

Giving Wind Direction

# WIND SYSTEMS



inFOCUS:

## Bolting & Torque, Wind Measurement

» Profile:  
ITH Engineering

JANUARY 2017



you only need  
**ONE**

## Increase Safety and Lower Costs

You do not need dozens of inspectors in your tower. Avanti helps you solve your safety and compliance challenges with just one visit.

### Safety Certifications

- Elevator
- Elevator Beam
- Elevator Disconnect
- Fences/Guardrails
- Fall Arrest System
- Ladders
- Rest Platforms
- Staircase
- Anchor Points
- Door Filter Replacement
- Emergency Lighting
- Fire Extinguishers
- First Aid Kits
- Rescue / Evacuation Kit
- HV / LV Cabling
- Grounding Wires
- Chain Hoist
- Edge Protection

We are certified to:

ISO 9001:2008 • ISO 14001:2004 • OHSAS 18001:2007

ASME A17.1.5.11 • GWO (Global Wind Organisation)



I: [www.avanti-online.com](http://www.avanti-online.com)

E: [info@avanti-online.com](mailto:info@avanti-online.com) P: 262 641 9101

# A Radical Change in Bolting is Coming Your Way

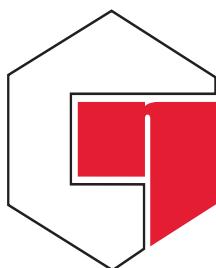
Norbar Torque Tools Introduces  
a New Generation in AC Powered  
Torque Multipliers



## EvoTorque® 2

It's Time to Change the Way You  
Think About AC Powered Torque Multipliers

- Operating ranges from 100 lb-ft to 4500 lb-ft
- Measures in Torque, Torque and Angle, and Torque Audit mode for pre-tightened bolts
- Versions for 110 VAC or 230 VAC
- Lightweight at only 23lbs.
- Factory calibrated and certified to  $\pm 3\%$  accuracy regardless of fluctuating voltages
- USB and Bluetooth® 4.0 data transfer (also called Bluetooth® Smart)
- 3,000 readings in internal memory, time and date stamped
- Includes PC software 'EvoLog' for data management and tool configuration
- From factory to field; for fabrication, installation, verification and maintenance



**norbar**<sup>®</sup>  
Norbar Torque Tools

Let's Talk Torque

Norbar Torque Tools, Inc.

440.953.1175 PH

440.953.9336 FX

[inquiry@norbar.us](mailto:inquiry@norbar.us)

[norbar.com](http://norbar.com)



14

## Improving Joint Integrity

*Three-part approach helps to reduce costs and increase production and quality.*

## ALSO IN inFOCUS

- 17** Understanding the difference between transducerized and current-control tools
- 18** Profile:  
ITH Engineering
- 20** Conversation:  
Philip W. Beck with Wind Measurement International

# DEVOTED TO PROTECTION™



## DEVOTED TO QUALITY

AMSOIL's reputation for producing the highest quality lubricants sets us apart from others in the market. With cutting-edge research and technology, our process guarantees a cleanliness code of 16/14/11 or better on every main gearbox, pitch, yaw and hydraulic lubricant we produce.

AMSOIL products are perfected in the lab and proven in the field. An approved lubricant for factory and service by today's top manufacturers is why owners, operators and manufacturers continue to move up to AMSOIL. Don't risk your assets with unnecessary filtering or additive treatments. Let the AMSOIL team show you how to maximize the return on your investments.

FIND OUT MORE AT [AMSOILWIND.COM](http://AMSOILWIND.COM)

**AMSOIL**  
Devoted to Protection™

# SECTIONS

Volume 09 Issue 01



## DIRECTION

Acciona's South Texas Wind Farm Begins Commercial Operation

8



## MAINTENANCE

Des-Case Reimagines the Oil Sight Glass

22



## INNOVATION

C6015 IPC from Beckhoff Offers Space-Savings and Flexibility

28



## MANUFACTURING

Siemens Inaugurates New Blade Factory in U.K.

34



## CONSTRUCTION

Whirlpool Breaks Ground on Latest Ohio Wind Power Project

40



## CROSSWINDS

Damper Can Stop Seismic and Wind Events and Help Lower Repair Costs

45



*Wind Systems* (ISSN 2327-2422) is published monthly by Media Solutions, Inc., 266D Yeager Parkway Pelham, AL 35124. Phone (205) 380-1573 Fax (205) 380-1580 International subscription rates: \$72.00 per year. Periodicals Postage Paid at Pelham AL and at additional mailing offices. Printed in the USA. POSTMASTER: Send address changes to *Wind Systems* magazine, P.O. Box 1210 Pelham AL 35124. Publications mail agreement No. 41395015 return undeliverable Canadian addresses to P.O. Box 503 RPO West Beaver Creek Richmond Hill, ON L4B4R6. Copyright 2006 by Media Solutions, Inc. All rights reserved.

# SEEKING OPPORTUNITY?



Scan *Wind Systems* website to enjoy a host of features, including:

- Our new jobs listing, for employers and jobs seekers alike
- Events calendar to keep you informed
- A searchable articles archive, downloadable individually
- View the digital magazine, or download entire issues
- Vendor listings, along with our annual Buyer's Guide
- Company profiles and Q&As
- Connect to the wind industry through social media
- Wind industry news from around the world

Visit [windsystemsmag.com](http://windsystemsmag.com) today and get connected!

# EDITOR'S DESK

## New Year, New Challenges

I hope everyone has recovered from 2016 and is ready to tackle a new year still filled with promise about wind.

To help keep those thoughts positive, our January issue of *Wind Systems* has informative articles from energy experts who have their fingers on the pulse of the industry.

A contentious U.S. presidential election had some in the industry worried about what the direction of wind would be, but the CEO of EnergiaWorks has shared his thoughts on the fate of renewable energy during a Trump administration. It's good news.

Our inFocus topics for January — bolting and torque, as well as wind measurement — are also here to help you better understand, well, the nuts and bolts of the industry.

Torkworx shares an article about improving joint integrity, and AIMCO presents its insights about bolting technology advancements.

Our company profile is with ITH Engineering. One of the main goals of this tooling and hardware manufacturer is striving to make bolting maintenance a thing of the past with maintenance-free hardware. The company also works on bolted joint design and engineering.

Wind measurement is — for obvious reasons — an important subject when it comes to the wind industry. It's also an area that has changed quite a bit in how wind measurements are actually taken.

In our Conversation, we chat with Philip Beck with Wind Measurement International on the aspects of wind measurement and the tools used to accomplish that task.

The technology that goes into constructing a wind turbine is always changing as new innovations step up to make a turbine better, stronger, and more economical.

In Crosswinds, we talk with Taylor Devices. The company is using applications it created for NASA and the space program to keep wind turbines, as well as tall buildings and bridges, from succumbing to the effects of seismic activity and wind excitation.

The company's damping technology takes the energy created from these events and transfers it into heat energy, keeping it from potentially damaging a structure. The bottom line of this technology is to lower repair costs — which keeps that bottom line healthier.

So, as we enter a new year and face new challenges, at least we know wind is not going anywhere anytime soon.

Renewable energy isn't just our future anymore, it's our present.

And as always, thanks for reading! ↗

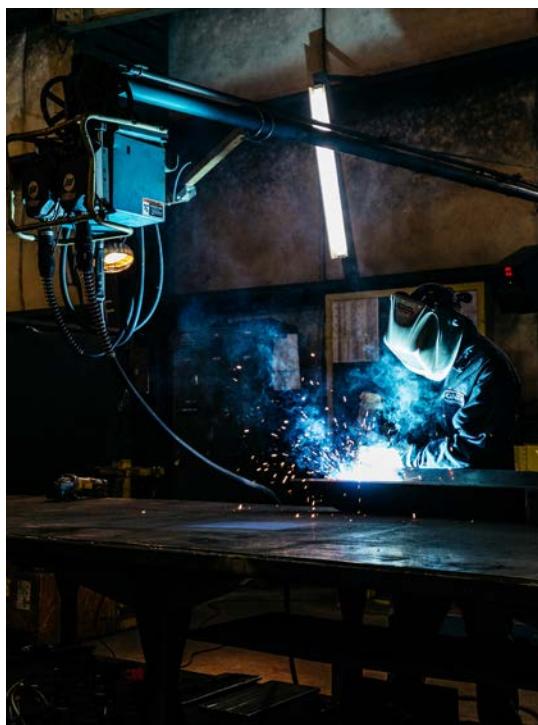
JANUARY 2017



**Kenneth Carter, managing editor**

*Wind Systems* magazine  
[editor@windsystemsmag.com](mailto:editor@windsystemsmag.com)  
(800) 366-2185, ext. 204

A handwritten signature in black ink that reads "Kenneth Carter". The signature is fluid and cursive, with a large, stylized "K" at the beginning.



## Robust Wind Industry Means A Lot of Jobs

Courtesy of AWEA

- The U.S. wind industry supported 88,000 jobs at the start of 2016.
- These jobs are spread across all 50 states.
- There are 21,000 wind-manufacturing jobs.
- More than 500 factories in 43 states build wind-related parts and materials.
- Ohio tops the list with 62 wind-manufacturing plants.

The American Wind Energy Association (AWEA) is the premier national trade association that represents the interests of America's wind energy industry. For more information, go to [www.awea.org](http://www.awea.org)



### B-RAD SELECT SERIES

**WORLD'S MOST ADVANCED**  
BATTERY POWERED TORQUE WRENCH



**QUICK SELECT**  
TORQUE SETTINGS

[www.radtorque.com](http://www.radtorque.com)

# DIRECTION

Policy • Advocacy • Business • Finance • Legal • Environment • International

## Acciona's South Texas Wind Farm Begins Commercial Operation

Acciona Energy, a leading global operator of renewable energy projects, recently announced the San Roman Wind Farm has begun commercial operation. The 93 MW San Roman project is Acciona's eighth wind farm in the U.S and brings the company's total U.S. wind capacity to 721 MW.

San Roman is near Brownsville, Texas, and is equipped with 31 AW125/3000 turbines manufactured by Nordex/Acciona Windpower. Each turbine has a rotor diameter of 125 meters and is mounted on an 87.5-meter steel tower.

In addition to owning and operating the project, Acciona served as general contractor for San Roman's construction, completing the project in about 11 months while generating more than 100,000 hours of work for local contractors and maintaining a near-perfect safety record. Acciona has hired a team of local employees to manage the wind farm's long-term operations and maintenance.

"Acciona is proud to complete this latest addition to our U.S. renewable energy portfolio and become a part of the community here in Cameron County," said Ilya Hartmann, CEO of Acciona Energy North America. "Acciona's expertise as a global leader in renewable energy, along with the great work of our local partners and contractors, helped make this project a success."

The new facility will produce enough electricity to power more than 30,000 Texas homes. Over its 25-year lifespan, San Roman is expected to generate \$30 million in tax revenue for local school districts and other public services, as well as more than \$25 million in lease payments to local landowners.



The 93 MW San Roman project is Acciona's eighth wind farm in the U.S and brings the company's total U.S. wind capacity to 721 MW. (Courtesy: Acciona)

Acciona demonstrated its commitment to sustainability during the development and construction of the San Roman Wind Farm by performing extensive wildlife studies prior to construction and providing safety and environmental training for all staff on the project.

The company also conducted a social impact analysis to understand the project's effect on local stakeholders. Based on this analysis of community needs, Acciona chose to establish a scholarship fund and a community benefit fund to support education and job growth in the area.

### 1,500 MW IN NORTH AMERICA

Acciona owns 721 MW of operating wind-power capacity in the United States, including the San Roman Wind Farm in Texas, three wind farms in Oklahoma (329 MW), one in North and South Dakota (180 MW), one in Illinois (100.5 MW), and another two in

North Dakota and Iowa (12 MW and 6 MW respectively). It also has a 64 MW concentrating solar-power plant in Nevada.

The company also has 181 MW of operational wind-power capacity in Canada (in Alberta, Ontario, and New Brunswick) and 556 MW in Mexico (all in Oaxaca).

With the new wind farm, Acciona Energy's renewable energy capacity in North America now exceeds 1,500 MW. Acciona recently announced that it will construct a new 168 MW wind farm and a 227 MWp solar plant in Mexico by the end of 2018.

Acciona has committed to invest about \$2.5 billion by 2020 to build new renewable energy installations worldwide, increasing the company's capacity by about 1,900 MW. ↗

Source: Acciona

For more information,  
go to [www.Acciona.com](http://www.Acciona.com)



# CASTROL® OPTIGEAR® SYNTHETIC CT 320

Introduced over 10 years ago and protecting 20,000 megawatts globally...and growing every day.

- Lowest water ppm in the market as reported by a major wind turbine OEM\*
- Higher viscosity index and long-term viscosity stability to provide increased protection over a wider temperature range
- Superior micropitting protection and foam control that outperforms other competitive oils
- Ease of changeover from other competitive oils

\*6-year field average 76 ppm

Contact our expert engineers to discuss how Castrol can extend oil change out intervals and reduce O&M costs.

Learn more at [Castrol.com/windenergy](http://Castrol.com/windenergy) or 1-877-641-1600.



### Avery Dennison Partners with Apex on Wind-Energy PPA

Global labeling and packaging materials manufacturer Avery Dennison Corporation has signed a wind-power purchase agreement (PPA) with Apex Clean Energy to offset 50 percent of the company's U.S.-based greenhouse gas emissions derived from electricity consumption, signaling commitment by Avery Dennison to renewable energy and energy efficient practices and technology.

Under the agreement with Apex's Perryton Wind, a 299.91 MW wind-energy project in Ochiltree County, Texas, Avery Dennison will purchase 20 MW of renewable energy capacity. The PPA is a key component of Avery Dennison's 2025 sustainability goal to reduce absolute greenhouse gas emissions from its operations by at least 3 percent annually, and by at least 26 percent overall, between 2015 and 2025, made as part of the company's new participation in World Wildlife Fund's (WWF) Climate Savers Program. Perryton will be Apex's fifth Texas wind farm, powering the equivalent of 108,000 U.S. homes. The facility will consist of 130 Siemens 2.307 MW turbines.

According to Roland Simon, vice president of global procurement and global sustainability leader at Avery Dennison, the partnership with Apex is one of the ways Avery Dennison continues to create shared value for the company, the industry, and communities worldwide. He noted that the PPA will provide clean, renewable electricity equal to 50 percent of the power consumed by Avery Dennison's U.S. operations.

"It's important for us to optimize renewable energy sources in a way that ripples outward to create change that encompasses far more than our own business," Simon said.

Apex, an independent energy solutions provider, was awarded a 2016 Green Power Leadership Award by the Center for Resource Solutions in October for its leadership in bringing wind capacity to market and its expansion of direct purchasing of clean energy by the public and private sectors.

"We leverage the depth and breadth of our national pipeline of projects, and we are committed to tai-

loring solutions that meet the specific goals of our corporate, utility, and public sector partners, from a facility purchase to a structured PPA," said Steve Vavrik, Apex's chief commercial officer. "The commitment to long-term renewable energy purchasing by companies such as Avery Dennison is providing a strong drive in the market to bring more clean energy to the grid."

Avery Dennison's investment in renewable wind power demonstrates its continued focus on energy efficiency and energy reduction. The agreement with Apex comes on the heels of Avery Dennison joining World Wildlife Fund's (WWF) Climate Savers Program, a global group of partner companies engaged in the transition to a climate-friendly economy.

Additional goals set with WWF include covering the equivalent of 100 percent of electricity consumption at Avery Dennison's U.S. operations with renewable energy by 2025 and addressing climate change through other areas of operations, such as maximizing use of paper made with recycled or certified wood fiber (sourcing only from certified sources by 2025).

