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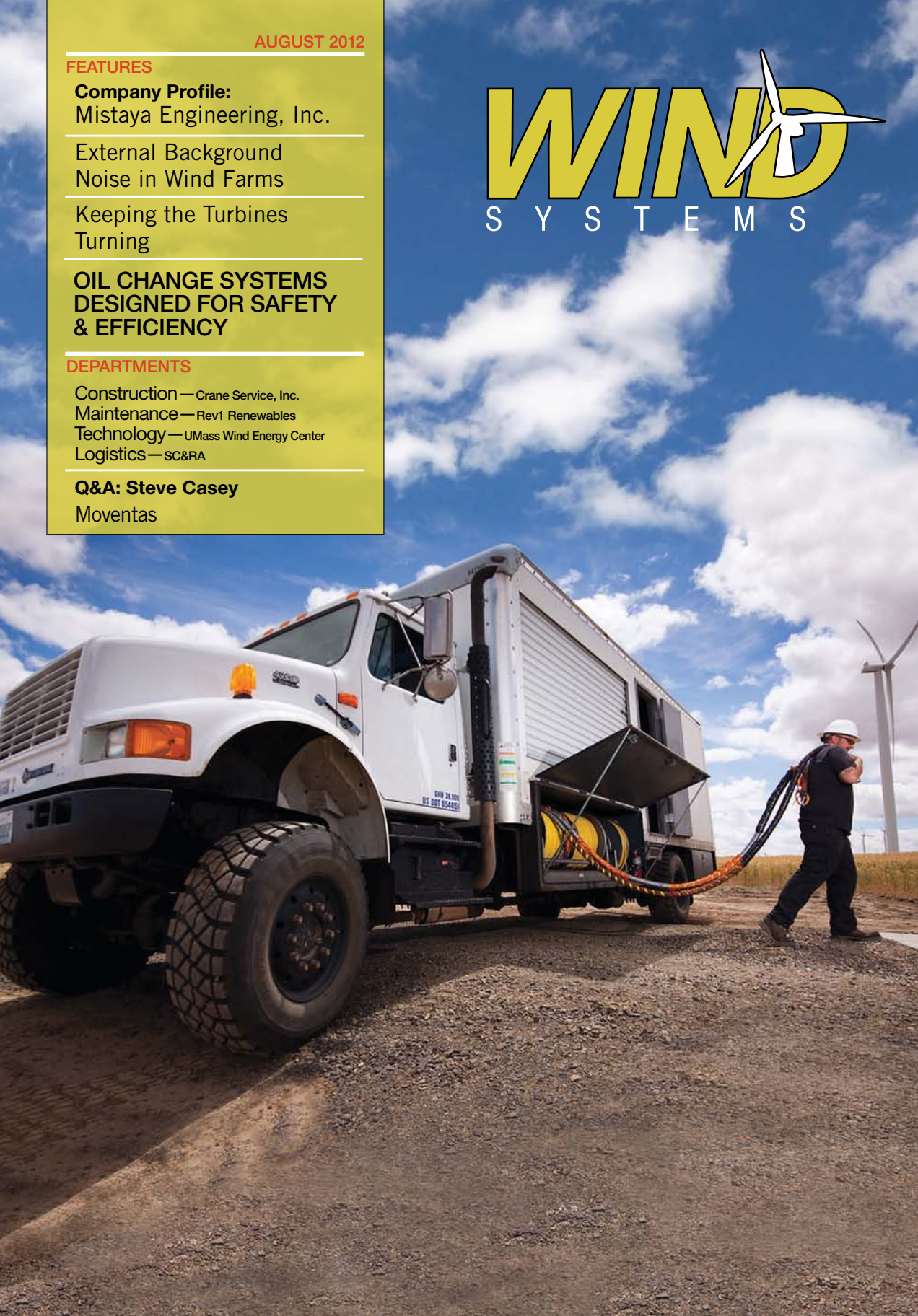

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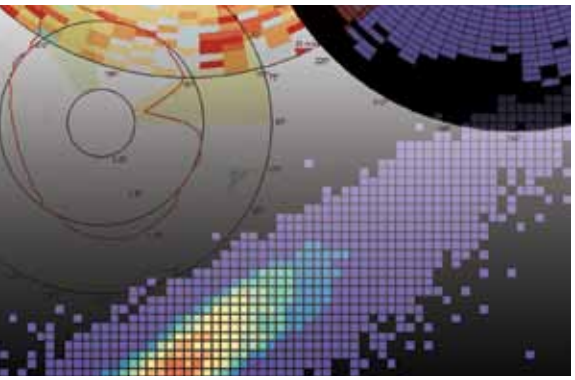

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EDLETTER

As many of the nation's wind turbines reach the end of their manufacturer warranty periods, wind farm owners are finally faced with some tough decisions when it comes to making costly repairs or continuing maintenance on their turbines.

I suppose it's the same kind of sticker shock you get when you buy an expensive automobile and the transmission, timing belt and valves all fail a week after the manufacturer warranty expires – except with wind turbines it's much more expensive than a car and not as simple to repair as towing the thing to the dealership for service.

This issue of *Wind Systems* magazine focuses on Operations and Maintenance (O&M) and how major Original Equipment Manufacturers (OEMs) and other companies are carving a niche into this new frontier of wind turbine service and repair.

As we've talked with manufacturers over the past few months, it's clear that the U.S. wind energy industry is sailing into unchartered territory as far as the failures they may expect or the costs associated with those repairs or replacement parts.

While wind generated energy isn't new, the technological advancements and the rapid pace of the renewable energy market does present challenges and unknown variables when it comes to the turbines.

Gearboxes are failing faster than anticipated. Blades are wearing faster or receiving more damage from extreme climate changes or outside forces.

When a turbine goes down, it not only affects the owner, but it affects the utility contract and the end users who rely on the power generated and supplied to the grid.

As you'll see in our feature articles this month, suppliers, component manufacturers, turbine makers, designers and service providers are all looking for ways to provide service to their current and potential customers by developing plans and options.

Some companies are handling maintenance and ongoing operations service in-house, while others are outsourcing some or all of their needs with dedicated construction and service providers or reworking deals with turbine or component manufacturers as the need arises.

Most owners say they have already developed service plans for the major O&M functions of their businesses, but some were not expecting early failures or problems and have had to quickly assess the situation and find solutions.

I'm curious to see how large the O&M market will grow. Some estimates regarding the need for additional trained service technicians indicate that the U.S. Wind energy industry will have 80,000 more workers in the next few years.

Let's hope that's true because that will truly be an indication that our economy is improving and the wind industry is growing.

Sherri Mabry, managing editor
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MOVENTAS ROLLS OUT UP TOWER REPAIR SERVICE

Moventas, one of the world's leading wind gear manufacturers, is expanding its up-tower service globally after a successful track record in North America. up tower repair significantly lowers wind farm O&M costs, hence making wind power even more competitive than before.

Developed by Moventas' U.S.-based engineers and following a year of successful up tower full-helical gear repairs in North America, the Moventas up-tower ability is the finest in the industry. Moventas can perform on-site inspections and repairs of high speed, low speed and intermediate assemblies to its own gearboxes as well as competitor models.

"Our goal is to significantly shorten response time, reduce customer cost and to continue to lead the industry in repairs that can be done on-site rather than in a workshop. This is a significant cost-saver for the industry, making it even more competitive compared to traditional energy forms than before", says Olli Välimäki, Senior Vice President of Service with Moventas.

By utilizing a mobile service unit and a small hydraulic crane, the Moventas up tower repair eliminates the costs associated with mobilizing large boom and secondary cranes normally required to bring the complete gearbox down from the nacelle. Shipping costs to and from the workshop are also eliminated, as well as the cost of the longer downtime of the turbine.

Every Moventas up tower repair also contains Moventas CMaS, an industry leading preventative condition management system that raises the turbine's reliability to the next level. All up tower repairs are carried out by experienced Moventas field service personnel, all qualified and trained to work safely at heights.

Moventas is currently building multiple self-contained mobile workshops specifically designed to perform this service at the wind site. Five mobile workshops will be strategically located in North America and an additional two units will be located in Germany and Spain before the end of the year. For more information, please visit www.moventas.com.

CONGRESSMAN CALLS FOR PTC EXTENSION

On the floor of the House of Representatives, Congressman John Garamendi (D-Fairfield, CA) offered amendments calling for immediate action

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

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to prevent the imminent collapse of the wind energy industry and the loss of 37,000 American jobs, including 1,000 in California.

The fast growing wind industry is crucial to securing energy independence and employs over 75,000 workers across the U.S. However, the Production Tax Credit (PTC), which supports the development of this emerging industry, is set to expire at the end of the year. The PTC, which is contingent upon energy production, helps wind energy businesses by attracting private investment.

"The wind energy industry in this country is about to come to a screeching halt," said Congressman Garamendi. "Instead of wasting billions padding the pockets of Big Oil, we should invest in the clean energy industries of the future, so once again we can Make It In America."

Congressman Garamendi submitted two amendments to the so-called Strategic Production Act, a bill that greatly benefits oil and gas producers, while wasting the enormous growth potential of renewable energy. Garamendi's first amendment called for a study of how the expiring tax credits would impact the expected increase in wind energy production over the next four years. The second amendment expressed the sense of Congress that wind energy is of the utmost importance to the supply of our future energy needs and thus the job creating wind energy PTC should be extended. The House Republican Majority prevented both amendments from being considered.

Local wind energy companies like NextEra and Enxco have been able to successfully expand production over the past few years in both Solano and Alameda counties, but if the PTC is not extended these expansions will likely cease, leading to avoidable job layoffs.

Congressman Garamendi is the author of H.R. 487, The Manufacture Renewable Energy Systems: Make It In America Act, which would create American jobs by requiring federal tax dollars for renewable energy systems are spent only on projects manufactured in the United States. As a state legislator, Garamendi wrote the first ever state clean energy tax credit.

HUSUM WINDENERGY 2014 ALREADY HALF SOLD-OUT

The major companies in the wind industry have decided to go with HUSUM WindEnergy in 2014. Today, two years before the leading international wind trade fair in 2014, bookings have already been taken for half the exhibition space. Before the 2012 exhibition opens its doors in almost three months, the organizers are completing a variety of infrastructure projects.

In the run-up to the 2012 edition of the international wind industry meeting in September the organisers, Messe Husum & Congress, are taking stock.

"We have long been fully booked for this year, and have firm bookings for 50% of the exhibition space for HUSUM WindEnergy in 2014," says Peter Becker, managing director of Messe Husum & Congress.

Various major wind industry businesses have already secured their space for 2014, including international turbine manufacturers such as Samsung, Vestas, Enercon, and Vensys, as well as major suppliers like WKN and Beckhoff AutomationFor chairman of the Vensys board, Jürgen Rinck, the advantages of Husum as an exhibition venue are obvious.

"HUSUM WindEnergy is the mother of all wind trade fairs. We have been showing here since 2005 and we will be back in Husum in 2014. Husum is the longest established trade fair for our industry and is notable for its high level of internationality. We particularly value the optimistic, happy and infectious atmosphere of HUSUM WindEnergy, which is the best possible foundation for showing successful projects."

The construction of a new access road, a logistics hall and a car park for an additional 1,000 cars are ongoing, but will be completed in time for the exhibition in September. "We are investing another 450,000 euros in the exhibition grounds, and we will have no problem at all in coping with the expected 36,000 visitors", says Peter Becker.

A new radio mast has already been erected at the fairground, which will provide glass fiber Internet access to all exhibition halls. Erection of the lightweight exhibition halls will begin in mid-July, all of which will be equipped with effective air-conditioning.

Once these are up the real excitement will kick in for the Husum crew. "We are really looking forward to this year's show. With 1,200 exhibitors it will be the biggest HUSUM WindEnergy since we started back in 1989," adds Becker.

ROMAX REDESIGNS GEARBOX WITH DOE

Romax has signed a contract with the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) to perform a major redesign of the research gearbox for the dynamometer testing facility at NREL's National Wind Technology Center (NWTC).

