



Wind System Services





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Your partner in wind system services

FORCE Technology provides a range of professional services to the wind system industry. Our longevity in serving the industry has given us a solid perspective on how to solve wind system related challenges both efficiently and cost effectively in order to enhance business operations.

Our focus: improved business value

Whether the task is to develop an effective strategy for asset integrity management of wind turbines, to use aerodynamic knowledge to assess e.g. their strength and dynamic behaviour, or whether it concerns production optimisation – we put our experienced resources to work to improve your business value.

Who benefits from our services?

Our services are aimed at manufacturers of wind systems as well as

designers, engineers and owners of wind parks. Furthermore, we assist insurance companies in risk and damage assessment of wind parks etc.

One-stop-shopping

By virtue of our broad and complementary scope of technologies and knowledge we supply to the wind system industry the optimum conditions for growth and value generation through our one-stop-shopping concept. This means that no matter the challenge we can assist in finding the exact solution and technology you need for your specific challenge – no more, no less.

Therefore you don't have to spend time contacting several different suppliers, as one is enough – namely FORCE Technology.



FORCE Technology in brief

FORCE Technology is a leading technology, consulting and service company. We offer our expertise to a broad range of industries, such as the wind system industry, production companies e.g. the pharmaceutical and food industry, the oil and gas industry, the public sector and many more.

Business areas

Our business activities are divided into nine areas according to specialist knowledge and competencies. From these business areas we put

together inter-disciplinary project teams of experts for the individual tasks in hand, depending on whether they involve consultancy, training or new developments. This ensures our customers access to the right knowledge and expertise at all times.

Our business areas cover:

- production excellence
- integrity management
- inspection and testing
- energy and environment

- materials and analysis
- welding and production innovation
- quality and metrology
- maritime services
- FORCE-Dantest CERT.

FORCE Technology headquarters are located in Brøndby outside Copenhagen. We also operate subsidiaries in Sweden, Norway, the Netherlands, Russia, Canada, the USA and Brazil. We employ a staff of more than 1,000.



Does your production flow?

Production optimisation through production excellence

Does your production system meet market demands for the least possible waste and greatest possible efficiency? Or do you suffer long lead times, rising stocks and poor supply capability?

Measurable results in production with production excellence

With the help of production excellence, FORCE Technology offers to boost the competitiveness and improve the earnings of your company.

We have comprehensive experience of building up, transforming and anchoring production systems based on production excellence within the wind turbine industry.

We focus on:

- reducing lead times by setting up demand-pull management and flow
- integrating value-creating quality control and documentation

- reducing your downtimes and turning equipment maintenance into a systematic discipline
- understanding the elements that create value for your customers, thus systematically reducing and eliminating all types of waste
- providing your company with the right tools and the right foundation needed to set up efficient production.

The need for long-term asset thinking

Holistic thinking through integrity management

The desire for increased profitability in wind system industry operations requires a holistic integrity management approach to manage safety, technical integrity and environmental performance.

Optimum results require the optimum partner

FORCE Technology is an experienced and recognised partner within asset integrity management (AIM) and can assist you with developing and implementing an AIM strategy that precisely fits your needs. The strategy contains an AIM plan for the entire life cycle of wind turbines, from the conceptual stage to de-commissioning and removal.

A profitability focused strategy

For the purpose of improving business revenue, the core of our strategy is enhancing such aspects as reliability, maintenance and safety throughout the lifecycle, thus minimising integrity problems in high risk areas where loss of integrity would have an impact on personnel safety, environment and economy.

What we do!

FORCE Technology can coordinate and handle corrosion control programs, which ensure that corrosion performance data and costs are reviewed and trended, ensuring optimum mitigation and proactive action.

We can also handle the inspection and maintenance programs, enabling immediate reporting on technical and security related issues. Reporting makes it possible to provide recommendations for improvements to operational issues. All relevant integrity performance and cost data will also be available – for cost optimisation.

We also optimise your organisation in order to assure unambiguous responsibility, accountability and ownership of the AIM activities throughout the organisation.

You will achieve:

- increased productivity
- reduced lead times
- reduced stocks of goods
- a reduction in goods in production.

These are all results that can be measured on the bottom line immediately after implementation, results you can maintain and improve on further.





Value-creating quality control

Tower inspection

Prolong the service life of your wind turbine towers with few repairs, even under extreme weather and wind conditions

FORCE Technology is internationally recognised for supporting the wind turbine industry with effective testing methods.

Our simple and rapid documentation of inspection results gives you the assurance you need that structures are free of unacceptable defects – at a time when the manufacture of larger and larger wind turbines is constantly increasing in tempo.

Long service life and few repairs

We assist customers in achieving an optimum design, which for example requires the minimum draw on resources. As we use the most advanced technologies in the market, we can ensure that structures comply with the manufacturing standards needed to ensure long service life and few repairs, even under extreme weather and wind conditions.

Value-creating documentation

FORCE Technology enables producers to document the quality of towers to authorities and owners. Our certified inspectors carry out inspections according to recognised procedures – while not causing bottlenecks in production.

We provide quality assurance which ensures optimum turbines and the greatest possible value for customers.

Blade inspection

Reduce your downtime through improved quality documentation of rotor blades

To power plant owners it is vital to achieve reliable energy production for many years with a minimum of costly repairs and downtime. Reliability in wind energy production is however closely related to the quality of all vital components – such as rotor blades.

Through FORCE Technology's non-destructive inspection services, all turbine blade manufacturers, power plant owners and insurance companies will be provided with independent documentation of quality performance of the rotor blades.

