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Recent Advances in Metal Forming Simulation

Arjaan Buijk, Managing Director, **Simufact-Americas LLC**

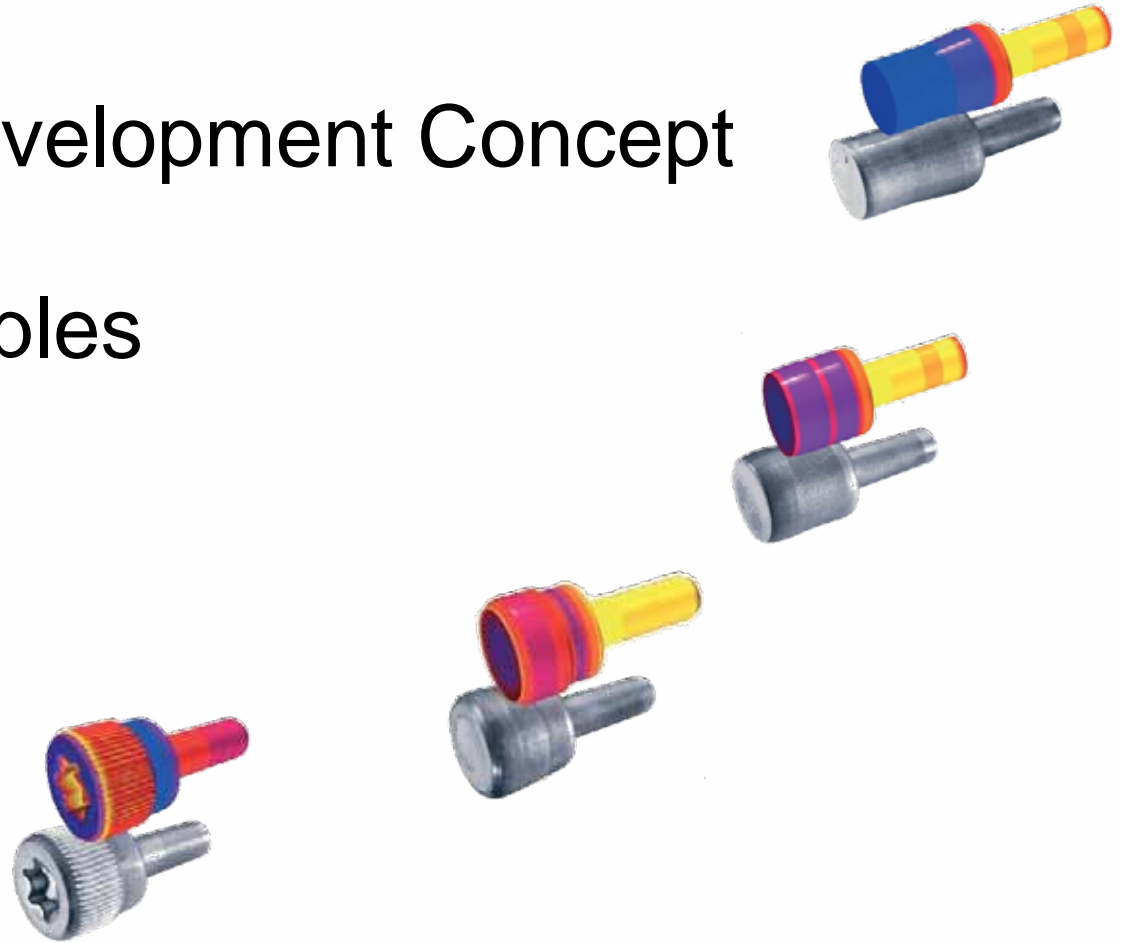
Gary Huang, Development Manager, Simufact-Americas LLC



