



## Naveen Kushwaha

Senior Process Engineer, Dr Reddys Lab. Hyderabad, INDIA

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### Summary

As a dynamic professional, I hold a doctoral degree in Chemical Engineering and have amassed over 7 years of extensive research experience focused on fluid dynamics, heat transfer, and particles flow dynamics. Currently, I serve as a Senior Process Engineer at Dr. Reddy's Laboratory, where I utilize my expertise to tackle challenges related to fluid flow, process development, scale-up, and design. My work revolves around the application of Chemical Engineering principles, as well as Computational and Mathematical Modeling.

### Experience

**Senior Process Engineer** – 02/2023 to Present

**Dr. Reddy's Laboratory**, Hyderabad, INDIA

- Developing Computational Fluid Dynamics (CFD) models for optimizing various manufacturing processes in pharmaceutical formulation, such as mixing in the vessel, crystallization, drying, and tablet coating, while considering scale-up effects.
- Collaborating with a cross-functional team consisting of scientists, process engineers, and manufacturing personnel to drive process improvement initiatives, with a focus on scaling up the mixing in the vessel.
- Utilizing the Discrete Element Method (DEM) approach to develop particle dynamics models for equipment like blenders, tablet coaters, and cyclone separators, and incorporating scale-dependent mixing in the vessel behavior into these simulations.
- Conducting case studies both in the laboratory and at plant scale to with CFD models and simulations, ensuring that the mixing in the vessel phenomena are accurately represented across different scales.

### Education

**PhD (7.14/10)**, *Chemical Engineering*, Indian Institute of Technology, Roorkee, India, (Dec. 2017-Jan. 2023)

- Modelling of Multiphase Fluid Flow and Heat Transfer Enhancement using Curved Surface. (PhD thesis).

**M. Tech. (7.65/10)**, *Chemical Engineering*, Indian Institute of Technology, Roorkee, India, (2015-2017)

- Heat transfer in curved channels, and
- Enhancement of Heat transfer in spiral coil using Nano-fluids.

**B. E. (72.68%)**, *Chemical Engineering*, Institute of Engineering, Jiwaji University, Gwalior, India (2010-2014)

- Process Upgrading of Heavy Crude Oil In-Situ Using Hydrogen.

### Patents (2)

1. Kushwaha, N., Kumar, V., Twisted Elliptical Tube-In-Tube Helically Coiled Heat Exchangers. Indian Institute of Technology Roorkee, (Class: **23-03**; Filed on: **10.09.2022**; File number: **370616-001**; **Granted on: 25.01.2023**).
2. Kushwaha, N., Silori, G., Kumar, V. 2021. A system and method for extracting shikimic acid from Chir pine needles. Application number **202111038776** dated **26.08.2021** (**Published on 22/07/2022**).

### Project (1)

- Design Innovation centre (DIC) IIT Roorkee P2P project entitled “*Investigation of a Himalayan pine species as a potential drug in the treatment of Swine flu (H1N1)*”. Project Id-DIC-P2P-2018-19-05.

## Fellowships And Awards

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- Mitacs globalink research award 2021
- The ministry of human resource development (MHRD), India fellowship at Indian Institute of Technology, Roorkee in PhD (dec 2018 to dec 2022).
- The ministry of human resource development (MHRD), India fellowship at Indian Institute of Technology, Roorkee during m. Tech. (July 2015 to Jun 2017).
- Team leader in “Vigyan Manthan-Mission Excellence Programme” organized by M.P. council of science and technology, Bhopal, India during 27th January to 6th February 2008.
- All India rank two (silver medal) in all India computer knowledge competition organized by national research institute of knowledge development, Chennai, India, 2005.