"We recognize Avery Dennison for its strong leadership in sourcing more renewable energy to help achieve the company's emission reduction target," said Matt Banks, climate and business manager at WWF. "As our newest Climate Savers partner and as a signatory of the Renewable Energy Buyers Principles, Avery Dennison has called for increased access to cost-effective renewable energy that will lead to measurable reductions in its greenhouse gas emissions while demonstrating to other companies the business and environmental value of scaling up to achieve a 2025 target."

"Working in partnership with WWF is part of our commitment to sustain a thriving business that is a force for good — one that generates value, in every respect, for all involved," Simon said. ↗

Source: Avery Dennison

For more information,  
go to [wwwaverydennison.com](http://wwwaverydennison.com)

### BASF Solutions for Wind Energy Comply with China Guidelines

The comprehensive wind-energy industry portfolio offered by BASF's Coatings division already satisfies the threshold limit values for industrial coatings expected to come into effect by 2022 in Beijing/China.

To curb air pollution in China's capital, the Beijing

Municipal Bureau of Environmental Protection has adopted a policy paper that provides for the two-stage reduction of emission levels for maintaining and repairing wind turbines and other structures. In line with this regulation, the threshold values that were

valid up to the end of 2016 will be tightened again in 2017.

BASF focuses on energy-efficient and resource-conserving formulations for both manufacturing and application of its products. Coating solutions for wind turbines developed and sold under the Relest brand feature high-abrasion resistance and elasticity and thus offer long-lasting protection from extreme weathering impacts. Rotor-blade surfaces in particular have to withstand extreme stresses such as wind, hail, and rain. For this purpose,

BASF has developed a special coating system consisting of gelcoat, putty, edge protection, and topcoat. The consistently used two-component polyurethane compounds offer an especially ecological alternative to solvent-borne products and thus comply with the VOC guidelines, including the tightened threshold values for use in Beijing. ↗

*Source: BASF*

For more information,  
go to [www.bASF-coatings.com](http://www.bASF-coatings.com)

## **Microsoft Makes Largest Wind-Energy Purchase to Date**

Microsoft Corp. recently made its largest purchase of wind-energy to date with the signing of two agreements. Combined, these agreements represent 237 MW of wind energy, which brings Microsoft's total investment in wind energy projects in the U.S. to more than 500 MW.

"Microsoft is committed to building a responsible cloud, and these agreements represent progress toward our goal of improving the energy mix at our datacenters," said Brad Smith, president and chief legal officer at Microsoft. "Our commitment extends beyond greening our own operations because these projects help create a greener, more reliable grid in the communities in which we operate."

Microsoft has contracted with Allianz Risk Transfer (ART) to fix its long-term energy costs and purchase the environmental attributes connected with the new, 178-MW Bloom Wind project in Kansas. The project is the first to use a novel structure developed by ART and designed to offset high upfront costs associated with the creation of large-scale wind projects. Microsoft is the first buyer to participate in this structure, which has the potential to bring clean-energy projects online at a faster pace.

"It is important for investors in renewable energy projects to secure long-term, stable revenues, and our structure does just that," said Karsten Berlage, managing director of ART. "We are thrilled to be partnering with Microsoft on this groundbreaking project."

In addition, Microsoft has contracted with Black Hills Corp. subsidiary Black Hills Energy, under a long-term agreement, to purchase 59 MW of renewable energy certificates from the Happy Jack and Silver Sage wind projects, which are adjacent to Microsoft's Cheyenne, Wyoming, datacenter. The combined output of the Bloom and Happy Jack/Silver Sage projects will produce enough energy on an annual basis to cover the annual energy used at the datacenter.

"Our longstanding partnership with Microsoft productively led to this landmark collaboration. This collaboration provided them the opportunity to utilize significantly more renewable energy while still ensuring the reliability they've come to expect through our energy infrastructure and generation resources," said David R. Emery, chairman and CEO of Black Hills Corp. "We are proud to be a strong supporter and partner in their mission to power their datacenters with increased renewable energy resources and look forward to our continued collaboration in the years ahead."

Microsoft and Black Hills Energy also worked together to create a new tariff, available to all eligible customers, that allows the utility to tap the local datacenter's backup generators, thereby eliminating the need for Black Hills Energy to construct a new power plant. The tariff received approval from the Wyoming Public Service Commission in July.

"We are constantly looking for new ways to approach energy challenges and avenues of engagement with our utility partners," said Christian Belady, general manager of cloud infrastructure strategy and architecture at Microsoft. "The team worked closely with ART to come up with a completely new model to enable faster adoption of renewables. Likewise, the tight engagement with Black Hills created the opportunity for Microsoft's datacenter to become an asset for the local grid, maintaining reliability and reducing costs for ratepayers. This kind of deep collaboration with utilities has great potential to accelerate the pace of clean energy, benefiting all customers — not just Microsoft."

These are Microsoft's third and fourth wind-energy agreements, joining the 175-MW Pilot Hill wind project in Illinois and 110-MW Keechi wind project in Texas. ↗

*Source: Microsoft*

For more information,  
go to [news.microsoft.com](http://news.microsoft.com)

# PERSPECTIVE

## Clean Energy Appears To Be Safe under Trump

**L**ike a lot of Americans who work in clean energy, I worried coming into the election about what a Trump presidency might mean for our industry and all of the public benefits it provides.

Candidate Trump, after all, railed at rallies that renewable energy “is not working so good.” He complained about solar’s payback time. Of wind power, which now supplies about 5 percent of the country’s electricity, employs 88,000, including more than 21,000 in manufacturing, and, in a growing number of places, is the least expensive form of new generating capacity available.

### SHORT-TERM GOOD

Now that the election has come and gone, I can’t say I’ve learned to stop worrying and love the bomb. But I can tell you I think Donald Trump will be good for clean energy in the short term at the least, lighting a fire under project developers who are pretty nervous about possible changes in federal policy and incentives. That’s the case even though two key drivers of clean-energy deployment, the federal Investment Tax Credit and the Production Tax Credit, have strong, bipartisan support and are thus unlikely to be repealed since they already are scheduled to sunset over the next several years.

The efforts of developers across the country will likely bump up



### William Liuzza

*Founder and CEO*

**CEO of EnergeiaWorks**

the rest of the supply chain — manufacturing, distribution, and construction — faster than we first anticipated. Think wind power before the 2014 expiration of the federal Production Tax Credit. That amped-up deployment can, in turn, help us solidify important industry trends and gains we’ve seen in recent years, including precipitous price declines, increased investment in research and new technologies, and more competition in the marketplace. All these can make wind and other clean energy more accessible to customers big and small and can make it a bigger player in the American industrial landscape.

### UNINTENDED CATALYST

With Donald Trump’s election as an unintended catalyst, our industry can continue to create more jobs, cut more carbon pollution from our energy supply, help our kids breathe increasingly cleaner air, and lower energy costs for everyone. That’s true no matter what the president-elect

has said about global warming.

We should take this opportunity and run with it.

I know we’re at an especially historic moment because of what our organization hears from the companies we work with as recruiters. “Since the election, we are operating in a policy environment for renewable energy in which the medium to long term is unclear at best,” notes Jon Rappe, senior vice president of renewable project developer ImMODO Energy Services. With good state and federal policies currently in place, at least for now, “we are staffing up and trying to get as many projects as possible in the ground before any new administration policies may take effect.”

### GOING FULL THROTTLE

It’s not just ImMODO that feels this way. One overseas renewable developer expanding into the U.S. market has told us to go full throttle on hiring now. Before the election, he had a slower schedule.

**William Liuzza** is the founder and CEO of EnergeiaWorks, a global clean energy executive recruitment firm. Liuzza is an accomplished writer and public speaker for renewable energy hiring trends. He also manages “Renewables UnWind,” a networking event for clean tech that has hosted thousands of professionals in cities around North America.

Another industry source, Brian Hill, the general manager of Bachmann said, "Our primary focus in the U.S. wind energy market is on operating assets, and those aren't going anywhere soon, no matter who is in office.

I expect our plans to support these wind farms will lead to additional work for contract technicians, project managers, and engineers. Regarding the overall growth in the wind, I believe the momentum of the industry would be very difficult to reverse at this point, especially in light of the price of wind energy compared to other sources, and recent trends of corporations such as Google, Amazon, and Microsoft securing large contracts for renewable energy. This continued growth should lead to manufacturing jobs throughout the OEM production chain."

Another industry insider, Benoy Thanjan of Reneu Energy, notes that much of "the growth in solar and wind has been driven by state-level policies and incentives and steep price declines in building projects. These two drivers are probably not going to stop."

Indeed, for 2015, wind and solar ranked No. 1 and No. 2 in terms of new electric generating capacity brought online, outpacing natural gas and other sources despite significant price drops for fossil fuels.

## AMERICA LOVES CLEAN ENERGY

This new growth can help us mature as an industry, but it can also do more than that. The American public already loves clean energy by overwhelming margins. That's true not just of Clinton fans but Trump supporters, too. Seventy-seven percent of them favor wind power, and 88 percent like utility-scale solar.

We should highlight the benefits we bring to the nation, like wind-sector job growth of 20 percent in 2016 or solar job growth that has averaged more than 20 percent per year over the last six years. Or how our industries can offer those without college degrees middle-class incomes, rather than the low-wage jobs that are too often their only other alternatives.

We should highlight that investment in renewable energy boosts local economies and creates jobs in the U.S. that cannot be outsourced such as construction, transportation, operations, and maintenance.

## ACCELERATING TRANSITION

We should talk up the more than 500 wind-power component

manufacturers we have in 43 states. These next few years are the time we should use to press our advantages with policymakers in Washington. They have an enormous impact on our industry's growth and our ability to deliver the public benefits of clean energy that make us so proud.

Donald Trump's electoral college victory is not something many of us in the clean-energy community thought would benefit our industry and the country and planet it serves. But we can use the next few years to do what we do best: accelerate the transition to a clean energy future.

Especially with our industry working as advocates, the idea that a Trump presidency can put a stop to clean-energy growth just might be the biggest hoax of all. ↗

**FIVE STAR FILTER**

**LARGEST STOCK & READY TO SHIP**

We provide a wide selection of high-quality filters for many wind turbines and compressors

 FILTER PADS	 BREATHER AIR FILTERS
 HIGH-PRESSURE HYDRAULIC CRANKCASE	 COMPRESSORS AND ENGINES
 OFF LINE LUBE FILTERS	 TOWER DOOR FILTERS

**Call us today to experience our Can-Do Guarantee!**

Phone 713.290.1972 Email [service@5starfilter.com](mailto:service@5starfilter.com) Website [5starfilter.com](http://5starfilter.com)

# inFOCUS

## Improving Joint Integrity

*Three-part approach helps to reduce costs and increase production and quality.*

By Pete Fuller

The wind-energy market has been calling for the need to reduce maintenance costs now and especially after the production tax credits expire. Mechanical joint integrity accounts for a large portion of the maintenance scope.



Load-indicating washer being installed during base-bolt tension check. (Courtesy: Torkworx)

Torkworx, being a leader in controlled bolting solutions, has a laser focus on power generation. It has been pivotal in the development and evolution of specific products and services proven to reduce maintenance costs while improving WTG joint integrity.

Torkworx approaches its solution in three parts, all designed to reduce cost while increasing production and quality. The three realized parts are technology, service, and equipment.

### TECHNOLOGY

On the technology side, Torkworx looked at how to reduce the overall costs and liabilities associated with torque and tension checks. Monitoring the bolt load was the obvious solution. But how to make it happen, and where to start? A bolting project on a slew-ring bearing application in the steel industry used a proven product manufactured in the U.S. This product allowed the monitoring of bolt load in real time on critical joints. This quality fastener company specialized in customer-driven solutions and began revising the design to fit Torkworx's application.



The result of the revision was a load-indicating washer designed for base bolts that reduces equipment costs and completion times. This washer measures the bolt load by simply attaching a gauge to the coupler immediately identifying any load loss. Load-indicating hardware can be installed on any mechanical joint and, with advancements in wireless technology, the data can be sent in real-time from remote locations.



Torkworx base bolt service truck on location. (Courtesy: Torkworx)

Imagine the cost reduction by removing the need for technicians to climb and use bolting equipment to perform these checks. For example, knowing a blade-bolt joint was failing before it caused any damage would be advantageous.

## SERVICE

On the service side, Torkworx looked at its internal service department and

how it could improve production and reduce costs. Thanks to bolting equipment and experience, contractors and owner/operators have asked Torkworx to perform thousands of base-bolt tension checks. Technicians are mechanics who can climb, so tensioning work is nothing new. Using a specialty company like Torkworx frees up customer manpower. This reduces the cost to complete

## ALSO IN THIS SECTION

- 17** Bolting Technology Advancements

- 18** Profile: ITH Engineering

- 20** Conversation: Philip W. Beck



Torkworx WTG specific rental fleet is constantly growing. (Courtesy: Torkworx)

the scope because specialty companies concentrate on nothing else but their specialty service, making them more efficient.

Torkworx has introduced some automated pressure reading systems along with equipment that has a reduced footprint. These innovations allow Torkworx to perform the task faster and with exceptional quality in reporting, which will increase customer confidence in the service. This new technology can also be used to monitor target pressures and completion times so Torkworx can observe performance in real time. This reduces costs, allowing Torkworx to provide a reduced per WTG rate. The savings in time and

manpower are immediate realized benefits for customers that are clear and justifiable.

### EQUIPMENT

On the equipment side, Torkworx listened to the market and began assembling turbine specific WTG tooling packages. Torkworx has been doing this on the conventional turbine side for a decade, so offering rental on specialty tooling made sense. It has been able to assemble a sizable specialty tensioner and electronic torque kit inventory. Contractors having a difficult time keeping up with equipment demands and repair costs along with the staggering initial investment now have immediate access to the required tooling at a fraction of the cost. ↗



Load-indicating washer with gauge attached confirming the load remained after the tensioning procedure. (Courtesy: Torkworx)



**Pete Fuller** has been in the bolting industry since 1997 beginning as a technician in the petrochemical and refining industry. He was recruited into the power generation industry to build and lead a startup bolting company, which he did successfully. In 2008, the company was sold and he and a select few of other key players from the bolting industry started Torkworx, LP where he remains the directing partner. For more information, contact Torkworx at support@Torkworx.com.

# Bolting Technology Advancements

*Understanding the difference between transducerized and current-control tools.*

By Paul Bundy

**W**hy is using a transducerized tooling system important? To understand that importance, the accuracy difference between transducerized and current-controlled tooling needs to be explained.

## CURRENT CONTROLLED

Current-controlled (open loop) tools are a dedicated system consisting of a tool, cable, and controller. They are pre-calibrated in a lab using an external transducer on a rundown fixture. The tool is operated on the external transducer at set torque points. The amount of current supplied by the system is matched up to the torque reading of the external transducer. The lab will input these torque readings that the system translates into the amount of current it needs to supply to achieve the amount of torque required.

Unfortunately, current controlled tooling is an open-loop design. Once the tool is removed from the external transducer, there isn't any true torque feedback into the system. The system simply supplies the per-set current, and the operator has to accept the torque was properly applied. However a number of things affect the torque output but not the torque readings of the system. Things such as temperature, gear wear, voltage, and motor performance all affect the torque output, but the system is unable to adapt and compensate for these changes.

It's simply all guesswork. It's also a dedicated system. Something as simple as changing out the cable voids the calibration.

## TRANSDUCER CONTROLLED

Transducer controlled (closed loop) tools like the AcraDyne HT system from AIMCO have the transducer built into the tool itself at the output shaft. The transducer is constantly measuring the torque in real time and feeding that back into the system. Variations of temperature, gear wear, voltage, and motor performance do not



The AcraDyne HT (High Torque) series used in the wind industry (primarily) for critical bolting when high torque is required.  
(Courtesy: AIMCO)

affect the accuracy of the transducerized system because they all happen before the transducer.

