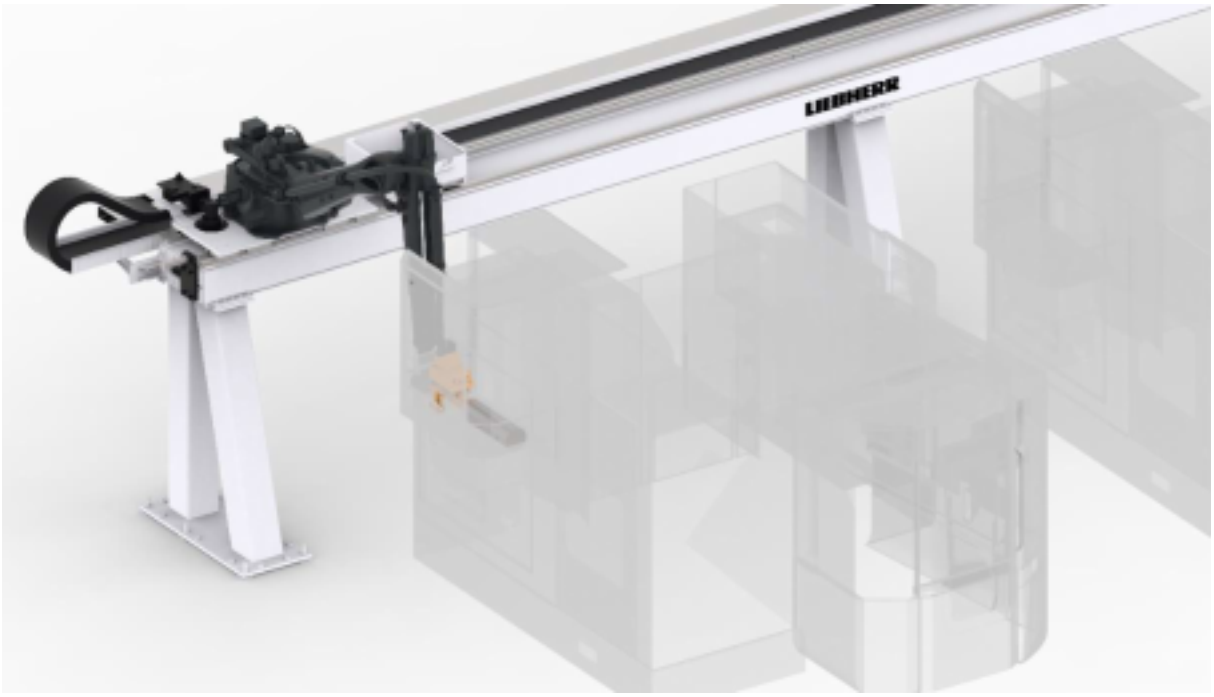
Systematically implementing lightweight construction: with digital workflows

About this project



SyProLei

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Markets:

Material: Carbon fibres, Others (Cross-material), Others (Cross-material), Carbon-fiber reinforced plastics (CFRP)

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

Lightweight construction is an important key to resource-saving, cost-efficient and sustainable products. Nevertheless, much of the potential remains untapped as there is a lack of systemic approaches to optimise costs, functionality and environmental performance in equal measure. Sectors such as mechanical engineering, the leisure industry and medical technology need solutions that apply lightweight construction not only at component level, but across entire systems. The researchers in the SyProLei project are addressing this gap with a comprehensive approach that integrates material, product and production perspectives.

Purpose

The aim of the scientists is to develop a universal methodology that integrates lightweight construction into the entire product development process. Digital workflows are intended to make the developed methodology usable for various industries. The project team is focusing on systematically analysing conflicting objectives, i.e. weighing up and balancing competing requirements such as costs, material and energy efficiency and functionality, which can influence each other.

The results are intended to form a basis for future applications. In this way, the researchers hope to contribute not only to technological innovation, but also to the reduction of material consumption, energy requirements and CO# emissions in both the manufacturing and utilisation phases.

Procedure

The project team first develops a methodology for the end-to-end development of lightweight products. The team then maps these in digital workflows. The researchers analyse existing processes in order to identify potential for conserving resources and saving materials. Building on this, the team develops innovative concepts and analyses them using multi-criteria evaluation methods.

The team tests the methodology using three practical use cases. They are developing concepts for reducing energy consumption and weight on a gantry robot. In a bicycle trailer, new materials and production methods improve safety and increase sustainability. Prostheses are made lighter, more functional and more sustainable through holistic optimisation by systematically coordinating all components and using new material and production approaches.

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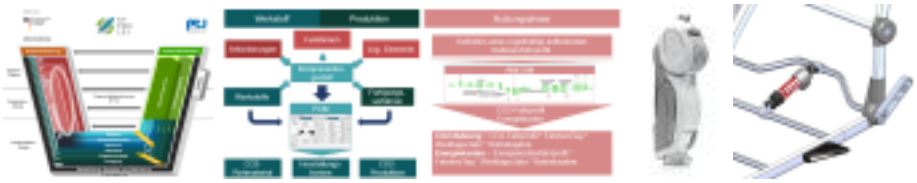

Funding duration:

Funding sign:	03LB2007	**Funding amount:**	EUR 2.8 million

Final report

Further websites

foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB2007A - SyProLei in the federal funding catalogue

www.syprolei.de/ - SyProLei website

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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, Machines and plants, Software & databases, Systems and end products	✓
Services & consulting Consulting, Engineering, Prototyping, Simulation	✓
Field of technology	
Design & layout Lightweight manufacturing, Lightweight design, Hybrid structures, Lightweight construction concepts, Lightweight material construction	✓
Functional integration Actuator technology, Material functionalisation	✓
Measuring and testing technology Component and part analysis, System analysis, Environmental simulation, Materials analysis	✓
Modelling and simulation Loads & stress, Life-cycle analysis, Multiphysics simulation, Optimisation, Reliability validation	✓
Plant construction & automation Plant construction, Robotics, Others (General mechanical engineering)	✓
Recycling technologies	

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Lightweighting classification

	Realisation
Manufacturing process	
Additive manufacturing Others (Cross-procedural)	✓
Coating (surface engineering)	
Fibre composite technology Others (Centrifugal process (fibre composite plastic))	✓
Forming Others (Cross-procedural)	✓
Joining	
Material property alteration	
Primary forming Others (Cross-procedural)	✓
Processing and separating Others (Cross-procedural)	✓
Textile technology	

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Lightweighting classification

	Realisation
Material	
Biogenic materials	
Cellular materials (foam materials)	
Composites Carbon-fiber reinforced plastics (CFRP)	✓
Fibres Carbon fibres	✓
Functional materials	
Metals Others (Cross-material)	✓
Plastics Others (Cross-material)	✓
Structural ceramics	
(Technical) textiles	