# Dr-Ing. Paul Kieckhefen

*Computational Engineer*

## Profile

- Driven computational engineer with a wide skillset finding innovative solutions to difficult problems.
- Equipped with data science and machine learning techniques.
- Chemical engineer by training, data scientist by heart.

## Experience

since 10.2021 **Senior Specialist Digitalization**, Fluid, Particle and Reaction Modelling, BASF SE.
- Simulation of chemical reactors on industrial scale using up to thousands of compute nodes
- Extraction of simplified models suitable for process design and scale-up
- Troubleshooting of plants for customers on three continents based on analysis of plant data
- Build model interfaces and plant data analysis dashboards

02.2018-09.2021 **Research Assistant**, Institute of Solids Process Engineering and Particle Technology, Hamburg University of Technology.
- Simulated of solids processing apparatuses from food, pharmaceutical and chemical industries
- Cooperation with Princeton University on using neural networks for closure laws
- Prepared three successful grant proposals totaling more than 2 M€
- Published 9 peer-reviewed papers on process optimization

09.2017-01.2018 **Master thesis**, *Evaluation of the Recurrence CFD method for the Simulation of Industrially Relevant Fluid and Particle Dynamics*, BASF SE, Ludwigshafen.
- Implemented a full-physics time-extrapolation method with a speedup of 10,000x

## Education

02.2018-12.2021 **Dr.-Ing.**, Hamburg University of Technology, Grade: with distinction.
Supervisor: Prof. Dr.-Ing. habil. Dr. h.c. Stefan Heinrich (stefan.heinrich@tuhh.de)
Thesis: *A Novel Method for Predicting Product Properties in Fluidized Bed Spray Granulation*

04.2016-01.2018 **M. Sc. Process Engineering**, *Hamburg University of Technology*, Grade: *1.3*.

10.2013-03.2016 **B. Sc. Bioprocess Engineering**, *Hamburg University of Technology*, Grade: *1.6*.

## Qualifications

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|---|---|
| Tech | excellent: Python (pandas, scikit-*, SciPy stack, tensorflow), C++ (MPI, CUDA) |
| Skills | advanced: HPC (high performance computing) infrastructure, dashboard development (dash, React), cloud infrastructure (kubernetes, docker, Azure cloud) |
| Software | Fluid flow simulation: OpenFOAM, ANSYS Fluent, Siemens StarCCM+, Aspherix/LIGGGHTS, CFDEMcoupling |
| Languages | German: native speaker English: fluent |

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## Publications


[1] B. Esgandari, S. Rauchenzauner, C. Goniva, P. Kieckhefen, and S. Schneiderbauer. "A comprehensive comparison of Two-Fluid Model, Discrete Element Method and experiments for the simulation of single- and multiple-spout fluidized beds". *Chemical Engineering Science* (2023). DOI: 10.1016/j.ces.2022.118357.

[2] P. Kieckhefen, S. Pietsch-Braune, and S. Heinrich. "Product-Property Guided Scale-Up of a Fluidized Bed Spray Granulation Process Using the CFD-DEM Method". *Processes* (2022). DOI: 10.3390/pr10071291.

[3] M. Orth, P. Kieckhefen, S. Pietsch, and S. Heinrich. "Correlating Granule Surface Structure Morphology and Process Conditions in Fluidized Bed Layering Spray Granulation". *KONA Powder and Particle Journal* (2022). DOI: 10.14356/kona.2022016.

[4] A. Atxutegi, P. Kieckhefen, S. Pietsch, R. Aguado, M. Olazar, and S. Heinrich. "Unresolved CFD-DEM simulation of spherical and ellipsoidal particles in conical and prismatic spouted beds". *Powder Technology* (2021). DOI: 10.1016/j.powtec.2021.05.012.

[5] P. Kieckhefen. "A Novel Method for Predicting Product Properties in Fluidized Bed Spray Granulation". PhD thesis. Hamburg University of Technology, 2021.

[6] P. Kieckhefen, M. Dosta, S. Pietsch, and S. Heinrich. "Possibilities and Limits of Computational Fluid Dynamics-Discrete Element Method Simulations in Process Engineering: A Review of Recent Advancements and Future Trends". *Annual Review of Chemical and Biomolecular Engineering* (2020). DOI: 10.1146/annurev-chembioeng-110519-075414.

[7] E. Diez, P. Kieckhefen, K. Meyer, A. Bück, E. Tsotsas, and S. Heinrich. "Particle dynamics in a multi-staged fluidized bed: Particle transport behavior on micro-scale by discrete particle modelling". *Advanced Powder Technology* (2019). DOI: 10.1016/j.apt.2019.05.025.

[8] T. Lichtenegger, P. Kieckhefen, S. Heinrich, and S. Pirker. "Dynamics and long-time behavior of gas–solid flows on recurrent-transient backgrounds". *Chemical Engineering Journal* 364 (2019), 562–577. DOI: 10.1016/j.cej.2019.01.161.

[9] S. Pietsch, P. Kieckhefen, M. Müller, M. Schönherr, F. K. Jäger, and S. Heinrich. "Influence of binary and ternary particle systems on the spouting stability in a three-dimensional prismatic spouted bed". *Powder Technology* (2019). DOI: 10.1016/j.powtec.2019.08.065.

[10] P. Kieckhefen, S. Pietsch, M. Höfert, M. Schönherr, S. Heinrich, and F. Kleine Jäger. "Influence of gas inflow modelling on CFD-DEM simulations of three-dimensional prismatic spouted beds". *Powder Technology* 329 (2018), 167–180.

[11] P. Kieckhefen, T. Lichtenegger, S. Pietsch, S. Pirker, and S. Heinrich. "Simulation of spray coating in a spouted bed using recurrence CFD". *Particuology* (2018). DOI: 10.1016/j.partic.2018.01.008.

[12] S. Pietsch, P. Kieckhefen, S. Heinrich, M. Müller, M. Schönherr, and F. K. Jäger. "CFD-DEM modelling of circulation frequencies and residence times in a prismatic spouted bed". *Chemical Engineering Research and Design* (2018). DOI: 10.1016/j.cherd.2018.01.013.

[13] S. Pietsch, P. Kieckhefen, M. Müller, M. Schönherr, F. K. Jäger, and S. Heinrich. "Novel production method of tracer particles for residence time measurements in gas-solid processes". *Powder Technology* (2018). DOI: 10.1016/j.powtec.2018.06.040.