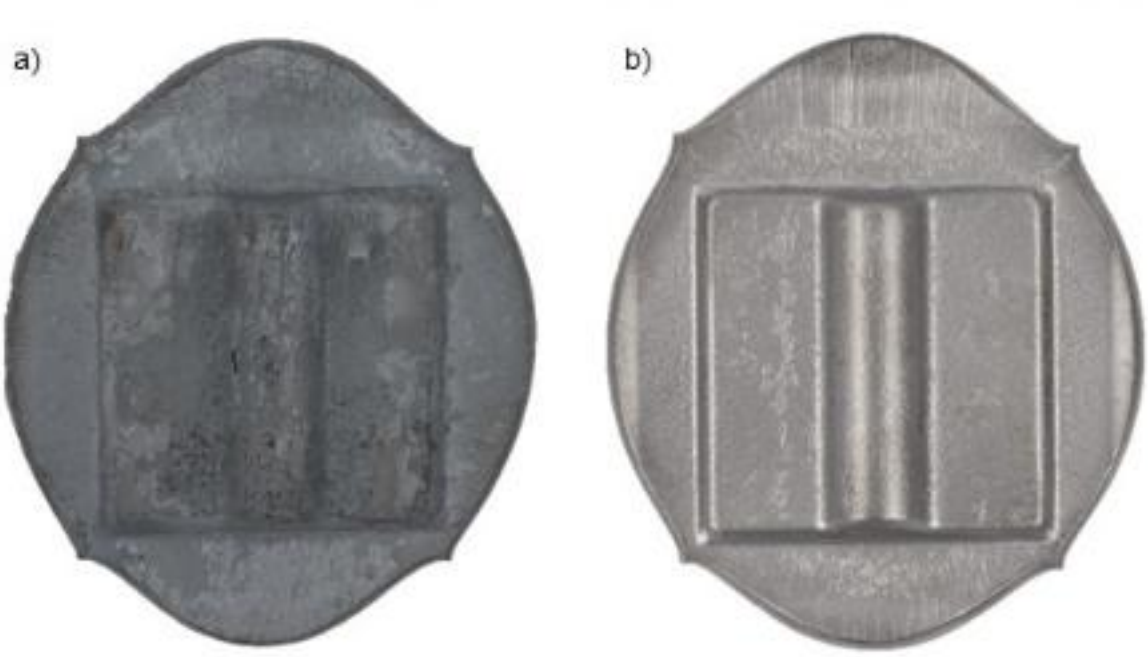
# Reducing scale formation and material losses: new approaches for sustainable production

## About this project




### ERProFit

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

**Markets:**

**Material:** Steel

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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 CO# savings: With a production of 500,000 components per year, up to 10,000 kilograms of CO# can be avoided.

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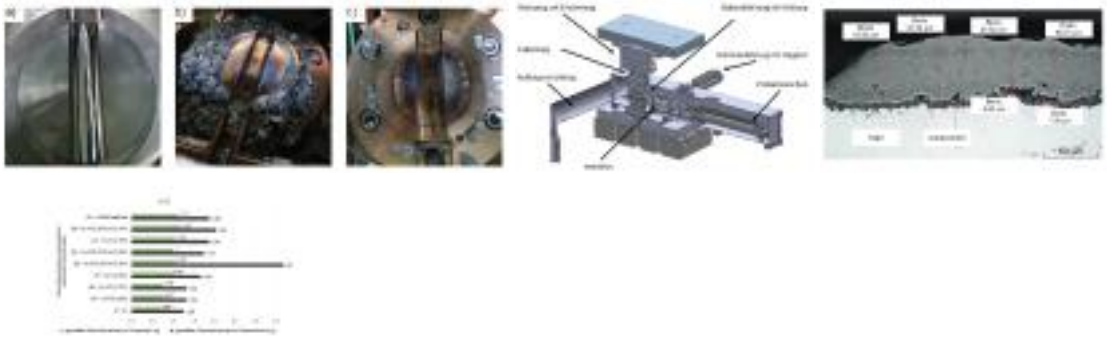

**Funding duration:**

| | | | |
|---|---|---|---|
| **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

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

## Project coordination

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## English (EN){{ Projektpartner }}

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

## Lightweighting classification

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

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## Lightweighting classification

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