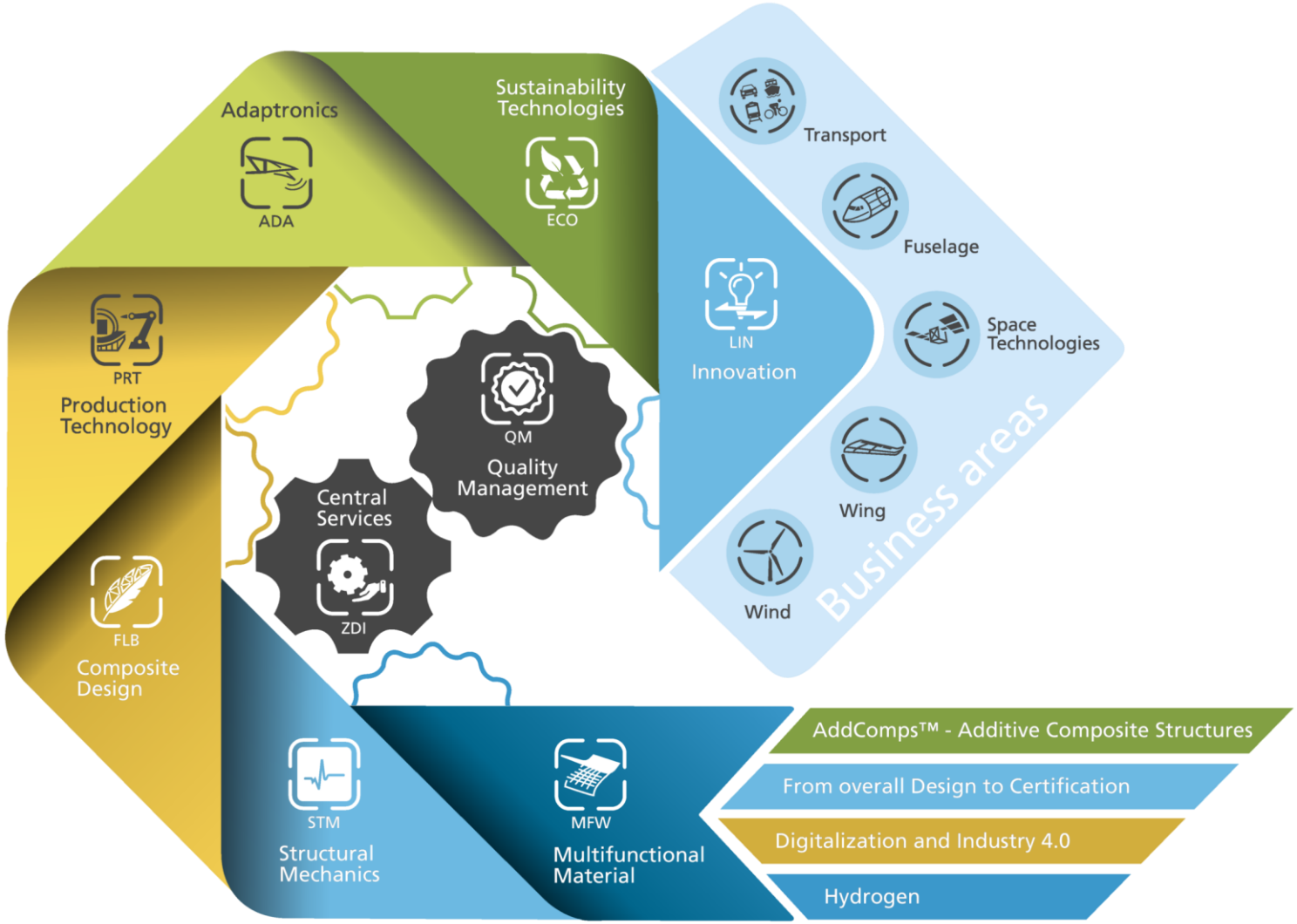
ADDITIVE FUNCTIONALIZATION

Maik Titze – Institute of Lightweight Systems, German Aerospace Center

Combination of short & continuous fibre-reinforced material for Additive Functionalization of a multi-curved thermoset shell

