

5TH WORKSHOP FOR FORMING AND PUNCHING

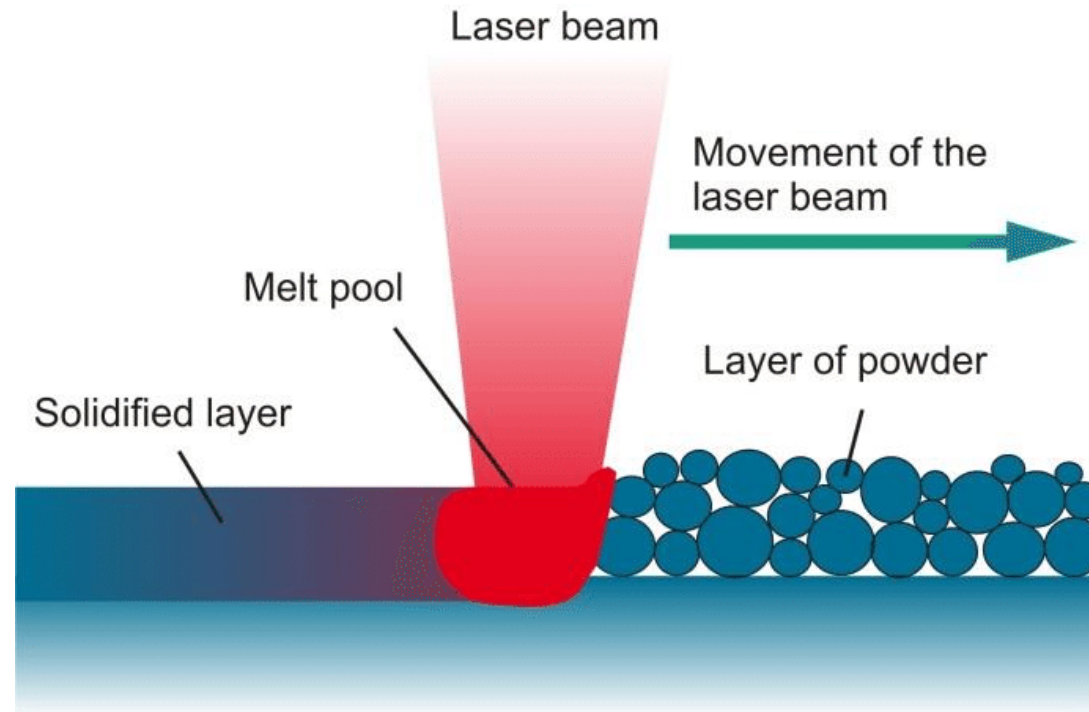
1ST GERMAN-CZECH BUSINESS MEETING

11 April 2024 | MSIC - VIVA | Ostrava | CZ

Dieter Weise, Fraunhofer IWU

3DCool-Tools / WORKPIECES

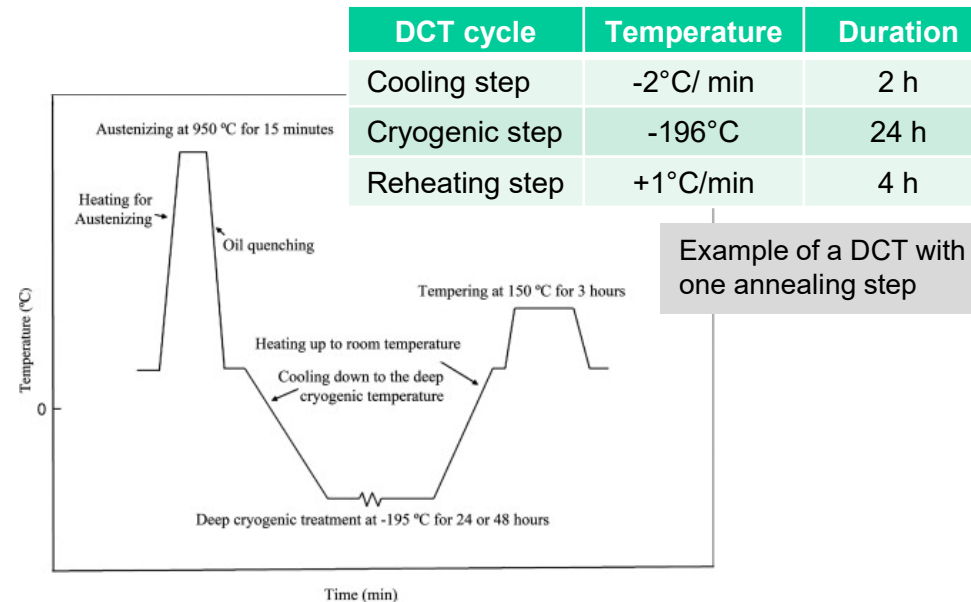
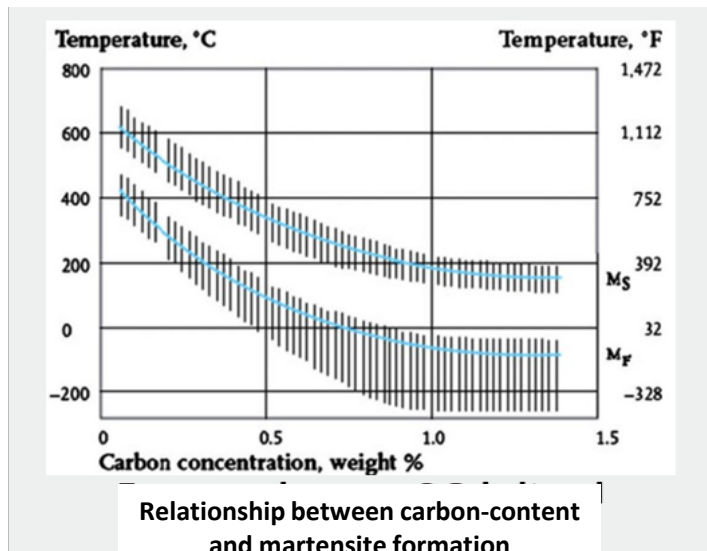
Highly wear-resistant additive-manufactured tools and components thanks to innovative diffusion and polishing treatments and residual stress reduction



