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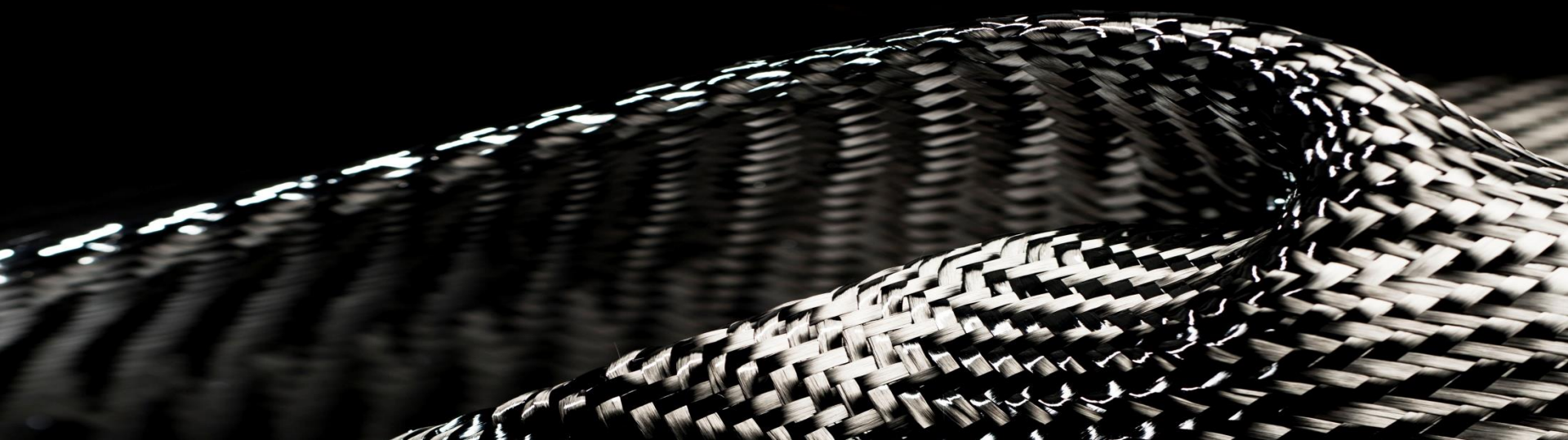
Virtual Composite Solutions

Leichtbaulösungen für die Zukunft

Dr.-Ing. Benedikt Fengler

Hannover, 03.04.2019



Introduction and Motivation

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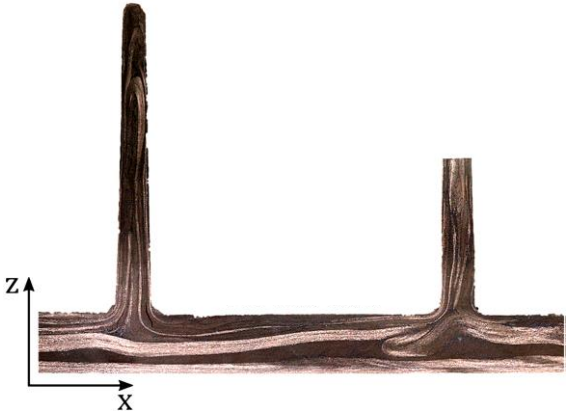
- Lightweight design is highly relevant in automotive and aerospace industry
  - Reduction of CO2 emission
- Fiber reinforced composites
  - Excellent specific material properties
  - Material properties emerge during manufacturing process
  - Prediction and consideration of manufacturing effects is crucial for a reliable part performance prediction
- Component development process with simulation support, ensures…
  - a reduction of necessary prototypes
  - an optimized manufacturing processes

BMW i3 - Composite-metal hybrid concept
(Source: BMW AG)



Sectional view: Displacement of fibers during mold filling process
(Source: PhD-Thesis D. Bücheler)

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Industries and applications

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Focus Industries

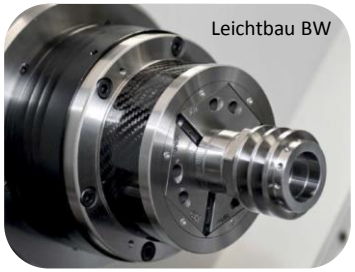
- Aerospace
- Automotive
- Motor Sport
- Sport and Leisure
- Mechanical Engineering

