



Ingenieurbüro Schumacher  
Faserverbundkonstruktion & Leichtbau

# Company Profile

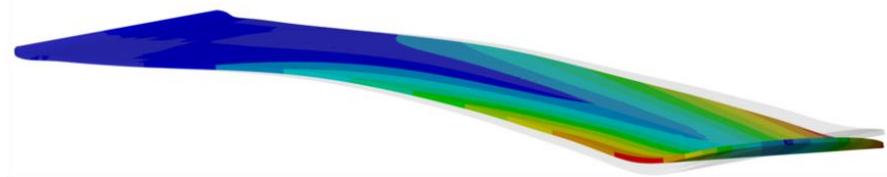
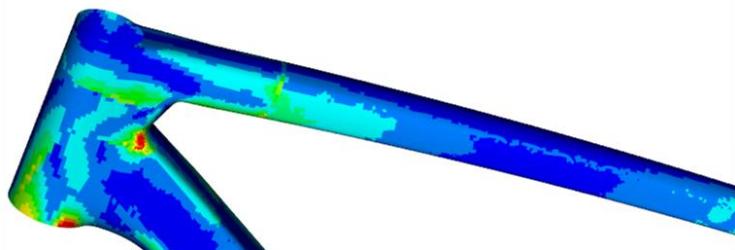
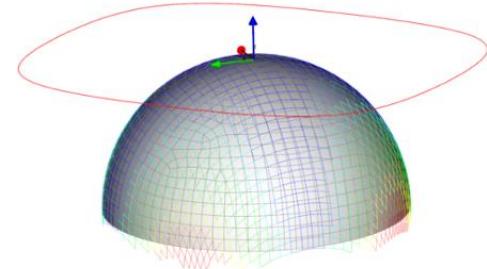
FkL Ingenieurbüro Schumacher  
M.Sc. Jana Schumacher

[www.fkl-ing.de](http://www.fkl-ing.de)  
+49 6150 830 89 84

# Field of action

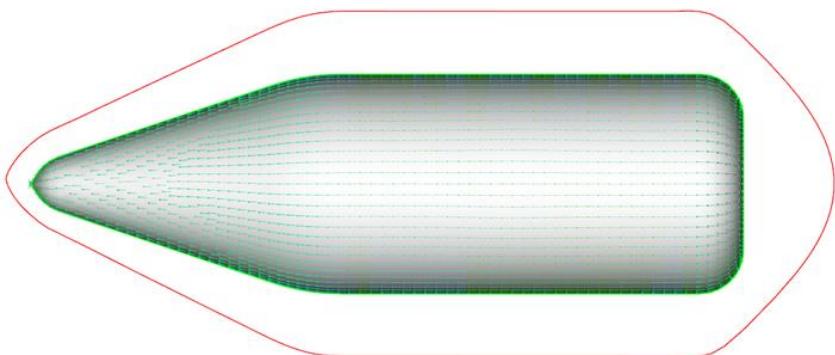
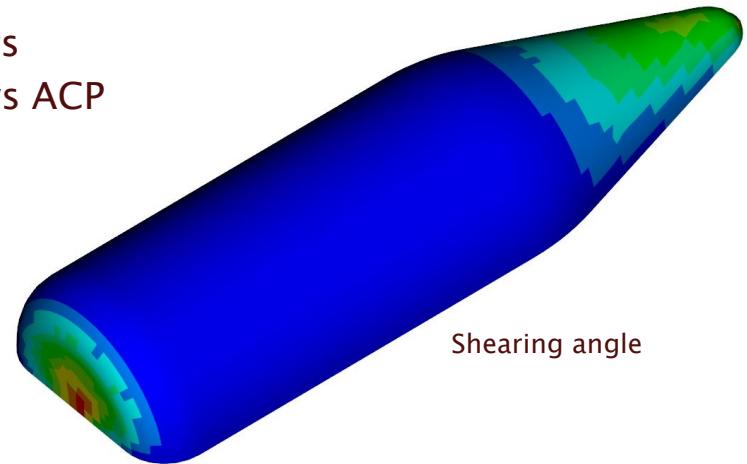
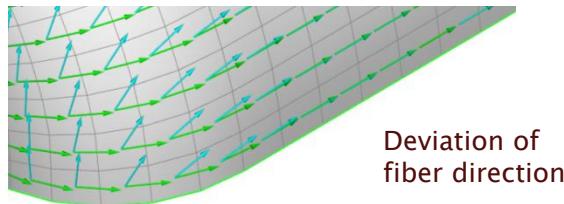
## Construction and calculation of composite parts

