## Solutions for special challenges in production

Within the framework of research and development projects, the Fraunhofer Institute for Large Structures in Production Engineering IGP realizes concepts for product and process innovations together with cooperation partners from industry. The research focus is on future-oriented industries such as shipbuilding and steel construction, energy and environmental technology, rail and commercial vehicle construction, and mechanical and plant engineering.
The scientists specialize in finding resource-saving alternatives that reduce the burden on the environment and workers. The aim of the research is to develop holistic solutions that enable more cost-effective and high-quality manufacturing.

Tasks from the production and manufacturing of large structures form the research focus of Fraunhofer IGP. In addition to the actual production and manufacture of the end products, their maintenance is also a focus of the research work.

## Competences

- Joining and Forming by Plastic Deformation
- Mechanical Joining Technology
- Thermal Joining Engineering
- Adhesive Bonding Technology
- Fiber Composite Technology
- Coating, Weathering and Corrosion Protection
- Factory and Work Organization
- Production Planning and Control
- Automation Engineering
- Measuring of Large Structures

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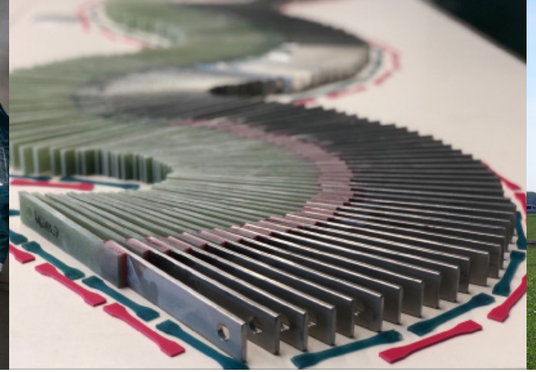
**Production technology for offshore plants**

# WIND WATER WAVE
# #weknowhow

*Foto: Photocreo Bednarek – stock.adobe.com*



## Corrosion protection – Offshore coatings for your requirements

Permanent humidity, high salt exposure, intense UV radiation and mechanical stress due to wave action: offshore installations are exposed to extreme conditions and require effective protection against corrosion. Fraunhofer IGP's Coating, Weathering and Corrosion Protection department is involved in the development of automated coating applications – including underwater applications – the field and laboratory aging of coating materials, and the quantitative evaluation of corrosion processes in the maritime and offshore sectors. With the development of innovative processes, our goal is to achieve more efficient and sustainable operation of your offshore equipment.

- Test/approval procedure for coating systems
- Selection procedure for coating systems meeting requirements
- Development and optimization of coating processes
- Climatic tests under operating conditions
- Corrosion protection evaluation of systems and components
- Damage analysis of coatings and
- corrosion phenomena

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## Fiber composite technology – Holistic solutions for the wind energy industry

The Fraunhofer IGP's Fiber Composite Technology department is concerned with the holistic optimization of large fiber composite structures such as wind turbine rotor blades. The focal points of the work range from the development of fiber composite construction methods and manufacturing processes as well as the optimization of manufacturing processes to the qualification of new fiber composite and core materials and the development of sustainable recycling solutions.

- Material tests on fiber composites, plastics and sandwich laminates (quasi-static, cyclic, under temperature)
- Production of laminates and test specimens according to standards and customer specifications
- Instrumented component and part testing
- Development of new test methods for special applications
- Damage analysis (macro/microscopic) and non-destructive component testing (ultrasound, thermography)
- Physical testing (density, FVG) and polymer analysis (DSC, DMA, rheology)

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## Bonding technology – A reliable partner for wind energy!!

It is hard to imagine wind energy without adhesive bonding technology. In order to carry wind energy further into the future, we are conducting research and testing in this area. One focus is the determination of approval-relevant characteristic values for the use of new adhesives in wind turbines, but also the simulation of production conditions (temperature and humidity) of the international market. This includes, among other things, the following tests according to DIN standards:

- Execution of a test program in accordance with the DNV-GL-CP-0086 regulation
- Tensile shear tests
- Creep tests on tensile shear specimens
- T-peel tests
- Tensile tests
- Glass transition temperature determination by DMA
- Application tests in a climatic chamber under different climatic conditions

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## Mechanical joining technology – We connect everything!

The correct selection and mastery of joining processes is a decisive factor in determining the functionality, reliability and safety of a design as early as the product development stage. At the same time, the optimum joining technology for the respective application helps to save costs and material during production. Large structures in particular pose special challenges for the joining processes.

- Preparation of expert opinions and test concepts according to DIN standards
- Determination of static friction coefficients
- Numerical simulation (FEM) with parameterized modeling
- Investigation of the fatigue strength of construction details and fasteners
- Derivation of maintenance concepts from the prestressing force-time behavior (mechanical maintenance-free)

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## Thermal joining and coating technologies for efficient manufacturing and high structural integrity

New material and process concepts in the field of welding technology as well as thermal coating technology allow combined new construction designs, higher lifetimes and availabilities as well as reduced manufacturing costs for a variety of wind turbine components. In the past, Fraunhofer IGP has developed and elaborated solutions in the following areas for a large number of customers from the wind energy industry:

- Weld post-treatment to increase fatigue strength
- Development and automation of welding processes with modern materials
- Testing, monitoring and certification
- Thermal spraying and surface functionalization for e.g. corrosion protection, fatigue strength increase, static friction
- Numerical and failure analyses
- Determination of characteristic values by mechanical-technological tests
- Chemical and optical material / joint analyses

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