The gearbox will be redesigned by this summer and rebuilding will commence later in 2012. Engineering and drafting services provided by Powertrain Engineers Inc. will assist Romax in this project.

In an effort to document and assess the design process, NREL previously completed a redesign/rebuild of two heavily used gearboxes that subsequently underwent in-field operation and dynamometer validation testing. With the help of industry and

academic partners, NREL has highlighted significant findings to reduce the number of gearbox failures seen by the wind turbine industry.

Ashley Crowther, the VP Engineering, at Romax's Wind Technology Center in Boulder, Colorado, is positive about gearbox reliability, saying, "Gearboxes are a reliable workhorse for so many industries, they increase the output velocity and provide a large saving in the costs of the electrical machine. Programs such as this one at NREL are important as they improve the knowledge across the industry allowing the progression of the wind turbine gearbox into a reliable product."

The redesign has the primary goal of allowing for the exploration of the effect of design details on the loads and deflections within the gearbox and a secondary goal of improving the design from the previous configuration. Romax has developed a detailed drivetrain engineering model of the current gearbox and performed extensive validation of the model versus a wealth of test data generated so far by the program.

Chris Halse, Engineering Manager at Romax, said, "We have shown by simulation and test several key issues with the 3 pointed mounted arrangement, such as the high sensitivity of the designs to rotor loads, if the gearbox is not correctly supported in the planetary stage. By improving this aspect of the design we can return to simulation and test and demonstrate the engineering approach to ensure future gearboxes don't have such problems. An original goal of the project was to ensure modelling tools are up to the tasks of predicting gearbox behaviour and we have certainly shown Romax is on top of that." For more information, visit www.romaxtech.com.

SUZLON GROUP ANNOUNCES EXECUTIVE BOARD APPOINTMENTS TO REpower

The Supervisory Board of REpower announces the appointment of Marcus A. Wassenberg as Chief Financial Officer, and Vinod R. Tanti as Chief Operating Officer. Tulsi Tanti, Chairman of Suzlon Group and Chairman of REpower's Supervisory Board, said, "For some time now we have been looking to both strengthen REpower's Executive Board and also leverage some of the many

synergy benefits between Suzlon and REpower. We believe today's Supervisory Board appointments progresses this in both regards."

Wassenberg has held a senior position at REpower since 2009. He brings to the CFO role strong management skills and a proven track record of realizing efficiencies in progress and change within the organization. Tanti, as COO, brings the strong supply chain strength of Suzlon into REpower to maintain and improve cost-efficiency, while meeting the highest standards of reliability and quality, in a highly competitive market. "The Suzlon Group is committed to REpower for the long-term and wishes to further develop the profitable and sustainable growth of the company. By appointing these senior and experienced professional executives to the company, I believe we will create significant value for our stakeholders over the near and mid-term."

"I have worked closely with Marcus Wassenberg for a number of years now and know he will make an important contribution on the EB as CFO," said Andreas Nauen, CEO of REpower. "I am also delighted to welcome Vinod Tanti to REpower. His rich experience and deep knowledge of supply chain management will benefit us significantly."

Wassenberg holds an economics degree from Ruhr-Universität, Bochum, and has held a number of senior finance and managerial positions in a range of sectors. Most recently he has been senior vice president of management control, where his duties included managing accounting, invoicing, and controlling for both REpower and its subsidiaries. Before joining REpower he held a number of senior positions at the Cirrus Group.

Tanti is a civil engineer with over 24 years' experience, including the last 16 years in the wind sector. As a senior member of the Suzlon Group he has been involved in all facets of the business, especially in organizing the low cost country supply chain into a highly aligned, lean, productive and competitive organization.

ENCORP HELPS COMPLETE NATION'S MOST ADVANCED MICROGRID PROJECT

Encorp LLC, a distributed energy control company, recently completed the

integrated monitoring and controls system as part of a first-of-its-kind smart microgrid at Santa Rita Jail in Dublin, Calif.

The microgrid, developed by Chevron Energy Solutions, is among the most advanced in the country. It integrates a diverse collection of onsite renewable energy sources at the 1-million-square-foot, maximum-security jail to ensure around-the-clock power reliability and reduce utility costs.

The Encorp system helps aggregate the jail's onsite generation sources of solar photovoltaics, fuel cells, wind turbines and emergency backup diesel generators with an advanced 2 megawatt energy storage system to reduce the facility's energy costs by an estimated $100,000 each year to safeguard it against power loss.

Six Encorp Gold Boxes™ help control the jail's daily 2-plus megawatt power demand by seamlessly balancing onsite generation and utility power to provide synchronous power. The seamless conversion of energy sources mitigates power disturbances.

An Encorp SCADA system automatically monitors and controls the operation by aggregating and analyzing real-time data from the different power sources that is sent to a central computer for operators to easily view.

With the completion of the smart microgrid, Alameda County's Santa Rita Jail is considered one of the most energy efficient jails in the U.S., with one of the most advanced power systems in the world. Part of what makes the microgrid "smart" is the Encorp computer system, which allows the jail to monitor how much power it's bringing in and how much it's generating onsite. This state-of-the-art Encorp technology also allows the jail to disconnect seamlessly from the grid and operate independently if needed. In all, the smart microgrid enables greater efficiency, reliability, security and resilience of electricity delivery systems.

"Encorp microgrid equipment supports the high-security needs of the jail, helping to ensure safety of inmates and staff," said Michael Clark, Encorp President. "Encorp equipment helps tie the disparate onsite energy sources together so they can communicate in the same language

and perform at optimum levels. The Santa Rita Jail microgrid is the latest example of Encorp's success integrating different forms of distributed generation sources."

For more information, call Encorp at 888-295-4141 or visit www.encorp.com.

NJC WIND TECHNOLOGY PROGRAM BEGINS FIFTH YEAR

Northeastern Junior College (NJC) in Sterling, CO, is beginning its fifth year of wind technology training programs. Situated in an area, which is a hot bed for wind development with more than 800 megawatts produced wind energy in an 80-mile radius of the school and two more sites going up this summer that will be producing an additional 200-300 megawatts. Six different turbine technologies are currently operating in the area near NJC near the Nebraska state line NJC, with the help of industry partners, developed an Associate of Applied Science degree in wind technology to produce competent and well-rounded technicians that can adapt to different technologies and situations. The local wind companies have helped by supplying equipment,

and donations to advance the college's program. The students complete a 240-hour internship in the wind industry to gain valuable work experience and must also take general education classes that advance computer, communication, and soft skills.

The NJC wind program recently graduated the second class of 17 technicians in May 2012. Within three months of graduation, 14 of the 17 students were employed as technicians with GE, NextEra Energy, Invenergy, enXco, and Blattner Energy. The remaining three students are continuing their education in business or engineering.

What sets NJC's wind program apart is its strong safety practices and on the job training attitude. Twenty-two students are allowed into the program each fall. The small class size allows for more hands on and one-on-one instructor time. Tuition, fees, and books for the program are approximately $10,000 for the full two year A.A.S. degree. Students leave NJC with an OSHA 10 hour certificate, CPR and First Aid certificate, and an associate's degree. At NJC, the three instructors in the wind training program have a combined eight years of wind industry experience

as technicians with three different companies. For more information, visit www.njc.edu or contact Jim Lenzen, assistant director of Renewable Energy at (970) 521-6740.

SPECTRO, INC. EXPANDS GLOBAL SALES AND SUPPORT ORGANIZATION IN CHINA

Spectro, Inc., one of the largest worldwide suppliers of oil and fuel analysis instruments to industry and military markets, has established a local sales and support office in Beijing, China under the leadership of China Sales Manager Alex Shi.

Shi previously held the roles of account manager at 3M Corporation, project manager at Sinovel Wind Corporation and marketing development manager at Keithley Instruments.

"China is the fastest-growing, lubrication-consuming market in the world," said Spectro Inc.'s President and CEO Brian Mitchell. "As such, we felt it was very important for us to have a physical presence along

with local representation and communications to establish and maintain effective sales and customer support channels. Further, our products can be used in other fluid applications beyond lubrication compounds. By understanding the local and regional needs more clearly, we can explore those other applications and refine solutions for them."

For more information, please visit www.spectroinc.com.

Rob Mackinaw
Crane Service, Inc.

Crane business is booming in Texas and this company provides fast response, skilled workers, and safety to get the job done.

IN THE PAST DECADE, JUSTIN MOFFETT has seen significant changes in the wind energy market. From his home base in Sweetwater, Texas, Moffett says wind turbines dot the horizon in every direction. Row upon row of turbines that were once considered a nuisance to the local citizens are now just part of the landscape.

In this area of Texas where wind power generation leads the world in megawatts of operational energy, it's no wonder that Moffett and others like him have worked for years on turbines or in businesses supporting the wind industry.

Moffett recently joined Crane Service, Inc. after spending 10 years in turbine construction for major OEMs before helping to start another crane and service business in Texas. With a background in both construction and crane work, Moffett's job in territory sales for Texas and eastern Oklahoma is a good fit for him and the company.

"My job is basically to sell operated crane work or crane sales," he said. "Wind energy is everywhere out here. There is a lot of demand for crane rental and service. You go out and usually the customer knows exactly what they need and the weight of the turbine. I work with them to determine what size crane they need – whether they are erecting an 80-meter, 69-meter or 100-meter turbine – we figure out what is the best piece of equipment to fit their job."

"We have 440-ton crawlers, hydraulic truck cranes, a new 550-ton Grove GMK-7550 hydraulic crane and everything down to a 15-ton carry deck," he said. "We stay busy and our equipment is always coming and going. There's a lot of work here for cranes and crane service."

In addition to the equipment mentioned, the company has a fleet of boom trucks, forklifts, all-terrain cranes up to 130-tons, rough terrain, crawler and lattice boom units, in addition to a Link-Belt AT-3275 all terrain unit with a tip height of 350 feet and 156,500 pounds of counterweight. The Manitowoc Model 16000 Crawler is a new addition to the fleet, according to Moffett. It has a lifting capacity of 440 tons and a 315-foot heavy lift boom with a luffing jib extension to 432 feet.

"We have smaller 25-ton cranes that we rent and the customer operates and the larger operated cranes are constantly moving and busy," he said.

While busy with lots of work and quick turnarounds, Moffett said safety is the most important factor with Crane Service and the industry as a whole.

"When I first started in the wind industry, it wasn't nearly as strict," he said. "There were processes and manuals, but not a lot of enforcement or guidelines. Now it's not left up to your imagination and that's a good thing."

Equipment is well maintained to manufacturer standards and inspected by third-party sources on a regular basis to ensure employees and customers and their jobsites are safe. This also applies to operator training, with each operator working and training on every piece of equipment and licensed to perform the work.

"Besides safety, a huge change is how everything looks now," he said. "I used to look out and see rolling hills and flat places. Now you see turbines -- 500 or more – and when people come to visit you take them out to see the wind farms. It's a unique experience for them. And it's especially beautiful at night. The FAA lighting is situated on every second or third turbine and they are all linked together so when one blinks they all blink. That's really a sight to see, but it's also fun to watch a turbine going up or a crane being assembled or disassembled.

With so many turbines in Texas, Moffett says most customers are knowledgeable about the work involved and sites or farms are easy to reach with heavy equipment.

"We have some challenging situations where there are some tight spots when we are moving from one location to another, but the assembly and disassembly and the guys who do that work do a great job."

For more information on Crane Service Inc. please visit their website www.craneserviceinc.com.

Merritt Brown
Rev1 Power Services, Inc.

In an effort to reduce hand and arm injuries, we should learn from the research on high visibility clothing and how we can make our hazards more conspicuous and safer.

IN MY EARLIER DAYS OF WORKING IN POWER generation facilities, it was common policy to give the new guy a bright red hardhat so that everyone else could look out for him and help him learn the ropes of the facility. Though such a policy may have inadvertently sanctioned the amusing initiation of a new recruit, its intention was to bring focus on an inexperienced member of the team. It was this visibility and guidance that helped the new employee avoid injurious situations until he became fully aware of his new surroundings.

