



Wind market forecasts and statistics paint a positive picture for the future, but there are issues and challenges for U.S.-based manufacturers seeking entry to the gearbox supply chain (courtesy of Vestas).

Tapping into the Wind Gearbox Supply Chain

BIG GEARS, BIG OPPORTUNITIES, BIG RISKS AND BARRIERS

Lindsey Snyder, Assistant Editor

Although typically considered a late bloomer in the call to wind energy arms, the United States is now the number one wind power producer in the world with over 25,000 MW installed by the end of 2008, according to the Global Wind Energy Council in January 2009.

President Obama has called for the country to double its production of renewable energy in three years, and as stated in the American Recovery and Reinvestment Act, wind has the potential to provide low carbon energy and a boost to the beleaguered U.S. manufacturing industry. The domestic gear market has started to itch for a piece of the pie.

At Gear Expo this year in Indianapolis, AGMA brought the subject front and center at a special seminar dedicated to informing U.S. gear manufacturers about the opportunities and challenges to entering the wind energy supply chain. Coordinated by wind engineering consultancy Romax Technology with support from consultants Garrad Hassan, bearing supplier Timken and the American Wind Energy Association (AWEA), the seminar covered a range of topics, including market dynamics and forecasts, technical trends, supply chain issues and company case studies. Limited places for the seminar sold out as a clear expression of the industry's

desire to explore the potential of wind energy as a new revenue stream.

In regards to the seminar, Joe Franklin, AGMA president, commented to Romax, "There are clear opportunities within wind energy for our members to leverage. However, as frequently happens with new market opportunities or new technologies, there is a distinct lack of good quality information and support for gear manufacturers who recognize wind energy's potential. This seminar is another step in AGMA's aim to help address this knowledge gap and ensure that the AGMA members and others in the industry are well informed and

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placed to make crucial decisions about its future role in supplying key components to this rapidly growing industry.”

Despite the 2009 financial situation, which is evident in stalled projects and financing bottlenecks, wind energy continues to grow. In the first half of 2009, over 4,000 MW of wind power was installed in the country, according to AWEA statistics.

“The wind market today is relatively stable and sane considering where it was 16–20 months ago,” says Matt Garran, supply chain manager for AWEA.

Garran believes healthy financial markets are imperative for wind industry growth, and the markets are returning to a healthy state in his view. “With stimulus funding, we are seeing new farms being planned and developed. The money is flowing,” he says. “It has not flowed fast enough to keep the industry at the level it was, but

having said that, what we’re seeing now is here are a number of manufacturers starting to consume their inventory, and you’re starting to see new orders being tendered for late January.”

Garran is optimistic, but he is quick to point out that the industry is not where it was in 2008. “You will see that level of growth return, but not immediately.

“Work is ongoing, but is reduced and is more thought out,” he says of the current state of wind affairs.

As the U.S. Department of Energy reported in 2008, there is the capacity to achieve 20 percent of the country’s energy from wind resources. In this scenario, new wind power capacity would increase to over 16,000 MW per year by 2018, and continue at that rate through 2030.

Although there is a positive picture

painting by market forecasts and statistics, there are issues and challenges for U.S.-based manufacturers seeking entry to the wind market. The current global market is dominated by a small number of European turbine manufacturers—Gamesa and Vestas are two of the largest. They have very strong relationships with trusted gearbox suppliers. “The Europeans have a different mindset about doing business,” Garran



Vestas is one of a small number of European turbine manufacturers dominating the market that have strong relationships with trusted gearbox suppliers. This makes market entry more challenging for U.S. gear companies (courtesy of Vestas).

says. “They’re looking for long-term relationships with a few key strategic partners that will grow with them. In North America, we’re used to doing contract volume work, and that’s two different mindsets.”

If U.S. companies are going to compete, they must be knowledgeable in turbine manufacturer supply chain issues, turbine technology, advanced gearbox design and other industry nuances. But the opportunity is clearly there.

The tremendously variable stresses wind turbines operate under is the main source of technological challenge. With reliability issues and high costs for maintenance and repair, turbine gearboxes are highly engineered to strict, specific manufacturing standards set by IEC and AGMA in conjunction with AWEA. These standards force

manufacturers looking to supply the industry to make significant investments in manufacturing equipment and design capabilities, so there is a great deal of cost and risk involved. “These gearboxes must be perfect,” says Roland Ramberg, chairman and CEO of the Gear Works—Seattle, which is a job shop involved in the repair and rebuild of wind gearboxes. “Defects can’t be tolerated. The costs of failure are so high.”

Cautious optimism is echoed throughout the industry. “Currently, there is huge pressure on the wind turbine supply chain and the industry is looking to potential manufacturers from other industries to help increase supply,” says Andy Poon, Romax Technology director of renewables. “But entering a new market, especially one as complex and unique as the wind energy industry, is a risk and, as such, needs qualifying through a sound understanding of industry demands. In

our position as a leading wind energy technical solutions provider for gearboxes, we feel it is important to provide accurate information to gear manufacturers to aid their successful diversification and development of the industry.”

