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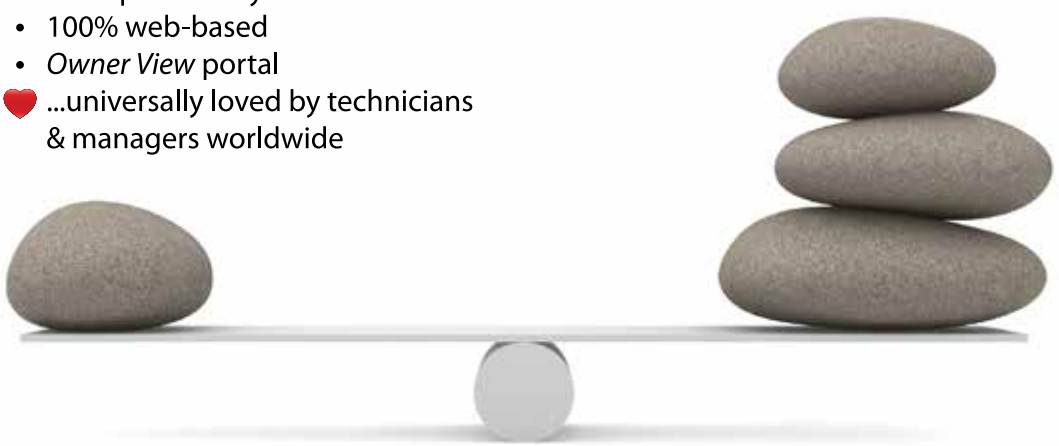

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RESOURCES

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EDLETTER

Our lives are often measured in seasons.

But the seasons would go unnoticed if they didn't change. You wouldn't know to appreciate spring if it weren't for winter. It's the transitions between seasons that make us take notice.

Winter fades into spring, and our surroundings see emerging growth, more activity, and new prospects. Our behavior changes. We venture out more; wear lighter clothes; go on trips.

It's mid-April at the time of this writing—near the exact mid-point of spring. In the short span of one week, the wind energy industry has sloughed off it's heavy winter coat and is getting active.

On April 10, President Obama reaffirmed the administration's commitment to expanding the nation's renewable energy efforts, as outlined in his fiscal year 2014 budget proposal. Clean energy plays a major role in the President's plan. The budget proposes $7.9 billion in clean energy spending (30 percent increase over 2012). It would also would raise (by 29 percent) spending levels on efforts specifically designed to make renewable energy a larger part of the nation's energy mix.

But the most notable provision of the budget proposal involves a permanent, refundable PTC. The proposal would generate $23 billion in renewable energy and energy efficiency incentives over a ten year period.

Based on prior opposition, it's highly unlikely that the President's proposal will pass in it's current form. Still, I applaud the administration for pushing for a long-term renewable energy policy, rather than stop-gap measures that cause industry uncertainty and volatility. It may not be the right fix, but it is a step in the right direction at the right time.

The next day, AWEA released its 2012 market report, highlighting the industry's record performance in 2012. Wind energy in the U.S. installed 13,131MW of capacity in 2012. That's an 28 percent increase over 2011 and represents a $25 billion total investment. Please see page 11 of this issue for a more information regarding the report.

Mid-month, the industry (finally) got some guidance from the IRS regarding language in the PTC extension granted in January.

In clarifying what it means for a wind project to "begin construction" prior to January 1, 2014, the IRS notice defines the term as "when physical work of a significant nature begins." It further clarifies such work, offering examples such as "the beginning of the excavation for the foundation," and "the pouring of concrete pads for the foundation." The beginning of component manufacture (under contract and allocated to a specific project) also is a qualifying condition. Also, a singular "facility," for construction deadline purposes, is now defined as the wind farm project as a whole.

As "safe harbor" provision is also outlined. As long as the owner has incurred at least five percent of the total cost of the project (and continues to work toward completion), prior to January 1, 2014, a project qualifies for the tax credit.

The tools, resources, and motivation we need in order to excel are pooling. It's time we begin to put them to use.

We now stand in the springtime of our industry's life—with new growth, more activity, and new prospects. Let's also be prepared to modify our behavior to match the season upon us.

Stephen Sisk, managing editor
Wind Systems magazine
editor@windsystemsmag.com
(800) 366-2185 ext. 209

WIND SYSTEMS

David C. Cooper
Publisher

Chad Morrison
Associate Publisher

EDITORIAL
Stephen Sisk
Managing Editor

Tim Byrd
Associate Editor

SALES
Glenn Raglin
National Sales Manager

Mike Barker
Regional Sales Manager

Tom McNulty
Regional Sales Manager

CIRCULATION
Teresa Cooper
Manager

Kassie Hughey
Coordinator

Jamie Willett
Assistant

ART
Jeremy Allen
Creative Director

Michele Hall
Graphic Designer

Rebecca Allen
Graphic Designer

CONTRIBUTING WRITERS
Julian Bell
Robert Bergqvist
Dickson C. Chin
Michael C. Gibbs
Jorge Goudet
Michael Graska
Cliff Jones
Lazaro Martinez
Mosby G. Perrow
Abrahan Puente
Steven Quayle
Mike Schmidt
Justin Travis
Jack Wallace

Media solutions

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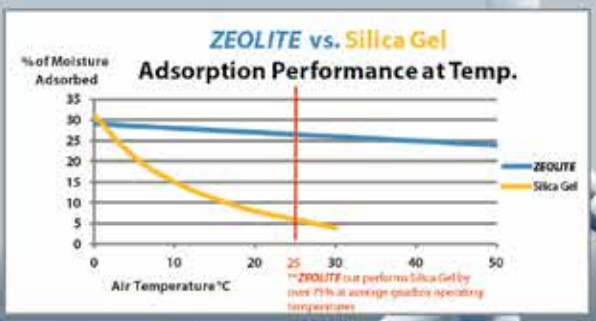

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Average Silica Gel Breather Life	= 6 Months	***ZEOZORB*** ZZ-300 Breather Life	= 12 Months
Average Wind Technician Labor Rate	= $40 hr	Average Wind Technician Labor Rate	= $40 hr
Number of Technicians Required	= 2	Number of Technicians Required	= 2
Number of Breather Change Outs Per Year	= 2	Number of Breather Change Outs Per Year	= 1
($150 x 50) + ($40 x 2 Tech x 2 Hrs x 2 Change x 50)=	$23,500	($75 x 50) + ($40 x 2 Tech x 2 Hrs x 1 Change x 50)	= $11,750
Total 3 Year O&M Cost	= $70,500	Total 3 Year O&M Cost	= $35,250
		Total Savings $70,500 - $35,250	= $35,250

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VESTAS RECEIVES ITS LARGEST CANADIAN TURBINE ORDER

Vestas has secured a firm and unconditional order for the delivery of 166 V100-1.8MW wind turbines along with a 20-year service and maintenance agreement for the 299MW Blackspring Ridge Wind Project, a joint venture of EDF EN Canada, Inc. and Enbridge. It marks the largest order for Vestas wind turbines in Canada.

Deliveries for Blackspring Ridge, located near Lethbridge, Alberta, are scheduled for the second half of this year and commissioning is expected to occur by mid-2014.

"We appreciate these two global energy companies making a long-term commitment to Vestas. Our partnership with EDF EN Canada and Enbridge shows their confidence in our ability to deliver turbines safely and on time," said Chris Brown, president of Vestas' sales and service division in Canada and the U.S. "This project also will increase our market leadership position in Canada and further builds on our strong service business in Alberta."

The 20-year service agreement—the longest in Vestas' history in the U.S. and Canada—features the Active Output Management (AOM) 5000 service option. AOM 5000 features an energy-based availability guarantee to ensure the turbines are operational when the wind is blowing. This service option includes the VestasOnline® surveillance system that remotely controls and monitors the turbines and predicts potential maintenance issues. This allows Vestas to plan maintenance so the turbines are operational for the maximum amount of time.

"Blackspring Ridge is an important addition to Enbridge's fleet of renewable projects as it significantly expands our wind energy portfolio in the Alberta market, which we first entered nearly a decade ago with our Magrath and Chin Chute wind farms," said Don Thompson, Vice President, Green Energy, Enbridge Inc. "Alberta is an attractive environment for wind investments due to its high wind capacity factor and access to transmission. We welcome this opportunity to continue expanding our renewable energy assets into Western Canada and are pleased to continue our relationship with EDF EN Canada and Vestas."

Companies wishing to submit materials for inclusion in this section should contact Stephen Sisk at editor@windsystemsmag.com. Releases accompanied by color images will be given first consideration.

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Vestas' U.S. factories in Colorado will be involved in manufacturing components for Blackspring Ridge, which will become Canada's sixth wind power plant to use V100-1.8 MW turbines. Overall, more than 600 V100-1.8 MW turbines are producing energy at 13 sites across Canada and the United States.

EDF EN Canada and Enbridge will develop and own Blackspring Ridge. Once commissioned, it will be the largest wind power plant in Western Canada with the capacity to provide electricity to nearly 140,000 households.

"EDF EN Canada looks forward to our first opportunity to install Vestas turbines in Canada as part of the Blackspring Ridge project," said Al Kurzenhauser, COO for EDF EN Canada. "Alberta is a promising market that allows us to expand our wind development success into Western Canada. The project further builds on our relationship with both Vestas and Enbridge, demonstrating our business model to optimize assets throughout North America."

Vestas installed its first wind turbines in the Canadian market in 1997 and since has become the leading wind-turbine supplier in the country and in Alberta.

For more information, visit www.vestas.com or www.edf.en.ca.

OBAMA'S 2014 BUDGET PROPOSAL MAKE GREEN ENERGY A PRIORITY

U.S. Deputy Secretary of Energy Daniel Poneman on April 10, detailed President Barack Obama's $28.4 billion Fiscal Year 2013 budget request for the Energy Department. Poneman emphasized the President's continued commitment to an all-of-the-above energy strategy that prioritizes investments in innovation, clean energy technologies, and national security. The Department's budget request is part of the administration-wide effort to strengthen the American economy with energy that is cleaner, cheaper and creates sustainable jobs. The FY 2014 budget request represents tough choices aimed at focusing taxpayer resources on areas that will yield the greatest benefit over time.

"The United States faces one of the greatest challenges ahead, the opportunity to

U.S. WIND ENERGY GROWS 28 PERCENT IN 2012 ON $25 BILLION INVESTMENT

Wind energy grew 28 percent in the United States in 2012, setting a new installation record and confirming its status as a mainstream energy source, according to the American Wind Energy Association's U.S. Wind Industry Annual Market Report for 2012, released in April.

In its best year ever, the U.S. industry topped all energy sources with 42 percent of all new U.S. electric generating capacity. Over 6,700 new wind turbines were erected, which produce enough electricity to power the equivalent of 3.5 million homes. Overall, America finished the year with 45,100 wind turbines that can power 15.2 million homes.

The bumper crop of wind energy benefited the U.S. economy across all 50 states, through $25 billion in private investment in new U.S. wind farms, tens of millions of dollars paid to landowners and local communities in lease payments and property taxes, and billions in projected savings for electricity consumers.

"We had an incredibly productive year in 2012," said AWEA interim CEO Rob Gramlich. "It really showed what this industry can do and the impact we can have with a continued national commitment to renewable energy. We're doing what Americans overwhelmingly say they want: making more clean, renewable energy, and creating good jobs in U.S. factories." The report found that more than 550 factories across the nation provide parts and services for the wind energy industry, which accounted for more than 80,000 American jobs in 2012.

While jobs numbers were hampered as the year went on by Congress's delay in renewing the primary incentives for American wind power—the production and investment tax credits—their extension on Jan. 1, 2013, for projects that start this year has sent the industry back to work.

Among project developers, NextEra Energy Resources installed the most new U.S. wind energy capacity in 2012, amassing 1,505MW. Iberdrola Renewables came in a distant second with 716MW of new installed capacity. EDF Renewable Energy, Caithness, and Duke Energy rounded out the top five, with 658MW, 640MW, and 620MW, respectively.

Geographically, Texas extended its lead among states generating wind energy. It also led all the other states in new wind energy installations. The Lone Star State realized the addition of 1,826MW of wind energy, and exceeded 12,000MW of capacity—accounting for more than a fifth of the nation's wind energy installations. California eclipsed Iowa for second in total installed capacity with the addition of 1,656MW of wind energy capacity. Kansas (1,441MW), Oklahoma (1,127MW), and Illinois (823MW) followed in new 2012 capacity.

On the global scale, the record year for new U.S. wind energy installation narrowly edged the new installations in China (13,000MW), but accounted for just less than 30 percent of global wind energy installations in 2012. New wind energy installations globally in 2012 amounted to 41,236MW.

General Electric maintained its top position as the world's leading turbine manufacturer, installing 3,003 turbines (5,014MW), amounting to a 44.5 percent market share in number of turbines (38.2 percent share of capacity). Siemens, Vestas, Gamesa, and REpower (Suzlon) rounded out the top five.

In addition to the industry's record growth last year, a growing trend augured well for its future: new purchases of wind power by 74 electric utilities, along with at least 18 major industrial consumers and 11 school and universities—all taking advantage of the chance to diversify their energy portfolio and stabilize and lower energy costs, typically on long-term, fixed-rate contracts. Rising utility interest has been seen again this year since the PTC extension, with at least seven utilities issuing new requests for proposals to purchase over 1,000MW of wind power.

Top 2012 wind energy industry facts, by the numbers:

- 13,131 – The amount of installed capacity, in megawatts, installed during 2012 in the U.S.
- 60,007 – The amount of total installed capacity to date, in megawatts, in the U.S.
- 25 – The total investment, in billions of dollars, in U.S. wind energy projects during 2012
- 890 – The number of utility-scale wind projects currently operating in the U.S., consisting of more than 45,000 turbines

AWEA Business Members can download their copy of the complete U.S. Wind Industry Annual Market Report by logging onto the Member Center at www.awea.org.

Source: American Wind Energy Association; American Wind Energy Association U.S. Wind Industry Annual Market Report Year Ending 2012.

lead the global clean energy race. We must continue to out-innovate, out-educate and out-build the rest of the world to meet this challenge," said Deputy Secretary Poneman. "This budget reflects strong commitments to fiscal responsibility and shared sacrifice, while embracing the President's all-of-the-above energy strategy which expands both oil and gas production and investments in new clean energy technologies, while advancing our national security." Specifically, the President's FY 2014 budget request for the Department of Energy:

- Invests in innovative research to lead in research, development, deployment, and production of clean energy technologies;
- Establishes a new goal of doubling American energy productivity by 2030;
- Calls for Congress to establish an $2 billion Energy Security Trust;
- Creates a new Race to the Top for Energy Efficiency and Grid Modernization;
- Helps consumers and businesses save money and improve their energy efficiency through the President's Better Buildings Initiative;
- Supports groundbreaking basic science research and innovation to solve our energy challenges and ensure the U.S. remains at the forefront of science and technology

For more information, visit www.energy.gov or www.whitehouse.gov.

DOE AND NREL ANNOUNCE INAUGURAL COLLEGIATE WIND COMPETITION TEAMS

The U.S. Department of Energy and its National Renewable Energy Laboratory (NREL) are announced the teams selected to take part in the inaugural DOE Collegiate Wind Competition.

The following 10 student teams were selected through a competitive process to compete in the inaugural competition:

- Boise State University
- California Maritime Academy
- Colorado School of Mines
- James Madison University (VA)
- Kansas State University
- Northern Arizona University
- Pennsylvania State University
- University of Alaska - Fairbanks
- University of Kansas
- University of Massachusetts – Lowell

The elite educational programs have committed to formulating an interdisciplinary team, integrating the three principal competition contests into students' coursework and senior design projects. The competition contests are designed to reach students from various engineering and business programs to provide them with engaging, real-world project experience as they prepare to enter the workforce. The selected programs garnered organizational support from their institutions as well as private-sector and community support.

