

# CASE STUDY



## R&D on wind turbines for standards in Taiwan

The Taiwan Electric Research & Testing Center (TERTEC) is developing test standards for new wind turbines. As these are produced at an increasing rate in Taiwan, and mainly for export, TERTEC is expanding its testing services to meet the standards of international trade partners. TERTEC plans to increase its competences to include test services, design recommendations, and accreditation, by acquiring more Brüel & Kjær solutions.

### CHALLENGE

Investigate new wind turbine designs to develop knowledge base and test standards.

### SOLUTION

PULSE analyzer platform with noise source identification system and microphones for testing according to IEC 61400-11 wind turbine standard.

### RESULTS

- Successful research in accordance with standards
- Easy problem solving through the power of PULSE
- Expanding lab competence to include test services, design recommendations, and accreditation

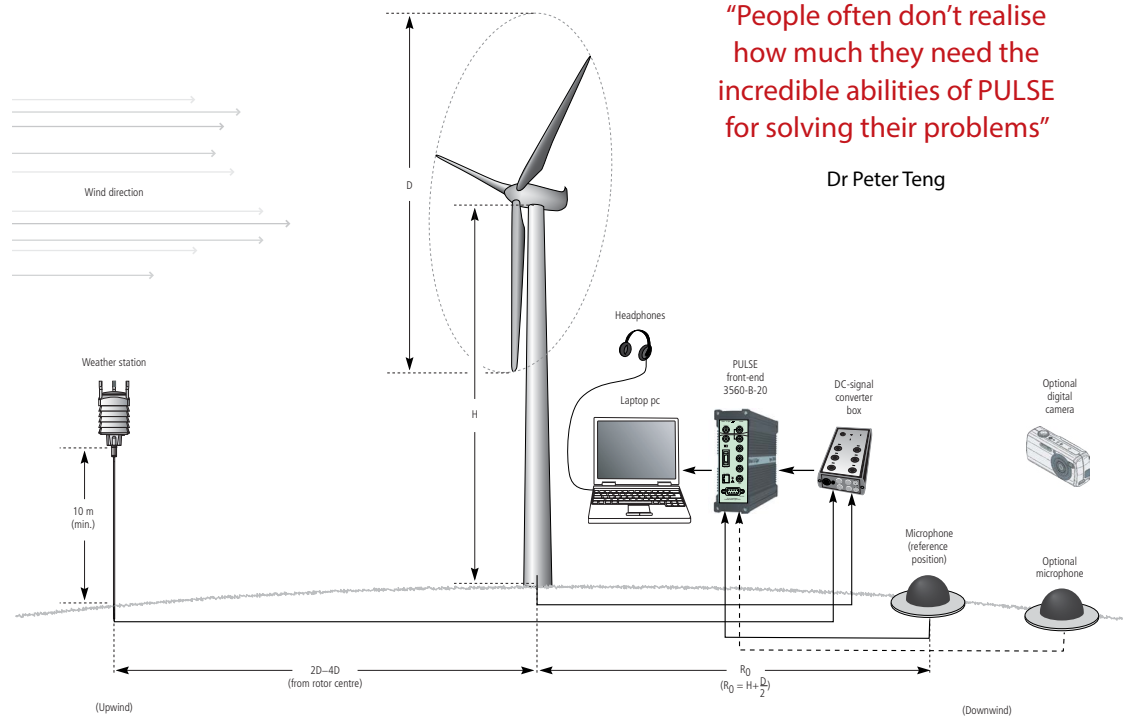


## The customer's challenge

TERTEC is a non-profit professional institute for research, testing and technology services. It turned its attention to wind energy in 2009, creating a renewable energy research group.

TERTEC's mission is to develop knowledge of new wind turbine designs to create testing standards for the Taiwanese government as part of a project covering wind, solar and wave renewable energy, electric vehicles and the development of fuel cells.

PULSE wind turbine sound power determination according to IEC 61400-11



Penghu Island off the coast of Taiwan, on which TERTEC has three permanent wind turbine testing sites





Currently, TERTEC has a PULSE system as part of a solution that includes microphones and calibrators that allows tests to be performed according to IEC 61400-11. "People often don't realise how much they need the incredible abilities of PULSE for solving their problems," says Dr Peter Teng, TERTEC's wind turbine testing lab manager.