- Supporting the compilation of the performance specifications
- Choosing suitable materials and production processes
- Material-copied geometry-design
- Draping simulation and deduction of pre-cup parts
- FEA stress analysis according to VDI 2014
- Stiffness analysis and calculation natural frequencies
- Workshops around the subject „calculation and simulation of composites“
- Used software: Ansys Mechanical and Ansys Composite PrepPost (ACP)

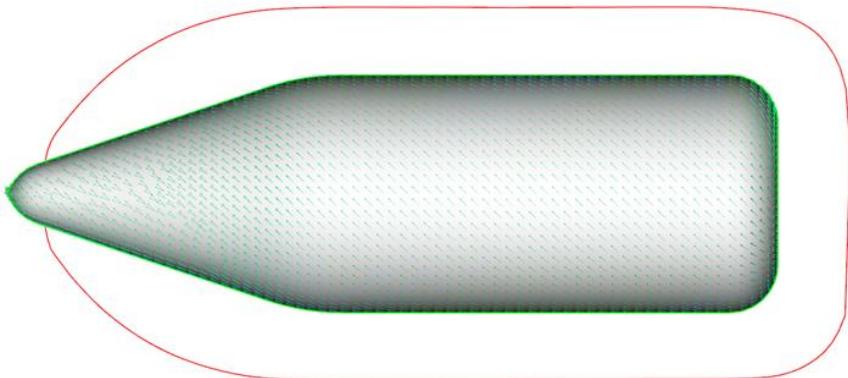


# Draping simulation

- Determination of fabric specific draping parameters
- Adding the parameter to the material cards of Ansys ACP
- Define the draping points
- Determination of the draped fiber direction
- Deduction of pre-cup parts as 2D-Scatch (.dxf)



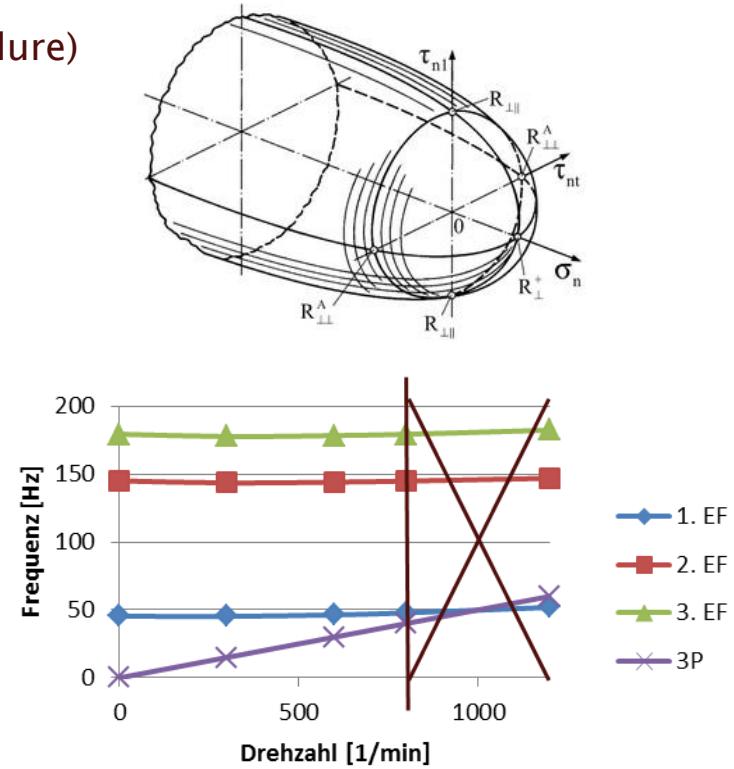
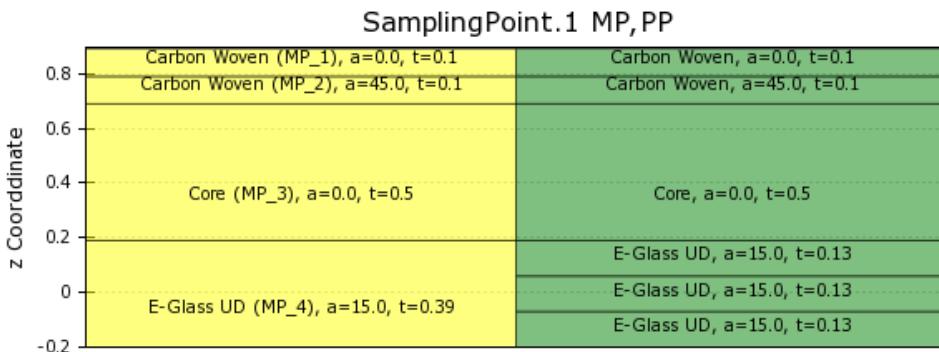
Pre-cut part of the 0°/90°-layer



