

# Sunil Kumar

Assistant Research Scientist,  
Centre for Environment and Energy Engineering,  
Department of Mechanical Engineering,  
University of Maryland, College Park, MD

4298 Campus Drive, 4164 Martin Hall,  
College Park, MD 20742  
Phone: 979-286-3587  
Email: [ksunil@umd.edu](mailto:ksunil@umd.edu)

Google Scholar: <https://scholar.google.com/citations?user=xG8hfxAAAAAJ&hl=en>

---

## EMPLOYMENT

**Assistant Research Scientist** CEEE, Department of Mechanical Engineering, 08/2025-Present  
University of Maryland, College Park, MD, USA

(Research work focused on CFD modeling, conducting numerical simulations, developing experimental setups and test facilities)

**Assistant Research Scientist** Environmental Modeling Program, 10/2024-07/2025  
Texas Transportation Institute, Bryan, TX, USA

(Research work focused on the environmental modeling and applications of Thermal-Fluid Science)

**Associate Research Scientist** Department of Biological and Agricultural Engineering, Texas A&M University, College Station, TX, USA 06/2021-10/2024

(Research work focused on computational and experimental Thermal-Fluid Science projects)

**Postdoctoral Researcher** Department of Mechanical Engineering, and Department of Biological and Agricultural Engineering, Texas A&M University, College Station, TX, USA 02/2019-05/2021

(Research work focusing on computational and experimental Thermal-Fluid Science projects)

## EDUCATION

**Ph.D.** Homi Bhabha National Institute, Mumbai, Maharashtra, India 2018

Department: Engineering Sciences,  
Major: Nuclear Engineering (GPA 3.7/4.0)

*Dissertation: Experimental and Computational Study to Suppress Thermal Stratification in a Water Pool with Shrouds*

**MTech.** Dept. of Physics and Astrophysics University of Delhi, Delhi, India 2011

Major: Nuclear Science & Technology (GPA 4.0/4.0)

*Project title: Thermal hydraulic behaviour analysis of Test Blanket Module for International Thermonuclear Experimental Reactor (ITER)*

**M.E.** Ecole Centrale Paris, University of Paris SUD-XI, Paris, France 2010

Major: Nuclear Energy (GPA 3.7/4.0)

*Thesis title: R&D on Gaseous Detectors for Muon Trigger in High Eta for Compact Muon Solenoid (CMS)*

**B.S.** Hindu College, University of Delhi, Delhi, India 2008

Major: Bachelor of Science (B.Sc.) in Physics (GPA 4.0/4.0)

*Project title: Development of electronic system fluid level indicator for opaque tanks*

## INTERNSHIPS / RESEARCH ASSOCIATE

### Internship

European Organization for Nuclear Research (CERN), Geneva, Switzerland 04/2010-08/2010

*Thesis title: R&D on Gaseous Detectors for Muon Trigger in High Eta for Compact Muon Solenoid (CMS)*

*Responsibilities: Testing detectors in clean room, assembly of detector, testing in X-ray irradiation and high energy proton beam, data analysis and shift duties for testing detectors in beam test.*

### **Research Associate position.**

Max-Planck-Institute for Nuclear Physics (MPIK), Heidelberg, Germany

11/2011-05/2012

*Project title: Development of Notch filters for Double Penning Trap Mass Spectrometer*

*Responsibilities: Simulation and optimization of filters, identifying component requirements, developing filters, and evaluating them in Penning Trap Mass Spectrometer.*

### **KNOWLEDGE AREA(S)**

Experiments and Modelling, Thermal system analysis, Heat Exchangers, Multiphase Computational Fluid Dynamics (CFD), Two-Phase Flows, Engineering Thermodynamics, Indoor and Outdoor environment modeling, Environment & Society, Nuclear Thermal Hydraulics, Nuclear Power Reactors

### **SKILLS & CERTIFICATIONS**

**Programming:** C, Python, MATLAB

**Data Visualization and plotting:** Microsoft Excel, Tecplot, OriginLab, MATLAB

**Engineering drawing CAD tools:** AutoCAD, SolidWorks

**Multi-physics simulation tools:** ANSYS (FVM, FEA, and FSI simulations), OpenFOAM, dsmcFOAM+, STAR-CCM+ (mid-level), COMSOL (novice), CIVA for Non-Destructive Evaluations

**Nuclear reactor core and system codes:** RELAP5

**Measurement and spectroscopy:** Thermocouple, Flow meter, Pressure Transducer, Differential Pressure Transmitter, PIV Measurements, X-ray measurement, Gamma-ray spectroscopy, Detectors: GM detector, NaI (TI) scintillation detector, and HPGe detector

**Hardware and malware:** Yokogawa, Micro-Controller, Sensors, NI-LabView

**AI/ML focused Modeling tools:** Pandas, Numpy, TensorFlow, Keras, Scikit-Learn, XGBoost, PyTorch, Transformers, NLTK, OpenCV, Detectron2, DLib