Fields of applications


BMW AG


Smcbmc-europe.org

Giant Bicycles



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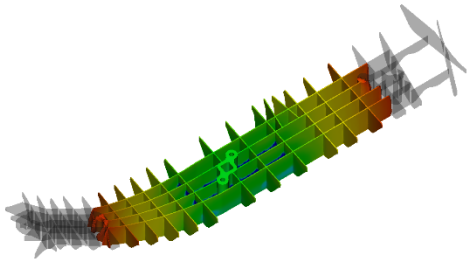
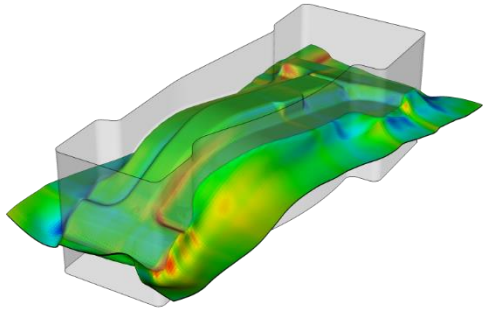
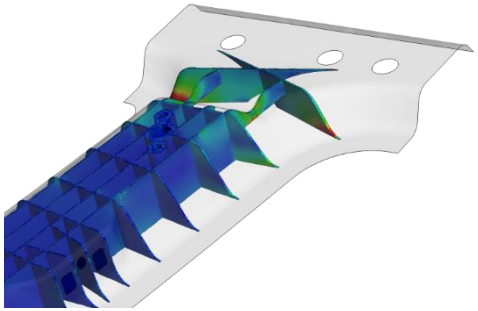
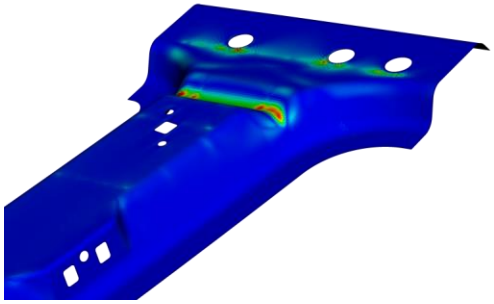
Process simulation



