



Best practice example

for lightweighting in Germany

Lightweight prosthetic adapter




Comparison of a lightweight prosthetic adapter (left) and a conventional prosthetic adapter (right)

Lightweight prosthetic adapters – the key to mobility for people with disabilities

Fields of application

 Medical technology

In this example, lightweighting allowed for the following reductions compared to a conventional model made of an aluminium alloy:

 Weight approx. -54%

Application

Disabled athletes with prosthetic legs want lightweight prostheses that offer a high energy return. For athletes having undergone a transfemoral amputation, a knee joint is inserted between the prosthetic foot and the prosthetic socket, which is usually connected to the carbon foot via an adapter.

Challenge

The focus of this project is on producing a prosthetic adapter with comparable strength, rigidity and interfaces with a conventional adapter. In addition, the weight of the prosthesis is to be significantly reduced. For athletes, this means that the mass to be dynamically moved is much lower, leading to greater speed and endurance.

Solution

The goals were able to be achieved through topological optimisation and the use of additive manufacturing. The design, produced using a generative process, was adapted to the primary loads and supplemented by secondary loads in order to make the design suitably robust.

Best-Practice-Beispiel | Lightweight prosthetic adapter



Lower part of a walking prosthesis



Test set-up of a prosthetic adapter

Weitere mögliche Anwendungen



Energy technology



Construction of rolling stock



Sports and leisure equipment



Aircraft construction



Shipbuilding



Spacecraft construction

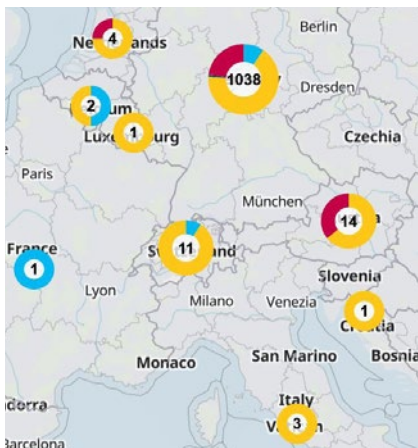
A further goal of the project is to improve the digital process chain. To assist with the topological optimisation process, a digital model was created, producing a simulated and geometric image of the physical object almost simultaneously, before it is manufactured. This was supplemented by information from digital production and the test process. Throughout these

activities, particular attention was paid to ensuring data integrity.

The combined use of simulation-based development and producibility through additive manufacturing not only opens up new possibilities and creates added value on the prosthesis market. It also raises the potential for improving brackets of all types through the ability to tailor such components to

the respective application. This can be harnessed particularly effectively in design and production processes that involve a digital process chain.

Compliance with all requirements relevant for the sector is ensured. Research activities are being conducted so as to further improve health and safety, environmental protection and recycling.



Der LIGHTWEIGHTING ATLAS

The LIGHTWEIGHTING ATLAS is an interactive web portal that pools information on those active in lightweighting and their skills across different industries and materials. The atlas is free to use and entries into the atlas are also free. You can find the LIGHTWEIGHTING ATLAS at www.leichtbauatlas.de

The Lightweighting Initiative

Modern lightweighting is of pivotal importance for German industry and its competitiveness. The Federal Ministry for Economic Affairs and Climate Action has established the Lightweighting Initiative to support lightweighting in Germany. The Lightweighting Initiative Coordination Office in Berlin, which is financed as part of the initiative, pools all activities relevant to lightweighting and supports German companies, especially SMEs, as they implement lightweighting.

Contacting the Lightweighting Initiative Coordination Office

André Kaufung
 Director of the Coordination Office
 Tel: +49 30 2463714-0
 Fax: +49 30 2463714-1
 Email: gsl@initiativeleichtbau.de
www.initiativeleichtbau.de

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