

# CASE STUDY



## Japan's largest wind turbine gearbox manufacturer: Ishibashi

Ishibashi faces a familiar challenge in manufacturing wind turbine gearboxes – ensuring the reliability and longevity that is critical to their customer's return on investment. The PULSE data acquisition systems and transducers Ishibashi uses are part of a comprehensive test stand setup that is ready to expand with the company.





## The company

**Kazuhiko Ishibashi is the third generation of his family to head the company**

Ishibashi is the largest manufacturer of wind turbine gearboxes in Japan, with offices in Tokyo and Osaka, a US subsidiary in Texas, and a joint venture company in China. It currently employs 145 people, of whom 10 are based in the US.

In addition to wind turbine gearboxes, Ishibashi makes products for the chemical and extrusion industries, industrial mixers, turbo gear systems, materials handling including conveyor systems, and special products for the steel industry.

A private, family company with some small private investors, the current President Kazuhiko Ishibashi is the third generation in his family to hold the post, and succeeded his father, who is now the chairman. Kazuhiko Ishibashi studied economics at Kwansai Gakuin University, before going on to spend a year studying mechanical engineering at Flender in Germany.

Ishibashi manufactures both standard and customised gearbox designs, typically delivering them in six months.



## History

Ishibashi was founded in 1932 as a forging plant, and began producing gearing in 1958. A joint venture with the German Flender group in 1989 became Flender Ishibashi. The first gearbox was a 600 KW unit supplied in 1998, and at that time Ishibashi received a request to start supplying wind turbine gearbox components for WInergy in Germany, which marks the beginning of their contemporary focus on gearboxes. This new focus brought the need for new equipment, leading to an investment in their first PULSE system from Brüel & Kjær.

**Gearbox components on Ishibashi's production line**





Most of Ishibashi's gearboxes are conventional ones using planetary gears

The agreement with Flender was reversed in 2001.

- Ishibashi became approved to the ISO 9000 standard in 1997 and ISO 14001 in 2006.
- An active partnership agreement with Mitsubishi heavy industries began in the early 2000s, which involves producing gearboxes of a unique design type.
- The Chinese and US offices were established in 2011

Today, Ishibashi makes 600, 1000, 2000, 2400 and 2500 KW gearboxes. These are conventional gearboxes using single planetary gears in most cases.

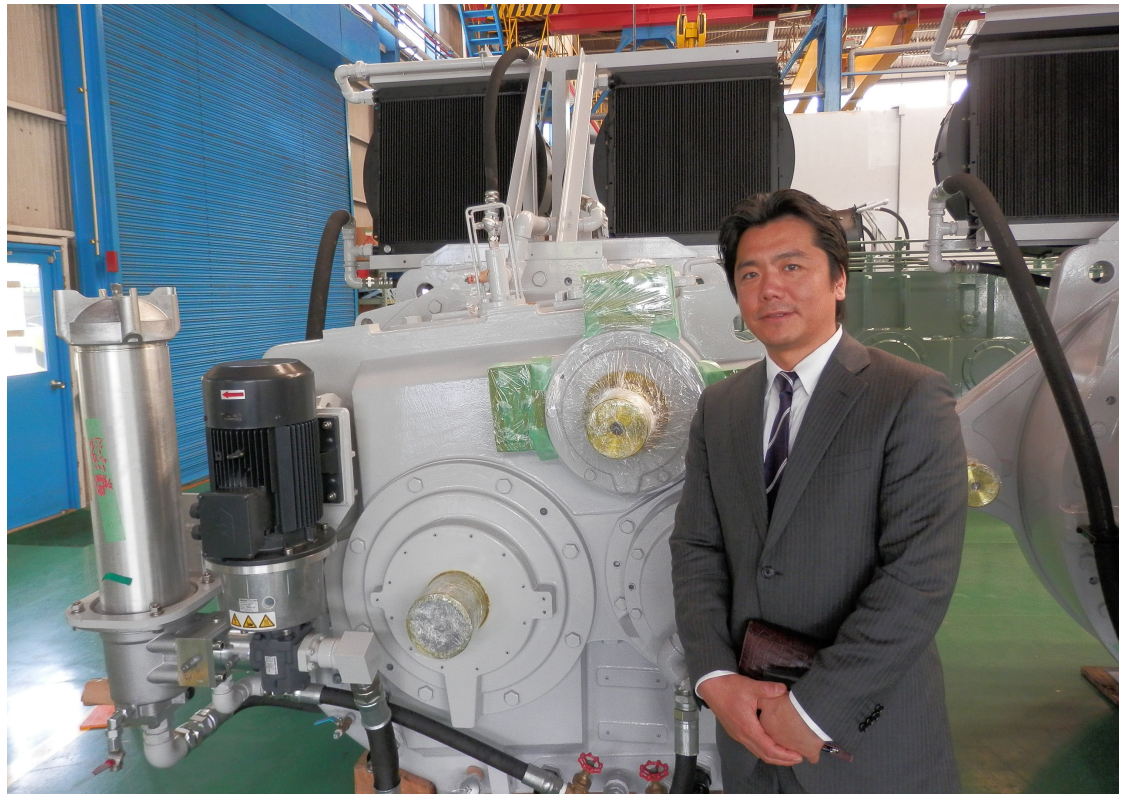


## Wind energy in Japan

Anti-nuclear public opinion became strong in the country following the nuclear emergency caused by the 2011 Tohoku earthquake and tsunami. This resulted, on 5 May 2012, in the last of Japan's 54 nuclear reactors going offline amid uncertainty over whether they would be reopened again.

