WIND SYSTEMS MAGAZINE

WIND SYSTEMS

GIVING WIND DIRECTION

WINDPOWER 2014

>> **Show preview,** page 32
>> **Schedule,** page 35
>> **Conversation,** page 36
>> **Profile,** page 38

» **Warranty worries in the U.S. wind maintenance market,** page 09

» **Excess water a threat to bearing life,** page 50

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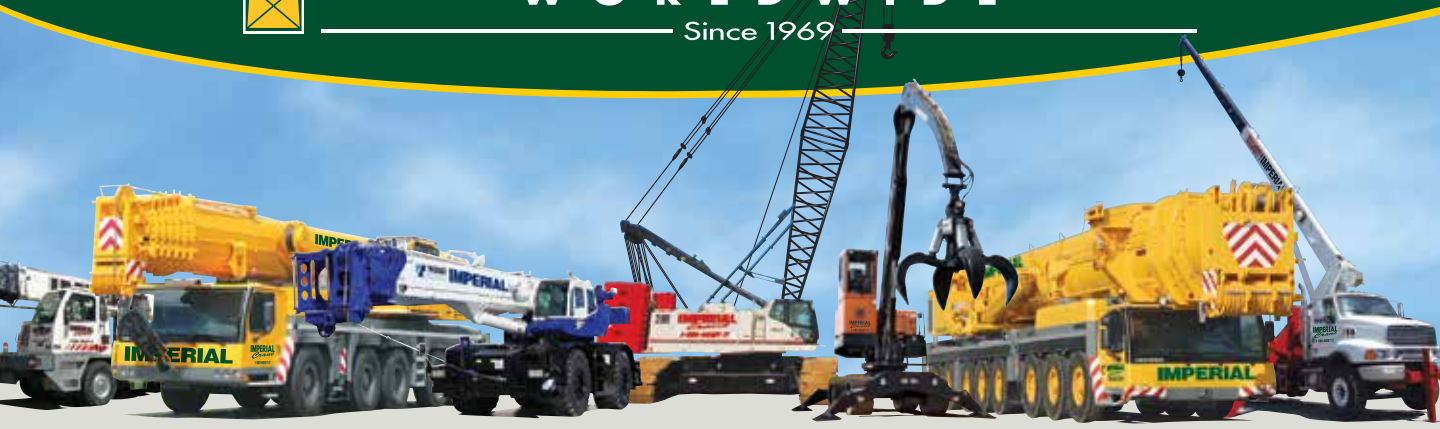

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20

Rethinking the "reactive" paradigm

By Phil Hatch, Romax Technology Ltd.
Global wind power operators draw from "InSight" in growing industry shift toward optimized predictive maintenance

36 CONVERSATION: Stefanie Brown
Director of Conference & Meetings, AWEA

38 PROFILE: C.C. Jensen A/S
For more than 50 years, filtration company C.C. Jensen has been battling oil's natural enemy—contamination—in an attempt to keep its customers' equipment running as long as possible.

ALSO IN INFOCUS

32 Las Vegas and Mandalay Bay host WINDPOWER 2014

35 WINDPOWER 2014 Schedule

44 EWEA annual event highlights expansion, technology, firm policy

45 At WIND EXPO in Tokyo, interest in Japanese wind market gains momentum

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SECTIONS

08 DIRECTION

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

During this winter's cold snaps, wind energy helps keep lights on and energy bills low

By Michael Goggin
American Wind Energy Association

09 Warranty worries in the U.S. wind maintenance market

By Chris Cioni and Dan Cass
GCube Insurance Services, Inc.

MAINTENANCE

48 Proper identification and understanding of fasteners is critical in wind industry applications

By Jack Wallace
Frontier Pro Services

50 Excessive water shortens bearing life

By Kevin Dinwiddie
AMSOIL, INC.

CONSTRUCTION

56 Construction event attracts nearly 130,000 while setting exhibit and education records

59 juwi Wind chooses H.B. White Canada to build four community wind farms in Nova Scotia

INNOVATION

60 LM Wind Power launches blade R&D project

Four-year research effort seeks to develop flexible blade concept that reduces cost of energy by up to 10 percent

62 Siemens touts benefits of D3 platform uprating

63 Google, 3TIER give the world universal access to global wind and solar resource potential

MANUFACTURING

66 SME event demonstrates the continued strength of U.S. manufacturing

68 Metalworking company CEO urges Congress to bring manufacturing back home

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Considering all that this industry has been through in recent years—another "boom-and-bust," political opposition, shaky policy—it would be easy to argue that wind energy needs a break. Raise your hand if you need a vacation.

The truth of the matter is, we can't afford to take a break. The very reasons we need a vacation are the challenges we continue to face. A record number of projects are in the construction phase. Technology is expanding at breakneck speed. Other renewable energy sources have redoubled their efforts in competing for market share. Coal is expected to remain relatively flat in the short term. The alternative financing models that we've been investigating may need to be put into practice.

The good news is, it feels like we're moving in the right direction. Is it just me, or does anyone else sense a changing of our collective outlook and attitude? Our past frustration now seems to be focused on moving the industry forward.

I think we can attribute much of that to the leadership that the American Wind Energy Association has brought to the table. This time last year, then-incoming AWEA chair Gabriel Alonso outlined a five-point strategy for a sustainable future for our industry. I'm paraphrasing, but this strategy involved: strengthening AWEA; proving wind's worth; developing a long-term strategy and acting on it in the short- and mid-term; unifying the industry under one voice; and encouraging a strong, vocal, participating membership.

In just a year, the industry has come a long way in acting on that philosophy. But we can't stop there. We can't allow ourselves to be overly distracted by small setbacks or other shiny objects. Admittedly, that will be difficult as we gather next month in the ADD capital of the world.

Thankfully, the Association has taken steps to ensure we stay on task. The theme of WINDPOWER 2014 is "Transformation in Motion." Personally, I think it's a spot-on description both of where we are and where we must perpetually be as we push toward a stable future for wind energy.

It takes me back to just after WINDPOWER 2013 in Chicago. *Wind Systems* was starting to reinvent itself editorially, and we felt the need to make a strong, yet simple statement that would solidify both our commitment to and position in the industry. What arose was "GIVING WIND DIRECTION," which in many ways

is nearly synonymous with "Transformation in Motion."

So when you make your way into the Mandalay Bay Convention Center next month, keep both in mind. If you're fuzzy on what we mean by "GIVING WIND DIRECTION," stop by booth 3074 (trust me, this time you won't be able to miss us) and a colleague or I will be happy to fill you in.

Oh, and have a little fun while you're in town. I'm not much of a gambler myself, but I do have one sure bet...

I'm putting it all on wind.

As always, thanks for reading!

Stephen Sisk, editor
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Michael works to promote transmission investment and advance changes in transmission rules and operations to better accommodate wind energy on the power system while maintaining systems reliability.

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Dan works directly with GCube clients to help advise and assist in the event of an unexpected event or a claim as well as provide technical guidance for underwriting considerations.

With over twenty years' experience in insurance and engineering roles, ***Chris Cioni***, P.E., is Senior Vice President of Underwriting for GCube Insurance Services, Inc. Cioni is responsible for underwriting operational and construction projects for renewable energy developments including wind, solar, hydro, biomass and geothermal projects in North America.

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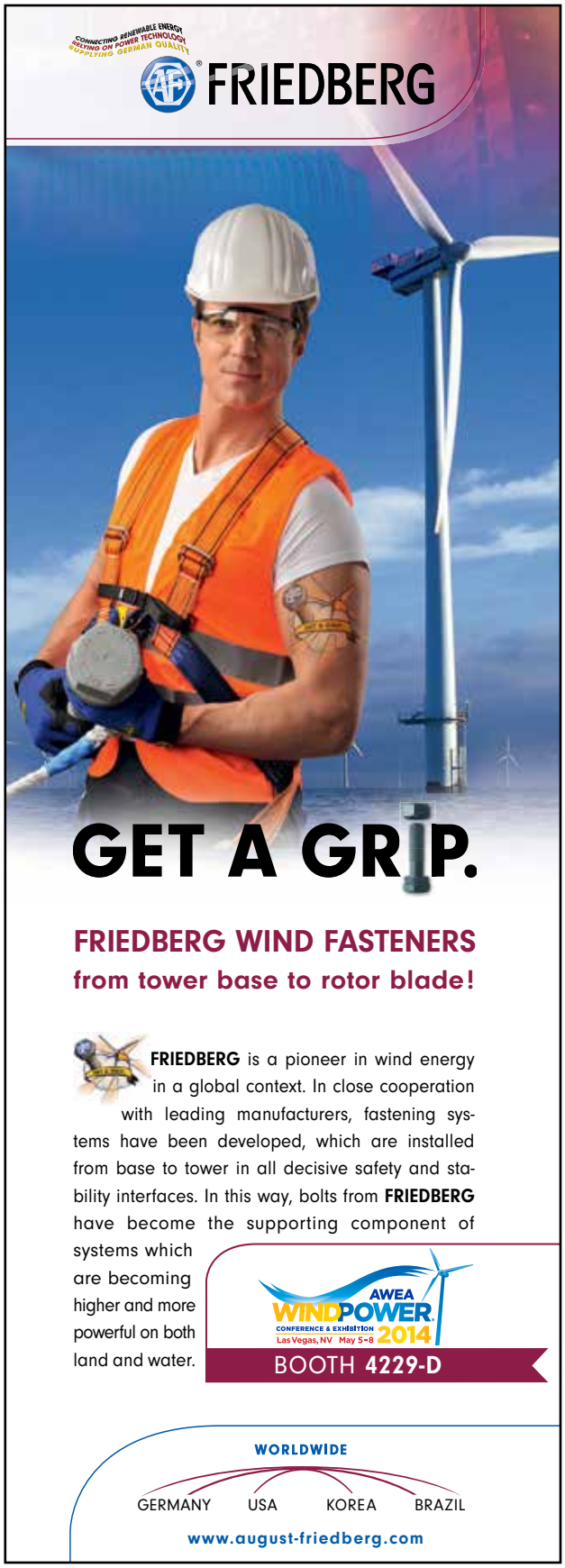
Jack Wallace started in the wind industry as a wind turbine technician in 1985. Since then he has trained hundreds of technicians in electrical troubleshooting, mechanical systems, composites, and wind energy related safety. He has a deep understanding and experience of what it takes to run a wind farm and is always ready to help others in wind to successfully run their wind power plants.

Kevin Dinwiddie is currently Senior Wind Turbine Tribologist at AMSOIL INC., with more than 35 years experience in the lubrication field. Over the years he has been involved with the National Renewable Energy Laboratory and the Society of Tribologists and Lubrication Engineers (STLE). Kevin currently serves as co-chair of the AWEA O&M Working Group—Gearbox Sub-Committee.

Stefanie Brown is Senior Director of Conference and Meetings with the American Wind Energy Association. Among her duties in this role are logistics, hotel and convention center relations, vendor facilitation, registration, sponsorship implementation, and catering. A member of AWEA's senior management team, Stefanie earned her bachelor of science degree from James Madison University.



DIRECTION

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

INDUSTRY AT LARGE

DURING THIS WINTER'S COLD SNAPS, WIND ENERGY HELPS KEEP LIGHTS ON AND ENERGY BILLS LOW

While the record cold across much of the U.S. in January and February was a top news story, what received less coverage was the role wind energy played in protecting consumers from price increases and reliability problems affecting other energy sources. Electricity supplies across the Eastern U.S. were tight as electricity demand skyrocketed at the same time many conventional power plants stopped producing due to mechanical failures from the cold and natural gas shortages.

Fortunately, wind energy provided large amounts of extremely valuable electricity as the cold successively challenged each grid operator:

- As the cold and high winds first rolled into U.S. on January 6, the Midwest grid operator saw very high wind energy output of around 8,000 MW, enough to supply 6 million average homes under typical conditions.
- Later that morning, the Nebraska Public Power District was able to meet record winter electricity demand with more than 300 MW of wind output, which provided about 13 percent of its total electricity demand. In a press release touting wind energy contribution, the utility explained that "Nebraskans benefit from NPPD's diverse portfolio of generating resources. Using a combination of fuels means we deliver electricity using the lowest cost resources while maintaining high reliability for our customers." The utility also noted that "NPPD did not operate its natural gas generation because the fuel costs were up more than 300 percent over typical prices."
- In Texas, the more than 2,000 MW of wind output that morning was the critical difference keeping heaters running as the grid operator struggled with numerous outages at conventional power plants. More than 13,000 MW of conventional power plants were down for maintenance, while another 2,000 MW of conventional power plants experienced unplanned outages, forcing the grid operator to resort to emergency procedures. In a similar incident two years ago, wind energy earned accolades from the grid operator for helping to keep the lights on as dozens of conventional power plants failed in another cold snap.
- By that evening, the cold air had reached the East Coast. The grid operator for the Mid-Atlantic and Great Lakes states, PJM, saw very high wind energy output when it needed it most. Wind output was above 3,000 MW when the grid operator faced extreme challenges due to the unexpected failure of numerous conventional power plants.
- The New York grid operator issued a press release highlighting the major contributions it received from wind energy and the difficulties it encountered due to failures of other energy sources that evening.

By Michael Goggin
American Wind Energy Association

- New England consumers also saw major savings as the region's wind plants ran at nearly full output, helping to mitigate the impact of extremely high electricity and natural gas prices.

Two weeks later, wind energy again provided large amounts of extremely valuable energy as another cold snap roiled the Eastern U.S. During the periods of peak demand on January 22-23, the PJM grid operator received between 3,000-4,000 MW of wind energy output. Wind played a critical role in diversifying the energy mix, protecting consumers from electricity and natural gas prices that skyrocketed to 10-50 times normal levels.

Finally, in early February, wind energy once again demonstrated its value, this time in California. Specifically, wind energy provided the California grid operator

with around 2,000 MW of output at the time of peak demand on the evening of February 6, and wind energy output remained high at around 2,500 MW for most of the rest of that evening. This came at a critical time for the operator, which issued a statewide "Flex Alert" because "A shortage of natural gas triggered by extreme cold weather in much of the United States and Canada is impacting fuel supplies to Southern CA power plants and reducing electricity generation."

Because it has no fuel cost, wind energy plays a critical role in protecting consumers from fuel price volatility. Through four separate mechanisms, wind energy keeps electricity and natural gas prices in check by:

- Directly offsetting the use of expensive energy
- Driving prices down for all consumers in the electricity market
- Driving natural gas prices down for all consumers in the gas market
- Hedging against energy price volatility

While wind energy provides these benefits during everyday grid operations, they are more pronounced during shortages like the extreme cold events seen in January and February.

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Warranty worries in the U.S. wind maintenance market

As an increasing number of turbine warranties expire, seamless collaboration among operators and insurers is crucial to long-term decision making and reliability

By Chris Cioni and Dan Cass
GCube Insurance Services, Inc.

The scale of the shift from original equipment manufacturer (OEM) agreements to independent maintenance contracts and its impact on the market is not to be underestimated. According to IHS Energy research, U.S. operations and maintenance (O&M) spending is forecasted to double to close to $6 billion by 2025 as a result of the number of turbines coming out of warranty. Worldwide, we estimate that around 30 to 35 percent of the market has made the shift, or is considering shifting to independent maintenance contracts.

The fate of the Production Tax Credit has driven owner/operators to search for alternative ways to reduce costs wherever possible—and there's no pretending that cost isn't the major factor driving this industry development.