The Collegiate Wind Competition is a forum for undergraduate college students of multiple disciplines to investigate innovative wind energy concepts; gain experience designing, building, and testing a wind turbine to perform according to a customized market data-derived business plan; and increase their knowledge of wind industry barriers. NREL is facilitating the inaugural competition, which will take place in spring 2014.

"Wind energy is one of the fastest-growing electrical energy options in the United States, and the industry requires a skilled workforce with talented people from engineering, business, and communications backgrounds, This competition will help attract students from a wide range of disciplines into this exciting industry," DOE Wind Powering America initiative National Director Jonathan Bartlett said.

The theme of the inaugural competition is to design and construct a lightweight, transportable wind turbine that can be used to power small electronic devices. A principal contest involves testing each team's prototype wind turbine in a wind tunnel under specific conditions. Each team's business plan and turbine will also be evaluated against other pre-weighted criteria. The third event of the competition will be a team-to-team debate relating to current wind market drivers and issues. Teams will be judged on the members' understanding of the issues posed to them, their communication of potential solutions, and their ability to promote constructive dialogue.

This competition is an opportunity for collegiate institutions to showcase student ingenuity and the programs that the students represent. In addition to this national recognition, the turbine from the college or university with the best overall score will be placed on temporary display at the DOE headquarters building in Washington, D.C. The competition enables NREL and DOE to support innovative and forward-thinking educational institutions that incorporate renewable energy technologies, helping to foster the growth of the future wind energy industry and workforce.

For more information, visit www.nrel.gov or www.energy.gov.

FIRST PHASE OF LONDON ARRAY FULLY POWERED

Full capacity has now been reached at the 630MW first phase of the world's largest offshore wind farm, the London Array. The commissioning of the 175th and final turbine happened at 4:09 pm local time on Saturday, April 6.

With all turbines now exporting power to the national grid, London Array is expected to produce enough green electricity to power nearly half a million homes a year. Turbine installation was completed in December 2012; since then the project has focused on fully commissioning and putting into operation all 175 of the 3.6MW Siemens turbines by this spring.

"This is the final major milestone of the construction phase and the culmination of more than two years' offshore construction work which began in March 2011 with the installation of the first foundation," said Project Director Richard Rigg. "It has been a complex operation but I am delighted that the commissioning of the wind farm has now been completed on schedule, despite the worst of the winter weather."

The project has started handing over to the Operations and Maintenance Team. This will be completed in the summer when the last shallow array cable has been buried.

Benj Sykes, Country Manager for DONG Energy's UK Wind business, said: "Building London Array, the world's largest offshore wind farm, is a great achievement. As we now look to our pipeline of future projects, DONG Energy is determined to drive down the costs of our offshore wind farms to €100 per megawatt hour for projects we'll be sanctioning in 2020. What we have learnt at London Array, together with our continuing focus on innovation in technologies and techniques, will help us achieve that." "London Array is a significant achievement in renewable energy," said Tony Cocker, Chief Executive Officer of E.ON UK. "The world's largest operational offshore wind farm will be capable of generating enough energy to power nearly half a million homes and reduce harmful CO2 emissions by over 900,000 tonnes a year. It's been a tough time for the team working on site. The recent bad weather and north easterly winds have whipped up the waves preventing access to the site so this milestone is true reward for their hard work."

London Array is being built around 20km off the coasts of Kent and Essex on a 245km2 site. Phase One covers an area of 90km2 and includes 175 turbines with a combined capacity of 630MW. A possible second phase could add enough capacity to bring the total to 870MW. The project

consortium partners have the following shareholdings: DONG Energy owns 50 percent, E.ON has 30 percent and Masdar has a 20 percent stake. For more information, visit www.londonarray.com.

GE PROTOTYPE OPERATIONAL AT EUROPEAN TEST SITE

General Electric has announced that a prototype of the world's most efficient high-output wind turbine, the new 2.5-120, is operational at a test site in Wieringermeer, Netherlands. The 2.5-120 is the company's first brilliant wind turbine, driving higher power output, improving service productivity and creating new revenue streams for customers.

The 2.5-120, announced in January, harnesses the power of the Industrial Internet to analyze tens of thousands of data points every second allowing for management of variable wind sources to provide smooth, predictable power. The turbine integrates energy storage and advanced forecasting algorithms while communicating seamlessly with neighboring turbines, service technicians and operators.

As the first wind turbine to bring together world-class efficiency and power output at low-wind-speed sites, the 2.5-120 captures a 25 percent increase in efficiency and a 15 percent increase in power output compared to GE's current model.

The turbine's high efficiency and high output unlock higher returns for wind farm operators at low-wind-speed sites. The turbine's advanced controls and 120-meter rotor enable increased energy capture and greater power output in low-wind areas. The taller tower, which has a maximum hub height of 139 meters, makes it ideal for heavily forested regions in places like Europe and Canada.

GE has worked with ECN, a Dutch independent research institute for renewable energy, for the past decade to validate its newest technologies. The 2.5-120 prototype will be tested and validated in accordance with the highest GE and industry standards through fall 2013.

For more information, visit www.ge-energy.com.

LARGEST WIND FARM IN SOUTHERN HEMISPHERE OFFICIALLY OPENS

Australia's 420MW Macarthur Wind Farm, largest in the Southern Hemisphere, featuring Vestas V112-3.0MW turbines has officially opened. Vestas CEO Ditlev Engel participated in the event, which included leading Australian state and federal government officials.

Owned by Australian-based AGL Energy and New Zealand-based Meridian Energy, the Macarthur Wind Farm is a genuinely global construction, engineering, and technology project, with equipment and personnel coming together from four continents. Vestas and Leighton Contractors combined to deliver the logistically complex, AUD $1 billion Macarthur Wind Farm three months ahead of schedule.

With the Macarthur project, Vestas has installed more than 50 percent of the cumulative wind energy capacity in Australia. When the 168MW Musselroe project comes online later this year, that number will rise to almost 60 percent.

"Vestas is strongly committed to the Australian market and very pleased to have such good working relations with our key customers here," Engel said. "Australia is now enjoying the benefits of large-scale clean energy investment and jobs, thanks to its Renewable Energy Target. Bipartisan support for this policy is a crucial element in creating the long-term business certainty to make billion dollar investments like the Macarthur project a reality."

The Macarthur project was the first to purchase the Vestas V112-3.0MW wind turbine. AGL Managing Director & CEO Michael Fraser says, "The V112-3.0MW is the perfect solution to meet our need for a highly-productive and cost-effective turbine for the medium wind speeds on the project site." For more information, visit www.agl.com.au or www.vestas.com.

FIRST WIND ADOPTS WTGSERVICE.COM MAINTENANCE MANAGEMENT SYSTEM

3Floorsup, developer of WTGservice.com, has today announced that First Wind is to adopt its industry-leading maintenance management system. First Wind has selected WTGservice maintenance management system for its in-house service operations. The wind industry-specific software will be used by First Wind technicians to track, manage and analyze asset history on First Wind's turbines across the continental USA and Hawaii.

"We are looking forward to using the WTGservice system as we grow our operations at First Wind," said First Wind's Vice President of Operations, E.J. Martin. "WTGservice has a strong track record in the wind industry and we're pleased to be working with them."

WTGservice.com is the most widely used wind-industry specific product of its kind; used with thousands of utility-grade turbines worldwide in multiple languages. It is used to plan, track and manage turbine maintenance and to analyze and report asset history.

"We're extremely excited and pleased to be working closely with First Wind as they expand their service division," said Steven Quayle, 3Floorsup Director of Business Development. "Working with First Wind demonstrates the suitability of WTGservice.com to industry stakeholders of all

kinds, from OEM's to independent service providers to, as in this case, owner operators."

"The beauty of WTGservice is the front end; technicians just get it. It's in no way daunting for them. As a result we're able to meet our client's greater ambitions for the collection and analysis of a complete service history of their fleet," Quayle said. The First Wind deal extends WTGservice's continued growth in the USA market, having achieved 50 percent plus year-on-year growth over the past three years. "It's another sign that service providers and owners are getting smarter about the effective planning, management and analysis of both scheduled and reactive maintenance."

With training and implementation already underway, First Wind is expected to be fully operational with WTGservice during April.

For more information, visit www.WTGservice.com or www.firstwind.com.

SAMPE 2013 TO BE HELD IN LONG BEACH, CALIF. MAY 6-9.

SAMPE 2013 offers innovative approaches in the materials and processes industry. Four days of high-level content draw on the expertise of the leading M&P producers in the research, government, and academic sectors.

At SAMPE 2013, top M&P industry professionals will lead sessions and provide attendees the tools they need to take their projects to the next level. Dr. John Tracy, Chief Technology officer and The Boeing Company Senior Vice President, Engineering, Operation & Technology will give an opening keynote presentation on developing the future of materials and processes that shape aerospace.

SAMPE 2013 delivers access to industry leading suppliers, education, and networking opportunities. Conference attendees are free to mix and match sessions from a series of composites and manufacturing topics. The organizing committee has also put together eight immersive short course tutorials to provide an overview of M&P hot topics.

Panels will include:

- Global Composites
- Integrated Computational Methods for Composite Materials (ICM2)
- Life Cycle Considerations for Engineered Nanomaterials
- Aviation and Eco-Innovative Materials
- How Can an Educated Workforce Reduce Risk in Composites Design, Manufacturing and In-Service Support?
- Manufacturing Challenges Facing the DoD (ITAR)

The 2013 SAMPE Fellows will be honored at a special Fellow Banquet on Monday evening, May 6 at the Renaissance Hotel. This event will take place during the SAMPE 2013 Conference and Exhibition in Long Beach, California, May 6-9.

For more information, visit www.sampe.org.

VESTAS APPOINTS NEW CHIEF FINANCIAL OFFICER

Vestas Wind Systems A/S appointed Marika Fredriksson as its Chief Financial Officer and member of the Executive Management. She succeeds Dag Gunnar Andresen, who unfortunately has decided to leave the company by the end of this month due to personal reasons.

Fredriksson has extensive experience in the role as CFO with 15 years in various industries and companies such as Gambro (2009-2012), Autoliv (2008-2009) and Volvo Construction Equipment (1996-2008). Over the years, she has also successfully participated in turnaround processes, change management and M&A. Fredriksson has gained international experience by managing change programs in various parts of the world as well as key acquisitions in Korea, the U.S., and China. She holds a masters' degree from the Swedish School of Economics in Helsinki.

"I would like to thank Dag Andresen for his important contribution to Vestas. At the same time, I am very pleased that we have managed to find an excellent new CFO in Marika Fredriksson, who will be joining Vestas on 1 May 2013. I am certain that she has the right competences, commitment and cultural fit into our Executive Management team," said Group President & CEO, Ditlev Engel.

"In Marika Fredriksson we have found a new CFO with the calibre and capabilities addressing Vestas' needs. I would like to thank Dag Andresen for his contribution to the company during the past year," said Chairman of the board of Vestas Wind Systems A/S, Bert Nordberg.

With the appointment of the new CFO, the Executive Management team at Vestas Wind Systems A/S consists of Ditlev Engel (Group President & CEO), Anders Vedel (Chief Turbines Officer), Juan Araluce (Chief Sales Officer), Jean-Mark Lechêne (Chief Operating Officer) and Marika Fredriksson (Chief Financial Officer).

For more information, visit www.vestas.com.

SUZLON GROUP CROSSES 1GW MILESTONE IN U.K.

Suzlon Group's U.K. subsidiary, REpower Systems SE, a leading manufacturer of onshore and offshore wind turbines, has reached the historic milestone of 1GW installed capacity across U.K. wind farms. REpower UK is only the third manufacturer in the U.K. to achieve the 1GW watershed.

Since its inception in 2005, REpower UK has consistently been one of the fastest growing turbine manufacturers in the U.K. The company has

> "We are delighted to reach the historic milestone of 1GW of installed capacity in the U.K. We believe this is testament to the quality and reliability of REpower's turbine technology which is ideally suited to U.K. wind conditions both onshore and offshore."

taken just over two years to add a further 500MW to its portfolio since announcing 500MW of installed capacity in the summer of 2010. By 2014, REpower UK is looking to secure 25 percent of U.K. onshore market share and 30 percent of U.K. offshore market share.

Since REpower UK reached 500MW installed capacity back in 2010, the manufacturer has added a substantial number of wind farms to its portfolio in England, Scotland and Wales. These include the Penny Hill wind farm developed by Banks Renewables which features six 3.4M104 turbines and was the project that took REpower UK to 1GW. 3.4M104 is currently the company's most powerful onshore wind turbine, and is the most powerful onshore turbine to be installed and operate in the U.K.

Rick Eggleston, Managing Director of REpower UK said: "We are delighted to reach the historic milestone of 1GW of installed capacity in the U.K. We believe this is testament to the quality and reliability of REpower's turbine technology which is ideally suited to U.K. wind conditions both onshore and offshore. We are committed to developing our market share and installed base in the U.K. wind power sector, and to building further on the successful relationships we have developed since we installed our first turbine in the UK in 2005."

For more information, visit www.suzlon.com or www.repower.de.

EDF-RE INCREASES INVESTMENT IN TEXAS WITH SPINNING SPUR II

EDF Renewable Energy announced it has exercised an option to acquire the remaining 49 percent interest in the 161MW Spinning Spur II

Wind Project from Cielo Wind Power, LP, bringing its ownership to 100 percent.

In addition, EDF RE has signed a turbine supply agreement with General Electric for the purchase of 87 wind turbines with a rated capacity of 1.85 MW each. Spinning Spur II Wind Project spans approximately 16,800 acres in Oldham County, Texas which is approximately 30 miles west of Amarillo. Construction is slated to start in June with an operational date of midsummer 2014. When complete, EDF RE will have put into service 472 megawatts in Texas.

Spinning Spur II will be one of the first projects to take advantage of the new CREZ (Competitive Renewable Energy Zones) transmission line in the panhandle. The electricity generated will be sold under a 10-year energy purchase agreement.

"Launching our third project in Texas demonstrates confidence in the next wave of wind power's growth and construction in the State," said Tristan Grimbert, President and CEO of EDF Renewable Energy. "In 2011, we determined to enter the Texas market with Spinning Spur I, and are pleased to build upon this success and increase our investment in Oldham County. We appreciate our partner, Cielo to open the doors for construction and ownership of these essential projects for the community, which promise to not only deliver clean energy but also economic development."

For more information, visit www.edf-re.com

THE SWITCH APPOINTS NEW GM IN CHINA

The Switch, a leading supplier of megawatt-class permanent magnet generator and full-power converter packages for wind power and other renewable energy applications, announced today the appointment of David Zhao in the position of General Manager for China.

This hiring of Zhao underpins the Switch's long-term ambitions to establish itself as the preferred partner in PMG and FPC in a market in which The Switch has been extremely strong. Zhao comes from a mechanical engineering background and previously held senior management positions in the telecommunication and transportation industries. He brings a wealth of capabilities in operations and sourcing. This move represents a further step in fully immersing the company in the market, which is of strategic importance to The Switch.

"The Chinese wind power market will remain challenging, particularly because of overcapacity. But the government still has ambitious plans to support the development of clean energy in the short and medium terms. The Switch has pioneered PMG and FPC technologies, and we are in a favourable position to meet the needs of Chinese manufacturers effectively," commented Zhao.

Zhao's leadership mandate includes implementing and applying The Switch's flexible business model in China to optimize operations and grow its local customer base. One main objective will be to enhance The Switch's local capabilities as well as improving business processes and promoting the company's engineering competence. "David will further improve the communication within the group and among the personnel in China. We have done great work building a good platform in that market and I am sure that our new General Manager will prove instrumental in improving our operations there," added Jukka-Pekka Mäkinen, Chief Executive of The Switch.

For more information, visit www.theswitch.com.