In a literal sense, poor visibility can be the cause of many hazards and injuries in our industry. Wind technicians work with their hands, whether it is with rigging equipment, hand tools, or climbing a turbine. Part of the responsibility of providing maintenance services is to continuously find ways to improve the safe working conditions of technicians. Whether we work during dusk or dawn hours, in high traffic construction areas, or in dimly lit towers and hubs, the risk of injury due to poor visibility can increase significantly.

According to the Bureau of Labor Statistics (BLS), the agency that compiles OSHA reportable injuries, in 2010 more than 209,000 injuries to the arms and hands were reported in the U.S. private workplace sector. Of those reported injuries, nearly 55% resulted in more than six days away from work. While we may logically believe that many of these types of injuries occurred before someone was really thinking about their task or when they became tired at the end of a long day, the fact is that most were inflicted at least two hours after the start of work and during work periods of less than ten hours. This particular BLS statistic might suggest that workers should be wide-awake, but simply not focused on the task at hand. Even the day of the week seems irrelevant, as the number of arm and hand injuries reported in 2010 varied by less than 3% Monday through Friday.

Certainly not a surprise to anyone the most common causes of these types of injuries are carelessness, lack of awareness, boredom, distractions, and disregard for safety procedures. Often the technician places their non-dominant hand in the line of fire, increasing the risk of hand injuries. At one time the worker can be a wide-awake and unwitting participant in an unsafe act, yet at another they can avoid the very same actions that put them in harm's way. Perhaps in the first scenario, the hand or arm just wasn't conspicuous enough to immediately gain the attention of the technician.

Conspicuity refers to the ability of an object to draw attention to its presence, even when someone is not actively looking for it. We know for example how a vehicle's headlights and brake lights make them conspicuous, or how a bright red hardhat brings our attention to a new employee. When we are casually looking around, sometimes an object will jump out of the background. Since getting technicians to notice where their hands and arms are placed can literally be a matter of life and death, creating an up tower work environment where arms and hands become more conspicuous, and where hazards can be found, will provide a real safety advantage.

High visibility clothing has been around since the 1970's and has become commonplace in today's wind construction industry. During construction or major maintenance high visibility vests are worn as a means to deliberately make the workers conspicuous to others. For many years red was considered the most conspicuous color but recent research has established that the most conspicuous colors are yellow and yellow-green, sometimes called lime yellow. Because the color-transmitting cones in our eyes do not work well in the dark, some colors are easier for us to see at night. We are most sensitive to greenish-yellow colors under dim conditions, making lime shades easiest to see in low lighting. This led to a study that found yellow-green fire engines have far fewer accidents than red ones, and now communities across the country are replacing the traditional red fire truck.

Considering the outcome of such studies, wearing clothing that is inconspicuous may be a leading contributor to many hand and arm injuries in our industry. Wearing black gloves that are close in color to the equipment we work on, for example, does little to draw sensory perception to where the hands are placed. Brightly colored gloves or those with bright colored fingertips can increase technician awareness of hand safety while working. In many safety-critical situations, it is vital that a viewer notice a sign or other object in order to avoid injury. However, words and numbers are not good conspicuity devices because reading text takes good acuity and mental effort. Color on the other hand, is easily and quickly perceived without the cognitive effort required in reading and can be perceived in peripheral as well as in central vision. Color-labeling what is otherwise an inconspicuous hazard can bring attention to pinch points, high voltage connections, and sharp edges.

Being left to work with some engineered hazards on our turbines, the least we can do is identify them and make them as conspicuous as we can.

Merritt Brown is vice president of Rev1 Renewables, an energy services company supporting wind, solar, and biomass clients worldwide. To learn more call (866) 738-1669 or go online to www.rev1renewables.com.

Yahya Modarres-Sadeghi, Ph.D.
UMass Wind Energy Center

Fluid-structure interactions in floating offshore wind turbines are among the most critical studies needed.

WHILE ONSHORE WIND ENERGY has been the world's fastest growing energy source for more than a decade, there is an increasing interest in using offshore wind turbines especially in deep water. The interest is mainly because of higher and more consistent wind speed offshore: no size limitation on the blade size due to the road and rail constraints; no visual and noise annoyance; more possible places for installation; and high potential for offshore wind energy extraction in the U.S.

Despite their great potential, there is no functional floating wind turbine in the world (apart from a few experimental ones), as there are yet many fundamental studies necessary before they can be realized. Among the most critical studies needed for the offshore floating wind turbines are studies on fluid-structure interactions.

When a structure is in contact with flow, it could deform or oscillate due to the fluid forces. The deformation or oscillation of the structure results in changes in the fluid forces, leading to new deformation of the structure. This is a fluid-structure interaction case.

In a floating wind turbine, many cases of fluid-structure interactions are observed. Large wind turbine blades, which are common for the offshore wind turbines, are susceptible to various flow-induced dynamical instabilities. This means that if the blades are too large, or too flexible, they can undergo large-amplitude oscillations in a plane perpendicular to the plane of rotation. The result is that the blade will break immediately, or will hit the tower. The blades are attached to a tower, which oscillates due to the interaction of the platform with the ocean waves. The entire floating wind turbine is supported by mooring lines, which can undergo vortex-induced vibrations (VIV). These are oscillations with amplitudes of the order of one cable diameter and a rather low frequency (usually ranging from around 1 Hz to around 10 Hz). Although its amplitudes and frequencies are not very large, VIV is a major concern, as it can lead to fatigue and failure of the mooring lines. A failed mooring system results in a floating wind turbine moving freely in the ocean – a situation that should definitely be avoided.

At the Fluid-Structure Interactions lab of University of Massachusetts, we study the fluid-structure interaction systems involved in floating offshore wind turbines, theoretically and experimentally.

The theoretical component of our work is based on analytical modeling of nonlinear fluid-structure interaction systems. For example, we are working on a nonlinear model to predict possible dynamical instabilities of large wind turbine blades. These models are coupled nonlinear partial differential equations, which are reduced to a set of ordinary differential equations using the Galerkin technique, and then solved using Houbolt's finite difference method. The results will give us the critical wind speeds for dynamic instabilities of wind turbine blades.

At the UMass FSI lab, we have a recirculating water tunnel with a test-section of 38 cm × 50 cm × 150 cm and a maximum flow rate of 1.0 m/s. We use this tunnel for the experimental components of our studies. We conduct tests to investigate the vortex-induced vibrations of a flexible cylinder placed in flow with various angles of inclination. In a floating offshore wind turbine, the mooring lines could be placed perpendicularly to the oncoming flow, and in some cases, with an angle with respect to the flow. We study experimentally the influence of this angle of inclination on the resulting VIV response.

In our open-section wind tunnel (operated by the UMass Wind Energy Center, in conjunction with the Mechanical and Industrial Engineering Department), we conduct experiments on small-scale wind turbine blades to study their instability. The wind tunnel has a cross-section of 1.0 m × 1.0 m and the maximum wind speed is 18 m/s. The goal is to quantify the onset of possible instabilities for flexible blades, with various designs. Increasing the wind speed from zero to the maximum, we measure the tip displacements of the wind turbine blades to see if any dynamic instability can occur. The results will help us validate our theoretical model for blade instability and to be able to predict the onset of instability for larger blades.

This is a summary of various ongoing FSI projects related to the offshore floating wind turbines. In future columns, I will give more details about the problems I have discussed here.

Yahya Modarres-Sadeghi, Ph.D., is an assistant professor of mechanical and industrial engineering at the University of Massachusetts Amherst and a member of its Wind Energy Center. He can be reached at (413) 545-2468 or modarres@engin.umass.edu. Also visit www.umass.edu/fsi.

Terry White
Specialized Carriers and Rigging Association

Association and member companies work on transporting topics and permitting processes for wind industry.

SINCE 1948, MEMBER COMPANIES of the Specialized Carriers and Rigging Association (SC&RA) have built a reputation for lifting, hauling and positioning massive items with precision and accuracy. Additionally, the association's Allied Industries members produce the specialized equipment, professional engineering, insurance, legal counsel and other products and services that make such monumental tasks possible.

SC&RA member companies perform the work that no one else can handle. And they take considerable pride in doing jobs safely, legally and profitably. These characteristics make SC&RA members exceptionally well suited for working with wind systems projects. Year after year, some of the most impressive entries in the SC&RA Hauling and Rigging Job of the Year Competitions involve the energy sector. Regardless of the type of energy ultimately produced, many of the lessons learned from such projects apply to the wind power segment, where SC&RA members have focused much of their attention in recent years.

SC&RA has exhibited annually at Windpower since 2010 to help explain benefits of working with SC&RA members when needing specialized transportation, crane and rigging services. The booths also further SC&RA's efforts to recruit members from within the wind industry, including at least three new members. Sharing SC&RA's presence at Windpower each year are more than 50 of the association's member companies. Largely as a result of SC&RA's participation at Windpower 2011, the association was asked to participate at the American Wind Energy Association's Transportation and Logistics Working Group meeting during that conference. This group, which already had some SC&RA members participating in it, provides another outlet to team with SC&RA in its permit uniformity goal.

SC&RA has worked long and hard on efforts to attain permit uniformity for oversize/overweight transport of items such as components for wind turbines, towers and blades. Permitting processes that vary from state to state can be every bit as daunting for motor carriers and their customers. SC&RA's unwavering conviction that a uniform system for issuing permits would promote more efficient interstate commerce and fuel the economic growth of all states involved led to the creation of the Specialized Transportation Symposiums.

Additionally, SC&RA members and staff participate at meetings of regional transportation groups, including the Southeastern Association of State Highway and Transportation Officials, the Washington Association of State Highway and Transportation Officials, and the Mid America Association of State Transportation Officials. Often, SC&RA staff executives are called upon to present an overview of issues facing the industry.

These efforts sometimes lead to SC&RA's direct involvement within states. For example, after Virginia enacted a bill last year that required the development of a uniform system of permitting for overweight and oversize vehicles within its boundaries, as well as a comprehensive, tiered schedule of fees for overweight vehicles, SC&RA staff and members began serving on three of the five working groups organized by the commonwealth.

In addition to state permitting issues, SC&RA addresses such areas as federal regulations involving hours-of-service for drivers, electronic on-board recorders; load securement; pilot car practices; and litigation concerns. The association meets as needed with federal officials, submits comments about pending federal regulations and works with related associations on specialized transportation issues of mutual concern. Similarly, SC&RA works on behalf of members in the crane industry and their customers, including those involved with wind systems. A popular session at SC&RA's Crane & Rigging Workshop last year covered the current and future wind-energy market. Other sessions focused on lift plans, load charts and numerous other topics of significance to the erection of wind towers.

SC&RA's upcoming 35th Anniversary Crane & Rigging Workshop in Louisville, KY, September 19-21, also will place a strong emphasis on logistical, safety, regulatory and legislative matters of relevance to wind systems. The 2012 workshop is expected to attract more than 425 industry experts, including equipment designers, safety directors, crane operators, operations managers, sales representatives and top management.

As with transportation issues, SC&RA also stays directly involved with crane and rigging issues at the local, state and federal levels. SC&RA actively participated on the 23-member Cranes and Derricks Negotiated Rulemaking Committee that drafted new federal safety regulations. Moreover, SC&RA tirelessly pushed for years to keep the promulgation process moving whenever it stalled.

SC&RA also supplies comprehensive coverage about the transport, erection and installation of wind systems in both of its official magazines, International Cranes and Specialized Transport and American Cranes & Transport, as well as in the association's weekly newsletter and quarterly safety newsletter. Among the most useful tools offered by SC&RA is the Membership Directory, which encompasses a network of about 1,300 companies. With members in 46 nations, SC&RA is uniquely qualified to further the wind-energy industry virtually anywhere in the world.

To learn more about this and other SC&RA products, events and competitions of relevance to the wind-energy industry, please visit the SC&RA website at www.scranet.org or call 703-698-0291.

