



# Siemens Gamesa cuts time to market for wind power

Enhancing the efficiency of turbine  
blade manufacturing with computer  
vision on Microsoft Azure

Global Business Services  
8-minute read

Siemens Gamesa  
Renewable Energy  
builds wind turbines  
that generate clean energy for  
millions of people worldwide.

To lead the green energy revolution, the company aims to boost capacity, but manual processes led to errors that slowed turbine blade production.

To accelerate manufacturing, Siemens Gamesa partnered with [IBM Services](#)® to create a machine learning (ML) solution on [Microsoft Azure](#)—using a laser grid to show exactly where to place each fiberglass layer with pinpoint accuracy.

The new solution involves multiple technologies, including computer vision, ML, edge computing and the Internet of Things (IoT). By engaging experts from IBM Services to work with its own [Digital Ventures Lab \(DVL\)](#) (external link), Siemens Gamesa gained the capabilities it needed to quickly lift its ideas off the drawing board and onto the factory floor.

New manufacturing  
system expects full  
ROI within

2.5

years

“Everyone worked together seamlessly as we tested the solution on a real blade—and IBM even made changes to the code on the fly. The project was an undisputed success, and IBM is the perfect partner for Siemens Gamesa.”

**Finn Mainstone**, Senior Product Manager, Siemens Gamesa Renewable Energy, S.A.

# Renewable energy for all

Siemens Gamesa is now using its data-driven manufacturing solution on one of its production lines in Aalborg, Denmark, where technicians cast turbine blades from fiberglass.

Finn Mainstone, Senior Product Manager at Siemens Gamesa, explains: “Each turbine blade is custom designed by our engineers to precise specifications, and any defects during the manufacturing process can result in complex, costly and time-consuming corrections. To avoid this situation, our teams see a laser grid displayed on top of each blade that shows them exactly where to place each fiberglass layer. Crucially, they can now get instant alerts if the solution detects any errors or abnormalities in the surface of the blade.”

He continues: “Thanks to IoT-connected cameras in our factory and continuous analysis using machine learning models on the edge, all managed on Microsoft Azure, our technicians can place each blade layer with greater speed and accuracy. As a result, we are on course to reduce manufacturing error rates caused by misplaced material, which helps keep our production lines moving smoothly. In fact,



once we roll the solution out globally, we will be better able to share best practices. This will reduce the learning curve for teams in our newly opened factories, such

as Le Havre, France—enabling us to boost our throughput, accept more client orders, and bring the benefits of green energy to more people around the world.”

# Defects drag down productivity



The aerodynamic profile of turbine blades is crucial for efficient power generation, and building each blade involves highly skilled work. “Even though our blades for the newest SG 14-222DD turbine are 108 meters long, they are still built almost entirely by hand,” says Mainstone. “Because each blade is made to order, our teams are more like artisan craftspeople building furniture than workers on an assembly line. But as with any manual process, there is an ever-present risk of human error.”

“We expect a payback period of about two and a half years for our Azure-based production system. And we expect the business case to get better and better as we add more functionality and see more secondary benefits.”

**Kenneth Lee Kaser**, Senior Vice President of Operations – Offshore, Siemens Gamesa Renewable Energy, S.A.

Siemens Gamesa has a rigorous quality assurance process, and turbine blades are inspected and repaired during the final stages of manufacturing. For example, if a piece of fiberglass is placed incorrectly or laid on top of a foreign object, the affected section of blade is cut out and replaced—a rare but costly occurrence.

“Each time we rework a blade, it raises our costs, and limits the number of blades we can produce in each period,”

continues Mainstone. “This additional pressure on our margins and throughput is a tough challenge in a highly competitive marketplace. Global demand for wind power is on the rise, and we knew that increasing our throughput would make it easier to capture these new opportunities and grow the business. To achieve our goal, we looked for a way to empower our technicians to work quickly with pinpoint precision.”

“IBM dedicated significant time and resources to help us refine our ideas. This process was extremely valuable when it came to determining the optimal design and configuration for the new solution.”

**Finn Mainstone**, Senior Product Manager, Siemens Gamesa Renewable Energy, S.A.

# Bringing in industry experts

To build new digital capabilities that bring greater standardization and efficiency to its global activities, Siemens Gamesa formed an internal team of transformation specialists: the Digital Ventures Lab. One of the DVL's first projects was a quality control system, which used a laser grid to show teams where to place fiberglass layers during production. However, the system could not detect defects in the manufacturing process and required significant and repetitive manual intervention to operate.

"We were confident we were on the right track by providing visual cues to our teams," Mainstone recalls, "and we saw great potential to enhance our processes by augmenting the quality control system with intelligent automation."

Melanie Beck, Senior Managing Consultant and Project Lead at IBM, continues, "The Siemens Gamesa team had an ambitious idea: mount an array of cameras above



each manufacturing station, and validate the placement of each layer in real time using computer vision and ML models."

The DVL created a detailed schematic of its target solution and looked for a partner

to bring its vision to life. "Throughout a demanding tender process, IBM Services consistently stood out as the leader," says Mainstone. "During a month of in-depth discussions, IBM developed a strong proposal that was fully aligned with our



brief and staffed by people with expertise, enthusiasm and deep subject-matter knowledge.”