EDF RENEWABLE SERVICES WINS O&M CONTRACT FOR EDOM HILLS WIND FARM

EDF Renewable Services announced it has secured the operations and maintenance contract at the Edom Hills Wind Farm. Owned and operated by a subsidiary of BP Wind Energy, Edom Hills is located in the San Gorgonio Pass near Palm Springs, California.

The site consists of eight Clipper Windpower 2.5MW turbines generating 20MW of renewable energy. Dalen Copeland, Director of Business Development for EDF Renewable Services, commented "Our experience with the Clipper turbines in Oaxaca, Mexico provides confidence that our O&M team will optimize availability for BP Wind Energy. Our depth of expertise in the San Gorgonio wind regime, complemented by our large local workforce, uniquely positions us to provide a smooth transition with minimum interruption of operations. With this contract, EDF RS services 87.5MW of Clipper wind turbines in the U.S. and Mexico."

Under the terms of the agreement, EDF Renewable Services will provide a suite of operations and maintenance services for wind turbine generators. EDF Renewable Services is an industry leader, providing O&M services to more than 7,000MW of wind and solar projects across North America. With over 25 years of experience and 450 full-time, trained and certified wind technicians employed, EDF Renewable Services has the resources and experience to optimize project availability and maximize revenues.

For more information, visit www.edf-re.com.

WIND ENERGY BLOWING LIFE INTO GLOBAL CARBON FIBER INDUSTRY

After years of steady but unimpressive growth, the global carbon fiber industry is finally set for a boom in revenue, thanks to burgeoning demand from the wind energy market, according to the latest report from business intelligence company GBI Research.

According to the firm's latest release, global carbon fiber demand will hit 153,700 tons in 2020, climbing from 52,500 tons in 2012—a massive increase of 193% in just eight years.

Wind energy—a vital segment of the rapidly expanding renewable energy market—will be the key driver of the carbon fiber industry, GBI Research colcluded.

Currently, wind turbine blades constructed from Glass Fiber Reinforced Polymer (GFRP) dominate the industry landscape, but due to their greater rigidity, lower weight and reduced cost, producers are making the move to carbon fiber alternatives.

Julian Bell
Signal Energy Constructors

Maximizing long-term integrity of wind turbine foundation integrity requires considerable attention to fundamental aspects of construction and design.

THERE ARE FOUR MAJOR areas of wind project construction: civil (roads, wind turbine foundations, etc.); electrical collection system; wind turbine erection; and high voltage electrical work (substation/switchyard/transmission line). This column will examine some of the critical aspects of foundation design and construction. Quality foundations are one of the most important aspects of wind farm construction. Balance of plant contractors must exercise diligence throughout the wind turbine foundation design, procurement and installation process to insure that their foundations maintain their integrity for the full life of the wind project.

COMPATIBILITY WITH GEOTECHNICAL CHARACTERISTICS

Foundation designers choose the appropriate foundation type based upon the soil characteristics at each foundation location. Borings should be done at each turbine site to determine the suitable design. There are a number of commonly used foundation types: spread footing (or inverted "T"), tensionless pier, rock anchor, and soil anchor. The geotechnical investigation must include the appropriate geotechnical tests necessary to appropriately select and design the foundation. The geotechnical report results will be used not only for the foundation design, but also to determine the appropriate concrete mix, collection cable sizing and grounding grid design.

WIND FARM FOUNDATION DESIGNERS/ENGINEERS

Contractors that are engaging foundation design firms should consider several factors in making their selection. The design firm should have experience in designing foundations in the soil conditions similar to the specific project site, along with knowledge relative to the foundation's constructability and costs. The firm should understand the turbine's electrical interfaces (conduit) and be comfortable integrating them into their design. The firm should be accustomed to developing a design that meets all codes, standards, and turbine manufacturer requirements, and at the same time is cost efficient. Importantly, owners typically employ a third-party engineer to review the foundation design, often as a requirement of the project lender. Foundation design reviews can be extremely rigorous and the design firm should be familiar with this process and capable of successfully shepherding their design through this review.

> "Foundation costs comprise a significant percentage of the overall construction costs, and are often on the project's critical path."

CONSTRUCTION ISSUES

Foundation costs comprise a significant percentage of the overall construction costs, and are often on the project's critical path. In addition, foundation quality must be checked at multiple points on every foundation. Accordingly, each aspect of the wind turbine foundation design/construction must be planned carefully before construction begins:

- Weather conditions–Concrete placement in both hot and cold weather conditions requires the performance of specific tasks to ensure wind turbine foundation quality. Proper planning is essential to make sure that the proper options to deal with weather conditions are available before the project starts.
- Concrete sourcing–Wind projects located beyond the acceptable driving distance from a permanent ready mix plant, or in areas where permanent ready mix plants are not capable of meeting the quantity requirements, will typically use an onsite batch plant. Permitting the plant can be a schedule issue, and batch plant operational availability is critical. Accordingly, whenever a batch plant is used, permitting should be performed early in the preconstruction phase, and a secondary concrete source must be available as a contingency.

Julian Bell is the director of preconstruction for Signal Energy Constructors. For more information visit: www.signalenergy.com.

- Material Procurement–Foundations use large quantities of reinforcing steel. Rebar is a commodity and is subject to price and availability fluctuations. The contractor must ensure that the wind turbine foundation design is completed (and approved) in sufficient time to allow for timely site delivery. In recent years, large foreign purchases of rebar have created extremely long lead times and upward price pressure.
- Installation Expertise–Wind farm foundation installation is essentially a manufacturing process that occurs in the field. Not all installation firms excel at relatively small, but repetitive, pours. Choosing the right installer is extremely important. Foundation quality depends upon attentiveness to detail in each installation phase: excavating, forming, rebar placement and tying, and concrete placement. Installation procedures are repeated for each foundation and it's important to get it right the first time. Successful foundation installers understand that crew efficiency increases with each foundation, and they count on this increased efficiency in pricing each project and in developing their quality procedures.
- Quality Assurance/Quality Control–Contractors must have a stringent QA/QC process for wind turbine foundation installation. The QA/QC system should be designed to verify each aspect of foundation installation. Signal Energy's list of inspection and verification activities for foundation construction contains over eighty items and is too lengthy to repeat in this column. However, two practices are worthy of mention: (1) Requiring a qualified representative of the project geotechnical engineer to observe the foundation excavation to verify that the soil conditions are consistent with the report; and (2) Requiring a qualified representative of the foundation engineer to observe the foundation installation to confirm that it is installed in accordance with the foundation design.

Wind farm foundation failures can have serious economic, safety and reputational implications for contractors, engineers, owners and turbine suppliers. Accordingly, contractors must exercise a high degree of diligence to ensure foundation integrity and reliability.

Jack Wallace
Frontier Pro Services

Avoiding contamination and performing grease sample analysis during low-speed bearing maintenance help mitigate chances of surprise events.

ON MOST WIND TURBINES TODAY, bearings outside of the main gearbox are lubricated with grease. Grease is typically pumped into a bearing with a grease gun, either manually or automatically. Other items such as open gear teeth are also protected with a layer of grease—applied by a brush, or automatic lubrication device. Applying this lubricant is fairly simple and is very successful in providing the necessary lubrication to bearings or gears.

For low-speed bearings, such as the blade pitch bearings and the main bearing(s) on the low speed shaft, grease is used to provide barrier lubrication to the mechanical components. This means that grease is used to coat the components so that the typically metal rollers and races don't touch each other during movement. This allows components to work without suffering any wear during use. If the metal components become bare of the grease coating, metal-to-metal contact occurs, causing wear and potentially resulting in damage to component surfaces. Usually this damage results in scarring the surface of the rollers and races, and wear debris is generated. The debris may not fall away from the wear surfaces and can be held in place by the surrounding grease. This debris then can be run through and in between items that should be protected by the grease coating, and instead the debris is caught between the two mating surfaces causing more damage and more debris. This is kind of like getting a rock stuck in your shoe and causing pain to your foot. It just doesn't belong there.

To prevent this from happening, you have to ensure to have enough grease in the mechanical device at all times. You also have to be careful when adding grease to the system not to introduce dirt or other contaminants into the lubrication system. This means that you must always be mindful when opening grease containers to not allow dirt from the ambient area to contaminate the exposed replacement grease. If you are pumping grease in with a standard grease gun, you must also always ensure that the grease fittings are wiped clean and that the grease gun application tip is clean. Usually it is good practice to discard the first pump from the grease gun to ensure that the grease at the tip of the gun is not contaminated. This helps to prevent introduction of contaminants during the maintenance service.

For all of you managers and owners, how do you know if your low speed bearings, such as your low speed shaft bearing(s), are being properly lubed? How do you know that the pitch bearings on your turbines are not being damaged due to insufficient barrier lubrication or contamination? The way to monitor the wear of these items is by collecting and performing "Grease Sample Analysis."

Grease sampling of low-speed bearings protected by grease for barrier lubrication has been used in the wind energy since the beginning of our modern industry. Part of the U.S. Windpower 56/100 wind turbine maintenance is to take grease samples during the service from the turbine's "free yaw" roller bearing. The grease samples are used to track the size and quantity of particles found in the sample over the life of the turbine. Grease samples are compared to previous samples, and to other turbine samples. Trending is done, and if the sample contains evidence of particles larger than considered acceptable, the bearing is scheduled for replacement. This collection of grease sample data helps to prevent surprises. For this type of turbine, the surprise that can happen is the failure of the bearing and the turbine coming off the top of the tower, unplanned, destroying the machine. The collection of grease samples is not a trivial pursuit.

Grease sampling of all low-speed bearings is something that all turbine owners and service providers should be performing. This is a fairly simple task and can be performed during the normal maintenance services without incurring that much more additional time to perform the service. It also helps to reinforce attention on the color and quantity of expelled grease from grease systems, which can also supply information as to the performance and health of the specific mechanical system.

These grease samples can be sent to a test center to be analyzed for wear debris. Usually the lab can determine if the wear particles from the grease sample are ferrous wear particles, non-ferrous wear particles, and if outside contaminants are present. The particles are classified for comparison. The analysis usually is supported by photographs, and is performed by experienced analyst.

Collecting and analyzing grease samples on a regular basis gives you the ability to spot trends or abnormalities that could potentially lead to equipment failure. This information allows you to make good decisions and reduces your chances of being broadsided by a surprise event. Remember, surprise events on a wind farm are rarely positive, and result in less production and expensive repairs.

Jack Wallace is director of wind turbine technical services for Frontier Pro Services. He can be contacted at jwallace@frontierpro.com. For more information on Frontier Pro Services, visit www.frontierpro.com

By Steven Quayle
WTGservice.com

Computerized maintenance management systems offer streamlined approach to maintenance and integration with ERPs for predicted growth of O&M segment.

IT WASN'T SO LONG AGO that I witnessed paper service reports being stored at the base of a tower. For many organizations, things haven't advanced far beyond that, with spreadsheets still being acceptable to some as a legitimate method of data storage.

In their 2011 study on Computerized Maintenance Management System (CMMS) usage, Reliabilityweb.com reported that almost half of all respondents believed there to be no return on investment from their CMMS. It's a staggering statistic, but kind of understandable.

Why then, in a recent report for Sandia Laboratories, did Management Resources Group conclude that a good CMMS "can play a significant role in achieving critical goals" on wind farms?

The truth is that a quality, well-implemented CMMS is critical to any legitimate service division. It starts by viewing a CMMS as not just a repository for asset history, but as a tool that can streamline and control day-to-day facility management.

BACKBONE OF A SERVICE DIVISION

A quality CMMS will permit all stakeholders, from technicians to service managers, from HR to the asset owners, to be in touch with the goings on of a facility, without having to necessarily be a power user. It should allow management to focus attention elsewhere and allow the system to do what it is supposed to do.

A CMMS should allow management to systematically manage workflow with consideration to the resources that are required. This not only means replacing the whiteboard of daily work with a more sophisticated and visible approach, but generally tying together key functions like safety, planning, troubleshooting, to mention but a few, in order to gain a holistic view of one or multiple sites.

The advent of Software as a Service (SaaS) is helping this happen, with CMMS users reaping the benefits of "anywhere, anytime" access, low start-up costs, reduced (and often eliminated) IT costs, painless, automated upgrades, and seamless integrations with other software including Enterprise Resource Planners (ERP's). Application Programming Interfaces, or API's, allow integrations to be established quicker and more easily than in the past. It also means that technicians are not spending time in front of big, clunky ERP's.

As the industry somewhat ironically plays catch-up to older, more established ones, the shift in asset demographics following a construction boom period is forcing all stakeholders to reassess systems and procedures to reduce overheads and streamline operations. IHS business analysts report that operations & maintenance costs are expected to double to around $6 billion within 12 years. This means that asset owners need to get smart about knowing their assets now. For many of them this has been severely neglected in the past resulting in an overall lack of quality historical data upon which to not only judge service tenders, but to predict future maintenance costs as the assets age.

Herein lies an opportunity for service providers, be they the OEM or ISP, to use their CMMS to strengthen and enhance their relationship with their customer by way of data openness. Owners on the other hand need to ask themselves if they are sufficiently prepared ahead of time with a comprehensive, searchable asset history. It creates an environment whereby knowledge is retained regardless of staff changes or shift in O&M strategy by the asset owner.

BEYOND SCADA

The benefits of SCADA are well documented, but what it can't tell is what actually went wrong, what the actual cause of the fault was, how the issue was rectified and can consequently be prevented in the future. It doesn't tell us what materials would be required if the same event occurred again, and what manpower would likely be called upon. Technicians and engineers tell us this, and a quality CMMS is the means by which that feedback can be stored and systematically called upon when and as required.

It therefore stands to reason that quality CMMS data will play an effective role going forward for troubleshooting, resource planning, and even design modification. The wind industry is really only scratching the surface of where the use of CMMS's can drive efficiencies. They are undoubtedly the next frontier in predictive maintenance and performance enhancement as quality subjective and often anecdotal data is harnessed and turned into a powerful resource.

It's impossible to predict the full extent to which CMMS data will be fully leveraged in the future. And yes, it is undoubtedly difficult to define a true return on investment of a CMMS. But perhaps instead of trying to determine ROI we should be asking if any legitimate service division can compete, both in service offering and in operational efficiencies, without this essential tool?

Steven Quayle is Director of Marketing and Business Development with WTGservice.com. He can be reached at 414-795-5289 or steven.quayle@wtgservice.com.

Michael Graska
Vectora Transportation LLC

Making accurate comparisons and a greater understanding the budgeting process can aid in avoiding transportation "bill shock."

AS THE SAYING GOES, "the devil is in the details." This holds true when budgeting a transportation project. Items are often left out of the budgeting process that are not accounted for when the final tab is added up. These unexpected, unexplained charges cause arguments between clients and vendors, and can cause the relationship to be damaged. This angst could have been avoided with a better budget process.

Before I go into the details of what should be included in a project transportation budget, we should first address why and how such budget gaps accrue. First, often a customer is inclined to accept the lowest bid without confirming if all quotes are equal. Bids often don't meet the "apples to apples" comparison test. Assumptions made without taking this variance into account often prove to be false. Second, suppliers often fail to include costs related to circumstances that they hope will not occur but often do. I call this the "ask for forgiveness rather seek permission" method of quotation. The best way to counteract budget gaps is to be totally transparent in the process while maintaining a consistent punch list so that all vendors are quoting the same items.

I suggest that the transportation budget be broken into three categories: Mobilization, Execution and De-Mobilizations. Budget items and associated costs should be considered for each category. As the category titles suggest, there is a natural flow in the budgeting process: ramping up, doing the work and ramping down. There may be similar tasks in each category, but the associated costs may vary. For example: In the mobilization phase, welding may be needed to attach a fixture to a rail car. Consequently, this welding will need to be removed from the fixture during de-mobilization. The two tasks are related, but the costs are not the same.