With average yearly maintenance costs of over $50,000 per turbine, operators will naturally look for ways to bring this figure down; however, once warranties expire, this exercise becomes increasingly complex.

During the OEM's standard warranty period, which is often non-negotiable, an operator will have a limited idea of the true operational experience of a wind farm, since not all day-to-day issues are shared by the OEM and the data history accumulated by the operator is not all encompassing.

When it comes to negotiating a follow-on O&M contract with the OEM, the operator is presented

with a 'menu' of options ranging from basic programs to comprehensive offerings. These packages come at a significant price; hence an inevitable shift towards independent contracts.

Some OEMs have differentiated their offering by providing Energy Yield Guarantees (EYG) or Annual Energy Production Guarantees (AEP), which cover the production of a wind farm, rather than its availability. These offer owner/operators the opportunity to make savings on personnel costs, since the bulk of maintenance work will be performed by the OEM for a price that guarantees a specified production output no matter what.

By comparison, independent O&M providers will offer a similar menu of incrementally priced offerings to the OEM, in conjunction with an availability guarantee, for a lower cost than the OEM can offer. Since the independent contractor is bound to this availability guarantee, it must continue to provide a robust and efficient program in order to meet targets. Owner/operators opting for independent contracts will thereby benefit from upfront cost savings while maintaining availability objectives.

Both of these routes have their benefits for an owner/operator, however, in our view, the biggest difference and greatest advantage is the EYG offered by some OEMs. While independent contractors can guarantee a particular percentage of

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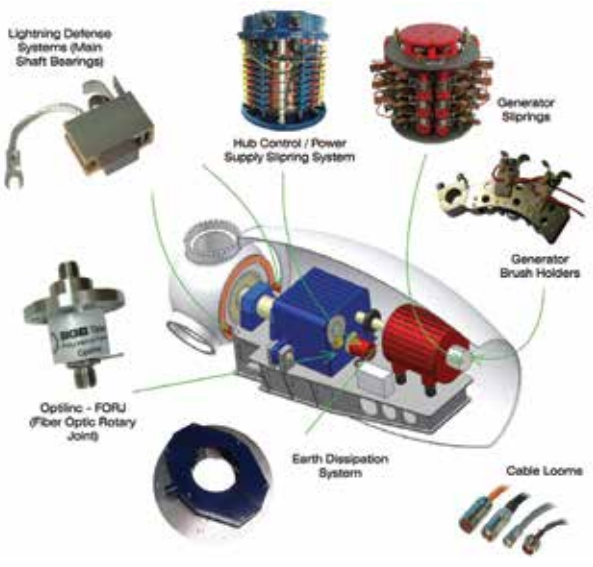

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availability, an EYG takes this one step further with a commitment to deliver a specific energy yield.

Relative experience is another area where the maintenance offerings of OEMs and independents can be differentiated. Manufacturers will naturally claim to know everything there is to know about their machines and will assert that they are in the ideal position to service these. This is a valid point—the OEM will possess the most comprehensive database available and will be up-to-date with a number of trends and issues that might not make it into the public domain.

Independent contractors, by contrast, will stress the value of lessons learned across the sector, having worked with a variety of manufacturers and equipment. They will be able to share these lessons openly with the client to ensure that projects continue to be managed effectively going forward.

Crucially, from an insurance perspective, both OEMs and independent contractors have a vested interest in keeping turbines working properly and minimizing down time. The best way to ensure this will always be to have a proactive maintenance program in place, ideally making effective use of condition based monitoring.

Naturally, however, any switch in maintenance practices is a source of potential concern for insurers and underwriters. An insurer will always feel most comfortable while the original manufacturer warranty is still in effect, and, once this has expired, will be in need of a certain level of reassurance in order to resolve uncertainty and maintain that level of comfort.

As such, when negotiating follow-on O&M contracts outside of the warranty period, there are several areas that operator/owners should consider to ensure that the relationship with their insurer remains positively engaged.

Firstly, the nature of any new contract and service level agreement should be carefully considered. Given the 'menu' of choices offered by independent contractors and OEMs alike, it's important that an owner/operator knows whether a site will be receiving a bare bones offering or a full wrap, comprehensive O&M service.

Secondly, if an independent service contract is being considered, operators should take care to determine the reputation of the company set to undertake maintenance work on their site. While the reputation of the OEM will have

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been a factor in the original equipment choice, owners will have to consider the experience and scope of operations of any third party contractor to ensure that they are the best fit for the asset involved.

Finally, underwriters are keen to see that an operator can display a commitment to best practice across the board where maintenance is concerned. In addition to a robust and suitable maintenance program, operators should be able to demonstrate that a supply of spare parts is available should a problem arise, that sufficient numbers of experienced technicians are on hand to conduct maintenance work and that strong contingency plans are in place.

Providing all of the above is enacted, insurers will work to develop an insurance program for a site that reflects the best practice of its owner/operator.

However, with a climate of uncertainty surrounding the future of O&M in the sector, the willingness of operator/owners to share information in a timely fashion is increasingly becoming the key requirement for keeping insurers happy and on board.

Having paid more claims in the renewable energy insurance market than any other provider; one of the biggest challenges we regularly face is convincing
clients to share information as soon as possible. Although we understand clients' concern that information will be used against them in an attempt to up their rates, we look at our relationship with the client as a partnership.

Crucial to this partnership is an open dialogue, affording us the opportunity to exchange ideas and strategies for more effective risk mitigation and loss control. It is vital that we receive information early so that we have time to act in a timely and effective manner.

Furthermore, the need to act early will be an ongoing theme as the market matures in the coming years. As wind farms grow older, wear and tear and equipment degradation is only set to increase. We need to see proactivity across the maintenance market. Regardless of who is responsible for maintaining this aging equipment, more real time analytics and condition-based monitoring will ultimately be required in order to minimize downtime and repair costs.

So in the end, it is not only about making a considered choice for a post-warranty maintenance program and demonstrating a wider commitment to best practice that owners and operators can maintain a strong relationship with their insurer; it is also about ensuring that an honest, open partnership is established alongside a commitment to proactive, preventative maintenance and associated technologies.

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Vestas adds another 450 U.S. jobs

Driven mostly by North American demand, OEM's total workforce addition at four Colorado factories to top 850

Two blade factories have already filled about 400 positions and Vestas expects to add at least 450 more production workers in 2014.

One of the best years for wind-turbine orders for Vestas has led to significant hiring at its four Colorado factories. The company's blade factory in Windsor, blade and nacelle factories in Brighton, and tower factory in Pueblo, expect to add more than 850 production workers this year after Vestas secured orders in 2013 for nearly 900 turbines.

Working with Elwood Staffing, Vestas this year already has filled about 400 positions at its Colorado blade and nacelle factories and has received more than 3,200 applications overall. About 450 additional factory positions are expected to be filled this year. Candidates can apply at ElwoodWindJobs.com.

"We are going to be extremely busy making blades, nacelles and towers this year through at least 2015," said Chris Brown, president of Vestas' sales and service division in the United States and Canada. "We have excellent turbines like the V110-2.0 MW and V100-2.0 MW that are very competitive in the U.S. market—and they're made right here in Colorado. Some of the world's largest utilities and energy developers are buying them because they are confident in the proven technology, quality, and durability of our products."

The positions are considered temporary with the opportunity to be hired as regular Vestas employees. Since late 2013, Vestas has already converted more than 60 people to regular employees at the Brighton blade factory.

HEADLINES

Senvion eclipses 10 GW installed capacity milestone

Senvion SE, a wholly owned subsidiary of the Suzlon Group, installed more than 1.4 GW of capacity in 2013 followed by a strong installation start in 2014–thereby breaking the mark of 10 GW of capacity worldwide. This capacity is enough to supply 20 million people–or the entire population of Australia– with electricity for one year.

Senvion installed the largest share of this total volume in Europe, where a total of 7.5 GW is installed here alone—on land and in the water. In its domestic market of Germany, the wind turbine manufacturer installed a total capacity of 2.8 GW by the end of 2013. The subsidiaries in France (1.5 GW) and Great

HEADLINES

Britain (1.1 GW) likewise make a major contribution to breaking the 10 GW mark. In North America, Senvion is active with a total of 1.8 GW of installed capacity. Asian countries contribute 375 MW to the group's capacity while the subsidiary in Australia contributes 196 MW.

A total of 10 gigawatts of installed capacity on four continents in more than 10 countries documents impressively that we have the right products for the global market—from our tallest turbine measuring 200 meters in height for low-wind locations in inland areas to powerful offshore machines," said Andreas Nauen, CEO of Senvion SE. "It was only recently that we founded a subsidiary in Austria. Turkey, India and Japan are other interesting markets we have our sights on."

Employees hired directly by Vestas receive a comprehensive benefits plan that includes health care, generous vacation and sick time, as well as a 401(k) with an employer match.

"Our world-class Colorado factories help us compete in the U.S. market," Brown said. "Since we opened our first factory six years ago, it's allowed us to conduct business in American dollars, build a domestic supply chain, and reduce transportation costs."

Based on orders received in 2013, Vestas has the potential for an additional 2.6 GW of turbine sales in the United States and Canada. In addition to fulfilling regional orders, Vestas also is exporting blades, towers and nacelles from Colorado to projects in Mexico, Brazil ,and Uruguay.

In 2011 and 2012, a downturn in the U.S. wind industry proved challenging for Vestas and other renewable-energy companies. Today, Vestas is completely debt-free, earned a profit in 2013 and expects strong earnings in 2014.

Vestas employs more than 1,450 people in Colorado with the large majority working at the manufacturing facilities. In 2013, Vestas hired more than 300 people at its tower factory in Pueblo to meet customer demand.

The tower factory plans to hire 80 more people in the next few months and is expected to reach full capacity utilization in 2014. Vestas also employs people in service and maintenance at two wind farms, as well as at a tools warehouse in Denver. By the end of 2014, Vestas expects to have more than 2,000 workers in the state.

Across the United States, the wind industry has more than 550 factories in 44 states. Turbine components produced domestically and installed in the U.S. have grown from about 25 percent in 2005 to more than 70 percent in 2013, according to the American Wind Energy Association.

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GE ANNOUNCES ITS NEXT-GENERATION "BRILLIANT" WIND TURBINE

2.75-120 features flexible storage, delivers 5 percent more AEP than its predecessor

GE recently announced its 2.75-120 wind turbine—a smarter, more powerful turbine—at the European Wind Energy Association's annual event. Part of GE's brilliant wind platform, the 2.75-120 provides 5 percent more annual energy production than GE's 2.5-120 model and is available with various tower technologies, ranging between 85-139 meters, and optional energy storage.

"As we accelerate our platform's growth in Europe, we will continue to invest in technology such as the 2.75-120's flexible tower and other energy storage options, making GE's wind turbines more customizable for developers and operators," said Cliff Harris, general manager of GE's renewable energy business in Europe.

The 2.75-120 is available on a steel, hybrid or space frame tower, helping to tailor the turbine for unique site conditions and bring wind power to new places across the continent. The range of tower height spans 85-139 meters tall.

Short-term or long-term energy storage is available with the 2.75-120, making wind power more predictable, flexible and fast responding through battery software applications. Short-term storage is integrated at the turbine level and long-term storage is centralized for the wind farm. These options further customize GE's offering based on-site or operator needs.

The 2.75-120 follows the success of its predecessor, the 2.5-120, announced in February 2013. Forty-four are being supplied to eight new German wind farms. The 2.75-120 is part of GE's brilliant wind turbine platform and utilizes the power of the Industrial Internet to analyze tens of thousands of data points every second, driving higher output, improving services productivity and creating new revenue streams for customers.

The 2.75-120 wind turbine is part of the company's commitment to technology solutions that save money and reduce environmental impact for customers. In February, GE renewed that commitment in announcing it would invest $10 billion additional in research and development by 2020. Part of that investment will go toward reducing the cost and increasing the output of its turbines to lower wind power generation costs.

VESTAS RECLAIMS TOP SPOT FOR GLOBAL WIND TURBINE INSTALLATIONS

Danish wind turbine manufacturer Vestas Wind Systems has regained its position as the world-leading turbine installer, reaching first place in the top five companies in terms of total capacity installed, according to research and consulting firm GlobalData's unique wind turbine installation figures for 2013.

The company's latest research shows that Vestas has knocked GE Power & Water out of this position from 2012. This comes following Vestas' high number of wind turbine installations in the US, which is a major market for the company.

Both GE Power & Water and Gamesa Corporacion Tecnologica slipped completely from the top five original equipment manufacturers in 2013, falling from first and fifth position, respectively. In 2013, GE Power & Water installed 980.2 MW of wind turbines, a drop of more than 80 percent compared to its 2012 installed capacity.

German turbine manufacturer Enercon has made the top five list as the second largest turbine supplier in 2013, climbing up from its fourth position in 2012. Germany, Canada, and Turkey proved major markets for Enercon in 2013, where the company installed total capacities of 1,484.8 MW, 582.5 MW, and 237.1 MW, respectively.

While Chinese OEMs were absent from the top five in 2012, Chinese wind turbine supplier Xinjiang Goldwind Science & Technology (Goldwind) has blown its way into third place in 2013, advancing from its seventh position in 2012. GlobalData states that this is due to the company's increasing domestic installations in China.

Meanwhile, German OEM Siemens slipped to fourth position in the rankings, as Goldwind overtook the company to claim its position from 2012. Siemens' drop follows its decline in U.S., UK, and Romanian wind turbine installations.

Like Goldwind, Suzlon Group was another new entrant in the top five and ranked as the fifth largest OEM for 2013, advancing from its sixth position in 2012. This is attributed to the company's large-scale installations in Canada, Germany, and Poland during 2013, according to GlobalData.

GE TARGETS NEW HEIGHTS WITH SPACE FRAME TURBINE TOWER DESIGN

GE's renewable energy business announced the introduction of its new space frame tower for multi-megawatt wind turbines at the European Wind Energy Association's annual conference in Barcelona, Spain.

The five-legged enclosed lattice tower enables towers up to 139 meters to be built more cost-effectively in never before accessible locations, using a logistics-friendly model of standard shipping methods and on-site assembly.

Courtesy: GE Power and Water

"The space frame tower helps our customers go taller in new locations, further enabling the growth of wind energy," said Cliff Harris, general manager of GE's renewable energy business in Europe. "This next innovation in wind turbine technology is a stepping stone towards towers taller than 150 meters in Europe. GE will continue to drive innovation and advanced technology for the wind industry in the coming years."

The space frame tower is being introduced with GE's new 2.75-120 wind turbine and was demonstrated in a full-scale turbine at GE's prototype site in Tehachapi, Calif.

The lattice tower is assembled at wind farm locations and then wrapped in an architectural fabric to provide familiar solid structural aesthetics. The tower improves serviceability with increased space down-tower, maintenance-free bolting system, and efficient installation and dismantling.

The space frame tower features a wide base supported by five legs that provide more room at the base of the tower than a traditional tubular tower. The additional down-tower space allows for storage within the turbine for ease in maintenance, site organization and balance of plant.

Parts manufacturing can be automated with the space frame tower to optimize quality control of the structure. The fabric casing is durable, weather resistant, and does not need to be replaced during turbine life.

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Rethinking the "reactive" paradigm

Global wind power operators draw from "InSight" in growing industry shift toward optimized predictive maintenance

By Phil Hatch
Romax Technology Ltd.

As in other heavy industries that utilize rotating machinery, wind turbine operators have come to realize that effective monitoring of critical drive train components can enable proactive maintenance and ultimately reduce operations cost over the long-term life of the producing asset.