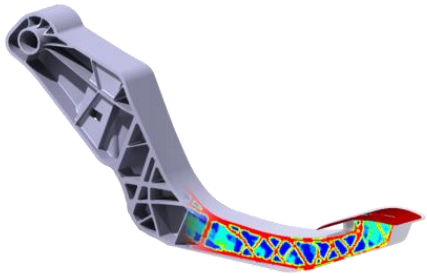


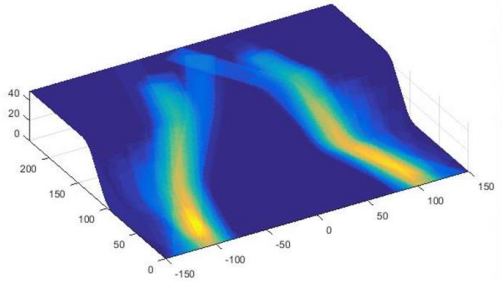
Structural simulation





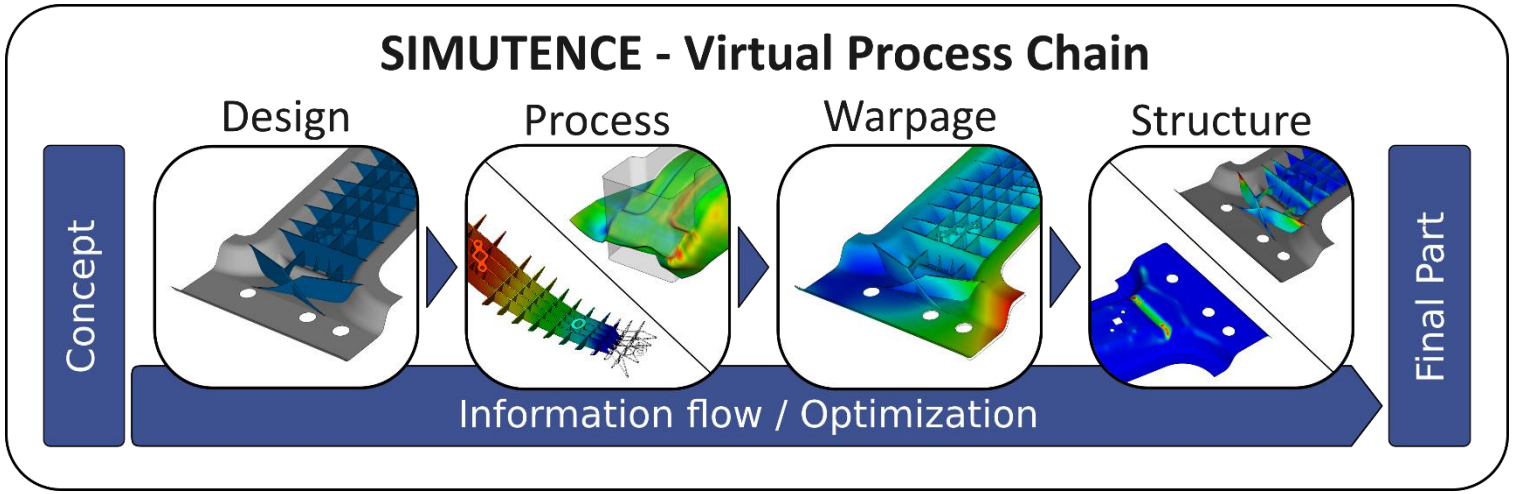
Design & Optimization





Virtual Process Chain

Services



Benefits due to a continuous CAE chain:

- Initial and early verification of the part manufacturability
- Consideration of manufacturing effects in structural performance prediction
- Enabling the iterative optimization over multiple simulation steps
  - Virtual design and process optimization
  - Accelerated design loops to reduce development time and resources

Our Mission

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Our mission is to help **designers and manufactures**

of composite parts to **develop and optimize**

lightweight parts and processes by our **virtual process chain**

Product Portfolio

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Consulting

- Consulting for process and structural simulation of composites
- Seminars and training for composite design

Engineering Services

- Product and process development along the virtual process chain
- Holistic and reliable design of fiber-reinforced composite parts and hybrids

Software add-on supply

- Development and supply of advanced simulation add-ons for commercial software
- Support and training for supplied simulation methods

Method Development

Development and application of advanced methods

Academic Method Development

- Long-year expertise in process and structural simulation of composites and hybrids
- Method development within PhD theses
- Public funded applied and fundamental research projects

Applied Virtual Design & Method Development

- Spin-off company of KIT-FAST
- Further development of simulation methods to the industry's needs
- Industrial projects for engineering services, consulting and software supply
- Application-oriented research projects

Interdisciplinary R&D Network

Holistic solutions from a single source

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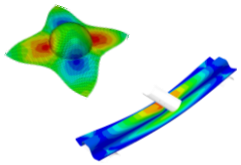
Academic Method Development

KIT Karlsruher Institut für Technologie

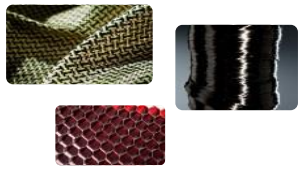
FAST Institut für Fahrzeugsystemtechnik



Material Characterization

KIT Karlsruher Institut für Technologie

IAM Institut für Angewandte Materialien



Applied Virtual Design & Method Development

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Manufacturing Process Development