Consequently, as Kazuhiko Ishibashi says, "The tsunami last year has created considerable interest in renewable energy, with special focus on solar power and wind energy. In addition," continues Kazuhiko Ishibashi, "the price of energy in Japan is currently very high, which is attracting a lot of foreign investment into renewable energy."

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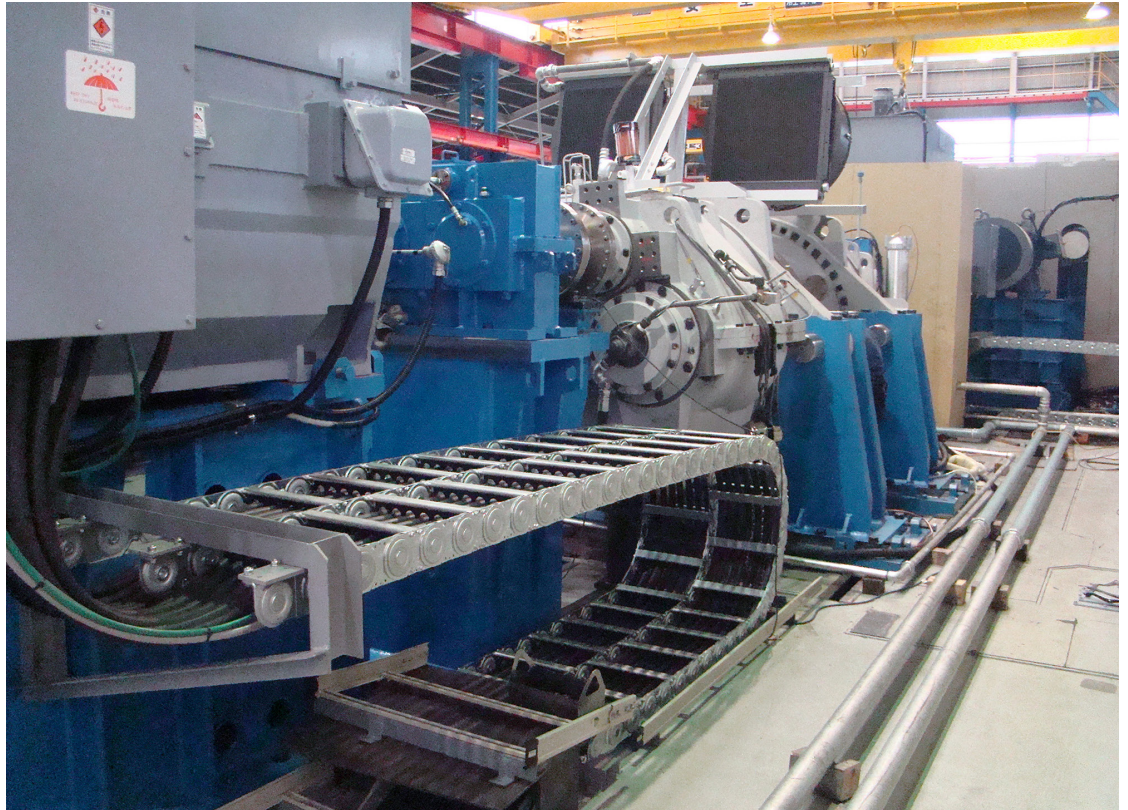
The Japanese government is actively funding research into renewable energy and has committed to long-term backing of investments into renewable energy. Among pilot schemes already under way including offshore, coastal areas, and on hills, Ishibashi has received a government grant for developing new technology including the development of gearboxes with multiple planetary gears with experimental features.



## Ensuring reliability

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Reliability is critical for wind turbine gearboxes, and Ishibashi supplies a two-year warranty as standard that can be extended by agreement with customers. "The goal however," says Kazuhiko Ishibashi, "is to provide a practical solution to cope with severe natural wind power input so that wind industry can be considered as an established energy source."



Tests are discussed with individual customers and tailored to their requirements, but a typical gearbox test involves subjecting it to light load and idling tests lasting 20 hours. Then shorter duration tests are performed, where the gearbox is subjected progressively to 25%, 50%, 75%, and 100% loading. These tests include acceleration and run-down, overspeed and reverse torque.

- The typical vibration range measured is from 20 Hz to 2.4 kHz.
- A climatic chamber tests components and complete gearboxes down to -40 C

Koji Okane is the Manager of the Quality Assurance Section, says about the testing, "We also simulate the lifecycle of our wind turbines by applying simulated loads over extended periods of up to 1200 hours of testing. We currently don't subject our components or systems to vibration testing, but are expecting this to be required very soon."

## Brüel & Kjær equipment

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The Brüel & Kjær instrumentation used is typically two triaxial accelerometers and a sound intensity probe, with Brüel & Kjær accelerometers and microphones used exclusively. PULSE hardware and software is used for R&D, and also records other important parameters including oil temperature and pressure. Ishibashi also uses specific CAE software, as well as software developed by Mitsubishi.

PULSE is the core of their testing procedure, and following the acquisition of their first system in 1998 they now have four PULSE systems in Japan and an additional one in the Chinese facility. According to Koji Okane, "PULSE is a very powerful and flexible data acquisition system that has enormous capabilities; we are only using part of its functionality."

## Future expansion

Kazuhiko Ishibashi calculates the company's current gearbox capacity is equivalent to 1.4 GW per year, which they are planning to expand upon. This will entail enhanced testing equipment, as Kazuhiko Ishibashi says, "We plan to invest soon in additional PULSE front ends to give us more channel capability."

Ishibashi has already started diversifying with the joint venture company in China, and has established a company in the US for servicing wind turbine gearboxes. In the near future they want to expand into India, on the basis of establishing joint ventures and subsidiary companies.

Alongside President Kazuhiko Ishibashi is Koji Okane, the Manager of the Quality Assurance Section



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