- Additive Functionalization for cost efficient production of composite parts
- Overprinting of a multi-curved shell with short & continuous fiber reinforced material
- Combination of thermoset and high temperature thermoplastic
- Demonstration of industrially available process chain including quality assurance

Institute of Lightweight Systems



7 Scientific Departments

- Complete process chain for the lightweight system construction of the future
- 180 employees in Braunschweig, Stade, Bremen, Aachen, Cochstedt

Quality Management – certified according to:

- ISO 9001
- Test Laboratories DIN ISO 17025 and Nadcap

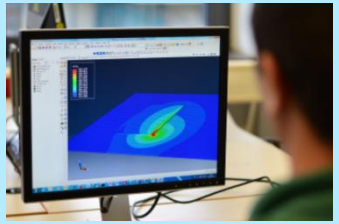
Centrale Services

- Administrative services for the institute

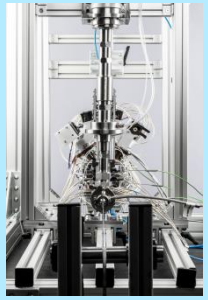
Strategic field – AddCompS™ – Additive Composite Structures

Functionalization of thermoplastics for improved performance

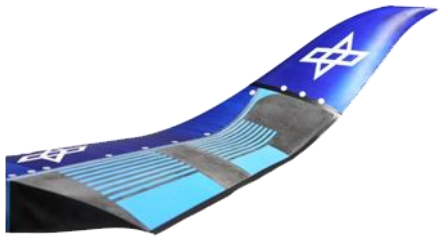
<< How can additive technologies contribute an added value for light weight structures >>