Optimization of tool materials regarding stresses and wear resistance:

Treatment	Parameters	Targets
Deep temperature treatment	- 70 bis -120°C - 1 h per 1 cm material thickness	<ul style="list-style-type: none"> Transformation of retained austenite Better dimensional stability Higher hardness
KryoTreatment, Deep Cryogenic Treatment (DCT)	-135 bis -196°C - 24 h or longer, reducing of treatment-time through cycling - possible	<ul style="list-style-type: none"> Formation of fine carbid germs increasing of carbides volume Higher wear resistance

Basic Effects of cryogenic treatment



State of the art

3D printing in industrial technology using

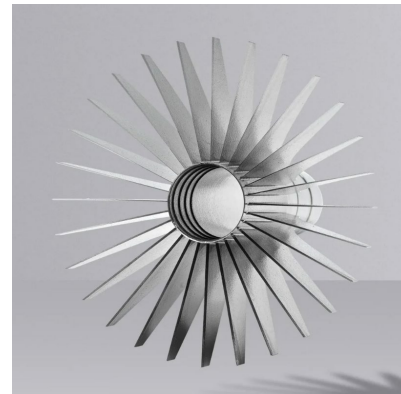
- Fabrication of implants with variable geometries (individualization) and precise adaptation possible
- Topological optimization (for example fabrication with original bone structure, material optimized tool structures or thermal regimes))

Possible applications in Czech and Germany

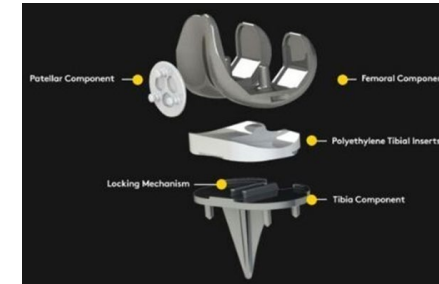
Different Materials in Czech and Germany



Spritzguss-Formeinsatz mit kontur-naher Kühlung (www.fkm.net)



Geometrisch komplexes und filigrane Schneidmesser (www.fkm.net)



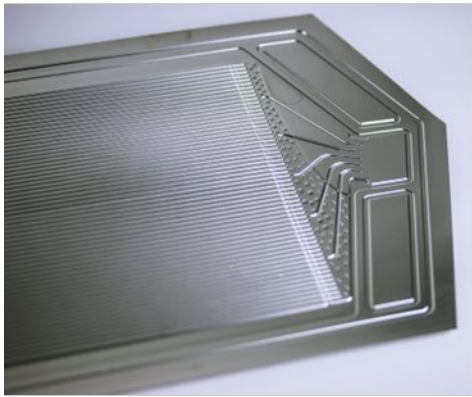
Production of total knee endoprotheses(Company USA 2021: Monogram Orthopedics)



Fräswerkzeuge, Formkerne, Stempel oder Matrizen die mittels 3D-Druck (Quelle: Kolibri Metals GmbH)

Hydrogen

Economical production of bipolar plates of the highest quality



Embossing



Hydroforming



Roll to Roll Technology



Hydrogen

Economical production of bipolar plates of the highest quality



- Development of optimal process sequences by developing formable coating systems for the substrate foils
Increasing tool life and surface quality through plasma electrolytic polishing
 - Development of efficient tool manufacturing technologies
 - Actual status recording (sensor-based monitoring) and development of a control loop with regard to data recording of component quality, tool geometry and press condition (press table deflection)
 - Development of suitable lubricants for the highest stress regimes
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HIGH-TEMPERATURE FORMING

