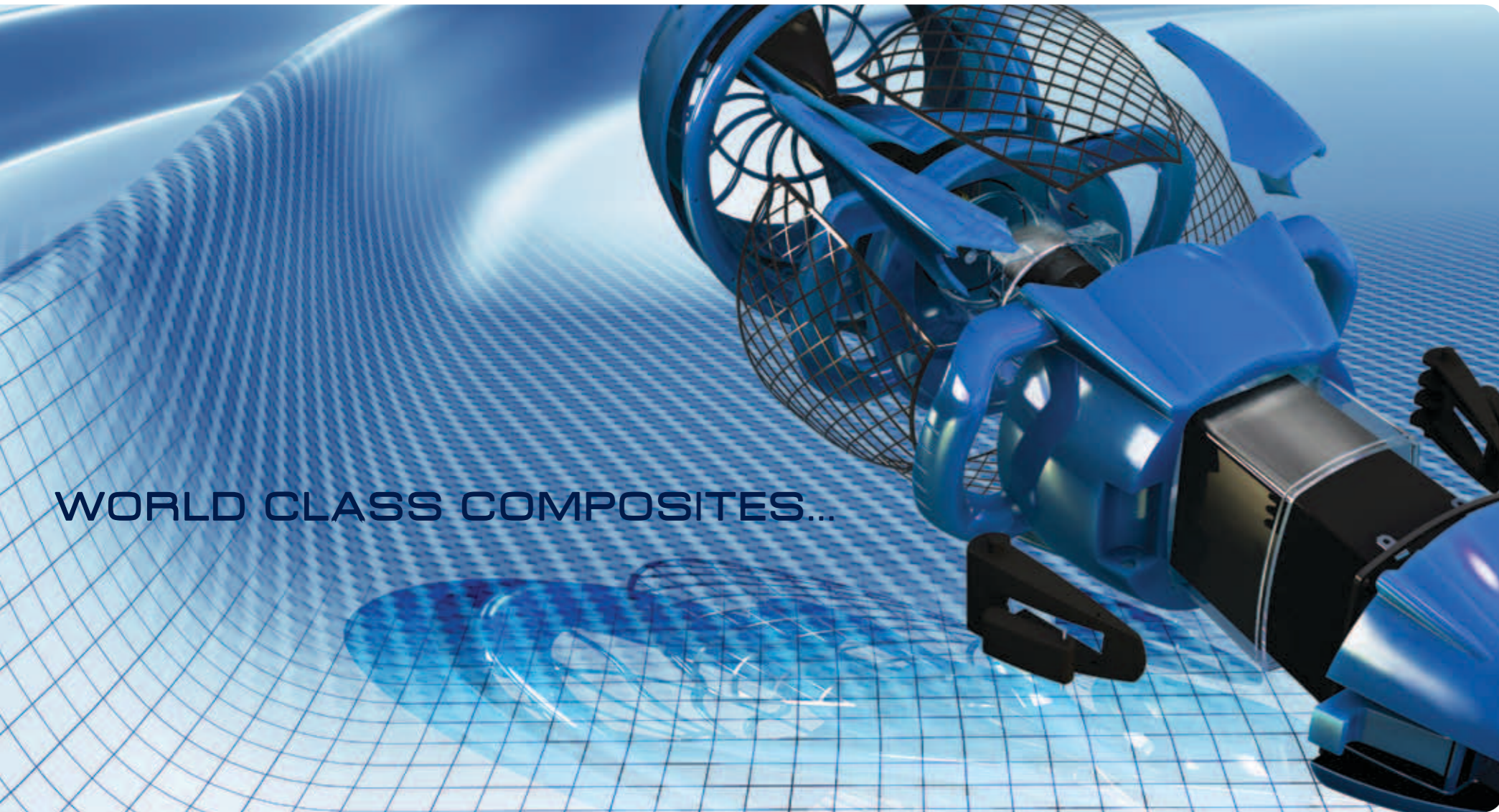


# COMPOSITES CONSULTING GROUP



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**WORLD CLASS COMPOSITES**  
THROUGH COMPETENCE, EXPERIENCE AND INNOVATION



**WORLD CLASS COMPOSITES...**

## **THROUGH COMPETENCE, EXPERIENCE AND INNOVATION**

There are numerous benefits when designing and manufacturing structures in composite materials compared to traditional monolithic materials. Some of the key benefits include corrosion resistance, lower maintenance, higher strength to weight performance and freedom of design. These benefits result in products with improved life cycle cost, lower fuel consumption, higher payload capacity, reduced energy use, and decreased environmental impact.