Some have characterized this as the evolution of the Operations & Maintenance (O&M) service organization from a reactive, fire-fighting approach to a predictive and optimized maintenance planning and execution mode of operation.

This evolution has not occurred overnight and it is has been a reaction to the various failures that operators have experienced on multiple projects across a wide cross-section of wind turbine types and models. Romax's customers have realized and acted upon the notion that knowledge is power—whether in securing concessions from a manufacturer at an end-of-warranty discussion, negotiating renewals, or for budgeting for major repair and replacement where O&M is taken in-house.

Shadowing the OEM during the initial warranty period—thinking strategically for the long-term

A top-five global developer and owner-operator of onshore and offshore assets in the U.S. and Europe has engaged Romax to "shadow" the OEM for the duration of the initial warranty period. The operator approached Romax and made the decision to utilize the InSight monitoring service as a way to gain knowledge of their fleet's "health." While the assets are covered under the OEM warranty for the first few years, there is often not a good alignment of vendor priorities to owner-operator priorities for the long-term operation of the asset. This can lead to incomplete information sharing, less than optimal maintenance practices (e.g. the "hidden" bearing problem that blows up three months after end of warranty) and a focus on contractual issues and their associated implications; as opposed to doing what's best for the long haul.

Romax Technology is monitoring this operator's turbines 24/7 with vibration data, oil sample data, maintenance plans and records and other sources of data. These are combined in a manner that gives the operator a big-picture view of the past, present and future condition of their assets in a way that previously only the OEM would have been able to create. Having access to this range of "big data" has enabled this operator to negotiate from a position of strength with the OEMs, and better

plan its operations and maintenance (O&M) budgets and projected spend when considering taking O&M in-house.

End-of-Warranty–better information leads to better outcomes

One of the most critical transition periods in the life of an asset is when the OEM warranty is ending. Operators have many choices to make at this point; in order to make the best decisions for the long-term they need all the information they can gather about the current health of their machines.

Conducting a machinery health assessment with vibration measurements can be of significant additional benefit in providing data for the operator in negotiations with the OEM.

ALSO IN THIS SECTION:

32 **WINDPOWER 2014 heads to the Las Vegas desert**

36 **Conversation:** Stefanie Brown, Senior Director of Conference & Meetings, AWEA

38 **Profile**
C.C. Jensen A/S

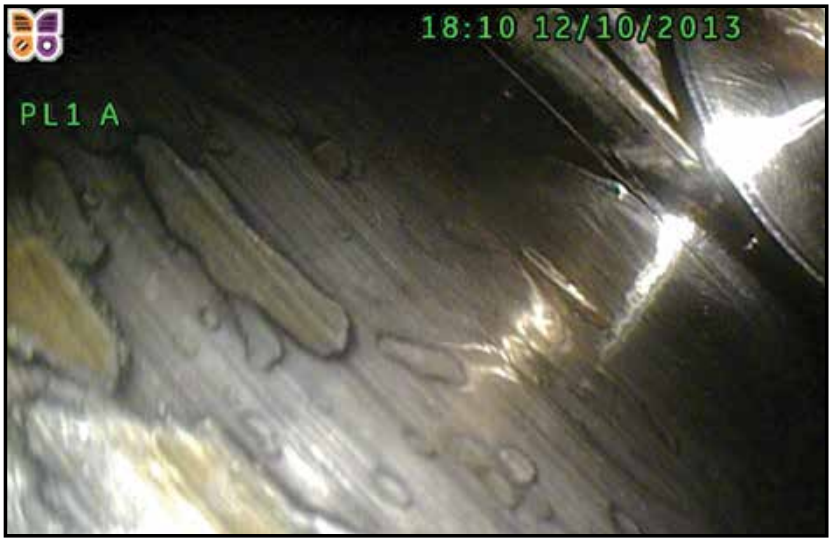

Figure 1

Typically at end-of-warranty (EOW) the operator will engage Romax or another party to perform detailed inspection of drivetrain components, hubs, blades and other large components in an effort to determine the state of the machine and any impending problems. For instance, wide-ranging gearbox borescope inspections are typically carried out (see Figure 1). However, it is difficult and time-consuming to see all contacting surfaces on all components, and it will not necessarily find all damage that may have occurred. Vibration measurements provide invaluable insight and help with focusing these inspections on particular gearboxes and particular components.

A U.S. operator recently engaged Romax to perform targeted EOW inspections. Romax first performed a machinery health assessment by thoroughly analyzing the CMS and SCADA data and then conducted inspections of particular gearboxes. The inspections confirmed excessive deterioration had occurred as predicted by the data analysis. Though the OEM had been monitoring the site as part of the warranty and O&M agreements, planet bearing

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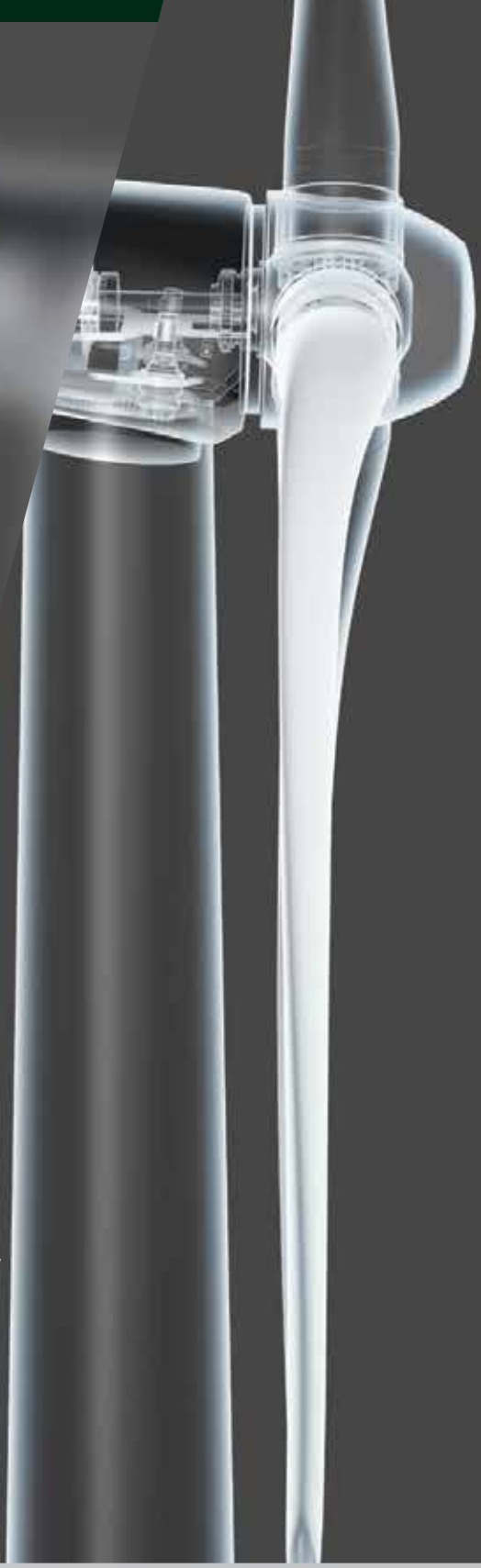

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*Compared to the closest global competitors. Based on independent trials conducted by Powertrib Ltd., The Oxford Science Park, Magdalen Centre, Robert Robinson Ave., OX4 4GA on 6th May 2010.

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Figure 2

faults were detected by Romax that had not been reported by the OEM. Detecting these faults enabled the operator to negotiate with the OEM from a strong position and get allowances for future gearbox repairs. Had this failure mode not been identified the site would have faced some very expensive repairs—challenging the already slim O&M budgets—instead of replacement under warranty.

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Periodic Portable Vibration Sweeps–what you don't know will definitely keep you up at night

Even after the EOW period is over, Romax recommend performing periodic vibration sweeps with portable vibration sampling equipment. Romax has developed and maintains its own equipment for use in these sweeps (see Figure 2).

Many of Romax's customers who don't currently have a permanent drivetrain vibration monitoring solution have requested a periodic "sweep" of either an entire wind farm or a subset population of turbines. The subset can be selected by reviewing prior sweeps and temperature data, oil/grease condition information and maintenance history. The periodic vibration sampling along with data from the other sources enables a trend to be developed which, combined with Romax knowledge of component failure histories and prognostics, can give the operator a clear view as to the future state of these components and consequently the costs that will be incurred to repair or replace.

Is it worth putting CMS in your turbines? A few OEMs thought so

Most of the fleet of wind turbines installed in the US during the last 10 years did not have OEM installed Condition Monitoring Systems (CMS) as standard equipment. In those turbines where it is installed the OEM benefitted by being able to manage failures proactively in a cost effective manner. They also benefit from the data as it may be used for future product optimization. Such equipment was offered as an option by OEMs, however, and was not perceived to offer enough value to developers. It is still perceived by many operators as too expensive and there has not been much activity, with a few notable exceptions, in the retrofit of CMS to the installed fleet.

One of Romax Technology's large global customers did make the decision a few years ago to retrofit their entire fleet with CMS as they determined a significant overall cost saving in doing so. The decision was made with a detailed calculation including the cost of the equipment, the detection efficiency, the predicted drivetrain failure rates and the future value of the cost savings enabled by early problem detections and associated cost avoidance.

Perhaps the biggest driver of any decision to retrofit CMS is the cost of the hardware and the determination of the payback period for the capital investment. The price of CMS hardware including vibration sensors and data acquisition units is reducing, and Romax believe that CMS hardware

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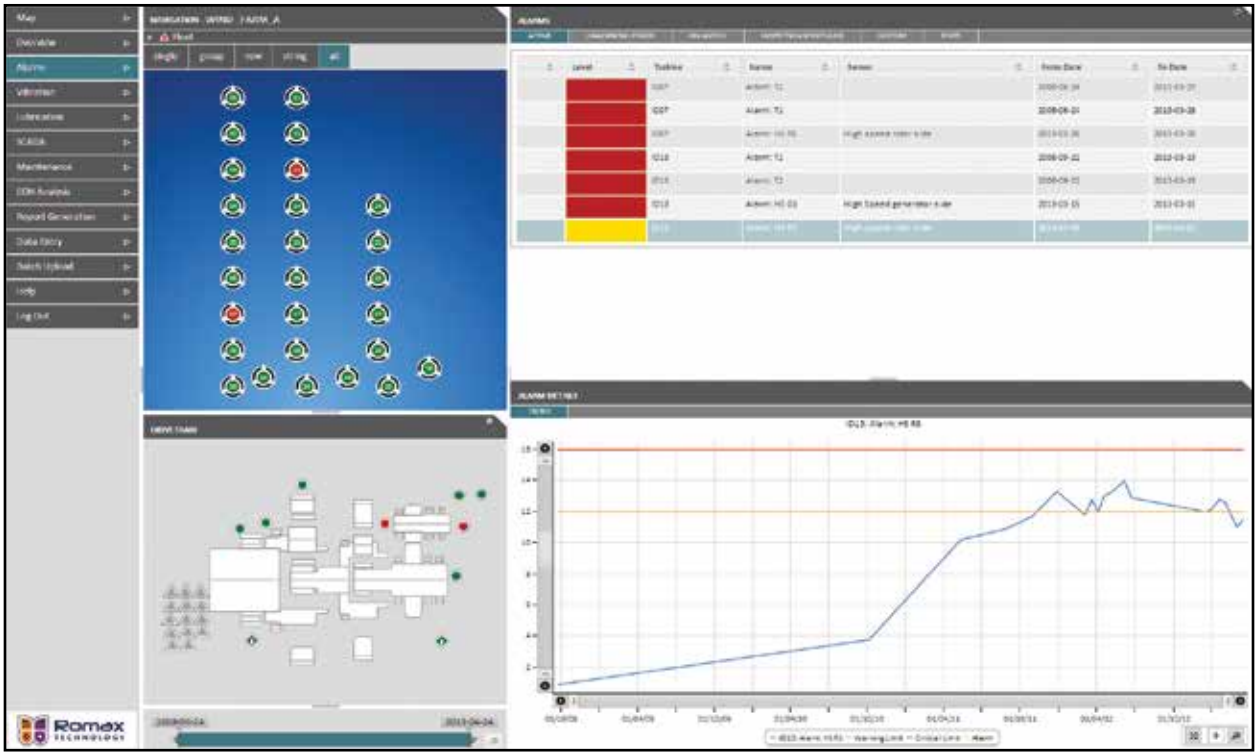

Figure 3

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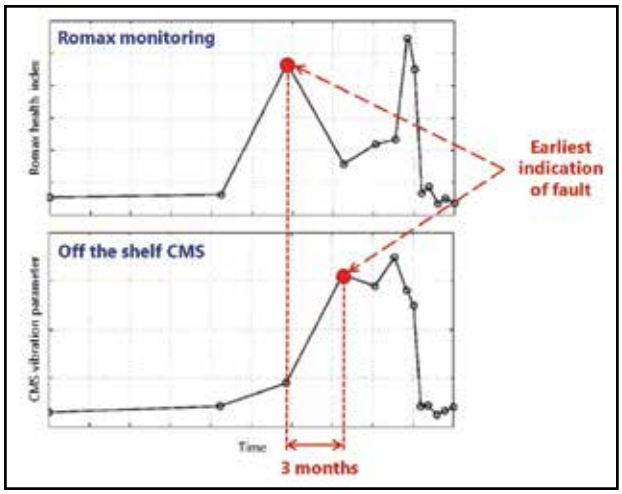

Figure 4

and services are vital for minimizing the cost of energy from wind. The payback on the capital cost has been demonstrated and it should not be a barrier to wider deployment in the wind industry.

However, installing the CMS hardware is not enough; ensuring quality data analysis, proactive site support and excellent communication are key drivers to maintain the return on investment. Once hardware is installed, the Romax InSight software solution and Romax's global team of experts can deliver monitoring, analysis and reporting services, utilizing the depth of knowledge of over 150 engineers delivering software and service solutions to designers and operators of rotating machines worldwide.

After the OEM is gone–is there a better way?

Many operators are now making a choice to not renew O&M services with their turbine OEMs. It is important not to lose the expert knowledge that the OEM has of "their" turbines during the transition. This knowledge is gained through access to operating data across their large installed fleet, and can be used for turbine-to-turbine and site-to-site comparative analysis. Often the OEM will not make an operator's own site data, particularly from installed CMS, available to the owner without explicit language in O&M agreements.

As a way to mitigate any ongoing reliance on the OEM for a true picture of their sites' "Machine Health," many operators have engaged the Romax InSight team to take over the real-time monitoring of their sites, including periodic reporting on information from installed CMS systems (see Figure 4). Independent service providers and in-house O&M groups may not have staff with the specialized training needed to analyze the many gigabytes of data generated. Such groups are augmenting their internal capabilities by accessing Romax's extensive experience in drivetrain design, root-cause analysis of failures, knowledge of vibration engineering as well as material and lubricant properties and their associated effects on performance. Specific examples of component faults and pending major catastrophic failures that Romax has identified for these customers are available in other publications, but suffice to say Romax has saved clients millions of dollars of expenses and lost revenues. Certainly over time these customers could have developed these capabilities in-house, utilizing the Romax InSight software tool, but in the near term the "catches" and savings have been real and quantifiable. Outsourcing monitoring to the Romax team of highly skilled engineers means that an operator can tap into the latest developments in fault-finding techniques and expert engineering knowledge on certain turbine types.