**Soft Skills:** Project Management, Team Building

### **RESEARCH EXPERIENCE**

**University of Maryland,**

**College Park, Maryland, USA**

*Assistant Research Scientist*

**August 2025 – Present**

- **Development of plate fin heat exchangers for HVAC&R applications**

In this of projects, I am developing plate fin heat exchanger that can accommodate multiple streams, multi temperature for HVAC&R applications. I am performing CFD simulations to compare the performance of different heat exchanger configurations. The findings will help users select desired heat exchanger configurations. *This research helped improving the skills of heat exchangers design and development.*

**Texas Transportation Institute, Texas A&M University,**

**Bryan, Texas, USA**

*Assistant Research Scientist*

**October 2024 – July 2025**

- **Experiments, Data Analysis and tool development for environmental emissions modelling**

In this group of projects, I have been involved in conducting experiments to study emissions from the exhaust of vehicles of various classes and sizes, and diesel fuel types. I also contributed to the development of a NOx emissions modeling tool, which supports the evaluation of large-scale, environmentally and economically sensitive construction projects. In another project, I was involved in data analysis and the management of a data library. *This research helped improve data-analysis skills using principles of data-science and development of emission modeling tools.*

- **Investigation on particulates emissions from surfaces and modeling the spreading in the environment.**

This project is currently in the development phase. My research focuses on investigating the effects of surface coating, heat generation, fluid flow, surface roughness, and applied pressure intensity on rotating surfaces. The goal of this study is to better understand the mechanisms influencing particulate emissions. Ultimately, this research aims to contribute to the reduction of particulate emissions, thereby decreasing environmental contamination.

Texas A&M University

Associate Research Scientist and Postdoctoral Research

College Station, Texas, USA

February 2019 - October 2024

- **Experimental Study on Heat Exchanger Efficiency Improvement Using Phase Change Material**  
Designed and developed a Chevron Plate Heat Exchanger-based experimental platform to improve thermal energy storage, performing experiments under various operating conditions to enhance heat transport and stabilize thermal systems. Additionally, I evaluated heat exchanger efficiency to identify opportunities for performance improvement. *Improved the heat exchanger efficiency applicable to energy storage and electronic cooling.*
- **Investigation of Local Interfacial Effects to Predict Permeability of Micropillar Arrays for enhancing heat transfer.**  
Developed a semi-analytical modeling framework to predict flow resistance by considering the local meniscus shape of the air-water interface. Additionally, I simulated various arrangements of micropillars and compared them to develop correlations for flow resistance. *Established the role of the pinning interface.*
- **Cooling of electronic chip by thin layer water evaporation.**  
Developed multiphase CFD models to simulate heat transfer using the Volume of Fluid (VoF) method, incorporating air, water, and water vapor phases. The simulations involved tracking water levels and the vapor and air phases in transient states. ANSYS Fluent and STAR-CCM+ were used for these simulations. *This study is beneficial for the development of evaporative and condensation-based systems, the design and development of heat exchangers, and the enhancement of HVAC&R systems.*
- **Studies on Controlled water evaporation using Discrete Simulation Monte Carlo (DSMC) method using OpenFOAM.**  
Developed CFD models to simulate heat transfer from surfaces at the microscale, focusing on molecular-level evaporation. The study specifically aimed to understand the influence of non-reactive gases, such as air, argon, and xenon, on evaporation from a thin water layer. The molecular dynamics of water evaporation were simulated in reference to air, considering both elastic and inelastic molecular collisions. *This research offers significant insights into applications such as material drying and the design of engineered surfaces to enhance evaporation and condensation processes.*
- **Improving energy efficiency in cotton conveying and drying**  
Developed a multiphase Computational Fluid Dynamics (CFD) model to examine the controlled drying process of cotton wads by flowing moist air at varying temperatures to improve energy efficiency. The study, conducted using the Volume of Fluid (VOF) method, is crucial for estimating the controlled drying duration for cotton and serves as the foundation for developing an experimental setup. *Research will help save thousands of dollars annually in electricity consumption for ginning facilities.*
- **Eulerian-Lagrangian based CFD simulations to evaluate the transportation of multicomponent droplets in a full-scale meat facility.**  
Employed a Eulerian-Lagrangian CFD approach to track droplet dispersion in a full-scale meat facility. After evaluating several flexible partition designs, I recommended the installation of optimally sized

transparent, flexible partitions between workers to minimize droplet transmission and reduce the risk of COVID-19 exposure. *Established rate of contamination spread and developed safety protocols in indoor settings.*

- **Eulerian-Lagrangian based CFD simulations to predict dispersion of droplets in a hospital room for earliest decontamination.**

Modeled various configurations of hospital rooms by changing the locations of diffusers and exhausts. Additionally, I implemented an air curtain to minimize droplet aerosolization time. As a result, the overall contamination period of the room decreased significantly. Specifically, the air curtain effectively removed sparsely distributed droplets in the indoor environment. *Established safest configuration of the hospital room for earliest decontamination of room for safety of hospital staff.*

- **Wind tunnel modeling and improving airflow sampler performance by optimizing their location and geometrical features.**

Modeled the AEPM wind tunnel at Texas A&M University to predict the performance of the airflow sampler. I am also optimizing the locations of iso-kinetic samplers and evaluating the overall particle collection efficiency of the filters. Additionally, I am simulating the complex design of industry-scale filters to predict particle deposition locations and assess sampler collection efficiency through the membrane. *study will be helpful for environmental air sampling measurements at a high sampling rate.*

