Nithin Panicker, Ph.D.

CFD Applications Engineer
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Highlights

2009 - 2023

- 14 years of experience in the field of **Computational Fluid Dynamics (CFD)** in both modeling and simulation of devices employed in Mechanical and Chemical engineering industries for understanding the underlying physical mechanisms, to generate high fidelity data and to improve design and operational efficiency using: OpenFOAM, StarCCM+ and FLUENT.
- **Media Press release** by Marquis Who is Who In America: https://www.24-7pressrelease.com/press-release-service/498954
- 17 publications (7 journals, 2 proceedings, 6 technical ORNL DOE reports, 2 thesis) in the field of CFD.
- **United States Patent application** filed on invention "Nozzles for enhanced entrainment" (application ID: 18371993)
- Recipient of a grant award as National Lab co-PI from United States Department of Energy High Performance Computing for Energy Innovation to optimize a waste heat recovery divide (award amt. $ 375000) **announcement of the award**: https://hpc4energyinnovation.llnl.gov/projects
- >25 manuscripts reviewed, Reviewer of more than 10 CFD fluid/thermal/mass transfer related journals
- 4 invited talks, 10 conference presentations, 1 poster, member of various CFD related professional organizations
- Numerous Invitations to publish papers in the special issue of various journals
- Cited in the book chapter: Advanced Approaches in Turbulence, 2021, a significant portion of Chapter 7 is based on the journal paper published during my PhD.
- journal papers in journals with impact factors 4.3 and above
- Oak Ridge National Lab, Advanced Reactor Engineering Division **appreciation** in recognition for outstanding initiative and creativity for **developing a modeling/simulation approach** to design a low-temperature waste heat recovery device that contributed towards the proposal that won the USDOE HPC4EI award in 2022
- **Student mentor** Mentored Undergraduate student recruited through Energy Efficiency Renewable Energy Program Office for High Performance Computing program, Oak Ridge National Laboratory

Education

2012 – 2017
- **Ph.D., Iowa State University** Mechanical Engineering.
  Thesis title: *Computational Models for Turbulent Bubble Columns.*

2009 – 2011
- **M.S., University of Cincinnati** Mechanical Engineering
  Thesis title: *Numerical Study of Flow and Deformations in Droplet flows Subjected to Alternating Electric Fields.*

Education (continued)

2005 – 2009 **B.Tech., National Institute of Technology, Surathkal** Chemical Engineering

Work Experience

2023 – present
- **CFD Applications Engineer, Oak Ridge National Laboratory**
- Role: **Co-Principal Investigator**, "**High performance computing to optimize an induced flow power generator device for waste heat recovery applications in data centers**". Project in collaboration with Spar Energy LLC funded by United States Department of Energy High Performance Computing for Energy Innovation program.
- Role: Main Technical contributor, "**Simulation of boiling in Nuclear Canister in a geological repository flooded by water** ". Project in collaboration with various National Labs, funded by Nuclear Regulatory Commission United States.
- Role: co-Technical contributor, "**Scalable Coarse Mesh CFD Solver for Large Scale Nuclear System Simulations** ". Project funded by Laboratory Directed Research and Development.

2020 – 2023
- **Postdoctoral research associate, Oak Ridge National Laboratory**
- Role: Main Technical contributor, "**Advanced Thermal-Hydraulic Model of Heat Recovery Steam Generator** ". Project in collaboration with Electric Power Research Institute USA, funded by United States Department of Energy High Performance Computing for Energy Innovation program.
- Role: Main Technical contributor, "**Optimization of Alumina and Aluminum Fluoride Feeding in Advanced Aluminum Smelting Cells Using Large Eddy Simulation**". Project in collaboration with Alcoa USA Inc, funded by United States Department of Energy High Performance Computing for Energy Innovation program.