Where are you?

There is an old adage—"money can paper over all bad decisions"—which is fine provided you have a lot of money to begin with. Many wind farm operators in the U.S. inherited O&M budgets that were optimistically planned by development groups in their organizations. Their calculations were based on small, historical sample sets that did not translate well to the multi-MW, hundred-plus turbine sites that have been constructed more recently. When faced with a budget that was constructed on a "best-case" scenario of wind turbines actually performing at their market power curves with little to no downtime for repairs or major component replacements, the operator is quite often left to borrow from the future to pay for today's problems. A better way forward is to implement the proactive strategies discussed here as a means to measure, predict and adjust how sites are run and maintained. Utilizing the knowledge gained will enable an optimized maintenance planning process that is sustainable for the long haul.

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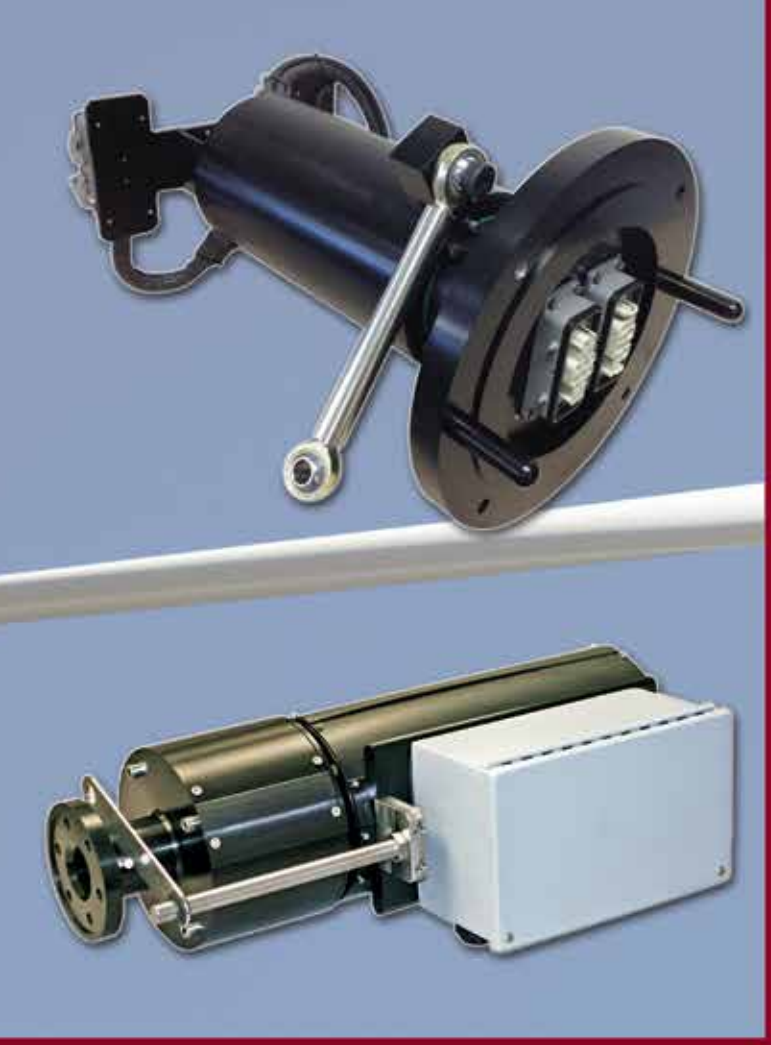

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Las Vegas and Mandalay Bay to host WINDPOWER 2014 as the industry's foremost event heads to the desert

From Staff and Press Reports

Courtesy: American Wind Energy Association

In less than a month, much of the wind energy industry will converge on Las Vegas, Nevada for the industry's premier event, WINDPOWER 2014, hosted by the American Wind Energy Association.

For the first time, the event will be held in Las Vegas, Nevada, at the Mandalay Bay Convention Center Exhibitors and attendees from around the globe will meet to discuss challenges, strategies, and opportunities.

As in years past, WINDPOWER 2014 will be centered dually on the educational conference and the industry exhibition, and flanked with special events, networking opportunities, technical training, and much more.

The overall theme for WINDPOWER 2014 is "Transformation in Motion," signifying the core purpose of the event is drawing wind energy professionals together in a collaborative effort in formulating wind energy's progression into the future.

The four-day event officially kicks off at 5 p.m. Monday, May 5, with an opening reception at House of Blues at Mandalay Bay.

CONFERENCE

On Tuesday, May 6, the WINDPOWER 2014 opening session at 8:30 a.m. precedes the opening of the exhibit hall and individual sessions. Conference attendees are able to attend any of 36 educational sessions, categorized into seven tracks. These sessions will feature more than 200 speakers from the wind energy industry, and address both general and specific challenges, trends, and outlooks directly related to the wind energy industry.

Session tracks include: The Business of Wind, Project Development, Driving Demand, Wind Resource and Planning, Technology and the Future, Wind Project Operations, and Community/Distributed Wind.

Following the individual sessions, attendees are invited to stay for the Knowledge Hub sessions for 15 minutes of informal discussion and networking.

At Tuesday's Power Session, the U.S. Department of Energy will present WINDPOWER attendees with an update and outlook on its "Wind Vision" initiative.

EXHIBITION

Serving as an opportunity for business and overall industry development, AWEA has gathered more than 400 companies involved in the wind energy industry to participate in the exhibition portion of WINDPOWER 2014. Exhibitors from around the world will be on hand to showcase their services, products, and projects.

The exhibit hall opens at 10 a.m. Tuesday and Wednesday, and at 9 a.m. on Thursday. The exhibit floor plan can be viewed online prior to the event by visiting www.windpowerexpo.org and navigating to the "Exhibitors" page. The floor plan site allows users to register an account and create a customized plan for use at the exhibition.

REGISTRATION

Those who wish to register to exhibit or attend WINDPOWER 2014, are invited to do so online at www.windpowerexpo.org. Early registration for the event has passed, but savings are still available through "Advance" registration through May 4. Registrants have multiple attendance options, ranging from single-day conference or exhibition passes up to the VIP conference pass. Registration price schedules vary depending on date of registration and AWEA membership status.

SPECIAL EVENTS & NETWORKING

Beyond the conference and exhibition, WINDPOWER 2014 offers networking opportunities and special events for its participants.

Prior to the event on Sunday, May 4, Suzlon is sponsoring the WINDPOWER 2014 Golf Open at Silverstone Golf Club. Proceeds from the event benefit the Wind Energy Foundation.

On Tuesday, May 6, beginning at 4:30 p.m., participants are invited to join in Exhibition Happy Hour in the exhibit hall. Extended booth receptions follow from 6–8 p.m. on Tuesday only.

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The WINDPOWER 5K will be held on Tuesday, May 6 prior to the day's events at Sunset Park. The run is sponsored by GE.

On Wednesday, May 7, at 4:30 p.m. educational poster authors will be on hand in the exhibition hall to discuss their scholarship.

Giving attendees the option to "take in a show" while in Las Vegas, AWEA has organized "A Sensational Night with a Sweet Bite," featuring exclusive WINDPOWER seating for Michael Jackson ONE, presented by Cirque Du Soleil. A dessert reception follows. Individual and group pricing are available for this ticketed event.

Visit www.windpowerexpo.org for complete information on these events.

LODGING

Considering all of the regular events for WINDPOWER 2014 are located at the Mandalay Bay site, participants making reservations for WINDPOWER 2014 lodging may find it beneficial to do so at one of the three hotel properties on the Mandalay Bay site—Mandalay Bay Resort & Casino, Luxor Hotel and Casino, and THEHotel at Mandalay Bay.

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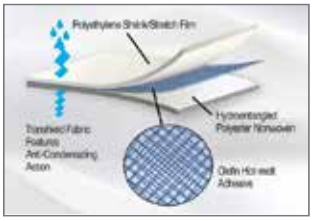

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Conference Schedule

Tuesday May 6

7:00am–5:30pm	Registration Open (Bayside Hall D)					
7:30am–8:30am	Continental Breakfast for Session Attendees (Mandalay Bay Ballroom IJK)					
8:30am–10:00am	WINDPOWER 2014-Welcome and Opening Session (Mandalay Bay Ballroom IJK) (Open to all attendees)					
10:00am–6:00pm	Exhibit Hall Open (Bayside Exhibit Halls)					
11:00am–12:30pm	**The Business of Wind** U.S. Wind Energy Market Forecasts: Where, When and How Much? (1A)	**Project Development** Don't Build Here, Go Over There–Current Challenges In Siting (1B)	**Driving Demand** International Market Update: Opportunities and Challenges (1C)	**Wind Resource and Planning** Lower Cost of Production–Uncovering Integration and Transmission Costs (1D)	**Technology and the Future** Wind Turbine Components & Subsystems Frontier R&D (Scientific) (1E)	**Wind Project Operations** Safety, Behavioral & Cultural Challenges and Solutions (1F)
12:30pm–12:45pm	Knowledge Hub in Each Session Room (Meet the Speakers)					
12:00pm–1:30pm	Lunch in Exhibit Hall (provided for Main Conference attendees, Main Conference exhibitors, as well as those who purchased lunch tickets)					
1:30pm–2:30pm	Power Session (Mandalay Bay Ballroom IJK)					
2:45pm–4:15pm	Innovative Project Finance (3A)	Shape or Be Shaped: Rebuilding the Foundational Support for Wind Energy (3B)	Beyond RPS: Policy to Projects-How Do State Policies Translate into Demand for Wind Power (3C)	Theory to Utility Application with Probabilistic Forecasting (3D)	Technical Challenges of Wind Plant Aerodynamics and Aeroacoustics (3E)	New Concepts in Performance Reliability (Scientific)(3F)
4:15pm–4:30pm	Knowledge Hub in Each Session Room (Meet the Speakers)					
4:30pm–6:00pm	Exhibition Happy Hour (Bayside Exhibit Halls) (Open to all attendees)					
6:00pm–8:00pm	Extended Booth Receptions					

Wednesday, May 7

7:30am–5:30pm	Registration Open (Bayside Hall D)					
7:30am–8:30am	Continental Breakfast for Session Attendees (Mandalay Bay Ballroom IJK)					
8:30am–10:00am	General Session (Mandalay Bay Ballroom IJK) (Open to all attendees)					
10:00am–6:00pm	Exhibit Hall Open (Bayside Exhibit Halls)					
11:00am-12:30pm	**The Business of Wind** Leading Project Finance: State of the Market (4A)	**Project Development** Gaining Clarity with an Eagle Eye View of Project Permitting (4B)	**Driving Demand** Tactical Issues, Case Studies of Utilities and Wind Power (4C)	**Wind Resource and Planning** Wind Forecasting Research–Spanning Time and Resolution (Scientific) (4D)	**Technology and the Future** What OEMs and Supply Chains Are Doing to Lean Manufacturing and Reduce LCOE (4E)	**WindProject Operations** Reliability-Past,Present and Future–Lessons Learned (4F)
12:30pm–12:45pm	Knowledge Hub in Each Session Room (Meet the Speakers)					
12:00pm–1:30pm	Lunch in Exhibit Hall (provided for Main Conference attendees, Main Conference exhibitors, as well as those who purchased lunch tickets)					
2:00pm–3:30pm	Standing Up for Wind: Success Stories from Congress and the White House (5A)	Reduce, Eliminate, Maximize – Super-Charging Your Project Development (5B)	Better Planning and Markets to Bolster Wind Integration (5C)	Improving the Art of Resource Assessment (5D)	Offshore Wind Substructure Technology (Scientific) (5E)	Long Term Ownership: Key Challenges and What to Expect (5F)
3:30pm–3:45pm	Knowledge Hub in Each Session Room (Meet the Speakers)					
4:30pm–6:00pm	Poster Reception (Bayside Hall D)					

Thursday, May 8

7:30am–1:00pm	Registration Open (Bayside Hall D)					
7:30am–8:30am	Continental Breakfast for Session Attendees (Mandalay Bay Ballroom Foyer)					
9:00am–1:30pm	Exhibit Hall Open (Bayside Exhibit Halls)					
9:00am–10:30am	**The Business of Wind** Ticket to Ride: Should Your Company Enter the U.S. Offshore Market (6A)	**Project Development** A Long Term Vision for Wind in the U.S.: A Peek under the Hood of the DOE Wind Vision (6B)	**DrivingDemand** A Strategic SWOT Analysis of Utilities and Wind Power (6C)	**Wind Resource and Planning** Advancements in Resource Assessment Technology (Scientific) (6D)	**Technology and the Future** Large Turbine Manufacturer Forum (6E)	**Community/ Distributed Wind** Is Community Wind at a Crossroads? Retrospective and Future Views (6F)
10:30am–10:45am	Knowledge Hub in Each Session Room (Meet the Speakers)					
10:30am–12:30pm	Leadership Power Hour Part 1 & 2 (Bayside Exhibit Halls)					
12:00pm–1:00pm	Lunch in Exhibit Hall (provided for Main Conference attendees, Main Conference exhibitors, as well as those who purchased lunch tickets)					
1:00pm–2:30pm	The Value of Wind: The Long Term Economic Benefits of Wind Power (7A)	Turbine on a Mountain… How'd They Do That? (7B)	U.S. Wind Turbine Standards: Impacts on Your Turbine Designs (7C)	Managing Interconnection Technical Risk (7D)	Wind Turbine Components & Subsystems on the Horizon (7E)	Disruptive Innovation in Distributed Wind (7F)
2:30pm–2:45pm	Knowledge Hub in Each Session Room (Meet the Speakers)					

Stefanie Brown
Senior Director of Conferences & Membership
American Wind Energy Association

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> *Collaborate with colleagues and peers—innovators, thought leaders and policy makers—as you chart wind energy's course into the future.*

Could you tell us about WINDPOWER 2014's "Transformation in Motion" theme?
Wind power is rapidly emerging as a key player in the new energy dynamic, and WINDPOWER 2014 puts you at the center of it all. Professionals from all over the world come here to network, learn and advance their organizational missions. Collaborate with colleagues and peers—innovators, thought leaders and policy makers—as you chart wind energy's course into the future. Modern energy demands modern solutions and everything that propels wind energy forward is assembled here. Be a part of the transformation.

What are your general expectations for this year's event?
This year's event not only includes all of the great things attendees have come to expect from WINDPOWER, but also some exciting new aspects as well. The additions like TIM talks and the industry segment roadmaps were created to enhance the value of the event for attendees and exhibitors alike!

How does this year's planned event compare with those in years past?
We've never hosted WINDPOWER in Las Vegas and we found a great location in Mandalay Bay. One key difference from past events is that all of our registrants will be housed in the same complex between Mandalay Bay and the connected Luxor hotel. So we won't need to bus people all around a city to 25–30 hotels like in years past. I think people will find that this greatly enhances their networking opportunities and ability to meet new people in all of the restaurants, outlets, even the elevators!

How can exhibitors and attendees alike benefit from the event?
With everything hosted in the Mandalay Bay complex, it will allow attendees, and exhibitors to interact more and many exhibitors are taking advantage of the wide range of venues within the building to host their own client dinners, receptions and parties – making it much easier for attendees to continue their experience after the official show activities are over for the day.

Could you tell our readers a little about the networking opportunities at WINDPOWER 2014?
In addition to all of the special events discussed below, we've extended last year's wildly successful Leadership Power Hour, from one to two hours on Thursday morning from 10:30–12:30 local time. The Leadership Power Hour(s) are when top executives from the exhibiting companies will be available in their booths to talk with attendees. Another networking opportunity for registrants with conference passes are the Knowledge Hubs which occur directly following the concurrent educa-

tional sessions, where attendees can stay and chat with presenters over a cup of coffee.