Outline



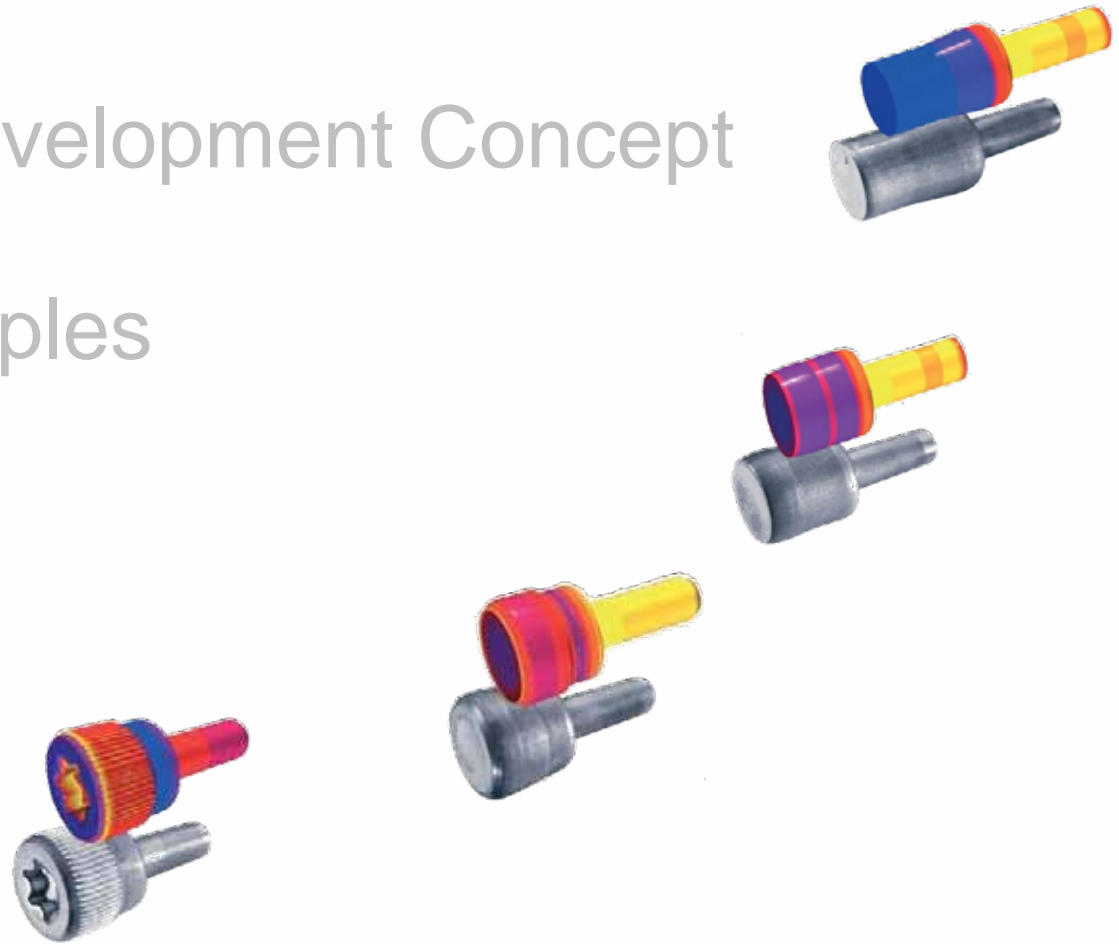
- Simufact – a brief overview
- Software Development Concept
- Some examples



Outline



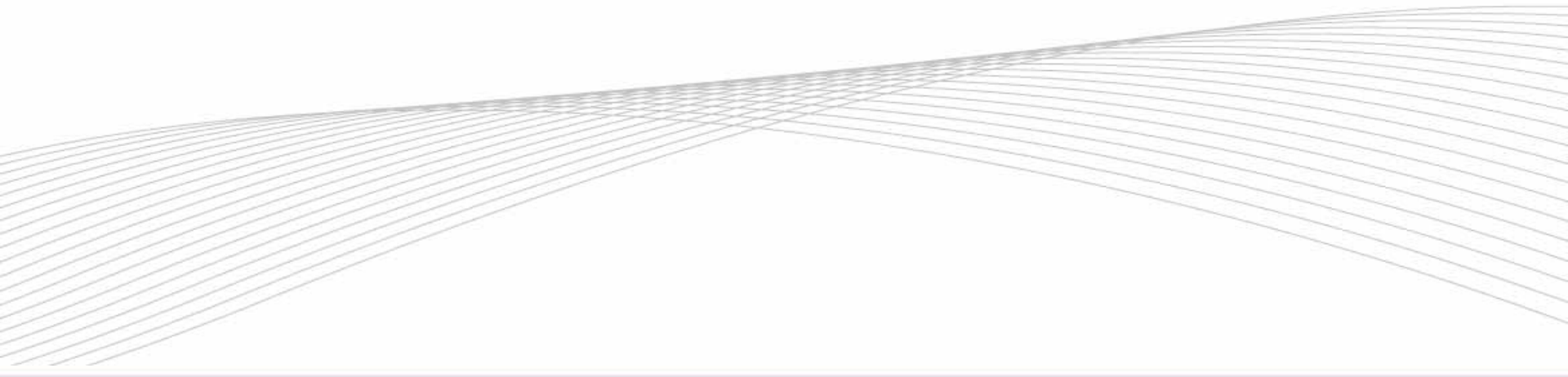
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simufact