Moving and static objects alike benefit from the superior characteristics of composite materials and designs. Although many companies have discovered the dynamic nature of composites, leading edge competence in composites is still in short supply.

Composites Consulting Group, an independent DIAB Group company, provides world class composite services to companies with a desire to make innovative products in composites. When working with Composites Consulting Group, the full value of designing with composites is realized. Composites Consulting Group has extensive engineering and manufacturing experience from a wide range of industries. The broad understanding of customers' requirements enables Composites Consulting Group to provide a complete set of specialist composite technology services.

Composites Consulting Group has a true passion for composites.





## OUR SERVICES

Composites Consulting Group consists of mechanical and process engineers, material scientists, naval architects and composite technicians with long term experience from various industries. Our consultants have extraordinary competence in different areas and are key in developing and delivering the most 'value adding' offer in the composite industry. To assist our clients in rapidly developing high performance and innovative products, Composites Consulting Group offers a complete set of consulting services including: design, engineering, testing, process consulting, training, tooling, materials and equipment. In addition to this, Composites Consulting Group naturally takes on customer specific consulting requests.

### DESIGN

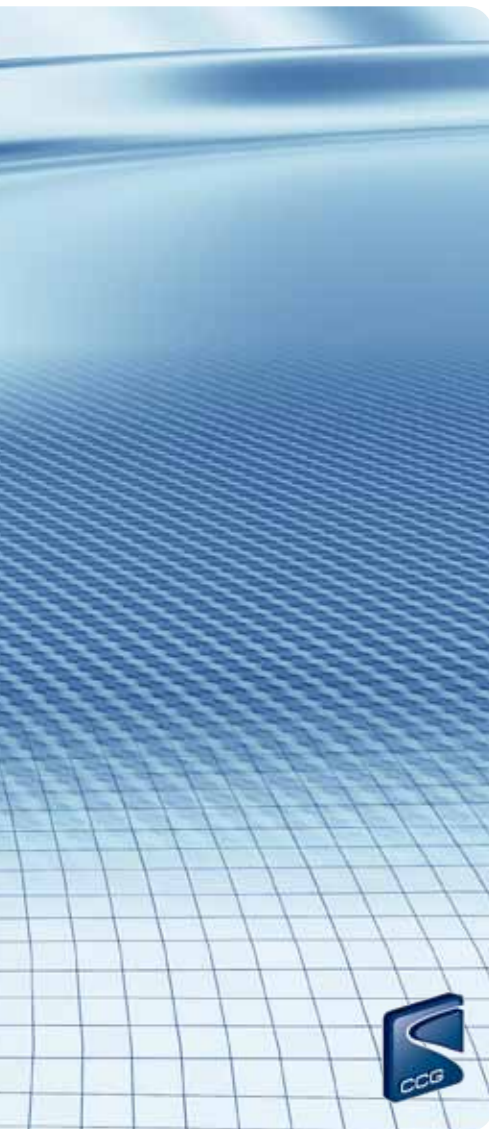
Composite materials offer nearly unlimited freedom of design, allowing exploration of innovative design concepts for many products. Composites Consulting Group provides the critical communication necessary to start clients down the path to the full benefits of composite design and construction such as free-form shapes and monocoque structures. Designers utilize a variety of industry standard design techniques from hand sketches to complete photo realistic 3D renderings to convey composite design concepts to clients. Covering every aspect of design, Composites Consulting Group offers: conceptual design, drafting, rendering, digitizing and optimization services for applications constructed from composite materials. We use common 2D and 3D software to meet our customers' needs.



### ENGINEERING

As with design, composite materials offer novel approaches to structural engineering. Composite engineering is not widely taught at universities, hence it is difficult for many engineers to take advantage of the benefits of composite materials. Smart, efficient engineering can dramatically increase the value that composites bring to product development. Composites Consulting Group engineers have expertise in diverse industries and truly understand performance requirements of composite products, whether it is structural, thermal, fire or cosmetic performance. We deliver a complete set of engineering services including structural, thermal and process analysis for composite structures based on geometry provided by clients or created by Composites Consulting Group. Our expertise is unique due to extensive composite moulding experience, resulting in designs that balance structural efficiency with ease of manufacturing. Our engineers utilize state of the art tools for analysis including 3D CAD, composites analysis, finite element analysis, flow simulation and even proprietary software developed within Composites Consulting Group.





