Federal Ministry
for Economic Affairs
and Climate Action

Best practice example

for lightweighting in Germany

CFC/GFRP milling cutter

Specialist tools for CFC

Shorter process times in CFC/GFRP work

Fields of application

Automotives | Machinery and plant construction | Aircraft construction | Spacecraft vehicle construction | Medical technology

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

Weight approx. -25% | Energy approx. -15% | Cost approx. -50% | Process time approx. -50%

Application

Milling, cutting, drilling – modern CNC-controlled machines and their tools form the basis for efficient industrial manufacturing and allow for materials and surfaces to be handled in a precise way and to the highest standards. An increasing range of products, including chassis, aeroplane parts and machinery, are made from lightweight materials.

Challenge

Lightweight, fibre-reinforced materials (CFC/GFRP/CMC) with their particular structures and abrasiveness are especially demanding when it comes to tools and CNC-machinery. Specialist tools optimised for these materials are required in order for these materials to be worked without fraying or delamination, and to the required standards of surface quality and cost-efficiency.

Solution

A toolmaker working in close cooperation with automotive, aerospace and machinery manufacturers has laid the basis for optimised CFC/GFRP milling cutters with a special diamond coating. The outcome: up to 50% less process/manufacturing time with equivalent or even better results in terms of quality.

Best Practice Example | CFC/GFRP milling cutter

Carbon chassis

Turbine blade made of lightweight material

Other potential applications

Energy technology

Commercial vehicles construction

Rolling stock construction

Shipbuilding

Manufacture of other vehicles

Lightweight, malleable, stiff and sturdy: fibre-reinforced materials (CFC/GFRP/CMC) offer major advantages. A project receiving public-sector funding for the development of milling tools optimised for certain materials has added another argument to the list by cutting process time for CNC work by up to 50%. Properties that make fibre-reinforced materials more difficult to work are their brittleness, direction-dependent behaviour, layered structures, and sensitivity to temperature. The newly developed milling cutters, which – set to high rotational speeds – can offer high performance without heating up the materials too much, can help prevent defects such as delamination or splintering. Adjustments made to the cutting geometry and the use of a diamond coating strong enough to withstand the abrasiveness of the materials allow for much shorter process times, better quality, and longer use times. 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

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

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