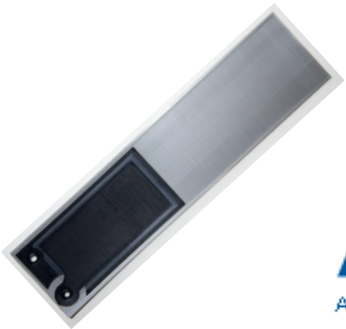


Simulation of additive Extrusion



Printing with short & endless fiber reinforced materials



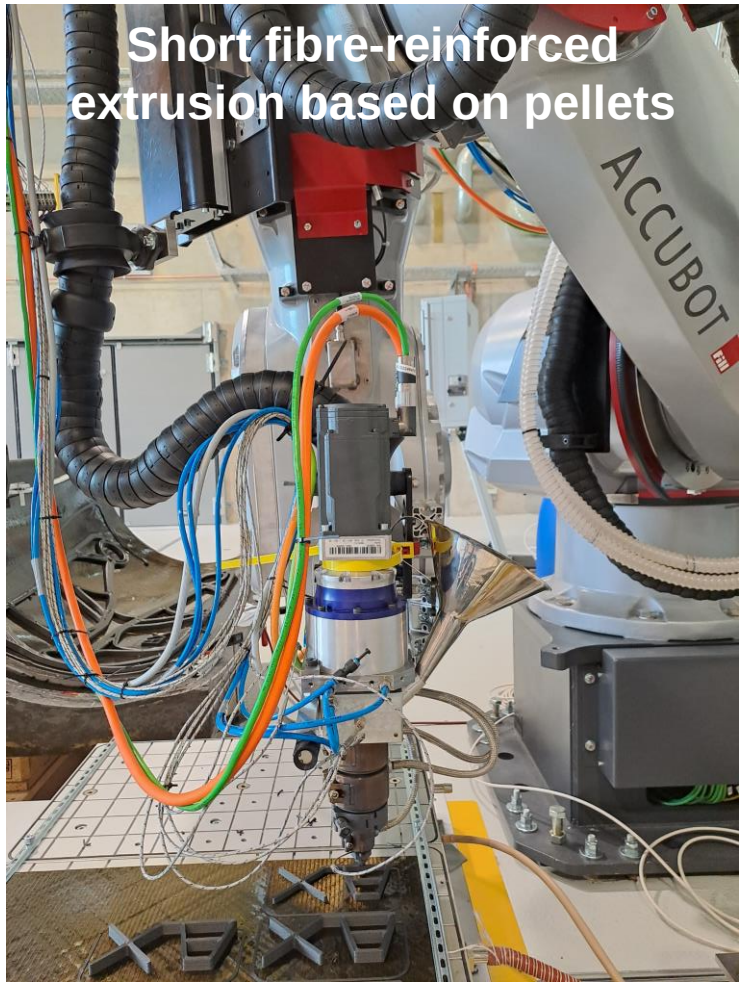


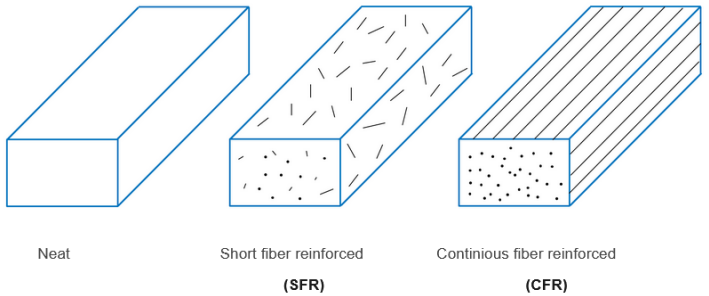
ADDITIVE EXTRUSION

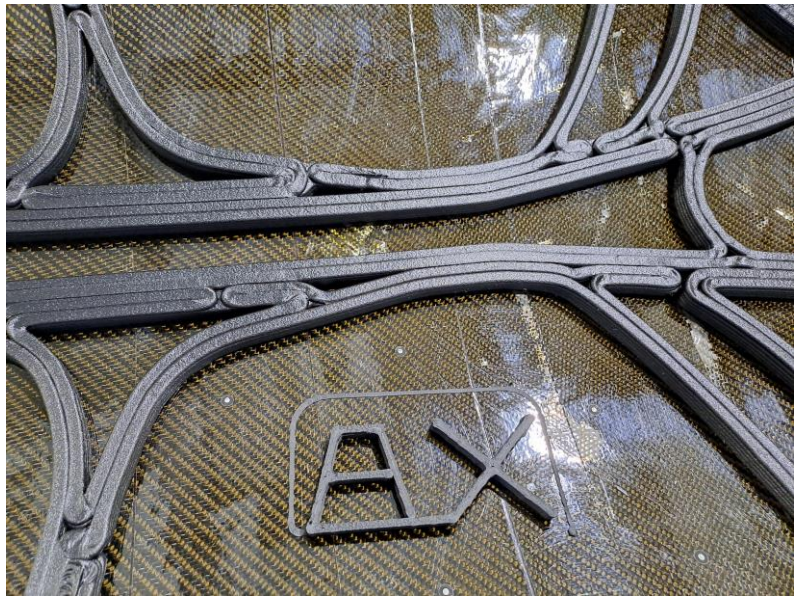
- Combination of manufacturing techniques
- Printed pressure actuated cells
- Sensors printed into structures
- Innovation Lab

