

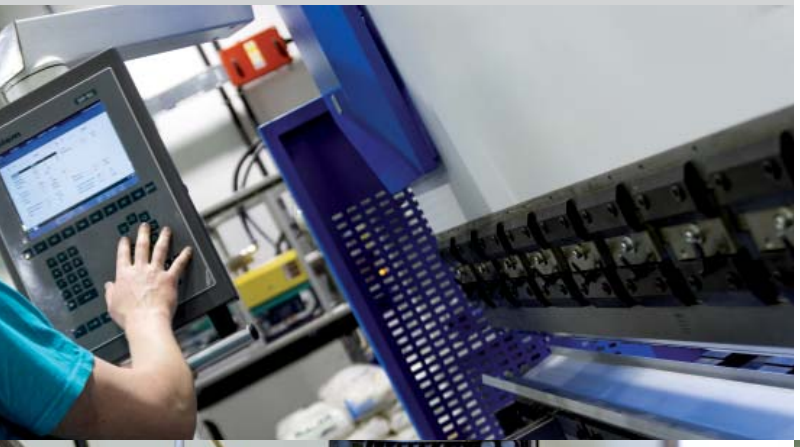
# Laboratory of Forming Processes

## Principal goals and activities

- Deformation analyses of the formed parts, prediction of critical areas in the products.
- Research of the influence of stress state and strain rate on the creation of ductile fracture in the formed products.
- Prediction of spring-back in the formed parts in consideration of forming technological conditions.
- Analysis of forming processes using FEM.
- Assessment of adhesives bonded joints and resistance to corrosion in adhesives used in the automotive industry.

## Specific instruments and outcomes

- ARAMIS 2M contact-less optical system for deformation analysis.
- Determination of forming limit curves (FLC) for FLD in conformance to standard ISO/DIS 12004-2.
- Instron Ceast 9350* system for dynamic testing of materials (ASTM D3763, ASTM D7136, ASTM D7192, ISO 6603, ISO 11343, ISO 8256).
- AHPS 2104×60 press brake*.
- Numerical simulations of metal sheet forming using CAD/CAM/CAE with a PAM-STAMP 2G software.
- MS2004 guillotine shear.
- CBA 300/63 hydraulic press.
- CUP 25 hydraulic press.
- LEN-P 40 eccentric press.
- LU 160 crank press.



## General focus of laboratory

- Comprehensive analyses of deformation in formed parts using ARAMIS 2M contact-less optical system.
- Analysis of dynamic effect in metal forming using ARAMIS HS system (synchronous recording on 2 cameras Photron SA3 with a framerate up to 100 kHz).
- Dynamic tests in materials, identification of flow stress curves at higher strain rates.
- Determination of forming-limit curves. Determination of forming limit curves in the laboratory (FLC curves) acc. to standard ISO/DIS 12004-2.
- Determination of the strain hardening exponent at equi-biaxial stress (hydrostatic „bulge" test).
- Determination of the shearing effect on limit states of deformation.
- Monitoring of energy-force parameters during forming, tensometric measurement of forces up to 500 kN.
- Research in the effect of technology and material parameters on the size of spring-back at the bending process.
- Assessment of numerical simulation results of forming processes in consideration of the quantity and accuracy of input data and comparison of the results with true strain in forming components.
- Measurement and assessment the influence of corrosion load and adhesives used in body shell building (fog test, atmospheric test, etc.).

## Offer of technology and expertise

- Research in metal processing, optimization of forming technology processes.
- Application of high-strength materials and low-density alloys to reduce the weight of the formed parts (e.g. TRIP, TWIP, Inconel alloys, Aluminium alloys, Titanium alloys and so on).
- Numerical simulation of forming technology processes.
- Prototyping, short-series manufacturing.
- Training/seminars for the industry in the fields of forming technology, design of forming machines and tools.

** in cooperation with the Department of Nanomaterials, Advanced Technology and Innovation at TUL*