What are the "TIM Talks?"

This is one of the new aspects we added this year to provide more opportunities for knowledge sharing and education, conveniently on the show floor. Transformation in Motion (TIM) talks are dedicated areas where exhibitors can present information on the latest innovations and technologies. Another feature on the show floor is in-booth demonstrations which we will help market to registrants so they can be in the right place at the right time to see some excellent product demos.

Tell us a little about the special events surrounding WINDPOWER 2014.

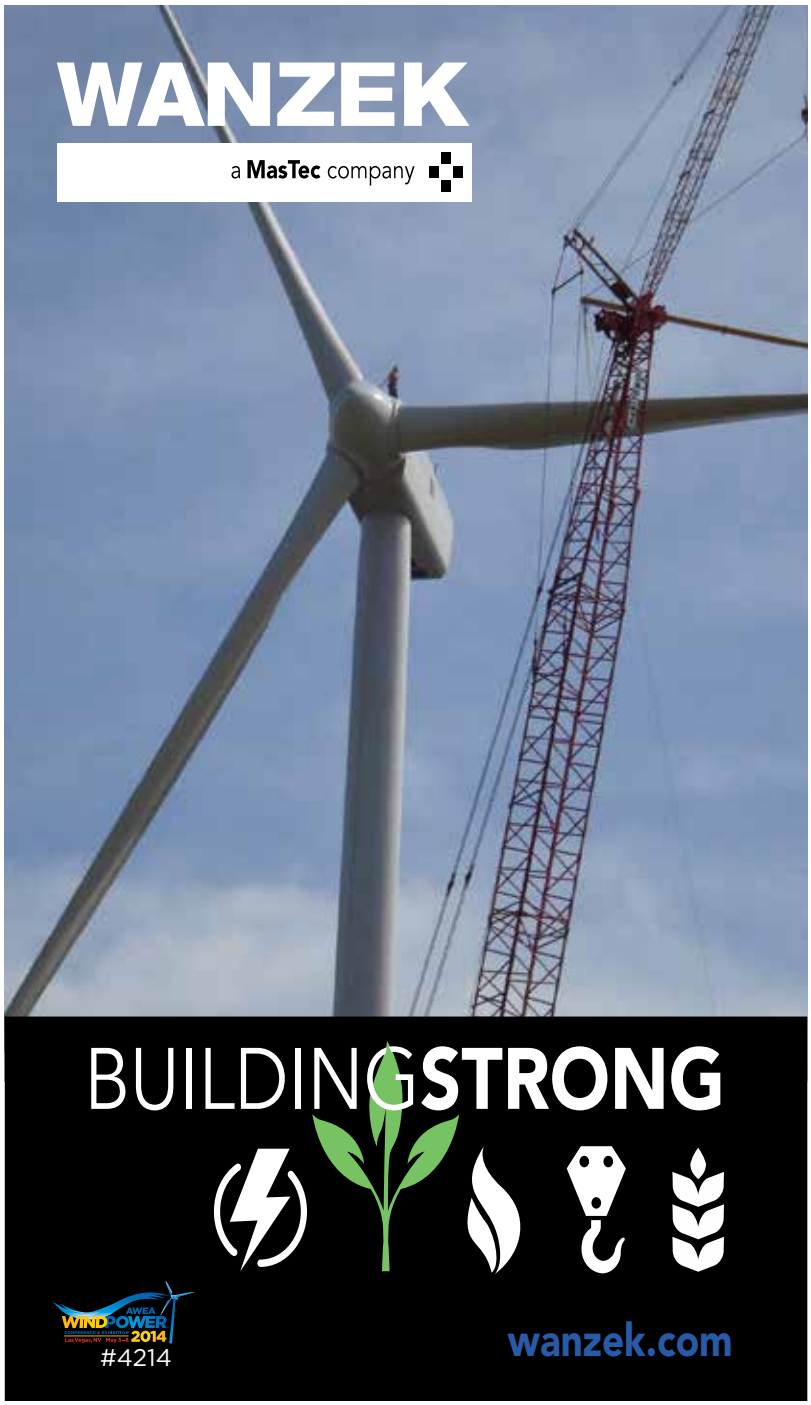
There are several special events planned for this year. In lieu of the Conference dinner and to take advantage of the wonderful shows in Vegas, we created a special ticketed event by pairing the newest Cirque du Soleil Michael Jackson ONE show with a post-show networking reception on Wednesday evening. Additionally, the 5K race and Golf Open have returned and for the first time DOE's Collegiate Wind Competition is co-located at WINDPOWER. And we kick everything off with the Opening Reception which will be held Monday night at the House of Blues.

What do you hope will be the takeaways for event participants?

The key is this year's theme "Transformation in Motion." The wind industry is growing and changing and WINDPOWER creates opportunities to facilitation that transformation.

One notable addition for this year's event is the smartphone app. Could you address that resource?

In addition to Attendee Connect, the online tool that allows registrants to maximize their experience by connecting with other attendees and scheduling meetings at the show, we are adding a mobile app as well. More details will be shared when we go live with the tool, but we know that attendees are more tech-savvy than in years past, which is also why we will be offering not only a printed Show Directory but also a digital version for those who would prefer it.



C.C. Jensen A/S

For more than 50 years, filtration company C.C. Jensen has been battling oil's natural enemy—contamination—in an attempt to keep its customers' equipment running as long as possible.

By Stephen Sisk

In the wind energy industry, being "offline" is generally thought of as a bad thing. Unless, of course, what's "offline" is helping ensure that you'll stay "online" for years down the road.

For two decades now, C.C. Jensen has made it possible, through the design and manufacture of its offline oil contaminant filtration systems, for the wind energy industry to conserve oil resources, cut lubrication costs, and extend the serviceable lifespan of wind turbine gearboxes.

"What we're all about is making clean oil," said Justin Stover, sales manager for C.C. Jensen. "Clean oil keeps the machinery running. Turbines need to keep spinning, and we feel like we have a part in that. No wind turbine gearbox has ever failed because the oil was too clean."

In the U.S., the company entered the wind power industry in 2000 when it became a business member of the American Wind Energy Association. The following year, C.C. Jensen attended the WINDPOWER show, which at the time, was held in a modest hotel ballroom in Washington, D.C.

When representatives from C.C. Jensen enter the Bayside Exhibit Hall at Mandalay Bay Resort and Casino in May to participate in WINDPOWER 2014 Conference & Exhibition, they will do so for the 14th time as a company—a claim few others can make.

In the time between those two events, C.C. Jensen's involvement in the wind market has tracked with the expansive growth of the industry itself. The company now claims almost 80,000 global installations of its wind turbine oil filtration units.

That success is driven by the consistent validation that the company's philosophy produces positive results. Established more than 60 years ago, the Denmark-based company has a wide range of oil filtration products for multiple industries. No matter the industry, the approach remains the same. The company's goals and operating philosophy is two-pronged. It seeks to conserve valuable resources by extending oil life, and to assist its customers in extending the lifespan of their equipment.

"The two go hand-in-hand and that's really what we aim for as a company—to help companies and organizations run smoother, reduce downtime, and increase their bottom line," Stover said.

"Oil is the one thing that most organizations are using in their machinery," Stover said. "If they take care of it, they can see it last two to three times longer, saving a tremendous amount of money. It's good for the environment, and their machines will be happier also. They'll last a lot longer."

The key to that result is to maintain clean oil. That's easily stated, but requires sophisticated equipment and technologies to achieve.

The enemy to clean oil is contamination. The company sees contamination—the introduction of insoluble, often microscopic pieces of metal, dust, oxidation deposits, etc.—as the biggest threat to gearbox lubrication. It claims that oil contamination accounts for around 80 percent of oil system failures.

On the positive side, however, C.C. Jensen also claims that almost 100 percent of these contamination issues can be prevented.

"When people look at a filter, they think 'a filter is just a filter.' It's much more complex than that," Stover said. "I think we have the most advanced R&D facility in the world for the development of filter media. They really tackle the complex issues that happen inside a gearbox in terms

of contamination. So often, the focus is on larger particles, but we're really looking at improving our fine filters. We are also looking to the future by developing our filters with nano fibers and other technologies that can selectively remove sub-micron particles that contribute to oxidation in the oil, which means the oil life is shorter. We can remove those harmful contaminants without removing the additive package, ensuring that you get longer bearing and gear life. It will also mean longer life for the oil."

The process of maintaining contaminant-free oil begins for C.C. Jensen during the manufacturing process. The company has equipment that can filter oil before it is first pumped into the gearbox prior to testing. For example the Gearbox Flushing Unit is designed to fill, flush and drain a

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new or repaired gearbox in under an hour. From there, the process involves having contaminant-filtration systems in place throughout operation. C.C. Jensen offers its HDU offline oil filter systems for this purpose. According to the company website, the HDU features "a 3-micron absolute cellulose-based filter insert with a high dirt-holding capacity that removes particles, retains oil degradation products (oxidation, resin/sludge, varnish), and absorbs dissolved/emulsified and free water from oil."

Further information about oil filtration and purification can be found online at www.ccjensen.com, which has a vast library of articles, case studies, and product brochures. Information ranges from general knowledge about contaminants and oil degradation to applicational studies of specific products.

C.C. Jensen's headquarters (which generates 40 percent of its power from an on-site wind turbine) is located in Svendborg, Denmark.

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In Barcelona, EWEA annual event highlights expansion, technology, firm policy

Participants tackle strategies toward reaching 2030 renewable energy goals

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New markets, technological breakthroughs and an end to political uncertainty—that's just three of the advances the wind energy sector is expecting in the coming years, revealed industry leaders at the EWEA 2014 Annual Event in Barcelona.

"We will see advanced technology that is subsidy free," said Anne McEntee, Vice President of Renewables at GE.

With high attendance levels and a buzzing exhibition hall, the overall vibe at EWEA 2014 was certainly positive. However, speakers did note that important challenges remain: securing 2030 renewable energy targets, cutting costs – in particular offshore, and building better electricity grids.

Andrew Garrard, EWEA President, warned that the current crisis in Crimea shows how dependent Europe is on fossil fuel imports. "The situation in Crimea is a wake-up call for all of us...it demonstrates the vulnerability of our fossil fuel supply", he said. An ambitious 2030 renewable energy target would boost Europe's renewables fleet and, in turn, energy security since President Putin cannot turn off the wind. Every EU citizen pays €2 a day for fossil fuel imports – or a total of €1 billion every day, he told the audience at EWEA 2014.

With over 150 companies and associations signing the "2030 declaration"—which calls on EU leaders to agree to ambitious and binding renewable energy targets at national level—the industry united at EWEA 2014 to ask EU leaders to make the decisions that will bring supply security to Europe.

"An ambitious target, binding on Member States, is the most cost efficient way to realise our goal of 100 percent renewables in the long term. Not to mention boosting a sector which provides 250,000 people with work in Europe," said EWEA 2014 conference chair and managing director of ENERCON, Hans-Dieter Kettwig.

For those seeking inspiration, the conference did not disappoint. Brazil, Mexico and South Africa triumphed as new markets brimming with wind energy opportunity. Ten leading CEOs revealed their company's strategies for survival, attendees heard that Google is looking to make more investments

in wind, and Maria van der Hoeven, chief executive of the International Energy Agency, talked on the IEA's support for 2030 renewable energy targets.

Meanwhile, EWEA released new material detailing the costs of fossil fuel imports to Europe, the IEA got frank about the effects of fossil fuel subsidies, and a separate EWEA report delved into a less publicised field – the massive consumption of water in the fossil-fueled power sector.

The event in Barcelona has now drawn to a close, but attendees full of new information, contacts and partnerships will certainly be looking forward to EWEA 2015 in Paris 17 – 20 November.

SECOND WIND EXPO SEES JUMP IN INTERNATIONAL EXHIBITORS, MARKING GROWING INTEREST IN JAPANESE WIND MARKET

For the second year, wind industry professionals gathered to participate in WIND EXPO, a conference and exhibition focusing on the growing wind energy market in Japan.

The event, held February 26-28 at Toyko Big Sight, in Tokyo, Japan, was one of eight concurrently running exhibitions that were part of World Smart Energy Week.

With major floating offshore projects currently taking place in the Japan, offshore related exhibits was one of the highlights of the show and actual project members took part in the show as exhibitors as well as conference speakers to share the latest information and to find business partners.

WIND EXPO saw modest growth in only its second year of inclusion as part of the larger event. Total exhibition floor space for WIND EXPO expanded by nearly 10 percent over 2013, showcasing both Japanese and international exhibitors and reflecting the increase in wind investment in the Japanese market.

The percentage of international exhibitors saw a significant jump of 70 percent, with some exhibitors participating as a pavilion.

Among the keynote presenters was Anne McEntee, GE's Renewable Energy CEO, who, during her

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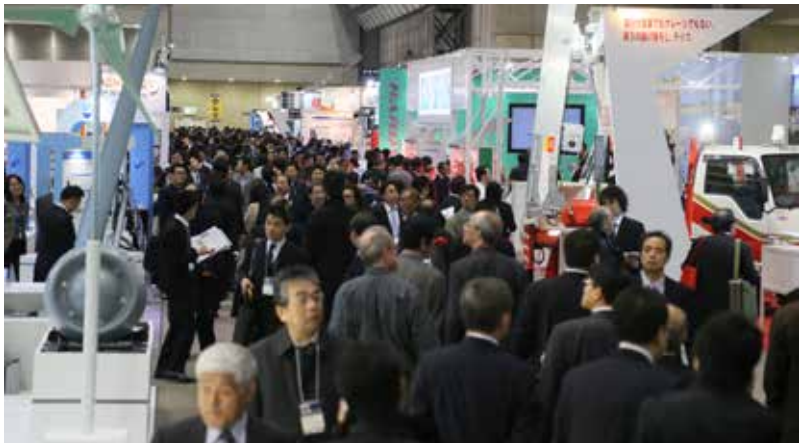

Courtesy: Reed Exhibitions Japan

address, announced GE's return to the Japanese market.

"The energy industry is going through major changes," McEntee said. "Particularly, wind power generation is going to play an important role thanks to its ever improving high-efficiency and reliability, and GE is committed to continue to support its evolutions.

I also would like to express special thanks to the government and policy makers for its various supports such as FIT and government supported projects. With those supports, I am confident Wind industry will continue to show significant growth in the future."

WIND EXPO is expected to expand even further in its third year, with the new feed-In-tariff coming into effect soon. The majority of the exhibition space for WIND EXPO 2015 was reserved during this year's event.

As a whole, more than 67,000 attendees attended the World Smart Energy Week 2014. Seminar session participation for the events jumped nearly 30 percent over 2013. More than 14,000 participated in seminar sessions.

World Smart Energy Week drew nearly 1,600 exhibitors across all of the events, 178 of which exhibited at the WIND EXPO event. That number was up slightly over the inaugural event in 2013 (167 exhibitors).

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PROPER IDENTIFICATION AND UNDERSTANDING OF FASTENERS IS CRITICAL IN WIND INDUSTRY APPLICATIONS

By Jack Wallace
Frontier Pro Services

> *"The number of hash marks on the top of the bolt determines the grade of the bolt."*

In the U.S. there are two distinct types of fasteners (bolts) used in wind turbines. One is of metric sizing and the other is a U.S. standard. Metric fasteners tend to cost more in the U.S. as they are still not the norm for our American society.

