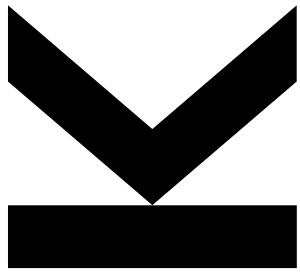


JKU

**JOHANNES KEPLER
UNIVERSITY LINZ**

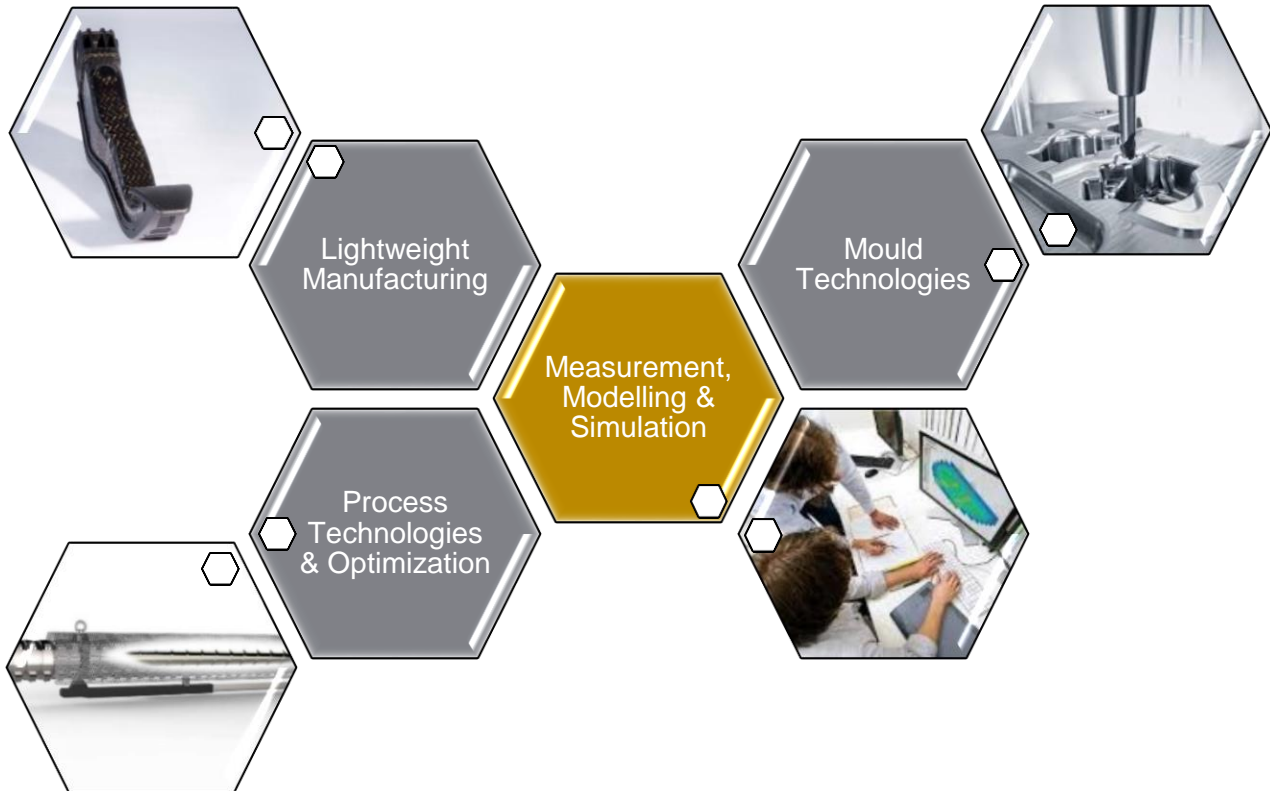
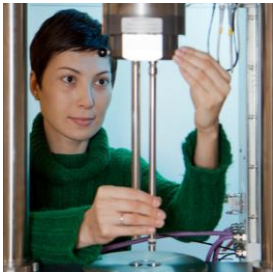
INSTITUTE OF POLYMER INJECTION MOULDING



