

Wind Energy: An Established Industry with Emerging Opportunities

Joseph L. Hazelton, Associate Editor



Photo courtesy of Hansen Transmissions

“An industrial business with a very important growth potential for the next decade.” That’s the wind energy industry as described by Ivan Brems of gear manufacturer Hansen Transmissions International nv.

Brems, vice president—corporate marketing and business development, should know. Hansen Transmissions is much involved in the business of turning wind power into electricity. Headquartered in Antwerp, Belgium, the company has a new factory that only manufactures gearboxes for utility-scale wind turbines.

Such turbines generate 1–3 megawatts of electricity. Each with a combination of planetary and helical gears, they can be found around the world in wind farms—collections of massive towers whose rotating blades generate electricity.

Though decades old, the wind energy industry still has growth potential in its main markets: Europe, North America and Asia.

Europe: Established, But Still Growing

Europe is the most developed wind energy market and has the highest demand, according to figures from the Global Wind Energy Council (GWEC). Europe had 40,900 megawatts of installed capacity at the end of '05. The next largest market, North America, had

9,800. Also, the European market installed no less than 5,000 megawatts of wind power each year in '03, '04 and '05.

Portugal, Italy, the United Kingdom and France were among the 10 fastest growing countries in '05, with each installing at least 350 megawatts of new capacity.

North America: Vast Potential

For U.S. gear manufacturers, the fastest growing market for wind turbine gears is their own. America installed more megawatts than any other country during '05: 2,400. The next largest amount of new capacity was 1,800, installed by Germany.

However, the North American market has been volatile, based on GWEC numbers. In terms of new capacity, Canada and the U.S. installed 1,700 megawatts in '03, about 500 in '04, then more than 2,500 in '05.

Brems says the U.S. will remain one of the largest wind energy markets during the next 10 years, possibly installing as much as 40,000 megawatts of wind turbine capacity.

Also, Canada appears to be an emerging market, installing 120 and 230 megawatts of new capacity in '04 and '05, respectively.

“The Canadian market is really breaking out now,” Brems says.

“Over the next 10 years, I believe they’ll have a growth potential of generating 6,000–10,000 megawatts of wind power generation.”

Asia: Vast Potential Too

“I would consider Asia to be the largest emerging market,” says David Neidig, vice president of ITAMCO, a manufacturer of wind turbine gears.

According to GWEC figures, India and China are fast growing. India installed 1,430 megawatts during '05, the fourth largest amount that year. China installed 490. Brems predicts each of the two Asian countries will install 15,000–20,000 megawatts in the next 10 years.

Brems gives several reasons for wind energy’s continuing growth: cost, public support for a clean environment, the growing need for energy around the world, and the ongoing emergence of new markets. Another of his reasons is political commitment.

Demand for wind turbines—and consequently, their gears—partly results from government action.

Main Markets: Nature of Demand

Wind energy’s main markets include countries committed to the Kyoto Protocol, an international agreement for reducing emissions of greenhouse gases. A main way of reducing emissions is to generate more electricity from wind power. Countries committed to the protocol include Denmark, France, Germany, Italy, Portugal, Spain, the United Kingdom, Canada, India and China.

The U.S. doesn’t operate under the Kyoto Protocol, but federal and state governments promote the development of wind energy.

More than 15 state governments promote it by mandating that specific amounts of their electricity must come from renewable energy sources, one of which is wind energy, reports the Union of Concerned Scientists, an environmental group consisting of citizens and scientists.

But government support can be withdrawn or can lapse.

U.S. Market: Tax Support

The U.S. has been an up-and-down market and depends considerably on a federal tax credit.

The credit is the wind energy production tax credit. The PTC is 1.9 cents for each kilowatt-hour of electricity generated by wind turbines during the first 10 years of a wind farm’s operation. The credit has been described as a way to help level the playing field between companies generating electricity from wind power and those generating it from other sources, like gas, coal, oil and nuclear.

The PTC has existed since 1992, but it’s not permanent, so the federal government must decide from time to time whether to extend the expiration date. On several occasions, it has allowed the PTC to lapse.