In the mobilization category, items to be considered are: design and engineering costs; installation costs; procurement of materials; logistics costs associated with preparing for the work; and acquisition of information. As the category title indicates, mobilization involves getting everything ready and mobilized in preparation for work to start. This includes understanding how to position resources, information, and money. An example of positioning of information is issuing the proper permits are in place before work begins. This phase is critical to the success of the overall project. The more issues are understood and anticipated, the more costs become transparent and lessen the chances for budget surprise down the road.

The execution phase is how you use the resources, information, and money to do the work. If the budgeting process was effective, you are matching actual costs to budgeted costs with very few surprises. Beware that this is the category that often vendors skimp on during the bidding process to earn a job, with hopes of recovering costs later. Once the project is initiated, the execution phase is where the time, resources and scope that were estimated and budgeted are compared to the actual. This is where the game is actually being played and you are keeping score. To do this, I like to use variance reporting to track project progress.

> **"The more thorough and detailed the budget is in all three categories, the easier it is to compare bids, understand true costs, and execute the project on time and budget."**

De-mobilization costs are often neglected to be considered or short-budgeted. But the money and time is real when it comes to ramping down a project. Clean-up and restoration costs should be included in this category. Movement of resources to a pre-project stage also has to be considered. I like to emphasize this category with clients since it is the one most underestimated and least understood.

So how do you avoid budget gaps, unnecessary conflict and strained relationships between clients and suppliers? The answer truly is: "the devil is in the details." The more thorough and detailed the budget is in all three categories, the easier it is to compare bids, understand true costs, and execute the project on time and budget. Always ask for the details of the budget. This allows you to compare bids and ensure that you are comparing apples to apples.

Michael E. Graska is senior manager of operations and engineering for Vectora Transportation LLC. For more information, go to www.vectoratransportation.com.

TORKWORX, LP

By Stephen Sisk

Torkworx, LP offers a wide portfolio of torquing and tensioning products and solutions designed to specifically meet the individual needs of its customers.

Done right the first time.

That's what it all boils down to for directing partner Pete Fuller and the 15 employees of Spring, Texas-based Torkworx. Those five words have carried the company from humble beginnings in a garage to exponential growth and a hefty portfolio of products and services—in only five years.

Drawing on a decade of experience in industrial bolting systems and technologies, Fuller started Torkworx, LP in 2008. His employer's bolting services group (which he began more than five years earlier) was purchased by a competitor.

Frustrated with the company's product line, which he described as "replaceable" and "disposable," Fuller sought an opportunity to provide customers with an alternative. In what would become the driving operating philosophy of his company, he recognized specific customer needs and demands and proceeded to provide a solution.

"What I did was look at different quality products that I was familiar with and that I believed in, and saw there would be a vacuum when this company came into play for those manufacturers. I continued my relationship with those same manufacturers with Torkworx. These are quality products made in the U.S., the U.K., and Canada."

In about a year, the company had moved out of Fuller's garage and had hired three employees. Another year passed, and they hired four more. In 2011, the company moved again—this time to a 10,000 square-foot facility.

Now, the company has 15 full-time employees and a product and service portfolio that rivals those of larger companies.

While the number of products and manufacturers is extensive, the focus is purposefully narrow. Torkworx is strictly about torquing and tensioning.

"We offer the most effective bolting equipment available that we've been able to identify through rigorous testing and in-field use," Fuller said.

That equipment includes all different types of torquing tools—manual, pneumatic, hydraulic, and electronic.

"Our products really consist of anything that's involved with controlling the way a mechanical joint goes together and comes apart," Fuller said.

That kind of versatility, according to Fuller, allows Torkworx to maintain its focus on its founding principle.

"One thing that we do really well is identifying customer needs. We allow the customer to tell us what their requirements are. Once we know those requirements, we provide an unbiased solution for that particular application."

Often, a customer's needs can't be met solely by off-the-shelf equipment. In those instances, Torkworx is able to re-engineer and modify equipment, or in some cases start fresh and develop suitable equipment through both in-house and vendor engineering personnel.

For example: If a customer has a highly-specialized, time-critical task that cannot be achieved using standard equipment, Torkworx consults with the customer to identify the task that needs to be performed. Once that has been established, the company works directly with the customer as well as vendors to build an effective custom solution specifically tuned to handle the task at hand, increasing speed and efficiency and allowing the customer to be more productive.

Torkworx' cites power generation industries as its primary client base—mostly in conventional power generation methods like gas and steam.

For more information about Torkworx' product and service offerings, call 888-502-WORX (9679), or visit www.torkworx.com.

However, the company has made significant strides in renewable energy as well.

"Most of our employees have come from a power services background. When renewable energy ramped up, we realized it was something that we needed to pursue," Fuller said. "We're accustomed to the customer bases in that industry, so it was an easy transition for us to extend our reach into renewable power services."

Specifically regarding wind energy, Torkworx offers its custom E-RAD torquing tool. This is a constant rotation torque device which is controlled by computer. Based on manufacturer claims, the tool: features a lightweight architecture; is faster than traditional torque tools; offers a high degree of strength and durability; and operates quieter than conventional torquing equipment.

According to Fuller, Torkworx takes this equipment a step further with the company's custom approach. Torkworx consults with the customer and pre-loads data and torque specifications that are unique to tasks the customer performs on a regular basis.

For example: If an ISP or wind farm operator performs maintenance tasks a certain turbine model within their fleet, Torkworx can load all of the torque information for every bolt on the turbine into the E-RAD control module. The technician then has the ability to pull up the necessary task or bolt for that turbine, push a button, and the tool automatically sets itself for that specific application.

Another feature of the E-RAD tool is its data collection capability. Once a technician has completed a given task, the tool is then able to export that data to computer spreadsheets for maintenance record keeping and follow-up with the customer.

Additionally, a large segment of Torkworx' wind energy portfolio involves basebolt tension checks. Although somewhat new to the company's product and service catalog (within the last 18 months), Torkworx has seen a considerable amount of success

> "One thing that we do really well is identifying customer needs. We allow the customer to tell us what their requirements are. Once we know those requirements, we provide an unbiased solution for that particular application."

with its basebolt services. According to Fuller, the company is averaging 1,200–1,500 turbine basebolt tension checks each year. Due to unique methods and technology, the company is able to perform this service much faster than what is considered normal.

"We've become so efficient at it that we can do a 100 percent basebolt tension check in less than one hour. We can do a ten percent check in less than 12 minutes," Fuller said. He attributes the increased efficiency not only to the equipment and technology, but also to the skill of the labor force, who are specialized in the task.

"We went into this kind of service with experience in the power industry," Fuller said. "We understand that time is money. The faster we can give them the turbine back, the better off they are and the more value we bring. Previously, with other contractors, it didn't matter if they were there for ten hours or ten days. They're charging the same hourly rate day-in, day-out. There was no incentive for them to get it done quickly."

Torkworx is poised for continued growth in the future. Currently, the company is seeing 32 percent annual growth. That's something that Fuller, who shares executive responsibilities at the company with his wife Kristi Fuller, attributes both to the company's unique approach of an unbiased solution to address customer needs, as well as a culture of responsibility of ownership among the work force. Pete Fuller estimates that the total combined torquing and tensioning experience between himself and the company's skilled labor force exceeds 100 years.

"Everybody is incentivized to perform and cut costs and increase margins," Fuller said. "Going back to our motto, it's in everybody's best interest, since they have skin in the game, to get it done right the first time."

As part of the company's growth plan moving forward, the woman-minority-owned business is evolving to begin to serve other industries. The company travels across the nation providing its services, and sells products internationally. Currently, Torkworx is making inroads into oil/gas and sub-sea/marine markets.

OPTIMIZED WIND FARM OPERATION AND MAINTENANCE

The challenges of selecting an O&M service provider in a maturing industry.

By Robert Bergqvist

Robert Bergqvist is vice president of sales and marketing with UpWind Solutions, Inc. He can be reached at 619-858-5488 or robert.bergqvist@upwindsolutions.com. For more information about UpWind Solutions, visit www.upwindsolutions.com.

WIND FARM OWNERS ARE FACED with many challenges to increase availability and production and reduce costs, all while performing safer than last year and with higher levels of quality. In addition, competing with the price of electricity from other sources of energy generation requires the highest standard of service for the lowest comparative cost. In other words, the owner's service provider must deliver more production for a fixed price that equates to a lower cost of electricity, ultimately giving the owner a better Return On Investment.

Overcoming these challenges is easier said than done, especially if you're not in 100 percent control of all steps involved in performance excellence. Wind farm owners rely on a supply chain every day to get spare parts, solve engineering problems, complete daily operations, execute planned maintenance and manage unplanned events. This supply chain is made up from companies that offer products and services throughout the wind farm's lifecycle—from independent engineering firms to development contractors, the wind turbine Original Equipment Manufacturers (OEMs), Independent Service Providers (ISPs), providers of spare parts and consumables, supplement labor contractors, inspection services vendors, etc. At

selection of vendors, for the various services and products needed, the wind farm owner places a great deal of trust on the vendor to perform in the best interest of the wind farm owner.

As the industry continues to mature, the quality of service and the capabilities of both OEMs and ISPs vary dramatically. In this context, it is essential that wind farm owners understand the breadth and depth of offerings from their existing, or potential, vendors. Identifying those who deliver value on a consistent basis and those who will continue to evolve and improve the solutions they provide to their customers. Equally important, wind farm owners have to take measures to get in control of their assets and not solely rely on their vendors. When buying wind turbines for a specific trust and signing up for the warranty and the initial years of Operations and Maintenance (O&M) services, there is a great deal of trust that is placed on the selected vendor. Since we're likely to see a number of wind turbine OEMs go out of business in 2013-2014, the selection process need to evaluate the likelihood of vendors being able to stay in business and grow their business at a sustainable rate. Unfortunately, one cannot rely on that the best technology will prevail. The vendor's ability to sell and service their customers, the way that their customers want to, also has to be weighted in, in addition to a number of other factors.

LIBERATING DATA AND DRIVING PERFORMANCE

For the thousands of wind turbines that are already operating, the wind turbine vendor selection has obviously already been made and the question at hand is how to manage that situation. Many wind farm owners have been doing their best to overcome operation manuals, drawings and master parts lists. Some have even made a conscious decision to invest in staffing and building up an in-house O&M organization with safety and quality programs of their own in order to not have to rely on their supply chain much. The investment that it requires to take on such an endeavor is however not something that every wind farm owner can stomach, and even so, it is not without

risks one expands beyond core business processes and know-how. The O&M services still remain part of the supply chain; it's just that the risk is now all on the wind farm owner. Managing hundreds of qualified technicians, asset condition, maintenance programs, etc. is quite different in nature compared to financing and developing wind farms. Safety, quality and training needs to be continuously measured and improved in order to reach an availability factor of 98 percent and above. There's no easy way around that and substantial investments has to be made on a continuous basis.

A wind farm owner who has concluded that they need to be in control of their destiny will soon learn that doing so does not come without the challenge of gaining knowledge of turbine condition, wear and tear, potential serial defects, and even whether or not the service teams perform the scheduled maintenance according to plan. Monitoring the service provider couldn't be more important in an environment where you're paying dearly for a warranty or rely on operation and maintenance providers that provide labor without support from their own quality and performance improvement system. One can also ask oneself whether the OEM recommendation for scheduled maintenance, spare parts replacements and use of consumables really is optimal from an asset management and production perspective. Further, if the maintenance schedule is built to manage an issue inherent to the design of the turbine, is the provider of the O&M services really incentivized and equipped to recommend alternatives that improve the wind farm owners cost structure and production?

Wind farm owners need to find cost effective means to understand the condition of their assets and to ensure that they are operated and maintained in the best interests of the owner. Condition Based Monitoring (CBM) solutions can tell a lot about the condition of wind turbines. But as most CBM systems were originally developed for gas turbines, steam turbines, large diesels, etc., the price point of those systems don't always fit the wind industry where unit output usually is in the 2MW range, compared to 1,000MW for steam turbines. A CBM system with many bells and whistles may not pay for itself when installed on a wind turbine—as the requirements for return on investment usually is shorter than five years. And yet, even if the very detailed reporting and analysis that is commonly delivered by the CBM systems of today, a decision is still likely to be made to dispatch a team of technicians to go out to the turbine and visually inspect the turbine, listen for abnormal sounds and borescope the gearbox. The cost of dispatching a small crew for a few hours is relatively small and the crew is usually already available on the wind farm site.

SQUEEZING VALUE OUT OF THE WARRANTY

Wind turbine field inspections are a very common means of base lining the condition of the assets and to support warranty claims. Wind farm owners realize that it's of essence to plan the End of Warranty (EOW) inspection to ensure that enough time has been allocated for inspection of all turbines, analyze the results and file claims well in advance of the end of warranty date. By planning the EOW inspection well in advance, wind farm owners can maximize the understanding of the wind turbines and any safety, quality or technical

issues they may have. In turn, this knowledge enables the wind farm owners to take full advantage of the value of the warranty. Good planning will afford the inspection team the appropriate window of time to complete the inspections in full, taking time to address critical findings in detail and producing high quality reports that enable the owner ample time to report back to the OEM in the appropriate manner, before the end of the warranty period.

To really optimize the EOW inspection, it is good practice to perform baseline inspections at the time when the units are first commissioned and placed into operation. This baseline enables the comparison of the current condition of the asset (at EOW) to the condition of the units at commissioning. It is an excellent way to track changes and justify claims that may stem from unusual wear and tear or unexpected failures. An asset inspection is also an inspection of the O&M service provider, regardless of whether it's performed during or after the warranty period. In the 3,000-plus EOW inspections UpWind Solutions has performed, we have found that a clean turbine usually reflects a well maintained turbine. Trash on the decks, uncleaned grease and oil spills, missing torque stripes, and so on are usually indications of underlying issues with asset health. It is therefore good practice to include general cleanliness and upkeep in the inspection scope of work as this is a very good indicator of potential future problems.

Not all warranty claims are approved and not all damage warrants a warranty claim. Regardless, the wind farm owner still owns the asset and has a vested interest in making sure that they are in control of future planned and unscheduled maintenance and its associated cost. The EOW inspection provides a baseline assessment of the condition of the turbine going into the post warranty period. This baseline assessment educates the asset owner to identify specific units and/or components that could need further inspection in the future and potentially maintenance reduced interval between maintenance activities. An extensive asset knowledge base may even extend the maintenance cycle if applied correctly. The key is understanding the asset condition in full and planning accordingly, where the baseline assessment provides for effective planning of maintenance programs going forward.

O&M EXCELLENCE REQUIRES COMPLIMENTARY OFFERINGS TO PROVIDE A COMPLETE SOLUTION

The areas mentioned in this article highlight the need for an integrated asset management solution that help wind farm owners liberate and capture a continuous flow of data from operational experience, performance indicators, turbine health indicators as well as field inspections. Careful attention has to be given to managing the overall cost of the solution and balancing the capabilities and cost of the various components that build it. With a cost effective asset management solution established, wind farm owners can focus their attention to closely managing the maintenance and repair activities, optimize the usage of spare parts and consumables, as well as implementing suitable wind turbine upgrades.

The successful wind O&M service providers of the future will distinguish themselves by being able to provide a complete O&M solution that combines discreet complimentary offerings. The wind industry is unique in the way that each unit produces single-digit MW power but also in that the number of units in the fleet completely outnumbers any other form of electricity production. In such an environment wind farm owners should demand that their operation and maintenance services providers have the capabilities to:

- Offer significant price reductions for spare parts and consumables
- Provide alternative parts that can extend the maintenance cycle
- Perform flawless repairs of gearbox, generator, blades, rotor, hub, etc.
- Upgrade drive trains and other critical components to extend the maintenance cycle
- Install blade vortex generators to improve yield
- Capture turbine tags and drive train data for instant and historical analysis in order to predict failures
- Supplement the analytics with comprehensive field inspections that identify wear and tear
- Store inspection data from large inspection campaigns and sporadic condition inspections on a continuous basis
- Support the field operation and maintenance teams with 24/7 remote monitoring and engineering resources
- Provide benchmarking of performance data with the rest of the fleet

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U.S. OFFSHORE WIND ENERGY—TRANSITIONING TOWARDS COMMERCIAL DEPLOYMENT

National Offshore Wind Strategy addresses concerns and outlines strategy for making offshore wind a reality for the United States.

