

## Pioneering Digital Engineering Across Industries

**SADEN GmbH** – Discrete Element Simulation and Digital Engineering

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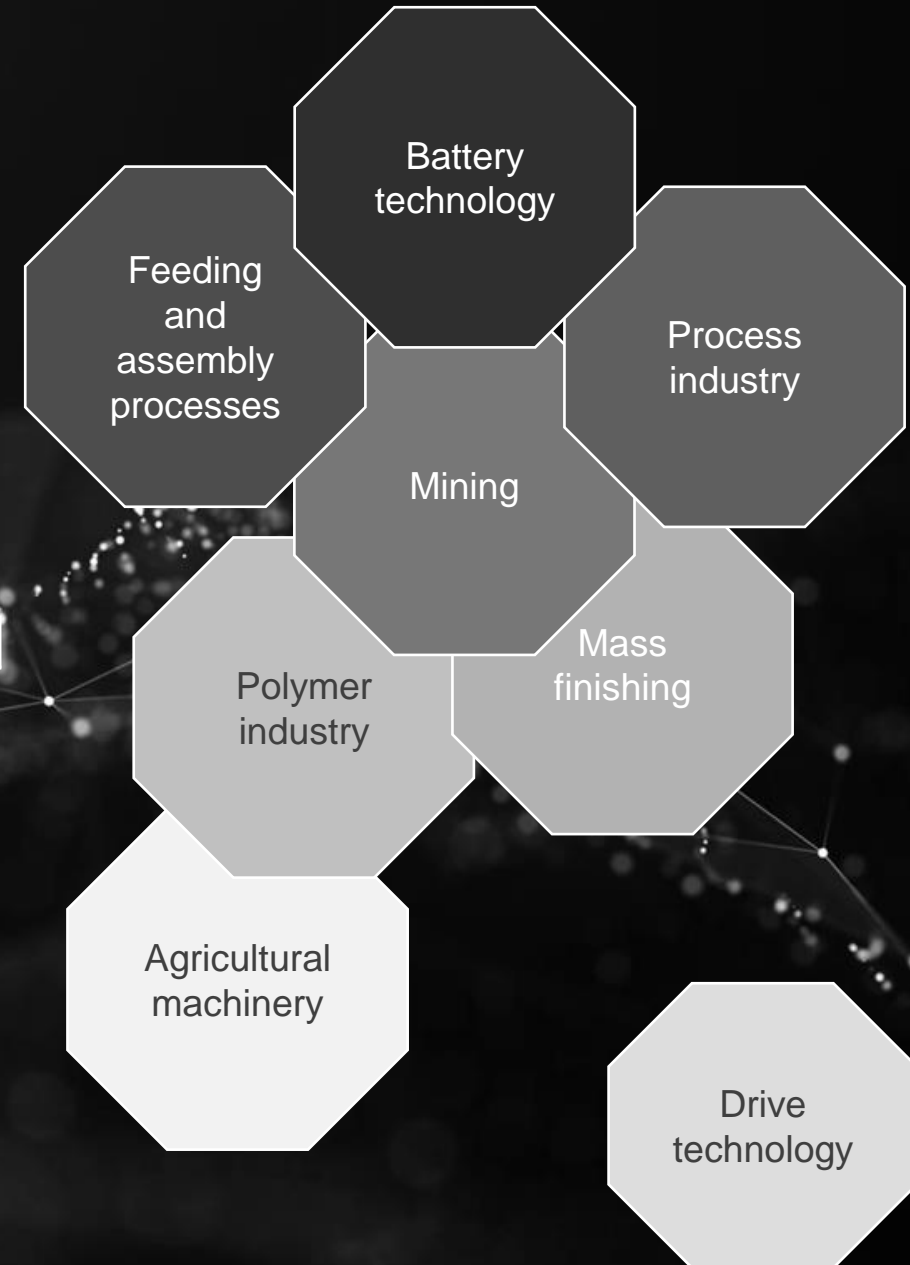
- Founded 2022
- Karlsruhe

### Field of activity

- Discrete Element Method, DEM
- Smoothed Particle Hydrodynamics, SPH
- Focus: particle-based simulation methods
- Computational Fluid Dynamics, CFD
- Finite Element Method, FEM (non-linear, multi-body)