Without the credit, demand in the U.S. market drops. The drops aren’t immediate—planning and installing a utility-scale wind farm takes time—but they are noticeable.

For example, the PTC expired June 30, '99, but was reinstated late that year. The lapse was followed by a drop. In '99, the U.S. installed 661 megawatts of new capacity. In 2000, it installed 53.

The credit, though, had been reinstated with a new expiration date, Dec. 31, '01. The U.S. installed 1,696 megawatts of new capacity in '01. The credit expired at the end of the year and wasn’t reinstated till March '02. Lapse led to drop. The 1,696 new megawatts in '01 was followed by 410 in '02.

The U.S. market may be more stable through '07. The federal

Residual Stress Retained Austenite Measurement

**THE MODERN APPROACH
TO SOLVING ENGINEERING
PROBLEMS.**

Crack initiation
Crack propagation
Stress corrosion cracking
Distortion
Fatigue life

LXR Laboratory Residual
Stress Measurement System

Automated NDT Systems & Services
PROTO
Manufacturing

www.protoxrd.com tel: +1 (519) 737-6330

MESH UP
www.gtcgears.com

Exclusive North American Distributor of
KHK GEAR

- Spur Gears
- Gear Racks
- Miter Gears
- Bevel Gears
- Worm Gears

From stock for all your metric gearing needs.

Quality Transmission Components

Phone: 516.437.6700
Fax: 516.328.3343

GLOBALSPEC®

SPIRAL BEVEL GEARS (Transmissions)



Spiral & Straight Bevel Gear Manufacturing.
Commercial to aircraft quality gearing.
Spur, helical, splined shafts, internal & external,
shaved & ground gears. Spiral bevel grinding.
Midwest Transmissions & Reducers.
ISO compliant.



MIDWEST GEAR
& TOOL, INC.
15700 Common Rd.
Roseville, MI 48066

midwestgear@sbcglobal.net

CONTACT:
CRAIG D. ROSS
(586) 779-1300
FAX (586) 779-6790

If you want to produce parts like these, your best choice is

Leistritz

Internal Whirling
ONLY Leistritz

Profile Rolling

External Whirling

Keyseating

201 934-8262 www.leistritzcorp.com
Leistritz Corp. 165 Chestnut Street Allendale, NJ 07401

government extended the PTC in mid-'05, months before it was due to expire and established a new expiration date: Dec. 31, '07. It was the first time the U.S. government avoided a lapse in the PTC.

After the credit was extended, the American Wind Energy Association said in a press release it "anticipates that strong growth momentum will continue in 2006 and 2007."

However, the government may not avoid lapses in the future. "If the government lets the PTC expire again, then that can have a negative impact on the market," Neidig says.

Serving the Markets

Gear manufacturers can serve the wind energy industry by making any of a range of parts and assemblies, from loose gearing to whole gearboxes.

In Plymouth, IN, ITAMCO supplies wind energy with gears and housings for utility-scale wind turbines. The company can manufacture a variety of wind turbine gears, but it tends to specialize in the internal ring gears. "We have a lot of a capability in that area," Neidig says. "We have a lot of shaping and grinding capacity."

ITAMCO wants to increase its business in the wind energy industry. "We're in the process of getting into assembling complete drives for the wind turbines," Neidig says. To this end, ITAMCO purchased a former automotive plant in Argos, IN, and plans to employ 40 people in the 385,000-square-foot facility.

Hansen Transmissions manufactures complete wind turbine gearboxes and built a new factory dedicated to making them. According to Brems, the factory performs all the processes for manufacturing wind turbine gearboxes, including heat treatment of all the gears, except for one—the large internal ring gear: "The nitriding of the ring gears is the only process we outsource."

The factory also includes two 4.5-megawatt test stands for running the gearboxes under full load. Brems says Hansen is adding another 4.5-megawatt test stand and is building a 13-megawatt test stand, for both production testing and for research & development.

"We have spent \$125 million dollars to build such a factory," Brems says. "On the one end, we bring in raw material, and on the other end, we ship out completely manufactured and tested wind turbine gearboxes."

