



Joe Kahn - Market Manager

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**WIND UP FOR SUCCESS. . . WITH NTN BEARINGS**

**Wind energy is not the next big thing – it's *already* here.** In 2008, an estimated 8,437 MW of new Wind Power Capacity was brought online in the United States alone, bringing the US total to over 25,000 MW. 2008 has made the US the fastest growing market for wind energy in the world, even exceeding that of Europe. *What other industry do you know of that's experiencing over 30% annual growth?*

**Why is wind energy so popular and what's driving this extraordinary growth?** Not only is it a renewable resource that reduces natural gas and coal consumption and conserves water, it is the most effective currently available technology for immediately reducing CO2 emissions. The US Department of Energy has estimated that 20% of the nation's energy can come from wind power by the year 2030. While several states institute their own renewable energy standards, tax credits will spur investments.

**NTN is committed to servicing the wind energy aftermarket.** As one of our most important strategic markets, NTN has a solid grasp on the wind supply chain. That means in many cases we know which bearings go in which gearbox, which gearbox goes in which turbine, and even which turbine goes in which wind farm! *You'll read more about what types of bearings are used in a wind turbine elsewhere in this newsletter.*

To aid in this assault on the wind aftermarket, we've made significant investments in both capacity and inventory. Our Macomb, IL (Bower) and Kuwana, Japan facilities have expanded, and we're building an entirely new factory set to open later this year in Hakui, Japan.

We've identified the most popular bearings used in US wind turbines and are expecting our first delivery of stock to Chicago soon. With the demand of wind turbine bearings continuing to be high, NTN knows that being prepared with the right parts at the right time is what it takes to be successful in the Aftermarket – *an Aftermarket full of opportunity.*

VISIT OUR **BOOTH**

**3121**



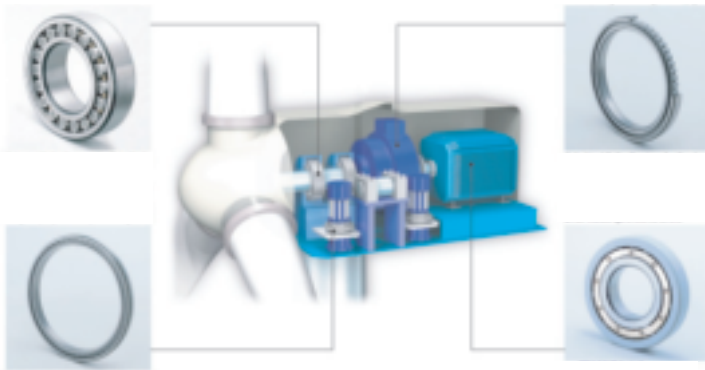


# WIND TURBINES

## NTN PROVIDES BEARINGS FOR MAIN ROTOR SHAFTS, GEARBOXES, YAW GEARBOXES AND GENERATORS

NTN is very proud of our status as a preferred OEM supplier to several global wind turbine manufacturers and of our long history of contribution to the European aftermarket. It's this same expertise and experience that we intend to share with our distributors to gain a large share in this aftermarket. Superior quality is a necessity when service is performed 300 feet in the air. Operators cannot afford the high costs associated with downtime and difficult access makes unnecessary maintenance unacceptable. That's why all NTN wind energy bearings undergo a specialized inspection process. Following final assembly, each bearing is measured individually and given a serialized number.

**ROTOR SHAFT:** Spherical Roller Bearings for Main Shaft:  
*Optimized designs increase efficiency and service life*



**GEARBOX:** Cylindrical Roller Bearings for Gearbox: *The gearbox bearings offer higher rigidity and lower friction through reduced rolling element slippage.*

**GENERATOR:** Insulated Bearings for Generator: *The "MEGAOHM Series" generator bearings are well insulated against electrical currents*

**YAW GEARBOX:** Tapered Roller and Angular Contact Bearings for Yaw Gearbox: *Compact designs that offer high load capacities*

**Main Rotor Shafts:** NTN's expertise in **spherical, cylindrical** and **double-row tapered roller** bearings ensure that designs are optimized, leading to increased equipment efficiency, more reliability and longer service. New materials and improved heat treatments significantly increase overall bearing service life. NTN manufactures all sizes of mainshaft bearings, from common 1.5 MW to upcoming 3.5 MW designs.

**Gearboxes & Yaw Gearboxes:** Responsible for transferring low speed rotor rotation into appropriate generator input speeds, gearbox applications generally use **cylindrical roller, tapered roller**, and occasionally **spherical roller** and **ball** bearings. NTN's world-class quality and experience along with its unmatched product offerings of both metric and inch sizes assures complete coverage in wind turbine gearbox applications. Specialized designs allow for both high speed and high load carrying capabilities. The yaw gearbox allows the turbine face to rotate to stay inline with changing wind direction. Yaw gearboxes are generally small and are capable of conveying large amounts of torque so the bearings used must be compact and have high load capacities. NTN's vast product portfolio has all applications covered with **tapered roller** bearings and **angular contact ball** bearings.