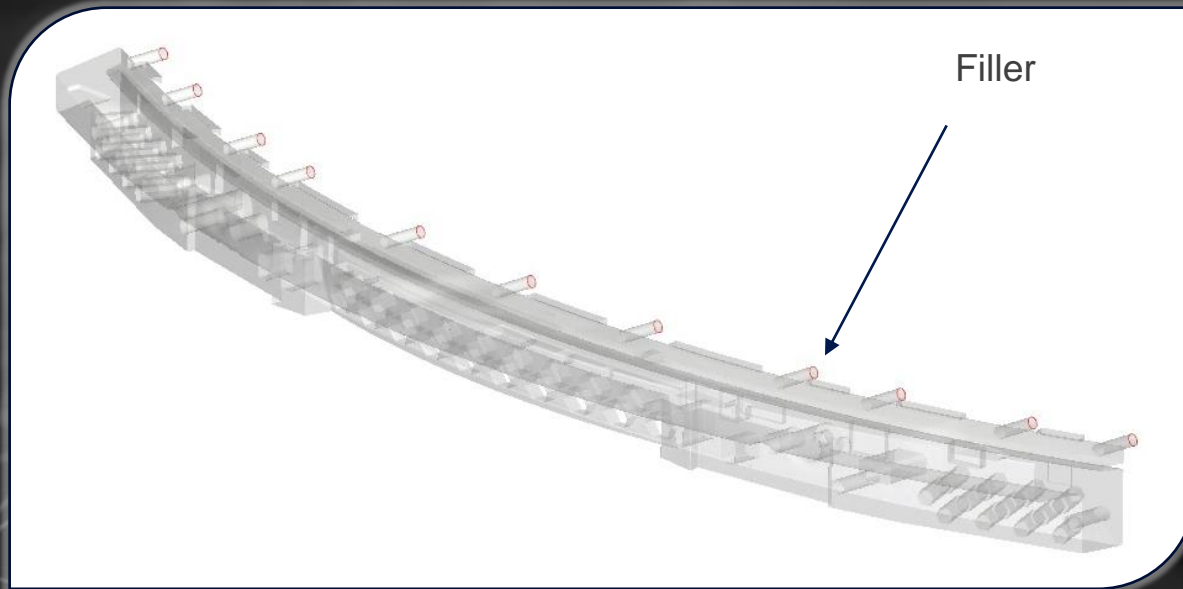
### Complete coverage of „simulative process chain“

1. Material analysis and characterization
2. Simulation of systems
3. Engineering

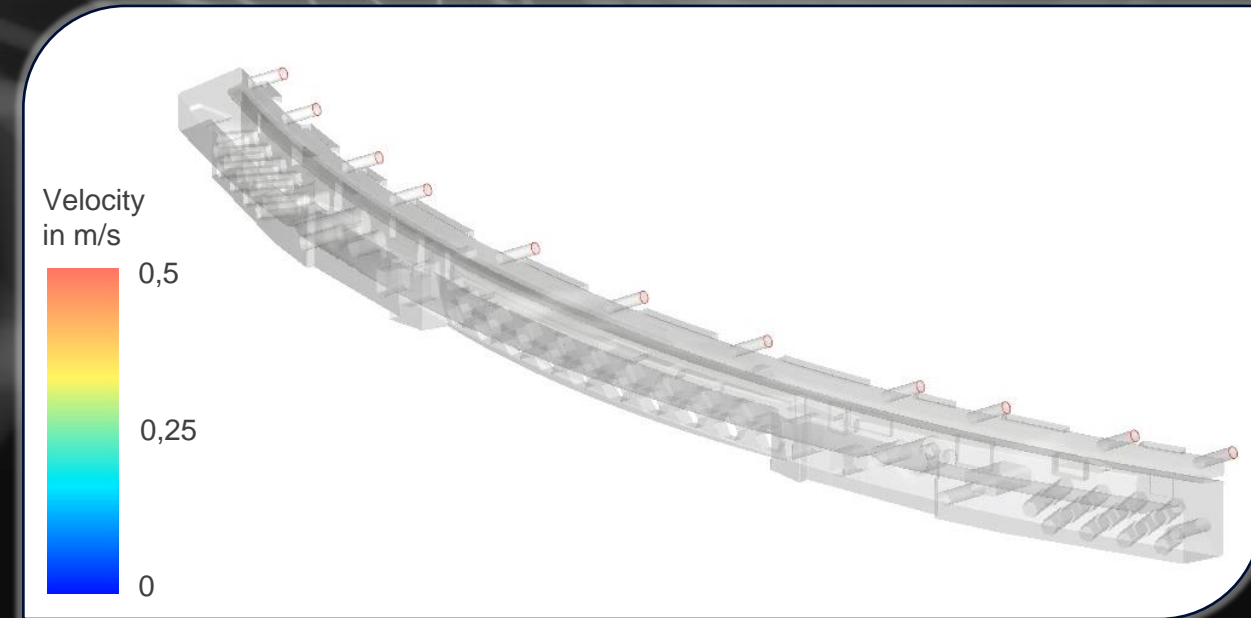


## Particle foam filling simulation

- Exemplary (generic) workpiece similar to a bumper
- 11 fillers, pressure filling
- Compression of beads by back pressure is considered
- EPP, expanded polypropylen