Pre-cut part of the ±45°-layer

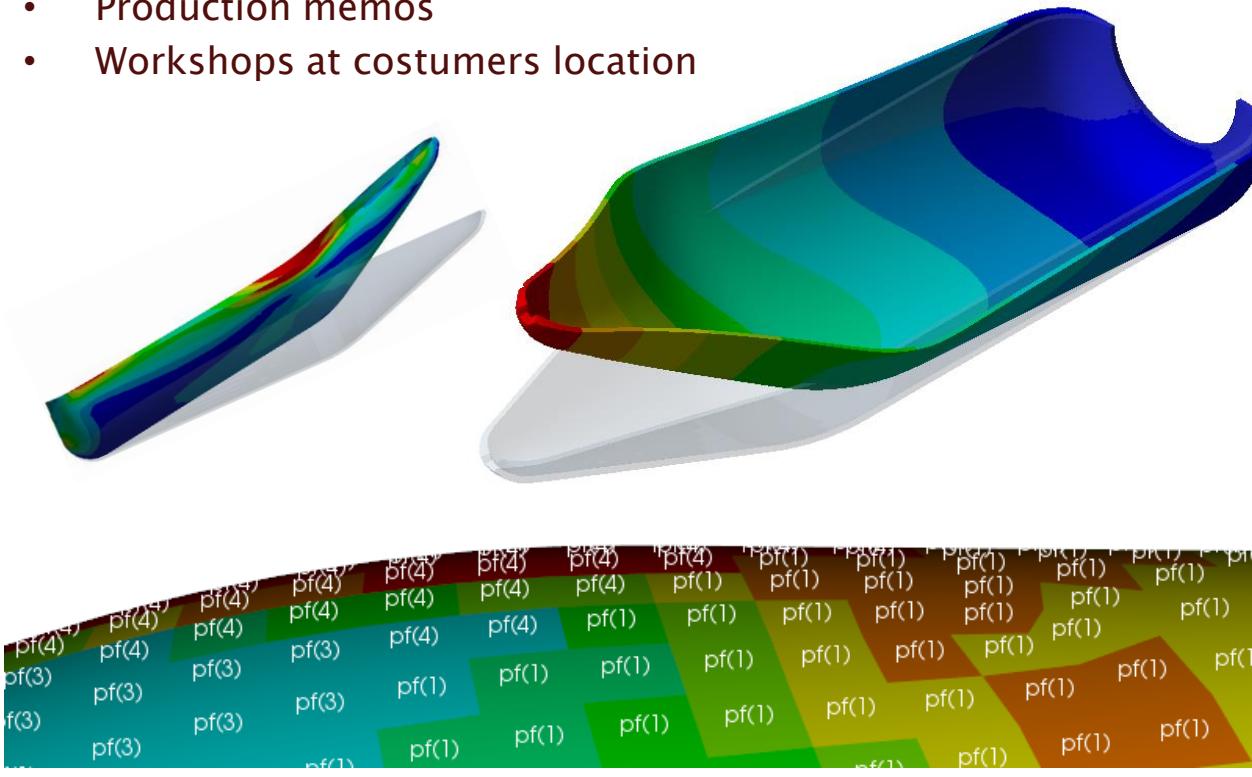
# FEA-Calculation

- Layer by layer setup in the ACP pre-processor
- Optimization of the whole laminate, including fiber angle of the single layers, pertaining to the following aspects:
  - Inverse reserve factor (fiber and inter-fiber failure)
  - Stability
  - Stiffness
  - Natural frequencies
  - Weight
  - Feasibility
  - Costs



# FEA-Calculation Evaluation

- Custom-made report of the results
- Documentation in form of presentations
- Lay-up plans
- Production memos
- Workshops at costumers location



The figure displays three screenshots of software interfaces related to FEA calculations:

- FEM-Berechnung Ergebnisse:** Shows contact information for FKL Ingenieurbüro Schumacher (M.Sc. Jens Schumacher, phone: +49 8150 980 33 94).
- Ziele und Anforderungen:** Lists requirements:
  - Hier identifizieren Ihre Anforderungen abhängig von Temperaturbereich -10°C ... +50°C