Today's Wind Turbine Gears

Generally, utility-scale wind turbines generate 1–3 megawatts of electricity. They're industrial applications, so they require large, coarse-pitch gears. A good example of what large means is the internal ring gear. "Wind turbines are using planetary systems with ring gears that are 60 inches in diameter and bigger," Neidig says.

However, wind turbine gears also have to be high quality. "Basically, all the gears get ground," Neidig adds. So gear quality is commonly Q12 or better under AGMA 2000-A88.

A utility-scale wind turbine commonly has 10 or more gears, most of them in the drive system. Generally, a turbine has either a.) one planetary stage, with spur or helical gears, and two sets of helical gears, or b.) two planetary stages with one helical gear set. Each planetary stage consists of a sun gear, three or more planet gears and an internal ring gear. Each set of helicals has two gears.

Size and quality aren't the only concerns. "We have to meet very long design lifetimes, 20 years," Brems says. "You need very high reliability."

Also, gears will likely become even larger as the wind energy industry shifts to increasingly powerful wind turbines.

Tomorrow's Wind Turbine Gears

The industry has already developed 5-megawatt turbines. "It's logical to assume these prototypes will be developed over the next years into serial production," Brems says, adding that turbines in the 6-8 megawatt range could be developed in the next five years.

Larger turbine gearboxes present problems in terms of size, weight and quality. Gearbox manufacturers may be able to reduce size and weight by having turbine parts, such as the rotor bearing, integrated into the gearbox itself, Brems says. He predicts quality levels for today's wind turbine gears should be sufficient for tomorrow's, but he cautions: "Achieving those quality levels as gearboxes grow bigger will be a challenge."

Still, Neidig says: "This wind turbine business has probably been one of the best things for the gear industry in a long time." ⚙️

For more information:

Global Wind Energy Council

Rue D'Arlon 63-65

B-1040 Brussels

Belgium

Phone: +(32) 2502-5502

Fax: +(32) 2546-1944

E-mail: info@gwec.net

Internet: www.gwec.net

Hansen Transmissions International nv

Leonardo da Vincilaan 1

B-2650 Edegem (Antwerp)

Belgium

Phone: +(32) 3450-1211

Fax: +(32) 3450-1220

E-mail: info@hansentransmissions.com

Internet: www.hansentransmissions.com

ITAMCO

6100 Michigan Road

Plymouth, IN 46563

Phone: (574) 936-2112

Fax: (574) 936-7224

E-mail: dkneidig@itamco.com

Internet: www.itamco.com



GROUND GEARS – Ten or Ten Thousand

For small to medium quantities of spurs or helicals that have to meet close-tolerance AGMA or DIN specs, our Reishauer grinders and M&M gear analysis systems are the perfect combination.

For Long runs, we offer the unique Liebherr CBN grinding process with full SPC quality control and documentation.

So whether your needs are for ten or tens of thousands, we invite you to join the growing list of INSCO customers who rely on us for consistent quality, reasonable costs, and reliable delivery.



412 Main Street, Groton, Massachusetts 01450

PHONE: 978-448-6368

FAX: 978-448-5155

WEB: inscocorp.com

ISO 9001 Registered

SETCO™

Precision Spindle Repair Services



- ✓ Expert CNC Spindle Rebuild Service
- ✓ All Makes & Models
- ✓ Belt-Driven, Motorized & Geared
- ✓ Best Service & Warranty in the Industry!



Authorized Service for
Franz Kessler
PRECISION SPINDLES
and Other OEMs

Great Lakes Service Center

Novi, MI 48375

Toll Free: 1-877-773-5349

Phone: 248-888-8989

Fax: 248-888-0765

Midwest Service Center

Cincinnati, OH 45233

Toll Free: 1-800-543-0470

Phone: 513-467-7262

Fax: 513-941-6913

Western Service Center

Huntington Beach, CA 92649

Toll Free: 1-866-362-0699

Phone: 714-372-3730

Fax: 714-372-3750

© 2005 SETCO Sales Company

Comment on this article by sending e-mail to
publisher@geartechnology.com

Register on our website and **SAVE \$100** on your next rebuild: www.setcousa.com