The TERTEC team is very satisfied with the service they have received from Brüel & Kjær. "It's like having a local partner with the support of a global organisation," says Peter. He is also investigating the potential of noise management systems for wind turbine applications. "We are interested in LimA and Predictor software for environmental noise studies, and in Noise Sentinel as a wind farm noise monitoring system," he says. "Our intention is to help wind turbine manufacturers with testing and certification services according to established standards."

### Wind power in Taiwan

"The Taiwanese government strongly believes in renewable energy," says Dr Peter Teng. When you look at the advances made in recent years it's easy to see why. Back in 2011, about 5000 wind turbines were manufactured in Taiwan, but the total for 2012 grew to more than 8500.

Of over 8500 turbines built annually in Taiwan, 40% are exported to China, and many to the other main export markets: Africa and South America. Domestically, the aim of the Taiwanese government is to have 1000 large wind turbines in 20 years capable of producing 4200 MW. Two-thirds of the turbines will be offshore.

The one maker of large, horizontal-axis wind turbines in Taiwan is Teco Electric & Machinery Co.

TERTEC also cooperates extensively with universities, and its renewable energy laboratory is located at National Penghu University. Penghu is an island off the coast of Taiwan, on which TERTEC has three permanent wind turbine testing sites.



## Wind turbine research – BSMI project

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In Taiwan, there are many manufacturers of small wind turbines which are less than 3 kW. In collaboration with the Taiwanese Bureau of Standards, Metrology and Inspection (BSMI), they are analysing the different types, of which about 50% have a vertical-axis format, and the other half are horizontal-axis types.

The wind turbine testing lab gathers data and knowledge to advise BSMI on new test standards, using two test sites for R&D testing – one in Penghu, and one in Tainan.

The lab itself was accredited by the DNV classification society on April 9th, 2013, for activities including power performance, acoustic noise, durability testing, safety and function.

## Future testing services development

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Brüel & Kjær's Fu-Jin Jian at the wind turbine test facility on the island of Penghu



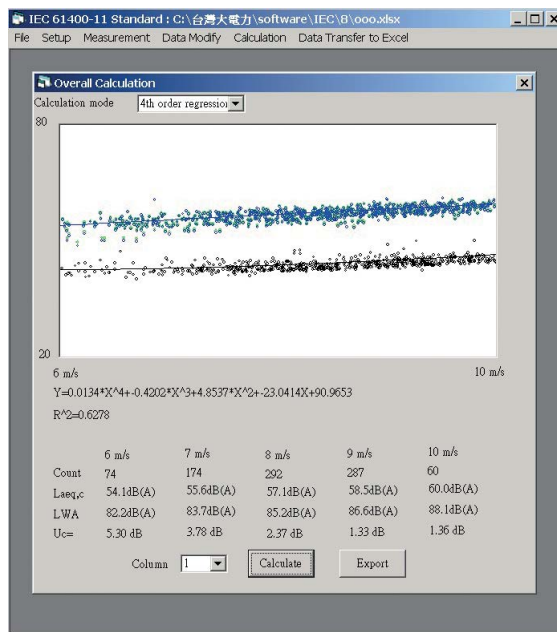
"All the work carried out at present is in connection with R&D, and we currently don't verify our customers' products," says Peter, "but in the future, TERTEC will also provide test services, give design recommendations, and provide help with international certificates."

"We want to develop specific tests to comply with the UK and the US standards based on BWEA and AWEA standards respectively. We also want to establish test standards for noise emission based on IEC 61400 Sound Power. And we want to offer design consultancy."

TERTEC has Brüel & Kjær software for testing according to the IEC 61400-11 wind turbine standard

“Part of the future test services work and R&D design consultancy will include advice or recommendations on maintenance practises, so in the future, we expect to purchase a vibration test system for testing the durability of components and systems,” he adds.

The TERTEC team also intends to purchase a number of additional PULSE systems together with solutions for noise source identification, sound intensity, and Operational Modal Analysis (OMA).



## The Taiwan Electric Research & Testing Center (TERTEC)

Dr Peter Teng has been at TERTEC for just over one year. He gained a PhD in electrical engineering in 2004. Here he is in the middle with fellow TERTEC Engineer Wei-Tai Chen (left), and Brüel & Kjær's Fu-Jin Jian (right).

Although a non-profit organisation, TERTEC is a commercial enterprise with membership available to all Taiwanese commercial companies. The electric utility Taipower, which is owned by the Taiwanese government, is the largest shareholder in TERTEC.

The HQ of TERTEC is in Taoyuan, which is 20 km south of Taipei.

Established in 1979, TERTEC now employs 160 people in total, with about 20 in the renewable energy research group.