If a fastener needs to be replaced and you have to call in an order to make the replacement, you may have to determine what type of fastener it is.

In order for a tech to select the correct fastener, he needs to be able to first determine if the fastener that is to be replaced is a standard bolt or a metric bolt.

For bolts this is usually pretty easy. Metric bolts have numbers marking the top of the bolts; while standard bolts typically have hash marks.

The number of hash marks on the top of the bolt determines the grade of the bolt. Metric bolts used in wind have markings such as 8.8, 9.8, 10.9 and 12.9. If you see markings like that, you know it is a metric fastener.

Standard bolts used in wind typically have: no markings; three hash marks; five hash marks; or six or more hash marks. Unfortunately, these hash marks do not directly state the grade of the bolt. You have to add two to the total of the hash marks to get the bolt grade. For a bolt with: no marking, add two, which is a "grade 2;" three hash marks, add two, so it is a "grade 5;" six hash marks is a "grade 8." What if a bolt has more than six hash marks? It is called "better than grade 8."

Confused yet? Okay, well just so you know: the larger the number, the better the grade of the bolt.

But there is still more to know. Sometimes you can replace a metric fastener with a standard fastener to save time or money, or in cases when the metric bolt isn't readily available and you need to quickly get a turbine back online.

When you need to substitute a standard bolt for a metric bolt, you can use the following comparison: A grade 8.8 metric bolt is about the same as a grade 5 standard; a grade 10.9 metric is about the same as a grade 8 standard; and a grade 12.9 is about the same as a "better than grade 8" standard bolt.

Other important factors in identifying fasteners are size and length. Bolt sizes are determined by the diameter of the shank of the bolt, not the head of the bolt. Bolt lengths are determined by measuring the length of the shank of the bolt, excluding the head, in millimeters for metric bolts, and in inches for standard bolts.

The nuts that are used on the bolts are not typically identified and if you had a mixed bag of standard and metric of similar size you would have to test-fit them on the threads to see if they are metric or standard. There is much more, but let's move on.

It pays to know your washers too. There are a few different types of washers used in wind. Without going into all the different types of washers, let me give you one hint on using washers on critical connections: Always use "hardened" washers. This is because you don't want

to use a soft washer in a critical load path in which the washer can be squeezed, squished out, and thinned. If it thins out, the bolt will loosen and the connection can fail. This can make you think that you didn't properly tension your bolt! Using hardened washers will help prevent the washer from causing a failed connection. If you don't know if the washers are hardened, don't use them.

Let's discuss tensioning fasteners a little bit further. Have you ever taken a spring and placed it in tension? Take, for example, the spring from a retractable ball-point pen. At some point, most anyone who works with machinery has disassembled a ball-point pen. If you pull the spring in tension a little bit and then let it go, the spring returns to its original shape. You can pull harder on this spring and it will continue to return to its original shape when you let go. At some point, however, if you pull it hard enough, the spring will reach its "yield point," and will not return to its original shape when released. This is very similar to a bolt that is being tensioned. We typically are instructed to tension a bolt to within 75 percent or greater of its yield strength. If we over-tension the bolt, it will exceed its yield point. An over-tensioned bolt is just like that over-stretched spring. The bolt becomes damaged and will not function correctly to maintain its tension.

Notice that I said "tension" and not "torque." When we torque a bolt, we are basically trying to achieve the proper tension. Many things can affect the resulting tension while torquing a bolt. Dirty bolt threads will cause increased friction and can result in a lower tension than expected. The same size bolt with clean and oiled threads will result in more tension while applying the same torque Did you know that if you handle the threaded portion of a bolt with your hands, that the oil from your skin is enough to affect the friction of the bolt and can result in a tension higher than expected? I find it much easier to use lubricated torques for consistent results and it takes less physical effort to achieve the target tension.

There is much more to cover but hopefully this has raised some curiosity and improved your understanding of fasteners used in the wind industry.

As always, work as safe as possible, and work to prevent surprises.

HEADLINES

GE lab to focus on innovation in wind turbine drivetrain repair

GE recently announced the opening of its Global Wind Turbine Drivetrain Repair Innovation Lab at the site of GE's Power Generation Repair Technology Center in Albany, N.Y.

The facility is equipped with advanced technologies to support fast development and innovation for repairs to the wind turbine's gearbox and rotor, creating a lab environment to simulate and solve problems that previously had to be worked on more than 100 meters in the air and at remote sites.

Technical capabilities of the Innovation Lab include:

- Rapid prototyping tools such as 3D printers and computer numerical control machines.
- Robotic welding and advanced machining tools.
- Repair of various gearbox models.
- Turbine generator repair.

Andy Holt, general manager of global wind projects and services, said: "This is the first facility of its kind dedicated to developing repair technologies and capabilities that reduce the life cycle cost of wind turbines. Albany was an ideal location for the facility with its close proximity to GE's renewable energy headquarters, the GE Energy Learning Center as well as the existing Repair Technologies Center. It is uniquely positioned for collaboration with the field, design engineering, training and product service teams."

The Innovation Lab aligns GE with customer needs by helping reduce maintenance and operating costs. GE engineers will have the space and resources to rapidly prototype and develop new technologies to apply to field service repairs. The team will focus on innovative approaches while fully vetting tooling and processes, keeping in mind safety, cost and the ability to address multi-unit configurations. With proximity to GE's renewable energy headquarters in Schenectady, the team at the Innovation Lab also will work closely with product engineering to improve serviceability.

EXCESSIVE WATER IN GEAR OIL SHORTENS BEARING LIFE

By Kevin Dinwiddie
AMSOIL INC.

The additives in wind turbine gear oils can be very different for each manufacturer. Even the same manufacturer may use different additives for specific gear oils. Some of these additives absorb more water than others and may cause excessive gearbox wear[1, 2, 3]. Excess water in wind turbine gear oil is associated with many negative effects. Some of these are listed in the 2003 ANSI/AGMA/AWEA 6006-A03 wind turbine document[3] such as:

- Accelerated additive depletion
- Accelerated oxidation
- Interference with oil film formation
- Contributes to foaming
- May plug filters
- May cause corrosion etch pits and initiate fatigue cracks
- May lead to hydrogen embrittlement promoting fatigue cracks

Even as long ago as 1977, a study by R. E. Cantley at the Timken Bearing Company concluded that water in SAE 20 oil caused increased wear (See Chart 1)[2]. The Cantley formula associates 100 ppm water to 100 percent bearing fatigue life. When oil adsorbs higher amounts of water, shortened bearing life can result; whereas oil with lower amounts of water can have longer bearing life. Some gear oils like AMSOIL PTN do not adsorb excessive water and are not associated with decreased bearing life.

There have been numerous studies detailing the negative effects that water has on oil. The results seem to be similar regardless of the type of oil being tested (i.e. transmission fluid, engine oil, or gear oil). It is notable that some gear oils absorb only slight amounts of water and are not associated with increased wear, and other gear oils absorb excess water which is associated with increased wear. The U.S. Navy confirmed this with its test on automotive gear oil and concluded that when water increases from 50 to 500 ppm, there was a reduction in L_{10} bearing life by a factor of three in some oils while others were unaffected[5]. L_{10} bearing life is the life at which 10 percent of the bearings in the application can be expected to have failed due to classical fatigue failure (and not any other mode of failure like lubrication starvation, wrong mounting, etc.). This

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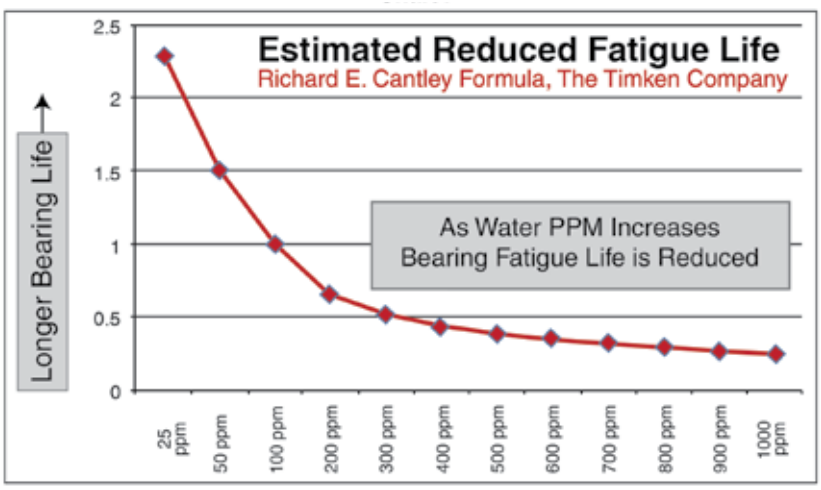

Chart 1

means that the increase to 500 ppm water caused an increase in failure rate three times that of the initial rated fatigue life.

Further documentation in 2011 of the negative effects of water on wind turbine gear oil can be found in the technical paper by M. H. Evans entitled "White Structure Flaking (WSF) in Wind Turbine Gearbox Bearings: Effects of "Butterflies" and White Etching Cracks (WEC)"[1]. Section 5.3 discusses how white structure flaking (WSF) was reproduced by adding water to a lubricant. According to Evans, the water contamination enhances hydrogen diffusion into steel which liberates on fresh surfaces in the micro-cracks, causing WSF. Evans also reports that water pulled in-between contacting surfaces results in collapsed oil film strength, causing rubbing of opposing surfaces or wear from reduced oil film thickness.

Chart 2 illustrates five different ways water can affect the operation of a wind turbine. The end result to the wind farm operator is shortened oil life, shortened gearbox life, and increased operating costs.

Choosing the right wind turbine gear oil with an enhanced lubrication additive package that resists water can improve operational costs in the following ways:

1. Longer oil life means less money spent on oil and oil changes
2. Extended gearbox life means reduced rebuild costs
3. Reduced downtime leads to increased turbine production
4. Potential for reduction in WSF related to longer gearbox run time
5. Reduced entrained air and foam relates to optimized oil film thickness and less wear

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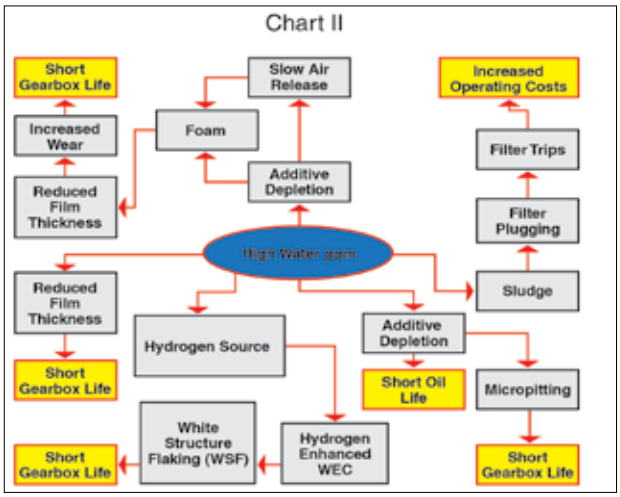

Chart 2

6. Retention of additives promote longer oil life and reduced micro-pitting wear
7. Elimination of filter plugging and low oil sensor trips and associated bonus climbs

The wind turbine industry is taking water contamination and associated wear seriously, and efforts are underway to reduce the allowable amount from 500 to 300 ppm for monitor level and from 1,000 to 600 ppm for action level[6]. Even this large reduction in allowable water ppm is not as low as European standards. The Danish Wind Standard, for example, is 200 ppm water for monitor and 400 ppm for action[4].

It is often less costly to change the gear oil to a type that does not attract water than it is to extend other efforts, including the installation of a dryer.

References:

[1] M.-H. Evans, National Centre for Advanced Tribology (nCATS), University of Southampton. White Structure Flaking (WSF) in Wind Turbine Gearbox Bearings: Effects of "Butterflies" and White Etching Cracks (WEC) Section 5.3, August 19, 2011.
[2] R.E. Cantley, "The Effect of Water in Lubricating Oil on Bearing Fatigue Life." ASLE Transactions, 20 (3), 244-248, 1977
[3] ANSI/AGMA/AWEA 6006-A03, AMERICAN NATION AL STANDARD
[4] Danish Wind Standard
[5] U.S. Navy Data – Ball Bearing (pg 36, 37, 38)
[6] ISO IEC 61400-4 Design requirements for wind turbine gearboxes, 2012

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Construction event attracts nearly 130,000 while setting exhibit and education records

Courtesy: CONEXPO-CON/AGG

The future on display as global industry showcase spotlights new product innovations, technology CONEXPO-CON/AGG and IFPE 2014 took center stage in Las Vegas March 4–8 with tremendous energy and serious buyers. Total registration of 129,364 soared past the last edition of the shows as they achieved the second-highest attendance in their history. The shows also set new records for exhibit space, number of exhibitors, and education tickets sold.

The co-located CONEXPO-CON/AGG and IFPE, at the Las Vegas Convention Center, delivered a global showcase of the newest product innovations and technologies for the construction, construction materials and fluid power/power transmission/motion control industries with more than 1,000 new products and services on display.

Attendees also took advantage of the shows' strong industry education programs and the unparalleled opportunity to connect with industry peers, take the pulse of what's happening, and learn what the future holds.

"The enthusiasm and traffic on the show floor was just incredible. Exhibitors cited the high quality of attendees; they told us these were serious buyers and reported robust sales to existing as well as new customers that exceeded their expectations," said Megan Tanel, CONEXPO-CONAGG show director.

Quality Attendance, International Scope

CONEXPO-CON/AGG & IFPE 2014 maintained the growing international scope of the shows with international registrations totaling more than 31,000, or an increase of nine percent from the most

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WINDPOWER GREEN TEAM

Courtesy: CONEXPO-CON/AGG

recent events. The number of countries represented increased to 170 from 159 in 2011, and the number of international attendees matched the record 24 percent of total attendance set in 2011. International attendance drew heavily from Latin America, China, Canada, and Europe.

More than 75 percent of show visitors were in managerial roles (with 36 percent of these with the top titles of president/owner and vice president/general manager/chief financial officer).

Both shows set new records for exhibit space and number of exhibitors, CONEXPO-CON/AGG with more than 2.35 million net square feet of exhibit space and more than 2,000 exhibitors, and IFPE with more than 161,000 net square feet and 400 exhibitors.

A record 41,000 education ticket sales were sold to the shows' education programs, underscoring their relevance to helping attendees succeed in today's business environment.

"CONEXPO-CON/AGG and IFPE 2014 reflected the feeling of momentum building in the industry. We are industry-run shows with industry needs put first; these show numbers are a testament to the value attendees, exhibitors, and other stakeholders derive from their participation," stated Melissa Magestro, IFPE show director.

Global Industry Gathering Place

Among the show visitors were Acting U.S. Deputy Secretary of Commerce Patrick D. Gallagher, Acting U.S. Deputy Secretary of Transportation Victor Mendez, and former U.S. Rep. James Oberstar, who served as chairman of the House Transportation and Infrastructure Committee from 2007 to 2011.

The shows were chosen for the prestigious U.S. Department of Commerce (DOC) International Buyer Program, which helps facilitate global attendance. More than 50 official international attendee delegations were organized by DOC as well as show industry partners.

More than 95 allied associations and groups were official supporting organizations, coming from the U.S., Canada, and 16 other countries worldwide.