  - Welche Ziele sollen verfolgt werden
    - Gesamt
    - Effizienz
    - Produktionsanzahl
  - Lastfälle:
    - F = 70 N
    - M = 20 N/mm

Includes a schematic of a cylindrical part under load F and moment M.
- FEM-Berechnungen Auswertung:** Lists evaluation tasks:
  - Maßgeschneiderte Ausarbeitung der Berechnungsgegebnisse
  - Une Dokumentation in Form von Präsentationen
  - Bildergalerie
  - Fertigungsinweis
  - Workshop beim Kunden vor Ort

Includes a 3D model of the part and a stress-strain distribution plot.

# Part of the „Ingenieursgemeinschaft FMS“



Dr.-Ing. Daniela Feldten



Dr.-Ing. Christoph Möller



M. Sc. Jana Schumacher

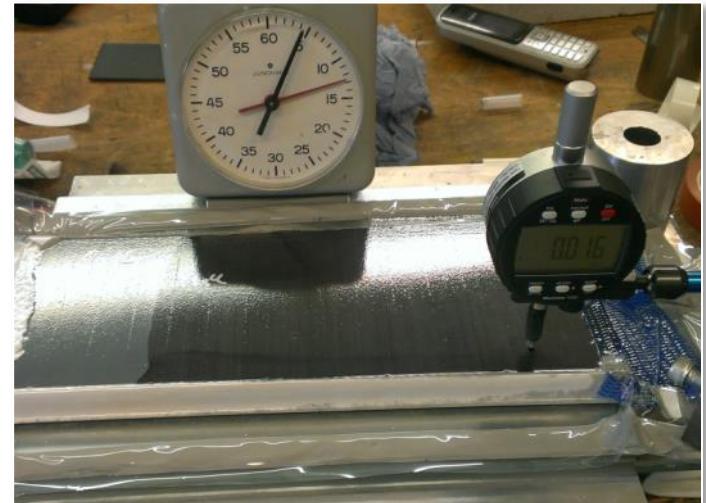
Shared address:

Egerländer Str. 6  
64331 Weiterstadt  
Germany

# More activities of the „Ingenieursgemeinschaft FMS“

## Production processes and prototype building:

- Material and production process testing
- Construction of samples and prototypes