FORMING AT TEMPERATURES
OF UP TO 1,250°C POSSIBLE
UNDER INERT GAS
(HYDROFORMING ALSO POSSIBLE)

Press mechanics :

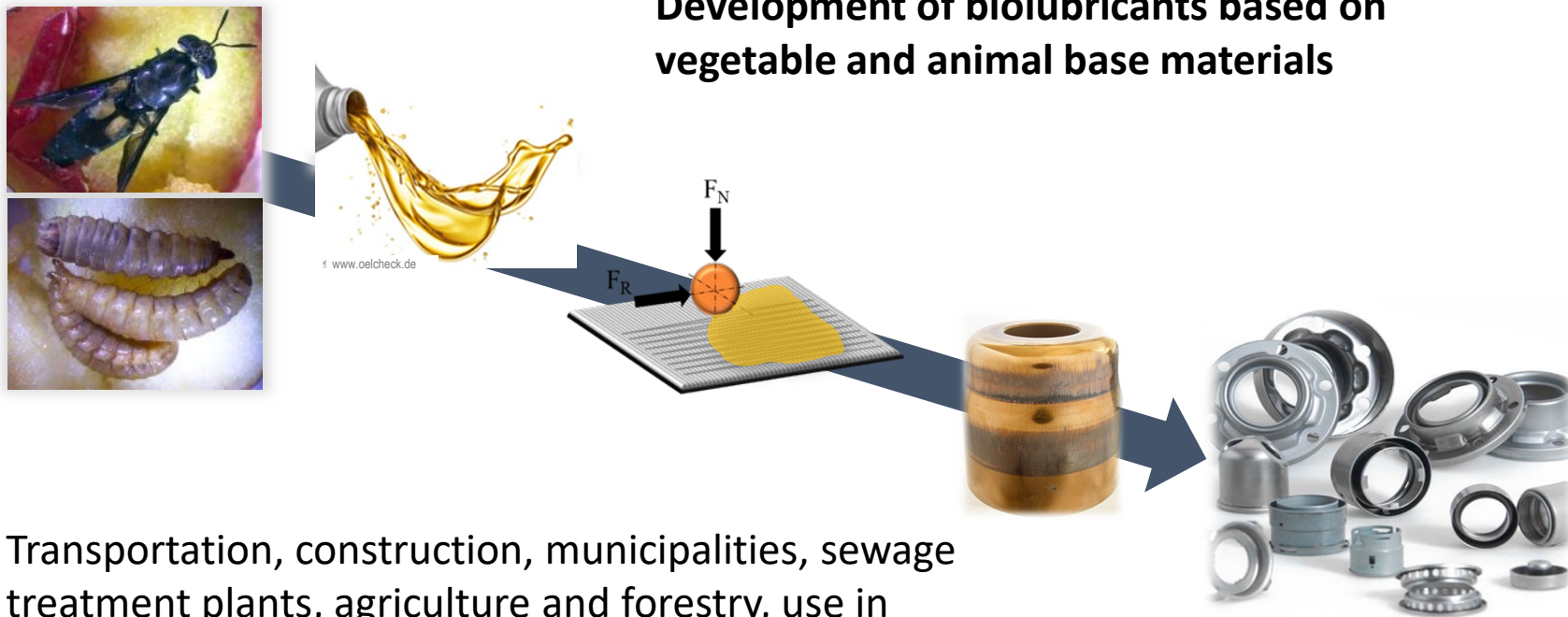
- 300 kN electro-mechanical pressing force and 100 kN tensile force interchangeable with hydraulic drive up to 500 kN
- Hydraulic cushion up to 300 kN (force/travel controlled)
- Integrated tool holder for 300mm x 300mm size
- Process movements and forces are initiated by water-cooled coupling elements consisting of plunger and die cushion

Oven system:

- Furnace system for hot forming in a protective gas atmosphere with complete separation from the environment at a maximum temperature of up to 1,250°C
- Vacuum in the furnace chamber down to -900 mbar and overpressure up to +60 mbar possible (inert gas nitrogen or argon)
- Mobile design also enables off-site use



Platform technology for the development of bio-based high-performance lubricants using multiple sustainable material cycles



Transportation, construction, municipalities, sewage treatment plants, agriculture and forestry, use in mountainous regions, energy and water management

Initial situation

Bio lubricants

■ Market situation

- Strong growth forecast for biolubricants
- The largest current area of application are:
 - Loss lubrication with release into the environment at low to medium loads
 - Hydraulic oils for construction and agricultural machinery
 - Saw chain and formwork oils
- Increasing demand for biolubricants for:
 - High-load applications
 - Forming technology
 - Highly loaded gears (e.g. wind turbines)
- Lubricant remains on the component
 - Accumulation in cleaning media, costly disposal