Simulating Manufacturing



A Brief History & MSC Connection



- 1995: Michael Wohlmuth and Hendrik Schafstall found a Spin-Off of the University of the Federal Armed Forces: FEMUTEC Engineering GmbH
- Focus was process simulation in metal forming
- Development and sales partner of MARC Analysis Research Corporation (Marc.AutoForge), later on (since 1999) MSC.Software, Software sales and engineering services in German language area (Germany, Austria, Switzerland)
- End 2006: taking over the whole (international) metal forming business from MSC.Software (OEM agreement for MSC.SuperForge & MSC.SuperForm)
- 2008: renaming the company to

simufact engineering gmbh



Michael Wohlmuth
Managing Director & CEO



Dr. Hendrik Schafstall
Managing Director & CTO

*Associated Partners and
Managing Directors*

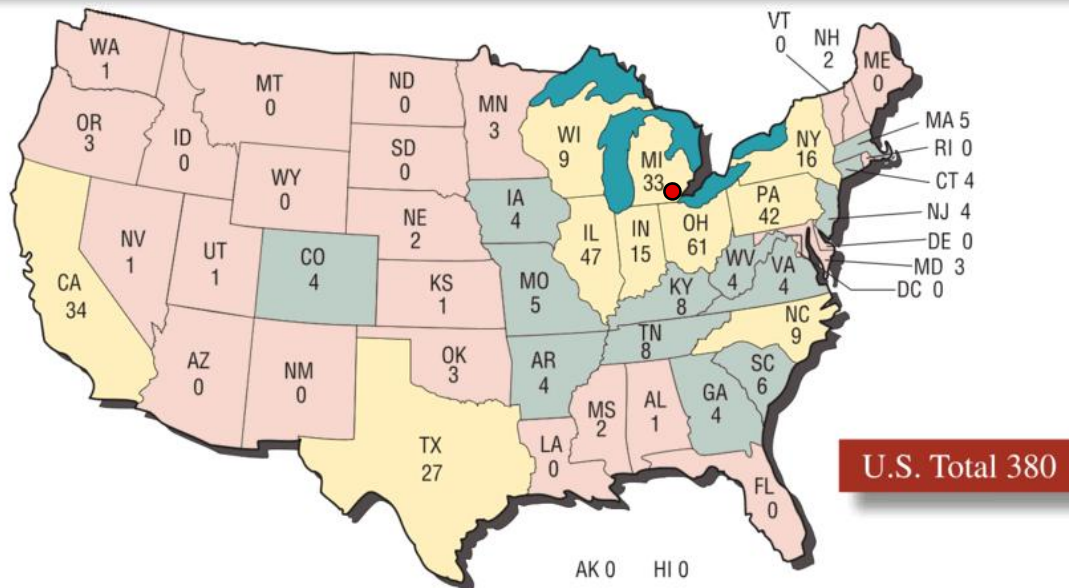
A Brief History & MSC Connection

- End 2007: Arjaan Buijk, former MSC.SuperForge development lead, starts Simufact-Americas LLC
- Mid 2008: Gary Huang, former MSC.SuperForm development lead, joins as development lead for the Solver Development Center.
- 2008-2009: Office in Brazil; Resellers in CA, TX, and Quebec.



Arjaan Buijk
Managing Director

Forging operations across America



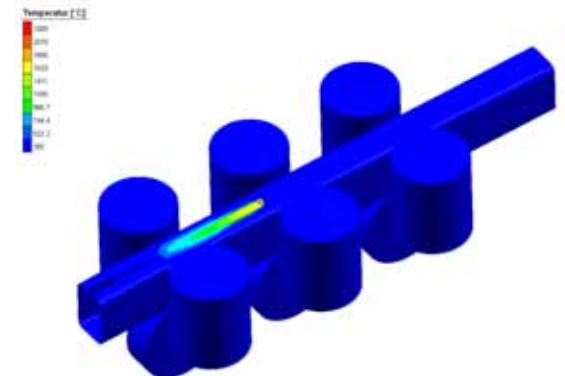
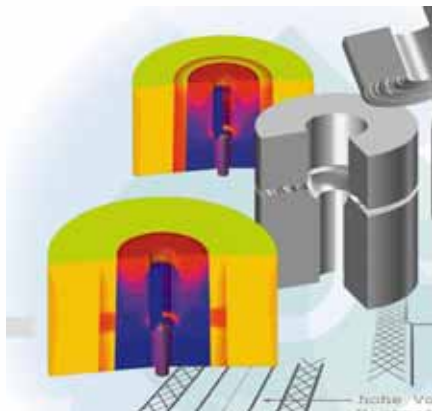
Dr. Gary Huang
Manager SDC