## TESTING

Design and engineering is only as good as the input data, and composite material properties are not readily available in a handbook. Unlike other materials, material properties for composites develop as the part is being constructed and are highly dependent on the manufacturing process. Composites Consulting Group maintains an extensive database of composite material properties and new materials are continuously tested. This enables customers to understand the performance and failure modes of composites. By sharing this expertise, our clients can further enhance the performance of their products and save valuable time and cost. Our capabilities include analytical, mechanical, fire, process, thermal and acoustic testing for composite materials and systems according to standard test methods, such as ISO and ASTM. We use both internal test equipment and third party laboratories to deliver the most appropriate solutions to our customers.

## PROCESS CONSULTING

Completing the design on paper or in the computer is only one step in the process of getting products to market. Efficient manufacturing must be utilized to maintain a competitive edge. Composites Consulting Group utilizes process specialists throughout the world to manage projects and resources, developing manufacturing strategy, material requirements, work instructions and factory setup for our customers' specific needs. Our process specialists have many thousands of hours of composite manufacturing experience, ensuring practical manufacturing solutions. Process Consulting includes development, training and implementation of composite manufacturing processes for specific composite parts or an entire factory based on standard composite manufacturing methods. We have expert knowledge in areas such as contact moulding, vacuum infusion and RTM-light.



## TRAINING

Knowledge and competence are key assets in any industry. Within composites, these talents can be hard to come by. Composites Consulting Group offers a complete training package ensuring that customers can continuously improve their products and grow their business. The training package includes topics like: composite design, engineering, manufacturing, vacuum infusion, RTM-light and repair.

Training seminars and on-site training courses are available from basic to advanced and are suitable for shop floor workers as well as development engineers and designers. In addition to custom training courses, seminars are run regularly throughout the year on five continents, so there is likely a course available close to you.



## TOOLING

Molds for fabricating composite structures are critical to their ultimate quality. The molds and tools must be designed properly to withstand the sometimes harsh environment of the molding process in order to ensure part quality and production longevity. In most cases, the molds for fabricating composite structures are composite structures in their own right. Composites Consulting Group offers a comprehensive tooling design service and has a broad network of well trusted manufacturers that assist our customers in implementing production of composite parts. We can assist with everything from creating master patterns to mould construction and break-in. Composites Consulting Group can also make the first prototypes at on site facilities prior to production.

## MATERIALS AND EQUIPMENT

The many options for composite materials and process equipment is both an advantage and a challenge for businesses that are new to composites. A product development project can quickly become overwhelmingly complex without the right guidance. Composites Consulting Group provides specifications, sourcing and supply of raw materials, consumables and equipment required to properly manufacture cost effective composite parts. This service rounds out our turnkey solutions for helping customers develop innovative products by leveraging the advantages of composite materials.

## OTHER SERVICES

Combined with the mentioned standard services Composites Consulting Group also assists customers with:

- Manufacturing Audits: Audits can make composite manufacturing more efficient and help with developing strategy for future production improvements.
- Cost Studies: Analysis of material costs related to a product or production run will help determine whether a project will come in on budget.
- Project Management: We can manage specific projects on a short or long term basis.
- Fire Risk Assessments: We can provide appraisals of fire, smoke and toxicity properties for composite products with respect to requirements for specific applications.
- Life Cycle Studies: After acquisition of a product, knowing the costs associated to operation and maintenance is crucial to understanding return on investment.
- Recycling Assessments: Once products have reached the end of their useful design life, they should be dealt with in an environmentally responsible way. A recycling assessment can determine how a product can be reused, recycled or disposed.



## WIDE EXPERIENCE

Composites Consulting Group provides an advanced offering to a wide range of industries already using composite technology. The offering is also very valuable to new markets and industries seeking to advance their traditional methods and materials through the use of composites.

## RENEWABLE ENERGY

Composites Consulting Group has an impressive list of projects from the renewable energy industry where we have provided various services for products such as wind turbine blades and nacelles, tidal turbines and solar collectors. Composites Consulting Group also provides focused training courses such as our Wind Turbine Blade Manufacturing training course aimed at increasing efficiency and improving quality of blade manufacturing.

## MARINE

Composites Consulting Group provides services within every aspect of the marine industry ranging from smaller leisure marine applications to cruise ships and navy applications. The extensive experience with all marine classification societies and the performance requirements of all types of vessels, whether powered by fossil fuels or the wind, allows us to assist clients in realizing the full potential of their products. Composites Consulting Group has been involved in both design and manufacturing set up of large composite ships with many documented successes.



## TRANSPORTATION

Composites Consulting Group offers designs with reduced vehicle weight, increased payloads, improved aerodynamics and reduced fuel consumption. Other design features include enhanced thermal and acoustic properties. These performance benefits can be achieved while still complying with strict fire and safety regulations for passenger transport applications.