Several national industry associations held their annual conventions or high-level board meetings at the shows; they joined hundreds of other industry and company meetings, from large events to smaller committees and other groups, all taking advantage of the shows to meet and share knowledge and learn from one another.

Education and Exhibits

The CONEXPO-CON/AGG 2014 education program covered 120 sessions over 10 targeted tracks. The IFPE Technical Conference anchored IFPE 2014 education, joined by half-day "college-level courses" and a new Fluid Power Seminar series, from *Hydraulics & Pneumatics* magazine.

CONEXPO-CON/AGG featured a new Demolition & Recycling exhibit pavilion from the Construction & Demolition Recycling Association (CDRA) and the Technology & Construction Solutions pavilion from the Associated General Contractors of America.

IFPE featured exhibit pavilions from the Power Transmission Distributors Association (PTDA) and for sensors manufacturers and product suppliers.

Reinforcing the global scope of the shows were eight international exhibit pavilions: CONEXPO-CON/AGG with China, Ireland, Korea, Spain and United Kingdom, and IFPE with China, Italy and Taiwan.

Show safety and education/training events at the shows included:

- NRMCA International Truck Mixer Driver Championship, from the National Ready Mixed Concrete Association
- Lift Safety Zone, from NCCCO National Commission for the Certification of Crane Operators and IPAF International Powered Access Federation
- Crane Operator Rodeo from Maximum Capacity Media

Industry recognition and networking events and programs also amplified the show experience:

- Innovation Awards program (from *Diesel Progress* magazine and global powertrain specialist ZF Friedrichshafen)
- Young Leaders event (from *Construction Equipment* magazine) Quality of Life industry recognition campaign (from Dexter + Chaney)
- 5K Run/Walk benefiting the non-profit Injured Marine Semper Fi Fund (from Maximum Capacity Media)

juwi Wind chooses H.B. White Canada as EPC contractor for community wind farms in Nova Scotia

H.B. White Canada Corporation, a wholly owned subsidiary of White Construction Inc., has been selected as the EPC contractor to build four wind energy projects in Nova Scotia.

The wind energy projects, have been developed by juwi Wind Services Canada, on behalf of the project's community and institutional owners. The selection was made after a competitive process managed by juwi Wind Services Canada.

"White is a top tier North American wind energy construction company and we saw real value in White's competitive pricing, capacity, and previous Nova Scotia experience," said juwi Director of Operations Jed van Sciver.

The 24-MW portfolio of community projects consists of:

- Pockwock Community Wind Project (10 MW)
- Millbrook Community Wind Project (6 MW)
- Truro-Heights Community Wind Project (4 MW)
- Whynotts Community Wind project (4 MW)

"The White organization and their affiliated companies have built over 10,500 MW of wind power projects throughout North America and traditionally builds much larger projects. However, the close proximity of these projects and our past experience working with First Nations made the juwi wind portfolio an attractive opportunity for our company," said Chris Hanson of White Construction Inc.

Mike Kosiancic of Firelight Infrastructure Partners, the common equity owner across all four projects said of White's selection, "It is really unique to have such a large and capable contractor building community wind projects this size."

The projects were developed as a portfolio under the Nova Scotia Community Feed-In-Tariff program, where each project is partially owned by the local community.

"Using the White organization gives our local investors greater certainty that our project will be completed on-time and on-budget," said Terry Norman, President of Chebucto Pockwock Lake Wind Field Limited.

Additionally, three of the four projects in the portfolio also have significant ownership positions held by Nova Scotia's Mi'kmaq Bands.

Chief Bob Gloade of Millbrook First Nation said, "As Chief of the majority owner in one of the projects and as Chairman of the Mi'kmaq Rights Benefits Committee, it was important to see that White had experience with First Nation's labor and contractors and that they will continue that commitment as they build these projects."

The four projects entered into turbine supply agreements with Vestas in late 2013 to supply a total of 12 V100-2.0 MW turbines.

Representatives from Vestas, White, juwi, owners, and the initial project developer, hosted public open houses in February to share information with stakeholders about the upcoming builds.

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LM Wind Power launches blade design research project

Four-year research effort seeks to develop flexible blade concept that reduces cost of energy by up to 10 percent

Courtesy: LM Wind Power.

A leading supplier of rotor blades for wind turbines, LM Wind Power, has announced the launch of an innovative research project to develop blades with flexible tip lengths. The four year project is supported by the Dutch Ministry of Economic Affairs and brings together a consortium of partners that includes the Dutch University of Twente and the research institute, Energy Research Centre of the Netherlands (ECN).

LM Wind Power is leading a consortium that will develop a cost effective, flexible blade length concept with the potential to reduce cost of energy by 8-10 percent. This project addresses the untapped potential of optimizing individual wind turbines to their maximum performance by extending the rotor diameter with variable tip lengths.

Energy output of a wind turbine depends on its location in the wind farm as they are subject to different wind conditions, often due to wake effects. Many of the wind turbines running today are not loaded to their full capacity as typically the turbines installed are of similar design regardless of the position in the array. This project seeks to change that.

"The cost of wind power, especially offshore wind power, needs to go down to compete with other energy sources and we are committed to making that happen," said LM Wind Power's VP of engineering, Roel W. Schuring. He continued: "This project with our Dutch partners, aims to help wind farm developers and wind turbine manufacturers to design wind farms better and to get the most from each turbine. This will improve annual energy production (AEP) and reduce cost of energy. The potential is huge."

The project looks at design, material, manufacturing, and assembly processes to achieve the most flexible and cost efficient solution. The concept is based on a standard basic blade part with variable tip lengths. It builds on an existing lightweight composite blade design, but innovates by using an assembly process, which leads to a permanent assembly of the two blade parts, adding minimal weight. The result is a larger rotor that increases annual energy production significantly for a relatively small investment.

The flexible tips are expected to be manufactured separately, which enables the use of specific techniques and a one-shot manufacturing technology while providing economies of scale. Assembly is expected to be done on or near site. The consortium points to offshore as the area that will benefit most from the method as the improved performance from the blade length optimization will see a quicker pay back at sea. The new rotor blade will also be a universal solution that can be adapted to various turbines and applied in every wind farm.

The four-year project is co-funded by the Dutch Ministry of Economic Affairs.

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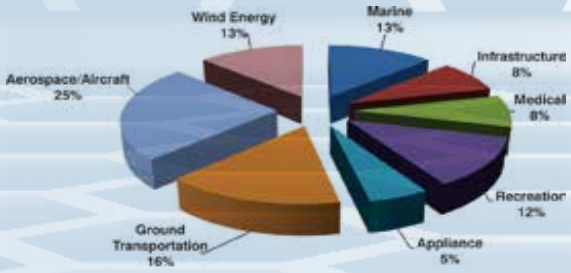

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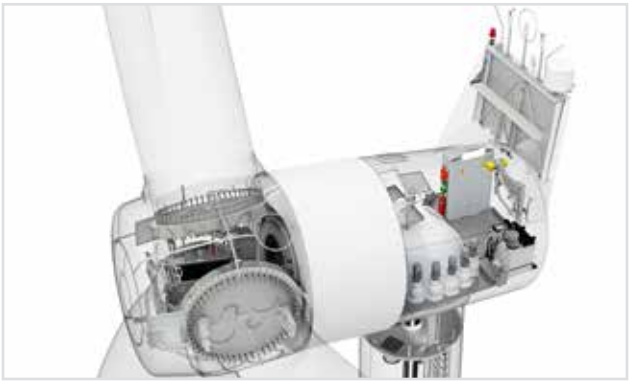

Step by step, Siemens Energy is successfully pursuing its strategy for lowering the costs of wind power. At the European annual event for the wind energy industry, EWEA 2014, Siemens Energy's Wind Power Division reported how the uprated performance of its direct-drive D3 wind turbines extracts higher energy yields. Exhibiting under the slogan "Watts up!" Siemens presented the new onshore 3.2 megawatt wind turbine, which, depending on its site of installation, can deliver up to 4 percent higher annual yield than its predecessor model.

Siemens has uprated its Platform D3 electrical generating capacity from 3.0 to 3.2 megawatts by improving the turbine control system. The uprating simultaneously demonstrates what impressive structural reserves are designed into the innovative technology of Siemens' gearless wind turbines. "One important goal of our development work is to utilize innovation to further tap the technical potential of our products," said Henrik Stiesdal, CTO of Siemens Wind Power. Stiesdal also chaired the presentations on "Hardware Technology" at the accompanying EWEA Conference. Other experts from Siemens gave talks at the conference on topics such as energy storage technology and electrical systems.

Siemens also set up an Xpert Center at its booth,

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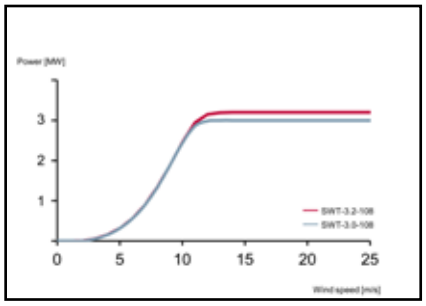

featuring short presentations addressing important questions about wind turbine engineering and operation. Siemens jointly presented one portion of the booth in its function as co-sponsor of the event with its host, the European Wind Energy Association (EWEA). There, visitors experienced the interactive "Wind Challenge" exhibit to gain a true sense of just how much energy is born by wind by determining the correct wind speed of a simulated air flow.

GOOGLE, 3TIER GIVE THE WORLD UNIVERSAL ACCESS TO GLOBAL WIND AND SOLAR RESOURCE POTENTIAL

3TIER, a Vaisala company operating in renewable energy assessment and forecasting, recently announced the public release of wind and solar annual averages from its global datasets as part of Google's Map Gallery launch. Through its collaboration with Google, 3TIER is excited to make this contribution to the global community and vastly improve access to wind and solar resource information by making it freely available to both researchers and the general public in Google's popular and widely used platform.

In the past, gaining access to high quality global wind and solar resource information from a reliable, consistent source was not an option for most people. This information is vital to a wide variety of fields, from energy development, infrastructure, efficiency, and policy planning to agriculture and conservation. However, it is often beyond the budgets of the non-profits, NGO's, and public agencies conducting this important research. For example, it will support individuals like energy consultant, Allison Archambault, and conservation geographer, James Oakleaf.

"My clients have found 3TIER's data highly helpful in painting a picture of renewable energy potential," said Allison Archambault, founder and

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principal, Fresh Generation, LLC, which provides strategic guidance, such as market research, policy analysis, and business development, to promote the adoption of sustainable, scalable renewable energy projects, particularly in rural and developing areas. "With better visibility into renewable resources, policy makers, companies, and consumers can make better decisions about how to unlock the value of a clean economy. There is an ah-ha moment when people see the resource mix for their place on Earth, so this democratization of data is an important contribution to the public domain."

James Oakleaf and his colleagues at The Nature Conservancy evaluate areas at risk for major development, including renewable energy, with the goal to help mitigate the impacts of new energy projects on wildlife and biodiversity. They will be using 3TIER's data to support research estimating potential renewable generation capacity in lands of low value for biodiversity conservation, highlighting places were renewable energy development should be prioritized.

"In our research, we hope to show that renewable energy and the environment do not need to be in direct conflict. Through education, planning, and smart infrastructure growth, there are ways both can exist harmoniously," Oakleaf said. "Global analysis like this requires a variety of data, and many times these are difficult to obtain, restricted in their use, or quite costly. Making high quality, accurate global data like 3TIER's publicly available is a tremendous resource for those in the conservation community."

"At 3TIER, our belief is that better information empowers smarter decision-making," said Dr. Pascal Storck, 3TIER global director. "Google's mission to organize the world's information and make it universally accessible and useful is well aligned with our goal and we are thrilled to be a part of this launch. Together we are truly making a difference for people like James and Allison."

3TIER's wind and solar datasets provide a sophisticated alternative to publicly available sources. Each dataset offers annual average values created using proven, widely-accepted scientific techniques and derived from long-term historical weather models of 10 or more years at high spatial and temporal resolutions.

Access to 3TIER's datasets within Google's Map Gallery is available at: http://maps.google.com/gallery/search?hl=en&q=renewable+energy.

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SME "Manufacturing 4 the Future" event marks the continued strength of U.S. manufacturing

Biennial event brings together leading manufacturing minds from aerospace, defense, and medicine, for shared collaboration and learning opportunities

For generations, the strength of our country has rested on the power of our factory floors—both the machines and the workforce behind them. This May, industry professionals will gather together on another floor, at the Mfg4—Manufacturing 4 the Future event to gain knowledge, network, collaborate and share solutions.

Mfg4, sponsored by SME, is one of the manufacturing industry's trusted sources of knowledge and information. The event will return to the Connecticut Convention Center in Hartford, Conn., on May 6–8.

This biennial event convenes professionals from leading manufacturers in aerospace, defense (including arms) and medical industries. New this year, is the addition of the co-located Micro-Manufacturing and Medical Manufacturing Innovations conferences. With a focus on these three major industries plus one strategic technology, Mfg4 encourages both industry solutions and collaboration through exhibits, education sessions, conferences, and networking opportunities.

The technologies to be exhibited include: additive manufacturing (commonly called 3D printing), automation, finishing and coating, fabrication, micromanufacturing, precision machining and tooling, quality, and more.

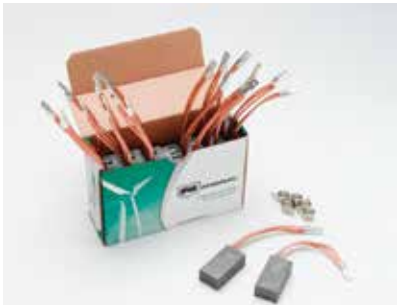
"Collaboration is key to innovation. At Mfg4, manufacturers from diverse industries can connect and innovate around their common design and production challenges," said Debbie Holton, SME managing director of industry and technology. "Surrounded by technology—in a highly interactive format—attendees will leverage the knowledge of industry experts and each other to gain competitive advantage."

The inaugural event in 2012 attracted registrants from 42 states and more than a dozen countries seeking to share integrated solutions to common manufacturing challenges. This year, SME is looking forward to returning to New England and exposing attendees to the newest technologies and applications in the region.

"Mfg4 is much more targeted to the markets and job titles we look for—the higher level engineer and department people. Our products require an investment so we need to meet management level people and Mfg4 is delivering just that," said Jeffrey Bourque, communications manager, Nikon Metrology.

This year's keynote speakers include: Tom Herald, PhD, senior fellow, Lockheed Martin – Global Training & Logistics; Dr. Robert J. Shaw, deputy director, office of technology partnership & planning chief, Venture Development & Partnership Office NASA Glenn Research Center; Peter Walsh, vice president, global operations, Medtronic; Christopher Kaye, vice president of research & technical innovation, U.S. Endoscopy; Lynn Gambill, chief engineer of manufacturing engineering & global services, Pratt & Whitney; Mike Reopel, principal, Deloitte Consulting.

For more information about registering, attending, exhibiting, or presenting at Mfg4, please visit mfg4event.com or call 800.733.4763. For the most up-to-date details, follow @mfg4event on Twitter.