*Management
Simufact-Americas LLC*

Business Objectives

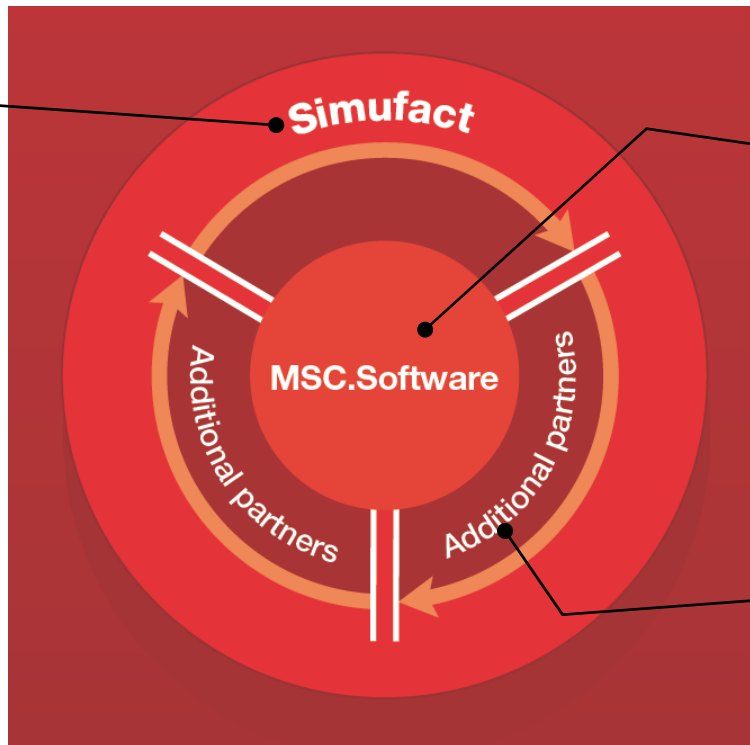
- Business focus is ***Virtual Process Development*** by means of process simulation
- The core business is **metal forming**
- Expanding into other manufacturing applications, e. g. **welding simulation**
- Our **central objective:**

providing high end simulation solutions for shop floor usage in the manufacturing industry



Software Development Concept

**GUI & Solver customization:
Simufact**



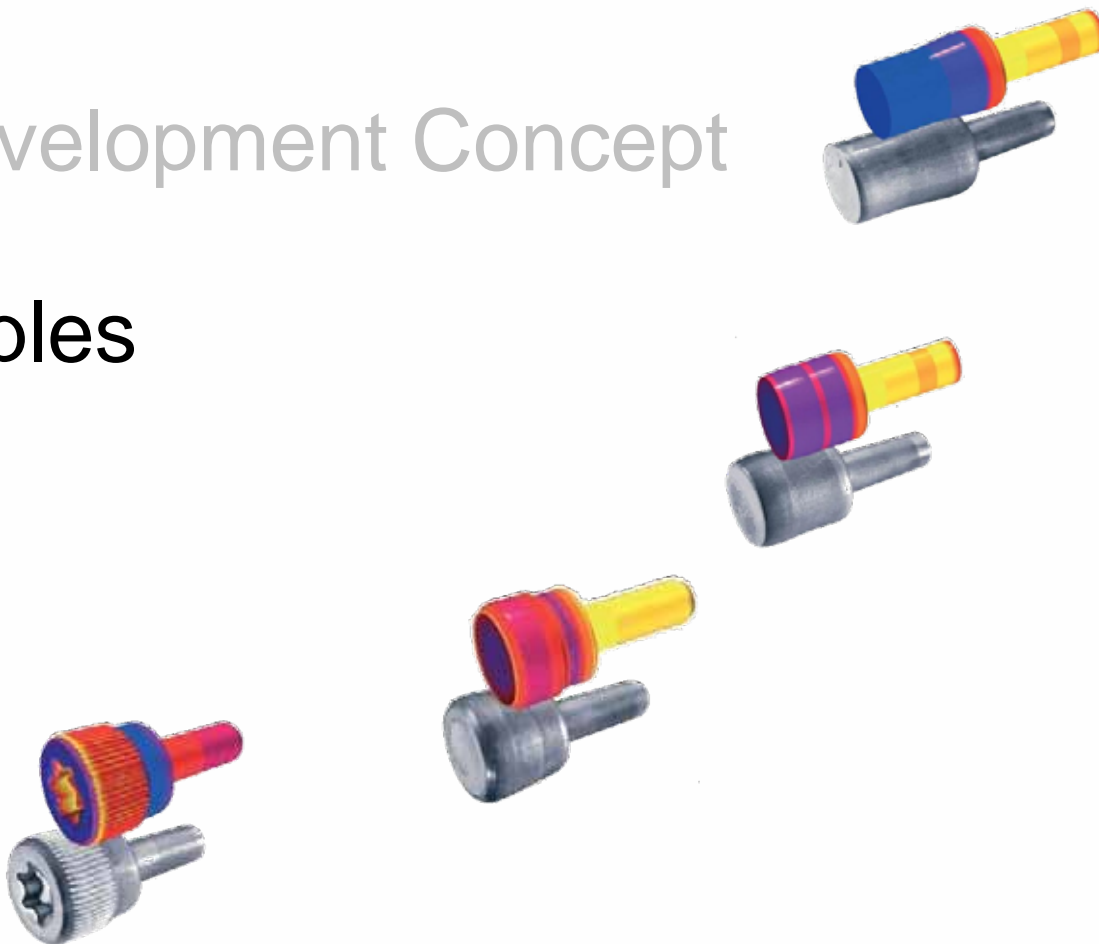
**Generic
Solver Technology:
MSC.Software**

**Additional Technology:
Other partners**

Every software vendor is responsible
for what he is most experienced in!