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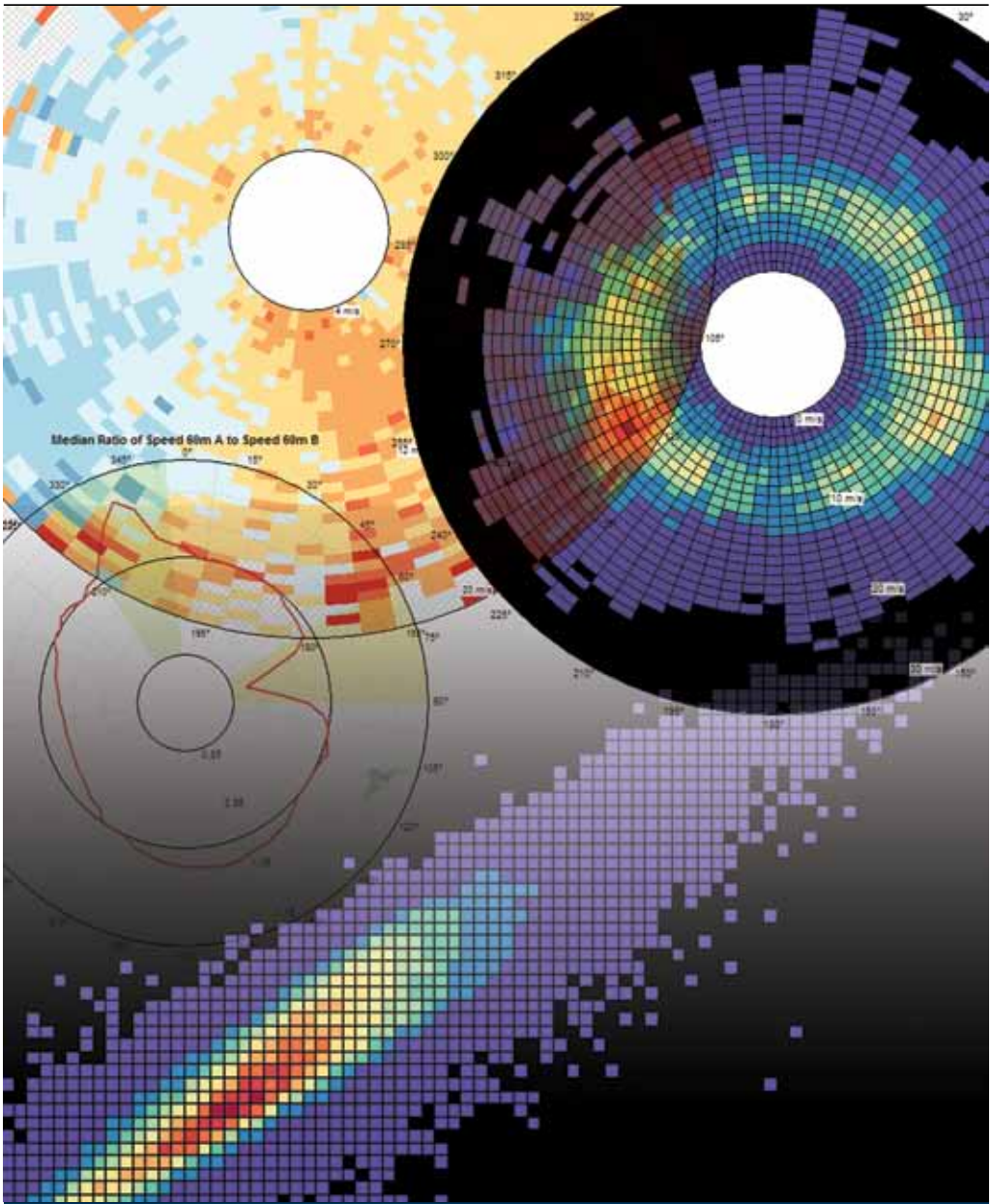
MISTAYA ENGINEERING INC.

By Sherri Mabry



Windographer allows users to analyze wind resource data in a single intuitive software package to simplify information collected from wind measurement equipment.

AS A YOUNG BOY GROWING UP in southern Alberta, Canada, where the wind is extremely powerful, Tom Lambert remembers being interested in renewable energy. His father used solar panels at the family home in the 1970s before others even considered tapping available renewable sources for power.

With a degree in mechanical engineering from the University of Alberta, and a Masters from Colorado State University, Lambert is now CEO of Mistaya Engineering, Inc., a software and consulting service that helps engineers develop renewable energy projects.

"Analyzing these projects involves large amounts of data to understand how power systems will perform with available resources," he said. "I had a hunch that the industry needed a tool designed especially for wind resource analysts who work with data generated by wind measurement equipment. When we developed Windographer, I was a little surprised at the relatively early adoption of the software by industry leaders."

Windographer was designed to quickly read wind data files from almost any source, sorting out the different types of data in the file and displaying it in a logical format that could be evaluated for quality of both the wind resource and data generated.

"The product has evolved the way I envisioned, but there have been some surprising things about its evolution, that I did not anticipate," he said. "I didn't realize it would be used as much as it is for operational assessments."

With more than 500 customers in 60 countries, Windographer has established a reputation since 2005 as being the industry-leading tool for simplifying and accelerating the wind resource assessment process.

"Our biggest customer group is wind power developers who are looking to analyze wind resource data prior to construction," he said. "Other users are consultants, academics and amateur meteorologists – it's an eclectic group of folks who are real lovers of data. Definitely, it's data-centric people who use Windographer because it provides tons of data and it's fun to use. You can zoom in and zoom out, filter, change settings, and the graphs update very quickly."

Developed as a stand-alone software package, Windographer integrates with other software products in a Windows-based system.

"We wanted to make sure it would fit in nicely to the ecosystem in the wind power industry, so we work hard to read all the common met tower, SoDAR, and LiDAR data formats, and to export to all the common software packages used to design wind farms," he said. "We designed it knowing that it would be just a part of the entire process of developing a wind energy site."

The main features of Windographer include intelligent data import, visualization, powerful quality control, and advanced analysis capabilities.

"Reading data files is one of the main features of Windographer," Lambert said. "We try to make it like magic. It can import data from almost any format and automatically determine the data structure without asking questions, so the user can get straight to analyzing data."

The software also provides a wide range of graphs and tables from the original file, and also calculates quantities such as air density and turbulence intensity for display in colorful graphs, wind roses and frequency histograms.

The software allows users to quickly detect and flag problems such as tower shading, icing events, and sensor malfunctions, and to analyze wind shear patterns and estimate wind speeds at the hub height of a particular turbine.

Users can also analyze tower distortion, estimate wind turbine energy production, and predict extreme wind speeds.

In the next few months a new feature will be introduced to allow comparison of one site to another. The Measure Correlate Predict (MCP) module will allow wind farm developers to correlate data from the proposed site with a nearby long-term reference station to provide information for climate adjustments. "The industry has evolved from the cowboy mode of operating, where you could get away with designing wind farms without much detailed analysis. These days, designers very carefully analyze both pre-construction and post-construction data, and software saves time and effort in the process."

Lambert believes technological solutions like Windographer will continue to be needed in the search for potential construction sites.

"The industry needs a higher degree of analysis and sharper pencils to handle the more challenging conditions we face as we construct wind farms in places with less energetic winds or more complex terrain," he said.

For more information, call 1-866-848-6232 or visit www.mistaya.ca or www.windographer.com.

OIL CHANGE SYSTEMS DESIGNED FOR SAFETY & EFFICIENCY

Down tower gearbox oil changes are designed with safety, efficiency, and containment in mind for efficient service and less downtime for wind farms.

By Jonathan Glessner

Jonathan Glessner is the vice president of Wind Service, Wind Service Manager for H&N Wind Wazee Companies. For more information, call 1-800-299-8658 or visit www.wazeeco.com.

IF THERE WERE ANATOMY LESSONS on wind turbines, it wouldn't take long to fully understand that the gearbox is the structure's most critical organ. It is essentially the beating heart of the wind turbine. Failure of the gearbox won't result in death but it could cost as much as $500,000 for emergency and reconstructive surgery. The gearbox is the part of the turbine that cannot be ignored, and thus requires attention to detail.

Historically, gearbox failures in the wind turbine industry are mostly mechanical in nature caused from undersized gearboxes. Failures that are most prominent are low-speed and high-speed bearing failures. Gearbox lubrication issues tend to be the other key reason leading to breakdown, typically coming from high-particle count and high-moisture content in the gearbox.

Most wind turbine owners either assume or were told by manufacturers that the majority of gearbox problems are caused by improper oil choice. In this case, one of two problems can occur – either the oil does not lubricate the gearbox sufficiently; or it holds moisture creating a "sludging" effect and therefore causes filters to plug. Ultimately, they both can lead to untimely shutdowns.

Another common cause of gearbox failure stems from improper oil changes. The industry has seen its share of inexperienced and unskilled service providers inventing oil change procedures that can lead to huge problems. Much of the problem comes from improperly mixing additives or non-procedural oil changes that cause oils to foam. When oil foams, it causes the gearbox oil sensors to detect low levels and shut down. Cutting corners in the oil change process – to save time and increase the number of turbines you can service in one day – can ultimately lead to unwanted downtime and expensive repair.

TWO TYPES OF OIL CHANGES

There are basically two types of oil changes. There is a "2-part" and a "4-part" oil change. A 2-part change involves two steps: drain out the old oil and add in the new. The 4-part change involves two additional steps: flushing and rinsing the gearbox. The 4-part process also includes flushing lines and changing filters. If using the same oil type, the 2-part change is sufficient. However, if the oil type is different and not compatible with the original oil, the 4-part change is required. A cleansing solution must be used to clear out all remnants of the used oil otherwise the foaming issues can arise causing the potential for considerable turbine downtime.

Currently, there are various systems used within the industry to change gearbox oil including some "custom-built" methods. There is the bucket method as well as another system that uses pressurized tanks involving a transfer of oil from either totes or drums. Both methods have proven to be inefficient and labor intensive. One significant disadvantage to the bucket system is that it doesn't allow for the 4-part change. In recent years, the industry has seen other methods that have proved to be inefficient and ineffective.

But methods that focus on safety and efficiency are most important for the future of the industry. Regardless of all other conditions, these two factors are the most critical of all. The other major focus area revolves around containment – eliminating the potential for oil spills. Anytime oil is handled or transferred, you are exposing yourself to a potential spill and environmental anxiety.

The latest technology that addresses all three of these primary concerns is the down-tower (executing the oil change from the ground rather that at the top of the tower) oil change service. The process is designed with safety, efficiency and containment in mind. The down-tower method provides obvious safety benefits and greatly decreases chances of spillage.

By implementing the procedures designed by the oil manufacturers (manufacturers, of course, know the oil better than anyone), gearboxes operate at maximum efficiency. Keeping the turbines running at this high rate translates into higher overall productivity.

Because the process is efficient and less complicated, it means less downtime for wind farms. It also means that conducting a service during the middle of the night or on a weekend is a very viable option. Truly, it is a 24/7 service. This method also allows for oil changes to take place in extreme temperatures because oil from the trucks is heated for quicker fills in any weather conditions.

Oil must reach the gearbox in an efficient, but contained manner. From an environmental stand-

point, it's important that the oil be contained throughout the entire process. Since environmental matters are of such great concern, oil spills are not an option. The final step to the process is to ensure disposal is done properly.

