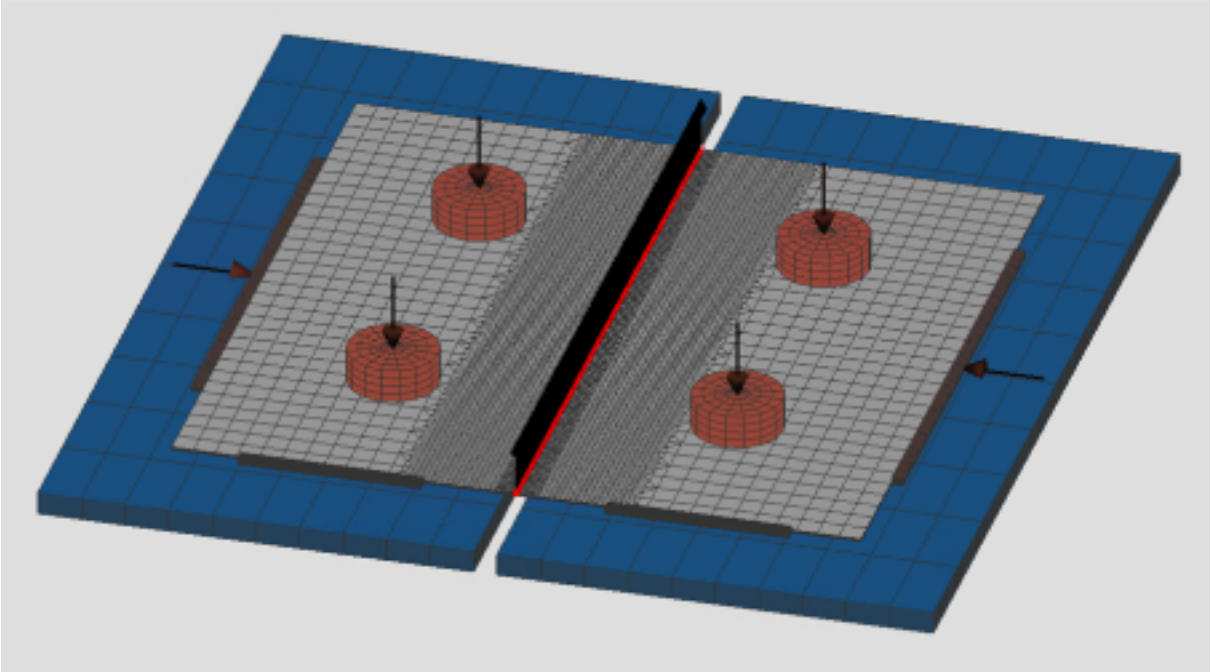
ultra-high-strength steel: optimising tailor-welded blanks with digital processes

About this project



TWBlock

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Markets:

Material: Others (Tailor Welded Blanks), Steel, Laminates

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

Technology Transfer Program Leichtbau

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Context

Tailor-welded blanks (TWB) are customised sheets that join steels of different strengths by laser welding. This allows the properties of the components to be precisely tailored to the intended applications. They offer great potential for lightweight construction in the vehicle and transport industry. By saving weight, they help to reduce CO2 emissions and increase material efficiency. Despite these advantages, their potential applications have so far been limited. Difficulties such as limited formability and the springback of weld seams make it difficult to use ultra-high-strength steels with strengths of over 800 megapascals (MPa). This is where the TWBlock team comes in. The researchers are developing innovative solutions to enable the use of even higher-performance materials. With digital solutions such as a digital twin and blockchain applications, they want to optimise the entire process chain and make it more sustainable.

Purpose

The project team is working on bringing TWBs made from ultra-high-strength steels with strengths of up to 1,000 MPa into series production. The aim is to better link the welding and forming processes and to precisely model the properties of the materials using simulation. With the help of a digital twin, they are trying to understand and optimise the complex interactions between material, weld seam and forming process. The team is also integrating blockchain technologies to make the data transparent and traceable along the entire production chain. Through these approaches, the researchers hope to help reduce CO2 emissions and advance lightweight steel construction in the automotive industry. At the same time, the team wants to improve the efficiency of production and promote collaboration between those involved.

Procedure

The researchers begin by comprehensively analysing materials and weld seams. They carry out tests to determine the mechanical properties of high-strength steels and their behaviour during welding and forming. These results are incorporated into the development of a digital twin that simulates the complex processes. The team uses it to improve the welding and forming processes in a targeted manner and to better utilise the lightweight construction potential of the TWBs. Blockchain technologies ensure the integrity of the data and facilitate collaboration between the project partners. Finally, the team will test the results on a demonstrator, a vehicle side member, under real industrial conditions in order to create the basis for transferring TWBs made from ultra-high-strength steels to series production.

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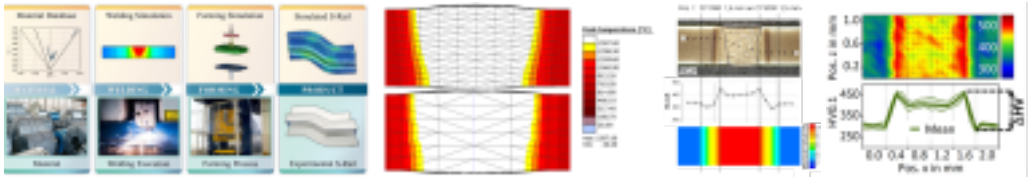

Funding duration:

Funding sign:	03LB2034	**Funding amount:**	EUR 1.6 million

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB2034A - TWBlock in the federal funding catalogue

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Project coordination

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English (EN){{ Projektpartner }}

Salzgitter Mannesmann Forschung GmbH, Salzgitter Europlatinen Gesellschaft mit beschränkter Haftung

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Lightweighting classification

	Realisation
Offer	
Products Parts and components, Semi-finished parts, Tools and moulds	✓
Services & consulting Engineering, Simulation	✓
Field of technology	
Design & layout Lightweight construction concepts	✓
Functional integration Material functionalisation	✓
Measuring and testing technology Materials analysis	✓
Modelling and simulation Crash behaviour, Loads & stress, Structural mechanics	✓
Plant construction & automation Automation technology, Robotics	✓
Recycling technologies	

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Lightweighting classification

	Realisation
Manufacturing process	
Additive manufacturing	
Coating (surface engineering)	
Fibre composite technology	
Forming Compression moulding, Deep-drawing	✓
Joining Welding	✓
Material property alteration	
Primary forming	
Processing and separating	
Textile technology	
Material	
Biogenic materials	
Cellular materials (foam materials)	
Composites Laminates	✓
Fibres	
Functional materials Others (Tailor Welded Blanks)	✓
Metals Steel	✓
Plastics	
Structural ceramics	
(Technical) textiles	