Outline

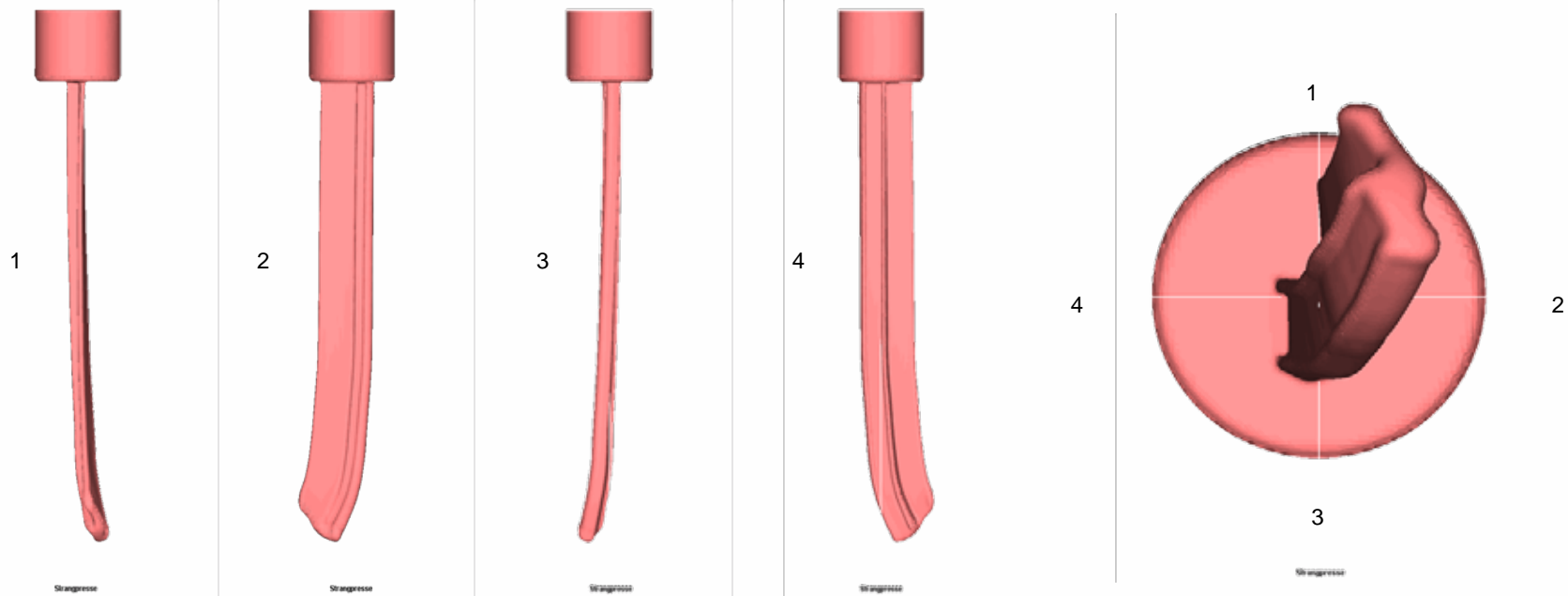
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- Software Development Concept
- **Some examples**



Extrusion – Bending & Twisting Effects



- ◆ The bending & twisting behavior is clearly visible
- ◆ Proper design of out-flow opening is critical



Extrusion - Temperature distribution



Cut through bar

[Movie](#)

Hot Forging of a Drawing Lug



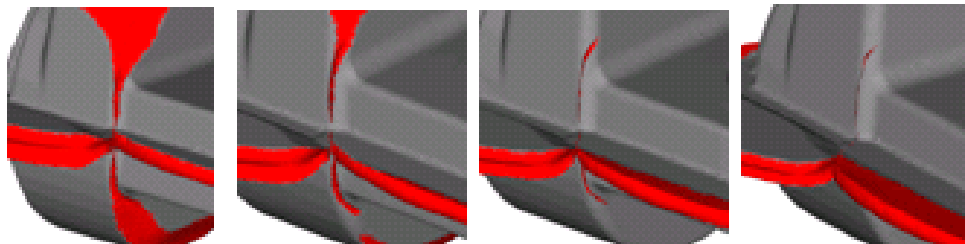
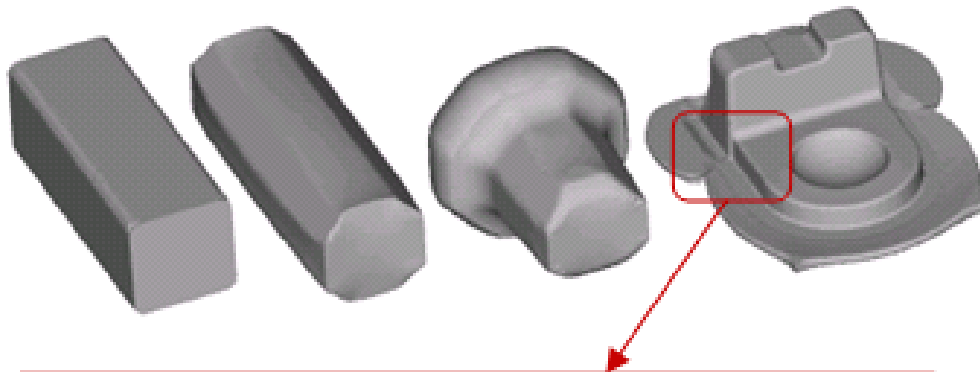
Operation	Method
Upset 1	3D Finite Element – Hex
Upset 2	3D Finite Element - Hex
Closed Die	3D Finite Volume