By Dickson C. Chin, Michael C. Gibbs, and Mosby G. Perrow

Dickson C. Chin is a partner, and Michael C. Gibbs is a counsel, at Jones Day in New York. Mosby G. Perrow is an associate at Jones Day in Washington, D.C. They can be reached at dchin@jonesday.com, mgibbs@jonesday.com, and mgperrow@jonesday.com respectively, or by visiting www.jonesday.com. The views expressed in this column are the personal views of the authors, and do not reflect those of Jones Day or its clients.

THE POTENTIAL IS ENORMOUS: offshore wind resource data for the Great Lakes and U.S. outer-continental shelf and coastal waters indicate that, for annual average wind speeds above seven meters per second, the U.S.'s offshore wind energy total gross resource is 4,150GW, or about four times the current total generating capacity of the U.S.[1] And certain findings in a recently released U.S. offshore wind energy market assessment sponsored by the U.S. Department of Energy ("DOE"), along with several recent DOE funds awards for advanced technology demonstration projects, indicate that the U.S. offshore wind energy industry is entering a critical phase of transition towards commercial deployment.

Back in February 2011, DOE published *A National Offshore Wind Strategy: Creating an Offshore Wind Energy Industry in the United States* ("National Offshore Wind Strategy"). The National Offshore Wind Strategy is intended to guide DOE's Offshore Wind Innovation and Demonstration ("OSWInD") initiative to support the development of a world-class offshore wind industry in the United States which is able to achieve the following deployment scenario: by 2030, 54GW of offshore wind generating capacity deployed at a cost of energy of $0.07/kWh; and with

an deployment scenario of 10GW of offshore wind generating capacity deployed by 2020 at a cost of energy of $0.10/kWh.

Key points highlighted in the National Offshore Wind Strategy include the following:

- Offshore wind energy can reduce the nation's greenhouse gas emissions, diversify its energy supply, provide cost–competitive electricity to key coastal regions, and revitalize key sectors of the economy by investing in infrastructure and skilled jobs.
- Challenges facing offshore projects include the relatively low cost of conventional energy, technical installation and interconnection challenges, and permitting delays due to insufficient site data and inexperience with permitting processes for projects in both federal and state waters.
- Since no one has installed wind turbines in U.S. waters, proposed projects lack critical data on the environmental and siting effects of offshore wind turbines and their installation, operation and maintenance. This lack of data drives up the costs of financing offshore wind projects to the point where financing charges account for roughly half of the cost of offshore wind energy.
- To achieve its target deployment scenario, the OSWInD initiative must accomplish two critical objectives: reduce the cost of offshore wind energy and reduce the timeline for deploying offshore wind energy.
- The OSWInD initiative has three focus areas:: (1) Technology Development, (2) Market Barrier Removal, and (3) Advanced Technology Demonstration. Activities within these areas will include innovative turbines, marine systems engineering, computational tools and test data, resource planning, siting and permitting, complementary infrastructure, and advanced technology demonstration projects.[2]

To implement the OSWInD initiative, the National Offshore Wind Strategy specifies several research efforts in Technology Development and Market Barrier Removal. Technology Development includes projects to develop the engineering modeling and analysis tools required to lower overall offshore facility costs and to design offshore-specific turbines. Market Barrier Removal includes an annual market data report and analysis of emergent policy and economic questions, which is intended to reduce information barriers to investment and inform better decisions-making by policy makers and other stakeholders[3]. In December 2012, Navigant Consulting, Inc. ("Navigant") released the first such report, the *Offshore Wind Market and Economic Analysis – An Annual Assessment*, dated November 28, 2012 (the "2012 Market Assessment").

The objective of the 2012 Market Assessment is to provide a comprehensive assessment of the U.S. offshore wind market, which will be updated annually for a period of three years[4]. These updates are intended to deliver reliable and consistent data for removing entry barriers and increasing U.S. competitiveness in the offshore wind market. The 2012 Market Assessment finds that the U.S. offshore wind industry is "slowly transitioning from early development to demonstration of commercial viability."[5] Worldwide, there are approximately 4GW

of offshore wind energy installations, most of which are concentrated in northwestern Europe, but with China recently gaining in market position. In the U.S., there are no offshore wind energy projects in operation or, as of the writing of the 2012 Market Assessment, under construction. Of the thirty-three announced U.S. offshore wind projects in various stages of development, there are nine that have reached what the 2012 Market Assessment defines as an advanced stage of development. Specifically, these nine projects have either obtained a site lease, conducted baseline or geophysical studies or entered into a power purchase agreement. Table 1-2 (page 38) of the 2012 Market Assessment provides summary data for these nine advanced development-stage U.S. projects.

Concurrently with the release of the 2012 Market Assessment in December 2012, DOE announced awards of up to $28 million in grants to fund the initial phase of seven offshore wind advanced technology demonstration projects. Three of the seven projects chosen for these grants appear to be pilot demonstration projects for three of the advanced-development stage projects included in the summary above: the Fisherman's Energy: Phase I project; Lake Erie Offshore Wind Project, and the Baryonyx Rio Grand Wind Farm. Those three as well as another one of the technology demonstration projects involve advanced, fixed-bottom foundation designs, while the remaining three involve semi-submersible or floating foundations, and all or nearly all of the seven projects plan to install direct-drive wind turbine generators on these foundations.[6]

The substructure and foundation systems of offshore wind energy generators differ significantly from those of land-based wind turbines.[7] Advanced bottom designs include tripod tube steel and guyed tube designs appropriate for depths below 30 meters (transitional depth) or for sites with softer soil composition. Other transitional-depth designs employ spaceframes, jackets or trusses. Each of these transitional-depth designs enable projects beyond the horizon where they could be entirely out of site from shore. Projects located at this distance could avoid breaking waves common in some shallow-water sites.[8]

Semi-submersible and floating designs could have even greater potential for cost savings and deep-water projects. These designs include the semisubmersible Dutch tri-floater, spar buoy with two

> "Of the thirty-three announced U.S. offshore wind projects in various stages of development, there are nine that have reached what the... [DOE] defines as an advanced stage of development."

tiers of guy wires, and three-armed mono-hull tension-leg platform.[9] Although largely untested, floating designs promise reduced costs through full assembly at quayside and a less complicated load-out. Floating designs also would have greater access to higher wind speeds and energy capture over deeper waters, and might reduce projects' environmental impacts. But significant cost drivers exist. Cost drivers include novel floating platforms, extensive mooring line systems, deep anchor installations, and technical risks associated with more remote locations.

In the initial phase, each of the seven projects will receive grants of up to $4 million to complete the engineering, design and permitting phase of the award. DOE will then select up to three of the seven projects to receive additional grants of up to $47 million over four years, subject to congressional appropriations, to fund follow-on phases of siting, construction and installation that will target the achievement of commercial operation in 2017.

REFERENCE CITATIONS:

1. U.S. Department of Energy, A National Offshore Wind Strategy: Creating an Offshore Wind Energy Industry in the United States (February 2011) ("National Offshore Wind Strategy"), p. 5.
2. National Offshore Wind Strategy, p. iii.
3. National Offshore Wind Strategy, p. 37.
4. 2012 Market Assessment, p. xiv.
5. 2012 Market Assessment, p. xv.
6. See DOE Wind Program Selects Seven Projects to Demonstrate Next-Generation Offshore Wind Technologies, December 12, 2012, http://ww1.eere.enegy.gov/wind/news_detail.html?news_id=18842.
7. See National Renewable Energy Laboratory, Large-Scale Offshore Wind Power in the United States: Assessment of Opportunities and Barriers at § 5.1 (September 2010) ("NREL Assessment").
8. See NREL Assessment at §5.3.2.3.
9. See NREL Assessment, Fig. 5-11.

Project name (State)	Proposed Capacity (MW)	Turbines (#)	Distance to shore (miles)	Average water depth (m)	Projected Turbine Model	Status notes	Target completion date b
Block Island Offshore Wind Farm (Deepwater) (RI)	30	5	3	N/A	Siemens SWT 6.0-120 (6MW)[a]	National Grid has agreed to a 20-year PPA. U.S. Army Corps of Engineers permit application and environmental studies underway.	2015
Cape Wind Offshore (MA)	468	130	10	10	Siemens SWT 3.6-107 (3.6MW)[a]	Project approved for federal waters and commercial lease offered in April 2010. In July 2012, the project commenced geotechnical and geophysical survey operations as part of its final design phase.	2014
Fisherman's Energy: Phase I (NJ)	25	6	3	11.5	XEMC-Dar-wind XD115 (5MW)	Received final permits from Army Corps of Engineers	2013
Fisherman's Energy: Phase II (NJ)	330	66	12	17.5	XEMC-Dar-wind XD115 (5MW)	Received a met tower rebate from the state and began baseline surveys in August 2009.	2017
Galveston Offshore Wind (Coastal Point Energy) (TX)c	150	60	7	14.5	XEMC-Z72-2000 (2.75MW)	Received lease from Texas General Land Office	2016
Garden State Offshore Energy Wind Farm (NJ)	350	70	20	2.5	(5 or 6 MW)	Awarded an interim limited lease and began conducting baseline surveys in 2009.	2017
Lake Erie Offshore Wind Project (Great Lakes) (OH)	27	9	7	18	Siemens SWT 3.0-101 (3MW)	Developers have signed lease with State of Ohio.	2016
Baryonyx Rio Grande Wind Farm (TX)[c]	1000	100-200	4.5	22	(5 or 6 MW)	Received lease from Texas General Land Office in 2009. Army Corps of Engineers environmental studies underway.	2018
Baryonyx Mustang Island Wind Farm (TX)[c]	1000	200	10	20	(5 or 6 MW)	Received lease from Texas General Land Office in 2009	2018

a) These projects have committed to a specific turbine with a turbine supply agreement in place. All other stated turbines are based on developer statements and may change.

b) Dates shown in this table are based on developer statements and may change based on permitting, leasing, surveying, and other activities.

c) Leasing and permitting requirements for projects in Texas state waters do not involve the Federal Energy Regulatory Commission or the BOEM Minerals Management Service, and may move more quickly than projects in federal waters.

Source: Navigant analysis based on published project information, developer statements and media coverage

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CHALLENGING INDUSTRY STANDARD CONTAMINANT FILTRATION

Breather filter dessicant evolves as wind farm development expands to harsher tropical and offshore environments.

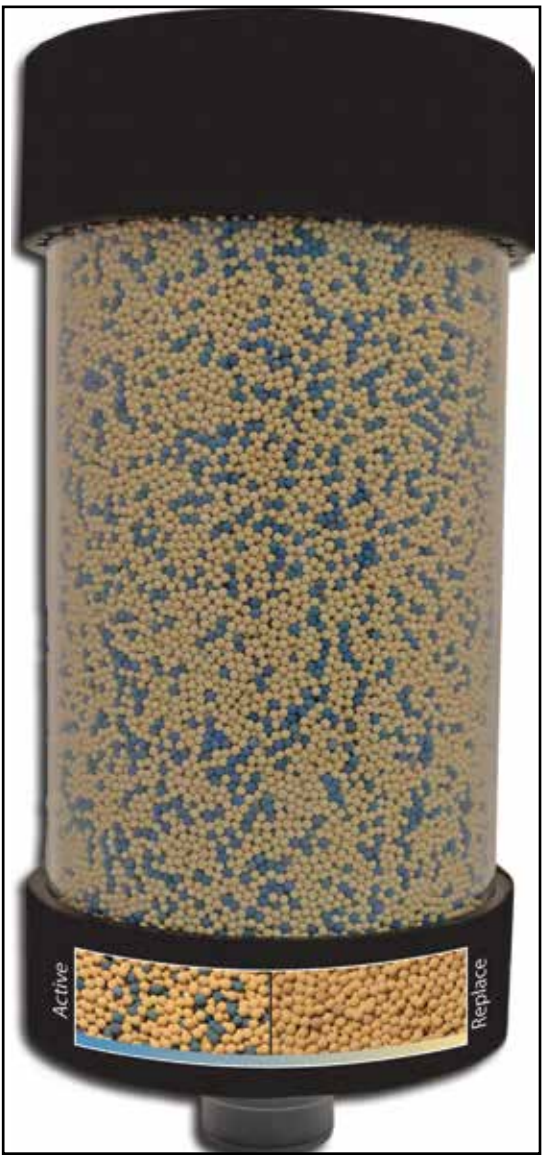
By Cliff Jones

Cliff Jones is Marketing Director for DryTech, Inc. He can be reached at 609-758-1794 or jonesc@drytechinc.com. For more information, visit www.drytechinc.com.

WITHIN THE PAST FEW YEARS, the growing emphasis on proper operations and maintenance procedures has created a need for better solutions to protect major wind turbine components—in particular, gearboxes and transformers. Instances of gearbox failures and downtime continue to plague the industry and its users. As the industry progresses, wind turbines are beginning to be placed in harsher environments such as tropical climates, arctic climates, and offshore which will exacerbate maintenance issues.

Some of the most susceptible components are the gearbox drive system, power transformers, bearings, and hydraulic systems. Properly maintaining clean lubricating oil is proven to be one of the best preventive maintenance practices an operator/owner can make. Three major factors influence the quality and cleanliness of a lubricant; monitoring, removing, and excluding contaminants.

Removing contamination, in particular moisture and particulate, is more difficult than preventing it in the first place; it costs about ten times more to remove contamination than to prevent it. Preventing the contaminants in the first place is certainly the best option and this is where new solutions should be considered.



During their beginning development phase, wind turbines used a basic breather vent to filter out particulate from incoming ambient air, but nothing to filter out moisture from ambient air. AWEA/ANSI/AGMA 6006-A03 F.5.3.3.2 standard states that gearbox lubricating oils should be kept under 500 ppm, parts per million moisture. Water in excess of this standard can lead to lubricant degradation; degradation of internal components; corrosion of metallic components; accelerated metal fatigue; accelerated additive depletion; accelerated oxidation; and can interfere with an active lubricant film formation. To this point, the solution has been the use of silica gel desiccant breathers, but even their performance is very limited.