#### *Additional Projects*

- **Accelerated MPPT Controller development for Photovoltaic Systems under Rapid Solar Radiation**

Participated in developing an MPPT controller to optimize power harvesting in PV systems under various irradiance conditions and proposed a Neural Network (NN) to update the duty cycle in response to sudden irradiance shifts. *This research helped improving the operational efficiency of the solar power plant.*

- **Thermofluidic design and performance analysis of heat exchanger**

Conducted the thermofluidic design and performance analysis of a shell and tube type heat exchanger, performing detailed CFD analysis and examining features such as the shell, tubes, side plates, and baffles. Additionally, I performed energy analysis using the LMTD and NTU methods and understood parameters affecting exchange coefficients and pressure drops. *Learned methods to improve the heat exchanger efficiency.*

**Homi Bhabha National Institute**

**Department of Nuclear Engineering**

**Mumbai, India**

*Doctor of Philosophy Research*

**August 2012 - June 2018**

**Thesis Title: Experimental and Computational Study to Suppress Thermal Stratification in a Water Pool with Shrouds**

I analyzed the full-scale Main Heat Transport System (MHTS) of the Integral Test Loop (ITL) for the Advanced Heavy Water Reactor (AHWR), performing ITL experiments, data analysis and developing a RELAP model to simulate the MHTS with a heat exchanger. Using RELAP modeling, I investigated the influence of various shroud designs on thermal stratification, developing models to evaluate their effectiveness and characterizing flow oscillations in the presence of shrouds. Additionally, I designed and performed Particle Image Velocimetry (PIV) experiments and conducted OpenFOAM CFD simulations to study the effect of adiabatic shrouds, proposing their installation for effective thermal stratification suppression. I also investigated the effect of inclined heaters and shroud combinations through experiments and CFD simulations to enhance thermal stratification suppression. *Research helped delay pool boiling by 333% resulting in 10 days compared to 3 days safe operations, enhancing nuclear reactor safety.*

**Max-Planck-Institute  
for Nuclear Physics****Stored and Cooled Ions Division****Heidelberg, Germany****Research Associate****November 2011 – May 2012****Title: Development of electronic notch filters for Double Penning Trap Mass Spectrometer**

Study focused on measuring the mass of novel elements. My responsibilities included simulating and optimizing filters, identifying component requirements, developing filters, and evaluating them in a Penning Trap Mass Spectrometer.

**European Organization for  
Nuclear Research (CERN)****Department of Physics****Geneva, Switzerland****Research Intern****April 2010 – August 2010****Thesis Title: R&D on Gaseous Detectors for Muon Trigger in High Eta for Compact Muon Solenoid (CMS) Experiment**

Study focused on detecting the subatomic particles. My responsibilities included testing detectors in a clean room, assembling detectors, conducting tests under X-ray irradiation and high-energy proton beams, performing data analysis, and managing shift duties for testing detectors in beam tests. *Contributed to the development of large size GEM detectors, which played a crucial role in detecting the Nobel Prize-winning Higgs Boson particles.*

**PATENTS AND INVENTION RECORDS**

1. Invention Record on rocks drilling for oil and gas extraction (filing in process) 2025  
*In this invention, specific process of rocks fracturing using clathrates with lowest water usage has been proposed.*

**PROPOSAL WRITING EXPERIENCE**

1. Grant proposal for DOE CMEI focusing on Next-Generation Geothermal Field Tests and Geothermal Resource Characterization and Confirmation (under development) 03/2026  
*Proposal focuses on development of High-Efficiency Thermal Conversion System*
2. Grant proposal to CARTEEH (*not awarded*) 2025  
*Proposed investigation of the Dallas, TX road network to study the impact of flooding for reducing environmental emissions through improved management strategies.*
3. Grant proposal to Texas Semiconductor Institute-CHIPS (*not awarded*) 2024  
*Development of a rapid and dependable cooling system for swiftly managing increased heat loads in semiconductor chips*
4. Supported writing of grant proposal to NIH (*Awarded*) 2022  
*To analyze a large meat facility, using CFD simulations and full-scale experiments, to minimize bioaerosol/contaminant dispersion.*
5. Supported writing of grant proposal to NSF-CBET program (*Awarded*) 2021  
*Analyzing the indoor conditions within a hospital room through a combination of Computational Fluid Dynamics (CFD) simulations and scaled experiments to reduce the transmission of SARS-CoV.*
6. Supported writing of grant proposal to DoE-Sc Program (*not awarded*) 2019  
*Development of a semi-empirical framework and small-scale experiments to gauge the evaporative cooling potential of devices.*

## TEACHING EXPERIENCE

- **Guest Lecture(s)**, for “MEEN 624: Two-Phase Flow and Heat Transfer” in MEEN department at Texas A&M University, College Station, TX Spring 2024
- **Class and Lab Instructor** for “BAEN 489/689 Aerosols and modelling” at Texas A&M University, College Station, TX, Spring 2022, 2024
- **Lead Teaching Assistant** for “BAEN 201: Analysis of BAEN problems” at Texas A&M University, College Station, TX Fall 2023
- **Guest Lecture(s)**, for “BAEN 320 - Engr Thermodynamics” in BAEN department at Texas A&M University, College Station, TX Fall 2021, 2022, 2023, 2024