DOWN-TOWER PROCEDURES

Once the proper oil change "procedure" is in place, the level of difficulty decreases. One of the most prominent features is the ability to heat the oil in the truck. When ambient temperatures are warmer and the tower has been

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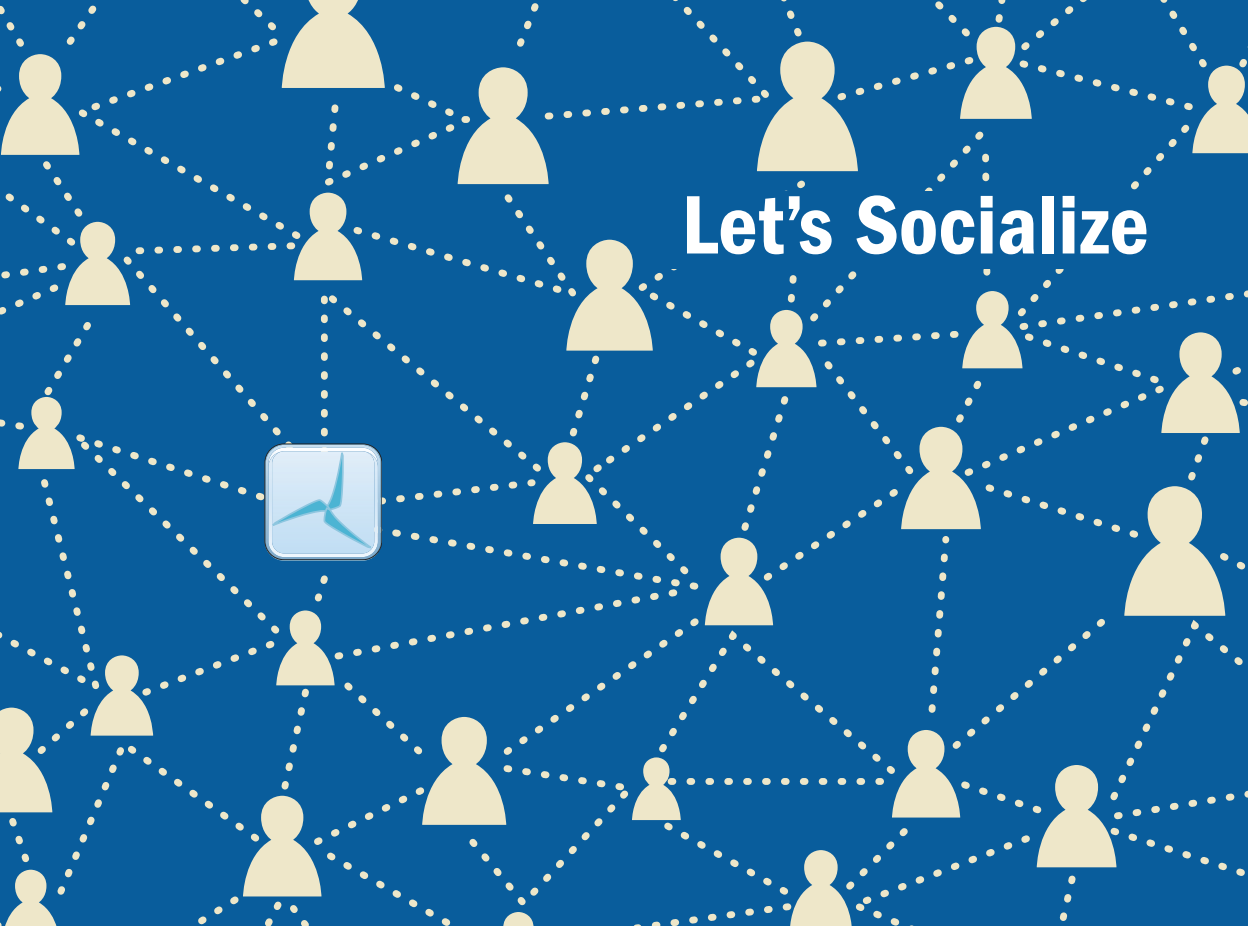
running, a 4-part change out can take less than a normal workday. With the tote system it has the capability of independently storing, containing, heating and maintaining a minimum of four 330-gallon totes. It can hold enough oil (virgin, rinse, flush and waste) to do multiple towers without returning to the O&M building to empty and restock.

The down-tower procedure utilizing custom-built trucks offers numerous safety checkpoints to prevent spillage. There is a safety and procedural "check list" to ensure all steps are followed. Beyond offering 100 percent oil containment, the process has leak detection and overfill warnings; automatic shutoff; valve-to-pump interlocking/bypass to prevent over pressure of rated hoses; valve interlocking to eliminate cross contaminations of fluids; flow monitoring for both draining and filling of the gearbox; and an adjustable fill gallon count to prevent "overfill" of the gearbox.

From the truck, this technology includes a wireless touch screen control system – sent via a truck-produced Wi-Fi signal – that eliminates any type of improper procedures taking place up tower. Depending on the filtration requirements of the customer (3, 5 or 10 microns), filters can be changed on the truck to accommodate the request. By using oil trays and pig mats, any residual spills can by contained.

Where other gearbox oil change methods each have their unique disadvantages, the down-tower system eliminates practically every one of these concerns. The track record on worker safety however (nearly 1000 oil changes with no injuries), is the biggest advantage to this method. Without having other day-to-day distractions on a wind farm like wind technicians do, the down-tower process offers comfort in speed and repetition.

The technological advances in gearbox oil changes have been a leading contributor to overall wind farm productivity.



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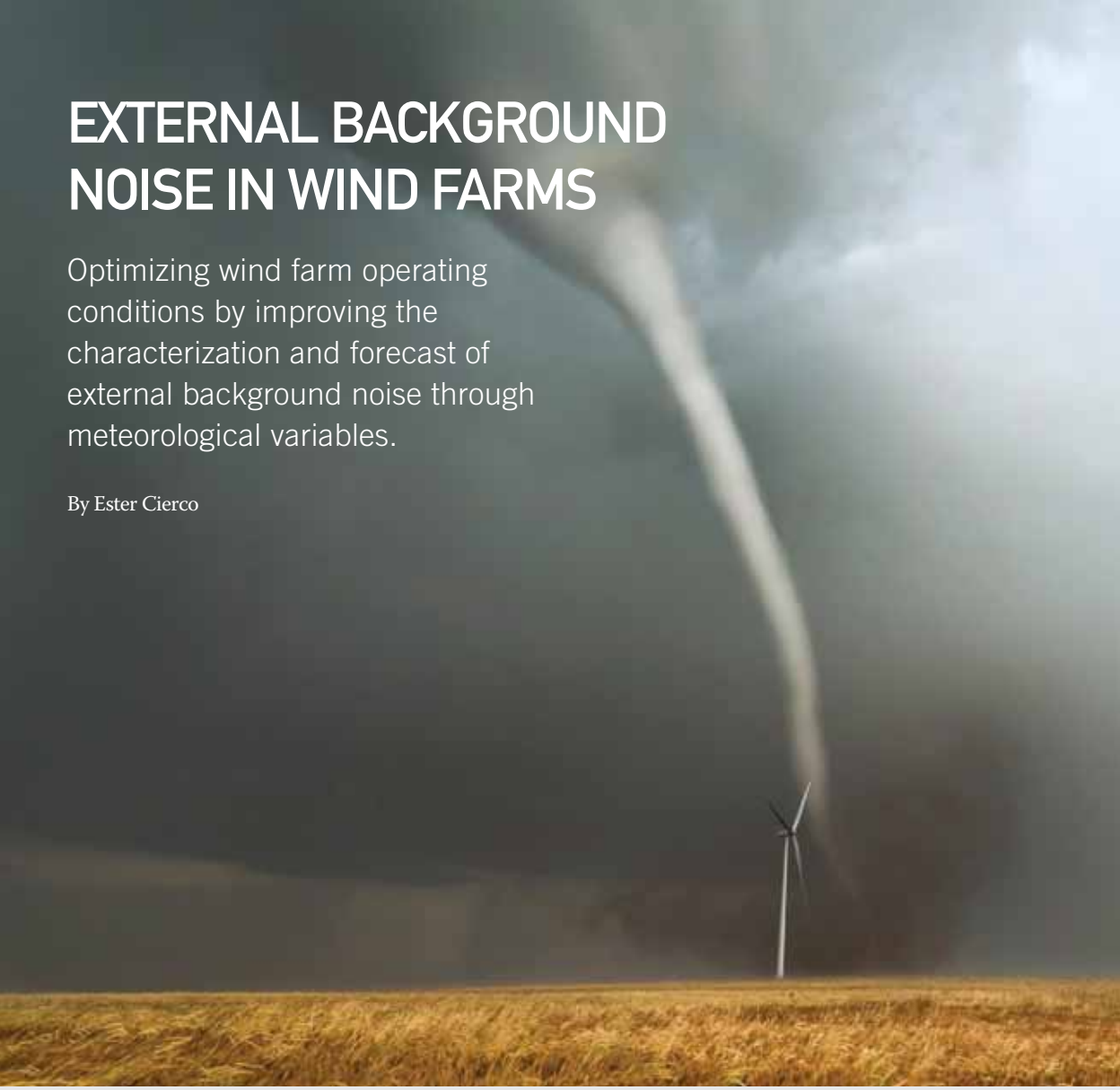
EXTERNAL BACKGROUND NOISE IN WIND FARMS

Optimizing wind farm operating conditions by improving the characterization and forecast of external background noise through meteorological variables.

By Ester Cierco



Ester Cierco, engineer at the R+D department of Ingeniería para el Control del Ruido, is the head project manager of SOME-ECO. For more information, visit www.icrsl.com.

NOISE IS OF INCREASING CONCERN to wind farm operators and standards in this field are becoming stricter. More and more, noise impact studies of noise generated by wind farms located near populations are taken into account. As a result, accurate vibro-acoustic studies are increasingly in demand to meet these requirements. Nevertheless, they do not seriously take into account the importance of external background noise in the contribution to the overall noise. Furthermore, background noise evaluation is often a poorly defined task, which does not take into account the different periods of the year, for instance. In practice, most current acoustic studies lack a long-term background noise prediction and it is virtually impossible to foresee it accurately. SOME-ECO (SOund MEteorological Environmental COrrelation) is a pioneering project whose goal is to improve the characterization and forecast of external background noise in wind farms by taking into account meteorological variables in order to optimize the wind farm operating conditions.

Under the leadership of ICR (Ingeniería para el Control del Ruido, S.L), a leading engineering company in vibro-acoustics, with the support of AEMET (the Spanish meteorological agency), the

main target of SOME-ECO is to make accurate long-term noise predictions in a particular environment with certain characteristics. For this purpose, SOME-ECO attempts to correlate external background noise with meteorological variables such as temperature, wind speed and relative humidity. Unlike current background noise measurement regulations, which do not comprehensively take into consideration the effect of these factors, SOME-ECO takes them into account in its calculations. Then, by knowing the influence of these variables and quantifying the correlation of short-term levels of background noise with their equivalent long-term values, SOME-ECO attempts to be able to make noise predictions based on these factors.

One of the most frequent choices to date is to define large safety margins in the prediction of background noise to account for its possible variations over time. However, this methodology is often inefficient and prevents the optimization of the financial return of the wind farm initial investment. Since current regulations do not specify the duration of the background noise measurements, they are usually carried out over short periods of time between 2 and 7 days. These short-time measurements prove to be insufficient and large safety margins are defined, instead of making accurate noise predictions based on the characteristics and the meteorological variables that influence the wind farm location.

SOME-ECO is reformulating the current methods for predicting external background noise and provides, for the first time, representative information that guarantees more realistic forecasts of background noise from representative variables of the site. The project seeks to optimize the installed power and the operating strategies of a wind farm. To do so, this study has two main phases to follow up: a first step that consists of generating a model by correlating external background noise with meteorological variables and a second step which is the noise prediction itself, from the generated model and short-time measurements of the studied location.

CREATING A MODEL: CORRELATION OF THE BACKGROUND NOISE WITH METEOROLOGICAL VARIABLES.

The first objective of SOME-ECO is to create a model by correlating background noise with climatic variables that are specific to a particular place for a period of one year. The purpose is to provide accurate and representative data on the contribution of meteorological variables to external background noise at different periods of the year and at locations with different characteristics.

To do so, ICR will analyze the behavior of atmospheric pressure, temperature, wind speed, wind direction and relative humidity among other things in five different representative areas of measurement. The 5 chosen locations are 2 urban areas and 3 rural areas. This work procedure allows to learn about the evolution over time of every variable separately and to study how they contribute jointly to external background noise by means of multidimensional data analysis. As a result, different models are obtained depending on the studied location (Figure 1). Other variables, such as the day of the week, the period of the year, may be included as well in the model.

