



# Best practice example

for lightweighting in Germany

Lightweight cargo tricycle



Cargo tricycle with a newly developed front end including transport boxes

## Lightweight cargo tricycle (Lasten-LeichtBauFahrrad, L-LBF)

### Fields of application



Logistics



Manufacture of other vehicles

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



Weight approx. -40%\*

\*through optimisation of the design, dimensioning and material (aluminium) of the frame structure and the rims.

### Application

Cargo bikes are becoming increasingly popular. In order to make them more attractive for short journeys than taking the car, they need to become lighter, more climate-friendly and more resource-efficient.

### Challenge

Using a commercial cargo tricycle as a basis, a prototype was created for making bicycles safer, more robust and more durable. The potential for optimisation was demonstrated in numerous areas: the overall design, choice of materials, integration of functions, and the integrated battery system.

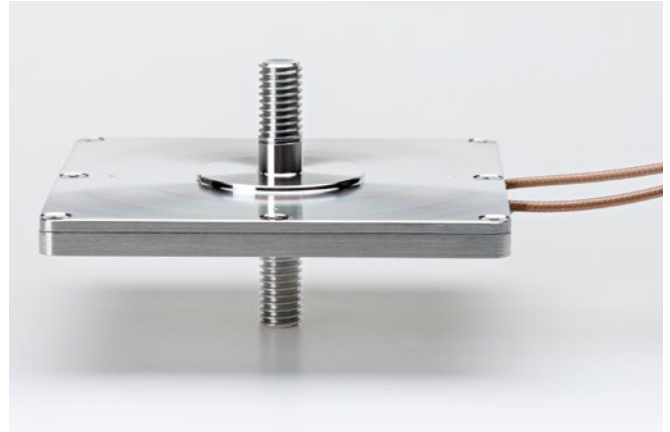
### Solution

By redesigning the front end of the commercial cargo tricycle, a weight saving of 39% was achieved. However, the focus was not only on modifying the design and switching materials, but also on integrating new functions, such as sensor modules able to measure and connect, as well as a tubular energy system (TES).

## Best-Practice-Beispiel | Lightweight cargo tricycle



Tubular energy system (TES), which is integrated into the centre tube of the front end of the tricycle in a way that makes it theft-proof.



Sensor module for measuring the transport mass and its distribution within the box.

### Other potential applications



Automotives



Machinery and plant construction



Sports and leisure equipment



Aircraft construction



Drone construction

The key feature on the new front-end frame is the aluminium tube, which contains the newly developed tubular battery system TES.

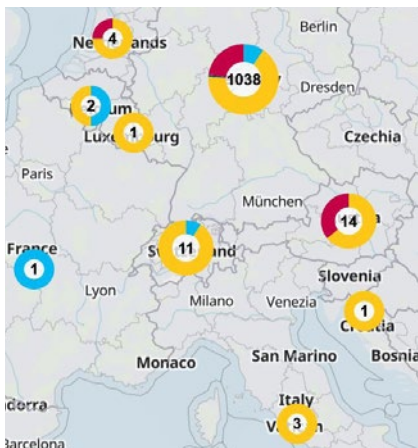
At 1000 Wh, this has twice the storage capacity compared with the commercial battery system and also has a specially developed battery management system. Special sensory connectors with thread connections on both sides and a

capacitive sensor system inside were developed and provided with electrode and elastomer foils.

These multifunctional elements connect the four corners of the transport box to the frame and each help to measure the load mass as well as its distribution across the box, which shown to the driver on a digital display on the handlebars.

The boxes are made of 100% recycled materials (e.g. recycled plastic, e.g. PET, polyurethane foam from mattresses) or 100% natural materials (e.g. meadow grass/flax, bark mulch, cork).

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](http://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](mailto:gsl@initiativeleichtbau.de)  
[www.initiativeleichtbau.de](http://www.initiativeleichtbau.de)

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