## GUIDING / MENTORING EXPERIENCE

- **Graduate and undergraduate student mentorship at University of Maryland** 2025-Present  
Developing research plans, discussing problem-solving strategies, writing, editing, and reviewing simulation work, writing journal papers, and reviewing presentations.
- **Graduate and undergraduate student mentorship at Texas A&M University** 2019-2024  
Teaching modeling methods, developing research plans, formulating experimental approaches, discussing problem-solving strategies, editing, and reviewing simulation work, writing journal papers, and reviewing presentations.  
**Graduate Students (PhD):** Brooke Smith, Meiyi Zhang, and Hyoungmook Pak Joseph,

## AWARDS and HONOURS

- American Society of Thermal and Fluids Engineers (ASTFE) Outstanding Reviewer Award, Oregon, USA 2024  
*(for reviewing scholarly articles in thermal-fluids engineering)*
- ICTP – IAEA study grant, ICTP-IAEA, Vienna, Austria 2017  
*(for attending school on nuclear energy)*
- ICTP – IAEA study grant, ICTP-IAEA, Vienna, Austria 2015  
*(for attending school on nuclear knowledge management)*
- Graduate Fellowship, Department of Atomic Energy, Delhi, India 2012  
*(for performing PhD research on PDHRS for SMR)*
- 3<sup>rd</sup> prize, Nuclear Energy Olympiad, Korean Nuclear Promotion Agency, south Korea - World Nuclear University, South Korea, 2011  
*(for presenting a public policy on acceptance of nuclear energy in India)*
- Internship Award, European Organization for Nuclear Research (CERN), Geneva, Switzerland, 2010  
*(for performing research on development of Gas Electron Multiplier Detectors)*
- Graduate Fellowship, Department of Science & Technology, Delhi, India 2009  
*(for completing my master's degree from University of Paris)*

## ORGANIZATIONAL SKILLS

- Co-organizer of “Workshop on Mitigating Bioaerosol Spread through Computational Fluid Dynamics” American Association for Aerosol Research (AAAR) 42nd Annual Conference 2024, Albuquerque Convention Centre, Albuquerque, NM, USA
- Co-organizer of “Workshop on CFD for predicting containment/droplets spread behaviour” American Association for Aerosol Research (AAAR) 40th Annual Conference 2022, Raleigh Convention centre, Raleigh, NC, USA

- Organized National Workshop on "Development of Indian Youth as Nuclear Communicators," 2015, Anushakti Nagar, Mumbai, India
- Organizing member of "Thorium Energy Conference," 2015, Mumbai, India
- Organizing member of "International Workshop on Nuclear Reactor Thermal Hydraulics," 2014, Mumbai, India
- Organizing member of "National Conference on Power from Thorium," 2014, Mumbai, India

## **INTERNATIONAL INVITED TALKS**

### ***Keynote Speaker***

- "*CFD Modeling: Relevance & Necessity in Academics*" at Mechanical Engineering International Conference 1.0 (MEICON 1.0) organized by Department of Mechanical Engineering, Research and Development Cell, and Institutional Innovation Council of OP Jindal University (OPJU), Raigarh, India, December 19-20, 2024.

### ***Invited conference***

- "*The Applications of Thermal and Fluid Engineering*" organized by Mechanical Engineering Department, Research and Development Cell, and Institutional Innovation Council of OP Jindal University (OPJU), Raigarh, May 18, 2023.
- "*Role of Engineers from development of Advanced Energy Management Systems to prevention of COVID-19 spreading*" organized by Department of Mechanical Engineering, COER University, India, April 21, 2023.
- "*Role of Engineers from development of Advanced Energy Management Systems to prevention of COVID-19 spreading*" Short Term Course (STC) on "Emerging Technologies in Thermo-Fluids and Energy Systems (ETTES-2023)", NIT Delhi, India, April 11 - 16, 2023.
- "*Nuclear Power Generation – Technology, safety & policies*" organized by Jindal Institute of Power Technology JPL, Tamnar, Raigarh, India, Raigarh, July 7, 2023.
- "*Nuclear Power Plant and Thermal Stratification,*" QIP Short Term Course on Radiation Health Safety and Security, IIT Kanpur, India, 2-7 March 2021.
- "*Ventilation Systems and COVID-19*", Organized by Canadian Meat Council (CMC) and North America Meat Institute (NAMI) for the North American industries, USA and Canada, November 24, 2020.
- "*Ventilation Systems and COVID-19*", Organized by Beef Cattle Research Council (BCRC), for USDA, Government of Alberta, and health experts from USA and Canada, Dec 8, 2020.

## **PROFESIONAL SOCITIES MEMBERSHIP**

- AAAR- The American Association for Aerosol Research professional member
- ASABE - American Society of Agricultural and Biological Engineers
- ASME - American Society of Mechanical Engineers professional member
- ASTFE - American Society of Thermal and Fluids Engineers
- AAAS - American Association for The Advancement of Science

## **RESEARCH PAPERS REVIEWED**

- Research Journal and conference papers reviewed: 100+.