Additive Functionalization

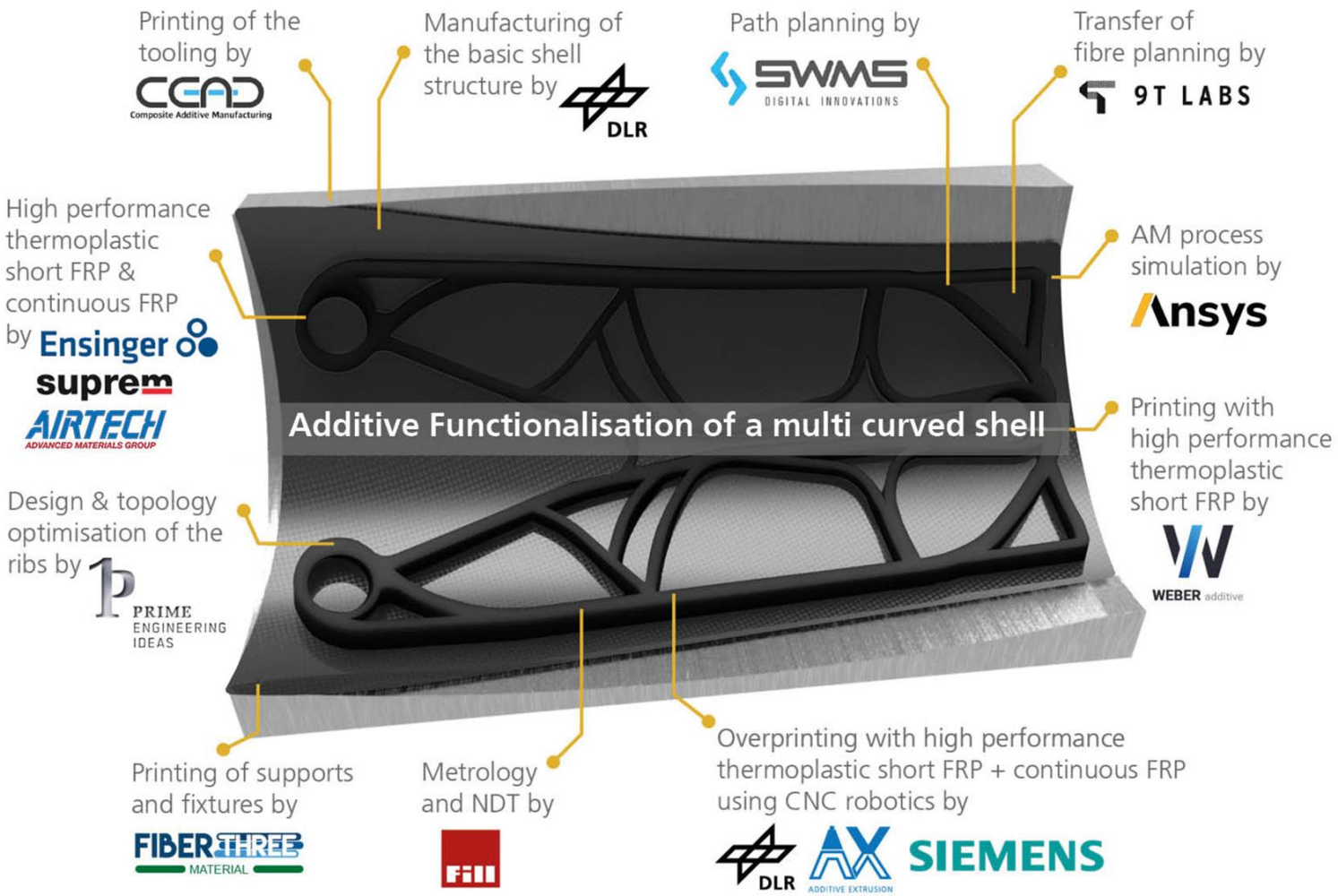
Combination of short & continuous fibre-reinforced material for Additive Functionalization of a multi-curved thermoset shell

