

# WHEN WE DO A REPAIR, IT HOLDS

**Marcin Majdzik**, together with Service & Logistics team members  
Roy Barwanietz (left) and Franciszek Nogalski (right)

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# MAINTAIN TO SUSTAIN

**Marcin Majdzik, LM Wind Power Service & Logistics Operations Manager in Poland explains the ins and outs of a service technician's job and why prevention is the best medicine**

'Beep, beep, beep,' it's 6:00 am. The alarm clock wakes LM Wind Power's Service & Logistics technician for the start of the day. Eating a quick breakfast and taking a longer check of the weather, the technician, along with his team, leaves for the customer site.

If weather conditions are right - winds below 12 meters per second, no rain or snow, low humidity and no fog - the LM Wind Power Service & Logistics team can get to work. According to strict safety procedures, they check and attach the ropes and wires, make sure all the necessary

equipment is loaded, and board the SkyClimber (a platform suspended on the turbine tower that "crawls" up the blade on wires) to go up the turbine. The team leader stays on the ground assuring safety, while two service technicians work together to repair the rotor blade.

"We're out in the wind and weather, dealing with heights and having to work inside the confined space of a blade. This is not a job for everyone," says Marcin Majdzik, LM Wind Power Service & Logistics Operations Manager in Poland and former Service Technician. "Yet our guys love it and they're doing really good work! It's both challenging and exciting. And we are so focused on quality. LM Wind Power Blades is the one building the blades, so we are the right ones to service them because we know all about them."

## **Solving common blade problems**

All LM Wind Power Service & Logistics technicians go through customized training and safety programs that set the standard in the industry. They know how to make just about any type of repair, even something very complicated.

"We do many different maintenance jobs. Quite often, we come across repair work done by a third party that needs a professional second fix. Some of our competitors will fix a crack while it is raining and that repair will not hold," says Marcin shaking his head. "We, on the other hand, work under strict quality measures - paying attention that moisture does not get into the covering or that any part of the blade is compromised. This means that when LM Wind Power Service & Logistics does a repair, it will last. We do it right and this prolongs the life of the blade for our customers."

Another issue is blade damage incurred in initial transport to the wind turbine site, making the purchase of an LM Service Warranty a smart buy. "These are things that you can't control: rocks flying up from the road, high winds, lightning and hail storms," Marcin notes. "Repairs due to transport damage could involve fixing a crack, and I've also seen cases where we have had to replace the entire tip."

## **Concentrating on reducing turbine downtime**

LM Wind Power's Service & Logistics technicians do everything possible to minimize turbine downtime. "It is expensive for the customer and we know that," says Marcin. "We are focused on making the repair as quickly as is safely possible."



## **TIPS**

### **MARCIN'S TOP 5 TIPS TO MAINTAIN YOUR BLADES**

LM Wind Power Service & Logistics Manager, Service Operations

1. **Have your blades inspected each year.** Fatigue starts with micro cracking that is not visible with the naked eye. Minor issues may be repaired with less down time.
2. **Consider a Bladelife™ service package to save costs on unplanned maintenance.** This can also help you reduce the risk of blade break-down and lost profits.
3. **Use PPT Tape.** This tape protects the first few meters of the leading edge against weather damage.
4. **Call a trained service provider.** Save costs by getting the repair done correctly the first time.
5. **Check references.** Make sure that your service provider has the right focus on quality and health and safety standards.



Working outside in the wind and weather, Marcin Majdzik, follows strict safety procedures when making rotor blade repairs.



## FACTS

### MORE ON LM WIND POWER SERVICE & LOGISTICS TECHNICIANS' TRAINING

Our LM Wind Power Service & Logistics technician training takes place regularly through regional workshops and is designed to comply with our strict quality and safety requirements. This globally coordinated training ensures that our service technicians have the same high skill level no matter where in the world they are trained and stationed.

In addition to the training in new products and repair methods, the customized training programs include safe pass training, first aid, working at heights and rescue activities, working in confined spaces and fire response.

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### LM WIND POWER SERVICE & LOGISTICS

LM Wind Power Service & Logistics is an independent provider of service and logistics support to wind turbine operators. Our service teams understand what customers need - that's why we work year-round in all conditions and can reach most locations within hours.

Our unique, expert knowledge of wind turbine blades coupled with our widespread network ensure reliable and efficient operations to improve overall performance and increase returns to wind turbine operators.

For more information about LM Wind Power Service & Logistics, please visit [lmwindpower.com](http://lmwindpower.com).