## EDITOR POSITION FOR PROPOSED BOOKS

- Taylor & Francis CRC Press publication
- Springer Nature
- Elsevier

## JOURNAL and CONFERENCE POSITIONS

### *Editorial board member*

- International Journal of Thermofluid Science and Technology 2022-present
- International Journal of Materials, Manufacturing and Sustainable Technologies 2023-Present

### *Session Chair*

- American Society of Thermal and Fluids Engineers (ASTFE) TFEC 2023-2026

### *Conference Session(s) Judge*

- The American Association for Aerosol Research 2023

### *Technical Program committee member*

- American Society of Thermal and Fluids Engineers (ASTFE) TFEC
- American Association for Aerosol Research (AAAR)
- American Society of Agricultural and Biological Engineers (ASABE) (observing member)

### *Journal(s) reviewer services.*

- ASME Journal of Heat Transfer (ASME-JHT),
- Multidisciplinary Digital Publishing Institute (MDPI)- Energies, Building, Sustainability, Applied Science,
- Building and Environment (BAE)
- Science of the Total Environment (STOTEN)
- International Journal of Thermofluid Science and Technology (IJTST)
- ASME Journal of Heat and Mass Transfer
- Physics of Fluids (PoF)
- ASME Journal of Journal of Energy Resources Technology (ASME-JERT)
- Heat Transfer Engineering (HTE)
- Transactions of the American Society of Agricultural and Biological Engineers (ASABE)
- Journal of Engineering

### *Conference reviewer services*

- American Society of Thermal and Fluids Engineers TFEC 2023-2026
- ASME Fluids Engineering Division Summer Meeting (ASME-FEDSM), 2022
- ASME Conference of Micro/Nanoscale Heat and Mass Transfer (ASME-MNHMT), 2019

## PUBLICATIONS

### Peer Reviewed Journal and Conference publications (DOI available)

1. Sunilkumar K. Prajapati, Ragesh G. Kapadia, **Sunil Kumar**, "A review on advancements in passive decay heat removal system of advanced nuclear reactors," Open Nuclear Energy, Volume 1, June 2026, 100001. <https://doi.org/10.1016/j.one.2026.100001>
2. Brooke L Smith, Meiyi Zhang, **Sunil Kumar**, Maria D King, "Aerosolization Affects *Bacillus globigii* Vegetative Cell and Spore Behaviors" Microorganisms, Vol. 13, Issue 11, page 25-32. <https://doi.org/10.3390/microorganisms13112532>

3. Shreesha Yogish Rao, **Sunil Kumar**, Kavita Rathore, Ashok K Dewangan, “*Nanofluids in Compact Heat Exchangers: Advances, Mechanisms, Challenges, and Sustainable Prospects in Thermal Management*,” International Journal of Materials, Manufacturing and Sustainable Technologies (IJMMST), Vol. 4, Issue 1, page 1-30. <https://doi.org/10.56896/IJMMST.2025.4.1.001>
4. Sunilkumar K. Prajapati, Ragesh G. Kapadia, **Sunil Kumar**, “*Numerical Investigation of the Subcooled Flow Boiling in the Vertical Heated Tube*,” International Journal of Materials, Manufacturing and Sustainable Technologies (IJMMST), Vol. 4, Issue 1, page 31-53. <https://doi.org/10.56896/IJMMST.2025.4.1.002>
5. Sunilkumar K. Prajapati, Ragesh G. Kapadia, **Sunil Kumar**, “*Multiscale and Multiphysics Coupling Approaches in Nuclear Thermal Hydraulics: A Review*,” International Journal of Materials, Manufacturing and Sustainable Technologies (IJMMST), Vol. 4, Issue 1, page 61-97. <https://doi.org/10.56896/IJMMST.2025.4.1.004>
6. P.K. Bhowmik, D. Chowdhury, H.H. Abdellatif, S. Wahlquist, **Sunil Kumar**, S. Sharma, A. Ali, F. Mascari, P. Sabharwall, Flow instabilities in helical-coil steam generators for small modular reactors: A review, Nucl. Eng. Des. 433 (2025) 113846. <https://doi.org/10.1016/J.NUCENGDES.2025.113846>
7. Madhu Jhariya, Ashok Kumar Dewangan, Syed Quadir Moinuddin, **Sunil Kumar**, Aqueel Ahmad & Ashok Kumar Yadav, Research progress on efficient battery thermal management system (BTMs) for electric vehicles using composite phase change materials with liquid cooling and nanoadditives. *J Therm Anal Calorim* 149, 13653–13680 (2025). <https://doi.org/10.1007/s10973-024-13752-x>
8. Hussein Sharadga, Ahmad Dawahdeh, **Sunil Kumar**, “*Accelerated MPPT Controller for Photovoltaic Systems under Rapid Solar Radiation Changes Using Neural Network*” 2024, Journal of Sustainability, MDPI <https://doi.org/10.3390/su16031021>
9. **Sunil Kumar**, K. Rathore, “*Renewable Energy for Sustainable Development Goal of Clean and Affordable Energy*,” International Journal of Materials, Manufacturing and Sustainable Technologies, Vol. 2, Issue 1, page 01-15. <https://doi.org/10.56896/IJMMST.2023.2.1.001>
10. K. Rathore, **Sunil Kumar**, “*Net Zero Emissions for Our Future Generations through Renewables: A Brief Review*,” International Journal of Energy Resources Applications (IJERA), Vol. 2, Issue 1, page 22-43. <https://doi.org/10.56896/IJERA.2023.2.1.004>
11. **Sunil Kumar**., Mark Klassen, David Kalassen, Robert Hardin, Maria King, “*Dispersion of sneeze droplets in a meat facility indoor environment - without partitions*”, Environmental Research (2023), doi: <https://doi.org/10.1016/j.envres.2023.116603>
12. Mukesh Kumar Awasthi, Ashwani Kumar, Nitesh Dutt, **Sunil Kumar**, “*Electrohydrodynamic capillary instability of Rivlin-Ericksen viscoelastic fluid film with mass and heat transfer*” 2023, Heat Transfer, DOI: [10.1002/htj.22944](https://doi.org/10.1002/htj.22944)
13. **Sunil Kumar**, M.D. King, *Numerical investigation on indoor environment decontamination after sneezing*, Environ. Res. 213 (2022) 113665. <https://doi.org/10.1016/j.envres.2022.113665>
14. **Sunil Kumar**, A. Thyagarajan, D. Banerjee, *Experimental Investigation of Thermal Energy Storage (TES) Platform Leveraging Phase Change Materials in a Chevron Plate Heat Exchanger*, in: Int. Mech. Eng. Congr. Expo., 2022: pp. 1–7. <https://doi.org/10.1115/IMECE2022-96226>
15. **Sunil Kumar**, R.B. Grover, H. Yadav, P.K. Vijayan, U. Kannan, A. Agrawal, R.B. Grover, U. Kannan, H. Yadav, A. Agrawal, *Experimental Investigations on Thermal Stratification in a Large Pool of Water*

