Virtual Conditioning of Progressive Dies
Increasing Productivity and Quality

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TE Connectivity …

has a 50-plus year history of leadership

is a $14.3 billion company
(FY2011 Results)

is a global company with nearly 100,000 employees

has over 500,000 products
**Session: Blechumformung**

**SIMULATION IN DER UMFORMTECHNIK**

### Automotive

- Alternative Power Systems
- Infotainment
- Sensor Technology
- Wire and Tubing
- Relays
- Terminals and Connectors
- Inductive Systems
- Cable Assembly Systems

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**TE Location Wört - Automotive**

**Stamping Wört**

- High speed stamping
- Progressive Dies for high volume production
- ~ 15 billion produced parts in FY 2011

**Stamping is a key technology within TE Connectivity**
Presentation Topics

• **Virtual conditioning**

• Situation before Finite Element Analysis (FEA) implementation

• Quality improvements by FEA

• Increasing productivity in tool shop by FEA

• Outlook

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**Virtual Conditioning**

**What is Virtual Conditioning?**

➢ To eliminate trial & error during fine tuning

➢ To simulate forming during die design phase

➢ To fix the proper blank profile at the first time

➢ To determine the right spring load

➢ To do feasibility studies w/o physical attempts
Forming features at terminals & connectors

- Insulation Area
- Carrier Strip
- Wire Area
- Transition
- Contact Body

Styles of Progression Dies

TE Stamping Dies
Presentation Topics

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Before FEA

In the past, many loops of optimization were required to get the right result.

These approaches …
- took much time
- needed much rework
- caused high costs
- spent resources of toolmaker's labor
- permitted no reproducible processes
- bred a lot of discussions

~ 6 - 20 weeks
Toolmaker

Conditioning is mainly performed by toolmakers and by hand.

- Profiling by using a file
- Continuous checking of form
- Adapting the tool shape

Situation in the Past

- It was toolmaker’s work! (3D shape)
- U-ing station
- U-ing insert
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Results of Quality Improvement by FEA

After modification lower damage values

→ no cracks. Smooth surface
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Determine Material Characteristics

Bending test
• Input from tensile test: Rm, Rp02, Epsilon, Youngs modulus.
• Modifying material properties
• Goal:
  Angle(FEA) = Angle(Bending device)
• Modified material properties for FEA in 3D
Breakthrough Innovation by FEA

First FE-trial to get the shape of the body area with given layout.

Initial Analysis

Not 90°!

Breakthrough Innovation by FEA

Modified layout by rotating walls in CAD and start another analysis with FEA.

Improved Analysis

90°!
Increasing Productivity in Tool Shop by FE Analysis

Simulation Potential

Future
- DIE Design & FE-Analysis
- Part fabrication
- Assembly

Today
- FE-Analysis
- DIE Design
- Part fabrication
- Assembly
- Conditioning

Past
- DIE Design
- Part fabrication
- Assembly
- Conditioning

Idea
Processing stages of a stamping die / Time to market
Final Product

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