Hydraulic Press

- Velocity = 250 mm/sec

Material

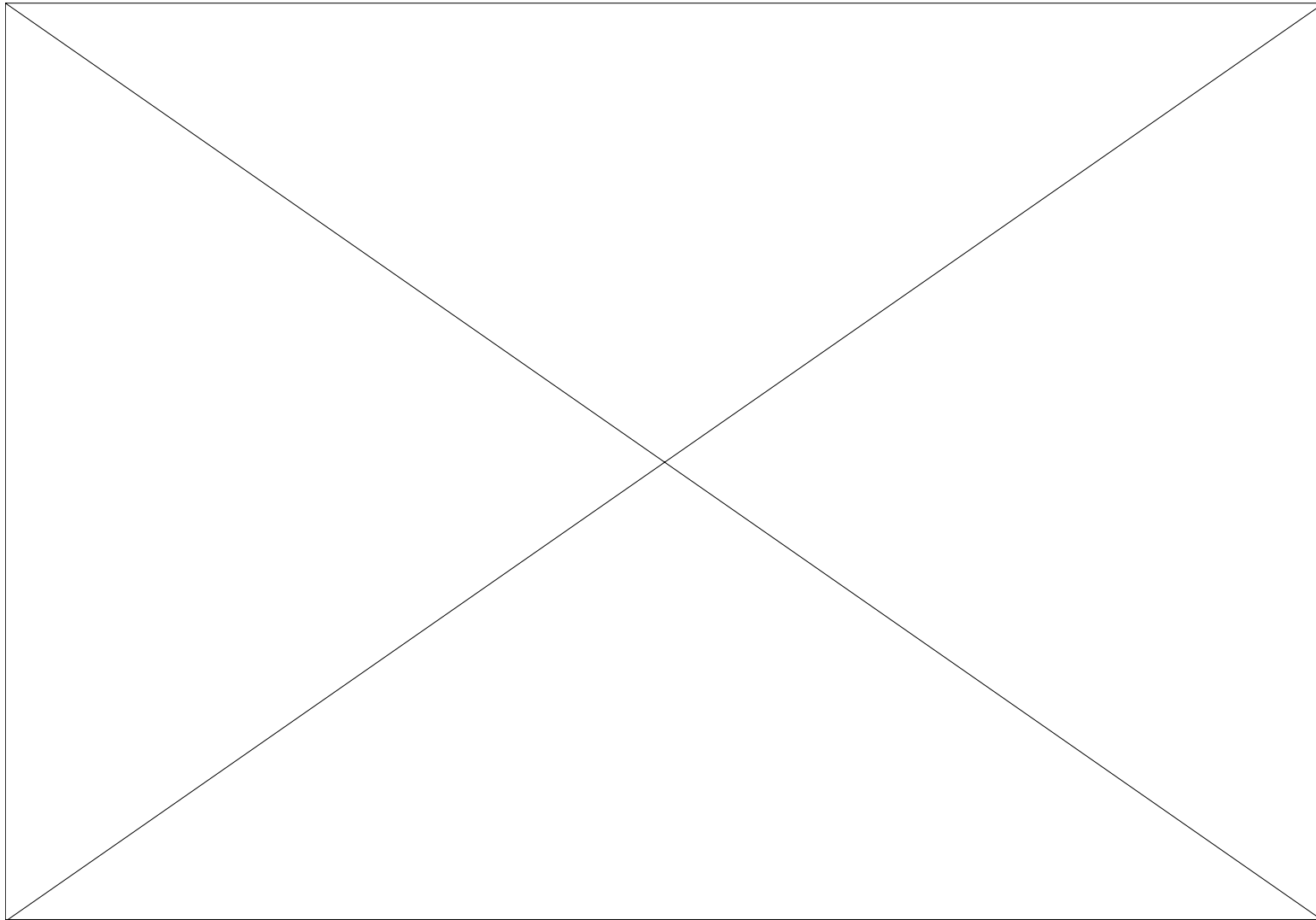
- DIN 1.0570
- Temperature = 1250 °C



Die Contact during final stage.