The system will simply keep applying power until the transducer reads the requested torque before shutting off. The AcraDyne HT system also records date, time, and rundown information of up to 32 different preset torque jobs stored in the controller. All the recorded torque data is easily exported to Excel with the touch of a finger.

The calibration of a transducerized tool is in the tool itself, not the system. Tools, cables, and controllers are all interchangeable. When the annual calibration is due, the tool is all that needs to be sent, not the whole system. ↗



**Paul Bundy**, AIMCO's Energy Services divisional sales manager, has been with AIMCO for 28 years and has been managing the Energy Services division of AIMCO since 2010 when AcraDyne, a division of AIMCO, launched its high torque series of transducerized tools ranging from 1 nm to 8,100 nm.

# PROFILE

## ITH Engineering

*ITH Bolting Technology is a tooling and hardware manufacturer that focuses on engineering and bolted joint design.*

By Kenneth Carter  
Managing Editor | Wind Systems

**I**TH Bolting Technology began life in Germany in May 1979. And as the family-owned company grew, it increased its presence all over the world, including the U.S. That's where ITH Engineering does everything around the bolted joint, including those used in wind turbines.

ITH Bolting Technology has been supplying to the wind industry since 1982.

"Obviously in wind turbines there are a lot of bolts," said Matt Rasper, president of ITH Engineering. "You have foundation studs; you have tower section bolts, bolts up in the nacelle to hold the nacelle to the tower and also blade studs. ITH is basically a bolting technology company. Our primary business has always been bolting tools."

### COMPLETE SYSTEM SUPPLIER

ITH Engineering was founded in May 1999. In addition to the bolting tools, ITH is also involved with specialty hardware.

"ITH is a complete system supplier," Rasper said. "We can supply the tools, hardware, services, and engineering for the wind applications. We have hydraulic bolt tensioners, torque wrenches, and nut runners (torque multipliers). We manufacture our own pump systems for the tools and have data collection software for bolting traceability."



ITH Engineering head office in McHenry, Illinois, near Chicago was the venue for "ITH Bolting Day"—an internal bolting technology conference of the international ITH network in 2014 with more than 70 participants. (Photos courtesy: ITH Engineering)

### ITH Bolting Technology

#### Founded:

1979 in Meschede, Germany

ITH Engineering founded in 1999

#### Headquarters:

Meschede, Germany

ITH Engineering in McHenry, Illinois

Further sales & service offices in Atlanta, Georgia, Houston, Texas, and Jerez, Mexico

#### Websites:

[www.ith.com](http://www.ith.com),  
[www.maintenance-free-bolting.com](http://www.maintenance-free-bolting.com)

One of the company's main goals is to assist OEMs and contractors in achieving more accurate and repeatable bolted connections. It's a tooling and hardware manufacturer heavily focused on engineering and bolted joint design, he said.

"We also help some OEMs with the bolt design itself," Rasper said. "If they come to us with an application that they're struggling with, we can give them advice on the bolted joint design or on which bolting method—tensioning or torqueing—is best suited for their application. We consider not only installation but also maintenance issues for bolted joints".

The main tools needed for wind turbines are hydraulic bolt tensioners and

torque wrenches that are used during the erection, according to Rasper.

## MAINTENANCE-FREE HARDWARE

But one of the things ITH is striving for is the creation of maintenance-free hardware. Annual bolt maintenance can be an expensive cost for wind sites.

"Over time, bolted connections can lose some of their preload due to vibration and relaxation," Rasper said. "Due to possible loss of preload, these connections might need to be checked from time-to-time and retightened."

ITH has been working with universities in Germany, the German Institute for Steel Constructions (DIBt) and a couple of wind-turbine OEMs to come up with a method to create hardware that will eliminate future maintenance requirements, he said. The company is striving for an improved hardware design that helps retain the original preload with only minimal load loss. The goal is to reduce and eventually eliminate the need for the maintenance checks.

"It's a little bit more of an engineered and machined hardware than the industry typically uses," Rasper said.

The industry currently uses an HV hardware — a standard for steel constructions — that's rough and mass-produced.

"Ours is a machined, better quality product. Once you tighten the joint — because of how it's machined — it retains its preload better over time," Rasper said.

He said the ITH hardware has been used from two major wind-turbine manufacturers, and during these projects, the hardware was certified by the international accreditation body DNV-GL and German Technical Inspection Association TÜV to be maintenance-free for five years (DNV-GL), respectively for 20 years (TÜV).



ITH performs wind-turbine bolting services on-site all over North America — also from its sub-offices in Atlanta, Georgia, and Houston, Texas. Above, wind-turbine foundation bolts are tightened precisely by an ITH bolt tensioning cylinder type MS and a compact high pressure pump unit Micro-MAX 70.

This zero maintenance will serve to positively affect OEMs and contractors and their bottom line significantly, according to Rasper.

"The main benefit is to the wind-farm owners because it tremendously cuts out the maintenance and labor hours," he said.

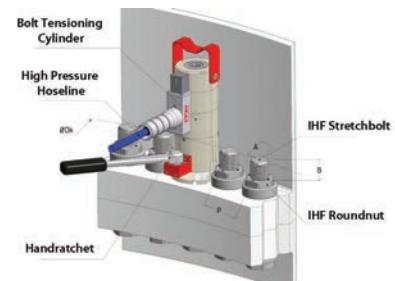
## OEMS AND CONTRACTORS

ITH's main focus is with OEMs and contractors.

"We know all the OEMs who manufacture the turbines throughout the U.S.," Rasper said. "So we focus our efforts mainly on the OEMs and the contractors because these are the people who buy the tools."

ITH will also contact wind sites where it has local offices and travel to wind sites in order to see if they may need any assistance, according to Rasper.

"In many cases, when a wind turbine is built, it's maintained by the OEM for a certain period of time before it's transferred over, as far as maintenance goes, to the owners," he said. "This is the point when the owners would typically need tooling. That's when we would like to contact them."



Maintenance-free bolting system for wind turbines: ITH bolt tensioning cylinder with hardware.

OEMs usually take care of the short-term service of a wind farm. For example, maybe the service contract is for the first two or three years, Rasper said.

"The OEM will have their own tools there, and they'll take care of the units," he said. "So when that service contract comes to an end, and it's time for the OEM to move on, then the owner of the wind farm has to procure his own tooling, so that's where there is an opportunity for us to potentially sell tools to that owner for maintaining it."

With that in mind, ITH strives to improve the industry.

"ITH is always working to improve the safety of operations, the quality of the bolted joints, the process, and time used to tighten them," Rasper said. ↗

# CONVERSATION

## Philip W. Beck

Business Development Manager  
Wind Measurement International



+353 87 372 4117



[www.windmi.com](http://www.windmi.com)



### Tell us about Wind Measurement International and its core philosophy.

Wind Measurement International installs met masts (measurement towers) in the U.K. and Ireland. This includes a met mast's full lifecycle: development, power curve, and ref masts. Installations also include temporary (tubular and lattice) and permanent met masts to 100 meters, according to CE BS IEC standards. This also includes all instrument brands. Full after-sales duties include inspections, refurbishing, and decommissioning. Our operations are subject to rigorous ongoing auditing and checking, and we hold all industry-related and nationally required certifications and permits in our target markets. Our wind-farm services include inspections, fall arrest system re-certifications, tower-structure upgrades and repairs, rigging works, design and construction of access tracks, hard-standing for cranes,

small and medium turbine installations including foundations and meter houses, substation inspection and maintenance, and transformer testing.

### What are your duties with Wind Measurement International?

My duties include business development and key account management.

### What are the different ways wind is measured?

Cup anemometers and wind vanes measure the speed and direction of the wind at the height they are mounted on a met mast. Lidar (Light Detection and Ranging) and Sodar (Sonic Detection and Ranging) carry out remote sensing from ground level. Satellites can also measure wind.

### How is wind measurement important to the wind industry?

At the prospecting stage, it is key to providing yield analysis, which feeds into the investment decision. At the operating stage, it provides an independent view of the wind conditions on site, which allows for better management of resources and higher energy production over time.

### How has technology improved how wind is measured?

Instruments have become more accurate, and independent calibration labs provide a high level of confidence in the

results. Mobile phone networks allow for data to be uploaded automatically from the loggers and visualized and analyzed very soon after the measurements are taken.

### Has wind measurement had an effect on how turbines are designed?

Wind measurements can be used not only to measure wind speed but also other key variables such as turbulence and wind shear. Modern turbines cater for low wind speeds, survive higher wind speeds, and are adapted to different turbulence and shear regimes. Hence the right turbine can be selected for any particular location to maximize the performance at that location.

### Have larger and taller turbines made wind measurement more of a challenge?

Not really. In recent years, the typical met mast requested in the U.K. and Ireland has steadily moved upwards from 60 meters to 70 meters, then 80 meters. And nowadays 100 meters is commonplace. Met mast technology is stable and extendable to these heights and above.

### Is wind measurement handled differently when it comes to offshore vs. onshore turbines?

The principles are the same, but offshore met masts are much sturdier than onshore ones and have to withstand significantly more punishment in terms of both static and dynamic loads. ↗

# AWEA Wind Project O&M and Safety Conference 2017



## Partnering for Success

**Success means driving operational excellence by partnering in four main sectors, health & safety, O&M, workforce training & development, and quality assurance.**

The AWEA Operations & Maintenance and Safety Conference is where the industry comes together to recognize unique challenges and identify solutions in these areas. And as the wind energy industry continues to expand, so does the need for an evolving approach to operating the nation's growing number of wind projects.

Fortunately, there is no shortage of experience to draw from in this arena. Individuals from across industry sectors and across functional disciplines will join in San Diego in February to set a vision and plan for continued and expanded operational excellence in the wind industry.

Make sure you are a part of the largest North American gathering of wind energy operational professionals and technicians, as we combine the essential elements of O&M, health & safety, workforce development, and quality assurance to develop a successful partnership for today and beyond.

- | February 28 - March 1, 2017
- | Paradise Point Resort & Spa, San Diego, CA

Early Registration ends  
January 13, 2017

Register now at [www.awea.org/oms](http://www.awea.org/oms)

# MAINTENANCE

Operations • Service & Repair • Inspection • Safety • Equipment • Condition Monitoring • Lubrication

## Des-Case Reimagines the Oil Sight Glass

Des-Case Corporation, a global manufacturer of specialty filtration products that improve process equipment reliability and extend lubricant life, recently launched an entirely redesigned oil sight glass (OSG) that pushes the boundaries of what oil sight glasses can do.

"We challenged our engineers to reimagine how an oil sight glass can increase the visibility, durability, and versatility of the process of visual oil analysis," said Brian Gleason, CEO of Des-Case. "Working closely with our customers, manufacturing team, and other industry experts, they have designed what is truly the next generation of the oil sight glass."

A clear cylinder that installs in the drain port of the oil reservoir of pumps, gearboxes, bearing housings, and other pieces of equipment, the sight glass provides continuous fluid monitoring of the clarity, color, sediment, and water contamination of the equipment's oil. An oil sight glass plays a critical role in early detection of contamination and allows for constant monitoring of what's happening inside equipment that might degrade both oil and equipment life.

The most important improvement in the new Des-Case oil sight glass is the improved visibility in detecting machine wear and contamination.

Most OSGs have clear bottoms making it more difficult to visually detect the presence of sediment in oil. Des-Case's new OSG has a white bottom that makes detection easier and more reliable. The redesigned device also has a dual-mount versatility for use in both horizontal and vertical applications, eliminating the need to buy two single-orientation OSGs. And the sight glass' polyamide casing not only provides a crystal-clear view of the oil, but it is strong enough to withstand the toughest environments.

Other improvements include a sloped floor for better sediment drainage, indication marks to easily monitor accumulation of water, and improved UV resistance and compatibility with all gear and mineral oils, most synthetic oils, and diesel.

"By using OSGs in combination with a desiccant breather and proper filtration, reliability and maintenance professionals can provide the ultimate protection and long life for machinery," Gleason said. "And by using Des-Case's reimagined OSG, they'll have the latest generation of engineering and technology that will ensure greater reliability for their plants and equipment." ↗



A vertical close up of the redesigned oil sight glass. (Courtesy: Des-Case Corporation)



Contamination particulates can be more easily seen against the OSG's white background. (Courtesy: Des-Case Corporation)

Source: Des-Case Corporation

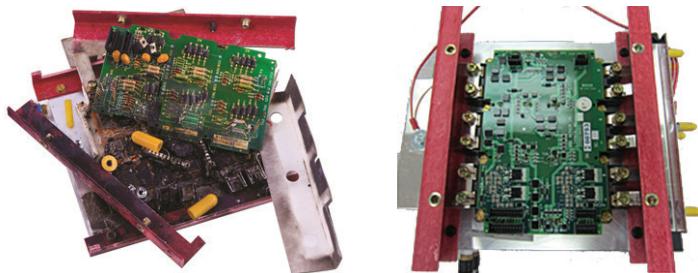
For more information,  
go to [www.descase.com](http://www.descase.com)

## PSI Repair Services Repairs Its 30,000th Turbine Part

PSI Repair Services Inc., a subsidiary of Phillips Service Industries and leading independent service provider to the wind-energy industry, announced it recently shipped its 30,000th repaired wind-turbine part to a prominent wind-energy company. Since 2009, PSI has provided economical repairs, as well as industry-leading engineering services, for the largest wind farms in the United States.

PSI's repair services cover all the leading wind-turbine manufacturers, such as GE, Vestas, Suzlon, Gamesa, Siemens, RePower, and Clipper. Commonly repaired components include printed circuit boards, pitch drive systems, inverters, converters, thermistors, IGBTs, PLCs, VRCC units, AEBIs, proportional valves, hydraulic pumps, pitch and yaw motors, encoders, slip rings, transducers, yaw modules, 3-phase bridge rectifiers, blade-bearing automatic grease dispensers, active crowbars, oil level sensors, battery chargers, cold climate converters, and much more.

PSI's engineering services include custom tests, root-cause analysis, product upgrades, remanufacturing, and new product-manufacturing services. The custom test program leverages advanced diagnostic equipment, allowing PSI to detect hard part failures, as well as parts degraded due to stress, right down to the microchip level. The root cause analysis service allows PSI to get a comprehensive view into a customer's production environment to identify all the elements that are connected to recurring problems so the appropriate corrective actions eliminate the problem once and for all. The product upgrade service allows PSI to improve upon legacy design with newer, more reliable technology. PSI's remanufacturing services are available for obsolete and unsalvageable parts, such as circuit boards and power supplies. Fi-



An IGBT before and after repair. (Courtesy: PSI Repair Services Inc.)

nally, the new product manufacturing service is available for customers who need a cost-effective option to produce a small run of unique legacy parts or components.

"PSI is proud to support the renewable energy industry," said Mike Fitzpatrick, general manager of PSI Repair Services Inc. "We understand the importance of keeping wind tur-

bines up and running, so we have created a wide variety of solutions to help O&M professionals achieve those objectives." ↗

*Source: PSI Repair Services Inc.*

For more information, go to [www.psi-repair.com/wind-turbine-repair](http://www.psi-repair.com/wind-turbine-repair)

When precision, reliability and quality are your expectations...

**TURN TO SOTEK/BELRIX**



A leader in the manufacturing of precision metal stampings. We supply custom stamped laminations and assemblies to a variety of customers - large and small.

Whether your need is for immediate turn around or delivery of production quantities on a regular basis, we are equipped to meet your needs.