Head: Univ. Prof. Dr-Ing. Georg Steinbichler



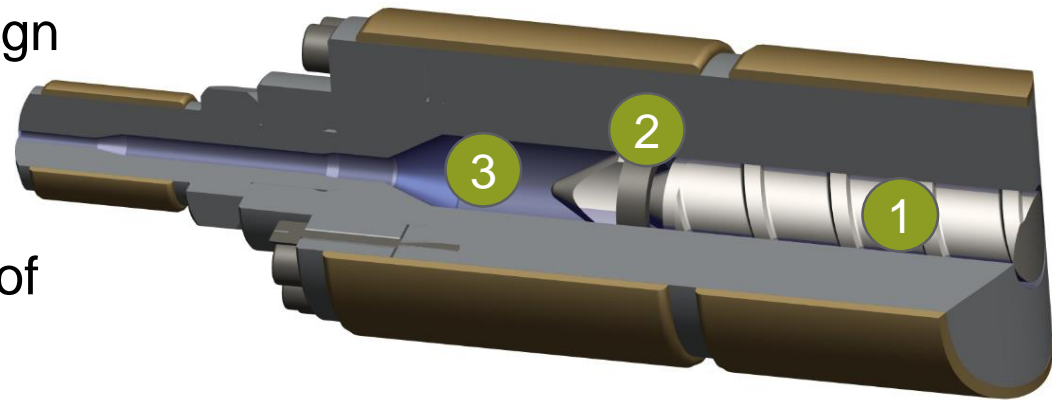
RESEARCH PROFILE



PROCESS TECHNOLOGIES & OPTIMIZATION

PLASTICIZING SYSTEMS

1. Optimization of screw design
2. Optimization of non-return valves
3. Noninvasive measurement of melt temperature profile
4. Simulation of melt homogeneity and mixing efficiency in single screw units



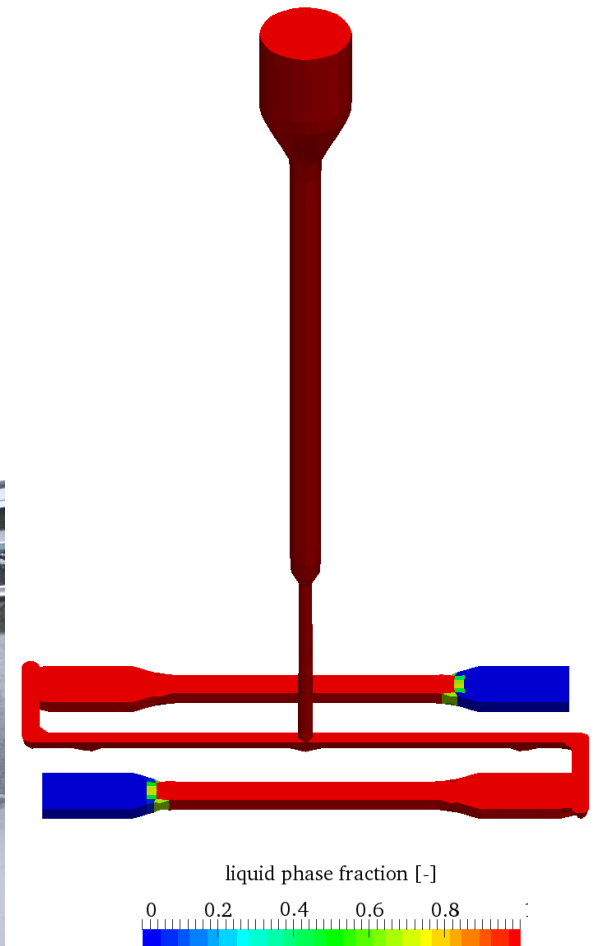
4



PROCESS TECHNOLOGIES & OPTIMIZATION

INJECTION SYSTEMS

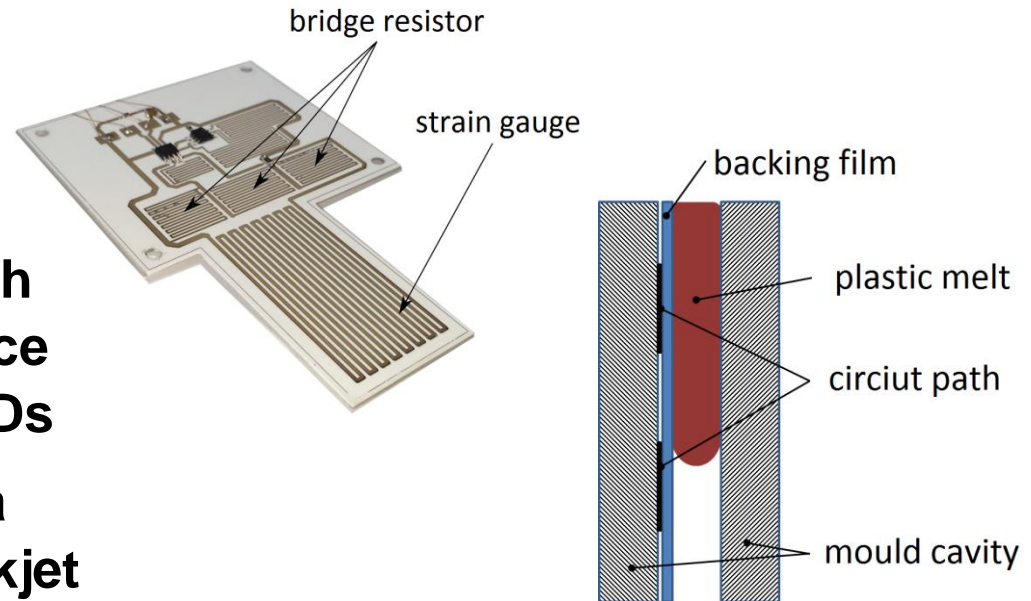
- Automated machine setup based on injection and machine simulation
- Online Process Optimization
- Online Material Parameter Estimation