Lap occurs during final stage

Hot Forging of a Drawing Lug

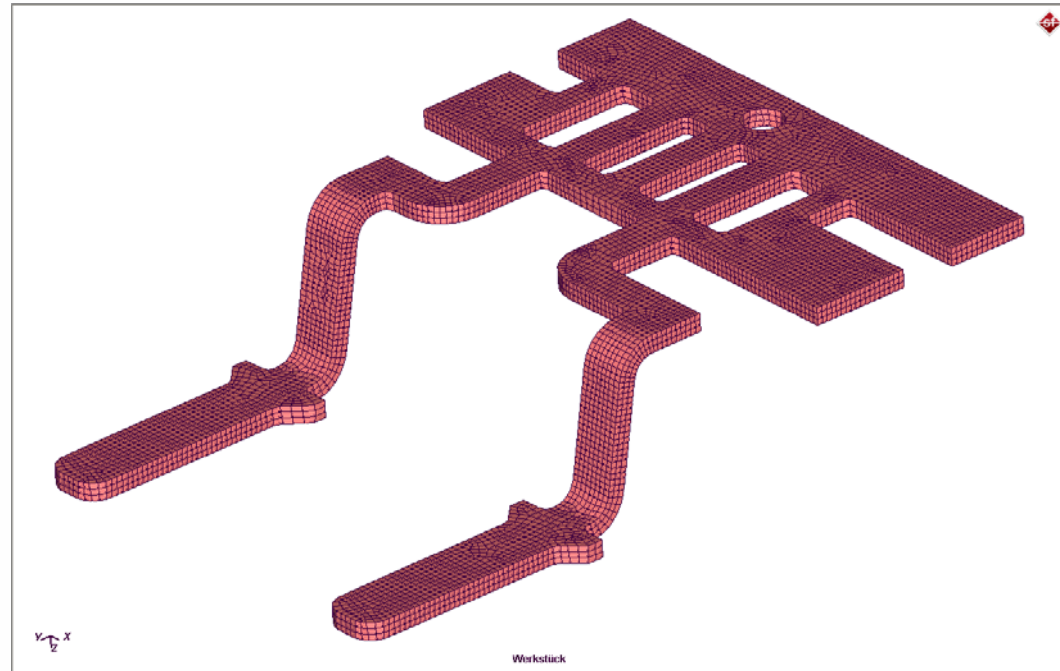


→ Large fold can be easily fixed by smaller stroke during 2nd upset. See WorkShop example !

Automatic meshing of sheet metal



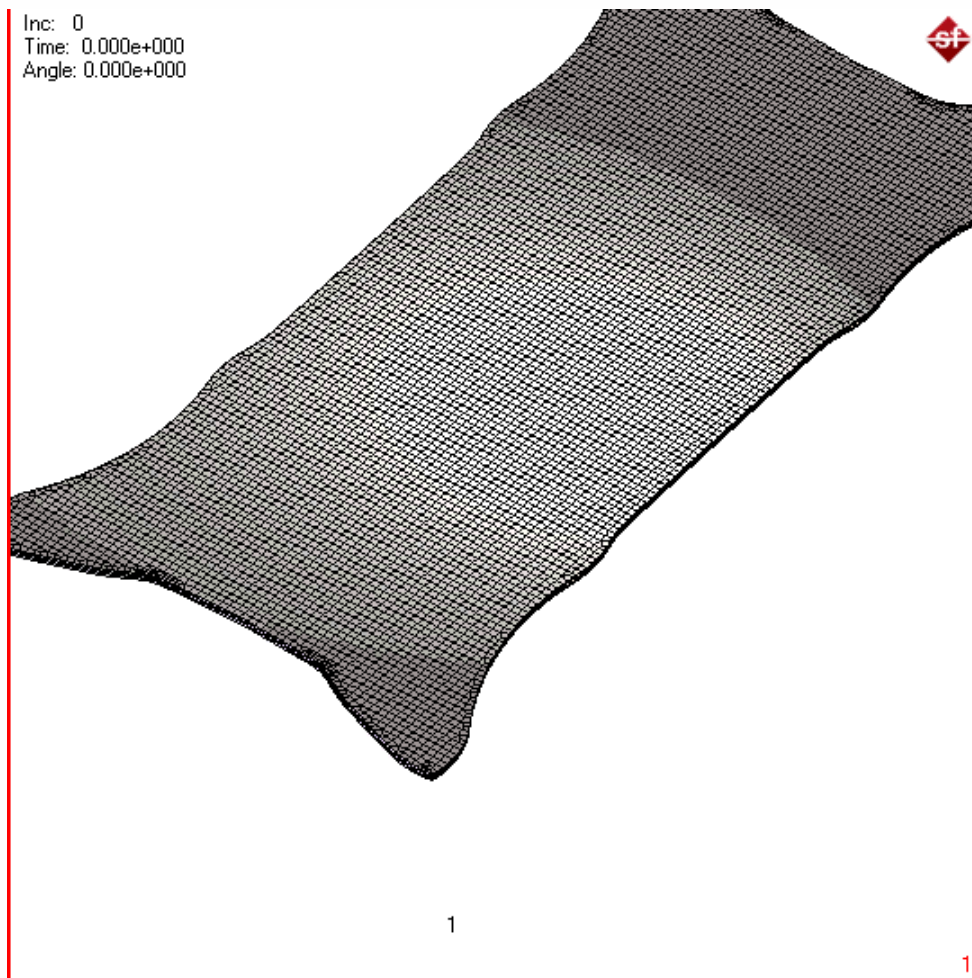
- Based on 3D STL-data of a sheet metal geometry.
- Automatic detection of thickness direction
- One surface will be automatically meshed with quad4 shell elements
- This mesh is expanded in thickness direction into hex8 volume elements
- A special optimization algorithm guarantees the best possible mesh quality and geometry approximation