**Generators:** In an electric environment, electrolytic corrosion from stray currents threatens bearing life. NTN's **ceramic-coated ball** bearings (**MEGAOHM™ Series**) insulate the bearings from electric current. The special ceramic coating is applied to the outer surface and side faces of the outer ring to prevent current from passing through the bearing. The unique design provides insulation resistance of at least 2000 MΩ under normal operating temperatures, alleviating electrical arcing and early failure. **MEGAOHM™ Series** bearings are available with or without seals or shields, and are fully interchangeable with standard, non-insulated bearings.

*For more information, contact Joe Kahn at 800-323-2358 Ext. 20461*



## VERIFIED VALUE ADDED PROGRAM

### NTN is continually striving to provide value to our Distributors and End-users.

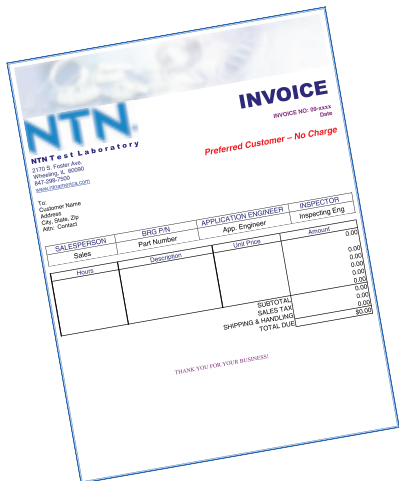
NTN is a company committed to being more than just an ordinary bearing supplier. We are continually striving to provide value to our distributors and end users. That is why, in addition to making bearings, we have become an industry leader in providing various services that compliment our products. You may be very familiar with these services through involvement with our sales and engineering groups. Whether it is providing training, after hours support, cost savings ideas or a variety of other services, NTN is dedicated to adding value to our products.

To further improve on our service offerings, NTN will implement a value added / cost savings program titled Verified Value Added™ (VVA) in March 2009. The VVA program will allow NTN to track all of the value added dollars provided to our distributors and end users. This information can then be presented in an accurate and concise way, allowing you to see the value we are providing you and your customers.



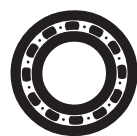
- In 2008 the TTU visited **twenty-nine** States and trained over **2,000** End-users.

One great example of a value added service provided by NTN is our technical training unit (TTU). The TTU is our mobile training unit – a classroom on wheels. This vehicle travels around the country, training customers on everything from basic bearing knowledge to complex installation and maintenance techniques. In 2008 the TTU visited twenty-nine states and trained over 2,000 end user employees. Our new VVA program will allow us to capture the value provided during these training sessions and present it to you in a format you can provide to your customers. Along with our training services, the VVA program will be able to track actual cost savings that we offer end users at their facilities. Extended bearing life, reductions in maintenance and inventory, and increased productivity are all things that result in a cost savings. NTN has always been dedicated to finding cost-saving solutions. Now, however, we will have the ability to track these savings, making sure that our entire sales force is actively providing these savings to you and your customers. You will soon begin to see the VVA program in action. We will also be working with end users to get a signature verifying all of the value added and cost savings dollars we uncover and provide.



We understand that in today's competitive business environment productivity gains are essential. To learn more about our VVA program, cost savings measures, or any other training option, please feel free to contact your local NTN representative. Common Value Added Services Provided by NTN:

- Experienced Engineering Support (*Applications Engineering and Failure Analysis at our Test Lab*)
- Three-Day Product Training School
- Web Based E-Knowledge Training
- Technical Training Unit (TTU) – mobile classroom instruction
- Lunch and Learn training with sales and engineering
- On Site Engineering Service
- Cost Savings / Troubleshooting at end users (*Improved Bearing Life, Increased Productivity, Reduction in Maintenance, Reduction in Inventory, etc*)
- After Hours support



# Dr. Pete's

# C O R N E R

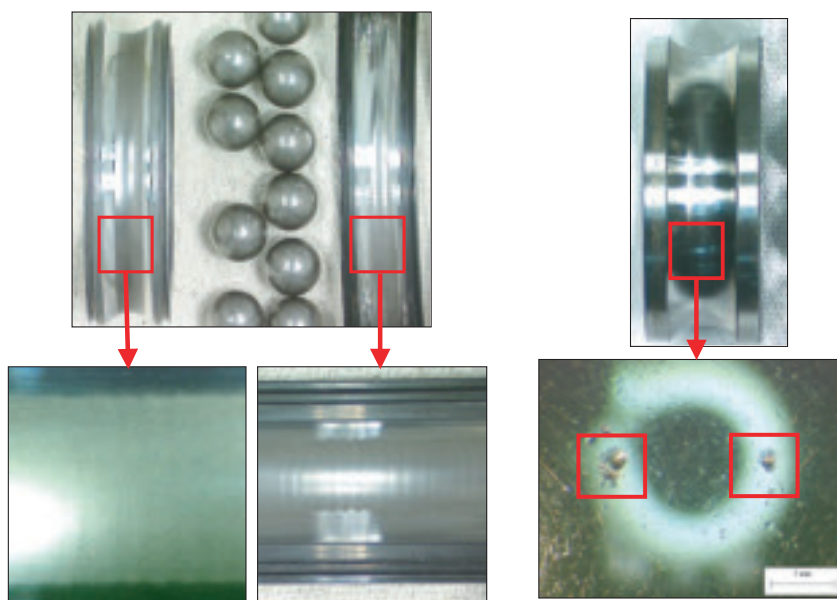
PETER LORENTZ  
Sr. Product Analysis Engineer  
NTN - Wheeling Test Lab

