

Advanced Particle Simulation

The team of Advanced Particle Simulation (APS) deals with all multiphase problems involving particle-laden flows or technical applications comprising porous media. We are adept in investigation and optimization of packed and fluidized beds as well as catalysts, filters and scrubbers by means of CFD or CFD-DEM approaches. From the highest level of detail to fast simulation of multiple scenarios we offer our customers a broad range of simulation concepts and assist them in accomplishing their mission.

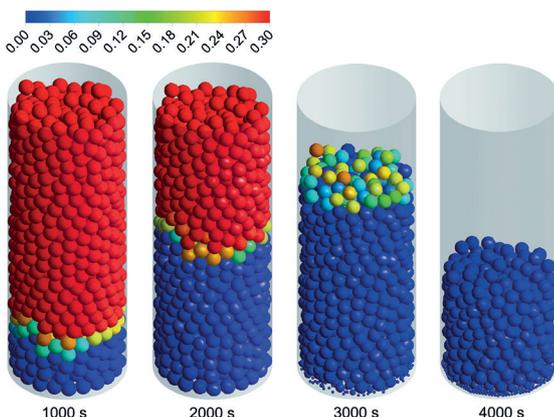
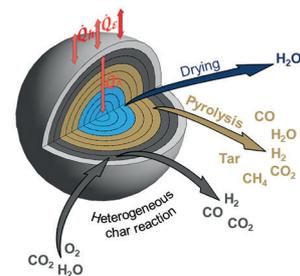
Our Passion

A multitude of today's technical applications comprises particulates or porous media, e. g. solid fuel combustion plants or exhaust gas after treatment systems. We are highly dedicated and versed in handling the intricacies of physical and chemical processes in the presence of particles. We assist our customers with long-term experience in the field of particle-laden flows and our comprehensive expertise in using numerical methods, such as CFD and DEM. Amongst others, we support you with simulation and consulting services for:

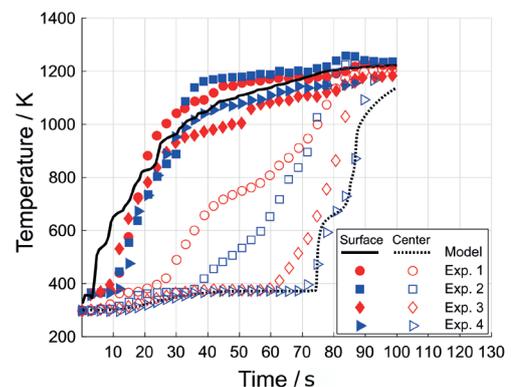
- Biomass, waste and sewage sludge combustion plants
- SCR catalysts
- DeSOx plants (Scrubbers)

The Highest Level of Detail

Particle-laden flows often are a complex interplay of particle-particle as well as particle-fluid interactions, involving numerous forces but also heat and mass transfer. Besides, heterogeneous and homogeneous chemical processes might be system inherent and have to be captured adequately. Therefore, we offer our customers a widely applicable inhouse framework.



▲ Water mass fraction in a fixed bed



▲ Schematic of inhouse particle model and surface as well as core temperature during single particle pyrolysis [Holtz, 2019]

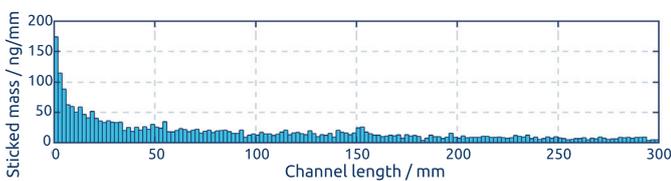
Clogging of SCR Catalysts

Exhaust gas after treatment systems strive for highest conversion rates, a maximum efficiency as well as durability and also size reduction in case of mobile applications. For maritime SCR systems, there exist a clear conflict between durability and compactness, if the catalytic converter is exposed to high particle loads. In order to avoid longer downtimes or irreversible damage of the SCR system, an evaluation of the clogging risk during the design process is valuable. We are equipped with comprehensive knowledge about the fundamentals of deposit formation and offer CFD simulation techniques for clogging risk estimation.



▲ Deposited mass on the frontal face of a maritime SCR catalyst and streamlines of the flow field brick up upstream

The clogging simulation can be performed unsteady or with a time-saving steady state approach. The concept enables comparison of operating conditions, brick sizes as well as cell densities and allows for detailed insights into the deposition process.



▲ Distribution of deposits alongside the brick axis of a maritime SCR catalyst

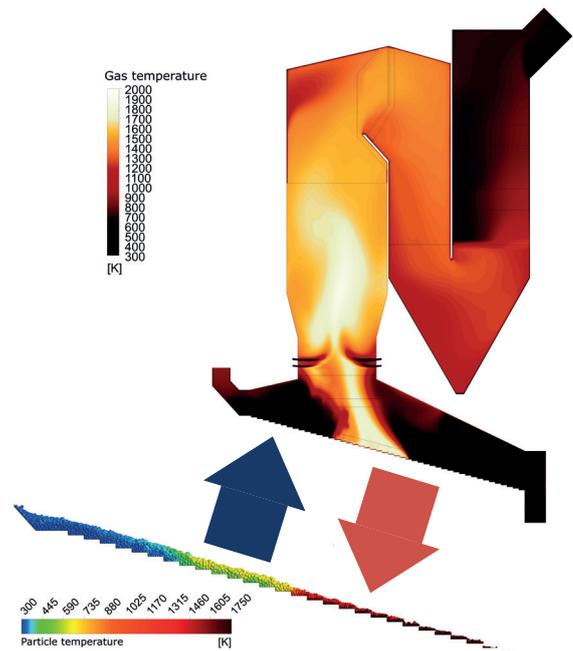
Key Services

- Performing numerical simulation of multiphase systems involving particles or porous media
- Investigation of relevant sub-processes
- Optimization of conversion systems
- Assistance and consulting for theoretical fundamentals or system improvement

**Are you interested in further information?
Feel free to contact our friendly experts.
Together we will find a solution for your challenges.**

Combustion Improvement

Emission abatement, fuel consumption as well as deposit formation and heat exchanger corrosion are central issues of many power plant operators. These are combustion inherent challenges, directly linked to the fuel conversion process and the fuel used. We possess expertise in thermochemical conversion of biomass, waste and sewage sludge and offer various simulation techniques ranging from fast-solving steady CFD to highly detailed CFD-DEM concepts for combustion analysis. With this, we can ensure to meet your project related requirements.



▲ CFD-DEM coupling for combustion analysis in a biomass grate firing system

Key Benefits for Your Project

- Fundamental knowledge of physical and chemical interactions between particulates and fluid
- Long-term experience in the field of numerical simulation of particle-laden flow and porous media
- Widely applicable portfolio of simulation techniques to ensure the best approach for your project situation
- Risk-free and detailed investigation of hardly accessible processes
- Direct communication to project managers and responsible operator



ADVANCED PARTICLE SIMULATION

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