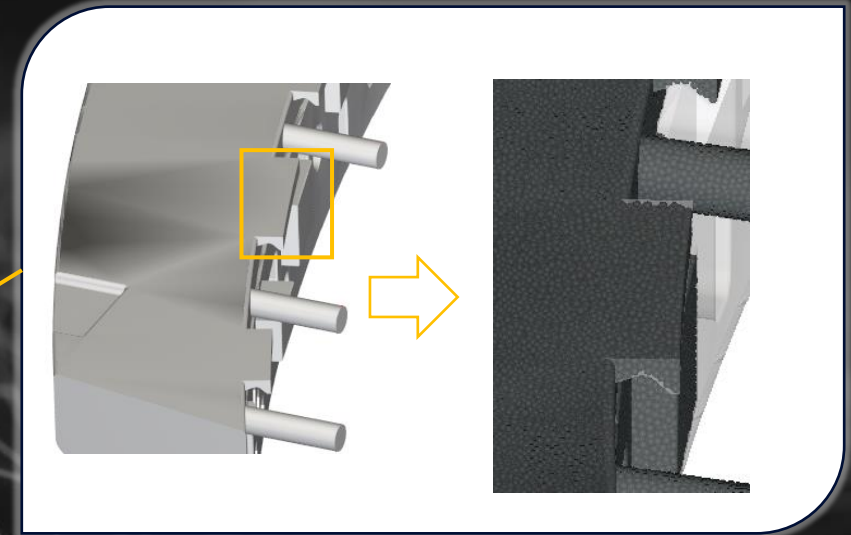
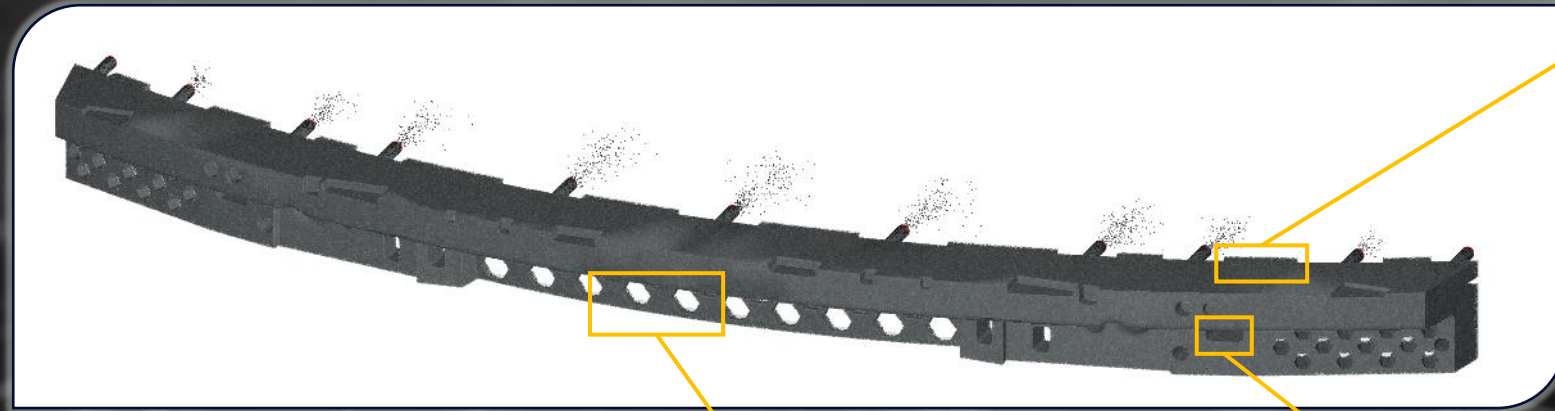
Filling process, beads with fixed color



