

Energy

1 TCP Offshore Wind Farm: 5.2-MW Wind Turbine Generators

At the TPC Offshore Wind Farm – Phase 1 Demonstration Project (the Project), for which Hitachi, Ltd. and its consortium partner, Jan De Nul nv (JDN), were awarded the engineering, procurement, and construction (EPC) contract from Taiwan Power Company (TPC), the installation and commissioning of 21 units of Hitachi’s 5.2-MW wind turbine generators (HTW5.2-127) have been completed, and all 21 units have been in operation since December 2021. As the Project is the first overseas and first offshore project for Hitachi’s wind turbine generator division, it has encountered various challenges, some of which were exacerbated owing to the COVID-19. Hitachi believes that these experiences can be utilized not only in the future offshore projects in the Japanese domestic market but also in the construction and operation and maintenance (O&M) of larger wind turbines.

In this Project, the consortium of Hitachi and JDN was also awarded with the 5 years of O&M scope, and today, the consortium continues to accumulate and digitize the technical knowledge related to the operation, maintenance, and preventive maintenance of the offshore wind farm. Hitachi, by integrating such data into the

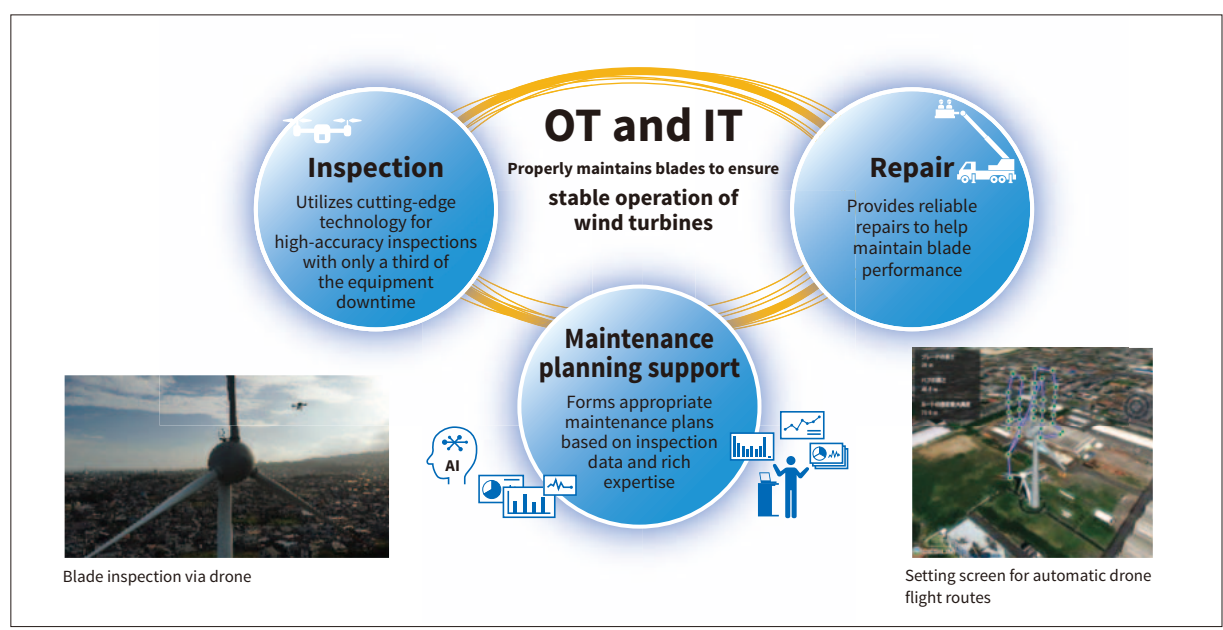


1 Taiwan offshore 5.2-MW wind turbine generators

Lumada model and using it, aims to contribute to the development of businesses related to the stable operation of wind power generation facilities, the life extension of existing wind turbines in Japan, and improvement of their availability.

2 Blade Total Service: Servicing Wind Turbine with Drones and AI

Wind turbines are being increasingly deployed to help achieve a decarbonized society. Many accidents involving the blades of these facilities have occurred due to poor maintenance and the natural environment (lightning strikes, typhoons, etc.), as well as deterioration over time due to operation. To prevent these accidents, in



2 Offerings and benefits of blade total service

March 2021, the Japan Wind Power Association issued “Guidelines for the Inspection and Repair of Wind Turbine Blades.” In April of the same year, the Ministry of Economy, Trade and Industry issued the “Revised Interpretation of the Technological Standard for Wind Turbines,” which strengthened the safety standards for blades.

Hence, as blades must be reliably inspected and repaired to ensure their safety and stable operation, Hitachi developed the blade total service. This service integrates IT with operational technology (OT); the former consists of digital robotics technology such as drones and artificial intelligence (AI), while the latter comprises maintenance-related expertise and repair technology. This one-stop service covers everything from blade inspection to maintenance planning and repair.