He continues: “IBM dedicated significant time and resources to help us refine our ideas. This process was extremely valuable when it came to determining the optimal design and configuration for the new solution. For example, we had to decide whether to deploy a small number of very expensive, high-resolution cameras or a large number of cheaper, lower-resolution cameras. IBM helped us identify the advantages and disadvantages of the various hardware and software options and come up with a balanced approach that met our needs.”

“With strong capabilities in machine learning and thorough cloud engineering practices, IBM helped us build a solution that meets all our needs. Even though it wasn’t part of the contract, IBM went the extra mile to help us configure the edge computing systems in our factory. And when COVID-19 hit, IBM Services rapidly adapted their IBM Garage Methodology for remote working, which helped us to stay on track.”

**Finn Mainstone**, Senior Product Manager, Siemens Gamesa Renewable Energy, S.A.

# Delivering real-time feedback

Working with the DVL, IBM Services helped Siemens Gamesa drive the project forward rapidly using frequent, iterative development cycles. Assisted by the IBM Garage™ Methodology, the two teams compressed large amounts of complex work into a very short period of time. Within a matter of months, Siemens Gamesa moved from design to prototyping to deployment of a minimum viable product (MVP) for its factory in Aalborg.

“We set out very specific requirements during the tender process, such as the ability to detect the white edges of fiberglass sheets over a white, 97-meter-long blade with minimal latency,” explains Mainstone. “With strong capabilities in machine learning and thorough cloud engineering practices, IBM helped us build a solution that meets all our needs. Even though it wasn’t part of the contract, IBM went the extra mile to help us configure the edge computing systems in our factory. And when COVID-19 hit, IBM Services rapidly adapted their IBM Garage



Methodology for remote working, which helped us to stay on track.”

By processing video on the Microsoft Azure IoT Edge platform, the company can apply advanced ML models to large amounts of

unstructured data in real time and use its laser grid system to deliver feedback to factory teams. Because the new solution is built on Microsoft Azure, Siemens Gamesa gains the peace of mind that this mission-critical digital service is designed to run



smoothly 24x7, thanks to robust high-availability cloud capabilities in line with Siemens Gamesa's demanding corporate IT standards.

"Siemens Gamesa uses Microsoft solutions widely in many parts of the business, so selecting Microsoft Azure for this project was a natural choice," comments Mainstone. "From the very start, we have been extremely impressed with the IBM Services team's knowledge and expertise around the Microsoft Azure platform. IBM brought the skills and experience to help us harness the full potential of Microsoft Azure, including components such as Microsoft Azure Machine Learning, Microsoft Azure DevOps and Microsoft Azure IoT Edge."

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# Spinning up new factories faster

The new solution is extremely versatile, which means it is easy for the Siemens Gamesa to add new capabilities. “We recently augmented the ML models created by IBM with a model we developed ourselves,” says Mainstone. “This new capability detects foreign bodies such as tools and debris in the mold, and proactively alerts our teams to remove them, helping us to avoid costly repair work further downstream.”

Building on the strong success of its pilot project for one production line in Aalborg, Siemens Gamesa is targeting a company-wide deployment of the new manufacturing solution.

Beck adds: “Because Siemens Gamesa built the core of the solution on Microsoft Azure and utilized [IBM Services AI@Scale](#) best practices, scaling out is very straightforward and cost-effective. Once the deployment is complete, we predict that Siemens Gamesa will significantly



improve the quality and consistency of its production processes while reducing costs and protecting its margins.”

In the next phase of the project, Siemens Gamesa will extend the solution to cover

all its manufacturing lines in Aalborg, its factory in Le Havre, France, and its factory in Hull, UK. Looking further ahead, the company is exploring the idea of implementing the solution in all its factories around the world.

“We expect a payback period of about two and a half years for our Azure-based production system,” says Kenneth Lee Kaser, Senior Vice President of Operations – Offshore at Siemens Gamesa. “And we expect the business case to get better and better as we add more functionality and see more secondary benefits.”

“Having a decision-support system of this kind will bring powerful benefits when we open new factories, as it will dramatically reduce the time required to train new production teams, cutting time to market,” Mainstone concludes. “IBM Services is one of our most trusted partners. Siemens Gamesa is poised to bring the next generation of renewable energy technologies to customers around the world, and we look forward to working with IBM as we roll out our manufacturing solution across the business.”



### About Siemens Gamesa Renewable Energy, S.A.

Headquartered in Zamudio, Spain, [Siemens Gamesa](#) (external link) is a global technology leader in the renewable energy industry. Specializing in the development, manufacturing, installation and maintenance of wind turbines, the company has been supporting the global transition toward sustainable energy since the 1980s. A key player and innovative pioneer in the renewables sector, Siemens Gamesa has installed over 107 GW of generating capacity in 75 countries worldwide.

### Solution components

- IBM Services®
- IBM Garage™ Methodology
- Microsoft Azure
- IBM Services AI@Scale

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