

Dr. Abhinav Rajan

Research Associate at Thermal and Fluid Transport Laboratory (TFTL)

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<https://scholar.google.com/citations?hl=en&user=VtrNxWYAAAAJ>

h-index: 5, Citations: 51

SUMMARY

Extensive experience in numerical techniques, particularly the Finite Volume Method (FVM), and hands-on experiments. Proficient in modeling complex engineering systems, with publications in high-impact journals and presentations at international conferences. Received travel grants during PhD, demonstrating my scholarly commitment. Proficient in ANSYS Fluent, COMSOL Multiphysics, and SOLIDWORKS. Dedicated to advancing the field through innovative research and collaborative work.

EDUCATION

- PhD, Mechanical Engineering, Indian Institute of Technology Madras, 8.22 2019- 2024
- Master in Thermal Engineering, Maulana Azad National Institute of Technology Bhopal, 8.6 2013-2015
- Bachelor in Mechanical Engineering, Rajiv Gandhi Proudhyogiki Vishwavidyalaya Bhopal, 79.72% 2009-2013

RESEARCH EXPERIENCES

Department of Mechanical Engineering, Indian Institute of Technology Patna Aug 2024-present

Research Associate, PI(s): Dr. Rishi Raj & Dr. Ashwani Assam

- Working on thermal management of thermally controlled modules of optronic devices, funded by DRDO.

Department of Mechanical Engineering, Indian Institute of Technology Madras Jan 2019-July 2024

Doctoral Researcher, Supervisor: Dr. K.S. Reddy

Thesis: "Investigations of Solar Parabolic Dish Collector with Thermal Energy Storage for Process Heating Applications"

- Developed integrated optical-thermal model to investigate the performance of solar parabolic dish collector and experimented with the lab-scale solar receiver to validate the thermal model. Used SolTrace, MATLAB, ANSYS Fluent, and deep learning. Additionally, carried out an economic analysis.
- Carried out the study to assess the performance of phase change material-based thermal energy storage under different geometrical and operational parameters. Developed the thermal model using ANSYS Fluent.

School of Civil Engineering, The University of Sydney, Australia Jun-Aug 2023

Visiting Researcher, Supervisor: Dr. Yixiang Gan

Topic: "Performance Assessment of Phase Change Material-Based Thermal Energy Storage"

- Developed a numerical model to investigate thermal energy storage for effective energy storage capacity for low-temperature process heating applications.

Department of Mechanical Engineering, Maulana Azad National Institute of Technology Bhopal July 2013-June 2015

Postgraduate Researcher, Supervisor: Dr. K.R. Aharwal

Thesis: "Performance Analysis of Cold Storage for the Different Stacking Arrangements"

TEACHING EXPERIENCE

Assistant Professor in Mechanical Engineering, Netaji Subhas Institute of Technology, Patna Sept. 2015-Sept. 2018

AWARD & FUNDING

- Receipt of Alumni Travel Grant, IIT Madras, 2024
- Received International Immersion Experience (IIE) Award, IIT Madras, 2023
- Conference Travel Grant to visit the University of Latvia, 2023
- Half-Time Research Assistantship for PhD funded by MHRD India, 2019-2023
- GATE Scholarship for master's degree funded by MHRD India, 2013-2015

PUBLICATIONS

1. [Rajan, A.](#), Reddy, K.S., "Integrated optical-thermal model to predict the performance of solar parabolic dish collector for process heating applications," Energy, 2024, **under review** (IF: 9.0)
2. [Rajan, A.](#), Gan, Y., Reddy, K.S. Performance assessment of phase change material-based thermal energy storage, Journal of Energy Storage, 87 (2024), 111424 <https://doi.org/10.1016/j.est.2024.111424> (IF: 9.4)