*with Immersed Isolation Condenser*, Int. Conf. Nucl. Eng. Proceedings, ICONE. 3 (2020) 1–7. <https://doi.org/10.1115/ICONE2020-16647>

16. **Sunil Kumar**, A. Thyagarajan, D. Banerjee, *an investigation on chevron plate heat exchanger filled with organic phase change material*, in: Proc. ASME 2020 Heat Transf. Summer Conf. HT2020 July 13–15, 2020, Virtual, online. <https://doi.org/10.1115/HT2020-9122>
17. **Sunil Kumar**, R.B. Grover, H. Yadav, P.K. Vijayan, U. Kannan, A. Agrawal, *Experimental and numerical investigation on suppression of thermal stratification in a water-pool: PIV measurements and CFD simulations*, 138 (2018) 686–704. <https://doi.org/10.1016/j.applthermaleng.2018.04.070>
18. **Sunil Kumar**, P.K. Vijayan, U. Kannan, M. Sharma, D.S. Pilkhwal, *Experimental and computational simulation of thermal stratification in large pools with immersed condenser* by, Appl. Therm. Eng. 113 (2017) 345–361. <https://doi.org/10.1016/j.applthermaleng.2016.10.175>
19. **Sunil Kumar**, R.B. Grover, P.K. Vijayan, U. Kannan, *Numerical investigation on the effect of shrouds around an immersed isolation condenser on the thermal stratification in large pools*, Ann. Nucl. Energy. 110 (2017) 109–125. <https://doi.org/10.1016/j.anucene.2017.06.022>
20. **Sunil Kumar**, P.K. Vijayan, M. Sharma, D.S. Pilkhwal, U. Kannan, A.K. Nayak, *Experimental and numerical analysis of thermal stratification in large water pool*, 2015. [http://inis.iaea.org/Search/search.aspx?orig\\_q=RN:47073982](http://inis.iaea.org/Search/search.aspx?orig_q=RN:47073982)

#### Journal papers under internal review

21. **Sunil Kumar**, Thyagarajan, Ashok., Banerjee, Debjyoti., “*An investigation on efficiency improvement of chevron plate heat exchanger filled with organic phase change material*”, ASME Journal of Energy Resources Technology (*Internal review in progress*)
22. **Sunil Kumar.**, Mark Klassen, David Kalassen, Robert Hardin, Maria King, “*Dispersion of sneeze droplets in a meat facility indoor environment - with partitions*”, Environmental Research (*Internal review in progress*)

#### Conference Presentations and posters (selected)

##### Energy management research conferences

1. **Kumar, Sunil**, Thyagarajan, Ashok., Banerjee, Debjyoti., “*Experimental Investigation of Thermal Energy Storage (TES) Platform Leveraging Phase Change Materials in a Chevron Plate Heat Exchanger*,” International Mechanical Engineering Congress & Exposition (IMECE 2022), October 30 – November 3, 2022, Columbus, Ohio, USA.
2. **Sunil Kumar**, R.B. Grover, H. Yadav, P.K. Vijayan, U. Kannan, A. Agrawal, R.B. Grover, U. Kannan, H. Yadav, A. Agrawal, “*Experimental Investigations on Thermal Stratification in a Large Pool of Water with Immersed Isolation Condenser*,” 28th International Conference on Nuclear Engineering, August 4 – August 5, 2020, Virtual.
3. **Kumar, Sunil**, Thyagarajan, Ashok., Banerjee, Debjyoti., “*Numerical investigation on thermal front propagation in a PCM filled heat exchanger for efficiency improvement*,” Summer Heat Transfer Conference (SHTC 2020), July 12 – 15, 2020, Rosen Shingle Creek, Orlando, FL, USA
4. **Sunil Kumar**, P.K. Vijayan, M. Sharma, D.S. Pilkhwal, U. Kannan, A.K. “*Nayak, Experimental and numerical analysis of thermal stratification in large water pool*,” Thorium Energy Conference 2015, Mumbai, Maharashtra, India.