For inspections, based on a flight route for each facility created with a dedicated cloud-based application, a drone automatically captures high-definition photos of each blade from five different directions. The acquired data is uploaded to the cloud and automatically classified based on power station, unit, blade, etc., after which the AI determines the location of damage. This data is used for optimal repair planning and highly reliable repairs, thus enhancing inspection quality, reducing equipment downtime, and improving post-repair durability to reduce the number of repairs. Overall, this contributes to the equipment’s stable operation.

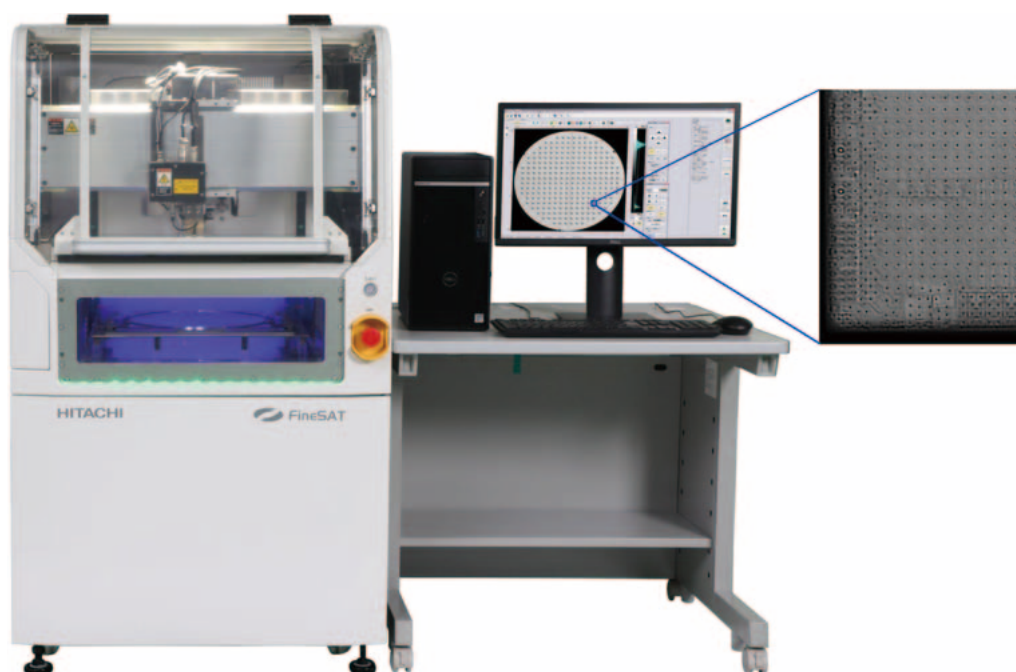
(Hitachi Power Solutions Co., Ltd.)

3 Ultrasonic Imaging System to Improve Productivity and Inspection Accuracy of Semiconductor Devices

In the electronic components and devices market, there is demand for miniaturized, high-performance semiconductor devices and electronic components used in electronic devices. To meet these needs, technologies to detect and analyze microdefects in high-density devices are growing in importance.

FineSAT, an ultrasonic imaging device, uses ultrasonic waves to nondestructively inspect defects within objects. FineSAT 7, the latest model, utilizes a new analog-to-digital conversion board developed in-house, increasing the sampling resolution 16-fold and doubling the measurement period compared to the conventional model. Through this, it improves the detection performance for defects using inspection images with higher resolution. Moreover, by enlarging the measurement tank where the inspection object is placed and employing the through-transmission method, which can inspect complex shapes such as multilayer devices, the new system can measure an entire 300 mm-wafer at once improving operating efficiency. With constant waveform recording, Hitachi will develop software functionality to extract useful information from the complex waveform data of the received ultrasonic waves, enabling advanced analysis of the object’s internal structure.

(Hitachi Power Solutions Co., Ltd.)



3 FineSAT 7, the latest FineSAT ultrasonic imaging system, and inspection image inside a semiconductor device

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Eurus Kamikatsu-Kamiyama Wind Farm Begins Commercial Operation

Eurus Kamikatsu-Kamiyama Wind Energy Corporation's Eurus Kamikatsu-Kamiyama Wind Farm (34,500 kW), the highest capacity wind farm in Shikoku, began operation in July 2022. Hitachi Power Solutions Co., Ltd. supplied 15 ENERCON GmbH-manufactured 2,300-kW wind turbines, which can provide electricity for nearly 20,000 average households and are expected to reduce carbon dioxide (CO₂) emissions by 31,000 t per year.

As the construction site is located about 40 km from Tokushima Port, in a region with mountains over 1,000 m high, it was necessary to transport large wind turbine components through steep and narrow areas. Adapting to these conditions, Hitachi performed road widening work in the mountainous areas and used special blade lifters to transport the blades at an incline. This made it possible to complete the construction in a previously inaccessible area and launch commercial operation. Hitachi also signed a 15-year comprehensive maintenance service contract for the wind farm, and will provide constant support to ensure the equipment's high availability.

The company will continue to offer full support for wind turbine projects throughout their entire life cycle, from project planning to implementation design, construction, maintenance, and management, helping to realize a zero-carbon society through the stable supply of renewable energy.

(Hitachi Power Solutions Co., Ltd.)



4 Operation of blade lifter