- Stator, Rotor, and Pole Laminations
- Stator, Rotor, and Pole Assemblies
- Vent and Finger Plates
- Stamping and Laser Capabilities
- Complete In-House Tooling Capabilities



Sotek, Inc. and Belrix Industries, Inc. • 3590 Jeffrey Boulevard • Buffalo, NY 14219  
716-821-5961 • fax: 716-821-5965 • [www.sotek.com](http://www.sotek.com) • [info@sotek.com](mailto:info@sotek.com) • ISO REGISTERED

SERVING MEDIUM TO HEAVY INDUSTRIAL MOTOR AND POWER GENERATION INDUSTRIES

### Siemens Signs Long-Term Wind Service Agreement in U.S.

Siemens has been awarded a long-term contract for service and maintenance at the Lower Snake River wind farm near Pomeroy, Garfield County in Washington State. The customer is Puget Sound Energy (PSE), headquartered in Bellevue, Washington. Completed in early 2012, the Lower Snake River project contains 149 SWT-2.3-101 wind turbines that produce up to 343 MW of renewable energy. On average, the facility generates enough electricity to power 82,000 average U.S. homes. The turbines have been serviced and maintained by Siemens since beginning commercial operation in 2012.

Under terms of the agreement, Siemens will provide long-term service and maintenance at the Lower Snake River project for an additional 10 years and install the company's Power Boost function and High Wind Ride Through (HWRT) turbine modernization products to all 149 units.

"We thank PSE for their continued confidence in our products and services," said Mark Albenze, CEO of Siemens Power Generation Services, Wind Power, and Renewables business unit. "This agreement and all Siemens' value-driven wind-service plans are targeted to each customer's specific operational needs. We combine our expert domain knowledge and global fleet data with our highly advanced digital services



Siemens provides service and maintenance for more than 4,000 installed wind turbines in the Americas region. (Courtesy: Siemens)

and analytics to customize a flexible service agreement that provides excellent value and lifecycle care and that helps drive down the costs associated with wind energy."

"We're very pleased to continue our partnership with Siemens for the Lower Snake River Wind Project," said David E. Mills, vice president of Energy Operations at Puget Sound Energy. "Siemens' dedication to workplace safety, operational excellence, high reliability, and great customer service really sets it apart in the wind industry. This new agreement will maintain the great plant performance we've seen since beginning operation in 2012 and deliver real value to our customers over the next 10 years."

Siemens' Power Boost functionality helps ensure a wind-power plant performs at high levels. This controller feature increases power production of the turbine by raising the output limitation under specific operating conditions. Depending on site conditions, the annual energy production can be increased by up to 4 percent. Part of "Siemens Digital Services for Energy" offerings, the digitally driven HWRT is designed to prevent the wind turbine from shutting down immediately as wind speeds reach above 25m/s. This leads to enhanced grid stability and replaces the high wind, fixed-threshold shutdown with an intelligent, load-based reduction in output power to help avoid shutdown during high winds.

In addition, with its sophisticated monitoring, management, and data analysis tools, Siemens' Remote Diagnostics Services, also part of "Siemens Digital Services for Energy," supports predictive maintenance planning by identifying certain potential issues before they affect operations.

Siemens provides service and maintenance for more than 4,000 installed wind turbines in the Americas region and more than 10,000 globally, with a combined generating capacity of more than 25 GW. ↗

*Source: Siemens*

For more information,  
go to [www.siemens.com](http://www.siemens.com)

## Magnetometer Provides Fast Measurements of Ferrous Wear Particles

The FerroCheck portable magnetometer from Spectro Scientific provides accuracy and convenience in measurement of total ferrous wear particulates in lubricating fluids.

FerroCheck enables users to perform accurate measurements of ferrous wear particles, both in the field and in the lab where it can be used to analyze gearbox, transmission, and other fluids in fleet and industrial maintenance applications.

FerroCheck works by sensing disruption of a magnetic field generated due to the presence of ferrous debris, specifically iron, in the oil. Operation involves simply drawing the sample, placing it in the instrument and using the touchscreen to complete the analysis and view the results.

Non-lab personnel can operate the FerroCheck with no solvents or sample preparation. The lightweight unit weighs less than five pounds, is compact and battery-operated for fast, 30-second testing of small samples.

The FerroCheck magnetometer can detect particles from nanometers to millimeters and has a sensitivity

range of 0 to 2,500 ppm with a limit of detection of less than 5 ppm. Re-

sults are highly repeatable (+/- 5 ppm at concentrations of 0 to 50 ppm).

## Powering the **future** through **education** and **sustainability**.

### DEGREE OPTIONS IN:

- Water Quality & Sustainable Aquatic Resources
- Heating, Ventilation & Air Conditioning
- Construction Technology
- Wind Energy & Turbine Technology

- Environmental Studies
  - Electrical Technology
  - Engineering Technology
- + Industry Training



**1-866-IA-LAKES • WWW.IOWALAKES.EDU**

EMMETSBURG • ESTHERVILLE • SPENCER • SPIRIT LAKE • ALGONA



The FerroCheck portable magnetometer. (Courtesy: Spectro Scientific)

Coupled with one of Spectro Scientific's condition-based maintenance systems (MiniLab Series, MicroLab Series, and ViscCheck 3000 Series), FerroCheck is part of a comprehensive solution that ensures asset availability and longevity.

When performing measurements on-site, FerroCheck eliminates the wait associated with lab-based fluid analysis and enables users to make immediate maintenance decisions

that reduce unexpected downtime and costs and eliminate potential catastrophic machine failures.

"FerroCheck is a great addition to Spectro Scientific growing portfolio of performance fluid analysis tools," said Robert Wopperer, Spectro Scientific vice president for business development. "FerroCheck enables users to perform rapid and accurate fluid assessments on-site as well as in the laboratory."

The availability and ease of the measurement facilitate frequent, routine use that supports predictive maintenance programs as well as detecting unforeseen incidences of ferrous contamination that, if unrecognized, can threaten the viability of large capital assets." ↗

*Source: Spectro Scientific*  
For more information,  
go to [www.spectrosci.com](http://www.spectrosci.com)

## Power Backup Systems Optimized for Seamless Switchover

Ultra Capacitor DC UPS power backup systems from Altech Corp. have been optimized for seamless switchover during power outages, interruptions, peak power demand, or power dips and sags.

Their advanced capacitor technology contributes to environmentally safe operation, compared with battery-based systems prone to emit toxic chemicals from discharging batteries. The technology further enables excellent energy storage, fast microcontroller-based charging and discharging, and extended energy release (up to 55

minutes). These systems will deliver higher energy (up to 10,000 W) than electrolytic capacitor-based technologies and higher power than batteries. They ultimately will help to ensure reliable and consistent power for applications in any industry or setting where uninterrupted power supply is both critical and essential.

The Ultra Capacitor UPS (Uninterruptible Power Supply) systems are available in 12VDC and 24VDC output versions from 3 A to 40 A, depending on the model. The CTEC and C-TEC P versions perform in

conjunction with separate main power supplies (with the C-TEC P system able to produce an output spike for applications requiring a temporary surge of power). The AC-C-TEC systems augment these designs by incorporating a built-in power supply with AC input for maximized ease and convenience. Compatible with all models, a CEM (Capacitor Extension Module) ideally extends buffer times for applications exhibiting increased power demands.

The systems excel at controlled shutdown functions, resist shock and

vibration, and they feature compact and sturdy convection-cooled metal housings built to weather extreme conditions. They are engineered to operate over a wide temperature range from minus-40 degrees C to 65 degrees C (minus-40 degrees F to 149 degrees F), require virtually no maintenance over their 15-plus years of expected service life, and can be DIN-rail mounted.

All systems meet relevant worldwide product standards and are covered by a three-year warranty. Altech additionally offers setup/monitoring software and comprehensive product support. Customized solutions (including available output models up to 600 A) can be developed to meet particular application requirements. ↗

*Source: Altech Corp.*

For more information,  
go to [www.altechcorp.com](http://www.altechcorp.com)



Ultra Capacitor DC UPS power backup systems. (Courtesy: Altech Corp.)

# women of wind ENERGY





**WoWE  
LEADERSHIP  
FORUM**

**Connect | Gain | Accelerate | Leverage**

**This year's Leadership Forum will focus on:**

- Expanding the Conversation about the Maturing Renewables Industry
- Energy Markets Education
- Enhancing Your Skills to Continue Growing Your Career

**Don't miss out! Join us November 14-15, 2016**

*Co-located with the AWEA Fall Symposium  
Hyatt Regency Hill Country Resort & Spa, San Antonio, TX*

**More information online at:  
[womenofwindenergy.org/leadership-forum](http://womenofwindenergy.org/leadership-forum)**

**Leadership Forum Lead Sponsor**

**Vestas**

**Thank you to our top sponsors!**

**AWEA** AMERICAN WIND ENERGY ASSOCIATION

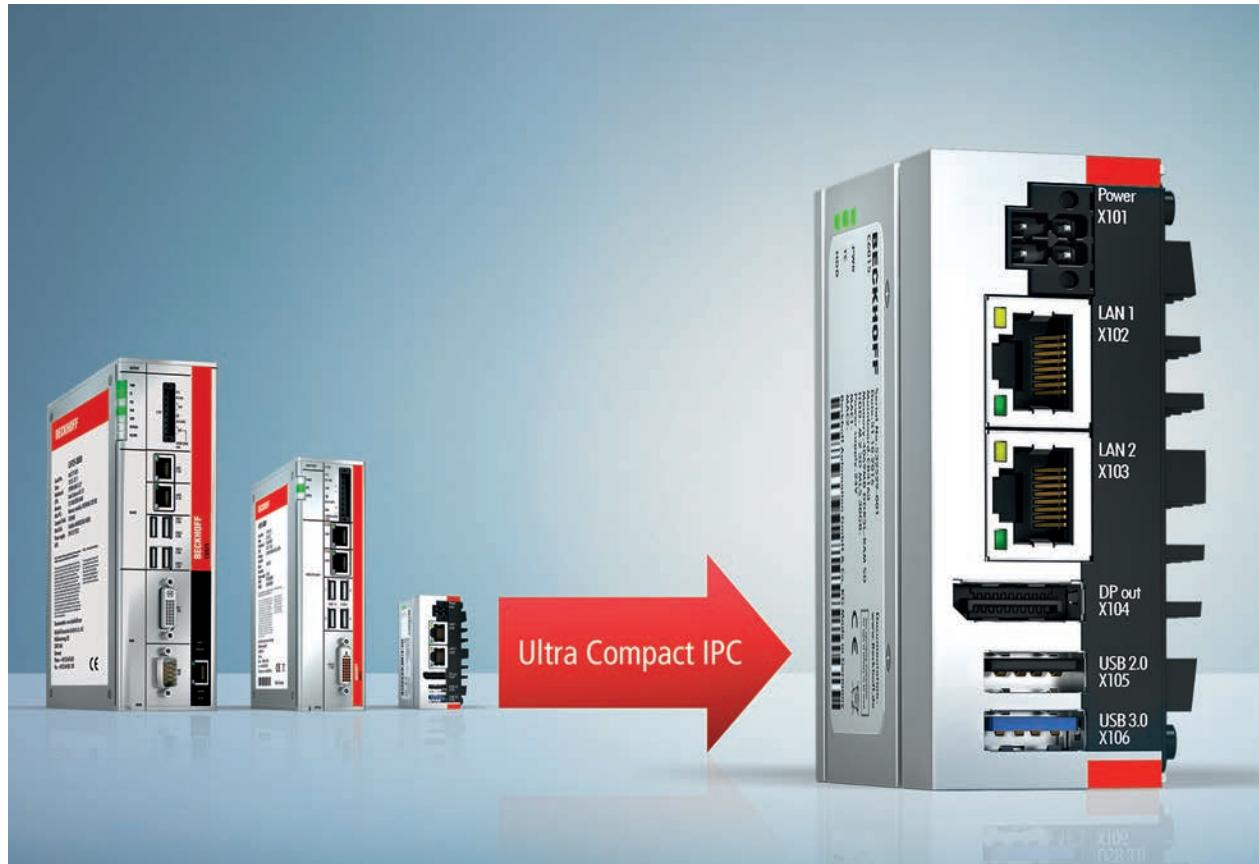
**GE Energy**

**DNV GL**

# NNOVATION

Research & Development • Design & Engineering • Forecasting & Analysis  
Consultancy • Certification & Standards • Efficiency • Emerging Technologies

## C6015 IPC from Beckhoff Offers Space-Savings and Flexibility



The new C6015 IPC can be applied universally in automation, visualization and communication tasks. (Courtesy: Beckhoff)

Beckhoff Automation introduced a new standard in ultra-compact Industrial PC technology at the SPS IPC Drives 2016 trade show in Nuremberg, Germany. The new C6015 Industrial PC (IPC) opens up new application areas for PC-based control technology, especially those with pronounced cost or space restraints. Fully suited to industrial applications, the multi-core IPC measures just 82 mm x 82 mm x 40 mm, demonstrating the extensive scalability of PC-based control technology from Beckhoff.

The new device is just one-third the size of the C6905, which was previously the smallest control cabinet IPC in the Beckhoff portfolio. Price savings of about 25 percent also place the device well below the previously least expensive x86 IPCs from Beckhoff. These features facilitate highly cost-effective implementation of automation, visualization, and system-wide communication in small and

mid-size applications with a minimal device footprint. As a result, the space-saving device opens up areas where PC-based control technology has not been used thus far, or where motherboards must be integrated as expensive custom solutions.

### UNCOMPROMISING INDUSTRIAL QUALITY

Despite its extremely compact and inexpensive form-factor, the ultra-compact C6015 IPC makes no compromises when it comes to industrial use. This includes the high computing power of the integrated Intel Atom CPU that features up to four processor cores. Moreover, the IPC leverages a robust, aluminum/die-cast zinc housing, designed for passive cooling and long-term availability. The device also offers a full range of standard features for industrial environments, such as extended operating

temperature range up to 55 degrees C and high resistance to vibration and shock.

The C6015 is also extremely flexible with regard to its many installation options. It can be mounted both vertically and horizontally on the rear wall of a control cabinet or attached to a DIN rail. Even in the tightest installation spaces, this permits various mounting scenarios with flexible orientation of the IPC. Due to the small dimensions of the device, this represents an important feature: When connecting up to six separate cables, it is crucial with the small design that the connections can be optimally aligned to the cable routing as dictated by the machine layout.

Apart from that, the full range of onboard equipment

and interface configuration together meet the requirements for a universally applied IPC: A 30 GB SSD and Windows Embedded Compact 7 operating system make the C6015 a powerful automation device even in its most basic configuration. Windows 7 and Windows 10 are also optionally available. Further hardware features include 2 GB DDR3L-RAM (expandable by the vendor up to 4 GB), a display port connection, an on-board Dual-Ethernet adapter with 2 x 100/1000Base-T connection and ports for both USB 3.0 and USB 2.0. ✎

*Source: Beckhoff*

For more information,  
go to [www.beckhoff.com](http://www.beckhoff.com)

## Sinamics Power Converter Works for Many Different Applications

Siemens introduces a second addition to its popular Sinamics DCP product family of scalable (4X), bi-directional DC-DC drives. The DCP 120kW facilitates the integration of larger energy storage systems such as batteries and super capacitors into multi-generator applications for a wide variety of industrial, smart grid, and e-mobile uses, including photovoltaics, fuel cells, wind power and high-dynamic uses such as peak shaving.

This new drive features combined buck/boost capability in a single device for optimized interconnection between DC sources and energy storage devices plus the DC link for both motor inverter and infeed/grid inverter. Available in a wide voltage range from 0-800V DC, this new inverter enables connection of energy storage systems to the DC link of an active line module. Bi-directional energy flow and scalable power are further features, along with a high efficiency up to 98.6 percent maximum energy yield can be fed back into a power grid, island, or industrial grid.

The compact footprint of the DCP



Siemens Sinamics DCP 120kW DC-DC converter has a myriad of uses in industrial, smart grid, marine, and e-mobile markets.  
(Courtesy: Siemens)

120kW converter results from the built-in reactors and control unit for space-saving design use. The built-in control unit also permits stand-alone operation of the drive. Profinet or Ethernet/IP are standard for Profibus communications.

Different infeed sources such as solar, fuel cell, and wind power can be connected to realize a multi-generator power system, further broadening the application of this unit.