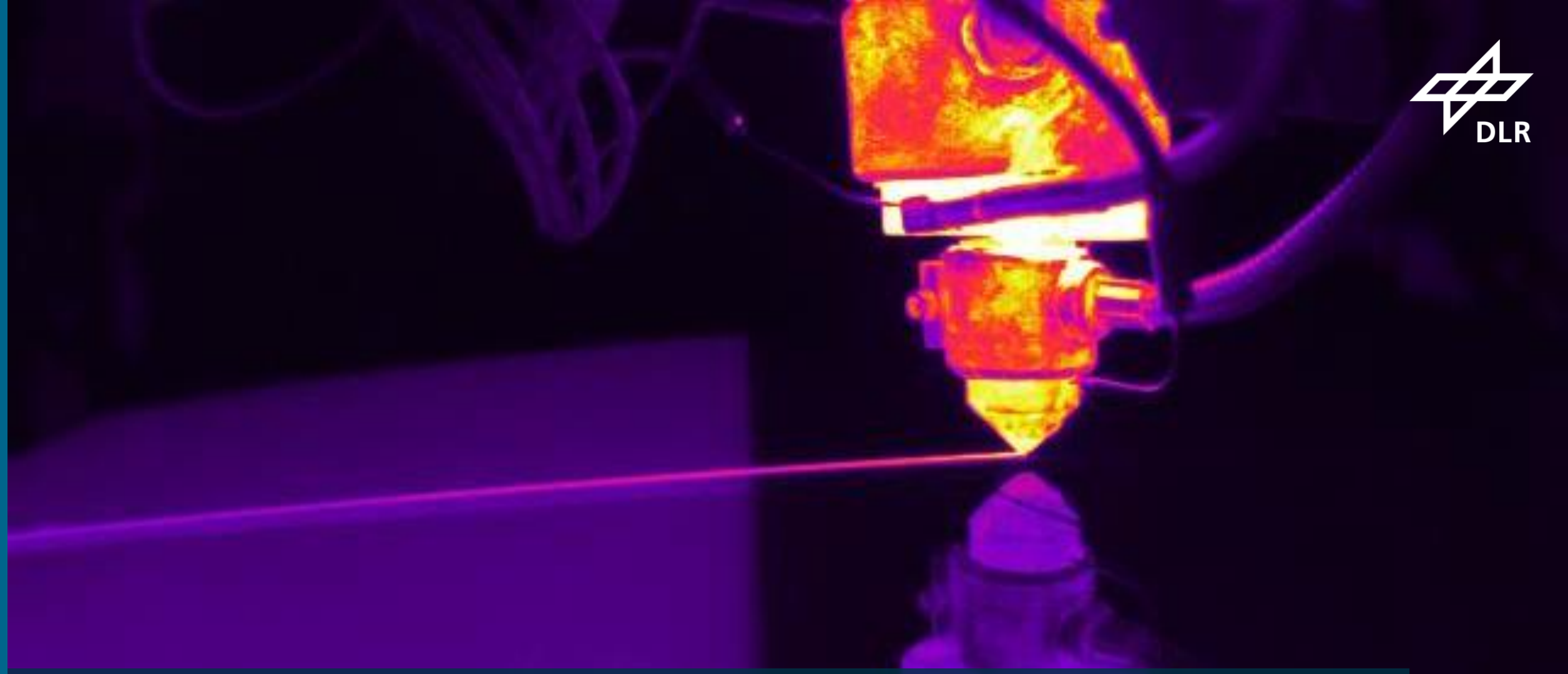






The EmpowerAX Demo Part – An example for successful collaboration



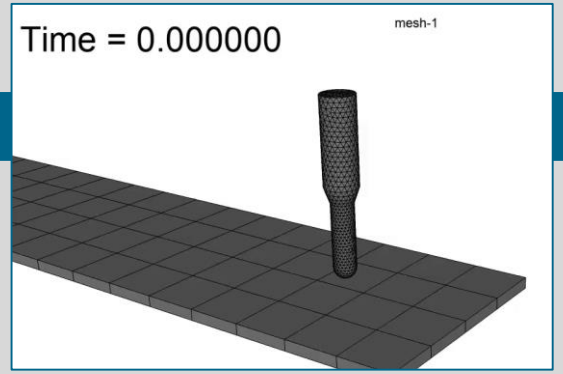


In-Line Quality Assurance using Thermography & Simulation

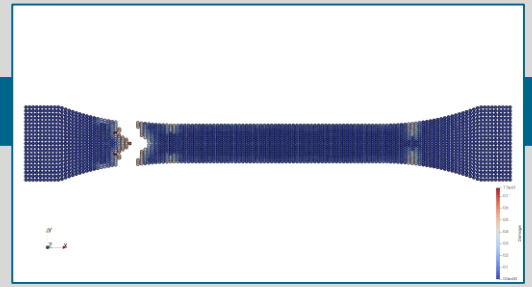
Simulation-based quality assurance

Offline thread

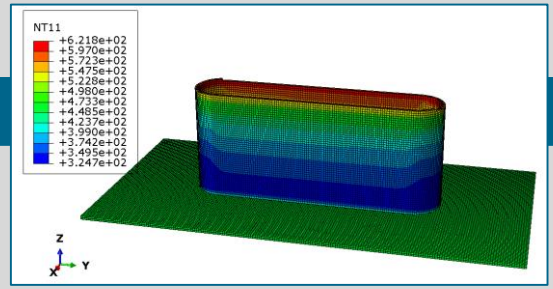
Analysis of bead formation to find optimal machine parameters



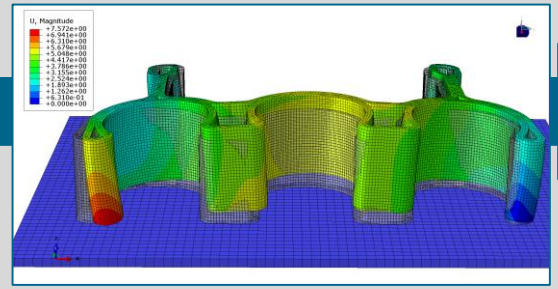
Virtual material characterization to reduce testing effort