Fraunhofer ICT
Germany

Western
North America

UNIST
ULSAN NATIONAL INSTITUTE OF SCIENCE AND TECHNOLOGY
Asia

Design Optimization

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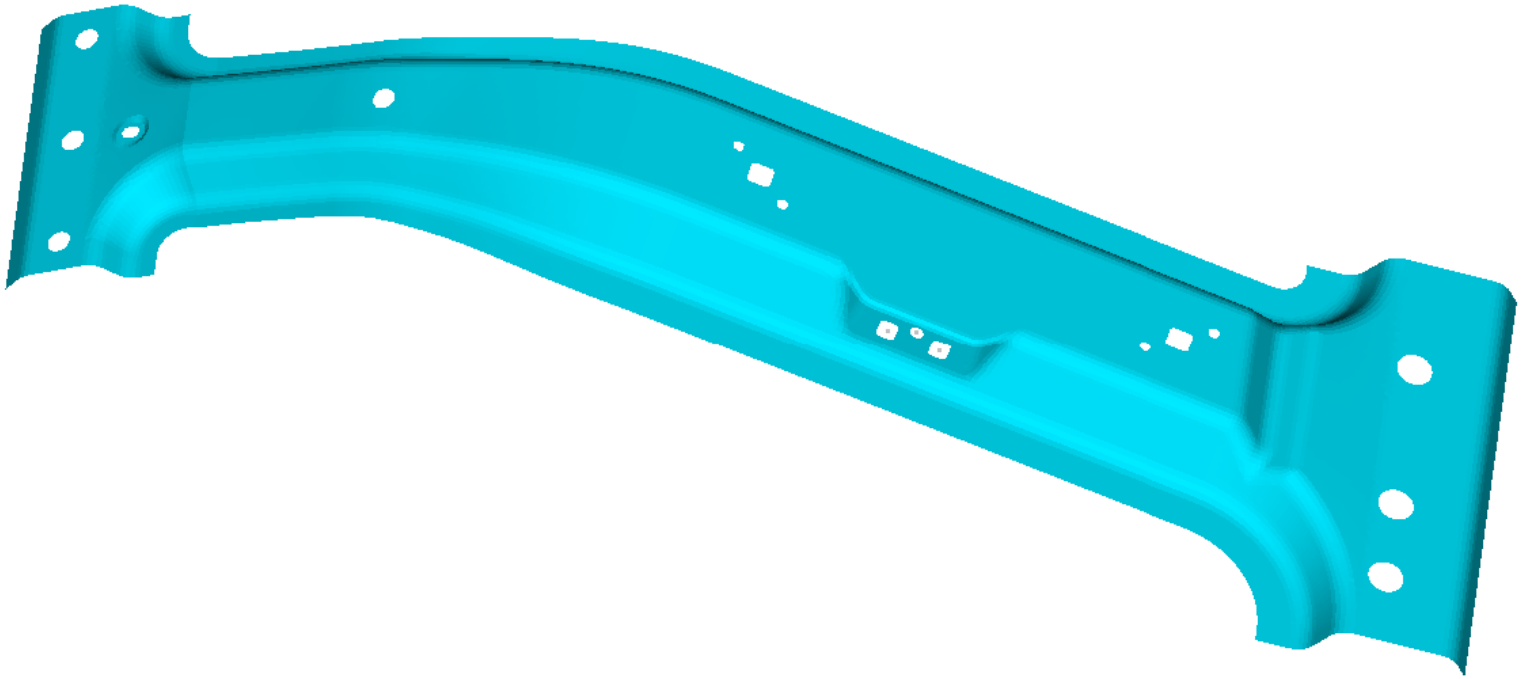
