

# Rahul Sinha

## PhD., Indian Institute Technology Patna, India

Thermal and Fluid Transport Laboratory (TFTL-2)  
Department of Mechanical Engineering,  
Indian Institute of Technology Patna, Bihar 801106, India  
**Email:** [rahul\\_1921me15@iitp.ac.in](mailto:rahul_1921me15@iitp.ac.in)  
[rahulsinha1456n@gmail.com](mailto:rahulsinha1456n@gmail.com)  
**Phone:** +91-748-188-5394



### OBJECTIVES

To develop and optimize sustainable, renewable energy-based thermal systems for independent control of temperature and humidity across diverse psychrometric conditions, with a focus on biomass energy applications, waste heat recovery, and energy-efficient storage solutions for perishable goods. Having more than seven years of strong experience in thermal, fluid, and biomass energy domains. Eager to contribute innovative solutions for state-of-the-art HVAC systems supporting thermal-fluid engineering principles to create sustainable and efficient renewable energy solutions.

*Area of interest: Independent temperature and humidity control, waste heat recovery systems, Off-the-grid HVAC solutions, Biomass gasification, Drying process*

### EDUCATION

- **PhD., Mechanical Engineering:** Indian Institute of Technology Patna, Bihar, India

**Development of an off-the-grid climate control unit with built-in humidity control for storage and processing of perishables** CGPA: 8.05/10  
(2019-2024)  
**Advisor:** Prof. Rishi Raj and Prof. Ajay D. Thakur

- **B.E., Mechanical Engineering:** B V Bhoomaraddi College of Engg. & Tech., Hubali, India  
CGPA: 8.25/10  
(2011-2015)  
**Metallurgical investigation of a cast Al alloy bracket from a washing machine**

### EXPERIENCE

- **PhD. Research scholar:**  
Indian Institute of Technology Patna, India
  - Development of an off-the-grid humidity control unit
  - Design and fabrication of an air-to-air heat exchanger
  - Experimental assessment of temperature (T) and humidity (RH) independent control unit over wide range of psychrometric conditions.
  - Instrumentation and control system for independent control of T and RH
  - Demonstration of drying Neem leaves
  - Investigating the quality and nutritional content of Neem leavesJuly 2019–  
November 2024
- **Junior research fellow:**  
Indian Institute of Technology Patna, India  
November 2016–

- Design and development of an integrated gasifier and hot water generator (IGHWG) August 2018
- Experimental assessment of the IGHWG system with GreenCHILL™ (a sorption-based refrigeration system)
- **Project engineer** August 2015-September 2016
  - Crawler Technique (I) Pvt. Ltd., Kolkata (Posted at Universal Rail Mill, Bhilai Steel Plant, Chhattisgarh, India)
  - Involved in the installation of hydraulic, lubrication, and grease systems and piping, which was set up by SMS Meer Germany & SMS Meer (I) Pvt. Ltd.

## PROJECTS

- Design and development of an agricultural waste-based gasifier heating system for GreenCHILL™ (UAY scheme, **funded by MHRD and DST, GOI**)
  - Development of an agricultural waste-based climate control unit for storage and processing of agricultural produce (IMPRINT-IIA scheme, **funded by SERB, GOI**)
- Advisors: Prof. Rishi Raj,  
Prof. Ajay D. Thakur  
Collaborator: New Leaf Dynamic Technologies Pvt. Ltd.

## PATENTS

1. Sunil; **Sinha, R.**; Thakur, A. D.; R., Raj, R.; Shukla, A.; Agarwal, A.; System and method for off-the-grid climate control, Indian Patent Office (Granted on March 5, 2024, Patent Number: 519459).
2. Sunil; Raj, R.; Thakur, A. D.; Rajan, B. K.; Chaitanya, B.; **Sinha, R.**; Agarwal, A.; System and method for heat recovery in gasification process, Indian Patent Office (Granted on March 1, 2022, Patent Number: 390902).