5. **Kumar, Sunil**, Vijayan., P.K., Kannan., U, Nayak., A. K., 2013, “*Investigation on thermal stratification on a large water pool with immersed condenser*”, Proceedings of the 22nd National and 11th International ISHMT-ASME Heat and Mass Transfer Conference December 28-31, 2013, IIT Kharagpur, West Bengal, India
6. **Sunil Kumar**, P.K. Vijayan, A.K. Nayak, “*Thermal stratification: a problem for passive safety system in advanced water reactors*” International conference on “Severe Accident Analysis and Management” 2013, IIT Kanpur, Kanpur, India
7. **Kumar, Sunil**, Hardin, G. Robert., and Maria King., “*Cotton Wads Drying in Conveyer Belt System: CFD Simulations*,” 2023 ASABE Annual International Meeting, July 9 - 12, 2023, Omaha, Nebraska, USA.
8. **Kumar, Sunil**, Hardin, G. Robert., and Maria King., “*Numerical investigation on seed cotton conveyance and drying for improving energy efficiency*,” Beltwide Cotton Conference, National Cotton Council of America, January 4 - 6, 2022, Marriott River Center Hotel, San Antonio, Texas, USA
9. **Kumar, Sunil**, Hardin, G. Robert., and Maria King., “*Improving Energy Efficiency in Seed Cotton Conveying and Drying*,” Beltwide Cotton Conference, National Cotton Council of America, January 5 – 7, 2021, (virtual conference), USA.

#### Aerosols generation and dispersion Research conferences

10. **Sunil Kumar**, Meiyi Zhang, John Cate, Hunter Welch, Maria King “*Airborne Transmission and Mitigation in Indoor Environments: Insights from the COVID-19 Pandemic*” American Association for Aerosol Research (AAAR) 42nd Annual Conference, October 21 - 25, 2024, Albuquerque Convention Center, Albuquerque, New Mexico, USA
11. **Sunil Kumar**, Maria King “*Mitigating Bioaerosol Spread Through Computational Fluid Dynamics*” American Association for Aerosol Research (AAAR) 40<sup>th</sup> annual Conference, October 21 - 25, 2023, Albuquerque Convention Center, Albuquerque, New Mexico, USA
12. **Kumar, Sunil**, and Maria King., “*Exploring the Impact of Diffuser Design on Droplet Dispersion in Indoor Spaces*,” American Association for Aerosol Research (AAAR) 41st Annual Conference, October 2 - 6, 2023, Portland, Oregon, USA
13. **Kumar, Sunil**, and Maria King., “*suppressing spread of viral sneeze droplets using transparent curtains in large food processing facilities*,” American Association for Aerosol Research (AAAR) 40th Annual Conference, October 3-7, 2022, Raleigh Convention center, Raleigh, NC, USA
14. **Kumar, Sunil**, and Maria King., “*Design-Aided Mitigation of the Spread of Virus Aerosols*,” American Association for Aerosol Research (AAAR) 39th Annual Conference, October 18 - 22, 2021, Albuquerque Convention Center, Albuquerque, New Mexico, USA
15. **Kumar, Sunil**, David Klassen, Tatiana Baig, and Maria King., “*Ventilation Systems and COVID-19*”, American Association for Aerosol Research (AAAR) 39th Annual Conference, October 18 - 22, 2021, Albuquerque Convention Center, Albuquerque, New Mexico, USA
16. **Kumar, Sunil**, and Maria King., “*Numerical Investigation on Transport and Removal of Airborne Virus from a Hospital Room*,” 38th American Association for Aerosol Research (AAAR) Annual conference (AAAR 2020), October 5 – 9, 2020, Raleigh, USA.