Third party blade inspection services worldwide

FORCE Technology carries out professional third party blade inspection services worldwide, in production as well as on-site in connection with:

- quality inspection in manufacturing processes
- quality documentation of manufactured rotor blades
- inspection of blades before dispatch
- warranty inspection before turbine handing over
- periodic maintenance inspection services
- damage analysis.

At every stage, documentation of hidden defects and damage is vital to the customer in order to achieve reliable energy production with minimum downtime loss.

FORCE Technology is a co-owner of and takes active part in the Blade Test Centre, a testing company specialised in prototype approval testing of blades. Other partners are Riso National Laboratory of Denmark and DNV.



Does your weld need repair?

Fitness for service assessment of wind turbine structures

From working many years in consultancy activities, we have extensive experience in stress analysis and design of fatigue loaded welded structures. For safety critical wind turbines FORCE Technology offers our customers to carry out a comprehensive fitness for service assessment of welded turbine structures.

Our fitness for service assessment includes a fracture mechanical evaluation of small weld flaw indications.

The fatigue life and the failure safety of the structure are analysed, and the assessment will give our customers the answer to the question: does the weld need repair, or is the flaw safe? Using the same procedure we provide for the optimisation of the customer's wind turbine structure by an improvement of the fabrication weld quality.

The main advantages for wind turbine manufacturers and owners

when dealing with FORCE Technology are:

- avoiding economically wasteful repairs of harmless weld flaws
- avoiding failure with severe economic and environmental consequences
- saving manufacturing costs by structural optimisation.





Are your turbines fit for harsh conditions?

Surface treatment of exposed structures

FORCE Technology is a leading service company within both surface treatment and inspection work. We ensure that exposed elements, such as for example wind turbine foundations, are able to withstand the environmental impact of harsh onshore and offshore conditions.

Through our specifications FORCE Technology focuses on value-creating quality control and documentation. We assess the need for corrosion protection and help customers to choose the right coating system for every area and location, and then follow up

with specifications both for painting work and customised inspection procedures.

Our certified experts perform all work in accordance with current standards (ISO 12944 etc).

Ensuring durability and reducing downtimes

FORCE Technology's treatment specifications and coating inspection services guarantee both durability and functionality for our customers. We reduce the customers downtimes, and we ensure rapid and reliable damage remediation.

We are able to do this thanks to our analysis facilities, which are among the best in the world. We have advanced test facilities at our disposal, including cyclic weathering test and the saltspray test for testing new rust-prevention treatment methods.

Through courses and training in surface treatment and corrosion protection FORCE Technology shares its experience, knowledge and creativity in order to create added value for customers.



Increased environmental friendliness and efficiency with LCA

Life cycle assessment makes for more efficient wind turbines

Wind turbines are environmentally friendly. But what can be done to develop wind turbines that both benefit the environment and increase efficiency? This is something FORCE Technology has the answer to.

We have many years' experience with environmental consultancy, and we possess wide expertise in providing consultancy services to the wind turbine industry. One important area is life cycle assessment - LCA.

In contrast to the traditional environmental approach to wind turbines, LCA involves environmentally assessing turbines from the perspective of their complete life cycle. By taking the life cycle perspective we ensure that environmental efforts are concentrated where they provide greatest benefits.

Environmental innovation and efficiency

FORCE Technology is able to prove the benefits of wind turbines compared to other sources of energy, in that we document the environmental properties of wind turbines through life cycle assessments. We assess the entire range of environmental impact from the extraction of raw materials to the scrapping of the product.

Our knowledge of the environmental aspects of wind turbines from cradle to grave provides the necessary basis for additional environmental innovation, a commitment that at one and the same time provides for greater environmental friendliness and increased efficiency for customers.



Aerodynamic knowhow leads to optimum design

Energy efficiency and increased reliability through wind engineering services

FORCE Technology is internationally recognised for supporting the wind turbine industry through our wind engineering services. We carry out tests in our wind tunnels and full scale wind measurements at and around wind parks.

Our wind tunnels are accredited by MESANET, and we offer:

- calibration of cup anemometers for suppliers and wind turbine producers from the whole world
- model scale landscape tests, where we assess the most suitable location for wind turbines at a specific site
- assessment of flow around wind turbine blades and blade tips.

Optimum design for secure operation and energy efficiency

At FORCE Technology we also have the latest technology within CFD calculation tools at our disposal, which can assist our customers to the optimum design.

Among other things, we can perform detailed studies of wind turbine blades (blades tips, vortex generators, stall strips etc.). We also perform more complete studies of entire blade systems and the location of wind parks.

FORCE Technology helps customers to obtain the optimum design in a large number of areas of the complete wind turbine design, thus ensuring them reliable operation and increased energy efficiency.

With the help of our great expertise, wind tunnel facilities and advanced calculation tools we are creating value for our customers.





Increase the returns of your management systems

Auditing of quality, environmental and occupational health and safety management systems

FORCE Technology is highly skilled and has many years' experience in the auditing of quality, environmental and occupational health and safety management systems, including in the wind turbine industry. We perform both internal and external audits – for example supplier audits throughout the world. Our professionalism is especially the result of a series of international approvals and a unique technical support base.

Value-creating consultancy

But besides the obligatory auditing our experienced auditors also focus on consultancy, which improves company management systems and increases the profitability of processes and procedures.

FORCE Technology is Denmark's largest provider of courses in auditing. Our courses at lead auditor level all provide interna-

tionally approved qualifications. Most of the courses are designed both as open plan courses and as company customised courses.

FORCE Technology is constantly developing new methods and tools for enhancing the efficiency and value of our auditing. This we do in order to provide our customers with the management tools needed to create results and boost profitability.





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