3. Rajan, A., & Reddy, K. S. Integrated optical-thermal model and deep learning technique to estimate the performance of a conical cavity receiver coupled solar parabolic dish collector, *Energy Conversion and Management*, 301 (2024), 118052 <https://doi.org/10.1016/j.enconman.2023.118052> (IF: 10.4)
4. Mandal, P., Rajan, A., & Reddy, K. S. Optical and thermal investigation of hyperbolic cavity receiver with secondary reflector for solar parabolic dish collector. *Thermal Science and Engineering Progress*, 47 (2024), 102350 <https://doi.org/10.1016/j.tsep.2023.102350> (IF: 4.8)
5. Rajan, A., & Reddy, K. S. Integrated optical and thermal model to investigate the performance of a solar parabolic dish collector coupled with a cavity receiver, *Renewable Energy*, 219 (2023), 119376 <https://doi.org/10.1016/j.renene.2023.119376> (IF: 8.7)
6. Rajan, A., & Reddy, K. S. Convective heat loss prediction from conical cavity receiver of solar parabolic dish collector using numerical method and artificial neural network, *Numerical Heat Transfer, Part A: Applications*, 83(6) (2023), 626-649, <https://doi.org/10.1080/10407782.2022.2102338> (IF: 2.0)
7. Rajan, A., & Reddy, K.S. Optical modeling of corrugation cavity receiver for large-aperture solar parabolic dish collector. *Energy Sources, Part A: Recovery, Utilization, and Environmental Effects*, 44(2) (2022), 3330-3348 <https://doi.org/10.1080/15567036.2022.2063458> (IF: 2.9)

CONFERENCE PRESENTATIONS

1. Rajan, A., & Reddy, K. S. "Deep learning model to predict the performance of solar parabolic dish collector with conical cavity receiver", 1st International Symposium on Renewable Energy Technologies: Energizing the Future, IIT Delhi, Aug 16, 2024.
2. Rajan, A., & Reddy, K. S. "Optical and thermal analysis of solar parabolic dish collector with hetero-conical cavity receiver for medium temperature applications," 21st International Conference on Sustainable Energy Technologies, Shanghai, China, Aug 12-14, 2024
3. Mondal, P., Rajan, A., & Reddy, K. S. "Thermo-optical modeling for hyperbolic cavity receiver of 40 m² parabolic dish collector," ISES Solar World Congress, New Delhi, India, Oct 30-Nov 04, 2023
4. Rajan, A., & Reddy, K. S. "Coupled optical-thermal modeling of solar parabolic dish collector for novel cavity receiver," 17th International Heat Transfer Conference, Cape Town, SA, Aug 14-18, 2023
5. Rajan, A., & Reddy, K. S. "Comparative study of cylindrical and triple concentric tube models for PCM-based thermal energy storage," 11th European Conference on Renewable Energy Systems, Riga, Latvia, May 18-20, 2023
6. Rajan, A., & Reddy, K. S. "Optical modeling of solar parabolic dish collector coupled with conical cavity receiver," 6th International Conference on Sustainable Energy and Environmental Challenges, Lucknow, Dec 27-29, 2021
7. Rajan, A., & Reddy, K. S. "Estimation of convective heat losses from conical cavity receiver of solar parabolic dish collector under wind conditions and receiver orientations", 19th International Stirling Engine Conference, Rome, Sept 22-23, 2021

SKILLS

- Technical Software: SolidWorks, ANSYS Fluent, COMSOL Multiphysics, SolTrace, ASAP (Optical tool), Origin, Tecplot
- Programming Languages: MATLAB, Python
- Other Software/tools: LaTeX, Filmora Video Editor, WordPress

SUPERVISION EXPERIENCE

- Co-supervised masters and PhD students in finding objectives, modeling, and analyzing the results
- Laboratory Demonstrator to Undergraduate Students and Visitors, 2022-2024

COMMITTEE LEADERSHIP

- Organizing Committee Volunteer in the 2nd International Symposium on Renewable Energy Technologies: Energizing the Future, 28 Aug 2024 at IIT Madras, India
- Organizing Committee Volunteer in the International Conference on Industrial Mechanical and Production Engineering: Advancements and Current Trends 2014 at MANIT BHOPAL, India
- Student Coordinator for Technical Poster Making event in TECHNOSAGA 2011 at Sagar Institute of Research & Technology Bhopal, India

PROFESSIONAL AFFILIATIONS

- International Solar Energy Society, 2023-Present
- Indian Society for Heat and Mass Transfer, 2022-Present