2019 – 2020
- **Research Engineer, FORD motor company**
- Develop CFD models for water management applications using StarCCM+ and PreonLab
- Perform multiphase simulations for water ingress into the engine bay, water ingress into the luggage compartment during lift gate opening/closing
- Develop analytical models for droplet dynamics on the lens/lidar of autonomous vehicle to couple it with CFD
- Secure field test data on water management for automobiles for CFD validation
- Python scripting to automate processes in the Particle based software PreonLAB
- Interact with cross-functional teams (Design Engineers, Program Engineers) to understand the design requirements

2017 – 2019
- **CFD Engineer, Tenneco Inc**
- Proposed design suggestions by performing CFD simulations of both system level and component level exhaust aftertreatment systems (Diesel Oxidation Catalyst, Selective Catalytic Reduction, Muffler, y-pipe) for various automotive clients (John Deere, GM and Isuzu)
- Performed conjugate heat transfer analysis for various designs of exhaust systems to understand and control the skin temperature
- Performed flow noise predictions exhaust tail pipes to aid acoustic Engineers

Work Experience (continued)

2012 – 2017

- **Research Assistant, Iowa State University**
- Role: Main Technical contributor, "**A fundamental investigation of turbulence in multiphase gas-particle flows**". Project funded by American Chemical Society Petroleum Research fund.
- Role: Main Technical contributor, "**Simulation of boiling on mixed wettability surfaces for enhanced heat transfer**". project funded by Defense Advanced Research Projects Agency.

2015 – 2015

- **Research Intern, Robert Bosch LLC**
- CFD modeling and simulation of Gas Absorption Heat Pump

Research Publications (*corresponding author)

Journal Articles

1. ***Panicker, Nithin**, Bazaz, G., Rao, V. M., Natesh, S., & Jain, P. K. (2023). Novel designs for ejectors for enhanced fluid recovery verified by com. *International Journal of Air-conditioning and Refrigeration (under preparation)*, -, -. doi:10.1016/j.apm.2018.01.011
2. ***Panicker, Nithin**, Passalacqua, A., & Fox, R. O. (2023). A brief review of multiphase turbulence and turbulence models to predict. *Fluids (under preparation)*, -, -. doi:10.1016/j.apm.2018.01.011
3. *__Panicker, Nithin__, Chudhary, R., Rao, V., Delchini, M., & Jain, P. (2022). A Large Eddy Simulation study of Turbulence, Alumina transport and Heat transfer in Conventional Smelting Cell Using OpenFOAM. *Metallurgical and Materials Transactions B*, *4*, e2205v1. doi:DOI:10.1007/s11663-022-02539-w
4. *__Panicker, Nithin__, Delchini, M., Sambor, T., & Sabau, A. (2022). Computational fluid dynamics investigations of flow, heat transfer, and oxidation in heat recovery steam generator. *Applied Thermal Engineering*, *4*, e2205v1. doi:https://doi.org/10.1016/j.applthermaleng.2023.120089
5. *__Panicker, Nithin__, Passalacqua, A., & Fox, R. O. (2020a). Computational study of buoyancy driven turbulence in statistically homogeneous bubbly flows. *Chemical Engineering Science*, *216*, 115546. doi:10.1016/j.ces.2020.115546
6. *__Panicker, Nithin__, Passalacqua, A., & Fox, R. O. (2020b). Computational study of the effect of homogeneous and heterogeneous bubbly flows on bulk gas–liquid heat transfer. *Journal of Fluids Engineering*, *142*(10). doi:10.1115/1.4047806
7. **Panicker, Nithin**, Passalacqua, A., & Fox, R. O. (2018). On the hyperbolicity of the two-fluid model for gas–liquid bubbly flows. *Applied Mathematical Modelling*, *57*, 432–447. doi:10.1016/j.apm.2018.01.011

United States Patent Application (ID-18371993)

1. Bazaz, G., **Panicker, Nithin**, Rao, V. M., & Jain, P. K. (2023). *Nozzles for entrainment flows*. US patent application filed.

