

DYNEXA



CFRP – THE MATERIAL FOR YOUR INNOVATIONS

**FOR INNOVATORS.
FOR PATHFINDERS. FOR YOU.**



FROM IDEAS TO REALITY

XPLORE DYNEXA

Pioneer. Technology Leader. Trendsetter. Driven by the Fascination for CFRP.
This is what DYNEXA is about.

We Live CFRP

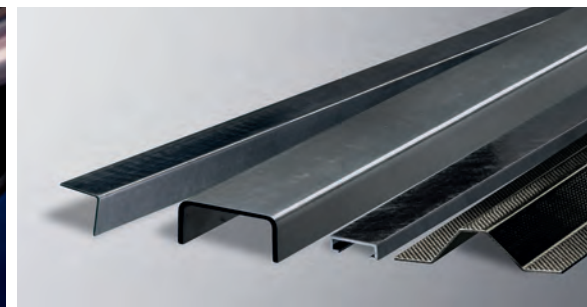
We are dedicated to one of the most fascinating materials in the world. And not without reason: when used in mechanical engineering, fiber-reinforced plastics create possibilities hitherto undreamed of. In times when established companies face increasing competition from emerging markets, there is a growing desire for differentiation. Despite increasing cost pressure, innovative, high-end solutions must be developed to keep the competition at bay. In this context, significant quantities in mass production are an added bonus. Making use of CFRP as a material for mechanical components allows for intelligent and outstanding solutions that are not achievable with conventional materials.

We Are Good at What We Do

As pioneers in the industrial use of fiber-reinforced plastics, we are experts and technology leaders in the design and manufacture of machine components made of CFRP. Our production is focussed on tie rods, struts, structures, levers, beams, shafts and other components, designed to perform under defined conditions. We offer attractive innovations with the help of material designs and the development and implementation of industrial scale solutions. We supply composite machine components to customers from various industrial sectors and are trendsetters in the requisite serial production methods.

Together We Are Strong

DYNEXA is a subsidiary of the globally-oriented Avanco Group, which includes companies such as INOMETA and XELIS. With more than 300 employees working at eight manufacturing locations and other sales offices, the AVANCO Group is a leading technology company in the high-end use of lightweight carbon-fiber composites and aluminum.



The AVANCO Group is a globally leading company engaged in the development, manufacturing and refinement of technical products made of aluminum and fiber composite materials (carbon fiber and glass fiber). These particularly includes tubes and profiles, tubular and prismatic lightweight components. The entire value chain is focused on the development of technically high-end solutions and their industrial production.

INOMETA is a market leader in the development, production and distribution of web guide and sensor rollers, technical tubes and functional surfaces. The lightweight design based on aluminum and carbon fiber composite materials are of particular importance to us.

XELIS is a partner of the global aviation industry for the development, production and integration of highly rigid lightweight structural components made of fiber-reinforced composite materials. In this context, a particular focus is on the series production of thermoplastic composite profiles based on the patented continuous compression molding technique X-CCM®.

As a group of companies, we combine broad expertise, strong development skills and reliable manufacturing structures for the entire range of today's fiber composite applications. Find out more about what we can do for you: [xplore DYNEXA](#).

DISCOVER DISCOVERY

ONE OF THE MOST EXCITING MATERIALS IN THE WORLD

Imagine a material that shrinks when subjected to warmth. Or a material that expands when pulled apart. A material that could basically have any feature you could imagine. And imagine, we are already working with that material: carbon composites.

Excellent Material Properties

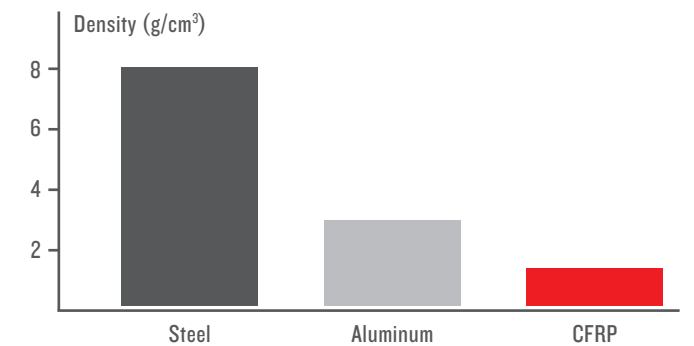
CFRP is the perfect mechanical engineering material. The material is essentially made of carbon fibers which have amazing tensile strength and are extremely stress resistant, making it possible to build components in CFRP with outstanding functions. The directional dependence of the characteristics, known as anisotropy, enables customized components with high-precision performance.