### **Books Chapters Publication**

1. **Sunil Kumar**, Robert Hardin, Maria King “*Modeling of flows through porous media,*” Computational Fluid Flow and Heat Transfer: Advances, Design, Control and Applications, Taylor & Francis, CRC Press Publication, (<https://doi.org/10.1201/9781003465171-8>).
2. **Sunil Kumar**, Debjyoti Banerjee, “*PCMs for Sustainability Applications by Leveraging Machine Learning,*” Phase Change Materials (PCMs) - Recent Advances, New Perspectives, and Applications, Intech Open Publication (<http://dx.doi.org/10.5772/intechopen.114380>).
3. **Sunil Kumar**, Kavita Rathore, Debjyoti Banerjee, “*Heat Transfer Fundamentals and Introduction to Heat Exchangers*” Advanced Applications in Heat Exchanger Technologies: AI, Machine Learning, and Additive Manufacturing, Taylor & Francis, CRC Press Publication, 2025 (<https://doi.org/10.1201/9781003509837-1>).
4. **Sunil Kumar**, Kavita Rathore, Mithilesh Kumar Sahu, Mohit Pramod Sharma, Kuber Nath Mishra, and Debjyoti Banerjee, “*Heat Exchanger Classifications and their Areas of Application*” Advanced Applications in Heat Exchanger Technologies: AI, Machine Learning, and Additive Manufacturing, Taylor & Francis, CRC Press Publication, 2025 (<https://doi.org/10.1201/9781003509837-2>).
5. Sumit Khatri, Suvanjan Bhattacharyya1, **Sunil Kumar**, “*Conventional Methods for Enhancing Heat Transfer Relevant to Heat Exchangers*” Advanced Applications in Heat Exchanger Technologies: AI, Machine Learning, and Additive Manufacturing, Taylor & Francis, CRC Press Publication, 2025 (<https://doi.org/10.1201/9781003509837-3>).
6. Nancy Maurya, Naman Jain, Tapasvi Bhatt, **Sunil Kumar**, and Suvanjan Bhattacharyya, “*Microchannel Heat Exchangers*” Advanced Applications in Heat Exchanger Technologies: AI, Machine Learning, and Additive Manufacturing, Taylor & Francis, CRC Press Publication, 2025 (<https://doi.org/10.1201/9781003509837-8>).
7. Arya Shah, Karan Sharma, Vaibhav More, M.D. Yadav, and **Sunil Kumar**, “*Fouling and Corrosion Prevention Strategies*” Advanced Applications in Heat Exchanger Technologies: AI, Machine Learning, and Additive Manufacturing, Taylor & Francis, CRC Press Publication, 2025 (<https://doi.org/10.1201/9781003509837-12>).
8. Kavita Rathore, **Sunil Kumar**, Debjyoti Banerjee, “*Introduction to Phase Change Materials*” Advances in Phase Change Materials and its Applications: Bridging AI and Thermal Solutions, Springer Publication, 2025 (*writing in progress*).
9. Chaitanya Mali, **Sunil Kumar**, Kavita Rathore, Debjyoti Banerjee, “*Advancements in Enhancing Thermophysical Properties*” Advances in Phase Change Materials and its Applications: Bridging AI and Thermal Solutions, Springer Publication, 2025 (*writing in progress*).
10. Sunil Kumar Prajapati, Kavita Rathore, **Sunil Kumar**, Debjyoti Banerjee, “*Machine Learning and AI in PCM Research*” Advances in Phase Change Materials and its Applications: Bridging AI and Thermal Solutions, Springer Publication, 2025 (*writing in progress*).

11. Mohit Sharma, **Sunil Kumar**, “*Environmental Impact and Sustainability of PCMs*” *Advances in Phase Change Materials and its Applications: Bridging AI and Thermal Solutions*, Springer Publication, 2025 (*writing in progress*).
12. Shreesha Rao, **Sunil Kumar**, Debjyoti Banerjee, Kavita Rathore, “*Global Market and Industry Trends for Advances in Phase Change Materials*” *Advances in Phase Change Materials and its Applications: Bridging AI and Thermal Solutions*, Springer Publication, 2025 (*writing in progress*).

### **Books Publication**

1. **Sunil Kumar**, “*Radiation Detection Basics & Development of Advance Gas Detector: Characterization and Experimental Validation*,” LAP Lambert Academic Publishing (2013-02-20), ISBN-13: 978-3-659-22249-8, ISBN-10: 3659222498, EAN: 9783659222498, category: Technology, (complete book of 176 pages). <https://www.amazon.com/Radiation-Detection-Development-Advance-Detector/dp/3659222496>
2. **Kumar, Sunil**, Rathore, K., & Banerjee, D. (Eds.). (2026). *Advanced Applications in Heat Exchanger Technologies: AI, Machine Learning, and Additive Manufacturing* (1st ed.). CRC Press. <https://doi.org/10.1201/9781003509837>
3. **Sunil Kumar**, Kavita Rathore, Debjyoti Banerjee, “*Advances in Phase Change Materials and their Applications: Bridging AI and Thermal Solutions*,” Springer Nature, 2025, (*Book submitted for publication*).
4. **Sunil Kumar**, Palash Kumar Bhowmik, Piyush Sabharwall, “*Advances in Small Modular Reactor Technology: Thermal-Hydraulic Design and Analysis with Techno-Economic Perspectives*,” Elsevier Publication, 2026 (*Book Writing in Progress*).
5. Mithilesh Kumar Sahu, **Sunil Kumar**, Kuber Nath Mishra, Kavita Rathore, Debjyoti Banerjee “*Sustainable Water Management: Innovations in Recycling and Desalination*” Springer publication, 2026 (*proposal under internal review*).
6. Suvanjan Bhattacharya, **Sunil Kumar**, “*Next-Gen Photovoltaics: Integrating Cutting-Edge Cooling Technologies*,” Springer publication, 2026 (*proposal under internal review*).
7. **Sunil Kumar**, Mohit Sharma, Sudhanshu Sahoo “*Advanced Thermal Hydraulics for Energy Systems: Theory, Applications, and Innovations*” Elsevier Publication, 2026 (*proposal under internal review*).