## CIVIL ENGINEERING AND CONSTRUCTION

The architectural and construction industries have a large potential for composites. Composites Consulting Group has delivered engineering and manufacturing solutions for composite towers, bridges, domes, and building facades, among other applications. These solutions benefit from lower transportation and installation costs, long, low maintenance lives, light weight and low corrosion.

## OTHER INDUSTRIES

Many other industries have tremendous potential for composite materials. Diverse applications benefit greatly from the use of composite materials. Some examples of projects Composites Consulting Group has worked on include: LNG tanks, storage tanks, sporting goods, machine covers, subsea and buoyancy applications.



## HOW WE WORK

To get an optimal result, it is important to have manufacturing in mind at an early stage. To provide the highest value to the customer, Composites Consulting Group can be involved from start to finish. We are accustomed to working with different certification authorities such as Germanischer Lloyd, Det Norske Veritas and American Bureau of Shipping. Projects are usually divided into three phases: Feasibility Study, Preliminary Engineering and Final Engineering Phases.

**Feasibility Phase:** In this phase, we determine if it is practical to design and manufacture the product in composite. Composites Consulting Group may develop a conceptual design or it might come from the customer. We evaluate materials and manufacturing methods to meet the product performance specifications. In some cases, a quick structural analysis is made to estimate the thickness and material selection. The final report includes recommendations and suggestions for next steps.

**Preliminary Engineering Phase:** This phase includes more detailed design and structural calculations. We fine tune the manufacturing concept with basic materials and manufacturing cost calculations. We may manufacture test panels or prototypes to prove the concept. The final report includes preliminary design drawings, calculations, cost estimates and manufacturing set up.

**Final Engineering Phase:** This phase includes finalization of the design and the structural calculations. We make a written detailed manufacturing plan to help our customers with tooling. We may conduct a test program to evaluate prototypes and verify design properties. We will manage the certification process when necessary.

## PARTNERS

To ensure delivery of a complete range of specialist services, Composites Consulting Group has a strong network of partners ensuring expertise in all areas of composites. We welcome more companies to join our partner network.



## REFERENCE PROJECT LIST

### Marine:

- Training of workers in infusion technology and infusion set up of 155' Motor Yacht
- Training of workers in infusion technology and infusion set up of 145' Patrol Vessel
- Flow modeling analysis for 155' Motor Yacht
- Flow modeling analysis for 145' Patrol Vessel
- Design support and infusion process analyzing, training of production personnel, responsible for infusion set up and implementation for 73' Fishing boat
- Structural laminate design, infusion process and FE analysis of a 25' rib boat
- Structural laminate design, infusion process and FE analysis of several rescue boats
- Structural laminate design, infusion process and FE analysis of a 80' Catamaran
- Scantling and engineering of several composite ships (catamarans, mono hull etc)
- Infusion process design, analysis and training for 20 meter hovercraft

### Transportation:

- Structural laminate design, infusion process and FE analysis of an ambulance
- Structural laminate design, infusion process, FE analysis, manufacture of prototype and testing of RV floor
- Structural laminate design and FE analysis of train front and roof
- Training of workers in infusion technology and infusion set up of train front

### Civil – Construction:

- Structural laminate design, infusion process and FE analysis of a building façade in Denmark
- Structural laminate design, FE analysis, suggestion of manufacturing methods of a façade for a government building in Spain
- Structural laminate design, FE analysis, suggestion of manufacturing methods of a façade for a public building in Spain

### Industry:

- Structural laminate design, infusion process and FE analysis of a communication tower
- Structural laminate design and FE analysis of storage tank trailer
- Structural laminate design and analysis of underground storage tank
- Infusion process design, flow modeling and training for portable shelters
- Structural laminate design and FE analysis of military containers
- Structural laminate design of fire truck tank

### Renewables:

- Structural laminate design, infusion process and FE analysis of 8 different Nacelles
- Structural laminate design, infusion process and FE analysis of several Spinners
- Training of workers in infusion technology and Infusion set up of a 38 m wind blade
- Audit of several wind blade factories
- Material optimization for infusion process of wind turbine blade





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For more information please visit  
[www.ccg-composites.com](http://www.ccg-composites.com)

Composites Consulting Group is an independent DIAB Group company providing businesses with world class competence in composites services, ensuring the full value of composite designs is realized.

Composites Consulting Group has extensive engineering and manufacturing experience from a wide range of industries. The broad competence and understanding of customers' requirements, enable Composites Consulting Group to provide a complete set of specialist services within composite technology.

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