Lessons can be learned from the Aerospace and Defense industry, where maximizing performance in the harshest environments has been the status quo of daily operations. Moisture control solutions are vital for proper operation of various military and aerospace systems. All of these moisture control solutions have one thing in common, the desiccant being used, ZEOLITE. Currently within the wind energy industry, silica gel breathers are the standard to protect against moisture contamination, however silica gel is not the highest performing desiccant available. Firstly, there is a common misconception within the industry about a desiccants adsorption capacity by weight. For example, the highest performing indicating silica gel can adsorb up to 33

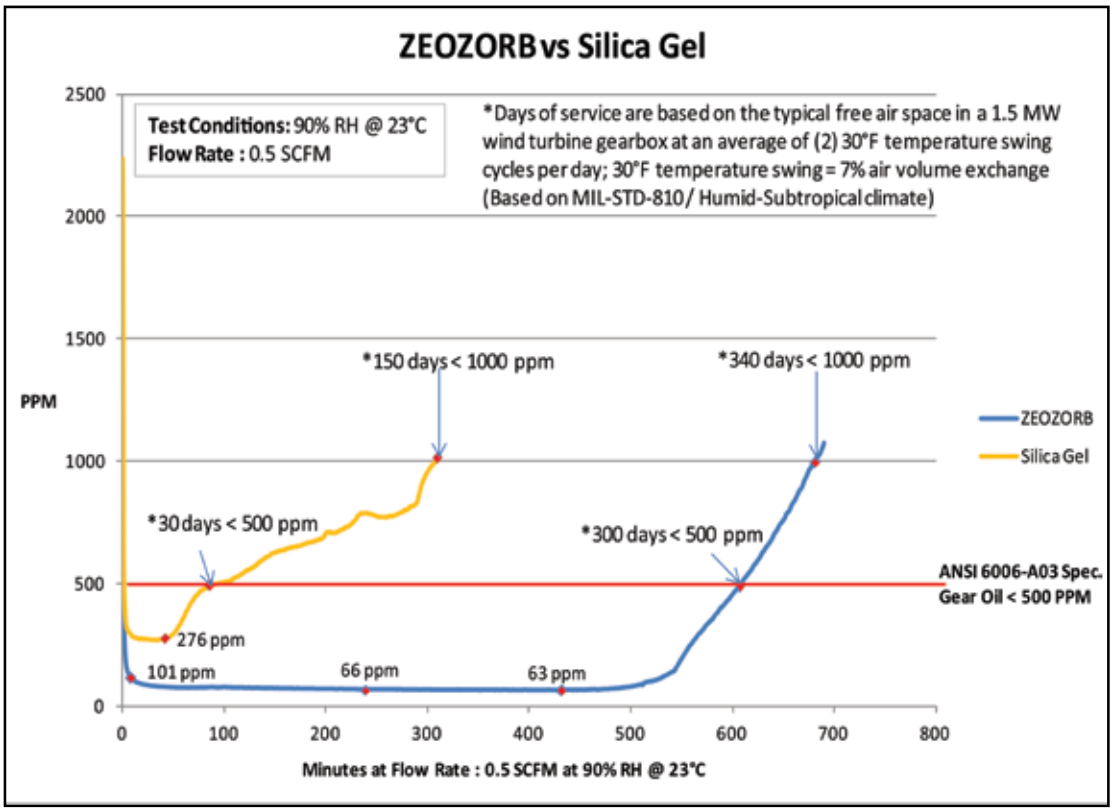

ZEOZORB vs Silica Gel
Test Conditions: 90% RH @ 23°C
Flow Rate : 0.5 SCFM
*Days of service are based on the typical free air space in a 1.5 MW wind turbine gearbox at an average of (2) 30°F temperature swing cycles per day; 30°F temperature swing = 7% air volume exchange (Based on MIL-STD-810/ Humid-Subtropical climate)
PPM
2500
2000
1500
1000
500
0
*150 days < 1000 ppm
*340 days < 1000 ppm
*30 days < 500 ppm
*300 days < 500 ppm
ANSI 6006-A03 Spec.
Gear Oil < 500 PPM
276 ppm
101 ppm
66 ppm
63 ppm
ZEOZORB
Silica Gel
0
100
200
300
400
500
600
700
800
Minutes at Flow Rate : 0.5 SCFM at 90% RH @ 23°C

Figure 1

percent by weight, where ZEOLITE can adsorb up to 27 percent by weight; therefore it appears silica gel is the better option. This is simply not the case, although silica gel adsorbs 33 percent by weight, the actual dew point or PPM level achieved is limited to around 250 ppm and can only achieve this level in a very narrow operating temperature range, above 25°C silica gel performance drops off drastically, whereas ZEOLITE can provide a significantly lower PPM level, less than 100 ppm at a very wide operating temperature range.

In addition, silica gel's higher 33 percent adsorption capacity is a bit of an unfair claim, since that capacity should be equated to a specific temperature and PPM level achieved. For example, a silica gel providing dry air at 10°Cdp (12,317 ppm)

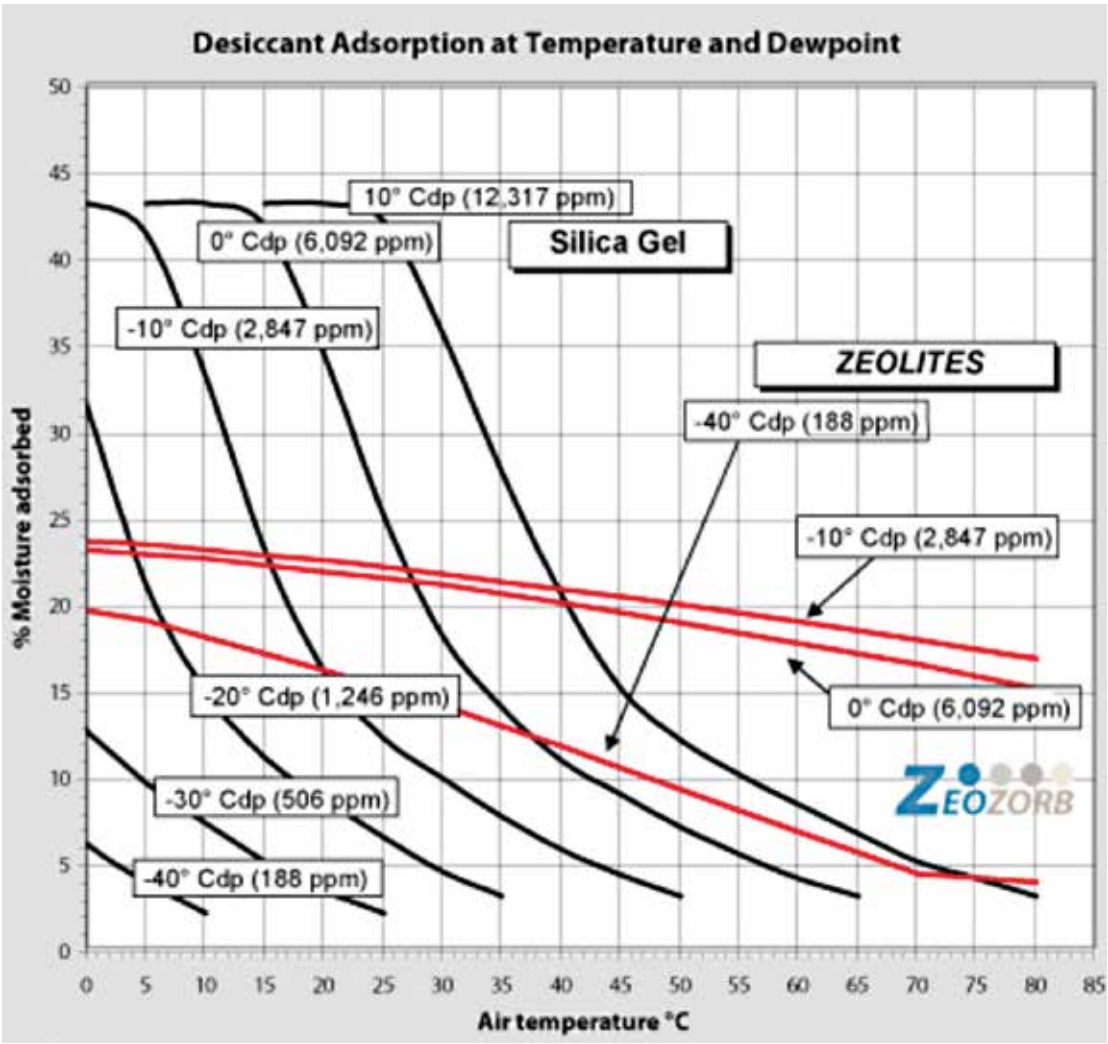


Figure 2

Oil	Test 1	Test 2	Test 3	Test 4
A320 Gear Oil	329 ppm	1129 ppm	298 ppm	201 ppm

Table 1

Silica Gel Desiccant volume	Adsorption capacity @ < 500 ppm moisture	Adsorption needed over 6 months	Amount not adsorbed over 6 months
3 lbs	82 grams	223 grams	141 grams (1/3 lbs)
ZEOLITE Desiccant volume	**Adsorption capacity @ < 500 ppm moisture**	**Adsorption needed over 6 months**	**Amount not adsorbed over 6 months**
3 lbs	299 grams	223 grams	0 grams (76 grams surplus capacity)

Table 2

at 30°C will adsorb 36 percent by weight, and a ZEOLITE providing dry air at 10°Cdp (12,317 ppm) at 30°C will adsorb 23 percent by weight, which appears that silica gel performs better. Silica gel does indeed have a higher adsorption percentage by weight, but it only provides relatively "dry" air, 10°Cdp (12,317 ppm). Let's look at a scenario where we would exceed the ANSI 6006-A03 F.5.3.3.2 standard of less than 500 ppm moisture. A silica gel providing dry air at -40°Cdp (188 ppm) at 10°C will adsorb 3 percent by weight, and a ZEOLITE providing dry air at -40°Cdp (188 ppm) at 10°C will adsorb 18 percent by weight. In a scenario where silica gel is being used and temperatures exceed 10°C the desiccant will not adsorb any moisture, therefore ZEOLITE desiccant should be used as it maintains 5-20 percent adsorption capacity throughout almost any temperature conditions while exceeding the

ANSI 6006-A03 F.5.3.3.2 specification of less than 500 ppm moisture.

After reviewing testing results Drytech can conclude that ZEOLITE significantly outperforms silica gel in any environment, but what does this mean for the industry? The company took a closer look and tested the headspace air dynamics of gearbox lubricating oils. After analyzing several gearbox lubricating oils with Karl Fischer Titration testing, the results were interesting. (See Table 1).

Test 1: New ISO 320 Gear Oil tested
Test 2: ISO 320 Gear Oil Saturated under the following conditions: 80% RH @ 75°F for 88 hours
Test 3: "Test 2 Saturated Gear Oil" conditions: 96 hours in DRYKEEPER box with ZEOLITE
Test 4: New ISO 320 Gear Oil conditions: 96 hours in DRYKEEPER box with ZEOLITE

The test results show that samples significantly increased in PPM level under test "saturation" conditions. In Test 3, where ZEOLITE desiccant was used, the specimen from Test 2 dropped dramatically in PPM level. In Test 4, where ZEOLITE desiccant was used again, the specimen from Test 1 NEW OEM gear oil dropped significantly. This is a very crucial dynamic that proves by keeping the free air headspace above lubricating oil in a gearbox or reservoir at a low enough PPM level it will liberate moisture within the lubricating oil itself. ZEOLITE desiccant should the industry standard, as its performance is superior to silica gel and will actually condition gear oil over its use.

"This is a very crucial dynamic that proves by keeping the free air headspace above lubricating oil in a gearbox or reservoir at a low enough PPM level it will liberate moisture within the lubricating oil itself."

Reducing operations and maintenance costs have been widely debated, and one suggestion is to extend operations and maintenance intervals beyond the 6 month industry standard. To accomplish this goal,

operators must ensure the size of the breathers being used in their application is sufficient. One solution is to use a manifold to allow for multiple breather use simultaneously. Depending on the environment, and free air volume within a gearbox or reservoir, maintenance intervals could be extended beyond two years. Looking closer, it appears that silica gel breathers are being saturated or fully spent well before their 6 month life span. (See Table 2)

Example: Typical air inhale into a 10 ft3 gearbox free air head space under a diurnal temperature swing of 30°F. Based on MIL-STD-810.

At the end of the day desiccant breathers are still a disposable commodity and longer term solutions should be developed. With the advancements of wind turbine technology, turbines are being placed further offshore, where operations and maintenance costs increase exponentially. Not only do wind farm owners need to pay for technician labor, but additional fuel and transportation costs make six month maintenance intervals cost prohibitive. Long term regenerative moisture control systems should be considered.

Currently, there are a few regenerative solutions in the industry, all which use silica gel. Silica gel has been the preferred choice when selecting a medium to be regenerated, because silica gel will regenerate when baked at 195°F. This low reactivation temperature is attractive as there are many options to generate a temperature of 195°F, but each time silica gel is reactivated it loses a percentage of its drying capacity.

One alternative would be to reactivate ZEOLITE which guarantees better adsorption performance in all environments and temperatures. ZEOLITE is much harder to reactivate, but thankfully, the need for these technologies has already been developed within the Aerospace & Defense industry. For example, Drytech, Inc., has developed a proprietary, Self Regenerating Filter System (SRFSTM), which provides a constant blanket of dry purge air less than 10 ppm moisture which can condition a gearbox, reservoir, and many other applications. The SFRS system requires a power connection and is maintenance free for 5 years.

As the wind industry continues its astonishing growth, OEMs and wind farm operators should explore new and innovative technologies to provide more robust operations and maintenance programs.

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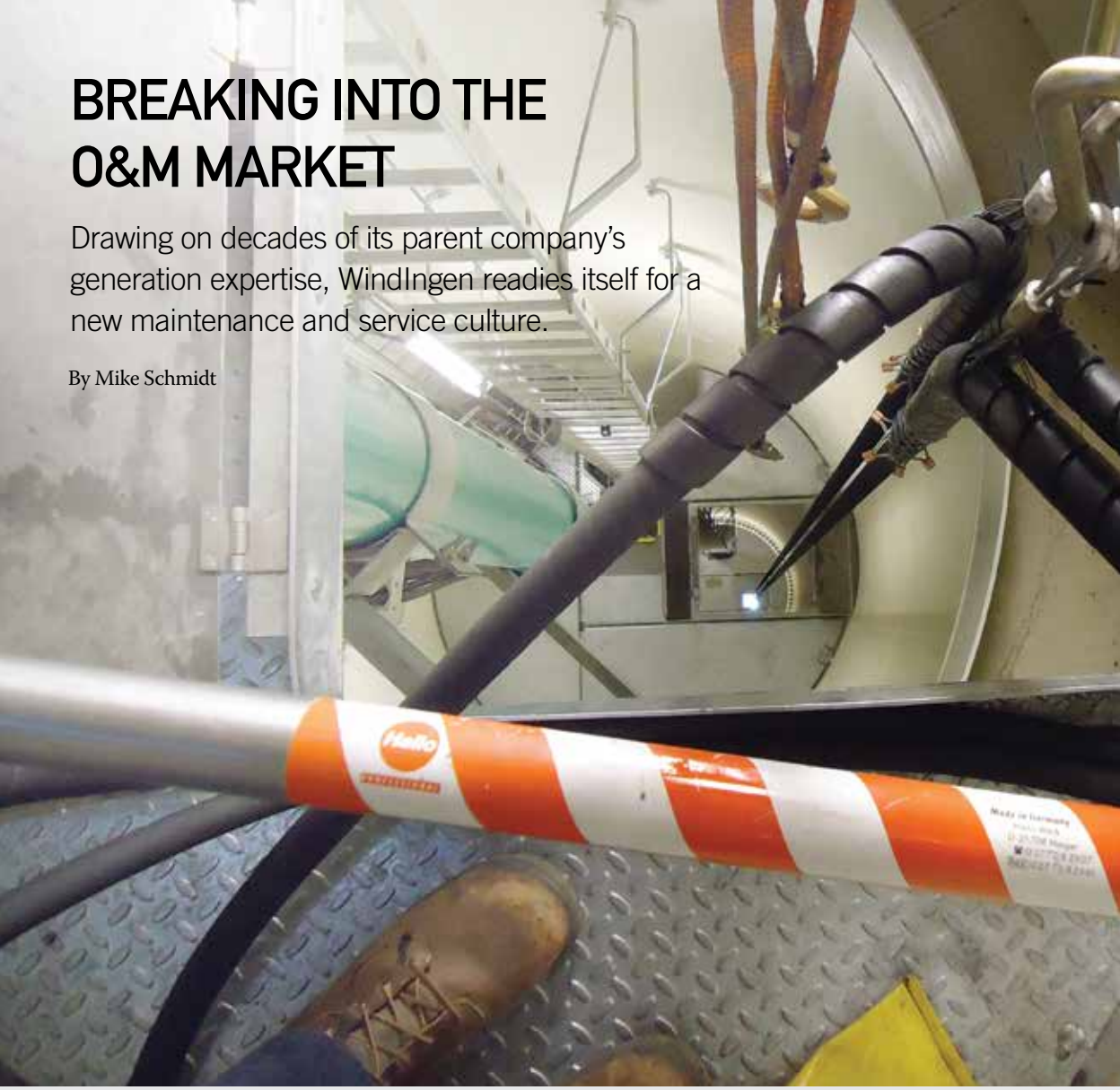
BREAKING INTO THE O&M MARKET

Drawing on decades of its parent company's generation expertise, WindIngen readies itself for a new maintenance and service culture.

