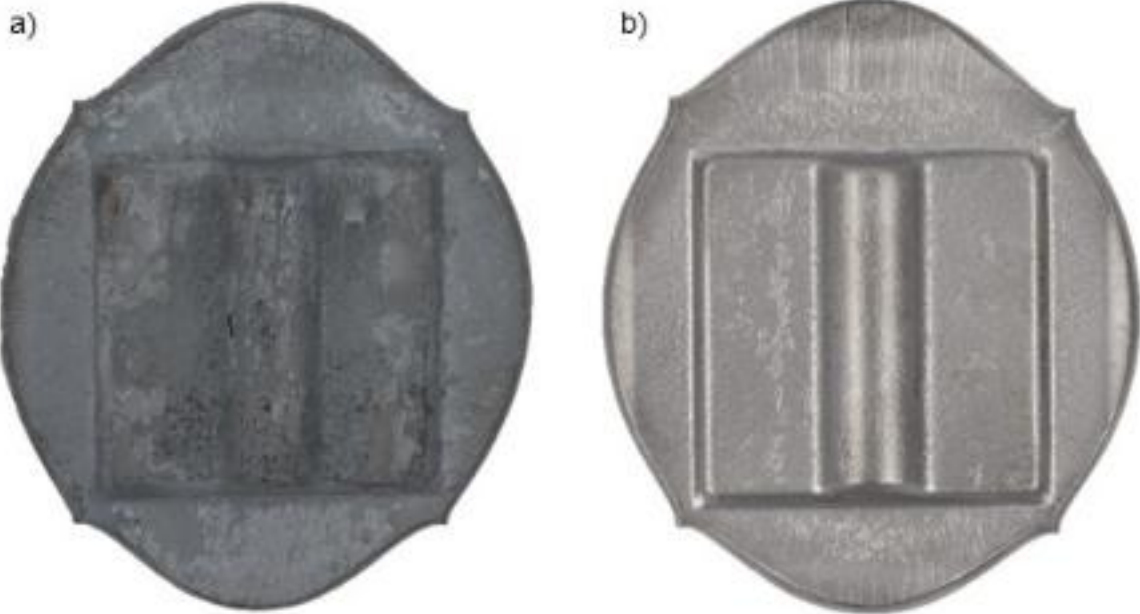


Reducing scale formation and material losses: new approaches for sustainable production

About this project



ERProFit

Reducing scale formation and material losses: new approaches for sustainable production

Markets: 

Material: Steel

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

Hot forging is a key process for manufacturing high-strength components, for example in the automotive and aerospace industries. In this process, steel is formed at high temperatures of over 950 °C, which leads to the formation of scale. Scale is formed through oxidation and causes considerable material losses of 2-3% of the raw material used. At the same time, scale accelerates tool wear and requires additional process steps such as descaling and cleaning.

The loss of material and the increased effort put a strain on the environment, lead to a high loss of energy for the additional material required and increase production costs overall. At the same time, the demand for lightweight components that combine materials such as steel and aluminium in order to reduce weight is increasing. The technical challenges here lie particularly in the reliable bonding of the two materials, as oxide layers such as scale hinder adhesion.

Purpose

ERProFit aims to minimise the formation of scale during hot forging. A low-oxygen production environment is intended to suppress oxidation and thus reduce material losses and tool wear. This also enables smooth, high-quality surfaces without additional post-processing. The project team wants to develop new technologies for the hybrid forging of steel and aluminium and thus promote lightweight construction.

By doing so, the researchers want to realise weight savings while ensuring a reliable material bond between the two materials. The project focuses on economically feasible solutions: Instead of costly new buildings, existing production facilities are being adapted to the new requirements through cost-effective retrofits. The team also uses industrial waste gases as a protective atmosphere. This increases sustainability and replaces expensive inert gases.

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Procedure

In the first step, the project partners are developing a concept for creating a low-oxygen atmosphere in the production environment of hot forging. By enclosing the production lines and using industrial exhaust gases, they can significantly reduce the formation of scale. This leads to lower material losses, improved material utilisation and a significant increase in tool life. At the same time, complex descaling processes and additional machining steps are eliminated, which increases the efficiency of the entire production chain.

Thanks to their retrofit concept, the researchers can adapt existing systems with minimal effort and realise sustainable production. The project team is successfully testing the technology under real-life conditions on commercially available forming machines. The results show great potential for CO₂ savings: With a production of 500,000 components per year, up to 10,000 kilograms of CO₂ can be avoided.

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Funding duration:

Funding sign: 03LB3017 Funding amount: EUR 220 thousand

Final report

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB3017A - ERProFit in the federal funding catalogue

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Project coordination

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English (EN){ { Projektpartner } }



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Lightweighting classification	
	Realisation
Offer	
Products Parts and components, Semi-finished parts, Machines and plants, Materials	✓
Services & consulting Training, Testing and trials, Engineering, Simulation	✓
Field of technology	
Design & layout Lightweight manufacturing	✓
<i>Functional integration</i>	
Measuring and testing technology Component and part analysis, Visual analysis (e.g. microscopy, metallography), Materials analysis	✓
Modelling and simulation Structural mechanics, Materials	✓
Plant construction & automation Plant construction	✓
<i>Recycling technologies</i>	

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Lightweighting classification	
	Realisation
Manufacturing process	
Additive manufacturing	
Others (Forging under a protective gas atmosphere)	✓
Coating (surface engineering)	
Fibre composite technology	
Forming	
Forging	✓
Joining	
Material property alteration	
Primary forming	
Processing and separating	
Others (Forging)	✓
Textile technology	
Material	
Biogenic materials	
Cellular materials (foam materials)	
Composites	
Fibres	
Functional materials	
Metals	
Steel	✓
Plastics	
Structural ceramics	
(Technical) textiles	