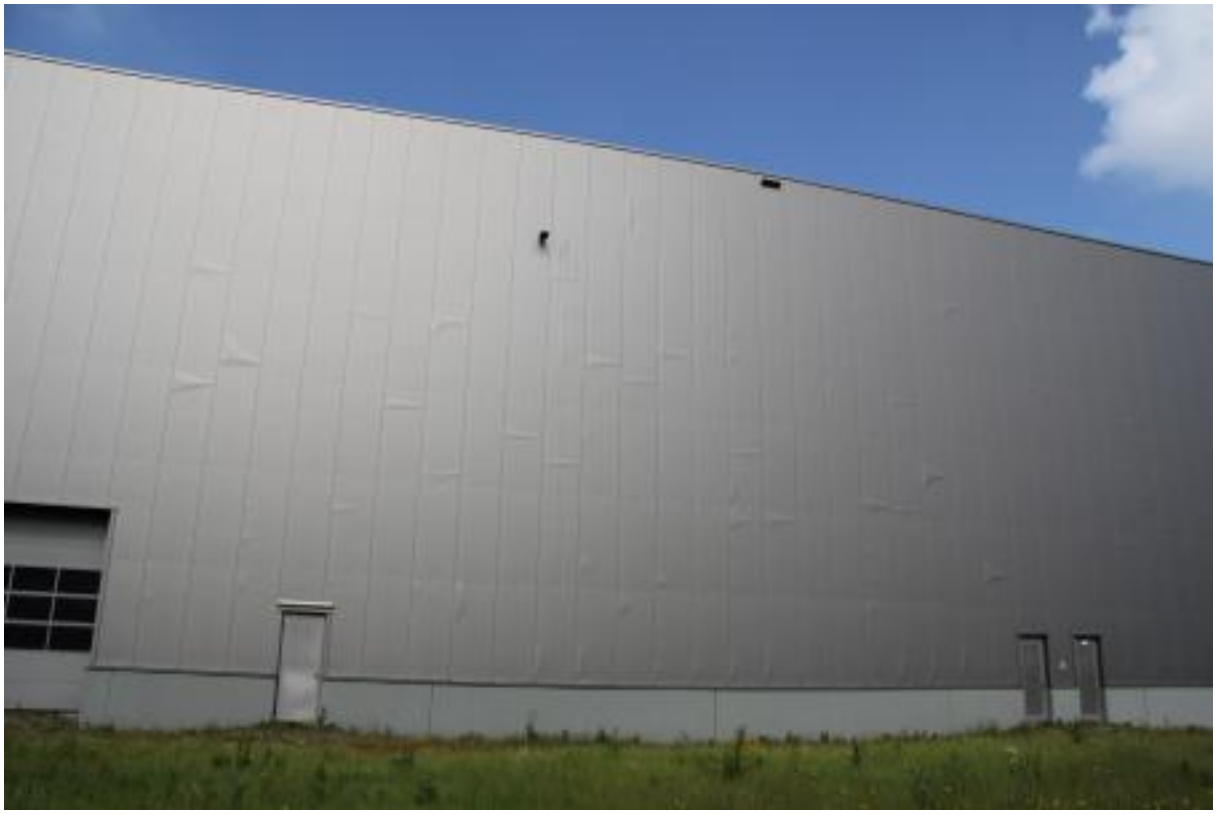
Sandwich elements without material defects: Ultrasound-based analysis reduces damage

About this project



ReSaMon

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Markets:

Material: Others (Polyurethanes), 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

Lightweight construction plays a central role in modern building construction. It saves material, reduces weight and improves the energy efficiency of buildings. Sandwich elements are widely used here. The panels investigated in the project consist of two thin layers of metal and a core of polyurethane (PUR) or polyisocyanurate (PIR). The core provides a high level of thermal insulation, while the outer steel sheets provide the load-bearing capacity.

During production, the core foams when heat is generated, i.e. exothermically. This can lead to the formation of invisible air pockets, known as blowholes. If they remain undetected, this can lead to complaints, reworking and additional material consumption - and therefore to higher CO# emissions and costs.

Purpose

The overarching aim of ReSaMon is to significantly improve quality assurance in the production of sandwich panels. The project partners want to detect defects in the foaming process before the panels leave the factory. The team wants to improve quality assurance so that over 95 per cent of all blowholes are detected during production. This will save manufacturers rejects, reduce rework and cut CO# emissions by up to 15 per cent.

Procedure

The project partners are integrating non-contact ultrasonic transducers into the production line. These transmit sound pulses through steel cover layers and receive the reflected signals. At the same time, the researchers are developing a digital twin: in the virtual model, they vary the cavity sizes and positions in order to simulate realistic test data.

The partners generate a data set with time and frequency information from the simulation and ultrasound measurements. Based on this, they train machine learning models that recognise typical fault patterns. Finally, the team validates the method on real sandwich elements using impulse hammer tests. In this way, it checks the reliability during operation and optimises the algorithms for industrial use.

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Funding duration:

Funding sign:	03LB3029	**Funding amount:**	EUR 2.3 million

Final report

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB3029A - ReSaMon 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 Materials	✓
Services & consulting Consulting, Testing and trials, Standardisation, Validation, Simulation	✓
Field of technology	
Design & layout Hybrid structures	✓
Functional integration Sensor technology	✓
Measuring and testing technology Component and part analysis, Visual analysis (e.g. microscopy, metallography), Materials analysis, Destructive analysis, Non-destructive analysis	✓
Modelling and simulation Crash behaviour, Loads & stress, Life-cycle analysis, Multiphysics simulation, Optimisation, Structural mechanics, Materials, Reliability validation	✓
Plant construction & automation	
Recycling technologies Downcycling, Material separation, Recycling	✓

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Lightweighting classification

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