PROCESS TECHNOLOGIES & OPTIMIZATION

SMART PLASTICS

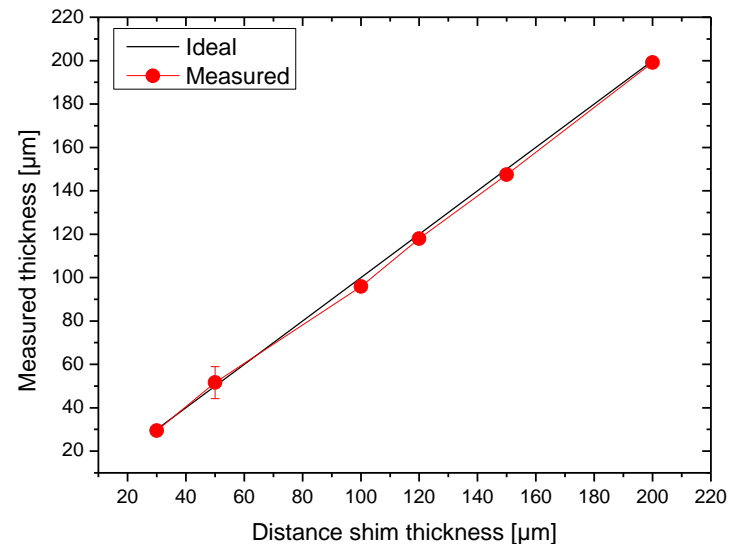
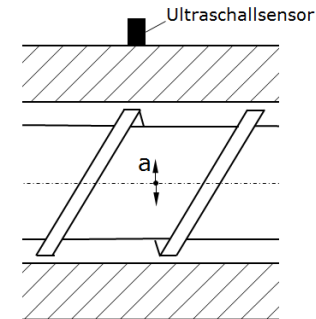
- Back injection of films with conductor path and surface mounted devices, e.g. LEDs
- Conductors printed with a commercially available inkjet desktop printer
- Possible application fields are components with integrated condition monitoring



PROCESS MEASUREMENT SYSTEMS

ULTRASOUND SCREW WEAR MEASUREMENT

- Non-invasive measurement
- No bore holes in barrel necessary
- Reduces machine down time from days or hours to minutes
- Measurement of temperature in the screw channels



EQUIPMENT



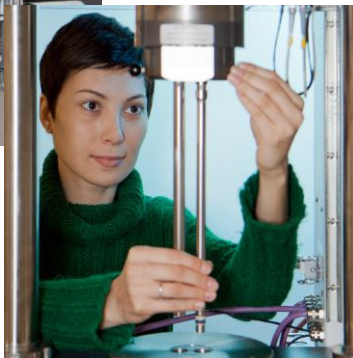
State-of-the-art injection moulding lab

- All electric IMM EM 310/100T
- Tie bar less VC 200/50 with servo electric hydraulic pump drive
- Efficient handling system
- Plasticating units with various screw diameters