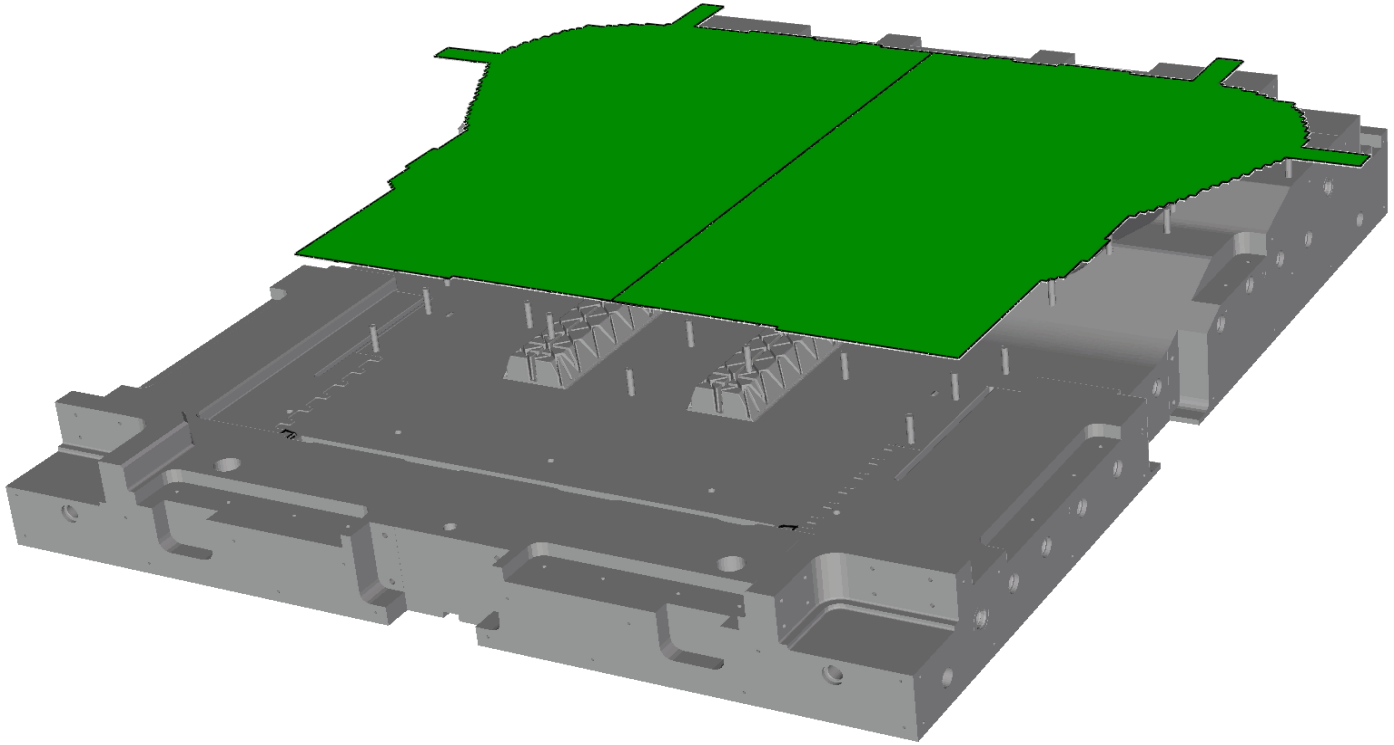
- Optimization methods for **advanced part design** processes
- Structural optimization for **new concepts**
- **Layup optimization** for high performance laminates