Uses for this new drive include peak shaving using stored energy on centrifuges, presses, elevators, stacker cranes, gantry cranes, and industrial lift trucks, as well as battery test systems, test systems for photovoltaic power

plants, smart grid uses including energy storage on wind and solar systems, fuel cells, and numerous marine applications such as emissions reduction, offshore platform winch and crane operations, and charging technology for e-boats with battery power. In the emerging e-mobility market, the unit is ideal for fast-charge stations for e-cars, e-buses, and hybrid systems that incorporate motors in combination with fuel cells or super capacitors. ↗

*Source: Siemens*

For more information,  
go to [www.usa.siemens.com/drives](http://www.usa.siemens.com/drives)

## Altitec to Increase Aerodynamic Efficiency of Wind Turbines

Global blade access, repair, and inspection specialist Altitec has been appointed official installation partner by the Renewable Energy Division at 3M, a global innovation company, to install its 3M Wind Vortex Generators. 3M Vortex Generators address aerodynamic issues common to most turbine blades and, in doing so, can increase a turbine's annual energy production by between 2 and 3 percent.

Rotor blades typically twist no more than 10 to 20 degrees from root to tip, and while chord length — the width of the blade at a given distance along its length — can vary, these factors prevent wind turbines from achieving optimal aerodynamic performance. This can often lead to undesired airflow separation — known as aerodynamic stall — and has a significant impact on wind-turbine efficiency, as well as generating additional noise.

In response to these issues, 3M, in partnership with Smartblade, has developed its Wind Vortex Generator, a reliable and quickly installed thermoplastic aerodynamic enhancement. They can be easily attached to the rotor blade, resulting in attached flow to enhance performance by guiding wind flow around its surface.

"In the Vortex Generator, 3M has hit upon an excellent way to address this problem, and we're looking forward to working with them to roll it out across the world," said Tom Dyffort, managing director for Altitec Group. "As one of 3M's official installation partners, Altitec has completed trial installations at sites in Poland, Spain, and Portugal, and hopes to carry out further installations in Chile."

"Vortex Generators are a financially and technologically economical solution which helps to optimize the aerodynamic efficiency of the blade and improve turbine annual energy production," said Santhosh Chandrabalan, global business manager at 3M. "We are delighted to have partnered with Altitec, whose specialist knowledge and experience in the field allows this product solution to be widely implemented."

Vortex Generators have undergone extensive testing and analysis in order to ensure negligible increases in load and deflection when they are installed. Indeed, it has instead been shown that by reducing stall, they help optimize a turbine's load characteristics and reduce noise.

Altitec, in partnership with 3M and Smartblade, statistically analyzes each turbine to ensure the Vortex Generators are positioned to maximize the annual energy production yield of the turbine.

In addition to their durability and easy application, Vortex Generators also can be adapted to fit almost any blade type, regardless of a turbine's manufacturer. They not only reduce flow separation and increase turbine energy yields, but they also reduce stall induced loads and help extend service life. ↗

*Source: Altitec*

For more information,  
go to [www.altitec.co.uk](http://www.altitec.co.uk)

## Siemens Presents Thermal Storage Solution for Wind Energy

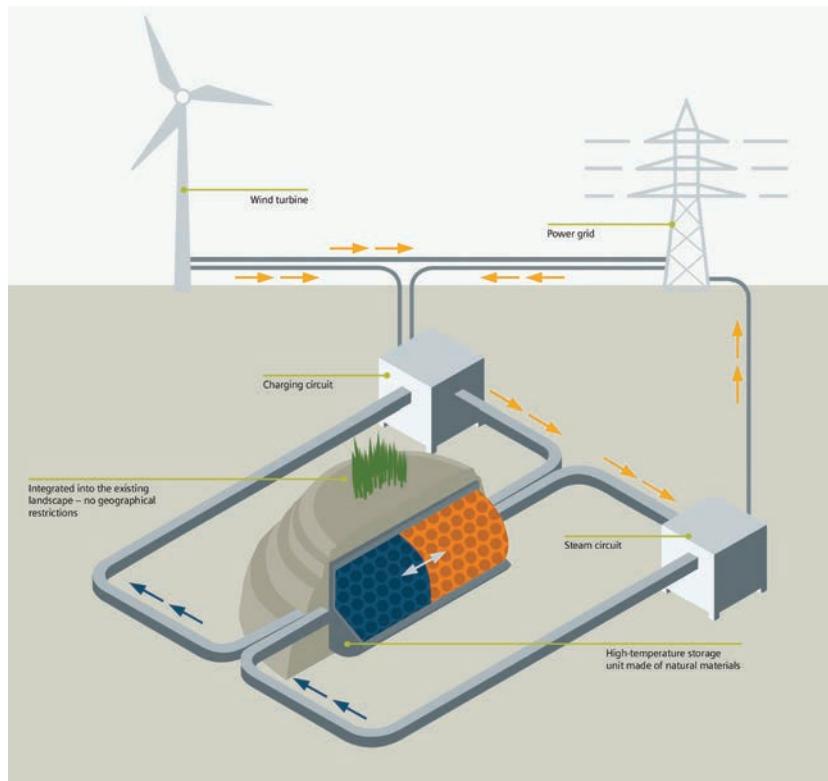
Siemens is developing economic storage technology alongside Technical University Hamburg Harburg (TUHH) and urban utility company Hamburg Energie. Siemens is researching a storage solution in the Northern German city that will set a future standard in efficiency. After having been converted to heat in rock fill, excess wind energy is

stored and protected with an insulated cover. When there is a need for additional electricity, a steam turbine converts the heat energy back to electricity. The simple principle of this store promises an extremely low-cost set-up. The project has therefore received research funding from the German Federal Ministry for Economic Affairs and Energy.

Siemens thermal storage solution will convert excess wind energy into heat energy where it is stored until it can be converted to electricity using steam. (Courtesy: Siemens)

Siemens is operating a test set-up for the storage solution, named Future Energy Solution (FES), at Hamburg-Bergedorf. Alongside scientists from the TUHH Institute for Thermofluid Dynamics, the company is researching how to make charging and discharging the store particularly efficient. The arrangement of the rock fill and the form of the surrounding insulating container are crucial. The store is being tested at temperatures more than 600 degrees C. Just like a hot air gun, a fan uses an electrically heated air flow to heat the stones to the desired temperature. When discharging, the hot stones heat the air current, which then heats a steam boiler; its pressure drives a generator via a steam turbine.

As the current test set-up only tests the thermal requirements for the storage process, no reverse current is generated. However, researchers wish to test the complete energy conversion in spring from electricity to heat storage in the rock fill and back to electricity. They are establishing a complete thermal store on the Trimet aluminum smelter site in Hamburg-Altenwerder to the south of the River Elbe on the German A7 highway. The full-size FES will be able to store about 36 MWh of energy in a container with about 2,000 cubic meters of rock. Via a boiler, the heat it contains will generate so much steam that a Siemens compact steam turbine can generate output of up to 1.5 MW of electricity for up to 24 hours a day. The researchers expect to generate effectiveness of about 25 percent even in this early development phase. In the future, the concept has the potential for an effectiveness of about 50 percent. Partner Hamburg Energie will investigate appropriate marketing options for the stored energy.



## SAN-EARTH M5C

### Effective Grounding with Conductive Cement

- Low Resistance Ground System
- Key to Lightning Protection
- Safeguard Personnel / Equipment
- Safe Proven Performance
- Maintenance Free
- Environmentally Safe
- Limits Corrosion
- Economical
- Permanent
- Prevents Theft
- Easy to Install
- Meets IEC 62561-7

**Sankosha U.S.A., Inc.**  
**406 Amapola Ave, #135**  
**Torrance, CA 90501**  
[www.sankosha-usa.com/sanearth.asp](http://www.sankosha-usa.com/sanearth.asp)  
**Toll Free: (888) 711-2436**  
**Phone: (310) 320-1661**  
**jerry@sankosha-usa.com**



**S** SANKOSHA

"The technology of our FES store deliberately uses mainly tried and trusted technology," says Till Barmeier, Siemens' project manager. "Because we are working here with tested thermal components and a series-ready steam turbine, we will be able to offer a practical solution within a few years. Our complete experimental system will be operational in just around 15 months."

Whereas many other stores generate high costs or

only permit limited storage capacities, the FES technology can be used in the most varied of sizes and output classes, and therefore always remains extremely economical. The only limit to the concept is the space required for the rock-filled insulated container.

*Source: Siemens*

For more information,  
go to [www.siemens.com/wind](http://www.siemens.com/wind)

## Pitch Control System Improves Turbine Reliability up to Three Times

The Industrial Group of Moog Inc. launched its next generation pitch technology — the Moog Pitch System 3. The first shipment of Moog Pitch System 3 is operating at a wind farm in Brazil.

The new pitch system was developed to meet the growing need for wind-farm operators and turbine manufacturers to reduce wind-farm capital and operating expenses (CAPEX and OPEX).

"The design of the new pitch system reduces the levelized cost of energy (LCOE) by increasing wind-turbine reliability and minimizing downtime," said Dennis Webster, general manager for the Wind Business Unit of the Industrial Group of Moog Inc.

Levelized cost of energy measures the net cost to install and operate a wind turbine against expected energy output over the course of the turbine's lifetime. There are a number of factors that contribute to LCOE, one of the most important of which is turbine reliability. Several industry research findings identify the pitch system as the No. 1-ranked component contributing to wind-turbine failure and downtime. Pitch systems are exposed to harsh ambient conditions inside the rotating hub, including extreme temperature, humidity, and vibration leading to lower reliability compared to other turbine components. Though pitch systems represent less than 3 percent of wind-farm CAPEX costs, they account for nearly a quarter of all downtime in turbines.

Most pitch systems used throughout the industry today consist of as many as 2,000 to 3,000 subcomponents depending on the manufacturer. With a highly integrated and optimized architecture that consists of significantly fewer parts, the Moog Pitch System 3 is up to three times more reliable than the industry's standard pitch systems. This leads to a reduction in both turbine downtime as well as scheduled and unscheduled maintenance activities.

"We benchmarked the reliability of existing pitch systems based on operational data from the industry and compared it with the reliability numbers provided by Moog for their new Pitch System 3," said Francesco



Wind turbine cutaway rendering shows Moog Pitch System 3 in operation. (Courtesy: Moog)

Vanni, senior engineer, Asset Integrity & Performance, DNV GL – Energy. "Our cost of energy model suggests that reliability improvements expected for the Moog Pitch System 3 could save up to \$1.70/MWh for a typical 3 MW turbine, a significant reduction in LCOE."

By reducing failures and downtime caused by overly complex pitch systems, the Moog Pitch System 3 improves productivity and ultimately enables wind-farm operators and OEMs to be more competitive in today's increasingly complex global energy landscape. Moog started shipping the new pitch system to turbine manufacturers in Europe and Asia in October.

Moog Inc. is a worldwide designer, manufacturer, and integrator of precision control components and systems. Moog Industrial Group designs and manufactures high performance pitch solutions for wind turbines including pitch control systems, slip rings, blade sensing, and services for wind-turbine manufacturers and wind-farm operators. Pitch systems monitor and adjust the angle of the wind-turbine blades and thus act as a critical safety system protecting the turbine against adverse wind conditions.

*Source: Moog Inc.*

For more information,  
go to [www.moog.com/wind](http://www.moog.com/wind).

## Ultrasonic Wind Sensor Is Alternative to Conventional Sensors

The WindSonic 75 is a genuine low cost alternative to conventional cup and vane or propeller wind sensors, with all of the advantages of solid-state ultrasonic technology. With no moving parts to jam, break, or wear out, this ultrasonic wind sensor is ideal for use in harsh weather conditions.

WindSonic 75 is a 2-axis ultrasonic wind sensor, providing wind speed and direction data via one serial or two analog outputs. To confirm correct operation, wind-sensor outputs are transmitted together with an instrumentation status code.

WindSonic has been designed as a lightweight (0.5 kilograms) and robust ultrasonic wind sensor with a corrosion-free polycarbonate construction. With a true solid-state construction, WindSonic can be operated in harsh environmental conditions without fear of damage often associated with fragile cup or propeller wind sensors.

WindSonic 75 is suitable for a wide range of wind-monitoring applications, particularly for marine and offshore (ships, data buoys) and land-based installations. With a corrosion-free exterior and no moving parts, the ultrasonic wind sensor eliminates the need for expensive on-site maintenance, particularly in remote locations where access is difficult. ↗



The WindSonic 75. (Courtesy: Dynamax)

Source: Dynamax

For more information,  
go to [www.dynamax.com](http://www.dynamax.com)

## Trident Sensor Products Introduced to China's Wind Market

Poseidon Systems, LLC has three key sensing solutions under the Trident Sensor Product Line. The three products include the Trident QW3100, the Trident DM4500, and the Trident AP2200. These products mark the entry of Poseidon Systems' Trident Product Line into China's wind-power generation market to extend the uptime and service life of difficult-to-reach gearboxes on wind turbines.

"We are proud to be part of the wind-power generation industry and to help our customers reduce the cost of energy production through innovative oil and gearbox health monitoring solutions," said Poseidon Systems President Mark Redding. "One of the key industry challenges has been excessive downtime resulting from unplanned maintenance activities; our solutions enable wind-turbine owners and operators to detect impending failures early, thereby minimizing repair costs and downtime and preventing catastrophic failures."

The ability to detect oil quality and condition enables maintenance intervals to be adjusted as needed, protecting and maximizing the uptime of critical assets.

Poseidon Systems' product offerings include:

**Trident DM4500 Wear Debris Monitor:** With real-time, in-line fluid sensing technology for the detection

of metallic wear debris and particulates in a lubrication system. By continuously monitoring wear-debris generation, the device alerts users to gearbox faults in their earliest stages, allowing for lower cost corrective actions, minimized downtime, and maximized gearbox life.

**Poseidon Systems' Trident QW3100:** With real-time, in-line sensing technology for monitoring the health state of lubricating fluids. The device provides continuous insight into oil health, promoting condition-based maintenance practices such as optimized fluid drain intervals and reduced dependence on offline analysis.

**Poseidon Systems' Trident AP2200:** An easy-to-use platform for collecting sensor data, processing and interpreting measurements, and posting information to web servers for remote access. The AP2200 makes collecting sensor data easy and reliable even in unreliable environments. Data is buffered in the 1.7 GB of on-board storage until successfully off-loaded via Ethernet, Wi-Fi, mobile networks, and more. ↗

Source: Poseidon Systems, LLC

For more information,  
go to [www.PoseidonSys.com](http://www.PoseidonSys.com)

# MANUFACTURING

Production • Fabrication • Components • Supply Chain • Materials • Tooling • Machinery

## Siemens Inaugurates New Blade Factory in U.K.



Siemens' new turbine blade factory in Hull, U.K. (Courtesy: Siemens)

Siemens recently inaugurated the new rotor-blade factory for offshore wind turbines in Hull, U.K., in an event attended by the Secretary of State for Business, Energy, and Industrial Strategy Greg Clark and representatives of the local community.

The site at Alexandra Docks has been transformed in under two years from a derelict industrial wasteland to a busy high-tech manufacturing hub. Now, the state-of-the-art factory has completed the first 75-meter-long blades stored on racks on site. Shipping to the first offshore wind project Race Bank is expected early this year.

"Our new factory in Hull ... is located in one of the most significant markets for offshore wind power and will produce rotor blades for our 7- and 8-MW wind turbines," said Michael Hannibal, CEO Offshore of Siemens Wind Power. "The new manufacturing plant is part of our efforts to establish offshore wind power as a

key pillar of a sustainable energy mix in Europe. At the same time, we are creating 1,000 attractive jobs here and thereby supporting sustainable regeneration in the Humber region."