The biggest opportunities rest in the industry’s anticipated growth, design development and maintenance/repair to existing, aging turbines.

“The opportunity is as broad as the industry,” Garran says. “Your OEMs and tier ones, some try to do as much in-house and others like to sublet as much as possible.”

Barriers to market entry include the high level of design expertise necessary, high cost and size of new equipment, short supply of qualified and experienced technicians and liabilities for design and warranties.

The risks are well documented, but for those accepting the challenge, what is actually involved in joining the wind gearbox supply chain?

For Clipper Windpower, the process begins by registering interest as a potential supplier via the company's web form. Clipper has a detailed supplier page on its website, complete with general information on what Clipper looks for in a supplier and FAQs (www.clipperwind.com/suppliers). "The supplier and approval process can take over a year," says Ian Cluderay, vice president of supply chain for Clipper Windpower.

"Time needed can be impacted on whether or not new equipment is necessary and purchased to support the project.

"Clipper looks for suppliers that are leaders in their respective industry with robust quality systems and mature manufacturing capabilities with the ability to increase capacity as demand requires it," Cluderay says.

Naturally, Clipper has received interest from many gear manufacturers, and multiple domestic and international companies currently belong to its supply chain. And while acceptance of a new supplier may take over a year, the actual decision-making is another process unto itself, involving multiple parties within the company. "The supply chain management team is in charge of this process, but all sourcing decisions involve input from key stakeholders, such as quality, engineering and manufacturing teams."

Winergy Drive Systems also has a detailed, time-consuming procedure for selecting new suppliers. "Our supply chain has been built over the last four years," says Parthiv Amin, president of Winergy. "It is a long process to qualify a supplier. It takes a year to a year and a half. We have a 12-step process."

And, as trends in the European business market indicate, "The idea is to partner for long-term opportunity," Amin says.

In June 2009, Winergy began production from a newly built, state-of-the-art, 130,000-square-foot gearbox

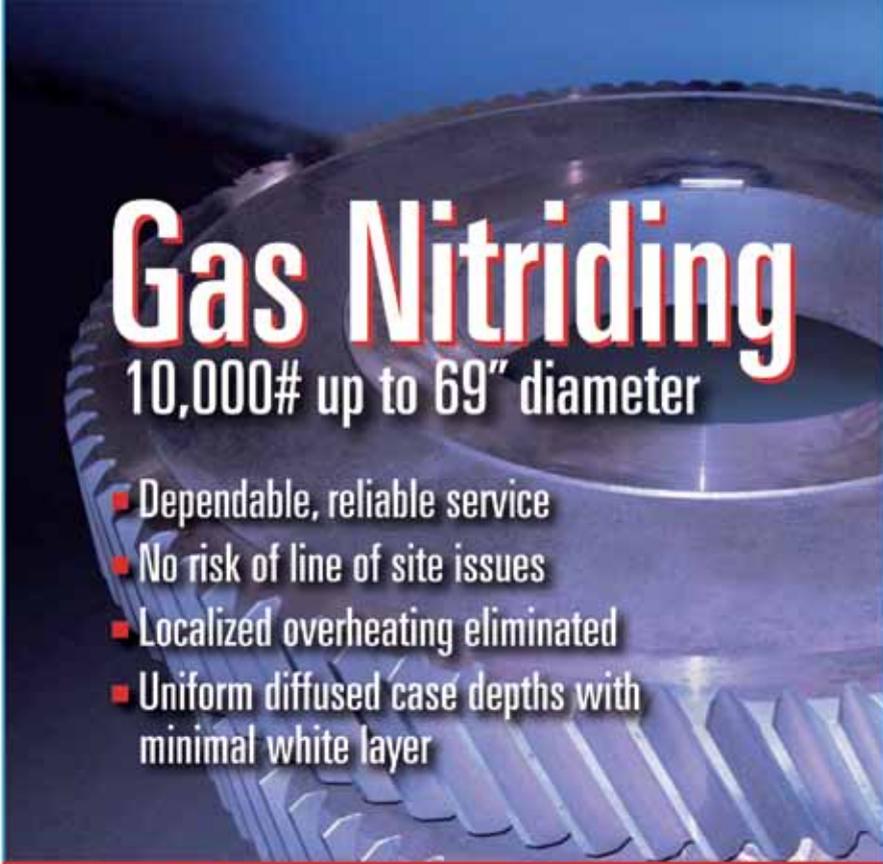
facility, about five miles from its existing plant in Elgin, IL. "We have converted the old facility into a parts manufacturing facility," Amin says.

The new site enables Winergy to import fewer of its gears from Europe; although, "Some of the gears do come from Europe." Amin estimates, "Less than 20 percent. The balance of the gears is bought from our supply chain locally. Of the 80 percent that is producing [gears] in the U.S., a percent

comes from our facility, but we are still dependent on our supply chain."

Winergy currently has four gear manufacturers in the U.S. supplying it with gears. Amin describes them generally as "mid-sized companies." The majority of them have previous experience in large automotive applications, like heavy trucks and off-road vehicle type applications. These categories of production have transitioned well into the wind industry, he says.