By Mike Schmidt

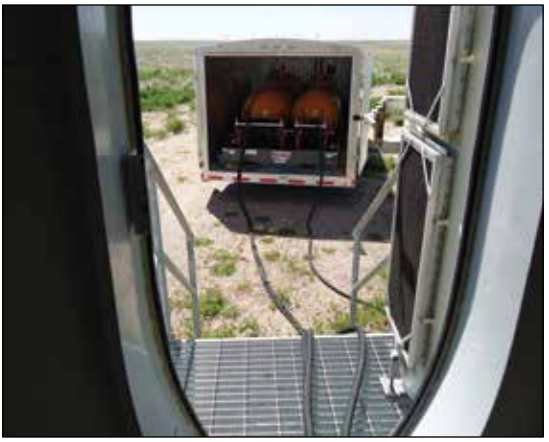


Mike Schmidt is field services and training manager for WindIngen, a division of MD&A. He can be reached at 970-224-3139 ex. 2101 or mschmidt@windingen.com. For more information, visit www.windingen.com.

THERE WAS A TIME NOT TOO LONG AGO when starting a business as an independent service provider (ISP) in the wind industry was as easy as hanging a shingle. Wind was new and exciting; money could be made and the explosive growth made huge demands of the supply chain. Since the industry was in its infancy, not many standards were in place requiring third-party service providers to show credentials or prove that they had experience providing maintenance and repair services working on anything, let alone wind turbines.

Times have changed. Many of the start-up companies that tried their hand at wind services are no longer around, and that may not be such a bad thing. Some of these companies were started and run by true opportunists, out to take advantage of a fledgling industry still learning how to walk. These companies regularly made commitments that they couldn't keep, hired workers that weren't properly trained to perform the work, nor were they prepared to complete the work to the safety standards expected from the power industry.

Though the wind industry is still young, it's maturing quickly. Wind farm owners and operators have become smarter over the past several years in regards to contracting for maintenance services. They



screen providers more rigorously and weed out the ones that don't measure up. More and more of the nation's wind fleet are falling into the asset portfolios of energy companies and utilities.

These owners may be new to wind but are very experienced at asset management and are savvy when it comes to awarding any type of service or repair contract to companies where staffing, experience, parts acquisition, and financial stability could leave their assets at risk. To mitigate that risk and manage cost, owners have taken different approaches, what works for some doesn't work for all. Take for example the model of self-performance; several companies are moving in the direction of not only managing the asset but operating and maintaining the equipment as well.

Some companies have been successful with this approach while others continue to experiment. This may work for asset owners who have economies of scale, but smaller owners need to rely on proven service providers to help them. Others have tried their hand at self-performing to one degree or another and have come to the conclusion that leaving maintenance and repair services to companies that specialize and have built a reputation providing these services is their best option.

WindIngen, a division of MD&A, was launched to support these customers. Starting WindIngen (the '-Ingen' part is short for 'ingenuity') was a logical move for MD&A, since many of their existing customers were expanding their portfolios to include wind.

MD&A (Mechanical Dynamics and Analysis) has been providing service and maintenance in the power generation industry for more than 30 years and has grown to be one of the largest independent service providers in the United States with more than 400 employees. MD&A's intention with WindIngen is to offer both new and long-time customers the same level of quality service in wind that they've come to expect from MD&A in traditional power generation.

Drawing on decades of experience and relationships, MD&A is leveraging their experience in power generation marketplace.

While the industry realized some considerable growth during 2006 through 2010, and lots of new people came into the wind industry, most came up through the ranks. Few moved to wind from traditional power. As such, wind asset managers and operations personnel did not have relationships with their counterparts in traditional power, even within the same company. Many still don't.

MD&A's WindIngen division started in June, 2010—a tough time for any company to get a start in the wind energy industry. MD&A could rely on a strong reputation in service, but would not be entitled to anyone's business. With the number of companies already in the space, many of whom were struggling to keep their teams busy, prices were and continue to be artificially low. Some companies have left wind and others are showing weakness. Starting a new service business in the wind service business is further challenged by the industry's general financial dependence on the Production Tax Credit (PTC). The PTC had been extended through the end of 2012. However, as the expiration deadline neared, uncertainty loomed in the industry regarding the PTC's renewal. Projects that were not already under construction stalled in the planning phase. Margins were under significant pressure, industry momentum had slowed to a crawl and owners were also under significant cost pressure. It was difficult to get owners to try a new company when many were still reeling from wounds suffered from poor service providers between 2005 and 2010. At the same time, OEM's were placing a larger focus on service. If they weren't going to be selling turbines until the recession ran its course, they would have to work harder

to increase market share in post-warranty service.

In short, WindIngen could take nothing for granted. They would need to work hard to overcome the stigma of being the new guy on the block, and become recognized as a bona fide and qualified ISP in the industry. WindIngen would have to prove all over again to many MD&A customers—to whom they had been providing service to for decades—that they could be trusted to service, maintain, and repair their wind equipment at the highest level, especially during a time of stymied growth and with stronger competition from the OEM's. They knew that they could do that if they continued to operate under the company's core philosophy of sticking to what you're good at: providing high quality service.

In the three years that MD&A has been providing service in the wind industry under the WindIngen name, they have steadily built a reputation of providing quality service primarily through project type work.

- WindIngen has performed more than 1,000 end-of-warranty inspections on a broad array of OEM platforms. These inspections have ranged from evaluating the general condition to more comprehensive inspections, including: electrical testing of up-tower transformers, generators, vibration data collection, blade inspections, and gearbox borescope inspections; as well as generator borescope inspections of windings and wedges.
- WindIngen has performed numerous major correctives such as gearbox and generator change-outs.
- WindIngen has performed nearly 400 oil changes ranging from a basic dump-&-fill to more involved 3-stage and 4-stage oil change when changing oil brands. Though they have performed oil changes going from the original

lubricant to all of the major oil brands, WindIngen technicians are trained and certified by AMSOIL, a leader in developing the change process and the only company offering such certification.

- WindIngen has been selected by Winergy as an ASP (Approved Service Provider) for performing inspections and up-tower repairs (warranty and otherwise) on Winergy gearboxes. WindIngen techs have completed several weeks of rigorous training at the Winergy factory in Elgin, Ill.

One specific example of how the company draws on MD&A's experience occurred when MD&A was asked to perform some unusual electrical testing on generators as part of extensive EOW inspections. While the technicians understood the test procedure, they wanted to make sure that the test was conducted properly in the field and the data was reliable.

WindIngen contacted the generator division of MD&A, located in St. Louis, and discussed the test procedure with one of the experienced engineers that specializes in generators. To ensure that the test was conducted properly in the field, the engineer was trained in climb safety and accompanied the team uptower for the first few tests. The test was conducted safely and the customer was impressed with the commitment to quality and the resources at WindIngen's disposal.

In the three years that the division has been around, they've worked diligently to bring the same level of quality, service, and professionalism that customers have come to expect from MD&A. The feedback received from customers regarding the level of safety, communication, job knowledge, work ethic, and professionalism displayed by WindIngen field technicians has been consistently positive, and has brought the division many repeat opportunities with customers.

Additionally, WindIngen offers site O&M services and they've been working toward landing their first site O&M contract. Owners are rightfully careful when selecting for company for this type services. Selecting a provider that can be trusted to perform all aspects of site operation from making availability a primary concern to procuring and managing parts, unscheduled maintenance, and major correctives, while making safety a part of the daily work culture.

MD&A has proven over the years to be resourceful in meeting their commitments and the needs of their customers. This resourcefulness has allowed MD&A to become a force in traditional power.

WindIngen will get its chance at O&M services as they continue to increase their presence in the industry. Several of the issues that smaller ISP's face in regards to being accepted by asset owners as viable alternative to larger ISP's and OEM's, MD&A already has covered:

- Financially, MD&A is strong and owners will conclude that the financial risk to their assets is mitigated.
- MD&A is not new to acquiring or creating parts for power generation equipment. The company owns two parts businesses and will leverage that experience to identify sources for parts and consumables.
- With regards to staffing, MD&A/WindIngen offers wages and benefits that are above the industry average. The company has a low employee turnover rate and an ability to source experienced technician staff in short order.

MD&A's success over the years has come from providing service in the power generation industry. They will make their mark in wind as owners come to understand who they are, where they've come from, and how they meet the commitments to their customers.

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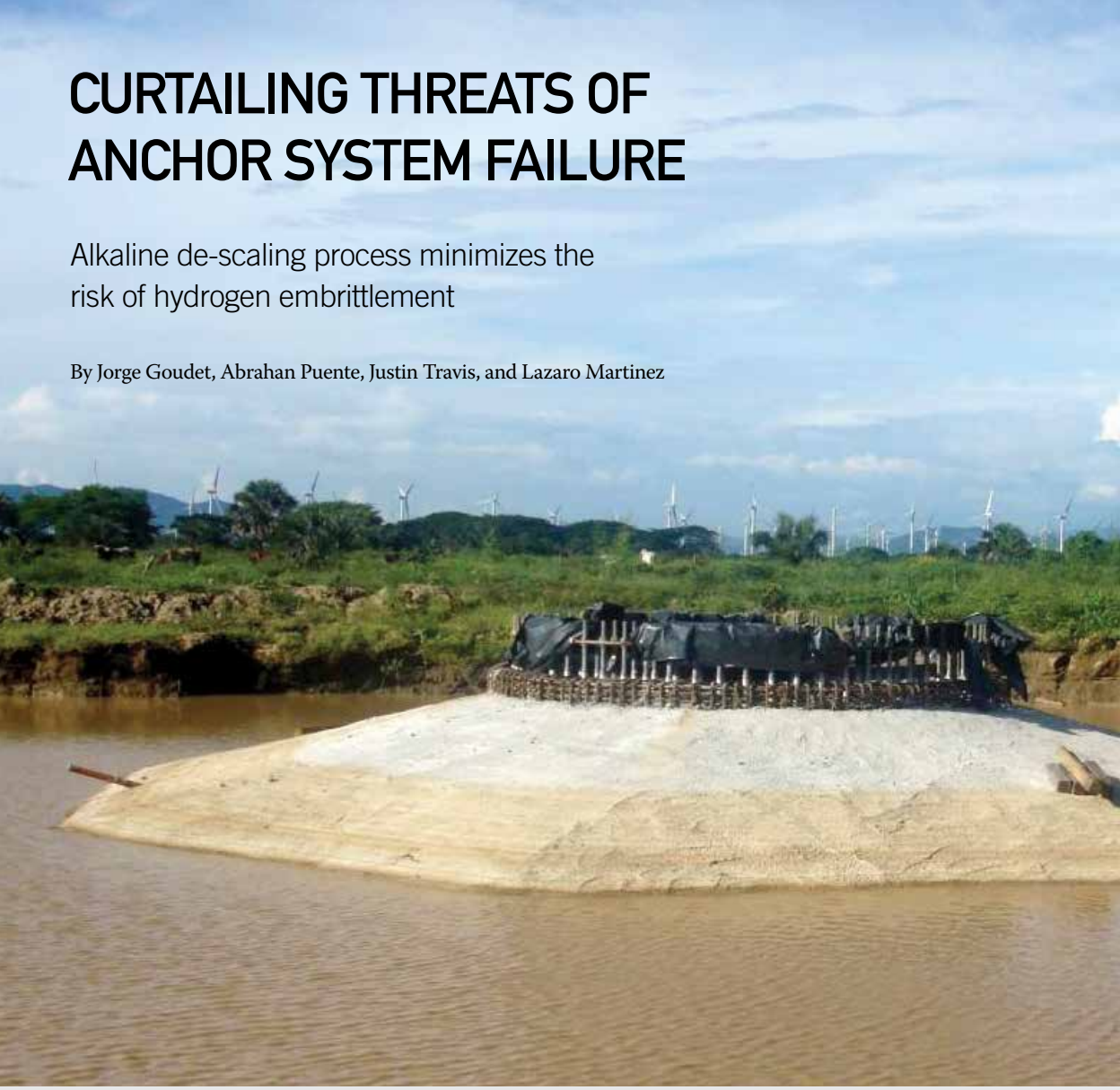
CURTAILING THREATS OF ANCHOR SYSTEM FAILURE

Alkaline de-scaling process minimizes the risk of hydrogen embrittlement

By Jorge Goudet, Abrahan Puente, Justin Travis, and Lazaro Martinez



Jorge Goudet is president and CEO; Abrahan Puente is engineering manager; Justin Travis is wind sales analyst; and Lazaro Martinez is director of wind sales for Latin America; all with Auge Industrial Fasteners. For more information, call 713-956-1700, email j.travis@augeusa.com, or visit www.augeindustrial.com.

IT IS NO SURPRISE THAT A COMMON GOAL amongst the wind industry's participants is to lower the total cost of ownership associated with developing wind farms without sacrificing on HSE. One way that companies can achieve this goal is by consistently seeking ways to adopt best business practices and by thinking outside of the box.

Auge Industrial Fasteners has a commitment to safety and innovation. One way in which it demonstrates this is through the integration of R&D and customer collaboration, or concurrent engineering.

To help illustrate this point, this article focuses on the significance of removing entrapped hydrogen from steel and how Auge, in collaboration with a customer, sought an innovative approach to minimize the risk of hydrogen embrittlement without cutting back on quality or safety.

In seismic regions around the world, hardened high-tensile strength anchoring systems are required (See figure 1.), which must be at a minimum 1040 Mpa (Reference ISO 898-1).

To make such materials comply with this value of resistance, its hardness is usually located above 35 HRC, as these are thermally treated by means of quenching and tempering. The original equipment manufacturers of wind turbines have established as a

requirement the avoidance of the natural phenomenon of corrosion by means of hot dip galvanization.

The process of hot-dip galvanizing typically consists of three steps per the American Galvanizers Association, including surface preparation, galvanizing, and inspection. During the surface preparation step, the steel material is introduced to acidic solutions like sulfuric acid or hydrochloric acid as a method for the removal of surface impurities and oxides.

The problem arises when coating a high-strength hardened alloy material by means of the hot-dip galvanization process. During this first step, there is a high probability of a phenomenon known as "Environmental Hydrogen Embrittlement" occurring because of the material coming in contact with the acid medium.

Environmental Hydrogen Embrittlement results from hydrogen being absorbed by solid metals. When hydrogen diffuses along the grain boundaries the hydrogen atoms are absorbed into the metal lattice and diffused through the grains, tending to gather at inclusions or other lattice defects.

Disassociated hydrogen ions take up very little space, but when the hydrogen ions combine to form hydrogen molecules (H2) they take up tens of thousands of times more space.

This applies stress on a granular level and may cause cracks to form, thus causing the part to fail when additional outside stress is applied during use. Also, this usually results in a loss of ductility or load carrying capacity, which may cause catastrophic brittle failures at applied stresses well below the yield strength. Failures occurring in service are serious and may be very costly.

Figures 2 and 3 show hydrogen embrittlement introduced during the galvanizing process.

For hydrogen to impose damage to steel, it must be in the atomic form. Being that hydrogen has the smallest atomic mass, it can enter the molecular structure of the steel. This is not true when two hydrogen atoms combine to form a stable H2 molecule. Hydrogen in the molecular form is too dense to penetrate the steel structure.

Because hydrogen is exceptionally mobile, it quickly penetrates into any recently formed cracks, lesions, or material surface discontinuities, and creates high stress areas within the steel structure.

