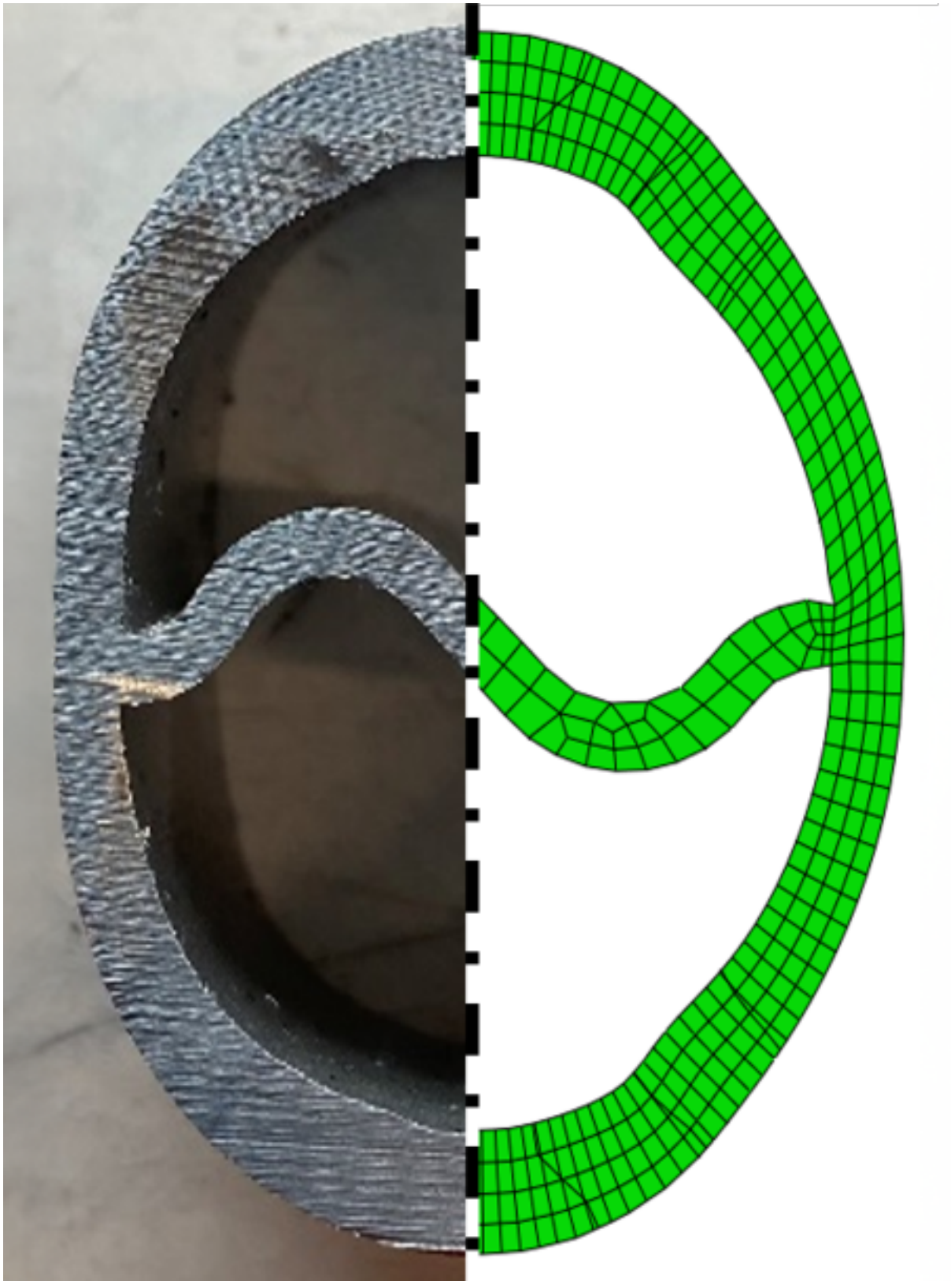
Innovative forming technology for vehicle parts: Flexible grading of aluminium profiles

About this project



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About this project

ProLeit

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Markets: 

Material: Aluminium, Magnesium, Steel, Titanium

This project is funded by the Technology Transfer Programme Leichtbau (TTP LB) of the Federal Ministry of Economics and Energy.

Technology Transfer Program Leichtbau

Context

Lightweight construction plays a key role in resource-saving mobility. Extruded aluminium profiles in particular are well established in vehicle and aircraft construction, as they combine high strength with low weight. To date, however, these profiles can only be monolithically customised in two dimensions - flexible modification along the longitudinal direction is not economically feasible with current processes. This leads to unnecessary material usage and requires costly reworking.

To overcome these limitations, the research team in the ProLeit project is developing a new type of grading technology that enables the profile geometry to be customised along the longitudinal axis.

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Purpose

The researchers want to transfer the newly developed grading technology from the laboratory to industrial practice. Their aim is to flexibly shape extruded profiles not only in cross-section, but also along the longitudinal direction. This means that material is only used where it is actually needed. This opens up new possibilities for lightweight construction that not only save material and costs, but also improve the CO# balance. Studies show: In the automotive industry, the process could open up lightweight construction potential of at least 25 per cent. The team is also researching how alternative geometries, such as oval, square and multi-chamber profiles and various materials, can be processed alongside classic round profiles in order to increase the range of applications and achieve further weight savings.

With the industrialisation of the process, the grading technology could also be used in other areas of lightweight construction - with applications far beyond mobility, for example in plant construction or the energy sector.

Procedure

In order to transfer the technology to industrial applications, the project team is developing an innovative forming technology based on roll forming. The profiles pass through special rollers that change the cross-section in a targeted manner. One focus of the work is the transfer of roll forming to complex profile geometries, such as multi-chamber profiles. To this end, the forming process is first simulated using numerical methods and then validated experimentally using real, extruded profiles. The results show a high level of agreement between simulation and experiment.

The scientists are also investigating how different material properties affect the forming process and which process parameters need to be optimised in order to ensure stable and reproducible components.

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Funding duration:

Funding sign:	03LB2015	**Funding amount:**	EUR 788 thousand

Final report

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB2015A - ProLeit in the federal funding catalogue

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Project coordination

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English (EN){{ Projektpartner }}

Lightweighting classification

	Realisation
Offer	
Products Parts and components, Semi-finished parts	✓
Services & consulting Training, Testing and trials, Engineering, Validation, Simulation, Technology transfer	✓

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Lightweighting classification

	Realisation
Field of technology	
Design & layout Lightweight manufacturing	✓
Functional integration	
Measuring and testing technology Component and part analysis, Visual analysis (e.g. microscopy, metallography), Materials analysis, Destructive analysis	✓
Modelling and simulation Loads & stress, Optimisation, Processes, Structural mechanics, Materials, Reliability validation	✓
Plant construction & automation Plant construction	✓
Recycling technologies	
Manufacturing process	
Additive manufacturing	
Coating (surface engineering)	
Fibre composite technology	
Forming Extrusion moulding, Stretch forming, Rolling	✓
Joining	
Material property alteration	
Primary forming	
Processing and separating	
Textile technology	

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Lightweighting classification

	Realisation
Material	
Biogenic materials	
Cellular materials (foam materials)	
Composites	
Fibres	
Functional materials	
Metals Aluminium, Magnesium, Steel, Titanium	✓
Plastics	
Structural ceramics	
(Technical) textiles	