## JOURNAL PUBLICATIONS

1. **Sinha, R.**; Thakur, A. D.; & Raj, R.; Investigating drying behavior and quality of Neem leaves using a novel biomass gasification-powered Climate Control Unit with Built-in Humidity Control, *Int. Comm. in Heat Mass Transf.* 2024, 150, 107888. <https://doi.org/10.1016/j.icheatmasstransfer.2024.107888>
2. **Sinha, R.**; Sunil; Agarwal, A.; Thakur, A. D.; & Raj, R.; Design, fabrication and performance assessment of a novel biomass-gasification powered all-season climate control unit for perishables, *Biomass and Bioenergy* 2024, 183, 107161. <https://doi.org/10.1016/j.biombioe.2024.107161>
3. Sunil; **Sinha, R.**; Chaitanya, B.; Rajan, B. K.; Agarwal, A.; Thakur, A. D.; & Raj, R.; Design, fabrication, and performance evaluation of a novel biomass-gasification-based hot water generation system, *Energy* 2019, 185, 148-157. <https://doi.org/10.1016/j.energy.2019.06.186>

## CONFERENCES

1. **Sinha, R.**, Sunil, Shukla, A., Thakur, A. D., and Raj, R., “Experimental Investigation of Biomass Gasification-Based Dryers for Neem Leaves,” Proceedings of the *27th National and 5th International ISHMT-ASTFE Heat and Mass Transfer Conference*, IIT Patna, Patna-801103, India, December 14-17, 2023. (**Best Poster Award**)
2. **Sinha, R.**, Sunil, Thakur, A. D., and Raj, R., “Design, fabrication, and experimental investigations of a heat recovery system from biomass gasifier exhaust for regeneration of desiccant,” Proceedings of the *4th International Conference on Recent Advances in Bio-Energy Research*, SSS-NIBE, Kapurthala, Punjab, India, October 09-12, 2023.

3. **Sinha, R.**, Sunil, Thakur, A. D., and Raj, R., “Development of an All Season Off the Grid Climate Control Unit for Agricultural Produce,” Proceedings of the *26th National and 4th International ISHMT-ASTFE Heat and Mass Transfer Conference*, IIT Madras, Chennai, India, December 17-20, 2021.
4. Sunil, **Sinha R.**, Agarwal, A., Thakur, A. D., and Raj, R., “Biomass Gasification-Based Low-Temperature Drying of Farm Perishables,” *International Virtual Conference on H<sub>2</sub> and CO<sub>2</sub> 2022 (ICH2CO2’22)*, Indian Institute of Science Education and Research Pune, India, November 17 – 19, 2022.
5. Kumar, A., Sunil, **Sinha, R.**, Maity, I., Raj, R., and Thakur, A. D., “Biomass Gasification Residue as a Rich Source of Carbon Nanomaterials,” Proceedings of the *27th National and 5th International ISHMTASTFE Heat and Mass Transfer Conference*, IIT Patna, Patna-801103, India, December 14-17, 2023.

## **MENTORSHIP**

- |  |           |
|--|-----------|
| M. Tech, Project   | 2019-2020 |
| <ul style="list-style-type: none"> <li>• Design of a moving grate system for reducing agglomeration of ash in a downdraft gasification unit</li> </ul> |           |
| B. Tech, Project   | 2023-2024 |
| <ul style="list-style-type: none"> <li>• Optimization and control of gasification process</li> </ul>   |           |

## **EDITORIAL WORK**

Reviewer of “*International Communication in Heat and Mass Transfer*” Journal.

## **SOFTWARES**

Solid Works, MATLAB, SIMULINK, Origin, COMSOL, Ansys, Adobe Illustrator.

## **ACADEMIC ACHIEVEMENTS & AWARDS**

- Received the **1<sup>st</sup> position in the Inter IIT Tech Meet 13.0**, Engineer’s Conclave event held at IIT Bombay from December 11-14, 2024
- Design team’s lead of the 27th National and 5th International ISHMT-ASTFE Heat and Mass Transfer Conference (IHMTTC-2023) held at IIT Patna on December 14-17, 2023
- Member of the Indian Society for heat and mass transfer (ISHMT)
- Received the **best poster award at IHMTTC-2023**, held at IIT Patna
- Awarded MHRD fellowship for pursuing PhD. at IIT Patna
- Qualified Gate-2017 exam, conducted by IIT Roorkee
- Industrial training at the National Thermal Power Plant, Barh, India
- Industrial training at Heavy Engineering Corporation Ltd., Ranchi, India

## **REFEREES:**

1. **Prof. Rishi Raj, Associate Professor,**  
Mechanical Department, IIT Patna, Email: [rroj@iitp.ac.in](mailto:rroj@iitp.ac.in), Ph.: +91-612-302 8166.
2. **Prof. Ajay D. Thakur, Associate Professor,**  
Department of Physics, IIT Patna, Email: [ajay.thakur@iitp.ac.in](mailto:ajay.thakur@iitp.ac.in), Ph.: +91-612-302 8126.