SIEMENS Gamesa
RENEWABLE ENERGY

" Fujitsu's ground-breaking Artificial Intelligence technology dramatically cuts the time required for an inspection of turbine blades."

Kenneth Lee Kaser
Head of Supply Chain Management
Siemens Gamesa

Siemens Gamesa partners with Fujitsu to co-create an Artificial Intelligence platform that can identify flaws during quality checks more quickly.

At a glance
Country: Denmark
Industry: Renewable Energy
Founded: 1847
Website: siemens.com

Challenge
Siemens must put each of the 5,000 blades it produces annually through a stringent quality assurance process. Any flaws when a blade is in operation could prove catastrophic and could inflict major damage to the company's reputation. However, manually evaluating UT scanning of each blade takes up to six hours.

Solution
The company wanted a faster solution that wouldn't compromise on accuracy or safety. Working with long-term partner Fujitsu, together they co-created an Artificial Intelligence solution that could automatically detect flaws through machine learning and deep learning capabilities.

Benefit
■ Evaluation of each NDT scanning reduced by 80%

■ Flexible licensing enables the customer to scale as it grows, with minimal upfront investment

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Customer

Siemens Gamesa Renewable Energy was born in April 2017 with the merger of Gamesa Corporación Tecnológica and Siemens Wind Power. It is a respected leader in the renewable energy industry, whose mission is to provide cleaner, more reliable and more affordable energy to society, while creating lasting value for all stakeholders. Siemens Gamesa is committed to offering innovative solutions for the energy challenges of the future.

Products and Services

- FUJITSU Artificial Intelligence
- Fujitsu developed FAIR software solution, with relevant API, GUI and reporting functionality

Vital quality assurance drains resources

Siemens Gamesa produces over 5,000 wind turbine blades every year for use in on/offshore wind farms. Each blade can be up to 75 meters in length and takes a highly-skilled professional Quality Controller up to six hours to evaluate the UT scanning in the quality assurance process. This is because the structure can contain multiple defect types, including how fiberglass can wrinkle during the production process. This has the potential to be catastrophic if this makes the blade crash during operation.

"This process requires highly-experienced operators to evaluate the blade quality, and it can be difficult for humans to concentrate for extended periods of time," explains Søren Rahmberg, Head of Global Quality Engineering, Siemens Gamesa. "We wanted to find a robust and effective solution to catch these errors without compromising the detection of in-material damage and risk a loss in reputation."

These manual scans are time-consuming and costly; however, the company cannot afford any flaws or defects in its fiberglass blades. Therefore, it turned to technology for an alternative solution. After evaluating the machine learning specialists on the market, Siemens chose to partner with Fujitsu, and together they examined the potential for an Artificial Intelligence (AI) approach to flaw detection.

"It's an innovative business and we are always eager to increase digitization wherever possible," adds Rahmberg. "So, when it came to this project, we needed a partner with machine learning expertise, broad support and global reach. Fujitsu ticked all those boxes and is well known in the industry as a world leader in AI."

Co-creation in action

Fujitsu Laboratories has been actively working on AI research and development for many years and so was ideally placed to co-create a new solution that could identify defects. After the initial Proof of Concept, and the capture of the customer's main requirements for a production grade solution, Fujitsu and Siemens Gamesa used an AGILE approach. This breaks down work into key functionality and delivers them in 'sprints' of two-week periods, with the customer in a closed loop prioritizing developments in forthcoming sprints, and evaluating functionality after each sprint. This ensured developed functionality was evaluated and qualified throughout the entire development phase. When co-creating with the customer, the Fujitsu team focused on the real market opportunity – ensuring that every request was checked for wider commercial viability.

"After contract negotiations, the project itself moved really rapidly, taking just three months to develop the application and algorithms," says Rahmberg. "It involved a lot of collaboration, workshopping and data sharing."

Fujitsu and Siemens Gamesa have trained the AI component to detect abnormalities in images. Siemens Gamesa created training samples with defects labelled. Utilizing the advanced Fujitsu machine learning technology, only a limited number of training samples were needed in order to secure 100 percent coverage of all defects, while providing the 80 percent efficiency gain needed.

Fujitsu delivered the complex and tailored AI software with a flexible licensing model, which meant that Siemens was able to minimize upfront investment. The solution is also designed to easily scale to include new models of wind turbine blades. "Flexible licensing means we can pay per plant with a predictable annual maintenance fee. It reduces the upfront CAPEX and gives us versatility," continues Rahmberg. "From a customer perspective, it increases value."

Speed and accuracy at low cost

The quality assurance process, which once took six hours to complete per blade, can now be carried out by the Fujitsu AI which detects abnormalities, and only leaves a fraction of the blade scanning to be inspected manually, reducing scanning inspection time by 80 percent.

With 5,000 blades produced every year, that adds up to a saving of almost 32,000 man-hours, which translates into significant cost savings, and reduced production lead times.

"We can focus our efforts on suspicious areas and disregard all clean data, we are not held back by tired eyes; humans only need to examine the blades that are flagged by the Fujitsu system," continues Rahmberg. "One of the key features of machine learning is that when we experience patterns we haven't seen before; the AI adapts to look for them in the future, embedding new learnings systematically into our processes. Essentially, the longer we use it, the smarter it becomes."

This is just one example of how Fujitsu is co-creating with its customers to take solutions to the next level. It listened to the problem, before jointly working on a solution that leverages AI deep learning, image and signal processing techniques during the inspection process.

"The Fujitsu development process has been impressively speedy; we honestly expected it to take longer because we are not used to the agile approach," concludes Rahmberg. "Longer term, we will explore introducing this AI approach to other application areas within our production as well."

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