Following Nature's Example

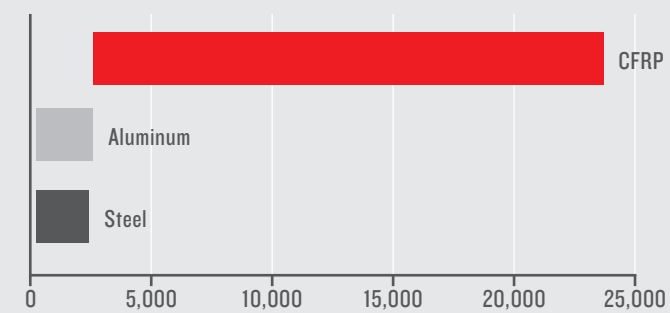
In nature, lightweight design is a principle: fibers are only positioned where really needed to avoid peak loads. We take this principle to heart when designing components made of CFRP. We too, add carbon fibers only where needed for a specific function and only in the required amount. In combination with special matrix materials, composite fibers bring sought-after features such as stiffness, strength, adjustable thermal expansion or defined damping properties to the component.

MORE EFFICIENCY THROUGH LIGHTWEIGHT DESIGN

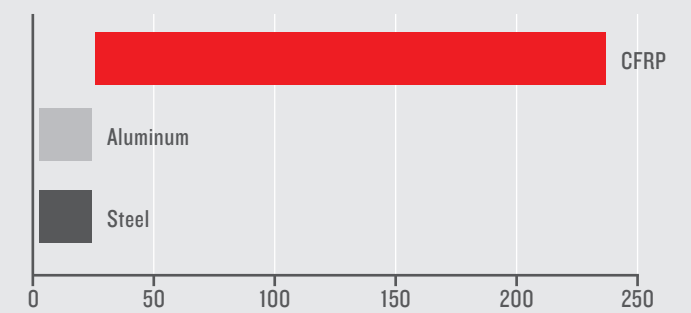
The density of CFRP is approximately 20 % of the density of steel and 57 % of the density of aluminum.



SPECIFIC STIFFNESS E/ρ [km]



SPECIFIC TENSILE STRENGTH R_m/ρ [km]



More Efficiency through Lightweight Design

In mechanical engineering, lightweight design is demanded in many places. For example in places, where masses need to be dynamically moved or accelerated. In such cases, lightweight CFRP is the material of choice because of its high stiffness and strength. In this way, components can be built that increase machine productivity and/or processing speeds while requiring smaller drives and bearings, which subsequently leads to a lower total cost of ownership (TCO).

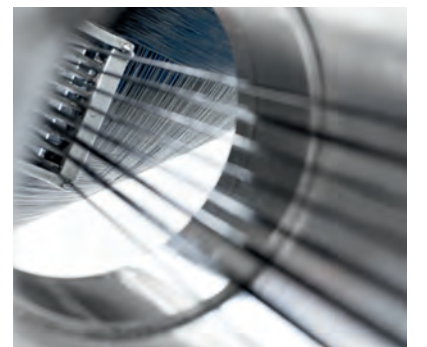
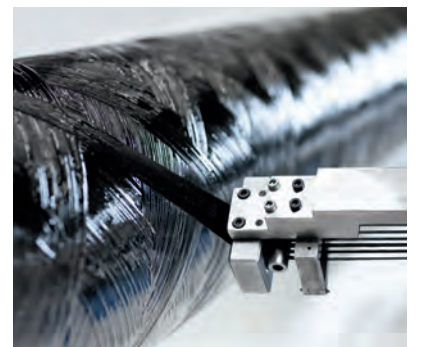
Getting the Right Setting

Carbon composites can be designed to meet your requirements and wishes. They have excellent passive damping properties, and can in some cases nearly cancel vibrations out completely. They are an excellent active vibration compensation material through the use of adaptronic technology. In addition, fiber-reinforced plastics can be made to have various

coefficients of thermal expansion, or even a thermal expansion of zero. All of these characteristics provide innumerable possibilities when designing components made of CFRP, as well as opportunities for real innovation.