As shown in figure 2, a seven-day evolution of four variables (rain, temperature, wind speed and

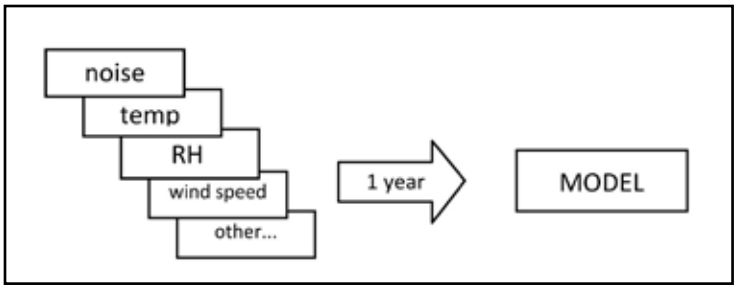


Figure 1: Diagram of the Model generation.

relative humidity) and background noise. Climatic variables measurements come from meteorological stations data and noise measurements are made at the same location in third octave bands, from 20 Hz to 10 KHz. The graphics below show the variables evolution with values every 10 minutes at a particular site. With regard to noise, it shows the equivalent continuous level every 10 minutes (Leq_{10min}) in global value (from 20 Hz to 10 KHz). Horizontal axis represents the UTC date and time.

Considering the measurements that have been used to date, they do not take into account the dependence relationship existing between climatic variables and background noise. However, SOME-ECO intents to correct this by providing representative data of this relationship at different periods of the year, on different days and at different times of the day depending on the climatic conditions of a particular site. The following expression presents such relationship:

$$S(t) = f(t, x_i) + e(t),$$

where $S(t)$ represents the SPL over time, $f(t,x_i)$ is the function that relates, linearly in the simplest case, the N variables x_i taken into account, where i=1,...,N, and $e(t)$ is a stochastic variable with a probability distribution function which depends on the site.

To sum up, the main purposes of this phase of the study are:

- Providing statistical analysis of the correlation between the equivalent level of external background noise and the meteorological conditions at a particular location (atmospheric pressure, temperature, wind speed and direction, relative humidity among other).
- Further exploring the factors that contribute to the generation of external background noise.

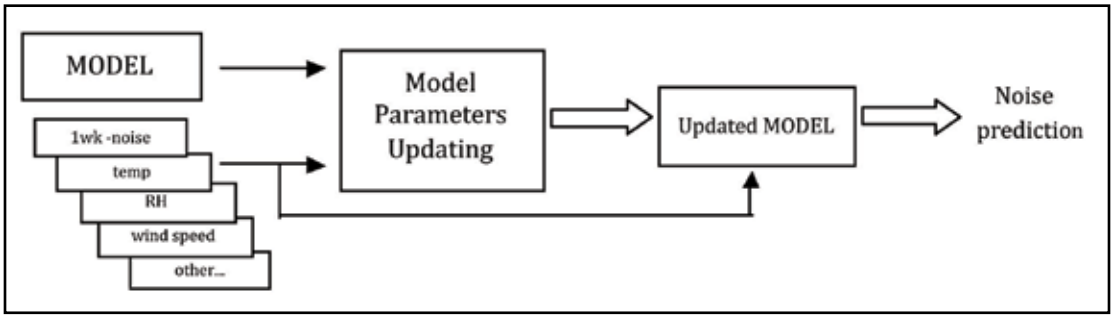


Figure 2: 7-day evolution of meteorological variables and SPL (Sound Pressure Level).

- Quantifying the relationship between meteorological variables and background noise according to different periods of the year and different times of the day.

PREDICTING EXTERNAL BACKGROUND NOISE FROM SHORT MEASUREMENTS

The goal of this phase of the study is to enable long-term predictions, which were impossible to carry out to date due to lack of experimental data.

Making one-year measurements is an unfeasible task in terms of economic costs as well as time costs. In practice, measurements are made during a period equal to or less than one week. The current standards that regulate the measurement of external background noise do not clearly specify the period of time at which measurements should be done. Since results obtained in one-week measurements may not be representative of the background noise at a particular site, noise prediction has to be made. In SOME-ECO, this prediction is made from the model generated in the previous step. Figure 3 shows a diagram of the prediction phase, which makes up the second phase of the project.

This phase starts with the updating of the parameters of the model depending on the characteristics of the location and the noise measurements made. Then, the noise prediction is made from the updated model

Figure 3: Diagram of the 2nd step.

and the meteorological variables of the studied site. Prediction will be as accurate as the model and the data are.

SOME-ECO seeks to correct inaccuracy in long-term noise predictions since this inaccuracy leads to establish large safety margins so that the

condition of low noise is usually activated in a wind turbine. As these predictions are based on the resulting data of studying several meteorological variables and their relationship with background noise, the first step of the project and the model updating are essential to perform a good prediction.

APPLICATIONS

SOME-ECO is aimed at wind farm construction companies and operators. The results of the research may be very useful at different stages of a wind farm project, such as the site-searching phase or during the operational phase after the wind turbines have been installed.

During the wind farm site-searching phase, SOME-ECO can be very useful for assessing the feasibility of a site on the basis of the long-term background noise predicted by SOME-ECO.

The main objective at this stage is to provide a background noise prediction much more accurate than establishing a large safety margin. This enables the client to weigh up the feasibility of a specific urban or rural site and its particular characteristics.

During the operational phase, SOME-ECO seeks to prevent from the need of periodic noise studies resulting from inaccurate noise predictions. ICR goal is to provide representative data that reveals the behavior of background noise. This will enable to avoid prediction errors caused by noise variations and provide the client with an accurate noise long-term prediction.

The knowledge of this data will help in saving time in detecting problems due to unexpected noise variations and saving money in applying solutions for these noise problems. Additionally, it will enable to optimize the initial investment, the installed power and the operating strategies of the wind farm.

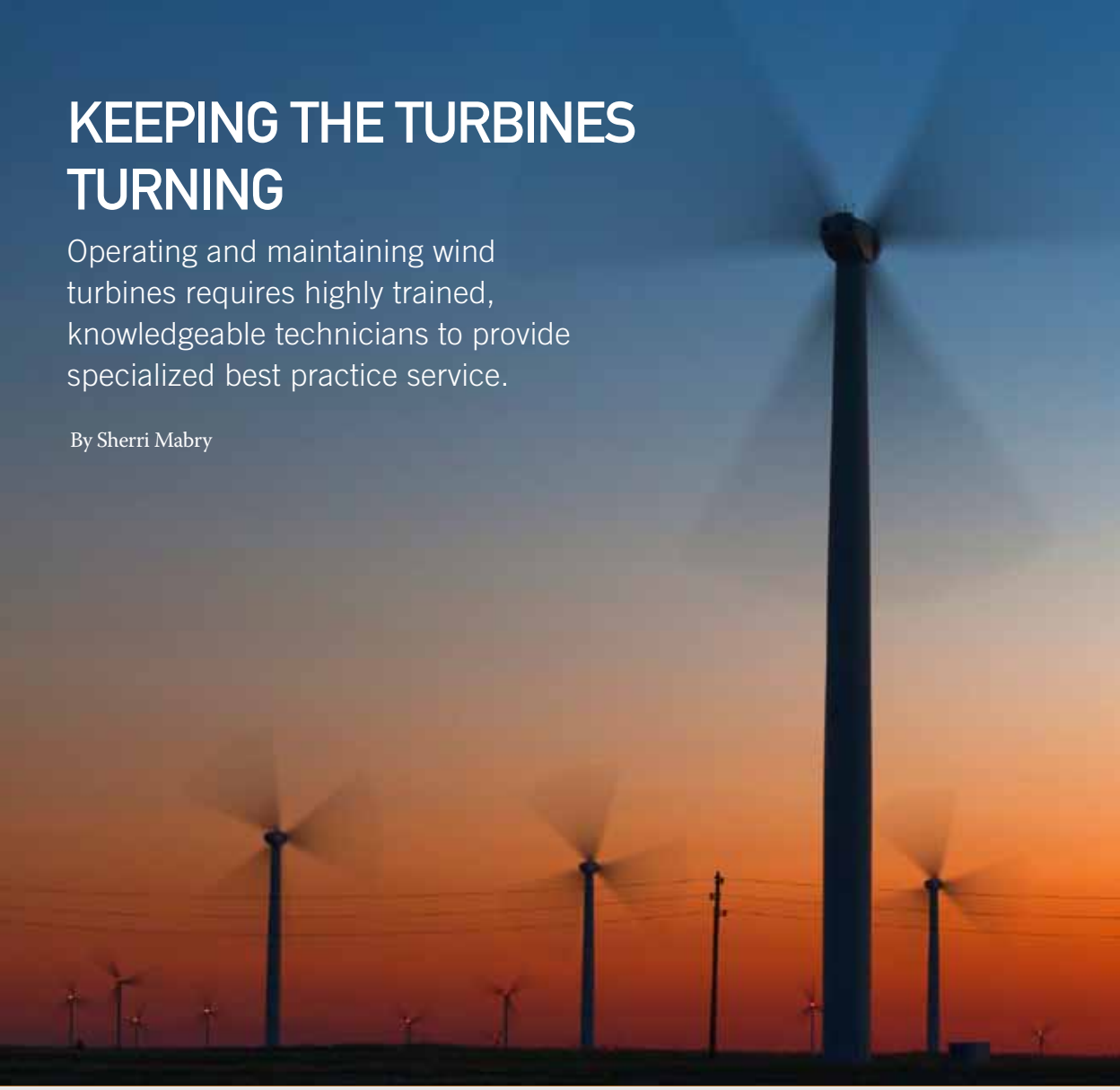
With SOME-ECO, wind farm operators and construction companies will obtain an understanding of the effect of meteorological variables on external background noise in order to obtain a correct definition of external background noise at different times of the year and in different climatic conditions.

SOME-ECO is reformulating the current methodology for background noise long-term definition and provides, for the first time, representative information that guarantees more accurate forecasts of external background noise at potential wind farm sites. For this purpose, it studies deeply the correlation between noise and several meteorological variables, as well as the characteristics of the site. The ultimate goal is to optimize the financial return of the initial investment in a wind farm, as well as to adjust the installed power and the operating strategies.

KEEPING THE TURBINES TURNING

Operating and maintaining wind turbines requires highly trained, knowledgeable technicians to provide specialized best practice service.

By Sherri Mabry



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WIND TURBINE OPERATIONS AND MAINTENANCE (O&M) is a growing business segment in the U.S. wind energy market. Wind farm owners must now decide whether they will handle O&M service with their own staff or contract with OEMs or private service providers to keep the wind turbines turning.

With more than 48,611 megawatts of wind power capacity installed in the United States and another eight megawatts under construction, the need for best practices in safety, diagnosis, repairs, and the use of trained and knowledgeable technicians is becoming more important than ever.

With approximately $40 billion worth of wind installations in the U.S. reaching the end of OEM warranty periods, operations and maintenance becomes one of the most talked about issues in terms of maintaining profitability and reliability, while trying to keep pace with increasing electrical generation demands.

A report by business intelligence company, GBI research, indicates that technological advancements in wind power mechanisms will allow wind farms to run far more efficiently and reap more profits as older wind turbines are upgraded. They say the immediate increased demand for global wind energy operations

and maintenance may eventually cause a reduction in revenue, but for now, business is booming.

GL Garrad Hassan, one of the world's largest renewable energy consultancies and a technical authority on renewable energy, says owners must carefully consider which post-warranty model of O&M to adopt. According to Cathy Syme, senior project manager for GL Garrad Hassan's asset management and operational services team, delivering a return on investment has always been the key focus, but there are also significant financial gains to be made in other ways by striving to maximize production and minimize costs.

Wind farm owners may focus on performance and reliability of the turbine and its components to understand why projects underperform or fail and what can be done to keep the wind project operating as expected. They must also consider safety standards, estimating costs, predictive maintenance and data analysis to improve performance and extend the life of the entire system.