## Publications (7)

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- Kushwaha N, Vikash, Kumar V. “Impact of Mixed Convective and Radiative Heat Transfer in Spiral-Coiled Tubes”. ASME. J. Heat Transfer. 2019; <https://doi.org/10.1115/1.4043946>.
- Silori G.K., Kushwaha N., Kumar V. (2019) “Essential Oils from Pines: Chemistry and Applications”. In: Malik S. (eds) Essential Oil Research. Springer, Cham. [https://doi.org/10.1007/978-3-030-16546-8\\_10](https://doi.org/10.1007/978-3-030-16546-8_10)
- Kushwaha N., Kumawat T, Nigam K, Kumar V. "Heat Transfer and Fluid Flow Characteristics for Newtonian and Non-Newtonian Fluids in a Tube-in-Tube Helical Coil Heat Exchanger" Ind. Eng. Chem. Res. 2020, 59, 9, 3972–3984; <https://doi.org/10.1021/acs.iecr.9b07044> (Invited manuscript for the special issue of “Characterization and Applications of Fluidic Devices without Moving Parts”).
- Kushwaha N., Kumar V. “Numerical Study of Saturated Boiling Heat Transfer over the Flat and Curved Surfaces”. Heat Transfer. <https://doi.org/10.1002/htj.22640>.
- Kushwaha N., Sasmito, A.P., Kumar V. “Vapour Bubble Dynamics and Heat Transfer Characteristics During the Boiling over the Spherical Surface” Heat Transfer <https://doi.org/10.1002/htj.22727>
- Kushwaha N, Jain N., Kumar V, Nigam K.D.P., “Numerical Study of Liquid-Liquid Two-Phase Flow through Coiled Flow Inverters: Effect of Volume Fraction, Dean Number and Orientation” Chem. Eng. Sci. 2023, 268, 118409 <https://doi.org/10.1016/j.ces.2022.118409>
- Kushwaha N, Kumar V, “Impact of Coil Curvature, Pitch, and Orientation on Vapor Hydrodynamics over Helically Coiled Tubes during Saturated Pool Boiling near Critical Pressure” Industrial & Engineering Chemistry Research, 62, 43, 18063-18078 <https://doi.org/10.1021/acs.iecr.3c02629>

## Conferences (6)

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- **Kushwaha N**, Kumar V, “Numerical Study of Saturated Pool Boiling Over Horizontal Tube”, 9<sup>th</sup> International and 49<sup>th</sup> National Conference on Fluid Mechanics and Fluid Power (FMFP 2022)
- **Kushwaha N**, Kumar V, “Saturated Pool Boiling of Hydrogen over the Cylindrical Rod”, International conference on Chemical Engineering: Enabling Transition Towards Sustainable Future (Chemtsf 2022)
- **Kushwaha N**, Jain N, Kumar V, Nigam KDP “Numerical Study of Liquid-Liquid Two-Phase Flow through Coiled Flow Inverters: Effect of Volume Fraction, Dean Number and Orientation” 15th International Conference on Gas-Liquid & Gas-Liquid-Solid Reactor Engineering (GLS 2022, AIChE)
- **Kushwaha N.**, Kumar V. “Numerical Simulation of Film Boiling over Sphere using Suppressed Interface Tracking Method: A Two-Phase Approach” 16th international conference on heat transfer, fluid mechanics and thermodynamics (HEFAT-2022)
- **Kushwaha N.**, Kumar V. “Numerical Simulation of Film Boiling over Sphere using Suppressed Interface Tracking Method: A Two-Phase Approach” 15th international conference on heat transfer, fluid mechanics and thermodynamics (HEFAT-2021)

## Grants

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- Co-PREPARE Academic Grant (CAG) for webinar on “Scientific & Academic Writing”
- Marco fund for SWEP Workshop 2021
- Shri S.P. Elhence Memo. Travel Grant.
- Jagdish Narain Travel Grant.
- Rai Bhadur Narain Travel Grant.

## Skills

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- Ansys Fluent (CFD)
- Ansys Rocky (DEM)
- OpenFOAM
- MATLAB
- Machine Learning
- Python
- Proficient in Fluid Dynamics, Heat Transfer, and Mass Transfer phenomena with strong mathematical ability.
- Skilled in programming with proficiency in Python, Matlab, and experience in a Linux-based high-performance computing environment.
- Hands-on experience with CFD software, including Ansys Fluent, Ansys Rocky, Workbench, and Design Modeler/SpaceClaim.
- Capable of performing simulations, optimizing designs, and validating results through comparisons with experiments and literature.
- Proficient in creating insightful visuals and animations such as contour plots, flow profiles, and path lines.
- Skilled in assessing and effectively communicating the impact on process understanding, efficiency, and robustness.

## Equipment Handling

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- Rheometer (Anton Par MCR702)
- HPLC (waters)

## Services

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- DAPC member at Department of Chemical Engineering, IIT Roorkee (2018-2019)
- As [reviewer](#) in “Energy Conversion and Management” journal