One of the frustrating things about the job is when poor weather conditions prevent technicians from going up the turbine. "Some of our customers see us sitting in the van and ask 'why are we waiting?' They need to understand, we want to go up, but we follow strict safety and quality procedures, which means that we can't in certain weather conditions. We don't like sitting around waiting for the weather to be good enough for us to go up and make the repair," emphasizes Marcin. "We want the turbine to be running, too."

### Everything by the book

All LM Wind Power Service & Logistics technicians have a separate work instruction document for each repair. These are collected in their "repair book," which outlines solutions based on 30 years of LM Wind Power blade experience. "We learn and follow the book. This book gives you everything," says Marcin. "We have every single answer for any repair in this book. And because of our experience, training and continuing education, I am confident we are the best in the industry."

### The best advice

"Get a yearly inspection. That's the best advice I can offer," Marcin answers, when asked what customers can do to prolong the life of their rotor blades. "It doesn't take so much time to do this, and we can prevent a small problem from becoming a major issue later on." LM Wind Power Service & Logistics technicians also have the direct phone numbers for LM Wind Power's blade engineers. "It rarely happens, but if we find something unexpected that we don't know how to deal with, we call one of our engineers. We always find a solution."



LM Wind Power helped build the new science block at Doddahullur Government High School in Hosakote, India.

DODDAHULLUR HIGH SCHOOL - IN A CLASS OF ITS OWN

# Powering imagination

As a twelve year old, Shwetha was just another shy Indian country girl. Now, three years later, the reticence has given way to a quiet confidence and strong ambition. Shwetha, who comes from a humble family, declares, “I will pursue science and become a doctor. They are next only to God in their ability to touch lives.” She is just one of a group of inspired 10th graders at the Doddahullur Government High School located at Hosakote, around 30 kilometers from Bangalore.

Doddahullur High school was chosen in 2006 for LM Wind Power’s community development program from a host of schools because it is close to LM Wind Power’s plant and Bangalore office. And since then, LM Wind Power has helped build a new science block (a special wing of the building) at the school and organized other community initiatives including free health checks, environment and safety days, painting competitions, and training camps.

## Science block powers imagination

The science block houses fully-equipped science and computer labs, and was built at a cost of nearly EUR 34,000 by LM Wind Power to develop and nurture talent among children of lesser privilege in the community. Since the block was inaugurated in 2006, students including Shwetha have gone on to represent the school at various science fairs and have brought home accolades.

Purushottam H. V., one of the science teachers at the school, says that the labs in particular have opened up a “new world” for the students - a world which is shaping their dreams. “Earlier, we had no facilities and it reflected on the students. But now the labs have given them the power to imagine and have inspired many to think of science as a possibility.”

## Hope for the future

Interestingly, the labs have not only encouraged scientific thought but have also triggered aspirations in areas such as computer graphics and animation. The school’s Headmaster Nyana Murthy acknowledges that there is a way to go before these aspirations are realized, but he is optimistic about the future.

“We are moving in the right direction,” he says, adding that the most important thing to come out of LM Wind Power’s efforts is the shift in the way students think. Nyana continues, “The science block built by LM Wind Power is not just a building but a platform for students’ aspirations. Now, they are daring to dream - and most importantly, they are not shy to express it.”

[Read more about LM Wind Power’s sustainability activities at \[www.lmwindpower.com/About/Sustainability.aspx\]\(http://www.lmwindpower.com/About/Sustainability.aspx\)](http://www.lmwindpower.com/About/Sustainability.aspx)



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A new world has opened up for Shwetha because of what she's learning in the science lab.

# From brain power to wind power

Imagine coming up with an idea, being able to immediately test it, and then applying what you've learned right away. It's a scientist's dream to go from idea to final product in a flash. Each day the research engineers at LM Wind Power have this opportunity. In the process, they're finding new solutions to increase blade efficiency, reliability and annual energy production.



**JESPER HASSELBALCH GARM,  
LEAD ENGINEER, STRESS ENGINEERING**

"We got rid of the boring and time-consuming manual work by creating numerous tools to build the models, process the data and write the reports. This way we can focus on understanding and discovering solutions."

## **Focus on research**

Research is the reason LM Wind Power is able to introduce rotor blades that are leading the industry. The company truly encourages its engineers to focus on discovering new ways to optimize blades and increase wind energy efficiency.

Jesper Hasselbalch Garm, Lead Engineer, Stress Engineering, explains, "We get the chance to dig deep into blades' structural problems and we get to the bottom of them. We have the resources to go all the way, to understand what we are simulating and testing thoroughly. For a mechanical engineer, it is a dream job. I'm fascinated by how we can develop highly loaded structures at minimum weight, while taking into consideration tough reliability requirements."