Among some of the recent industry announcements, turbine OEMs, component manufacturers, service providers and other specialists in operations and maintenance are offering customers options for maintaining their assets.

PSI Repair says its off-warranty repair support for wind energy owners and O&M is a fast and affordable solution for upgrading and extending the life of out-of-warranty products. The service includes upgraded electronic, hydraulic and precision mechanical components that drive the turbines' pitch and yaw systems as well as down tower electronics. The company offers component repair on printed circuit boards, PLCs, control cards, VRCC components, IGBTs, thyristors, converters, pitch motors, hydraulic pumps, servomotors and transducers using the latest diagnostic tools to detect failures down to the microchip level. Service solutions range from minor component changes to full replacement of circuit boards to improve performance and reliability. All repairs come with a free evaluation and one year warranty.

The company also provides comprehensive remanufacturing services for unsalvageable, obsolete components and restocking programs to provide fast turnaround and reduce inventories.

"PSI is a one-stop resource for wind farm O&M professionals," said Mike Fitzpatrick, general manager of PSI Repair Services. "No other repair service provider in the wind industry can match PSI's breadth and depth of cost-saving services or has a dynamic engineering services department quite like PSI."

OEM's are also expanding their services to meet the needs of turbine owners. GE is expanding its wind industry services to include "Production-Based O&M, according to Andy Holt, general manager of wind services for GE Energy, in a recent industry announcement.

Production-based O&M agreements use a fixed and variable fee structure instead of a time-based availability with the goal of maximizing production for customers. The variable portion of the agreement is based directly on wind farm production relative to megawatt hour with GE and its customer. The total cost of the O&M agreement, not just the availability bonus to reduce upfront costs, balance risks, and promote a "run it like we own it" approach to service, is one way GE is helping customers.

"By focusing on production, we are adding value for our customers," he said. "We are better aligning our goals with theirs and better sharing the risk between

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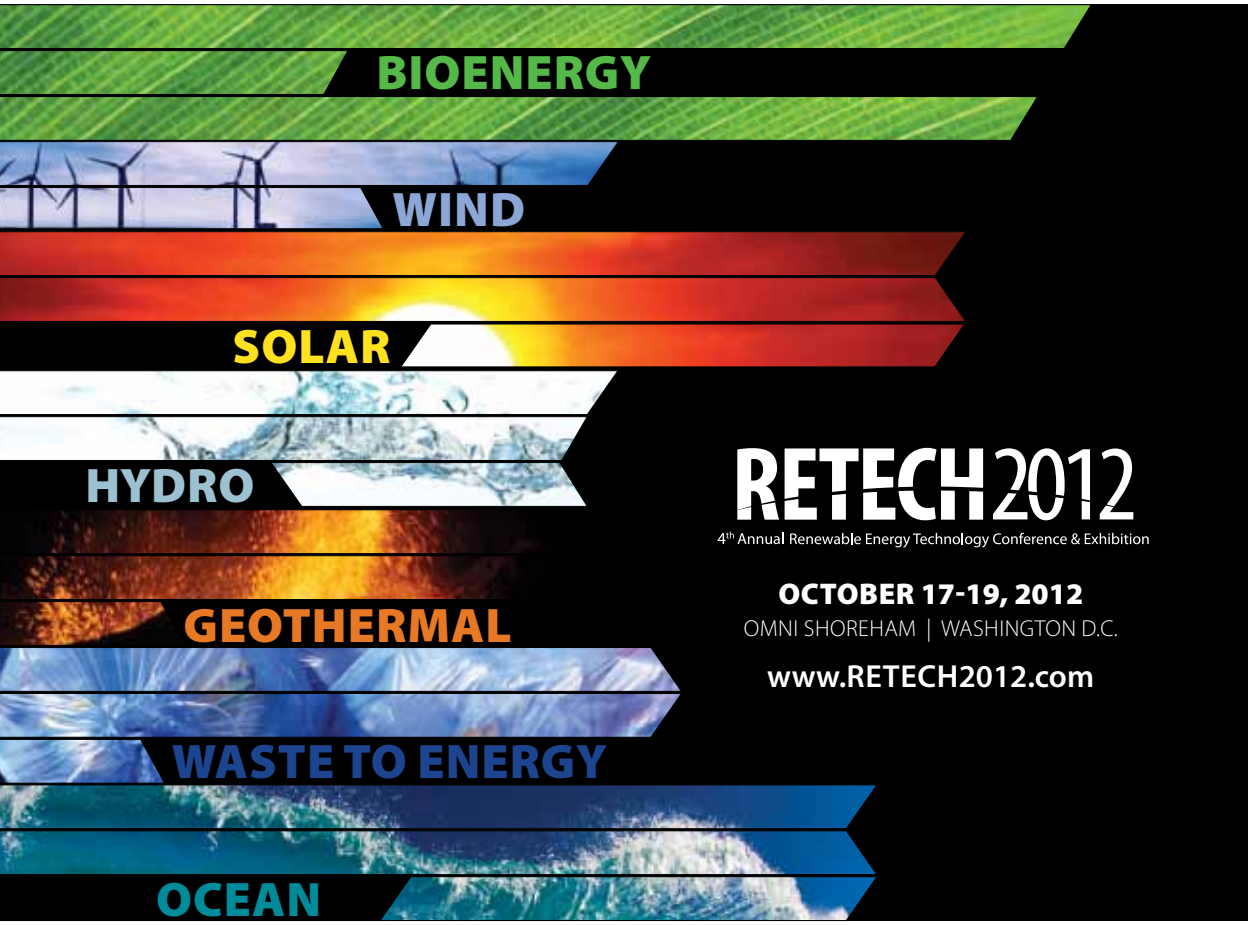

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GE and our customer. Production-based O&M brings us another step closer to running the turbines like we own them."

The contracts with GE give customers access to wind turbine upgrades, service facilities and a network of skilled, highly trained local technicians who are connected to GE's engineering organization, according to the manufacturer.

Like GE, other manufacturers and suppliers are offering specialized service or contracts for customers with O&M needs for their turbines.

Moventas, one of the world's leading wind gear manufacturers is expanding its up-tower repair service globally to offer its customers better cost-savings and less downtime in repairs, maintenance and monitoring.

Steve Casey, general manager of Moventas, Inc. says the company is providing up-tower repair service in North America to replace the high-speed, intermediate and low speed assemblies on site, thus eliminating the need to ship the gearbox to the manufacturing facility for repairs.

"This began last year when we performed the first full helical up-tower gearbox repair," he said. "We have since performed numerous full helical repairs, including one in Germany. The real credit goes to our Field Service Manager, James Macik and his team of technicians for making the concept a reality. This service eliminates the need for the large boom and secondary cranes normally required to take the entire gearbox down tower. This is a significant cost savings for our customers."

By using a mobile service and small hydraulic crane, field service technicians can bring the complete gearbox down from the nacelle.

In addition, Moventas' up-tower repair service makes it possible to perform end of warranty inspections, condition monitoring, standard high-speed pinion and bearing change-outs and pitch tube repairs.

"The CMaS unit, which is unique in that it was designed specifically for wind gears, monitors the condition of the oil in addition to providing 24/7 vibration feedback. Since we cannot dyno-test our up-tower helical repairs,

we install our CMaS system on each repair to ensure that the gearbox is operating on the same standards as it would if it were repaired in our facility."

Casey says Moventas also started a mobile workshop that is deployed to the site to provide customers with immediate response time and reduced travel costs. Moventas is also adding more mobile units throughout the U.S. and Europe with expansion planned in India, Australia, Brazil and China.

"Our goal is to significantly shorten response time, reduce customer costs and to continue to lead the industry in repairs that can be done on-site rather than in a workshop," says Olli Valimaki, Senior Vice President of Service with Moventas. "This is a significant cost-saver for the industry, making it even more competitive compared to traditional energy forms than before."

Another specialty provider is Gearbox Express. This company targets a very narrow section of the market focusing on down-tower services, technical advice and field support. "We don't compete with any channel partners, including O&M providers. We are completely independent in the market and we know that repairing gearboxes will become a necessity for OEMs and operators," said Bruce Neumiller, CEO of Gearbox Express.

Since Gearbox Express doesn't perform up tower work on the installed wind turbine, the company can maintain a good working relationship with O&M providers, and since they don't manufacture gearboxes, OEMs and turbines owners are also open to working together.

"Many owners have multiple makes of gearboxes in their fleet, and with GBX, they can have one supplier for all of them," he said. "We know replacing the gearbox quickly is better for our customers."

Gearbox Express uses original gearing when possible and they provide a 43,000-square-foot facility with a 3.1 MW regenerative test stand designed to test a variety of gearboxes in real-world, variable conditions that allows engineers to vary torque to induce spike loads to replicate conditions the gearbox might encounter on-site.

Neumiller says the company is also able to load test speed, vibration and oil cleanliness in addition to offering enhanced filtration systems, lube system upgrades, oil sampling kits and water removal devices during the remanufacturing process.

Gearbox Express believes it has positioned itself to be a niche service provider concentrated on gearboxes for wind turbines. "As the industry reaches maturity, there will be a rude awakening "As the industry reaches maturity, there will be a rude awakening as to the volume of gearboxes that will fail. We are ready for that day."

MFG companies also launched MFG Wind, a new brand that represents the comprehensive wind-focused capabilities of the company's network of factories and engineering resources, which includes Wind Energy Services Company for field repair and maintenance services, replacement parts, reconditioning services and factory repairs to improve the life of older, smaller turbines.

Molded Fiber Glass Companies (MFG) says it provides a one-stop resource for 'all things composite' across the entire lifespan on the wind turbine, including support to OEM manufacturers and wind farm operators as well as emerging O&M companies. "The mission at MFG Wind is to be a fully resourced composites partner to the wind industry, and the recognized standard for quality workmanship," said Gary Kanaby, director of sales and marketing. "MFG has been visionary about wind energy since the beginning, and we believe MFG Wind is configured to provide customers with the quality of support they need to maintain healthy operations."

For engineering and technical workforce solutions, Renewable Concepts, Inc. offers specialized solutions with 24-hour-lead times to help customers complete their projects in a timely manner.

Renewable Concepts is a division of RTP, Inc., which provides a wide range of general contracting services with more than 50 years experience in construction, operation and maintenance.

RCI performs on-site and off-site tower source inspections and carries out repairs on components in the pre- and post-construction stages. Services include special projects personnel, owners representatives, construction and commissioning manager and I&C technicians and can work with owners in power generation from initial development and planning to final turnover.

Working in construction since 1996, the founder and CEO, Rob Tinsley started Renewable Concepts to address the unique needs of the wind industry. "The wind industry now needs an "Angie's List" to help wind farm owners choose between all the O&M service providers on the market," he said. "We have service providers who are more about quantity than quality. This hurts the industry."