Conference Proceedings

1. *__Panicker, Nithin__, Chudhary, R., Rao, V., Delchini, M., & Jain, P. (2021). Computational modeling and simulation of aluminium smelting process using openfoam. In *5th thermal and fluids engineering conference (tfec)* (pp. 789–802). doi:10.1615/TFEC2021.mpm.036670

2. *__Panicker, Nithin__, Delchini, M., Sambor, T., Sabau, A., & Jain, P. (2021). Advanced thermal-hydraulic model of heat recovery steam generators. In *5th thermal and fluids engineering conference (tfec)* (pp. 647–656). doi:10.1615/TFEC2021.fip.036547

Department of Energy Technical reports

1. *__Panicker, Nithin__, Rao, V., Bazaz, G., & Jain, P. K. (2023). *Design and development of a waste heat to power device using computational fluid dynamics simulations.* doi:10.2172/1844874
2. *__Panicker, Nithin__, Chaudhary, R., Delchini, M., Rao, V., & Jain, P. K. (2021). *Computational fluid dynamics simulations to support efficiency improvements in aluminum smelting process.* doi:10.2172/1844874
3. *__Panicker, Nithin__, Delchini, M., Sambor, T., & Sabau, A. S. (2021). *Computational fluid dynamics simulations to predict oxidation in heat recovery steam generator tubes.* doi:10.2172/1844874
4. Mathew, S., Santhosh, B., __Panicker, Nithin__, Davidson, G., Nicholas, K., Nole, M., … Gonzalez, E. (2021). *Steady-state and time-dependent coupled simulations of a critical dual-purpose canister in a saturated repository*.
5. __Panicker, Nithin__, Nicholas, K., Mathew, S., & Davidson, G. (2021). *Dual purpose canister thermal simulations in sub-cooled regime: Relap vs. cfd comparison*.
6. Pointer, D., Santhosh, B., Delchini, M., Kwitae, C., __Panicker, Nithin__, & Turckson, B. (2021). *Scalable coarse mesh cfd solver for large scale nuclear system simulations*.

Conference presentations

Conference

1. __Panicker, Nithin__, Chaudhary, R., Delchini, M., Rao, V., & Jain, P. (2022). *Large eddy simulation of aluminum smelting process using openFOAM, 7th Thermal Fluids Engineering Conference meeting, las vegas, nevada, may 16-18 2022.* Virtual Conference.
2. __Panicker, Nithin__, Chaudhary, R., Delchini, M., Rao, V., & Jain, P. (2021). *OpenFOAM based modeling and simulation of aluminum smelting process ,16th united states national congress on computational mechanics , 2021.* Virtual Conference.
3. __Panicker, Nithin__. (2020). *Aluminum smelting modeling and simulation, Oak Ridge National Lab CFD day meeting 2020.* Virtual Conference.
4. __Panicker, Nithin__, Chaudhary, R., Delchini, M., Rao, V., & Jain, P. (2020). *Computational modeling and simulation of aluminum smelting process using openFOAM, 5th Thermal Fluids Engineering Conference meeting, 2020.* Virtual Conference.
5. __Panicker, Nithin__, Delchini, M., Sambor, T., Sabau, A., & Jain, P. (2020). *Advanced thermal hydraulic model of heat recovery steam generator, 5th Thermal Fluids Engineering Conference meeting, 2020.* Virtual Conference.
6. __Panicker, Nithin__, Passalacqua, A., & Fox, R. (2016). *Computational study of turbulent bubbly flows, AIChE Annual meeting 2016.* doi:https://www.aiche.org/proceedings/people/nithin-s-panicker-3
7. __Panicker, Nithin__, Passalacqua, A., & Fox, R. (2014). *Analysis and closure verification of multiphase turbulence models for gas -liquid flows, AIChE Annual meeting 2014.* doi:https://www.aiche.org/proceedings/people/nithin-s-panicker-3
8. __Panicker, Nithin__, Passalacqua, A., & Fox, R. (2013). *Meso-scale direct numerical simulations of mono-disperse bubbly flows, AIChE Annual meeting 2013.* doi:https://www.aiche.org/proceedings/people/nithin-s-panicker-3