Sustainable and Eco-Friendly

Compared with traditional materials such as steel or aluminum, fiber composites have less environmental impact, require less energy during production and emit fewer greenhouse gases. Less environmental impact and a smaller carbon footprint make CFRP a viable material for the future: for technical designs that are both intelligent and sustainable.



The filament winding process allows the production of tailor-made components with a high degree of process automation.

INNOVATING TOGETHER

Innovations arise from the need to improve, a desire for advancement and the pursuit of perfection. Together we will drive developments and move you all the way to the front.

FASTER. HIGHER. STRONGER.

At Your Side from Start to Finish

Our range of services includes the entire product development cycle from collecting ideas, development, design and testing down to production in series. Throughout all stages of development, you can rely on our competence and unrelenting motivation. Our product development works with state-of-the-art scientific knowledge. Day in day out, we prove our ability to run serial production of CFRP machine components with many thousand individual parts per year and in excellent quality.

Always One Step Ahead

Our work for you begins before we have even met. We have our own research and development department to stay abreast of the wide range of applications of fiber composites, and closely collaborate with leading university and research institutions in the field of fiber composite technology and related areas of knowledge such as textile technology and machine dynamics. In doing so, we make sure that you can rely on us to have the comprehensive material knowledge which is always abreast of the state of scientific knowledge. And sometimes even ahead of it.

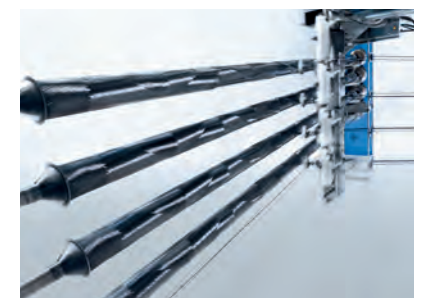
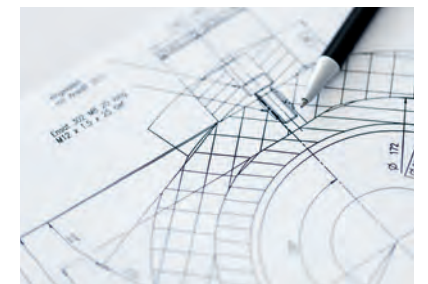
Keeping Our Eye on the Target

Solutions that are precisely tailored to your demands require dedicated, extensive development. We have implemented a systematic and methodic way of working which takes the characteristics of CFRP into account. Only as late as during production we bring matrix and fiber together to create the final material. The interaction between component geometry, specific component requirements, manufacturing methods and material characteristics requires skillful planning, constant process evaluation and targeted optimization.

**Each step brings us closer to our goal:
developing tailor-made components for you.**



Special resins form the matrix of a thermoset composite material.



From the original idea to the production process: we offer the entire product cycle from a single source.



A VIEW TO THE FUTURE

IN THE BEGINNING, THERE IS THE TASK AT HAND

Form follows function? Or might "Form follows material" be closer to the truth? Free your mind of all the restrictions you used to be subjected to when developing new ideas. Now is the time to step out of the box of conventional wisdom, to look at things from a radically new angle and to consider fresh possibilities.



More than just a Lightweight

CFRP is an outstanding material not only because it is particularly well suited to lightweight construction, but also because it can offer so much more. Replacing an existing component made of conventional materials with an identical component made of fiber-reinforced plastics might make sense, but may prove to be short-sighted. One question should always be at the forefront of your ideas: What functions must the optimal component for my machine be able to fulfill?

Freedom at the Idea-Finding Stage

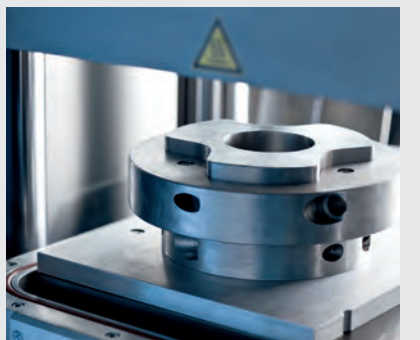
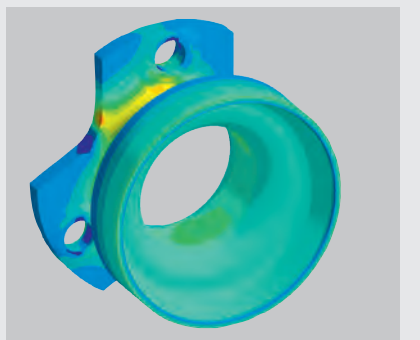
When working with conventional materials, the material characteristics determine the design of the component. When working with CFRP, the requirements concerning the component determine the material design. This will result in numerous new possibilities when implementing your ideas. And will, of course, bring about innumerable ideas. Almost anything you can imagine is possible. In the end, you can decide which characteristics your product should have.