With its partner Associated British Ports (ABP), Siemens is investing £310 million in Hull to create a world-class center for offshore wind manufacturing, assembly, and logistics. The centerpiece of the investment, the wind-turbine blade factory, is now fully operational. The full Alexandra Dock site, including a new harbor for pre-assembly and load-out of wind-turbine components, will be fully on stream this year. Siemens had employed almost 700 people in Hull so far. Another 100 permanent staff are employed at Alexandra Dock working for Siemens' suppliers. Additional recruitment up to 1,000 people will continue as the site becomes fully operational.

Hundreds more jobs have been created during construction and in the supply chain.

The new production site has an area of 540,000 square meters, including an area reclaimed from a wet dock. The new factory itself covers 40,000 square meters and has an optimized material flow based on the Siemens Production System (SPS). Storage, supply chain, and assembly work are interconnected with modern database systems to produce 75-meter-long rotor blades for offshore wind turbines of the 7- and 8-MW class.

Offshore wind-manufacturing sites such as Hull or Cuxhaven in Germany are efficiently linked by new transport vessels and embedded in Siemens' logistics concept with the goal to leverage innovation and industrialization on the way to lowering the costs of offshore wind energy. A key element of the concept is an improved transport solution, using dual-purpose transport vessels to avoid both heavy component lifting through innovative Ro/Ro handling and cost intensive shipping of heavy components.

There is a growing market for wind turbines designed for erection off shore. Offshore wind-power plants are being built primarily in the North Sea and Baltic Sea off Europe's northern coastline. However, wind-power projects are being developed in other regions as well, such as along the East Coast of the United States and in Asia off the coast of China and Taiwan. ↗

*Source: Siemens*  
For more information,  
go to [www.siemens.com/wind](http://www.siemens.com/wind)

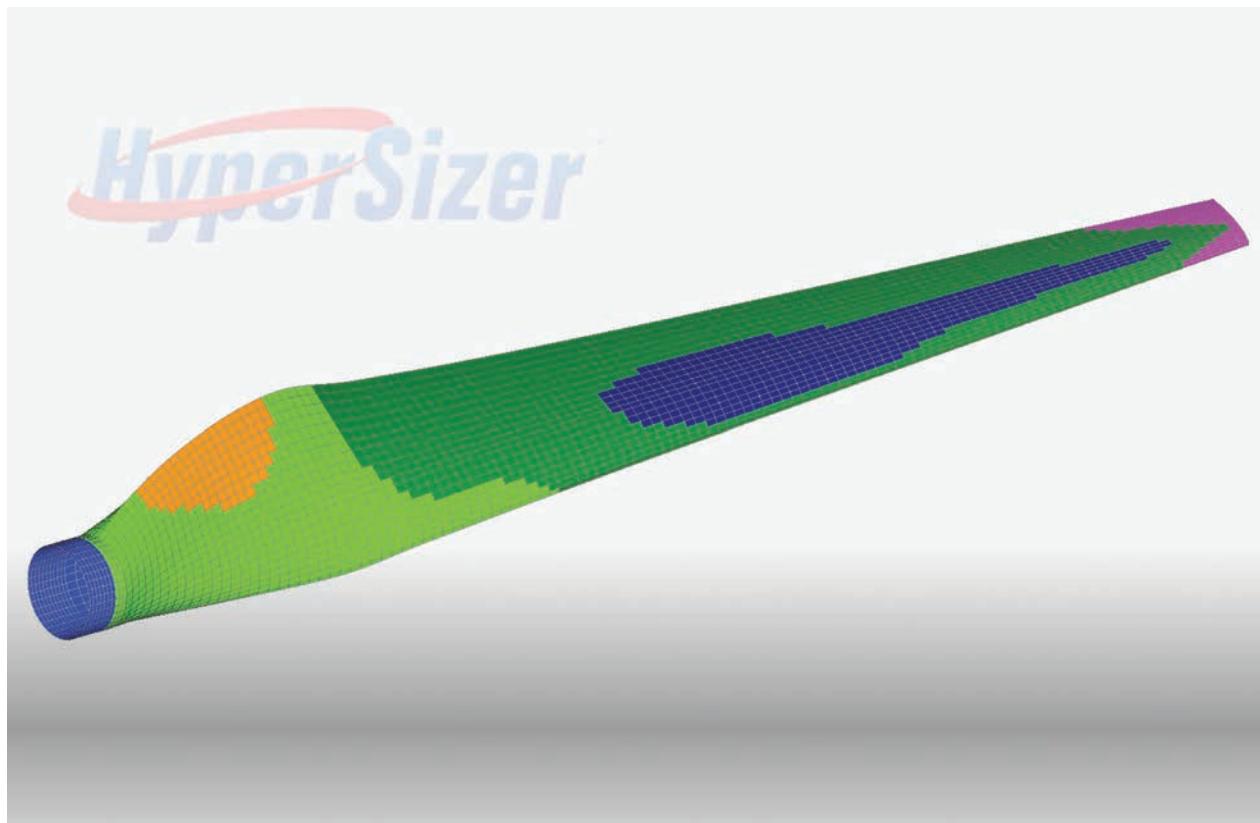
## HyperSizer Express Is Designed for the Wind-Industry Composite Engineer

Manufacturers in an ever-widening array of industries are discovering the versatility of composites for strong,

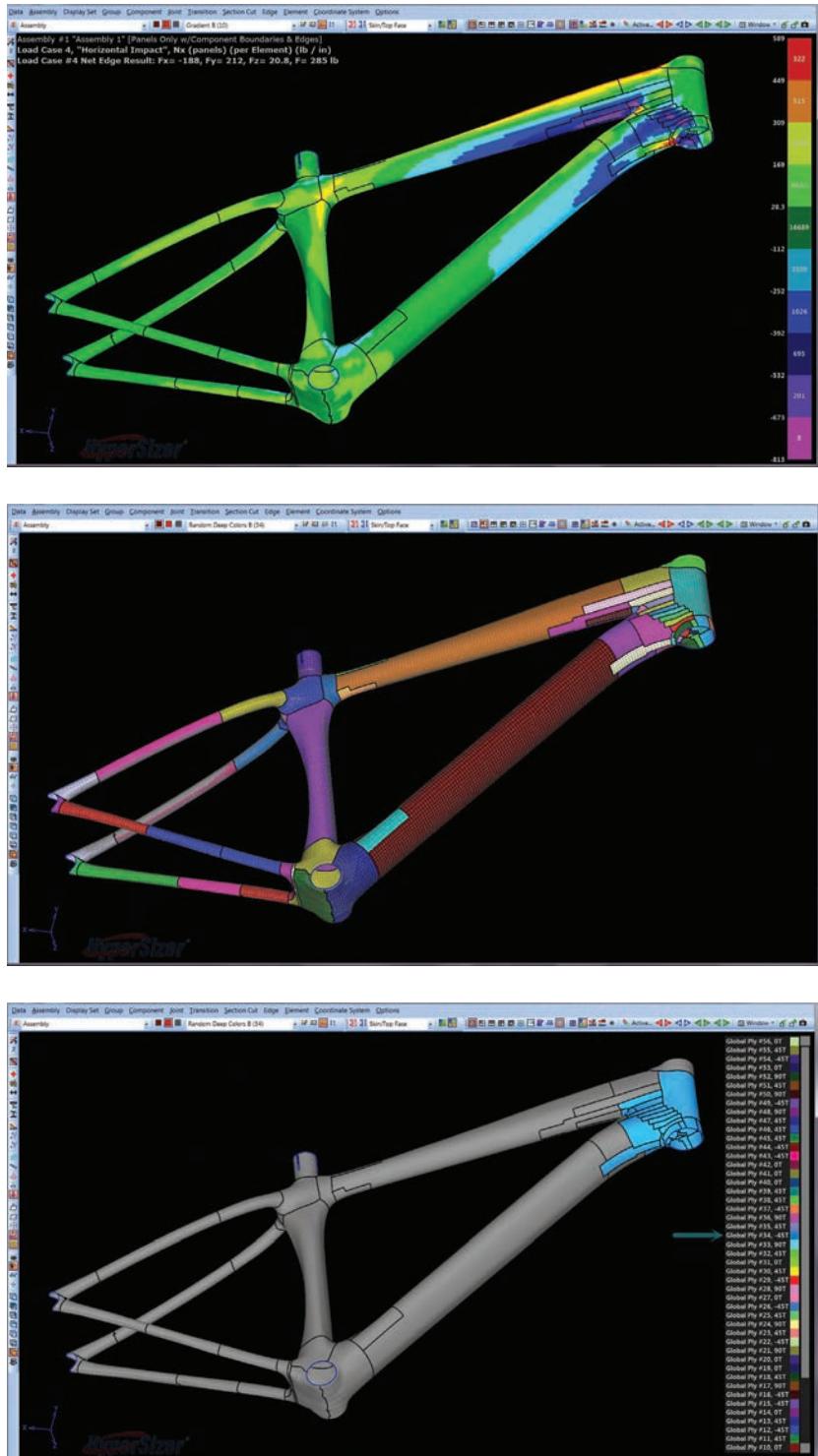
lightweight designs. Whatever the application, for the most cost-efficient and highest performance use of

these advanced materials, design optimization software is essential.

Now, NASA-born Collier Research,



HyperSizer Express optimizes the ply shapes of a composite wind blade to meet stiffness and strength requirements simultaneously.  
(Courtesy: Collier Research)



Screenshots of a HyperSizer Express analysis of bike-frame: (top) Import FEA stresses, (center) optimize property zones, (bottom) sequence laminates. The sequence would be similar with any composite structure, from a wind-turbine blade to a sailboat hull. (Courtesy: Collier Research)

a leader in the field of aerospace composites and metals optimization for more than 20 years, has just released HyperSizer Express, which delivers key capabilities of Collier's high-end HyperSizer tool in a user-friendly package aimed at the composite engineer.

"Not every designer or engineer working with composites needs all the options in the professional version of our software," said Collier founder and President Craig Collier. "But they do want the robustness of a proven, core analytical code running underneath, from the very early stages of their design process. HyperSizer Express provides all that—and it's insanely fast and easy to use as well."

Collier said 95 percent of users can, without a manual or instructions, import their finite element model (FEM) into Express and produce optimum composite laminates that satisfy all analyses to all load cases within 30 minutes. The automatically updated model will arrive at the minimum weight with global plies identified, layer-by-layer, producing fully manufacturable laminate designs.

"This kind of nonparametric optimization in Express is one reason it is so easy to use," Collier said. "You don't have to put in constraints or minimum/maximum values. You just say, 'I want to make this out of carbon fiber,' or 'I want to make this out of fiberglass,' and the software will show you the optimum solution based on your FEM."

## TIGHTER COUPLING TO FEA OPTIMIZES PRODUCT BEHAVIOR ANALYSIS

Express is even more tightly coupled to FEA programs, such as NASTRAN and Abaqus, than the Pro version is.

"Tight FEA coupling is key for the

types of mechanical response analyses an engineer would carry out with Express," Collier said. "These are driven primarily by bending stiffness, which requires a direct interaction with FEA solutions when optimizing laminate stackings."

"These capabilities meet the needs of a broad range of composite engineers who work with laminates as well as with honeycomb or foam cored sandwiches," he said.

Applications include:

- Wind energy: Turbine blades
- Automotive: Doors, trunks, hoods, body panels, floor panels, body in white
- Sporting goods: Bike frames, snowboards, tennis racquets
- Medical: Orthopedic prostheses
- Industrial: Robotic end effectors
- Marine: Yachts, sailboats
- Aerospace: Seats, doors, winglets, flaps

## A DEEP AEROSPACE PEDIGREE

Collier Research's professional version of its software was the first to be commercialized out of NASA and has most recently been used to help design the heat shield of the space program's multipurpose crew vehicle and the Bell Helicopter/Spirit AeroSystems entry in a Department of Defense program competition.

"When using Express, you get the same exact margins of safety and the same exact material allowables as our Pro version intended for the aerospace industry, with 25 years of maturity and verification behind it," Collier said. "But now it's wrapped in a new interface streamlined for more efficient composite design optimization."

Express and Pro products are both being used at large OEMs. Some

parts are completely designed, analyzed, and certified with Express, and others parts may first be done in Express, then handed off to Pro to do stiffened panels or bolted/bonded joints.

The transition from Express to Pro is seamless because the two programs share the same database.

"Should you want to go to the Pro level later, all the data you've entered and computed with Express will be intact so you can see everything you've done so far," Collier said.

## HOW EXPRESS WORKS

The Express interface guides the user through the entire analysis process in a highly intuitive manner, step-by-step. Checkboxes on the status console confirm progress — from model import through material selection, FEA solver choice, selection of failure

# BLADE REPAIR TRAINING



**TRAINING IN:**

- ENGINEERING • MANUFACTURING • REPAIR

**DIRECT SERVICES:**

- ENGINEERING • ONSITE TRAINING • CONSULTATION

Fab & Repair - Phase 1:  
January 9-13 & January 30 - February 3  
Advanced Composite Windblade Repair:  
March 6-10

(Please visit our website for additional classes & dates)

**ABARIS** TRAINING

+1 (775) 827-6568 • [www.abaris.com](http://www.abaris.com)

## Delivering Value with Wind Energy tooling

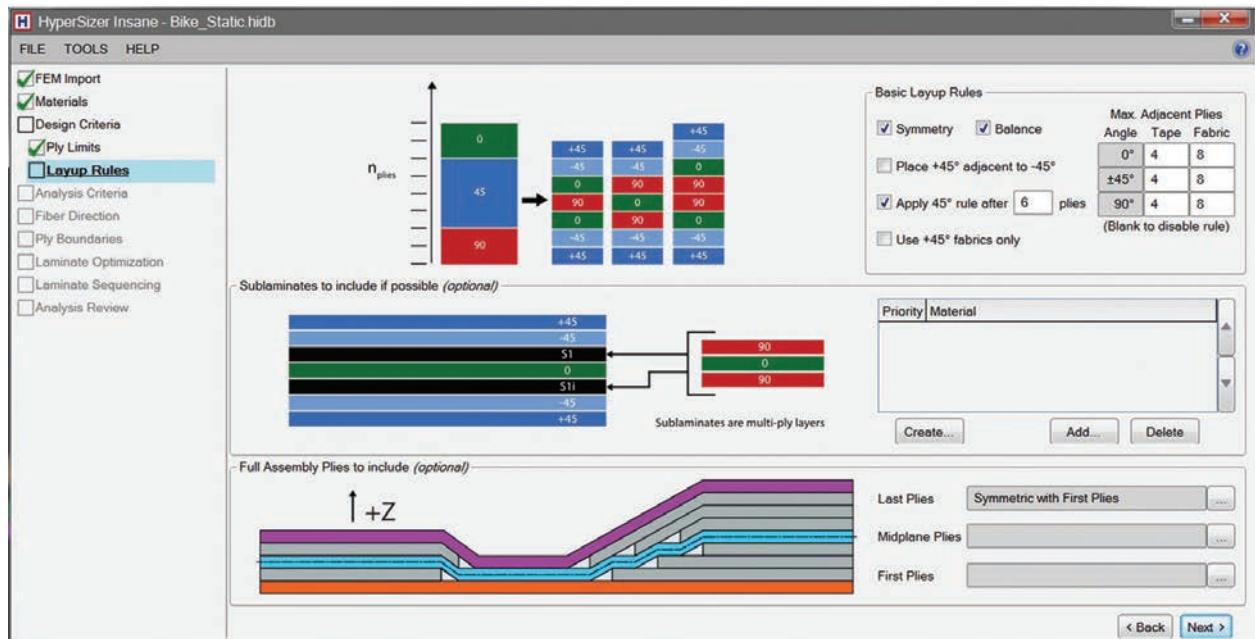
LARGE SCALE | HIGH QUALITY | PRICE COMPETITIVE | ON-TIME DELIVERY



- ▶ Patterns, Molds, Plugs
- ▶ Precision 5-axis machining
- ▶ Composite Fabrication
- ▶ Engineering Services

[www.janicki.com](http://www.janicki.com)  
360.856.5143

**JANICKI** INDUSTRIES



Screenshot of HyperSizer Express composites ply layup tracking. Note interface checkmark system at upper left. (Courtesy: Collier Research)

and design criteria, laminate optimization and sequencing, and analysis results (controlling load case, failure mode, safety factors, and update of FEM with optimal laminates).

