ANSYS Fluent and delivered lectures on Vehicle Aerodynamics to a 50+ audience within IIT Guwahati. Jan-Apr 2018
- Secured 1st position among 10 teams in Shock-Zorber, a suspension making competition held under the IIT Guwahati's technical festival. Nov 2017

PUBLICATIONS

1. **Parmar H. B.**, Fattahijuybari H., Yogi Y., Nejati S., Jacob R., Menon P., Warsinger D. M., "Nanofluids improve energy efficiency of membrane distillation", submitted to *Nano Energy*, January 2021.
2. **Parmar H. B.**, Chandrasekaran A., Fattahijuybari H., Warsinger D. M., "Rapid vapor flow heat pipe effects in vacuum gap membrane distillation", planned submission in *Joule* (2021).
3. Yogi Y., **Parmar H. B.**, Fattahijuybari H., Sett S., Li L., Roy R., Weibel J. A., Miljkovic N., Warsinger D. M., "Slippery liquid infused porous condenser surfaces (SLIPS) for high efficiency air gap membrane distillation", submitted to *ACS applied materials and interfaces*, January 2021.
4. Yogi Y., **Parmar H. B.**, Fattahijuybari H., Roy R., Nejati S., Sett S., Li L., Rao A. K., Miljkovic N., Weibel J. A., Warsinger D. M., "Energy efficiency and flux enhancement using superhydrophobic jumping droplet condensing surface in air gap membrane distillation", planned submission in *ACS applied materials and interfaces* (2021).
5. Fattahijuybari H., **Parmar H. B.**, Alsaati A., Warsinger D. M., "Porous condensers for improved efficiency in membrane distillation", planned submission in *Applied Energy* (2021).
6. Fattahijuybari H., **Parmar H. B.**, Alsaati A., Wenbo S., Warsinger D. M., "Carbon nanotube forests for conductive gap membrane distillation", planned submission in *Advanced Functional Materials* (2021).
7. Warsinger D. M., Fattahijuybari H., Rezaei M., **Parmar H. B.**, Nejati S., Camacho L., "Unifying efficiency metrics for solar evaporation and thermal desalination", planned submission in *Energy and Environmental Science* (2021).

PATENTS

1. Warsinger D. M., **Parmar H. B.**, Das A., Fattahijuybari H., "Thermal Vapor Compression Membrane Distillation Hybrid using Vapor Selective Membrane", *U.S. Provisional Application*, PRF number: 2021-WARS-69279, November 2020.

PRESENTATIONS AND ACKNOWLEDGEMENTS

1. **Acknowledgement (modelling framework and results)**: Warsinger D. M., Nejati S., Fattahijuybari H., "Energy Efficiency Metrics in Membrane Distillation", in review for book: *Advances in Water Desalination Technologies*, World Scientific Publishing Company, 2021.
2. **Parmar H. B.**, Fattahijuybari H., Yogi Y., Warsinger D. M., "A novel flow based energy efficiency enhancement on membrane distillation", Borchardt Conference, 25th Triennial Symposium on Advancements in Water and Wastewater, February 2020.
3. **Acknowledgement (process graphics)**: Mavukkandy M. O., McBride S. A., Warsinger D. M., Dizge N., Hasan S. W., Arafat H. A., "Thin film deposition techniques for polymeric membranes – A review", *Journal of Membrane Science*, vol 610, 118258, 2020.
4. **Parmar H. B.**, Cho H., Lee C., Choi T., Kim M., Jung D., Ahn Y., "Development of membrane-less microfluidic microbial fuel cells", Research Conclave, IIT Guwahati, March 2018.