The Destination Determines the Course to Take

Together with you we will determine the precise requirements on your specific component and the technical possibilities of designing the ideal fiber composite product. In the process, we will be looking very closely at what kind of conditions the individual components will have to endure so that we can add special design characteristics to that particular component. On the basis of this analysis we then develop a congruent specification in which all tasks and requirements are precisely described.

The Right Structure

When designing the component, we focus completely on optimizing our design concepts for fiber composites. With CFRP, you have the unique opportunity of keeping the entire system in perspective so as to make the product lighter and better through function integration. We have recognized that it is precisely at the stage when we implement multifunctional components and structures into our design that we can integrate various functions such as vibration damping, thermal stability, transmission of information, and conductivity into the end product. To ultimately select the perfect solution, we rely on tried and tested systematic and methodical processes such as the utility value analysis or the morphological box.



Perfect products require thorough analysis and careful planning.



FROM POSSIBLE TO OPTIMAL

THE ABILITY OF ABSTRACTION

How many aspects are there to any given problem? Could there be more than one correct answer to any given question? When it comes to designing components made of composite materials, there is only one essential truism: Leave the well-trodden paths behind and widen your horizons. Together we will find the best route to take.

From Concept to Design

Once all the requirements the component will have to meet have been determined and the stage of drafting is completed, designing and implementation begins. In this context, we always adhere to lightweight design principles to achieve a material volume usage which is as uniform as possible. For example, we will add sandwich or framework solutions to bolster flexionally stressed components. An extensive mechanical analysis is carried out to make sure that the product will not fail due to lack of stability and/or strength. At this point, ergonomic and aesthetic as well as safety-related aspects of product design need to be factored in. Shape and form come to life.

The Diversity of Production

When using CFRP, various methods of manufacture are available. Once required material characteristics, desired geometry and needed

quantities have been determined, finding the most suitable method is not difficult. It is our philosophy to optimize the fiber composite with regard to mechanical characteristics, production requirements and costs at the same time. The latter we achieve by making, among other things, intelligent use of various fibers and fiber types as well as hybrid methods of operation.

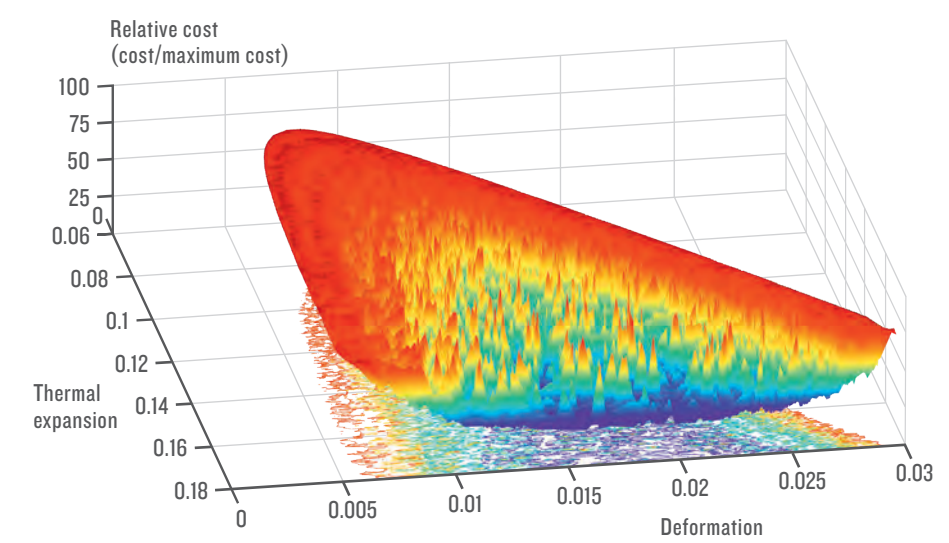
Proper Calculation

For our engineers, having knowledge of the selected process is of tremendous importance. For our standard manufacturing processes, all realizable fiber orientation and safety factors due to manufacturing tolerances and methods are well-known. With the help of linear and nonlinear rigidity and deformation analysis on the product, points of strain can be precisely located within the individual layers of the component. Thanks to our analytic as well as numeric design programs

and the application of the most suitable material strength criteria, we are able to precisely design the component.