## **Generating ideas to optimize blade performance**

The research starts by looking at five or six, two-dimensional blade sections or airfoils. Stefano Bove, Project Manager, Research, says, "We use Computational Fluid Dynamic (CFD) software to optimize the airfoils, or aerodynamic profiles, based on aerodynamic force specifications. Then the airfoils are tested in our wind tunnel facility to verify their ability to extract energy from the wind. Once the airfoils are verified, we design the entire three-dimensional blade geometry and simulate the aerodynamics of the entire blade by CFD. LM Wind Power is unique in aerodynamic design because we have the capability and flexibility to perform aerodynamic tests in our own wind tunnel. When you talk about aerodynamic features to enhance blade performance, the wind tunnel test is the only reliable way of assessing them," continues Stefano.

In order to determine optimal blade strength, LM Wind Power engineers look again at sections of the blade - split up into a finite number of squares and triangles - using simulation software to optimize the layout of fiberglass, and then they test structural responses. This is the Finite Element Method (FEM).

## **Aligning all the parameters and adapting results quickly**

LM Wind Power's engineers simulate reality using their Virtual Test Bench. They make a model in the computer and correlate this model to the real thing. It allows testing on blade parts before doing the real test on the final design. They are able to optimize a blade with higher strength and lower weight.

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**STEFANO BOVE,  
PROJECT MANAGER, RESEARCH**

“If we have an idea, we can test it right away. The process from idea generation to implementation is faster.”



“The advanced tools we apply enable us to work faster and to involve the customer more easily. We can try things out, see what happens and determine what we need to do next,” says Jesper.

Another important element the LM Wind Power engineers study is the driving forces on a blade to determine its resistance to cracking. This is called fracture mechanics. “Through fatigue simulations at very high wind speeds, we are able to calculate just how much load a blade can stand over a 20-year period - and do it with amazing accuracy. As a result, we learn how much wind and weather a blade can withstand before problems develop - and more importantly, find new ways to design blades to make them more efficient and longer lasting,” Jesper explains.

The ability to immediately test a blade is an advantage when it comes to getting a blade to market quickly. “If we have an idea, we can test it right away,” Stefano adds enthusiastically. “The process from idea generation to implementation is faster. It’s gratifying to see that your research work is actually applied.”

#### **In-house tools give time for solutions**

LM Wind Power has built advanced automated tools for working with all the known aspects of blade optimization allowing engineers time for out-of-the-box thinking. “We got rid of the boring and time-consuming manual work by creating numerous tools to build the models, process the data and write the reports,” says Jesper. “This way we can focus on understanding and discovering solutions.”

Because LM Wind Power has a high focus on blade research and development, customers get a much better blade. “We are creating and testing many blades each year, which enables us to optimize the routines,” Jesper adds. “This leads to lighter, more efficient and reliable blades.”

#### **Breaking barriers**

The challenging work LM Wind Power engineers have varies from day to day. “It’s never boring,” says Stefano. “We are continuously developing new technologies to increase annual energy production. We are pushing the boundary of innovative design all the time. We truly are breaking barriers.”



 Watch how LM Wind Power works to set the standard for future wind turbine blades at [www.lmwindpower.com/CostofEnergy](http://www.lmwindpower.com/CostofEnergy)



# Together we make it happen

LM Wind Power CEO Roland Sundén talks about sharing the company's new strategy and vision with employees around the world.

Sharing our new strategy face-to-face with every employee seems like an impossible task - but not for Roland Sundén, LM Wind Power's CEO. He has over the last four months traveled around the world on a "Power Tour" to meet with key management groups at all locations and hold 'indabas' with all employees.

"We wanted to share the wider vision for our business with all employees," Roland explains. "Our intent was to share information, have a

While there are so many positive impressions, the tour also made other things clear. For instance, how important it is to make sure the connections forged between staff around the world will remain and grow. "I am always worried about the constant challenge of how we can connect the organization better," says Roland. In the hundreds of conversations he had on this Power Tour, however, what was reinforced most was the relevance of LM Wind Power's new strategy. "Our new brand promise is so much more than a slogan.

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» What impressed me the most has been seeing first-hand the intelligence and quality of our people. I am so grateful for their energy and commitment. Roland Sundén

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dialog and foster new collaboration in line with our values. I think we did that, but what we got out of it was much more, especially for me personally.

What impressed me the most has been seeing first-hand the intelligence and quality of our people. I am so grateful for their energy and commitment."