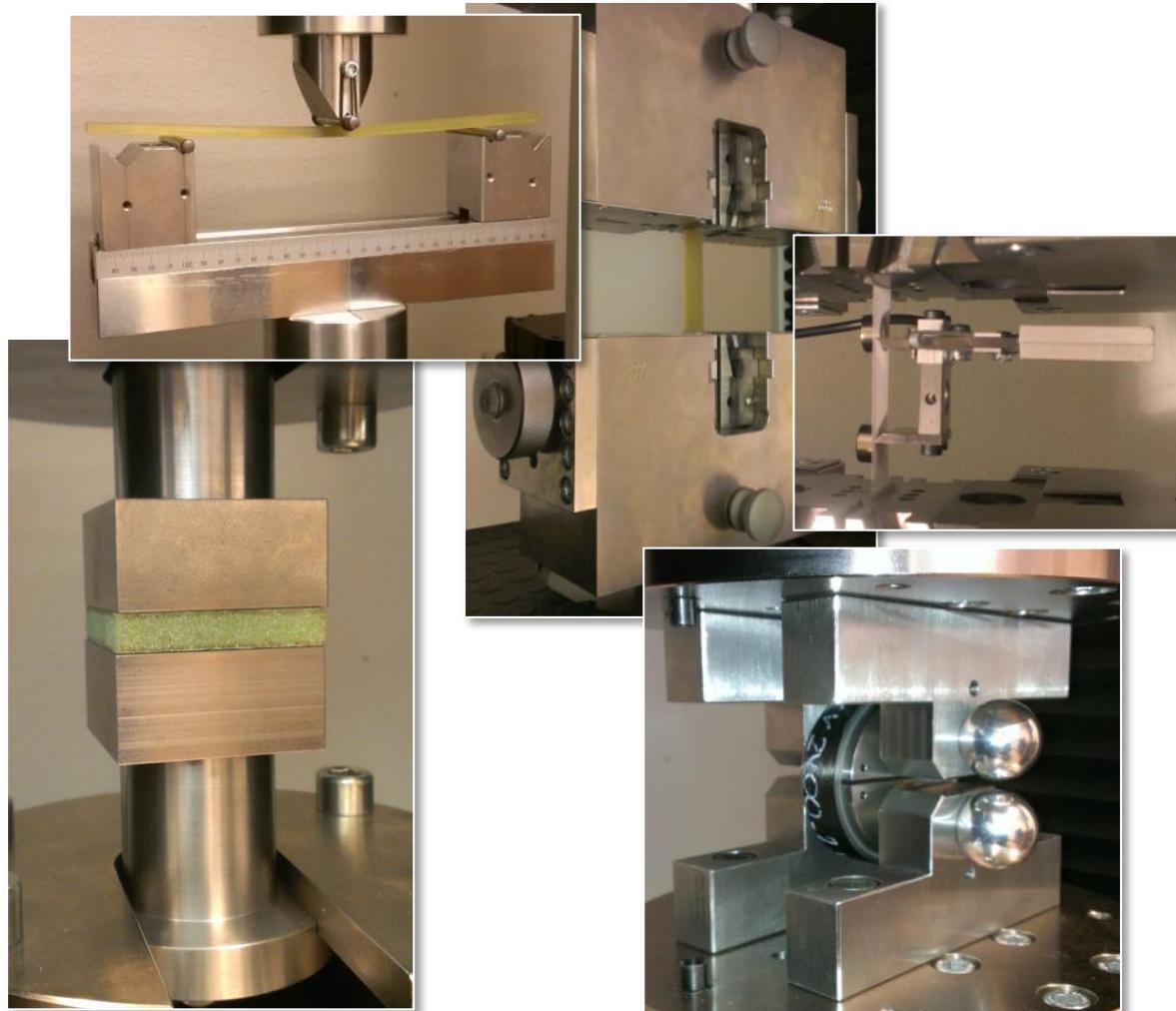


# More activities of the „Ingenieursgemeinschaft FMS“

## Material and component testing:

### Zwick 1475

- $F_{\max} = \pm 110 \text{ kN}$
- $v_{\text{test}} = 0,001-1000 \text{ mm/min}$
- $s_{\text{test\_max}} = 1750 \text{ mm}$
- Klasse 0,5 (DIN EN 7005 / 9513)



We're looking forward  
for your inquiry

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