Achieving Optimum Results

We can evaluate various possible ways of building a component with the help of special optimization programs. On this basis we pursue an integrative approach, starting with raw materials and production processes down to product performance, and as a rule use an analytic method for multi-parameter-optimization. In addition, we have developed our own optimization methods that take into account the decidedly nonlinear nature of fiber composites optimization. By breaking an optimization task down into several milestone tasks, we strive to come up with the best solution: the Pareto optimum.



Complete numerical enumeration of an optimization task to determine the Pareto optimum.

HIGH PERFORMANCE IN SERIES

WHEN WISHES BECOME REALITY

We love success. The enthusiasm of the moment when an idea takes shape for the first time. The joy of seeing a project come together. We try to produce as many of these moments as we possibly can. Because we just cannot get enough of them.



The Final Touch

In the detail design phase, the true-scale, detailed draft is turned into component drawings suitable for production. In this way, the design takes into consideration assembly-friendly tolerance concepts as well as the tools and manufacturing processes needed to run an efficient and cost-effective CFRP production. We then run one more set of computer-based manufacturing method simulations to either detect process design errors early on or even to determine possible influences on the mechanical calculations.

Prototypes

The time has come: the result of our collaboration will be tangible for the very first time. We manufacture prototypes with which we do extensive testing either at our own facilities or with the help of networking partners, looking for all kinds of possible errors. In case it is planned to produce larger quantities, it is always worth having a so-called pilot series. In this way we can find out if all equipment, such as tools and devices, are ready for series production and will ensure a troublefree production that prevents waste.

Success in Large Quantities

We can satisfy all your wishes, from individual units and small series to large series production. In this context, our manufacturing technology focusses on filament winding technology. In addition, we are putting more focus on further production methods such as compression molding, and within the Avanco group of companies, there is practically no method of manufacture for fiber composites that we do not have access to.

Efficiency in Implementation

On a global scale, we have the largest carbon fiber winding capacity. At the same time, optimized and highly automated processes allow us to effectively produce even small quantities, going from design and process planning all the way to production. The comprehensive stock of existing winding tools helps ensure that normally no additional tools need to be obtained when working with standard dimensions.

It goes without saying that we avoid all unnecessary waste during production. Careful planning and production know-how create efficiencies that are beneficial to you.

Quality in Series Production

As fiber composite experts with nearly 30 years of process and production experience, we have continuously geared our quality management towards the special requirements of our material. Our products require the exceptionally high awareness of quality of each and every employee and a strong focus on using defined processes.

Our process-oriented thinking focusses on series production, we are certified according to DIN ISO 9001 and have developed several quality management tools which we use for things such as evaluating our suppliers, materials, production processes and prototypes.



Large quantities, efficiently produced in series.



Expert advice for our customers and thoughtful planning of production processes are daily routine for us.

WE LOVE OUR WORK. AND WE LIVE OUR WORK.

To us, nothing is more exciting than CFRP. Every day, we face the challenges brought on when designing products that require fiber composite components. Our enthusiasm and passion are reflected in our extensive experience, our comprehensive knowledge and our highly motivated staff. We create a sense of achievement in everything we do. This is appreciated by our customers, among which are many well-known machine manufacturers. And perhaps soon, you too.

ONLY ONE QUESTION REMAINS: WHAT CAN WE DO FOR YOU?

THINKING AHEAD
TOGETHER

So now you know what we can do. Maybe it is time for you to let us know what we can do for you.
Together, we can develop a solution that fits your needs perfectly. We are looking forward to hearing from you.

DYNEXA GmbH & Co. KG
Dr.-Werner-Freyberg-Straße 7
69514 Laudenbach, Germany

T +49 (6201) 29 086-0
F +49 (6201) 29 086-302
info@dynexa.de
www.dynexa.de