Analyse temperature distributions for optimal process parameters

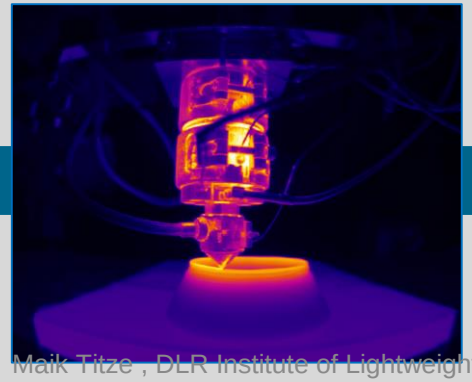


Analysis of part deformations to match required part dimension

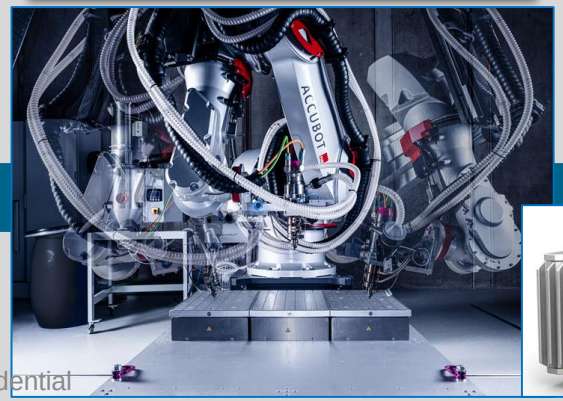


Online thread

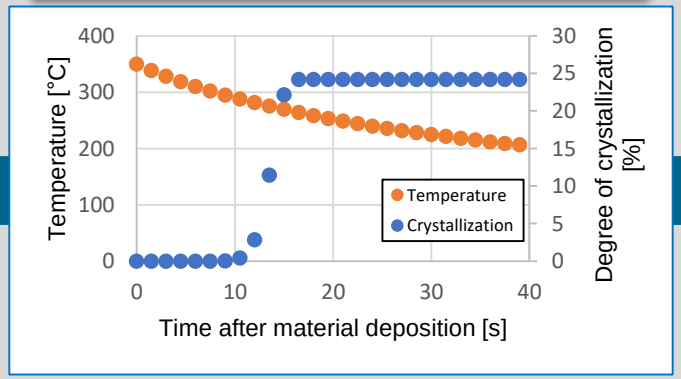
Thermal camera based monitoring of temperatures



Siemens Edge Device Integration



Development of in-situ methods to evaluate key properties (Bonding, Overheating, Crystallization



FUTURE PERSPECTIVE

rCF Semi-finished products (Continuous fibers)

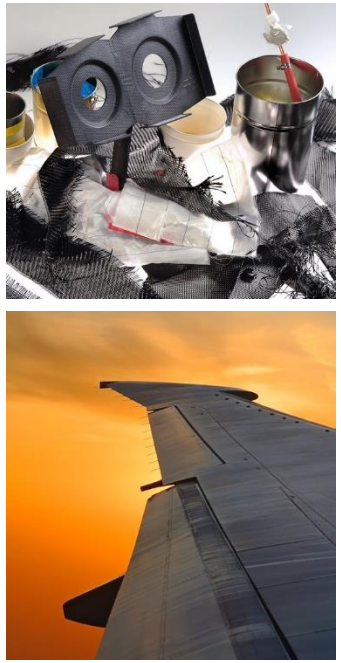
vCF

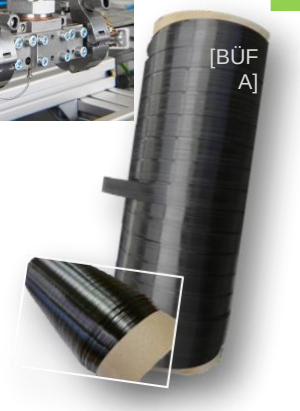
First use

rCF
(Downcycling)

**rCF stripes
(upcycled)**

Impregnation





Material-Cycle

Life Cycle Assessment

Material degradation (short fiber-reinforced thermoplastic)