## ELECTRICAL PITTING AND EROSION IN GENERATORS

### Problem:

Electrical pitting and erosion is a failure mode that is very common in the wind energy industry and can be very easily detected once the bearing inner race is cut open. This type of failure occurs in the generator portion of the wind turbine and is caused by “stray” current passing through the bearing.

The damage seen to the right is attributed to current passing through the bearing from improper grounding of the generator. Electricity will take the path of least resistance, and sometimes that may be the bearing itself. The “stray” current will arc from one surface to the other in order to find a ground. So essentially, as the current goes through the bearing outer ring, it arcs from the raceway to the ball, then from the ball the inner ring raceway, and finally goes to through the shaft to the ground. The arcing effect causes damage to the raceway surface by heating up the arc point on the surface and fusing the material.



(Figure 1): **Electrical Fluting**  
Bearing was rotating/Constant current flow

(Figure 2): **Electrical Pitting**  
Bearing was not rotating/  
Release of built-up charge

There are two forms of electrical damage seen on bearings. Dynamic electrical damage occurs when the bearing is rotating and the arcs are evenly spaced (Fig. 1), and is very visible. Static electrical damage occurs when the bearing is not rotating and a discharge of current is passed through the bearing. The damage observed is that of a molten pool of metal, very similar to that of a weld bead (Fig. 2). Either form of damage will eventually result in audible noise and/or vibration and result in a lowered bearing life. Decreased bearing life increases downtime for repairs and reduces the overall efficiency of the wind farm, obviously not a desirable situation.

### Solution:

NTN's **MEGAOHM™** Series bearings are the solution to combating electrical pitting in wind turbine generators. **MEGAOHM™** bearings have ceramic coating on the outer surfaces of the outer ring to insulate the bearing from stray current, thus eliminating the potential for electrical damage to the raceways and rolling elements. The crack-resistant coating exhibits insulation resistance of at least 2000 MΩ under normal operating temperatures. The bearings are fully interchangeable with standard bearings and offer significant cost benefits to alternative hybrid ceramic-ball bearings. NTN has a long history of using **MEGAOHM™** bearings in OEM wind turbines and other aftermarket applications.



## ROB ZELLER MARKETING MANAGER

A business understands that a great product, combined with the proper price, distribution coverage and promotional mix, is key to success. Often, the Marketing Department is responsible for the coordination and assists in the execution of functions. NTN congratulates Rob Zeller on his recent promotion to Manager of Marketing Department. Rob began with NTN in 1999 as an Applications Engineer after completing his degree in Mechanical Engineering from University of Illinois-Champaign. During his ten years with NTN, he also worked at the Automotive and Industrial Engineering Headquarters in Japan for a year, and moved to the Marketing Department two years ago. Rob says the move was logical because it makes sense to have someone with a technical background setting the marketing strategy for a technical product. Rob recently completed his MBA at University of Chicago and likes to travel, play guitar and autocross.

### WE ASKED ROB TO SHARE SOME **PERSONAL INSIGHT** ON THE FOLLOWING SUBJECTS...

*Congratulations on the promotion. What are your goals and vision for the marketing department?*

*Marketing has played a support role heavily focused on pricing until recently. We have spent the last year learning about the markets NTN serves. Based on the knowledge we have gained, and continue to gain, marketing will help set and implement the company's aftermarket strategy. Good understanding of that market is essential to ensure that together our customers and our company are successful!*

*What actions are being taken to help NTN achieve these goals?*

*We are now industry focused and each market analyst focuses on two target markets. They are the company's market experts and will assist in growing sales, promoting products and educating customers. Their knowledge will help NTN provide the essential ingredients to add value for both our customers and end-users. We will also help our customers have a positive experience with NTN through some of our recent initiatives such as our redesigned Distributor On-line Ordering System and the development of NTN's Verified Value Added™ program.*

*Why is NTN placing more emphasis on marketing?*

*The Marketing Department is responsible for working with our customers to identify opportunities in the aftermarket. We take this a step further by leading the entire NTN organization to market, working with manufacturing, operations, engineering and sales to ensure we have the right bearings on the shelf as well as knowledgeable sales and customer service staff. Furthermore, NTN's quality product and superior customer service have given us great success with the world's largest OEM's. Marketing leverages quality product, market knowledge, and wide product line developed at the OEM level to help our aftermarket customers be successful.*





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MAY 4 - 6, 2009

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MAY 4 - 7, 2009

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