Filling process, beads colored by velocity

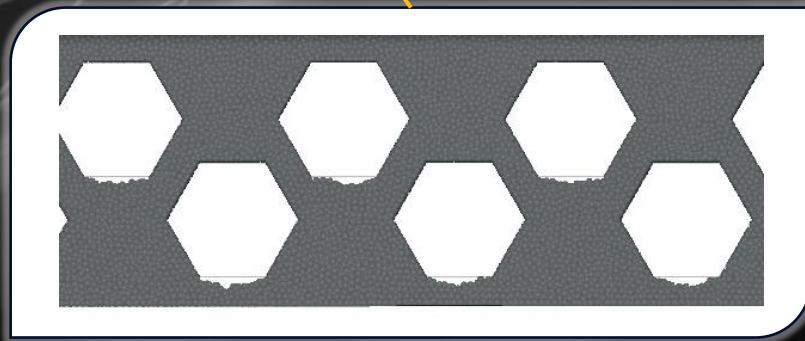
## Particle foam filling simulation

- Detailed analysis
- Generally acceptable filling result  
→ underfilled areas will get filled by expanding beads



Overhanging geometry filled

Slightly underfilling  
at hexagon



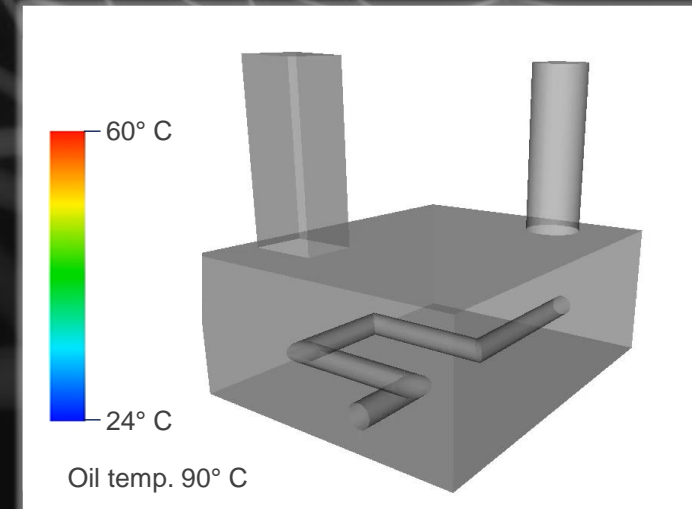
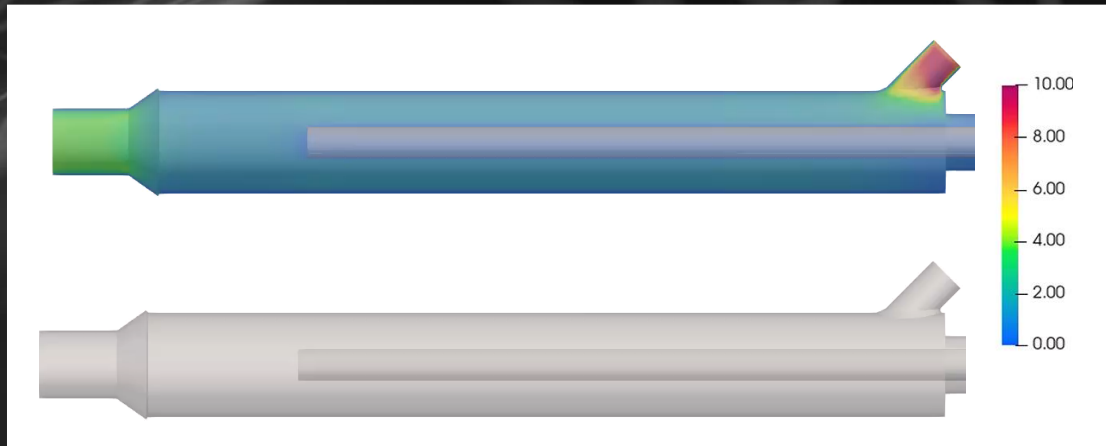
## Further simulations

Use case: Particle foam

Dosing of the beads and pneumatic transport of the beads

Flow through the injector

Heat flow in the mold incl. cooling by water nozzles





Material analysis and characterization

Validation of simulations

Analysis and optimization of processes and machines

Process and machine design

Automation of simulation processes

Development of simulation models and methodologies

Simulation data management and analysis (incl. machine learning)

Program development for data visualization and evaluation

Discrete  
Element  
Method,  
DEM

Smoothed  
Particle  
Hydro-  
dynamics,  
SPH

FEM

CFD

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