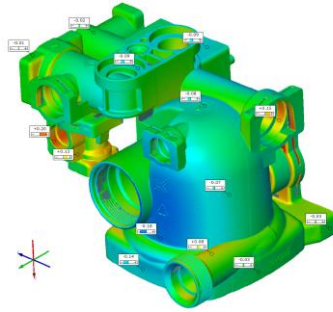


High pressure capillary rheometer (HCR) Göttfert Rheograph 25

- Viscosity at high shear rates
- pVT-Data
- Thermal conductivity

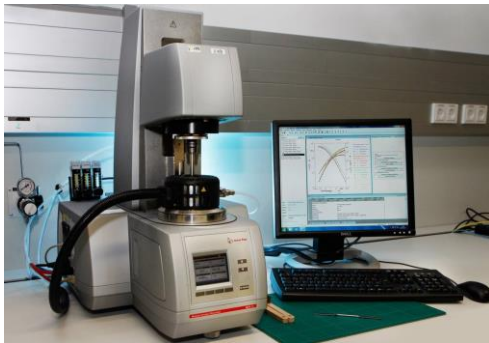


EQUIPMENT



Comet L3D fringe projection sensor

- 3D data acquisition for process and quality control



Rotational Viscometer

- Viscosity at low shear rates



Differential Scanning Calorimetry (DSC)

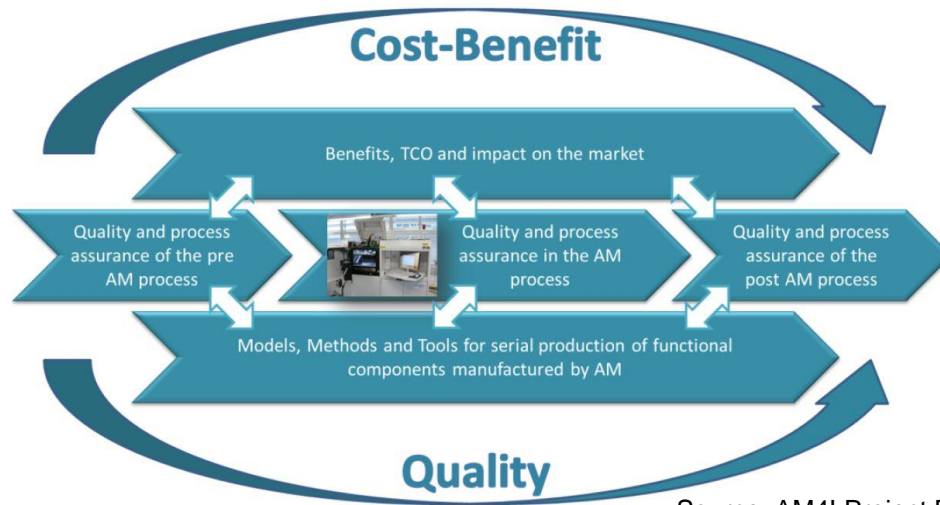
- Determination of e.g. melt temperature,
- Enthalpy and specific heat capacity
- Reaction kinetics

Thermal Imaging System

MAJOR TOPICS IN PROJECT AM4I



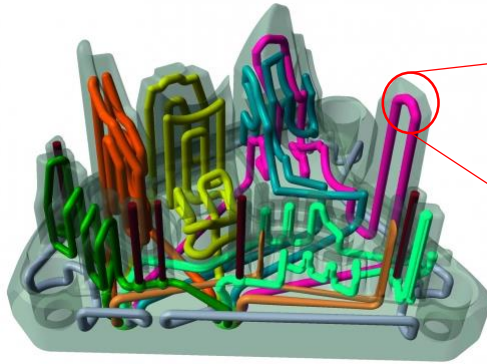
COST-EFFECTIVENESS



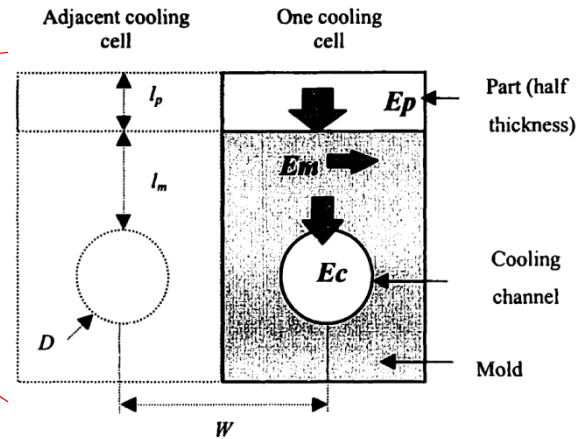
Source: AM4I Project Proposal

- Where does it make sense to use additive manufactured injection moulding inserts?
- Comparison of conventional and additive manufacturing method
- Potential fields of application