We actually do have the Power to Deliver. Also our vision that 'Together, we capture the wind to power a cleaner world' implies everyone working in a shared effort, united in pursuit of the same goals. Everything we do is aimed at this. Together, we can make it happen."



## What is an 'Indaba'?

Chris Springham, Vice President, Global Communications at LM Wind Power explains...

### VILLAGE VOICES

I first encountered the Indaba while working with the oil industry in the rural communities of West Africa (Nigeria, Cameroon, Equatorial Guinea and Kenya) during the '90s. I was constantly amazed by the power of these events. In a traditional African village, it is used for community information and conflict resolution. Sometimes there is entertainment and teaching, too, in the form of storytelling. The whole village gathers round and discusses the issues of the day. Sometimes they draw pictures in the dirt in the middle of the circle to illustrate a point. Speakers use props or show things as evidence to make their point. Everyone can see, hear and speak freely.

### HOW DOES IT WORK?

I adapted this brilliant African method to work in a modern factory, but soon learned the value of preparation and attention to detail. An Indaba is cheap. It actually costs nothing, it's easy to organize and it relies on the power of proximity, a joint experience and face-to-face communication. By eliminating the use of typical electronic presentation tools like microphones and PowerPoint slides and bringing the group very close to each other, we can secure the attention, engagement and interest of everyone present. Everyone can see, hear and speak freely. There is nothing between the speakers and the audience. It encourages eye contact, openness, honesty and trust.

### CELEBRATING THE OCCASION

It takes courage and conviction to accept that any question can be asked - especially in a difficult conflict, or a context where change is being announced. However, the more likely the speaker presents an open position, the more likely the responses are to be heard and accepted to some degree. Many LM Wind Power people have commented on the positive energy released by these events, the sense of common endeavour and how addressing the more difficult questions often brings relief - a sense that someone cares, someone is listening and prepared to explain. It is a powerful force for motivation.

See more of LM Wind Power's Power Tour at [www.lmwindpower.com/Career.aspx](http://www.lmwindpower.com/Career.aspx)



## Longest cargo ever transported by air lands safely in Denmark

A record breaking journey ended safely in June when the largest airplane in the world, (a Russian cargo carrier, the 175-ton Antonov 225) brought two LM Wind Power GloBlade® test blades from China to Denmark. The innovative, new blades make their mark in history, as the longest cargo ever to have been transported by air.

LM Wind Power's new GloBlades® are 42 meters long and were flown to the company's state-of-the-art technology center at Lunderskov, Denmark. LM Wind Power ships its prototype blades into Denmark for thorough testing, as it does all new blade designs. Twenty years of operational life is simulated as the blades are put through tests resembling the full forces of nature.

This pioneering logistics triumph was achieved through close cooperation between LM Wind Power's growing Service & Logistics organization and Geodis Wilson, contractors to the project, ensuring the fast, safe and efficient transport all the way from Tianjin, China to Lunderskov, a distance of 4,650 miles (7480 km) in 12 hours.

📺 See the video online at [www.lmwindpower.com/Antonov](http://www.lmwindpower.com/Antonov)

## New Korean sales office meeting market demands

LM Wind Power recently expanded its sales office in Seoul, Korea to service not only brakes but also blade customers and meet the growing demand from major Korean companies that are entering the wind energy market, including Samsung, Hyundai, Daewoo, and Doosan.

The Korean office will be manned by Director Regional Key Accounts, Song Ho Keun. Song Ho Keun has more than 20 years of marketing experience from various industries including several years with Samsung Electronics. "I am excited to have joined this industry and contribute to building even stronger relations to our Korean customers while working on attracting new ones," Song Ho Keun says.

According to **SERI Quarterly**, a Korean wind energy trade publication, Korea's heavy industry companies are looking to become a global player in the wind power industry - looking for markets overseas, as well as establishing offshore wind farms with 2 GW potential by 2020.



Director Regional Key Accounts, Song Ho Keun leads LM Wind Power's Seoul sales office

## Indian wind market bouncing back – LM Wind Power responds

After a few years of decline, the Indian wind energy market is on the rise. According to the Indian Wind Energy Association (InWEA), India is ranked fifth in the world in terms of installed wind power capacity. Currently, the InWEA reports the Indian wind power market has 11.8 GW of installed capacity. They estimate that India's on-shore wind energy utilization potential is around 65 GW.

In order to respond quickly to market demands, LM Wind Power Blades will expand its facility in Dabaspet, India (near Bangalore) by 1,800 square meters to include additional molds and work areas. LM Wind Power is also in the process of hiring more than 200 people to ensure our blade delivery meets the increased demand.