While Express is primarily aimed at the composite engineer, it does provide capabilities for metals optimization as well.

"You can use Express to determine whether composite is really the material system you want to use for your product," Collier said. "You can quickly identify the performance with a different metal, such as aluminum or steel."

"Optimization has become an essential tenet of engineering," Collier said. "But there are still so many people out there who are not doing any optimization at all. Our aim is to support them with a user-friendly, practical tool that works for every engineer." ↗

*Source: Collier Research*

For more information,  
go to hypersizer.com

## Senvion Acquires Euros as Next Step of Its Product Strategy

Senvion, a leading global manufacturer of wind turbines, has acquired 100 percent of the shares of Euros Group in an all-cash transaction, just three months after announcing the acquisition of Kenersys assets in India. Euros, located in Berlin and southern Poland, covers all areas of rotor-blade design and production as well as master plug and mold design, backed by its skilled product development team.

The fully functional blade, mold, and master plug manufacturing facilities in Żory-Warszowice and Usztron in Poland are part of the transaction. The acquisition also includes the production site staff. The facilities in southern Poland are able to produce all onshore mold and blade types, including all blades in the Senvion portfolio.

"The Euros transaction successfully builds on Senvion's product innovation and market entry strategy," said



The Euros transaction successfully builds on Senvion's product innovation and market entry strategy.



Jürgen Geissinger, CEO at Senvion. "With the addition of a mold factory and an experienced mold and blade development team, Senvion will be able to reach a shorter time to market for new blades and also be able to produce additional new blades with a reduced time to market. This will enable Senvion to enter new markets with new products more quickly. This strategic move is important to further prepare for our next market entries and also to achieve cost savings and thereby contributing to lower LCOE efforts."

"Senvion is pleased to announce this partnership with the experienced and skilled blade development team at Euros," said Paulo Silva, senior vice president of global blades at Senvion. "This agreement will help us to benefit from the complementary skill sets and the rich and varied experience of the Euros team, in addition to expanding and complementing our own blade capacities. Together, we will be able to offer complete blade solutions in-house — from the development and the mold-making through to the final blade."

"Euros and its employees see the acquisition by Senvion with great optimism," said Michael Wolf, managing director of Euros group. "The obtained know-how over the past 20 years about innovative tools for rotor blade engineering for on- and offshore areas including mold design and construction as well as blade production can now be applied on a broader scale."

To date, Senvion has produced its blades in Bremerhaven in Germany and Vagos in Portugal. With the addition of the Euros production sites in Poland, Senvion will control both the end-to-end production cycle and also expand its blade manufacturing capacity by 25 percent. ↗

Source: Senvion

For more information,  
go to [www.senvion.com](http://www.senvion.com)

## Vestas Wins 65 MW Order in Sweden

Long-term partner OX2 has placed an order for 18 V126-3.45 MW turbines with power-optimized mode to 3.6 MW for the Högkölen wind-power project in the Ljusdals municipality in eastern Sweden.

The Högkölen wind farm will be another in a long series of orders between Vestas and OX2 and the fourth order placed by OX2 in 2016. The cooperation between Vestas and OX2 spans more than 10 years and has yielded more than 900 MW in total wind projects across the Nordics.

"With the Högkölen wind farm, we further strengthen our long-standing partnership with Vestas as well as our market position in northern Europe as a leading developer and EPC supplier," said Paul Stormoen, managing director

of OX2 Wind. "Högkölen will be OX2's 36th wind power project in the Nordics"

"We are very proud that OX2 has yet again chosen our upgraded 3 MW platform for their latest project," said Klaus Steen Mortensen, president of Vestas Northern Europe. "The more than 900 MW in wind projects across the Nordic region is the result of the close collaboration and strong track record between OX2 and Vestas."

The order includes Vestas de-icing system as well as supply, installation, and commissioning of the turbines. Delivery is expected to begin in the second quarter of 2018. ↗

Source: Vestas  
For more information,  
go to [www.vestas.com](http://www.vestas.com)

**ITH**  
Bolting Technology

Tension & Torque tools for wind turbines

Bolt Tensioning systems      Torque Wrench systems      Nut Runners (Torque multipliers)

ITH Bolting Technology offers tension and torque tools for wind turbines. The advertisement features three main product categories: Bolt Tensioning systems, Torque Wrench systems, and Nut Runners (Torque multipliers). It includes images of the tools and workers using them in a wind turbine environment. The website www.ITH.com and phone number (815) 363-4900 are provided for contact.

www.ITH.com | (815) 363-4900

# CONSTRUCTION

BOP/EPC • Project Status • Siting • Equipment • Project Due Diligence • Services

## Whirlpool Breaks Ground on Latest Ohio Wind-Power Project

Whirlpool Corporation recently broke ground on a project to build three wind turbines to help power its Marion, Ohio, manufacturing facility. The three turbines will deliver wind-generated power directly to the plant, and when fully completed, are expected to provide about 19 percent of the facility's total power consumption.

The Marion wind project — scheduled for completion in early 2017 — is expected to eliminate the equivalent of more than 9,000 tons of carbon dioxide. All three turbines will be built and financed by One Energy as part of its "Wind for Industry" projects.

"We're always exploring cutting edge technologies that will bring us closer to accomplishing our sustainability goals," said Ron Voglewede, director of Global Sustainability at Whirlpool Corporation. "We're excited to bring a local focus for our global commitment to sustainability here in the Marion community and throughout Ohio, where we have significant investments in employees and facilities."

Whirlpool Corporation's Marion facility is the largest employer in the county, with the plant's 2,400 employees producing an average of 4 million clothes dryers a year. This latest wind project is one way the company continues to strengthen its commitment to American manufacturing in Ohio.

"We're pleased to be partnering with One Energy on another wind project. The wind turbines are not only a responsible investment for the environment, but also a smart financial decision," said James Gifford, the Marion Facility Plant Lead at Whirlpool Corporation. "By reducing our electricity consumption, we expect to cut down on our overhead costs significantly."

The Marion plant is one of three facilities in Ohio where Whirlpool Corporation is implementing wind



Rendering of what the Marion Wind turbines would look like once completed. (Courtesy: Whirlpool Corporation)

energy to partially power its manufacturing operations. Two wind turbines at the company's Findlay plant have been operational since January 2016. In October, a similar project began at Whirlpool Corporation's Ottawa facility. Following the completion of the Marion and Ottawa projects, many dishwashers, freezers, and clothes dryers manufactured by Whirlpool Corporation and sold in the United States will be made, in part, with wind energy.

As part of its commitment to the local Marion community, Whirlpool Corporation will also create one \$5,000 MW STEM Scholarship per wind turbine (\$15,000 annually) to be awarded every year to a graduating senior from local Marion area high schools as a way to inspire education in the technologies and industries of the future. ↗

Source: Whirlpool Corporation

For more information,  
go to [WhirlpoolCorp.com](http://WhirlpoolCorp.com)

## Siemens Celebrates Topping Out Ceremony at New Germany Turbine Factory

Siemens recently celebrated the topping out ceremony for its new wind-turbine manufacturing facility in Cuxhaven, Germany, attended by Parliamentary State Secretary Enak Ferlemann, Lower Saxony's State Secretary of Economic Affairs Daniela Behrens, and the mayor of Cuxhaven, Dr. Ulrich Getsch. The structural steel uprights now stand for the production building, which will offer 56,000 square meters of floor space. This new facility in northern Germany is one of Siemens' most important investment projects

in recent years, with some 200 million euros invested in what is the company's first offshore wind-turbine production plant in Germany.

"In celebrating this topping ceremony, we mark another important milestone for our new, state-of-the-art production site for offshore wind turbines in Cuxhaven," said Markus Tacke, CEO of Siemens' Wind Power and Renewables Division. "The new manufacturing plant is part of our efforts to establish offshore wind power as a



Siemens celebrates the topping-out ceremony for its new wind-turbine manufacturing facility in Cuxhaven, Germany. Julian Egger, on the left in the safety equipment, is tightening a steel pin together with the political leaders and company representatives. (Courtesy: Siemens)

key pillar of a sustainable energy mix. At the same time, we're creating up to 1,000 attractive jobs here, and thereby supporting sustainable structural change in the coastal region."

Siemens already has received almost 1,600 job applications. A number of suppliers who will serve the plant have also announced plans to establish local businesses.

Enak Ferlemann, Parliamentary State Secretary at Germany's Federal Ministry Transport and Digital Infrastructure, underscored the significance of the project for offshore wind power in Germany.

"Siemens' new production plant in Cuxhaven sets an important signal for further expanding offshore wind power in Germany," Ferlemann said. "The power generated by offshore wind farms will contribute substantially to our future energy mix, while simultaneously helping us to achieve the climate goals of the Paris Agreement."

"Siemens' new manufacturing plant is and will be the single most important anchor for the new German offshore industry center in Cuxhaven, and underscores the essential role Lower Saxony is playing as Germany's leading energy-provider state and driver of the nation's energy

transition," said Daniela Behrens, state secretary at the Lower Saxony Ministry of Economic Affairs, Employment, and Transport. "We heartily welcome this positive development for Cuxhaven and the entire region."

Many new future-fit jobs are being created along with high-quality infrastructure that will strengthen Lower Saxony as a business location.

"The city of Cuxhaven is extremely pleased that, with this topping off ceremony, we're able to celebrate yet another milestone achieved in establishing Siemens' new production site," said Dr. Ulrich Getsch, mayor of Cuxhaven. "Siemens is creating attractive jobs here and further expanding the region's know-how."

Construction of the production building, which in places will stand 30 meters tall, is scheduled for completion by mid-2017. A two-story building enclosing about 3,800 square meters of floor space is being erected next to the production building to house offices and the site cafeteria.

This new manufacturing plant in Cuxhaven will begin producing nacelles for Siemens' next-generation offshore wind turbines in mid-2017. The wind turbines are designed

for installation at sea, each delivering an electrical generating capacity of between 6 and 8 MW.

There is a growing market for wind turbines designed for off shore. Offshore wind power plants are being built primarily in the North Sea and Baltic Sea off Europe's northern coastline. However, wind-power projects are being developed in other

regions, as well, such as along the East Coast of the United States and in Asia off the coast of China and Taiwan. ↗

*Source: Siemens*

For more information,  
go to [www.siemens.com/wind](http://www.siemens.com/wind)

### Siemens Receives Order for Onshore Wind Project in South Korea

Siemens Wind Power has received an order to supply 17 direct drive wind turbines for the Uljin onshore wind power plant in Gyeongsangbuk province on the east coast of South Korea. The customer is SK D&D Co., Ltd., a Korean developer of real estate and renewable energy projects.

The scope of supply includes the delivery and technical field assistance for the installation of 16 wind turbines of the new type SWT-3.6-130 on different towers ranging from 85- to 115-meter hub heights and one SWT-3.0-108 on a 71-meter tower. Siemens also was contracted for full service and maintenance over a period of 10 years including Siemens' advanced remote monitoring and diagnostics services.

The Uljin wind farm project is Siemens' second project for SK D&D and also its second order in South Korea. In 2014, both companies successfully completed the 30 MW Gasiri Wind Farm close to the city of Gasiri in the province of Jeju-do.

Due to site conditions in the coastal mountains of the Gyeongsangbuk Province, the new Uljin project will feature two different turbine types and four different hub heights. Besides one SWT-3.0-108 wind turbine with a 108-meter rotor and rated at 3 MW, 16 of the turbines will be the latest Siemens onshore model SWT-3.6-130. This IEC class II turbine is designed for medium wind sites and delivers 3.6 MW of electric power.

Installation will start in spring 2018, commissioning is targeted for late 2018. Once in operation, the wind-power plant will supply green energy to about 35,000 households.

"We are proud that SK D&D decided to partner with us again for their second wind project in South



Siemens Wind Power will supply 16 units of the new SWT-3.6-130 wind turbine to the Uljin wind farm at the east coast of South Korea. (Courtesy: Siemens)

Korea," said Thomas Richterich, CEO Onshore at Siemens Wind Power. "Uljin wind farm is a very important project for us since it marks the premiere of our latest generation of direct-drive turbines in the Korean wind market." ↗

*Source: Siemens*

For more information,  
go to [www.siemens.com/wind](http://www.siemens.com/wind)

### Dong and Eversource Partner to Make Large-Scale Offshore Wind in the U.S.

Dong Energy is teaming up with Eversource Energy — the premiere transmission builder in New England — who has acquired a 50 percent ownership interest in Bay State Wind in order to jointly develop the project.

The proposed offshore wind farm would be about 15 to

25 miles south of Martha's Vineyard in an area that has the potential to develop at least 2,000 MW of electricity — enough to power 1 million Massachusetts homes.

"Offshore wind has great potential in the U.S., and I am very pleased that we are entering into a strategic



882:66:63

872:9873:72

74:663:62

09:982:73

882:66:63

872:9873:72

# IMAGINE WHAT'S NEXT.

**Register today to get the ultimate view of where construction is going.**

Imagine less downtime. Imagine being more efficient. Imagine seeing what's next from over **2,500 exhibitors** spread out over **2,500,000 square feet**.

Imagination becomes reality in Las Vegas on March 7–11, 2017—and if you make your reservation right now, you can ensure your spot at this huge event... and save!

**Get the special \$149 rate (and save up to \$100) by registering early at [www.conexpoconagg.com](http://www.conexpoconagg.com).**



**IF IT'S NEW,  
IT'S HERE.**

**March 7–11, 2017 | Las Vegas Convention Center | Las Vegas, USA**

Co-located with



partnership with Eversource to develop our first project in New England," said Samuel Leupold, EVP and CEO of Dong Energy Wind Power. "Offshore wind will add to the diversity, and the security, of Massachusetts' energy mix."

"New England is setting the pace for a national clean-energy future with its proven track record in energy efficiency and bold clean-energy goals," said Jim Judge, president and CEO of Eversource Energy. "Our partnership with Dong Energy on Bay State Wind represents a significant opportunity to help make those goals a reality, and we look forward to delivering this renewable and reliable source of power to customers."

### A 50-50 PARTNERSHIP

Dong Energy Wind Power U.S. Inc. and Eversource will seek to jointly develop, construct and operate the utility-scale offshore wind project in a 50-50 partnership. Dong Energy will use its market leading expertise in the offshore wind sector to lead the development and construction of the project's offshore generation and transmission assets.

Eversource will leverage its strong transmission expertise in New England to develop and construct the onshore transmission system.

"Offshore wind is a reliable home-grown energy source that can be delivered at scale to Massachusetts residents and businesses," said Thomas Brostrøm, general manager for Dong Energy Wind Power U.S. Inc. "New England's water depths and wind speeds are similar to those in Europe and provide attractive conditions."

### A LANDMARK MOMENT

In April 2015, Dong Energy secured newly assigned project development rights to a 300-square-mile ocean area 15 miles off the coast of Martha's Vineyard that was made available for lease by the Bureau of Ocean Energy Management (BOEM) in a competitive solicitation. In August 2016, Massachusetts formally adopted a comprehensive energy bill that includes a first-of-its-kind mandate that



Dong Energy's wind division has built more than one quarter of the total offshore wind capacity in the market. (Courtesy: Dong Energy)

state utilities purchase 1,600 MW of offshore wind power by 2027. The first state-led procurement process will begin in June 2017. This represents a landmark moment for the offshore wind industry in the United States.