9 **Panicker, Nithin**. (2007a). *Economical chemical engineering techniques to perform solar water desalination„ Annual Technical symposium manipal institute of technology, 2007.*

10 **Panicker, Nithin**. (2007b). *Modeling and simulation of quenching of steel, Annual Technical symposium indian institute of technology, 2007.*

11 **Panicker, Nithin**. (2007c). *Numerical study of nucleate pool boiling: Effect of surface wettability„ American Society of mechanical engineers imece, 2013.*

Invited talks

- **Aerospace expo 2021**, talk on the advancements of CFD techniques in multiphase flows
- **Global Summit and Expo on Aerospace and Mechanical Engineering, 2021** https://www.thescientistt.com/aerospace-mechanical-engineering/
- **Aerospace expo 2020**, talk on advancements in multiphase flows
- **High Performance Computing manufacturing day organized by Lawrence Livermore National Lab** Optimization of Alumina and Aluminum Fluoride Feeding in Advanced Aluminum Smelting Cells using Large Eddy Simulation - Alcoa

DOE Grants applied

- HPC4EI High Performance Computing to Optimize an Induced Flow Power Generator Device for Waste Heat recovery (**won** $375000) Role: co-PI
- Induced Flow Generator System for Waste Heat Recovery from Drying Processes, $500,000 (**accepted for first round, unsuccessful**) Role: National lab PI
- Alternative paths for carbon dioxide removal (CDR) through salt water utilization and venturi scrubber capture systems, $400,000 (**accepted for first round by DOE HPC4EI, review in progress**) Role: National lab PI
- Aerothermal Optimization and Reduced-Order Model Development for an Induced Flow Generator for Low-Temperature Waste Heat Recovery, $400,000 (**accepted for first round by DOE HPC4EI, review in progress**) Role: National lab PI
- High Performance Optimization of Liquid Piston Compression for Long-Duration Energy Storage, $400,000 (**accepted for first round by DOE HPC4EI, review in progress**) Role: National lab co-PI
- Performance certification of components of long-Duration Energy Storage, $250,000 (**DOE Energyverx voucher program, review in progress**) Role: National lab co-PI

Reviewer

- **JOURNALS**
- Powder Technology
- Applied Mathematical Modeling
- American Institute of Chemical Engineering
- Journal of Fluids Engineering
- Heat Transfer Research
- Journal of Enhanced Heat Transfer
- Canadian Journal of Chemical Engineers

Reviewer (continued)

- Experimental and Computational Multiphase Flow
- Journal of Mechanical Science and Technology
- Cleaner Materials
- Fluids

- **CONFERENCE**
- American Nuclear Society

Achievements

- **ORNL Appreciation**, For creating outstanding CFD research plan for commercializing a product for small Business.
- **US Department of Energy, High Performance Computing for Energy Innovation Award as co-PI ($ 375,000)**, in collaboration with the small business Spar Energy LLC for design and development of a novel next generation energy system.
- **Press release**, Marquis Whos Who in America.
- **Cited in the book: Advanced Approaches in Turbulence**, a significant portion of Chapter 6 is based on my PhD work
- **University Graduate Scholarship**, Granted by University of Cincinnati to perform Master of Science in Mechanical Engineering.

Professional Membership

- **American Society for Fluid and Thermals Engineering**.
- **American Nuclear Society (Alternate chair conference session: Advances in thermal hydraulics)**.
- **USCACM**
- **American Society for Mechanical Engineers**
- **American Institute of Chemical Engineers**

Teaching

- **Teaching assistant, 2014**, Fluid flow lab. Mechanical Engineering, Iowa State University
- **Teaching assistant, 2013**, Heat transfer lab. Mechanical Engineering, Iowa State University

Mentorship

- **Student mentor** Mentored Undergraduate student recruited through Energy Efficiency Renewable Energy Program Office for High Performance Computing program, Oak Ridge National Laboratory