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The run-of-the-mill, high-volume small component auto suppliers are not ideally equipped for a simple transfer of skills into the wind industry. "The quality requirements are much tougher than what the automotive guys are used to," Amin says. "They have good quality procedures in place, but the precision and volume is a challenge for them."

Another way Winergy's new facility is improving the prospects for domestic gear suppliers is that it has the capabilities of a shop floor classroom with brand new machinery and quality control. This enables Winergy to teach new employees and prospective suppliers the skills they need to transfer to wind without having to send them to Germany, as was the case in the past. "These guys know how to make gears; they know how to make good gears. The question is how to do it for wind. What machines, tools and techniques to use," Amin says.

One less obvious segment of the wind market Winergy is involved with

and was also a subject of the AGMA seminar at Gear Expo is the repair and remanufacture of existing turbine gearboxes. Wind gearboxes are expected to be perfect, but they are nevertheless subject to failures on top of normal wear as they withstand dramatically variable loads.

About 10 percent of Winergy's total business is in repair/rebuild jobs. Another player in this field is the Gear Works—Seattle, as mentioned earlier.

The Gear Works is a family-run job shop specializing in small lot production of larger precision gearing—from 12 inch diameters to four meters—and gearbox repair service for all industries. The business from wind applications has grown in light of the recent industry growth. This includes a significant physical growth in the gearboxes. "In the last 10 years, it has become a bigger segment of our business, and the units have grown larger," Ramberg says. "Ten years ago we were fixing gearboxes of about 100 kw; now we're replacing gearboxes of 1.5 MW."

The Gear Works opened a new repair and test facility about four years ago. It is capable of repairing gearboxes up to 20 tons. Material handling and logistics of the wind industry are just as complex as the engineering.

Experience is a major factor in successfully catering to the wind industry, and the Gear Works stands apart from others by its history in the large precision gear industry. "I believe we are one of the few, if any, that has the ability to do the teardown, forensics, engineering and manufacturing of the components," Ramberg says. "I call it a fully integrated facility."

The initial investment involved to cater to such a high-end market is daunting. For the Gear Works, the focus was not on a single market, like wind, but the other large-sized gear markets that exist, like mining and off-road vehicles. "We made huge investments in our business in the last 10 years. I would say it wasn't only focused on wind. It was focused on real high-end gear and engineering capabil-



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ities and quality control. We invested heavily in gear inspection equipment and in our inspection department, and in metallurgical testing and nondestructive testing.”

With the large-scale means in place, “the [wind] industry lends itself to our existing capabilities.”

And the quality standards are equally as important in repairing gearboxes. “We were always into large precision gearing,” Ramberg says. “To be prominent in the wind repair niche, it’s paramount that you are able to replace the existing gears to the same quality or better than they were originally produced. The gears being produced for the wind industry now are some of the best in the world. To fix them, you need to have the same quality as the original manufacturers.”

In addition to appropriately scaled equipment that includes cutters, grinders, heat treating and testing, Ramberg points to the importance of investing in the work force as much as the machinery. “You need a good engineering team to do failure analysis and forensics to figure out why they’re failing.

“The talent—you don’t just pull off the street to perform this kind of work. It is as much an investment in people as it is in the tools themselves.”

So what about those skilled workers?

The Society of Manufacturing Engineers (SME) announced in December a new collaboration with AWEA and its Canadian counterpart, CanWEA, to not only help equip the industry with a well-educated, skilled work force, but to help connect suppliers with turbine manufacturers.

“SME’s partnerships with two of the strongest industry voices for wind energy—the American Wind Energy Association and the Canadian Wind Energy Association—will help build capacity and provide support for the wind energy manufacturing supply chain,” says Pam Hurt, SME strategic alliances manager, in a press release.

“These working relationships enable SME to connect manufacturers to a growth industry that is fair-

ly young but still complex. By sharing technical information and programming, our associations support advanced manufacturing and its work force.

“SME will provide the platform for a technical community network to share manufacturing knowledge, expertise and opportunities for the North American wind energy industry,” Hurt says.

AWEA is doing its part to help

by organizing various industry events nationwide, including regionally based supply chain workshops, which have proven very popular. “In every program we’ve done, the number of attendees has well exceeded the expectations,” Garran says.

As far as getting involved in the wind industry supply chain at this highly competitive stage, “I’d say if you don’t get involved in the next year or two, you’ll be outside looking in,”

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Winergy's Amin says. "Two years ago was even better. If you're not getting involved now, the train is leaving the station. If you're going to do it, now or over the next 14-18 months is the time. But after that, it is going to get more difficult. Not anyone from automotive can jump in."

He estimates it will take 12-18 months for manufacturers starting the investment now to begin getting wind business; although, "If you asked me this question a year ago, I would have said 2-3 years."

While expressing as much caution in his forecasts as others, Amin was equally as expressive in his enthusiasm for the opportunities that exist for gear manufacturers. "It is once in a lifetime the opportunity comes to be in a new industry." ⚙️

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