Sheetmesher applied to stamping



Inc: 0
Time: 0.000e+000
Angle: 0.000e+000



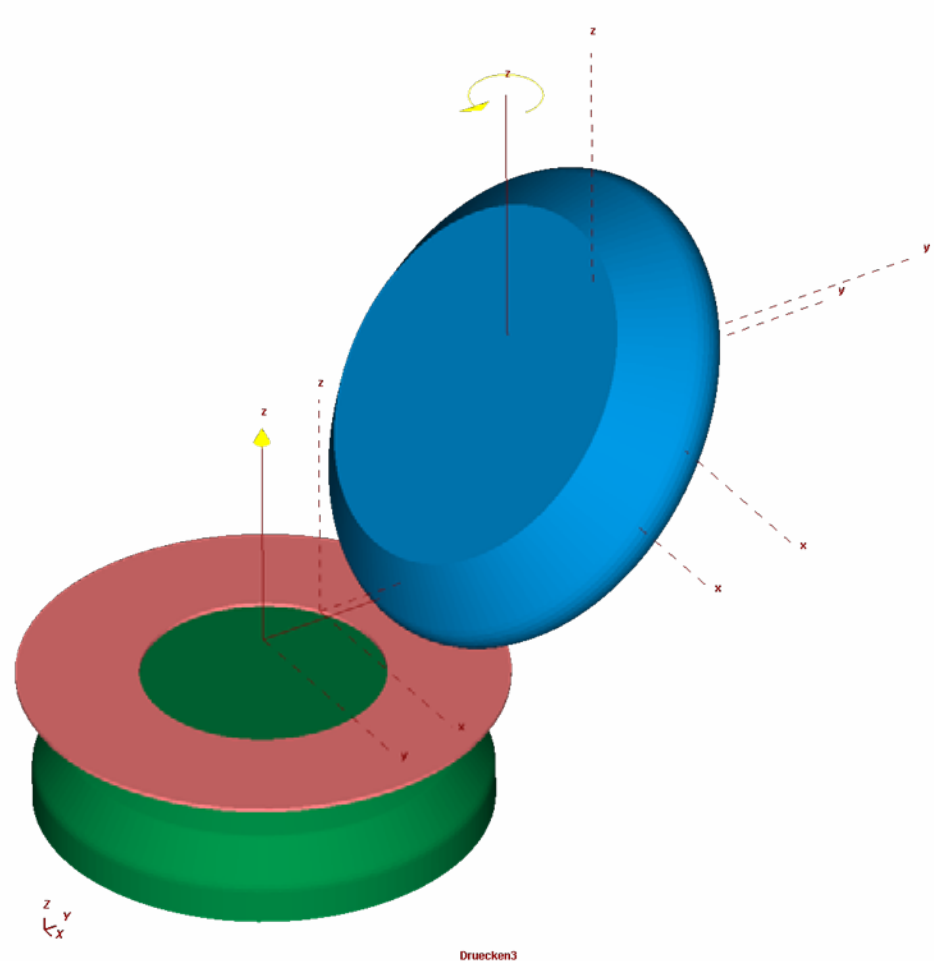
Movie2

Sheetmesher applied to flow-forming



Movie

- ◆ User-friendly definition of local coordinate system
- ◆ Easy definition of all degrees of freedom
- ◆ Realization of all moving directions possible
- ◆ Visualization possible with a preview and during result analysis



e=MSC^x

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Thank You !

**To learn more about Metal Forming
Simulation, please join us at our booth &
tomorrow's Workshop**





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- For further information please contact

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