Dong Energy and Eversource are committed to playing a central role in bringing their companies' respective expertise and successes to bear in order to help the state meet this goal. The companies expect that first power can be delivered in the early 2020s.

At 2,000 employees strong, Dong Energy's wind division has built more than one quarter of the total offshore wind capacity in the market. Since launching the world's first offshore wind farm in 1991, Dong Energy has pioneered and refined the approach to developing and constructing offshore wind farms. Each year, the company is building bigger, more efficient projects that can power even more homes with clean, reliable, and renewable energy.

"We are encouraged by the dramatic progress that Europe is making in the offshore wind market," said Lee Olivier, EVP of Strategy and Business Development at Eversource Energy. "Wind technology is rapidly advancing; output is increasing, and prices are dramatically dropping. Now is the time to bring that progress here to New England, and we are thrilled to be partnering with a developer who has such a successful track record." ↗

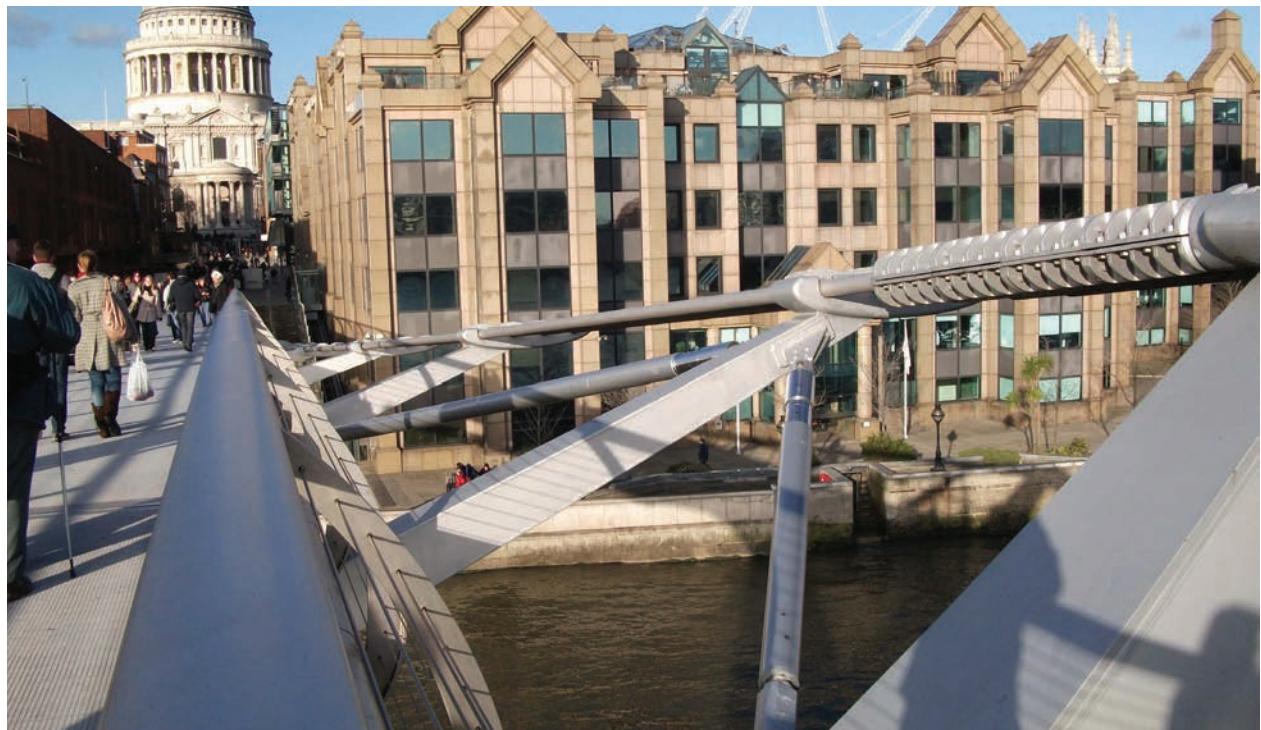
*Source: Dong Energy*

For more information,  
go to [www.dongenergy.com](http://www.dongenergy.com)

# CROSSWINDS

## Getting Rid of the Shakes

*Dampers can stop damage from seismic and wind events and help lower repair costs.*



Taylor's infinite life, low friction dampers are used on the Millennium Bridge in London. The dampers were originally designed for a space shuttle launch. (Courtesy: Taylor Devices)

By Kenneth Carter  
Managing Editor | Wind Systems

The effects of seismic activity and wind excitation on tall structures can run the gamut from costly repairs to dangerous destruction.

Engineers are now helping to reduce such ground-level damage with technology originally created for a higher calling: the space program.

"Back in the early '90s or so, we started getting more into providing dampers for structural control of

buildings and bridges and other types of civil engineering structures using the technology we developed for NASA and the military," said Alan Klembczyk, vice president of sales and engineering for Taylor Devices.

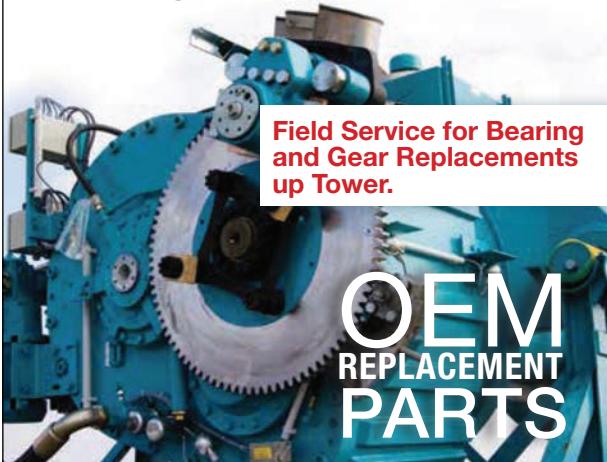
Taylor Devices is a manufacturing firm that's been incorporated since 1955. It manufactures custom dampers, shock absorbers, rate controllers, and all types of energy-management devices.

### MILITARY AND AEROSPACE TECHNOLOGY

"We've had a company strategy to balance our marketplace for applications for 50 percent military and aerospace and maybe 50 percent industrial and commercial," Klembczyk said. "And we use a lot of the technology that was developed for military and aerospace applications, including NASA,

*Continued on page 48*

Factory Trained Service Provider for  
**Winergy Drive Systems**



**Field Service for Bearing  
and Gear Replacements  
up Tower.**

**OEM  
REPLACEMENT  
PARTS**

**GWO, NR35 and NR10  
Certifications**



**FGGS**  
FIELD SERVICES

Contact us today...

115 Technology Drive  
Suite A-201  
Trumbull, CT 06611  
P +1 (203) 268-5961 X-15  
F +1 (203) 459-0301  
info@fggscorp.com

Locations:  
US/Brazil

[www.fggscorp.com](http://www.fggscorp.com)

## WIND TURBINE TECHNICIAN ACADEMY

Competency-based, hands-on training  
Industry-guided skill assessments  
Industry tools and equipment  
ENSA GWO Certified Safety Training

Change your life and your world.

Kalamazoo **VALLEY**  
community college  
269.353.1253  
[www.kvcc.edu/wind](http://www.kvcc.edu/wind)



# WIND SYSTEMS

*Giving Wind  
Direction*

**David C. Cooper**

Publisher

david@msimktg.com  
ext. 200

**Chad Morrison**

Associate Publisher  
chad@msimktg.com  
ext. 202

### EDITORIAL DEPARTMENT

**Molly Rogers**

Editor

molly@msimktg.com  
ext. 205

**Kenneth Carter**

Managing Editor  
editor@windsystemsmag.com  
ext. 204

### SALES DEPARTMENT

**Mike Barker**

Regional Sales Manager  
mike@windsystemsmag.com  
ext. 203

**Tom McNulty**

Regional Sales Manager  
tom@windsystemsmag.com

### CIRCULATION DEPARTMENT

**Teresa Cooper**

Manager

info@windsystemsmag.com  
ext. 201

**Cole Morrison**

Assistant  
ext. 209

**Jamie Willett**  
Assistant

### DESIGN DEPARTMENT

**Shane Bell**

Creative Director

design@windsystemsmag.com  
ext. 206

**Michele Hall**

Graphic Designer  
michele@windsystemsmag.com  
ext. 211

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage-and-retrieval system without permission in writing from the publisher. The views expressed by those not on the staff of *Wind Systems* magazine, or who are not specifically employed by Media Solutions, Inc., are purely their own. All "News" material has either been submitted by the subject company or pulled directly from their corporate web site, which is assumed to be cleared for release. Comments and submissions are welcome, and can be submitted to editor@windsystemsmag.com.



**Media solutions**

**Published by Media Solutions, Inc.**

P. O. Box 1987 • Pelham, AL 35124  
(800) 366-2185 • (205) 380-1580 fax

**David C. Cooper**

President

david@msimktg.com  
ext. 200

**Chad Morrison**

Vice President

chad@msimktg.com  
ext. 202

**Teresa Cooper**

Operations Director  
info@msimktg.com  
ext. 201

## AD INDEX

5 Star Filter .....	13
Abaris Training Resources .....	37
Amsoil .....	3
Avanti Wind Systems .....	IFC
AWEA .....	21
Castrol Industries .....	9
Con Expo - ConAGG '17 .....	43
FGGS Field Services .....	46
Iowa Lakes Community College .....	25
ITH Engineering .....	39
Janicki Industries .....	37
Kalamazoo Valley Community College .....	46
New World Technologies .....	7
Norbar Torque Tools Inc .....	1
NTC Wind Energy .....	47
Sankosha USA .....	31
Sotek/Belrix Industries .....	23
Stahlwille Tools .....	47
TORKWORX LP .....	BC
Wind Systems .....	.5, IBC
Women of Wind Energy .....	27



# 730



**MANOSKOP® 730 N** MANOSKOP® 730 N - at home in all weathers, such as in wind turbine maintenance. Accurate up to 1000 N·m. Quick & easy one-handed setting - proven to be reliable and robust - keeps downtimes to a minimum. Promised.

Experience integrated tool solutions for maintaining wind turbines. Experience the »Made in Germany« difference.

Made in Germany

Tel.: (+1) 262-583-4060  
Info@stahlwille-americas.com



• Grout Sleeves are More Effective in Protecting Bolts from Grout

• Saves Labor – Enhances Safety – No More Cutting Foam

• Displace Almost No Grout, Resulting in a Considerably Stronger Foundation



800.359.0372  
JWBRUCE@NTCWIND.COM  
NTCWIND.COM

Call to inquire about our special limited time pricing!

for the benefit of the structural engineering community."

Taylor creates seismic dampers or structural dampers that are able to stop the damage from seismic activity or high-wind events before it can happen.

"Our basic seismic damper uses fluid to turn mechanical energy into heat energy," Klembczyk said. "We now have approximately 700 applications worldwide that uses our dampers for use on buildings and bridges. These also include wind applications where a building might be subjected to wind excitation."

Although most of Taylor's public work is for buildings and bridges, the technology will work for structures such as wind turbines as well.

## HOW IT WORKS

Nondisclosure agreements prevent Klembczyk from discussing details on how Taylor's dampers will be used in the wind industry, but he said the technology works in much the same way it does for other structures.

"A wind turbine, being a tall structure, is very similar to a tall skyscraper, and wind can excite that structure and could cause cumulative damage and could also result in unacceptable deflections and accelerations during wind events," he said. "So very similarly, you could apply distributive damping inside the tall wind turbine, so as the wind excites it back and forth, instead of that turbine flexing back and forth, (the damper) would turn that energy into heat energy by putting that energy into the fluid of the damper, and it could control the oscillations that way. We've done tall buildings. We've done wind turbines. And we've actually done stadium light poles in a similar fashion as well."

The bottom line is the dampers can help decrease the maintenance needed for a wind turbine, which makes it

more economical and adds years to an asset, according to Klembczyk.

"If you take a look at the amount of investment you have to make in order to put direct acting dampers into a structure, the cost is relatively small when you look at saving the maintenance cost that would occur normally," he said. "Our dampers will reduce deflection and acceleration and therefore structural stress in a wind turbine."

## SKINNY BUILDINGS

As an analogy, Klembczyk points to the desire to build tall, but skinny, buildings.

"Many tall buildings are being made with a higher slenderness ratio, and a slenderness ratio is basically the ratio between the width and the height of a building," he said. "So, more and more tall buildings are being built these days that have much lower frequencies than they used to. The buildings are becoming taller and skinnier, and therefore have a lower frequency to the point where the occupants of the building could actually be subjected to accelerations that would physically make them sick."

Because of that, ISO standards require building acceleration in high-wind events to be held below a certain level.

"Many buildings now don't have enough damping in them in order to satisfy the acceleration criteria for occupant comfort," Klembczyk said. "So adding damping to structures can easily bring that acceleration criteria back down, so the occupants in the building would not be subjected to high acceleration. That's becoming more and more prevalent in structural engineering these days in order to satisfy wind excitation."

Taylor got involved in seismic damping applications in the 1990s when the many benefits dampers

could offer to buildings and bridges and other structures became apparent, according to Klembczyk.

"One of the more significant product lines that we offer that nobody else in the world offers is an infinite life, low friction damper," he said. "And these are of particular interest to structures that are under continuous excitation from either pedestrian motion or wind excitation."

This type of damper uses a special metal bellows seal, similar to an accordion, Klembczyk said.

"Picture an accordion built out of thin stainless steel elements, and as that accordion flexes back and forth during excitation, those metal bellows will actually encapsulate the damping fluid, and as the convolutions of the bellows flex back and forth, as long as we hold the stresses of those bellows below the fatigue endurance limit, we have a damper that will last forever," he said. "So no matter how many billions and billions of cycles that these dampers are exposed to, you'll never have any kind of failure."

## DESIGNED FOR SPACE

This type of damper is being used on the Millennium Bridge in London, according to Klembczyk. The dampers that Taylor used were originally designed for a space shuttle launch.

Much of the technology used in everyday life more than likely began in the head of an engineer who designed it for a trip into space. Now, industries across the spectrum, including wind, are able to take advantage of those advancements as well.

"Back in the '60s and '70s and '80s, there was a lot of government money being put into the space industry, and now the structural industry is starting to reap the benefits of that technology, even though it's decades later," Klembczyk said. "So, we're still finding new applications for space technology." ↗

# EXPERT KNOWLEDGE. SUSTAINABLE FOCUS.

Staying on the forefront of the new energy economy requires cutting-edge information from authoritative voices. Each month, *Wind Systems* keeps its readers attuned to the latest innovations in the wind energy industry. Let us be your partner in driving sustainability—and your business—to new heights.

For your FREE subscription to *Wind Systems*,  
log on to [windsystemsmag.com](http://windsystemsmag.com).

*Giving Wind Direction*

**WIND**  
SYSTEMS



ISO 9001:2008 Registered • ISO/IEC 17025:2005 Accredited

ONSITE BOLTING SERVICES DONE RIGHT.

WE KNOW CRITICAL BOLTING...

and how to grow a beard!



## WIND ENERGY SOLUTIONS

- ACCELERATED TORQUE AND TENSION SERVICES
- TURNKEY BOLTING SERVICES
- COMPLETE OEM TORQUE AND TENSION SYSTEMS
- BOLTING CONSULTATION SERVICES
- ISO 17025 ACCREDITED CALIBRATION SERVICES
- REPAIR SERVICES FOR MOST TOOL MODELS
- ERAD DIGITAL TORQUE CONTROL SYSTEMS
- ELECTRIC GEAR TURNING SYSTEMS
- WTG SPECIFIC BOLT TENSIONING SYSTEMS
- HYDRAULIC WRENCH SYSTEMS
- WTG SPECIFIC SELF LOAD MEASURING FASTENERS

info@torkworx.com

888.502.WORX

torkworx.com

*extreme bolt working solutions*

sales  
rental  
service  
consulting  
engineering