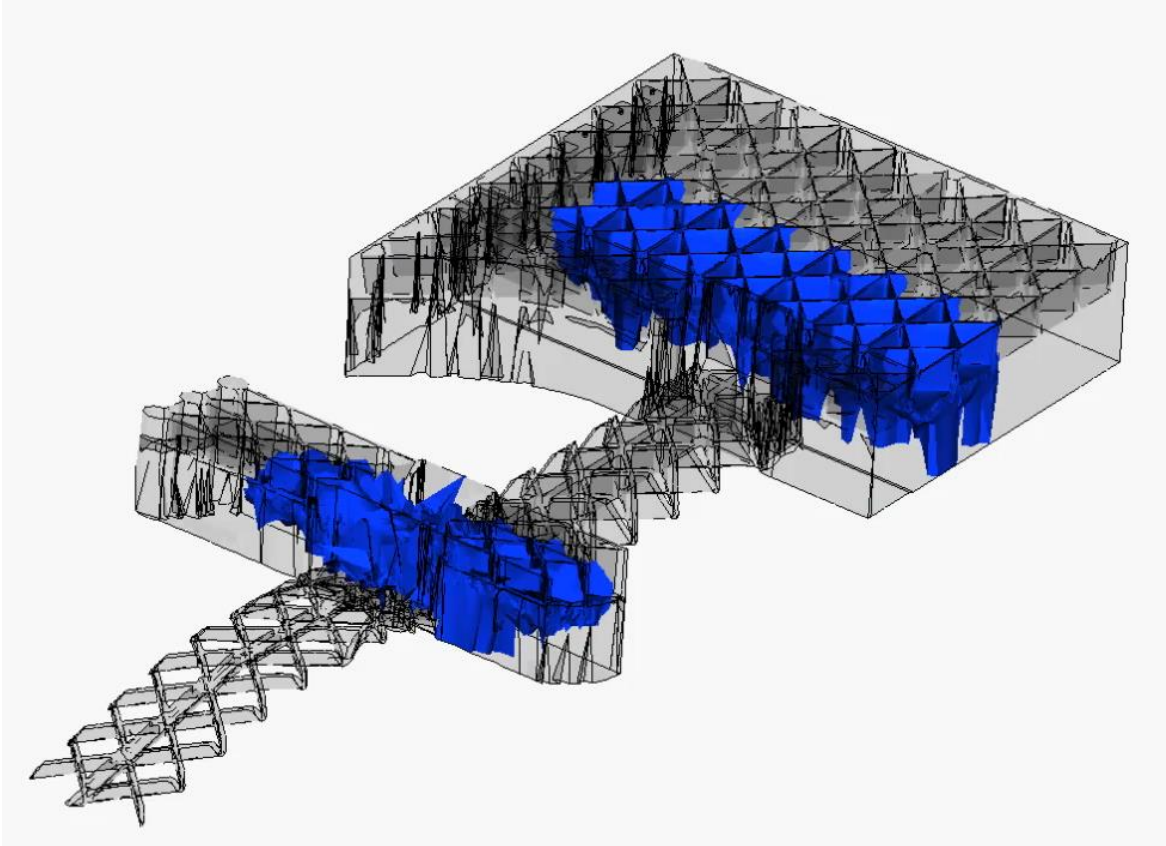
Thermoforming simulation

- Prediction of **wrinkling behavior**
- Determination of a tailored blank for **near-net shaped forming**
- Prediction of **fiber orientation** for structural analyses



Process Simulation

- Ensuring of **mold filling and balancing** of LFT strands
- Prediction of **press pressure** and center of gravity
- Prediction of **fiber orientation distributions**



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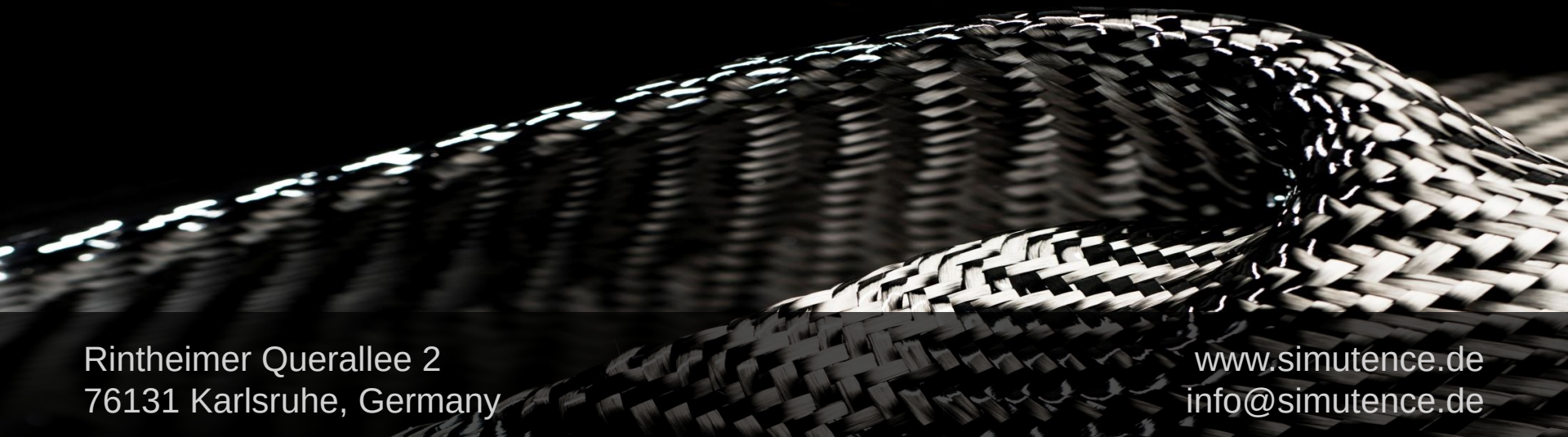

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