

# CASE STUDY

## Burke E. Porter Machinery Company – Turnkey test-stands for wind turbine gearboxes

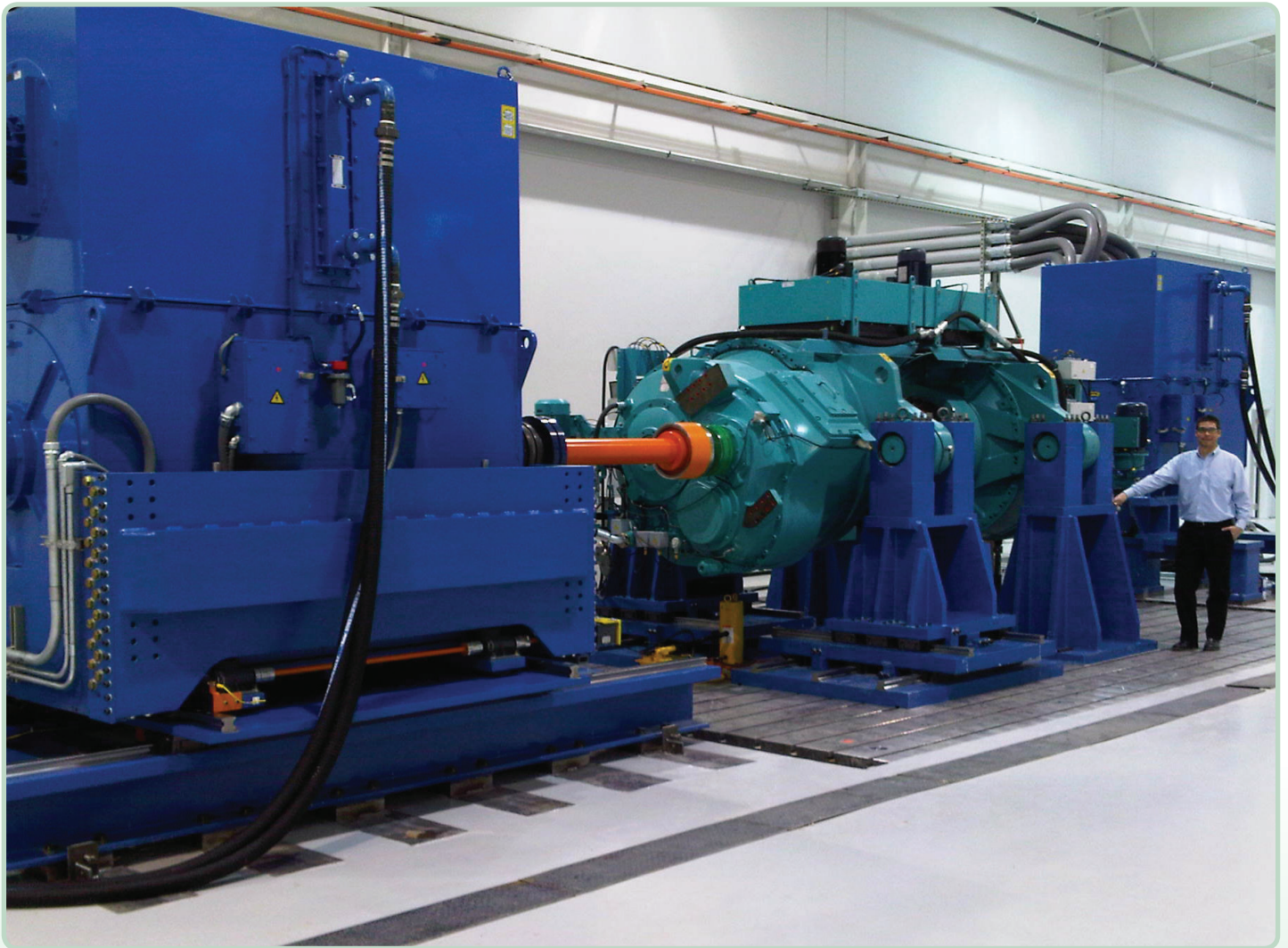
USA

Wind energy

PULSE, transducers, analysis software

*Burke E. Porter Machinery Company produces test-cells and test-stands for the wind energy and automotive industries. These systems are large turnkey units that incorporate all of the equipment needed to test and analyse large rotating machinery such as wind turbine gearboxes, while accurately simulating the real-world effects of the enormous forces that wind turbine gearboxes are subjected to.*

*Photos courtesy of Burke E. Porter and Broadwind Energy*



## Overview

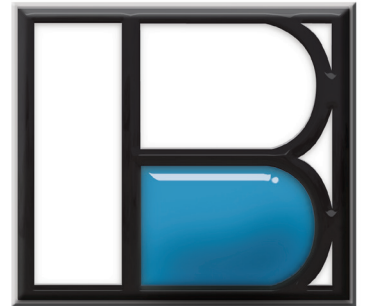
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Continuing a long tradition of using Brüel & Kjær equipment, Burke E. Porter supplies their wind turbine gearbox test stands with PULSE Data Acquisition Hardware and PULSE software built in, as well as the associated transducers and cabling. In this way, they incorporate the complete sound and vibration testing solution from Brüel & Kjær into a cohesive system that tests wider parameters.

