

Manufacture forming tools more sustainably: Avoid cold welding with additive manufacturing

About this project



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EnERU

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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](#)

Context

The production of forming tools for stainless steel tube processing causes high costs and environmental pollution. Until now, it has required many energy-intensive steps such as vacuum hardening, multiple tempering and a complex physical vapour deposition (PVD) coating. In the PVD process, thin, wear-resistant layers are applied to the workpiece in a vacuum chamber. This improves the surface hardness, but is resource- and energy-intensive.

Another key problem is cold welding during use: During bending, the tube and tool rub against each other, causing metal particles to bond unintentionally. This impairs the service life of the tools and leads to production errors. The research team in the EnERU project is developing a new method to manufacture tools more efficiently and extend their service life.

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Purpose

The researchers want to replace the existing coatings with an integrated functional layer. Instead of hardening and coating the entire mould, they are focusing on targeted reinforcement of the stressed areas. They are using the laser metal deposition process (LMD), an additive manufacturing technique. In the LMD process, metal powder or wire is melted locally with a laser and applied in layers. This creates a metallurgically bonded, wear-resistant surface without having to treat the entire mould.

This eliminates energy-intensive steps such as vacuum hardening and tempering. At the same time, material consumption is significantly reduced because the researchers only reinforce the mould where it is actually necessary. The new process should significantly reduce CO₂ emissions per mould.

Procedure

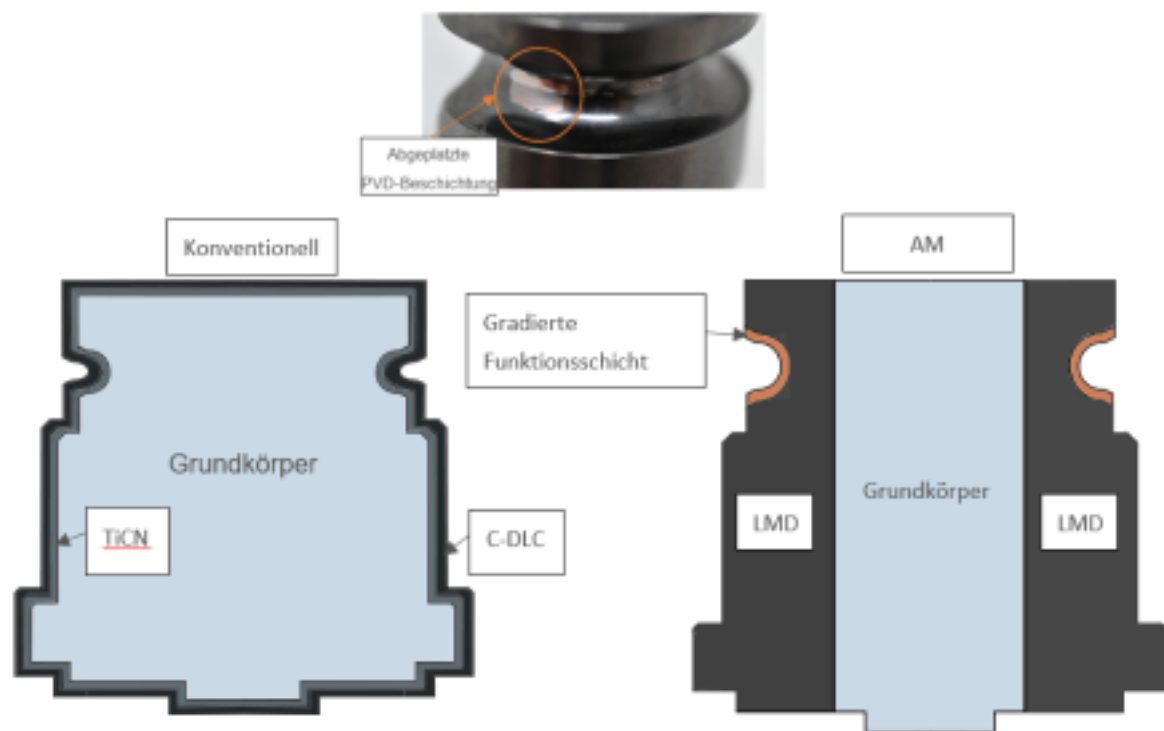
First, the team analyses why the existing tools fail. They measure the loads during the bending process and simulate the forces at work. Based on these findings, they develop new materials that are more resistant to cold welding. They then test different material mixtures and grading strategies in order to achieve a stable transition between the base body and the functional layer.

They then produce prototypes using LMD technology and subject them to practical tests. The new tools have to prove themselves in real bending processes and demonstrate their durability under industrial conditions. Should a tool nevertheless show signs of wear, the LMD process enables a targeted repair in which only the affected area is renewed instead of replacing or recoating the entire tool.

The project is therefore laying the foundations for more efficient, more sustainable production of bending tools. In the long term, the technology could also be used for other forming processes such as the cold forming of aluminium tubes.

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Funding duration:

Funding sign:

03LB3037

Funding amount:

EUR 302 thousand

Final report

Further websites

foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB3037A - EnERU in the federal funding catalogue

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Project coordination

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English (EN){ { Projektpartner } }



Lightweighting classification

Realisation	
Offer	
Products Tools and moulds	✓
Services & consulting Engineering	✓

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Lightweighting classification	
	Realisation
Field of technology	
Design & layout Lightweight manufacturing	✓
Functional integration Others (Functionalisation Component)	✓
Measuring and testing technology Materials analysis	✓
Modelling and simulation Loads & stress, Materials	✓
<i>Plant construction & automation</i>	
Recycling technologies Others (Increased service life)	✓
Manufacturing process	
Additive manufacturing 3D printing, Deposition welding, Others (Laser metal deposition (LMD))	✓
Coating (surface engineering) Galvanising	✓
<i>Fibre composite technology</i>	
Forming Bending	✓
<i>Joining</i>	
<i>Material property alteration</i>	
<i>Primary forming</i>	
Processing and separating Turning, Milling	✓
<i>Textile technology</i>	

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Lightweighting classification	
	Realisation
Material	
Biogenic materials	
Cellular materials (foam materials)	
Composites	
Fibres	
Functional materials	
Metals	✓
Steel	
Plastics	
Structural ceramics	
(Technical) textiles	