Research focus areas



FACULTY OF ENGINEERING

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Lightweight design



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Virtual product development and design methodology



Machine elements and component design



Mechatronic systems in mechanical engineering

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Energy-efficient technical systems thanks to lightweight design

The energy efficiency of technical systems has become more and more important in industry during the past few years. In this context, lightweight design has become a key factor in product development as a reduction in unnecessary weight means more energy-efficient products. KTmfk's efforts in lightweight design can be divided into three core areas: simulation-based design, materials characterisation and structure optimisation. Within our research projects and working groups, we have already developed innovative solutions which make it possible to use the lightweight potential of technical systems in many applications.

Research focus area Lightweight design Materials characterisation

Simulation-based design

Design of fibre-reinforced plastic components in early product development

Thanks to their excellent mechanical properties fibre-reinforced plastic components are used more and more often in modern lightweight structures.

However, the design of fibrereinforced components presents a considerable challenge for product developers as the mechanical properties of these composites are largely

dependent on the fibre orientation matching the exerted load. The development of strategies and methods to design fibre-reinforced plastic components is therefore crucial in the early stages of product development, focusing on short fibrereinforced thermoplastics and continuous carbon fibre reinforced plastics.

Development of crashworthy lightweight design concepts

In addition to the lowest weight possible, crash safety is an essential requirement for lightweight structures especially in automotive and aircraft manufacturing. In order to achieve sufficient crash

safety in lightweight designs, state-of-the-art simulation processes analysing the crash behaviour before the



prototype has been manufactured are required in the early stages of product development.

Materials characterisation

Characterisation of materials under highly dynamic load

Before simulating a component's crash behaviour, its behaviour under a highly dynamic load must be determined precisely. At KTmfk, high-performance equipment is available for this purpose: a servo-

hydraulic high-speed testing machine and an optical evaluation system with two high-speed cameras. The data obtained in this process are then used to create realistic simulation models.



Structure optimisation

Structure optimisation in the design process

Structure optimisation methods have proven to be effective tools for designing lightweight components in the product development process. However, the benefits of structure optimisation are

often diminished by the time-consuming reconstruction and interpretation of the optimisation results. KTmfk is therefore developing methods and tools that enable to transfer optimisation results into feature-based CAD models.