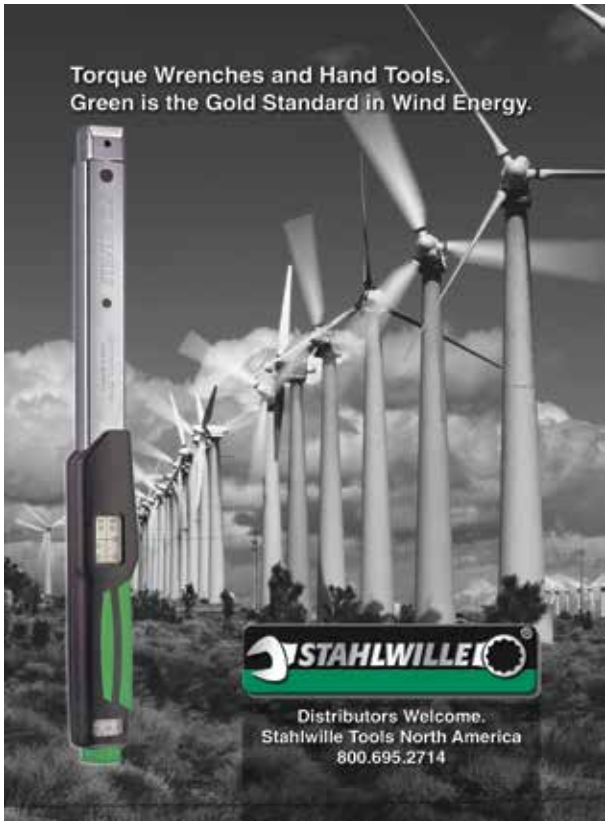


New carbon brushes designed to lower maintenance costs, improve generator reliability

Morgan Advanced Materials Electrical Carbon business announces that its range of carbon brushes are ideal for wind turbine applications, with new designs and materials that are resulting in longer brush life and increased generator uptime. Morgan's globally available brush grades are created to be environment-specific, offering maximized performance in low or high load conditions. Leading-edge laboratory equipment, coupled with years of experience in carbon brush technology, has led Morgan to develop advanced materials to address the environmental extremes experienced by wind turbines, including scorching heat or corrosive sea salt. The brushes are also engineered to deliver high performance in low-humidity atmospheres, a common environmental factor affecting many wind farms.

The field-tested carbon brushes are backed by unmatched application engineering, customer service, and global reach to support demanding environments. They offer exceptional performance, and feature low friction due to their superior film formation. In addition to being able to endure extreme atmospheric conditions, Morgan's range of carbon brushes are tolerant to contamination and provide an excellent lifespan with minimal slip ring wear and a low brush-to-brush wear differential. Despite their relatively small size, carbon brushes and related assemblies are a critical component in a generator's overall efficiency and output. Morgan's carbon brushes are ideal for wind turbine generators that are subjected to extremely harsh environments, along with other challenges, including sudden changes in wind speed, very low humidity, and the on/off cycling of the generator unit. Their superior design also results in lower maintenance costs and significantly improved generator reliability.

For more information, visit www.morganadvancedmaterials.com.



CEO URGES CONGRESS TO BRING MANUFACTURING BACK TO THE U.S.

Precision Metalforming Association (PMA) member Kevin Harberts called on Congress today to support industry efforts to bring manufacturing back to America—for good. Harberts, president and CEO of Kryton Engineered Metals, Inc. in Cedar Falls, Iowa, testified today before the U.S. House of Representative's Committee on Small Business Subcommittee on Economic Growth, Tax, and Capital Access about reshoring, or bringing outsourced manufacturing work back home to the U.S. In his testimony, Harberts stated, "This time a year ago we had 63 employees, today we have grown to 71 and hope to hire another 8–12 this year. We attribute this growth directly to reshoring a product line which left the U.S. a decade ago and came back to America's heartland."

Founded in 1981, Kryton Metals is an industry leader in manufacturing spun and fabricated metal products. Company sales were hurt by the economic downturn in 2008-9 and Harberts was forced to lay off a large number of employees. His business turned around when a foreign manufacturer decided to reshore work and moved production from Europe to his plant in Iowa.

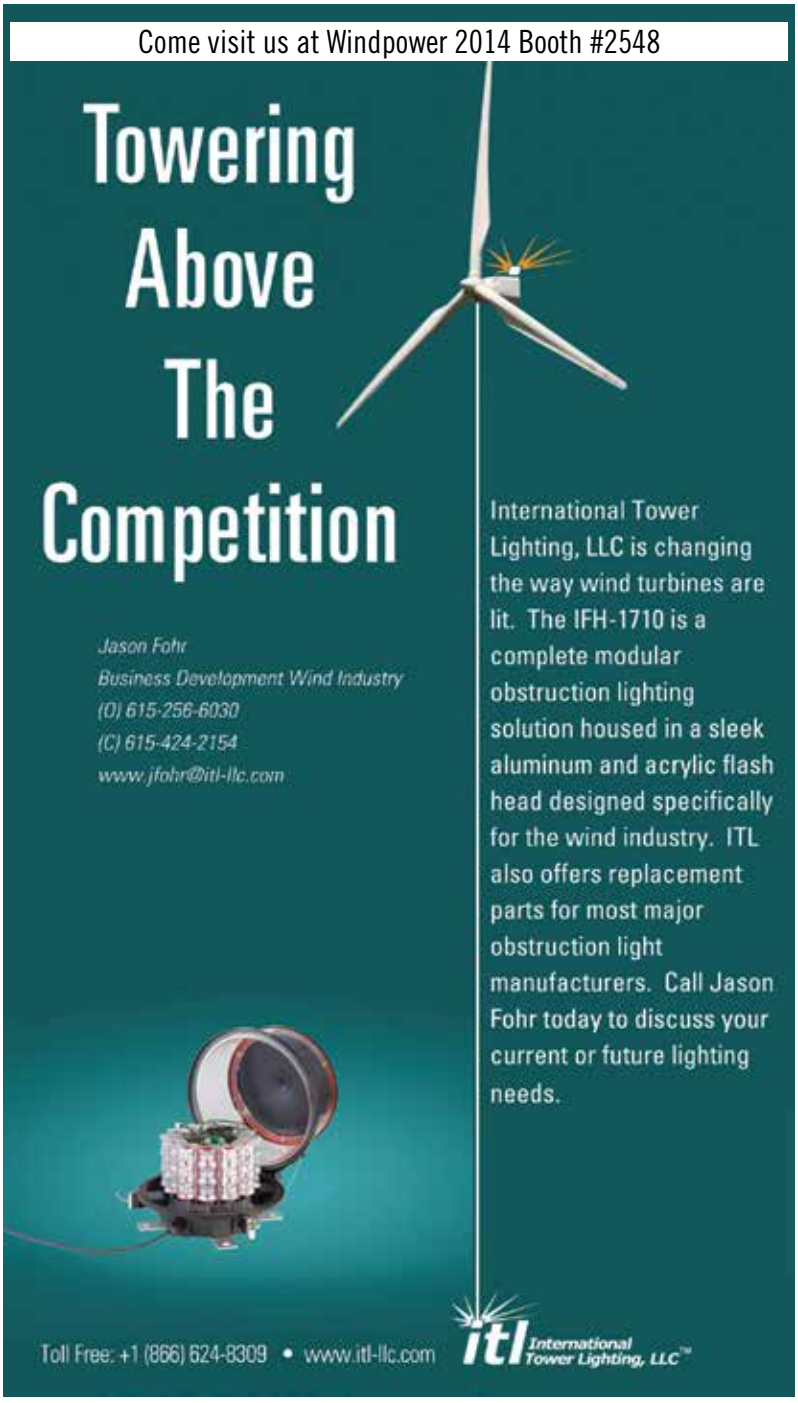
"Foreign manufacturers choose to reshore and source from U.S. suppliers for several reasons such as price, quality, availability of raw materials such as steel, and location," said Harberts in his testimony. "The decision of our customer to supply from Kryton Metals will carry us into 2020. ... We are going to save our customer money, grow our business, and—most importantly—create jobs in Iowa and throughout our entire U.S. supply chain."

Harberts has high hopes for the future of Kryton Metals and the U.S. manufacturing sector but said that uncertainty in Washington has a chilling effect on American manufacturing growth and reshoring opportunities.

"While politicians argue among themselves, employers like me are stuck in a holding pattern," he said, "We don't know whether Congress will extend the R&D Tax Credit, we're unsure what new rules OSHA and the EPA will impose on us, and we can't find qualified workers in large part because Congress has not updated our job training laws in over a decade."

Harberts concluded his testimony by appealing to Congress to take action and make the U.S. a coveted manufacturing location for global businesses.

"Domestic manufacturers can only lower their prices so far and we're not changing our location," he pointed out. "To improve manufacturing's forecast, we must look to overseas opportunities and convince foreign customers that the U.S. is THE place for manufacturing. Manufacturers are doing our part to encourage reshoring—now it's Washington's turn."



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AD INDEX

AIMCO 17
Amsoil. . . . . IFC
Argo Hytos 70
August Friedberg GmbH 7
AWEA Windpower 2014 55
B S Rotor Technic USA 52
BGB Technology Inc 10
C C Jensen 27
Canadian Valley Technology Center 28
Capital Safety 53
Castrol Industries 23
Cincinnati Gearing Systems 67
Complete Wind Corporation 42
Eickhoff Corporation 13
EMA Electromechanics 62
Fiberglass Recycling Alternatives LLC 22
Frisa 51
Hy-Pro Filtration 47
Hydac International 43
Imperial Crane Services Inc 1
International Tower Lighting 68
JLM Systems Ltd 14
Mankiewicz Coatings 46
MOOG 31
NCSG Crane & Heavy Haul Services 54
Nord-Lock 59
Norm Tooman Construction 33
OFS Specialty Photonics 41
Pamco Machine Works Inc 63
P & R Technologies 12
Polytech Services Company 45
Renewable Energy Systems Americas Inc 57
Ritter Forest Products 24
Royal Purple 29
RP Machine Enterprises Inc 40
SAERTEX . . . . . IBC
SAMPE 61
Sensors Expo & Conference 65
Senvion 19
SGS Herguth Laboratories 5
SONOCO 71
Sotek/Belrix Industries 16
SPX Flash Technology 15
Snap-on 69
Stahlwille Tools NA Inc 67
Stego Inc 14
Team 1 Academy 25
Thermo Bond 63
TorxWorx 3
Transhield Inc 34
United Rentals 11
Wanzek Construction 37
Willman Industries 52
WINDRUSH LLC 26
Winergy . . . . . BC
Women of Wind Energy 64
ZF Services LLC 71

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If you're attending WINDPOWER 2014 in Las Vegas, all of your dining, shopping, gaming, and entertainment can be found without ever leaving the Mandalay Bay property. Below, you'll find listings of restaurants, lounges, and bars at Mandalay Bay.

RESTAURANTS & DINING

NAME	CUISINE	PRICE	MEALS	ATTIRE	RESERVATIONS
Aureole	French, American	$$$$	Dinner	Dressy	Yes
Bayside Buffet	Buffet	$$	Breakfast, Lunch, Dinner	Casual	—
Beach Dining	American	$	Seasonal	Casual	—
Border Grill	Mexican	$$	Lunch, Dinner	Casual	—
Burger Bar	American	$$	Lunch, Dinner	Casual	—
Charlie Palmer Steak	Steakhouse	$$$$	Dinner	Dressy	Yes
Citizens Kitchen & Bar	American	$$	Breakfast, Lunch, Dinner	Casual	Yes
Crossroads at House of Blues	International	$$	Breakfast, Lunch, Dinner	Casual	—
Fleur by Hubert Keller	International	$$/$$$	Lunch, Dinner	Upscale Casual	Recommended
House of Blues Foundation Room	American, Steakhouse	$$$	Dinner	Dressy	Reqd. for 10 +
Hussong's Cantina	Mexican	$$	Lunch, Dinner	Casual	—
Kumi Japanese Restaurant + Bar Akira Back	Japanese	$$	Dinner	Business Casual	Yes
Lupo by Wolfgang Puck	Italian	$$$	Dinner	Dressy	Yes
Mix	French, American, Global	$$$$	Dinner	Upscale Casual	Recommended
Mizuya	Sushi	$$	Lunch, Dinner	Casual	—
Rick Moonen's RM Seafood	Seafood, Sushi	$$$	Lunch, Dinner	Casual	Yes
Noodle Shop	Chinese	$$	Lunch, Dinner	Casual	—
Raffles Café	Steak, Seafood, Sandwiches	$$	Breakfast, Lunch	Casual	—
Red Square Restaurant & Lounge	Russian, Continental	$$$	Dinner	Casual	Yes
Rí Rá Irish Pub	Irish, American	$$	Breakfast, Lunch, Dinner	Casual	—
Rx Boiler Room	Contemporary American	$$	Dinner	Smart Casual	Yes
Slice of Vegas	Pizza, Sandwiches	$$	Lunch, Dinner	Casual	—
Sports Book Grill	Sandwiches, Burgers, Salads	$	Lunch, Dinner	Casual	—
STRIPSTEAK	Steakhouse	$$$$	Dinner	Dressy	Yes
The Café	Soups, Sandwiches, Seafood	$$	Breakfast, Lunch, Dinner	Casual	—
Verandah	Italian	$$$	Breakfast, Lunch, Dinner	Casual	Yes

BARS AND LOUNGES

NAME	THEME/SPECIALTY	HOURS	GUEST LIST
Bikini Bar	Beach	Seasonal; 8 a.m.– 5 p.m.	—
Charlie Palmer Steak Lounge	Resataurant lounge	Daily; 5 p.m. – 10:30 p.m.	—
Evening Call	Frozen cocktails	Daily; Hours vary	—
Eyecandy Sound Lounge	Dance/Interactive	Daily; Hours vary	Yes; Call concierge
Fat Tuesday	Frozen cocktails	Daily; Hours vary	—
House of Blues Foundation Room	Views/Exotic	Opens at 10 p.m. daily	Yes; Call concierge
Minus 5 Ice Lounge	Glacial ice	Daily; 11 a.m. – 3 a.m.	—
Mix Lounge	Modern/Views	Daily; Hours vary	Yes; Call concierge
Mizuya Lounge	Restaurant lounge	Daily; Hours vary	Yes; Call concierge
Orchid Lounge	After dinner/Desserts	Daily; Hours vary	—
PRESS	Indoor/Outdoor; Relaxed	Daily; Hours vary	—
Red Square Restaurant & Lounge	Vodka	Daily; Hours vary	Yes; Call concierge
Rí Rá Irish Pub	Irish pub	Daily; Hours vary	Yes; Call concierge
THElounge	Upscale/Contemporary	Daily; 10 a.m. – 2 a.m.	—
Verandah Lounge	Mediterranean	Daily; 11 a.m. – 10 p.m.	—

This is not a comprehensive listing of all restaurants, lounges, and bars. For more information, visit Mandalay Bay's website at www.mandalaybay.com.

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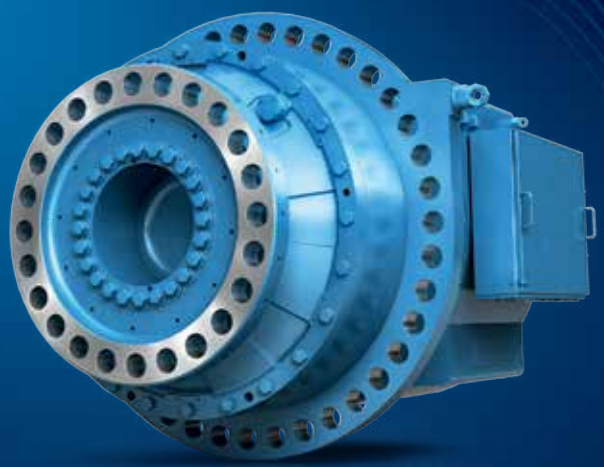

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