



# Best practice example

for lightweighting in Germany

Lightweight linear drive

Length: 1 m, weight: -50%



Weight: -70%



Weight: -75%



Components of the CFK linear drive (above: stator, below: f.l.t.r. rotor mould, saddles)

## Fibre-composite linear drive

### Fields of application



Machinery and plant construction

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



Weight approx. -70 %

### Application

A linear drive is an electric engine whose design, in this case, is based on a stator, a rotor and lateral guide elements. This design allows for straight, hovering movements with high levels of acceleration; a pneumatic suspension system eliminates almost all friction.

### Challenge

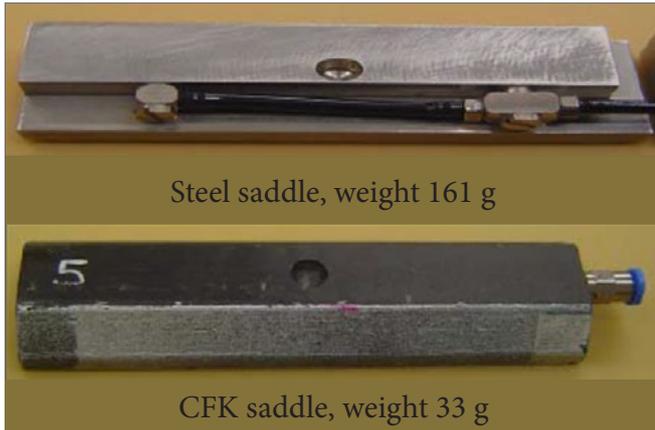
The objective of this project was to replace metals in order to reduce weight whilst maintaining at least equivalent properties, thus improving the drive's efficiency.

### Solution

The task was solved by adjusting the geometry of the design around the use of fibre-composites and with the help of FEM simulations (finite elements method).

The manufacturing process used for all 3 components (stator, rotor, saddles) is RTM (resin transfer moulding).

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Reproduction of the reference saddle (above) and of an CFK saddle (below)



Prototype on the basis of the fibre-composites developed as part of the project

### Other potential applications

n/a

In the interest of achieving maximum efficiency in the production of the composites, the premoulding process (for stators and rotors) was developed further and priority given to achieving a high level of functional integrity (saddles). This was notably important in the design of the lateral guide elements. The aim was for the newly developed component was to be as economically viable as the steel structure.

In the case of the saddle, it proved possible to achieve the necessary stiffness by using high modulus fibres. The high level of functional integration (moulding close to the final geometry, integrated air ducts, dry-running coat applied during the process) makes it possible to produce the component at a viable cost.

It proved possible to increase the system's thrust to 220% and to double its acceleration to 131 m/s<sup>2</sup>.

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



### The 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. 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

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