CONTACT

Fraunhofer
IWM

FRAUNHOFER INSTITUTE
FOR MECHANICS OF MATERIALS IWM

SERVICES

Process simulation and visualization

SimPARTIX® simulations enable us to help you carry out specific optimization measures. In doing so, you benefit from our many years of experience in the field of the numerical simulation of granular materials and complex fluids.

Software licenses

If you would like to deploy SimPARTIX® yourself, then you can purchase an individual license from us for your particular applications. You can choose which parts of the simulation software you wish to use.

TYPICAL APPLICATIONS

Process optimization in the fields of:
- Powder technology (die filling, compaction, sintering)
- Shape forming (tape casting, extrusion)
- Printing processes (screen printing)
- Separation processes (wire sawing, machining)

Material behavior of:
- Powder, bulk material, granular media
- Suspensions, pastes, slurries, gels

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Institute management
Prof. Dr. Peter Gumbsch

The Fraunhofer Institute characterizes, simulates and evaluates the behavior of materials in components and systems during manufacture and service. The aim is to improve safety, reliability, life time and functionality of components and systems as well as the cost-effectiveness of processes.

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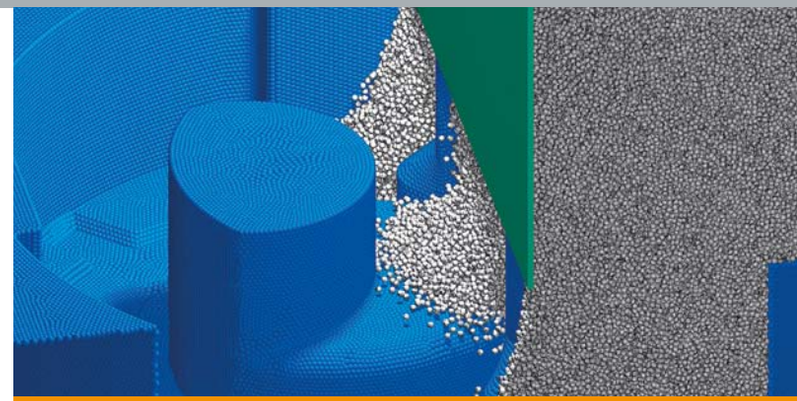
www.simpartix.com



SimPARTIX®

PARTICLE-BASED SIMULATIONS OF FLUIDS AND GRANULAR MATERIALS

www.simpartix.com

DYNAMIC PROCESSES REALIZATION AND OPTIMIZATION

SimPARTIX® is an innovative and powerful simulation suite for modeling the **dynamics of fluids and granular media on the basis of particles** developed at the Fraunhofer Institute for Mechanics of Materials IWM in Freiburg.

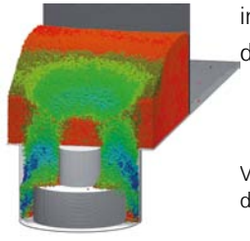
Based on sound physical models, the software uses the Discrete Element Method (DEM) and the Smoothed Particle Hydrodynamics Method (SPH) to investigate the **behavior of various classes of materials in the most diverse applications.** The detailed evaluation and high-resolution 3D graphics of the simulations provide in-depth insights into the dynamics of a process.

Typical applications for SimPARTIX® are **powder technology production processes**, the **flow behavior of suspensions and pastes** as well as **the dynamics of bulk materials**. Customers from industry use the simulation suite in collaboration with the Fraunhofer IWM to thoroughly optimize their manufacturing processes, increase process efficiency and reduce costs.

CASE STUDIES

Die filling

SimPARTIX® simulates the density distribution during die filling at particle level. This allows for a computational process optimization aimed at achieving a homogeneous bulk density. The homogeneous filling of the die prior to compaction is an important requirement for maintaining the dimensional accuracy of the final part.



Visualization of the powder flow during die filling (color coding: particle velocity).

Magnetorheological fluids

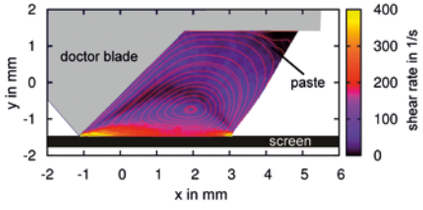
Magnetorheological fluids (MRF; iron particles in carrier oil) are used in automotive clutches where they are responsible for continuously adjustable torque transmission. Particle-based simulations give us insight into the mechanisms within the clutch so that we can investigate the influence of individual MRF parameters on torque transmission.

Simulation of the MRF in the shear field between two clutch discs.

CASE STUDIES

Screen printing

Simulations of the screen printing of circuit boards give us information about the flow and peeling behavior of the paste. SimPARTIX® is used to model different pastes and to identify the properties which guarantee the optimum printed image, helping to avoid expensive trial-and-error studies.



Flow behavior of a precious metal paste during the printing process.

Tape casting

Simulations of ceramic tape casting at the Fraunhofer IWM are used to analyze the influence of several material and process parameters on tape properties. This analysis covers the macroscopic flow behavior as well as the structure at the microscopic level.

Microscopic representative volume cell of a casting slurry (only solid particles are illustrated).