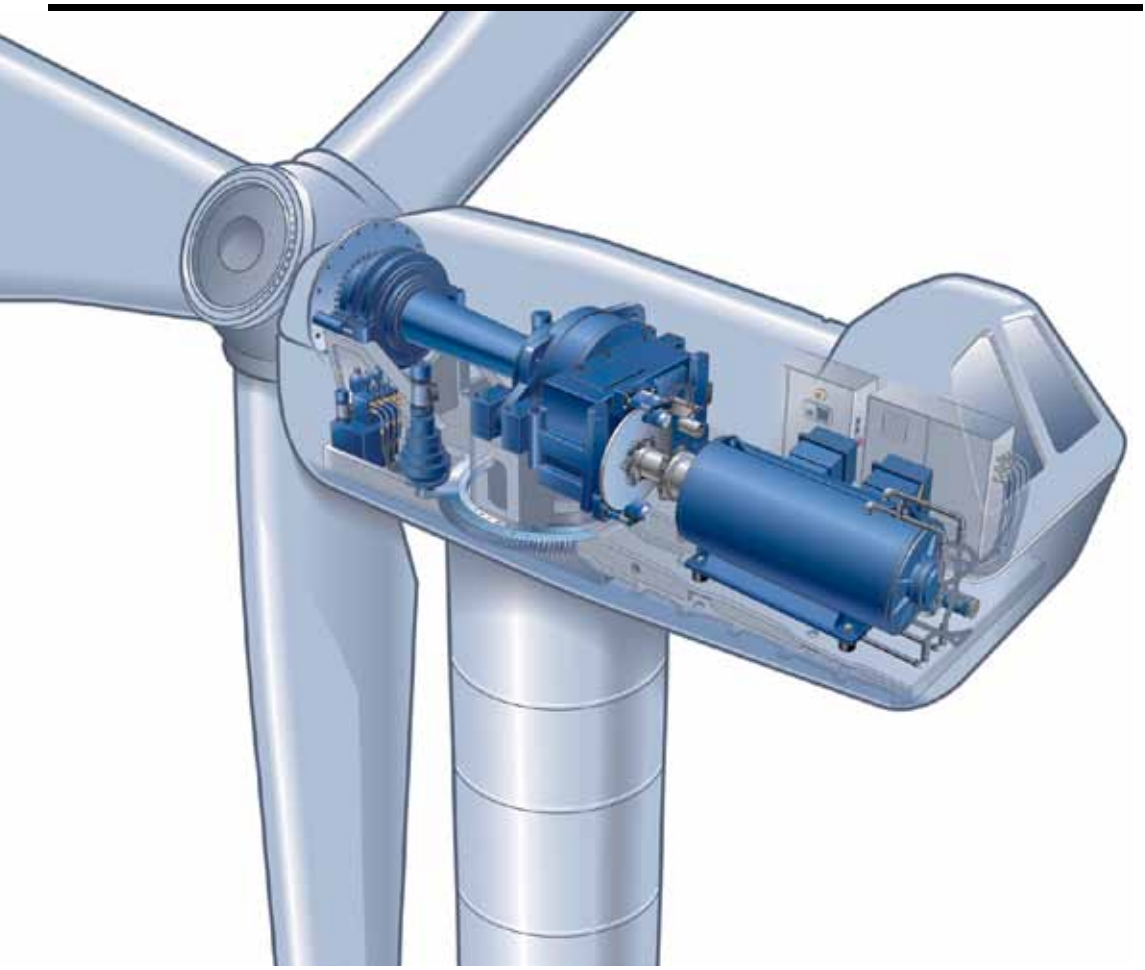
One of the driving forces for creating the company was Tinsley's belief that it was possible to deliver quality maintenance, construction and repair services to wind farm owners while maintaining a professional working relationship that solved customer problems.

"Our reputation is unchallenged. I would rather close the doors and keep my reputation than have a large company with lower standards."

RCI does not use subcontractors and each employee participates in a six-week evaluation period and training in addition to required refresher training each year. Tinsley says he hires the most experienced employees and has worked with educational programs and instructors to design courses for new students entering the field. "When we do hire students, they have to have some other tangible skills to relate, like a strong electrical background or a fabrication background. Construction is still basically construction. It doesn't matter whether you work on water tanks, in ethanol plants or on wind turbines, and I've done it all. You need the right people, the right tools and the right training for the job you're doing."

With the main headquarters in Kansas, RCI is centrally located for rapid deployment to minimize job costs.

New SKF Reinforced All-Rubber HSS Radial Shaft Seals



New SKF reinforced all-rubber HSS radial shaft seals introduce improved solutions for reliable protection against contaminant and extended service life for large-size bearings in wind turbine drivetrains. These high performance seals are designed for easy installation or uptower replacement during planned maintenance procedures. For new designs their minimal space requirements allow for smaller and lighter bearing housings, potentially reducing turbine weight.

These seals feature a well-proven, spring-loaded sealing lip design with a defined radial load for reliable sealing performance. Available in solid and split versions, the seals can be equipped with an optional SKF Springover specially engineered to keep the spring in correct position.

For more information, call 1-800-440-4SKF or email: skfusainfo@skf.com or go to www.skfusa.com.

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

Hughey & Phillips Introduces New LED Obstruction Lighting Solution

Hughey & Phillips (H&P) new HORIZON™ line L-810 low-intensity products provide an LED based solution for the FAA L-810 steady burning lights and can be powered using a solar array for renewable energy applications.

The HORIZON™ line of LED obstruction lighting is the next expansion of H&P's obstruction lighting portfolio. The HORIZON™ L-810 is a steady burn Obstacle Light and is available in both single and double configurations operating at a range of 95-277VAC and also in a range of 9-48 VDC. Both configurations are available as new fixtures and as replacements light modules for existing incandescent obstruction lights.

For more information, call 877-285-4466, or visit www.hugheyandphillips.com.

Castrol Introduces Performance Biolubes Product Line

Castrol Industrial North America, Inc. announces the launch of the Performance Biolubes product line. The Performance Biolubes technology platform adds a range of bio-based lubricants, and metalworking fluids to Castrol's existing line of lubricants supplied to the aviation, industrial manufacturing, marine and energy markets. Initially these products will be available in North America with plans for future roll out to Castrol's global operations.

At its inception in 1991, the Performance Biolubes technology began as a research project at the University of Northern Iowa. Guy Chiatello, Senior Technical Advisor of Castrol Industrial's Performance Biolubes team commented, "We are on the cusp of a major change in the lubricants industry, and Castrol is striving to lead that change with the addition of the Performance Biolubes cutting edge technology into their portfolio. That's what's exciting to me." The addition of the Performance Biolubes product line expands Castrol's customer offering through incorporating products that are built from bio-based oils, and are free of chlorine and secondary amines.

Dave Fuerst, President of Castrol Industrial North America said, "With this expansion in our offering, Castrol will have an impressive line of environmentally responsible products available to our industrial customers. New technology is a core element of Castrol's strategy to increase our momentum in the B2B lubricants market and to capture the market transition to more environmentally responsible products." For more information call (630) 961-6993 or visit www.castrol.com.

Timken Online Intelligence System Provides Preventative Solutions

The Timken Company's Online Intelligence System (OIS) identifies potential bearing and gear issues before they become major problems for wind turbine owners. With operating conditions that change as frequently as the wind, mechanical equipment used in wind turbine applications encounters variable speeds, loads, temperatures and more, making it difficult to consistently and accurately monitor the machine's health.

"It takes significant technical expertise to perform condition monitoring in extreme applications," said Hans Landin, director of process industries original equipment and wind energy for Timken. "Timken offers a comprehensive wind turbine service platform that includes online monitoring systems, a qualified wind field service organization, and upgraded solutions that can help lower the total cost of ownership for our customers."

The Timken OIS is a breakthrough condition monitoring/data collection and reporting system specifically designed for these extreme ranges of a wind turbine application. The Timken OIS utilizes a combination of vibration, high-definition shock pulses and analog/digital inputs to identify main-shaft bearing, gearbox and generator problems before they develop into life-limiting conditions.

Early detection allows for better maintenance planning, reduced downtime and increased cost savings. Timken's technology advantage and analysis helps wind turbine owners plan their maintenance and lower overall costs to keep equipment availability at a high level.

For more information, visit www.timken.com.

Parker Launches Two-Phase Evaporative Cooling Solution

Parker Hannifin Corporation unveils the first in a series of stand-alone cooling units for cooling down tower power converters in 1.5 - 8.0 MW sized wind turbines. The 50 KW capacity cooling unit on display at the show, is targeted for 1.5-2.5MW sized wind turbines, and will be followed by additional models with cooling capacities of 18 - 200KW.

Parker Precision Cooling Systems has adapted its long-established two-phase evaporative cooling technology into a system that efficiently cools critical wind turbine power generation systems, with higher efficiency, safety and power density, compared to water cooling. The stand alone cooling system is meant for down tower installation, to cool offshore and onshore new wind turbine converter systems, and also easily enables retrofit or upgrade of existing wind turbine converter legacy cooling systems.

For more information, please contact Parker Precision Cooling Systems at www.parkerprecisioncooling.com.

Trendelkamp Introduces Lifts

Trendelkamp introduces its new personnel and maintenance lifts for towers (inside) and a newly designed blade access platform (360°) for easy access and service on blades and wind energy facilities.

Due to its modular design the lifts, (lift capacity of 660 lbs.) with an easy access sliding door can be assembled on site in less than two hours.

The easy to trailer new designed blade access platform allows the service crew a fast and mobile set-up at site in approximately one hour, and is a safe and efficient inspection, maintenance and repair option on all sizes and heights of blades.

For more information, please call (770) 931-9199, e-mail: tlp@trendelkamp.com or go to www.trendelkamp.com.

ADINDEX

Steve Casey
General Manager, Moventas, Inc

MOVENTAS IS LAUNCHING ITS NEW UP-TOWER REPAIR SERVICE, WHAT IS THIS?

This is a global initiative that began last year when we performed the first full helical up-tower gearbox repair in N.A. This service consists of replacing the high speed, intermediate and low speed assemblies on site, eliminating the need to ship the gearbox to our facility for repair. We have since performed numerous full helical repairs, including one in Germany. In addition to the shipping time to and from our factory, we also eliminate some of the disassembly and assemby time associated with a complete gearbox tear down at our facility.

IS THIS AVAILABLE ONLY TO MOVENTAS CUSTOMERS?

We have recently expanded into non-Moventas models and will continue to do so to provide this service to multiple turbine types on a global basis.

WHAT IS THE BENEFIT OF THIS NEW REPAIR?

This service eliminates the need for the large boom and secondary cranes normally required to take the entire gearbox down tower. This is a significant cost savings for our customers.

WHAT OTHER TYPES OF REPAIRS OR INSPECTIONS WILL YOU PERFORM?

Along with the full helical repair, we offer to our customers end of warranty inspections, CMaS monitoring, standard high speed pinion and bearing change-outs and pitch tube repairs.

PLEASE EXPLAIN THE CMAS PORTION OF THE SERVICE.

CMaS is the name of our conditioning monitoring unit which is unique in that it was designed specifically for wind gears. It monitors the condition of the oil in addition to providing 24 / 7 vibration feedback. Since we cannot dyno-test our up-tower helical repairs, we install our CMaS system on each repair to ensure that the gearbox is operating to the same standards as it would if it were repaired in our facility.

I UNDERSTAND YOU ARE BUILDING MOBILE WORKSHOPS. PLEASE EXPLAIN.

We started with one mobile workshop that we deployed to the site where we would perform the full helical repair. We built a second unit that was recently on display at the AWEA show in Atlanta and we are in the process of building three more units for North America.

WHERE WILL THE MOBILE UNITS BE LOCATED?

Each unit will be strategically located throughout North America to provide our customers with immediate response time and reduced travel costs. The same is happening this year in Europe and will be expanded into India, Australia, Brazil and China after that.

WHEN JONATHAN COLLINGS FORWARDED YOUR CONTACT INFORMATION HE SAID YOU WERE THE REAL "FATHER" OF THE METHOD. WHAT DOES THAT MEAN?

I helped facilitate. The real credit goes to our Field Service Manager, James Macik and his team of technicians for making the concept a reality.

PLEASE TELL US MORE ABOUT MOVENTAS.

Moventas has based its expertise on bringing together decades of experience and leading-edge technologies derived from our long history in gear manufacturing. The uncompromising reliability of our mechanical power transmission equipment is the ultimate requirement. Competent engineering, the latest technology production processes and constant testing guarantee the quality of our products.

Our gear units are specifically designed to withstand the most extreme conditions in the world from the arctic tundra to deserts and offshore installations. As the world's leading wind turbine manufacturers know, the Moventas brand stands for reliability, responsiveness and assurance as a dependable partner. Moventas is well known for reliable power-transmission solutions in the wind power industry and our wind turbine gear units are in use all over the world, wherever wind is farmed. We have significantly increased our North American capacity to meet our customers' demand from both a service and production perspective.

Please Contact Steve Casey at Moventas, Inc. at (503) 247-6107 or email steve.casey@moventas.com.

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