When embrittlement failures do occur, they often drastically increase the costs and lead times associated with the development of a project.

In order to prevent this phenomenon, it is very common to use alternative methods of cleaning such as sand blasting or air blasting instead of using acid solutions. Also, it may be recommended

CRITICAL NATURE OF WIND TURBINE BOLTED JOINTS PRESENTS THE NEED FOR COMPETENCY TRAINING FOR WIND ENERGY PERSONNEL

By David Lay

It has been said that those who do not learn from the mistakes of the past are doomed to repeat them. Yet in an industry where geometric growth and relentless technological innovation are the norm, there has been little time to develop a reliable and useful "institutional memory."

Nowhere is this more apparent than in the human factors area where often the most senior mechanical installation personnel may have less than a year's on-the-job experience and may be faced with assembling new turbine models with almost every installation.

To address this experience gap the wind industry must invest in effective competency training programs for craftspeople which transfer accumulated experience, impart new knowledge and set a standard for safety and performance.

Competency training requires more than exposure to abstract knowledge tested through written examinations or rote memorization of procedures. Competence is the ability to successfully apply knowledge and to demonstrate one's capabilities by doing, not just knowing. Moreover, it implies performance to meet a generally accepted standard.

We take for granted that a welder must be certified before he is allowed to lay a bead. The same is true of electricians, crane operators, and even the drivers of heavy goods vehicles who deliver to our sites.

But for many of the crafts no clear performance standards have been set, and little or no formal instruction is required. One example is the skill of bolted joint assembly. There are nearly a thousand critical bolts in the average wind tower and turbine, the failure of any one of which could potentially cascade into a catastrophic system failure. Great efforts are made to check and recheck the tightness of bolted joints at pre-determined intervals at great expense in time and money, yet little or no attention has been given to pre-qualification of bolting personnel and procedures to avoid the loosening of critical joints in the first place.

Other industries have begun to take up this challenge. The bolting of pressure vessels common to power plants, pipelines, and oil and chemical refineries is now done subject to strict "best practices" guidelines such as those published by ASME and by CEN (the European Committee on Standardization) both of which are in the process of issuing training and testing standards personnel involved in bolting pressure joints. In the structural bolting field clear guidelines and procedures govern every aspect of joint assembly in bridges and buildings but no clear standards have been set and no specific curricula has been adopted by the wind industry.

Most of the incoming mechanical workers who will be needed to staff the continued growth of the wind power industry will have to come from trade and technical school programs specifically targeted to the skills necessary in the wind industry. One of the pioneering education programs that early-on realized the need for measurable standards in wind technician education is presented by Airstreams Renewables, Inc., headquartered in Tehachapi, Calif. Mike Messier, vice-president of training describes his course as "sound classroom instruction paired with hands-on practice on real-world equipment." Similar high-quality programs are now underway at a growing number of colleges and trade schools across the U.S. and internationally.

We applaud these efforts and urge manufacturers, erection and maintenance contractors, and the academic community to collaborate and develop workable education and qualification standards to ensure the future safety and security of the wind industry and to make sure that the lessons so dearly learned are not lost or left to be relearned by each new generation.

David Lay is director of training at Hytorc. He can be reached at 800-367-4986.
For more information, visit www.hytorc.com.
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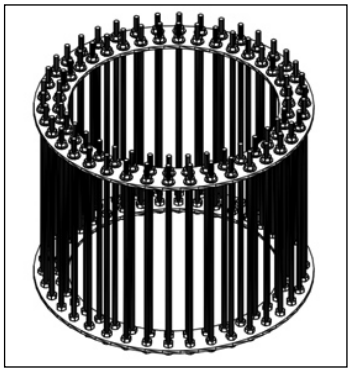

Figure 1: Foundation for wind turbines.

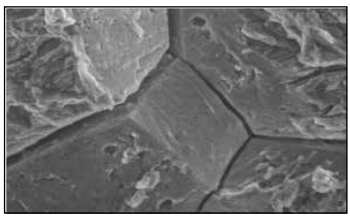

Figure 2: Hydrogen embrittlement introduced during the galvanizing process.

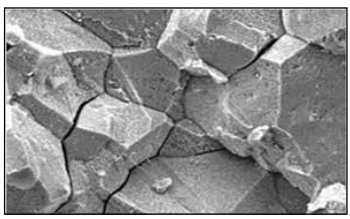

Figure 3: Embrittlement of steel microstructure due to exposure to hydrogen.

to use post-backing for dehydrogenization.

To ensure risk reduction, Auge Industrial Fasteners has developed an alternative cleaning method consisting of an alkaline de-scaling process. The results are in full compliance with ASTM A153 and EN 10684 (thickness, adhesion test, etc.). Upon completion of laboratory testing and customer approval, Auge now applies hot-dip galvanized anchoring systems safely, through a process free of acidic solutions. This process achieves the reduction of cost and lead time by reducing the need for baking the steel.

This alkaline cleansing process, known as Auge Rhino™, is one example of how Auge can create secure and innovative solutions that benefit the customer's bottom line, security, and industry. Since 1965, Auge Industrial Fasteners has been recognized as a leading manufacturer and distributor of a wide variety of commercial, specialty, and exotic alloy fasteners, and specialty machine parts. Auge's 150,000 sq. ft. state-of-the-art manufacturing facility near Mexico City has a large capacity to produce specialty fasteners tailored to the customer's unique specifications and drawings. The plant is a fully integrated turnkey operation. Every process is performed under the same roof, from the stocking of the raw steel (foreign and domestic), to the in-house heat treatment, to the coating/plating (if applicable).

IronClad Extreme Duty Foundation Anchor Bolt Caps

A brand new design, Norm Tooman Construction's IronClad™ Extreme Duty Foundation Anchor Bolt Caps were developed to address the need for caps that resist damage from falling sheet ice and environmental exposure while more effectively sealing out moisture in humid or salt water environments. Extreme Duty caps feature four separate sealing surfaces including an o-ring and an outer flexible skirt. The Extreme Duty cap self-taps to screw onto the bolt, which allows for increased pressure at the seal and use on multiple sizes of rods. The company has more than doubled the thickness of the polypropylene material and maximized UV protection. The Extreme Duty cap will accommodate bolt projections from 6–16 inches and features a ½-inch ratchet drive receiver within a hexagon nut at the top for fast installation and removal. Heated grease or cosmoline can also be injected or poured through a protected port at the top of the Extreme Duty cap, displacing any condensation that could potentially accumulate around the lower portion of the nut. As with all of Norm Tooman's products, the IronClad Extreme Duty Foundation Anchor Bolt Cap is proudly made in the USA. Norm Tooman Construction also sells Corrosion Block™ grease, which is applied to each bolt prior to cap installation. It is important to remember that bolt caps are most beneficial when used in conjunction with excellent quality anti-corrosion grease and thorough grease coverage on the bolt.

For more information, visit www.normtoomanconst.com

Companies wishing to submit materials for inclusion in this section should contact Stephen Sisk at editor@windsystemsmag.com. Releases accompanied by color images will be given first consideration.

Handheld Infrared Oil Analyzer Provides Direct, Immediate Measurement of Lubricant Condition

Lubrication abnormalities are a major cause of equipment downtime and failure. To prevent those costly occurrences, the FluidScan® Q1100 handheld infrared oil analyzer from Spectro Inc. enables users to determine when oil is no longer fit for use due to liquid contamination or degradation. The compact instrument provides direct, immediate measurement of water, total acid number (TAN), oxidation, glycol, total base number (TBN) and other parameters via Spectro's patented Direct Infrared Spectroscopy (DIR) technology. DIR operates without wet chemistry and requires no solvents; only one drop of oil is needed for analysis. In addition, the unit's patented flip-top design speeds test preparation and cleanup.

The route-based capability of the FluidScan Q1100's operation allows the device to virtually eliminate mislabeled samples and long wait times for laboratory analysis. The results highly correlate to TAN and TBN laboratory tests conducted with ASTM D664 and D4739 titration methods and water tests with the ASTM D6304 Karl Fischer Titration method.

Routes, similar to thermography or vibration routes, can be downloaded from the Emerson AMS Suite's OilView™ software to the Q1100. Results can be uploaded back into OilView. Oil data can be analyzed, along with data from other predictive maintenance techniques, in the Emerson AMS software for Machinery Health™ Management. The Q1100 includes a large and expandable reference library of industrial mineral and synthetic lubricants for gearboxes, turbines, compressors, and hydraulic systems.

"The FluidScan Q1100 provides a compact, easy to use and powerful entry product for customers seeking to adopt or expand their onsite oil analysis activities," Spectro president and CEO Brian Mitchell said. "It also extends the oil analysis capability for existing users of the Spectro 5200 TriVector™ Oil Analyzer by enabling route-based oil analysis and an interface with OilViewTM and AMS Suite Asset management software."

For more information, please visit www.spectroinc.com, or call 978-431-1120.

Rennsteig Tools's SRW 1000 Tool Securely Removes and Installs Retaining Rings from 15" to 40" in Size.

Today, new processes and work methods are being developed along with being improved at an accelerating pace. Tradespeople along with technicians use an expanding range of techniques and they need special tools to use them efficiently. These special tools are used in a wide variety of industries, especially the wind power industry where they are used in production, assembly and repair/maintenance. To be useful, a tool needs to enable precise, ergonomic, safe and damage-free work. The special tools simplify work with new materials, shapes and sizes, bringing users and companies tangible benefits. They save time and costs, while at the same time helping maximize work safety—an important part of trouble-free production and maintenance work.

In close cooperation with users, Rennsteig engineers develop tailor-made, high quality tools for a wide variety of applications and industries that meet and often exceed all quality parameters.

As a German producer of these high quality hand tools, Rennsteig Tools, Inc. designs and manufactures state-of-the-art tooling "Made in Germany." The company follows a long tradition of specialty hand tool development and manufacturing which enables it to craft exceptionally dynamic hand tools.

The SRW 1000 tool is no different in this aspect. It has been designed for applications where large shafts and bearings transmit very high forces and torques. For example, wind power turbines, hydroelectric power facilities, press construction, ship building and aerospace. It is easily operated with an Allen key (which is included), ratchet wrench or cordless screw driver with an adapter (also included) and is designed for installing along with removing retaining rings in one operation. The tool is usable with retaining rings ranging from a diameter of 400–1000mm (15"–40"). Opening to a width of 250mm (10"), the tool securely holds the ring open using a self-locking precision spindle action. The interchangeable paired tips that are supplied with the tool come in a 6mm and a 9mm size (custom designs are also available) to cover the different diameter holes in these large retaining rings. The tips hold the ring securely due to short, direct contact sockets. These tips are made of high strength, hardened and tempered steel.

For more information about the SRW 1000 along with Rennsteig Tools, Inc. and its other line of tools, please visit www.rennsteig.us. Also, check out this link to a video on the use of the SRW 1000, http://youtu.be/6KOpH3_dz5Q.

Custom Fit Wind Turbine Component Covers

Transhield, Inc. is a global supplier of custom fit covers for shipping and storage protection for a variety of industries, including wind power applications. These wind power application covers are a patented alternative for heavy, expensive custom tarps or conventional hand wrapping with the added ability to shrink the cover for a tight fit, resulting in quality protection for wind power products including root end sections, tower sections, blades and other products. These custom fit covers offer protection against dirt and water during shipping and storage for a smoother transition from factory to field. Various openings can be designed into the covers allowing zipper or Velcro openings for access or different trailer configurations with wind tower section covers. Covers are easy to apply, can be removed quickly and easily and in many cases are reusable.

Made from Shrinkable Fabric™, Transhield covers consist of three layers: an outer layer that is UV-resistant and anti-condensation, the middle layer is a hot melt adhesive containing no solvents and a soft, cloth-like polyester inner layer. These covers feature the patented Adhesive Additive Delivery—Vapor Corrosion Inhibitor (AAD-VCI) system which provides 100% protection from corrosion during transportation and storage. This unique non-abrasive composition protects against the elements during transportation and storage without causing damage to paint, gel coats or decals of products.

For more information about Transhield, Inc.'s line of custom fit covers, visit www.transhield-usa.com/transhield_windpower_covers.html.

ADINDEX

Craig Firl
North American Technical Manager, Capital Safety

TELL US ABOUT YOURSELF AND YOUR RESPONSIBILITIES AT CAPITAL SAFETY.

Over the 30 years I've been with Capital Safety, I've held various positions in engineering support, quality assurance, customer support, marketing, and technical services. I have extensive knowledge in the areas of fall protection applications, product support and service, product development, and fall protection standards/regulations.

WHAT CAN YOU TELL US ABOUT THE RECENT CHANGES TO THE ANSI Z359 FALL PROTECTION CODE?

One of the most recent ANSI Z359 Fall Protection Code standards is ANSI Z359.7. This is a new umbrella standard, meaning it applies to all component standards within the Z359 family (i.e., it applies to the harness, energy absorbing lanyard, self retracting device, and anchorage connector standards within the Fall Protection Code). The ANSI Z359.7 standard is for testing and verification, and it requires all ANSI Z359 compliant products to be tested in an accredited laboratory to the most current version of the specific standard. All aspects and areas of the standard must be complied with.

While most manufacturers did test some items to the ANSI Z359 standards in the past, testing is now mandatory per the 359.7 standard. In addition, retesting is required to assure the products continue to comply; testing is required at least every five years if the manufacturer has a documented quality system, or every two years if no formal quality system is in place.

IS THIS STANDARD SOMETHING THAT WILL HAVE TO BE ADOPTED BY ALL WIND ENERGY PSE SUPPLIERS?

ANSI remains a voluntary standard, but because of the mostly outdated, minimal OSHA standards that we have for fall protection, the ANSI Z359 Fall Protection Code is typically where most companies in any market or industry will look to for guidance and direction when it comes to protecting people working at height.

WHAT STEPS ARE BEING TAKEN BY CAPITAL SAFETY TO HAVE ITS EQUIPMENT CERTIFIED UNDER THE CHANGES TO THE STANDARD?

Capital Safety has always performed extensive testing and documentation on its products and has had its own accredited lab for about three years now. With that said, we still needed to conduct an extensive amount of testing to bring everything up to full compliance with the new standard. The documentation and making it available to customers was a large project, but one that the company saw as important. Customers can now go online via the Capital Safety website and download a certificate of compliance for all applicable ANSI Z359 complaint products.

WHAT IS THE APPROVAL AND CERTIFICATION PROCESS FOR PRODUCTS?

ANSI Z359.7 applies to all new ANSI compliant items being produced. Therefore, if it is marked as ANSI Z359 compliant, it has been thoroughly tested in an accredited lab. Most manufacturers have to go to an outside lab to have this testing done, resulting in a bit of a waiting period.

Over the past year or so, Capital Safety has been testing its products in its own accredited lab in order to meet the new compliance standard. If an item is not an active product in our manufacturing system, but someone requests that product be certified, Capital Safety would run the required tests. This normally amounts to no more than a week or two.

HOW WILL THE CHANGES TO THIS STANDARD BENEFIT WIND ENERGY INDUSTRY PERSONNEL, SUCH AS O&M TECHS?

Knowing that the products have been tested in an accredited lab should be important to anyone who has to work at height, and having the documentation available to prove it gives peace of mind. People using ANSI compliant equipment are assured that the product performs in accordance with the most recent standard.

For the complete Q&A with Craig Firl, visit windsystemsmag.com.

For more information about Capital Safety's line of safety equipment, visit en.capitalsafety.us. For information regarding the ANSI Z359.7 standard, visit en.capitalsafety.us/ANSI3597/tabid/3202/language/en-US/Default.aspx.

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> Eliminates foam and sludge in normal operating conditions

> Extends gear box life due to reduced wear and improved protection of gear and bearing surfaces

> Provides excellent protection against micro-pitting

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