## LM Wind Power Service & Logistics expands

LM Wind Power Service & Logistics has recently opened two new North American regional service centers in Abilene, Texas and in Eldridge, Iowa. These centers service numerous wind farm installations in the southern and northern USA.

LM Wind Power Service & Logistics is part of the LM Wind Power Group and offers inspection, repair, overhaul, preventive maintenance as well as blade logistics, covering the full spectrum of service to wind turbine owners anywhere in the world.

According to Roman Thomassin, VP, Global Service & Logistics, "Our customers operate in a demanding environment and we are now even better equipped to respond quickly to their needs. We have unique, expert knowledge of wind turbine blades to improve overall performance and increase returns to wind turbine operators globally. We select our service locations with great care to ensure reliable and efficient operations for all customers."

## First GloBlade® produced, illustrating innovation and speed to market

Just seven months after the project was conceived, LM Wind Power's first state-of-the-art rotor blade - GloBlade® - was produced.

"Our ability to bring our new GloBlades® to the market so quickly reflects the efficiencies LM Wind Power has in terms of engineering, design and manufacturing. It's truly been a worldwide effort," Frank V. Nielsen, Chief Technology Officer explains.

GloBlade® is designed to fit a broad range of design platforms for today's 1.5 MW turbines - enabling customers to open new markets in lower wind classes with their existing turbine design, and at the same time extend the market lifecycle.

Currently, GloBlade® is available from LM Wind Power factories in China, and will be available from one plant in the USA later this year. More plants are planned for 2011.

### **GloBlade® at a glance**

- Extends lifetime of existing design platform for 1.5 MW turbines
- Generates more power from existing platform technology
- Minimizes blade weight
- Additional AEP increase of 4 percent compared to LM 40.3 with the same design platform
- Takes wind power into lower wind class areas, classes III and IV

[Read more online at www.lmwindpower.com/GloBlade](http://www.lmwindpower.com/GloBlade)



MARKET VIEW: CHINA

# Phenomenal growth expected to continue through 2020

**With four locations in China, LM Wind Power Blades is well-positioned to meet the swiftly growing needs of this dynamic wind energy market**

In 2009, China became the largest region in the world to capture wind power. In fact, China has broken records on installed capacity several years in a row - and the Chinese need for wind energy continues to increase. The goal in China, according to experts, is to move from a current 25.8 GW wind power installed to 150 GW in 2020.

#### **Time-to-market a plus**

"The biggest customer need in China is speed," says Ian Telford, LM Wind Power's VP of Sales & Marketing. "The Chinese want to go faster than anyone else." And there is a lot of market activity because of it: enormous competition, consolidations, and acquisitions. Since the Chinese energy needs are growing at such a phenomenal rate, companies that survive must be able to act quickly. "We have the advantage of being able to establish a new blade workshop and start production six months after groundbreaking," Ian adds.

#### **Understanding customer needs**

By 2012, nearly one third of LM Wind Power's business is expected to be in China. It's an important focus and customer relationships are key. LM Wind Power's Commercial Director in China, Ming Cai, says, "Our customers here appreciate LM Wind Power's advantages - our technology, reliability and experience in the industry."

Ming Cai continues, "Buying behaviors here differ by customer. Some focus on quality, some on technology, some on lower cost, and some make decisions for political reasons. No matter what, it is critical in this market to be very good friends with your customers and understand their needs."


#### **Looking toward the future - challenges and opportunities**

Government policies, increasing costs, sourcing problems, these are some of the issues LM Wind Power will face as the market in China continues to grow. "There are always these challenges in an emerging market," Ming Cai states.

Experts also expect the Chinese market to flatten off in the next two years as the grid infrastructure connecting turbines to sub-stations is completed. "We need time for the grids to catch up," says Ian. "However, because of continuing economic expansion in China, the need for electricity will increase," he emphasizes. "The future of wind is very certain in China."

LM Wind Power will take advantage of this future. "New products will happen first in China because they will try them first," Ian comments. "The market is also moving toward class III and class IV wind areas - this suits us well as our blades are longer and lighter."

Continued success in China depends on staying on top of these quickly changing market demands. LM Wind Power is doing this by creating and maintaining strong customer relationships and by making the technology and R&D more localized. "We need to be a Chinese company in the China market," says Ming Cai. "And we have things in place to make this happen."

 [Read the full story about what's happening in the China market at www.lmwindpower.com/News.aspx](http://www.lmwindpower.com/News.aspx)