## The company

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Burke E. Porter Machinery Company was established in 1953 in Grand Rapids, Michigan, originally producing wood-working equipment. In the early 1970s, the primary focus shifted to automotive test systems, including End-of-Line (EOL) production dynamometers, R&D dynamometers, production and assembly systems, contract manufacturing (build to print), and custom machinery. In 1987, the company began to expand internationally and reach out to foreign markets. Since then, Burke E. Porter has placed major emphasis on acquiring international accounts, so that in 2005, exports outside the US represented around 55 percent of total sales.



Following an expansion phase since 1994, the company has entered the automotive wheel and tire assembly business, tripled its manufacturing space in Wuxi, China, and has leveraged its global manufacturing and service infrastructure to offer global contract manufacturing to other machinery and mechanism providers. The company has a truly global profile, with in-house production and R&D capabilities in China, the US and Belgium, and ships to customers in countries including the US, Belgium, Brazil, China, Germany, India, Japan and Korea. More recently, Burke E. Porter has entered the wind energy industry, producing their largest test stand to date in the process.

## A synergistic partnership

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*At the back, Brüel & Kjær's Scott Summerton stands next to Scott Bohr, Sales Manager for Energy Infrastructure (right). At the front are Project Manager Jon Lawrence, Software Team Leader Keith Thompson, and Software Engineer Mark Dornbush.*



The growth potential of wind energy is a valuable area that Burke E. Porter is well suited to service, by transferring years of experience and competence from the automotive industry. Building on this expertise gained in their more established business areas, Burke E. Porter works with Brüel & Kjær's own established system to create a turnkey product that incorporates all of the important test aspects in one solution.

The approach allows Burke E. Porter to concentrate on their own core area of expertise, such as testing torque, temperature and pressure, and

investing their time building technologically advanced, flexible stands that are optimised to quickly accommodate multiple gearbox types. Being able to purchase the complete sound and vibration setup 'off the shelf' delegates that facility, drawing instead on the extensive development gained by Brüel & Kjær in that area.

Both companies are increasingly transferring the benefits of experience gained in other industries to the wind energy industry. As Scott Bohr, Sales Manager for Energy Infrastructure says, "Like us, Brüel & Kjær has a proven track record in other, equally demanding industries around the world, so they align well with our profile, and were an obvious choice as a partner."

The partnership between Brüel & Kjær and Burke Porter stretches back more than 15 years, and has always been flexible, and responsive to shifting demands. "Both of us represent reliability and usability for the end-user, and both of us are innovative and seek to add value to the customer's investment," says Scott.

## New challenges

Being larger than any they have made before, the new models of test benches for wind turbines broke new ground for Burke E. Porter. Rolling out this new product without teething issues was a paramount concern for Scott and his team, requiring a strong emphasis on ensuring high-quality, third-party components.

As with all of their solutions, the wind turbine gearbox test stands come with a guaranteed 99 per cent uptime, which is assisted by remote login capabilities that allow technicians to remotely test and troubleshoot the system at the customer's site. In addition to this, a two-year warranty includes provision of free service and parts support.

"Bringing this breakthrough product to market smoothly required a lot of things to fall into place at the right time, and required the systems to work effectively together. Brüel & Kjær's history of solid innovation was a safeguard that ensured the sound and vibration aspect of our new test stand would work correctly the first time," says Scott.