THERMAL DESIGN



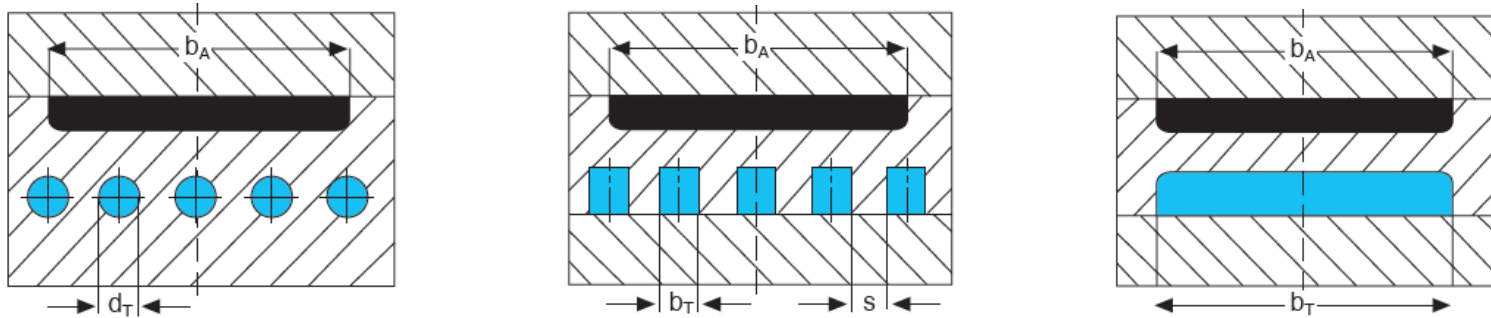
Source: LBC Engineering



Source: Dissertation-Conformal cooling and rapid thermal cycling in injection molding with 3D printed tools, 1999, MIT

- Thermal design of additive manufactured injection moulding inserts
- Maximize cooling efficiency
- Homogeneous temperature distribution

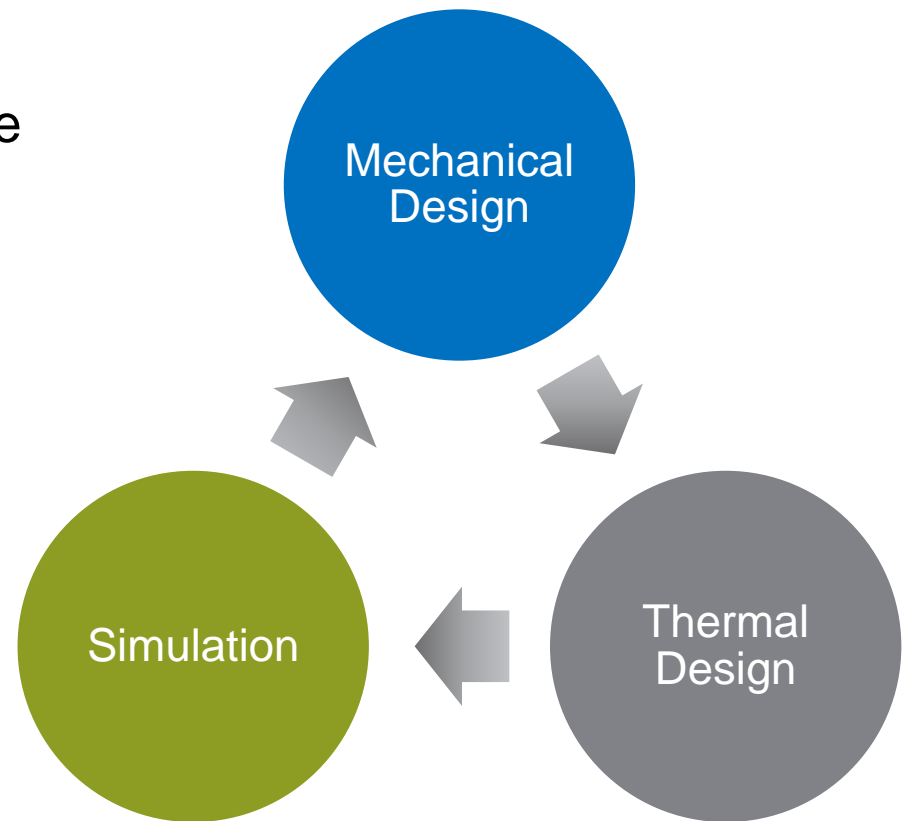
MECHANICAL DESIGN AND GEOMETRY



- Topology optimization
- Determine the minimal distance between the cooling channel and the cavity
- Determine the optimal distance between the cooling channels

CAE - APPROACH

- Combination of the mechanical and the thermal design with simulation tools to improve overall design
- Assistance for the user
- Reduction of construction time



OTHER IMPORTANT ASPECTS

- Cavity surface quality
- Durability & Wear
- Possibilities and Limitations

THANK YOU