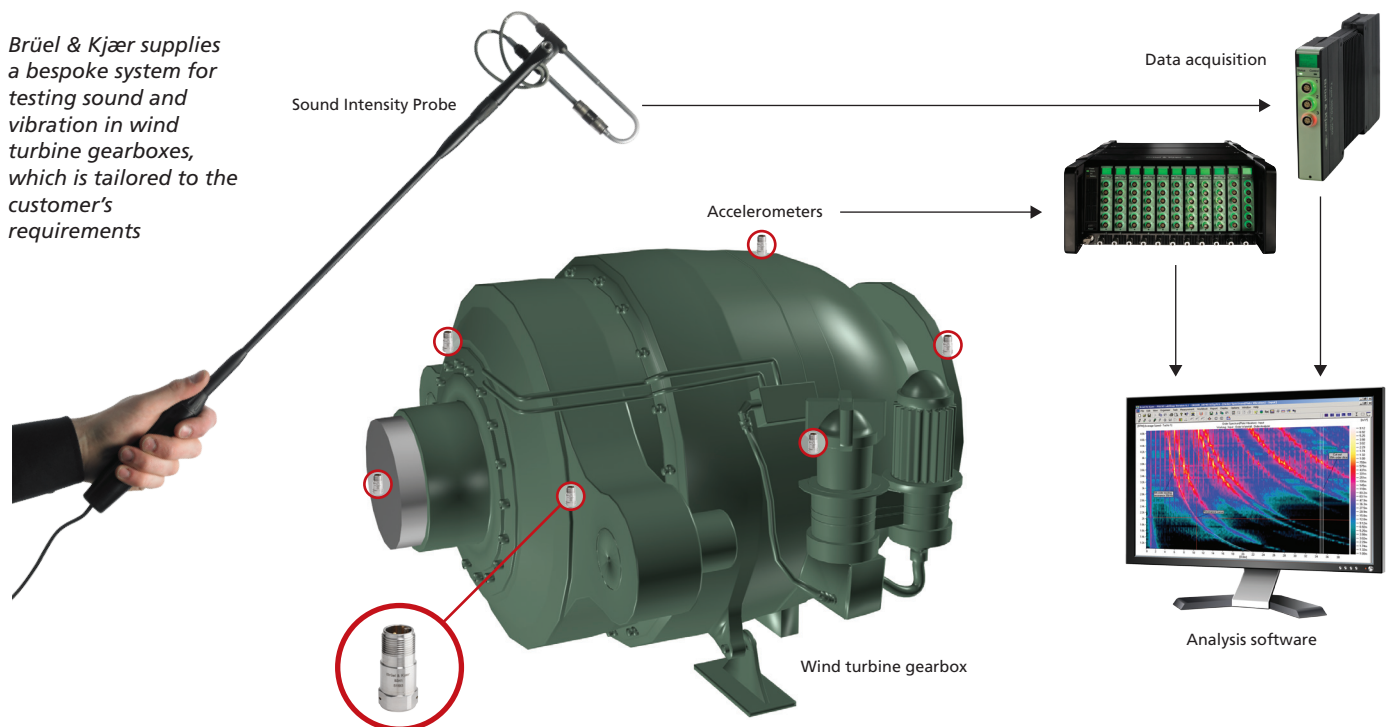
## Supplying the supplier

Noise and vibration analysis is employed on many of Burke E. Porter's traditional powertrain component test cell installations as well, for which they manage the procurement, installation, and run-in prior to shipment. As a turnkey system supplier, they also take full responsibility for the integration and proper setup of the noise analysis package, and assist in meeting whatever noise and vibration requirements their customer may have.

The user-interface was key here, as Scott says, "Brüel & Kjær are easy to work with and have a huge variety of offerings, so that everything can be customised to fit the end-user's specifications. The products are easy to setup and interact with, and critically, they are very flexible."

Brüel & Kjær's typical gearbox test system consists of acoustic and vibration transducers, a data acquisition system front-end, and analysis software. Using Brüel & Kjær's PULSE LAN-XI modular hardware allows a near-infinite combination of channels, outputs and inputs, and has the advantage that it can be easily scaled.

A variety of analyses can be applied, including FFT and CPB analysis, order analysis, noise source identification, operating deflection shapes and operational modal analysis. Each of these capabilities can be added to the base analysis package as necessary, and cover the complete range of testing requirements, from isolating inefficiencies and flaws, to analysing design effectiveness.





## The end-user

Complete test stands are configured to cover a wide range of components and parameters – down to smaller parts and systems such as brakes, pitch control, yaw motors, and non-rotational bearing stress. Noise detection components are key, as noise is responsible for a significant number of the product warranty returns experienced by Burke E. Porter's customers.

*Broadwind Energy use one of Burke Porter's integrated test stands at their facility in Texas*



One of Burke E. Porter's wind turbine test stand customers is Broadwind Energy, who supply wind turbine gearbox refurbishment and servicing, among other services like welding and gear manufacturing. Expanding quickly to meet market demand, they are a typical customer type in that they appreciate a turnkey solution that can release them to concentrate on their own core business area.

Crucially, the end-user has one point of contact for a complex machine with a single point of contact for any issues that arise. Meanwhile, Burke E. Porter have – in Brüel & Kjær – a single contact for sound and vibration, whenever they need it, and who can also provide the expertise, training and servicing as necessary.

## The future

Following a weak year in 2010, the world market for wind energy is gaining momentum. Below China at the top of the global wind market are USA, Germany, Spain, and India, with these top five representing 74 percent of the global wind capacity. Companies servicing and testing existing turbines can look eagerly upon a growing global wind capacity that hit 215 GW in June 2011. Among new markets it seems that Brazil's wind power is taking off, and is set to exceed 5 GW by 2013 – a five-fold increase.

Emerging markets mean that wind energy construction is likely to move, and manufacturers are developing new products, some of which are larger than ever before. A new wave of offshore-specific models will hit the market from 2014. Efficiency and reliability will be key factors for bigger and more costly solutions with less-proven, larger parts, designed for more demanding environments like offshore use, where servicing and repair costs are also higher.

Clearly, turbines and all of their components must meet ever-more demanding quality and reliability standards, as these future trends look set to make these factors more critical. For Burke E. Porter, a healthy future waits over the horizon, needing new and larger test systems to guarantee new designs. Their firm relationship with Brüel & Kjær is poised to supply effective solutions to the burgeoning wind power market, shortening the end-user's path to reliability.