

GLOBAL SOLUTIONS

GLEASON CORPORATION • KEEPING THE WORLD IN MOTION™



Hansen®
TRANSMISSIONS

Windpower Grows Stronger

Rising energy costs and the need to limit emissions linked to global warming have helped make wind power the world's fastest growing source of renewable energy. The total installed wind power capacity today stands at well over 70,000 MW (megawatts) worldwide – by 2015 industry experts predict that this capacity will reach 300,000 MW (1 MW produces enough electricity to meet the needs of 750 households). Today Europe leads the market with some 70% of the global total. But India has now surpassed Denmark as the fourth largest wind market in the world, an indication of the emerging Asia market's insatiable appetite for new sources of clean energy.

Arguably one of the most important contributors to this growth worldwide is Belgium's Hansen Transmissions. Wind turbine gearboxes produced at Hansen's ultra-modern Lommel, Belgium plant account for 2,200 MW of annual windpower output, or roughly 16% of the total wind turbine capacity installed worldwide in 2006. And with a doubling of Lommel plant capacity currently underway, and the unveiling of plans for a wind turbine gearbox plant in Tamil Nadu, India, Hansen's global windpower role is poised to be even greater.

“ Our ability to produce highly reliable, quiet-running gear boxes would not be possible without the latest Gleason-Pfauter technology. ”



Wind turbine leader Hansen Transmissions is doubling its Lommel, Belgium plant capacity and expanding into India to help meet the world's fast-growing demand for bigger, quieter, more reliable wind turbines.

Ask Hansen/Lommel Gear Department Manager Marc Hellinx what customers like most about Hansen's wind turbine gear transmissions and he'll tell you they never have to think about them. "Today's wind turbine gear units must run with extraordinary reliability, because they're often offshore or in other inaccessible areas operating in adverse conditions making repair and maintenance difficult and expensive," says Mr. Hellinx. "Noise can be a consideration too with installations increasingly found in densely populated areas. Our ability to produce highly reliable, quiet-running gear boxes faster and more economically here at Lommel would not be possible without the latest Gleason-Pfauter technology."

Hansen's ambitious expansion at both Lommel and in India will include as many as 50 of the latest, and largest, Gleason-Pfauter CNC machines for hobbing, shaping, internal milling and critical hard finish profile grinding. They join 18 Gleason machines already at work at Lommel, machining complete the 3 meter ring gear, 1600 mm sun gear and three to five smaller planets that go into each of Hansen's latest direct-drive planetary gear boxes.

It's not surprising that Hansen has put its faith in Gleason technology, says Mr. Hellinx. "Wind energy is by far the most challenging application for a gear unit due to the high and dynamic loads," he says. "The performance and reliability of a gear unit is determined both by the design and the ability to manufacture the gears and other components to very high quality levels, far above those required in other applications. This is particularly true in our critical finish profile grinding operations after heat treat. In this area, Gleason offers the right technology."

The latest generation of Gleason-Pfauter Profile Grinders, all equipped with powerful new Siemens SINUMERIK 840D CNC, seem almost to have been invented for the rigors of windpower gear production at Hansen. Among the many features that Hansen uses to speed the hard finishing of their high quality gears:

- **Adaptive Process Control Software, to save precious minutes in cycle times by reducing the 'cutting of air.'** Heat treat distortion is hard to predict, making it difficult to program a grinding cycle for the perfect gear. As a result, the cycle can take longer than it should, because the grinding wheel might not actually be making contact with the tooth flank as much as predicted, thus removing less material and causing dressing intervals to occur more frequently than needed. Gleason's Adaptive Process Control detects when there is no contact between grinding wheel and tooth flank during axial infeed, and automatically increases the feedrate to compensate. This dynamic adaptation of the axial feedrate to actual part size after distortion ultimately can add up on a large part to many minutes of cycle time savings, as well as resulting in fewer dressing cycles per workpiece.

The latest Gleason- Pfauter CNC profile grinding machines are helping Hansen meet the need for faster production of the highest quality gears.

- Patent-pending software to automatically compensate for clamping mis-alignments, and dramatically reduce (and possibly eliminate) both radial eccentricity and axial runout after setup.
- On-machine 'Power Dressing' to ensure the highest level of accuracy and repeatability. The dressing unit is integral with the grinding head to ensure maximum repeatability. Compensation for wheel wear between dresses is automatic. Modifications to create any profile modification to the grinding wheel is faster, more accurate.
- Fully automatic determination, before grinding, of optimum distribution of stock allowance (stock division) using on-machine inspection.
- Operator-friendly Windows® based user interface with Gleason-Pfauter dialogue program for quick, simple programming.
- A grinding technology database that recommends and optimizes the 'perfect production' methodology.
- K-Chart inspection that allows specific input for both profile and lead modifications.
- A special design Internal Grinding Adapter, used for the internal grinding of the ring gears.

Gear shaping without mechanical guides.

Hansen also has invested in the latest Gleason P800/1200 ES Gear Shaping Machines, which represent a significant technology breakthrough from conventional shapers that require mechanical guides to produce the required helix angle in helical gears. For example, Hansen uses a long sun shaft with a coupling gear on the end to connect the planetary gear stage with the gear box by fitting into a coupling gear on the inside of the gear box's low speed hollow shaft. Both these coupling gears can only be produced by shaping. Gleason's ES technology enables Hansen to produce the required helix angle by using CNC and software to superimpose a twisting motion electronically on the cutter as it rotates. All gear cutting, tooling and part parameters, including the helix angle to be shaped, are simply entered into a user-friendly dialogue program, and the CNC controller calculates the necessary data/setting automatically. As a result, Hansen has eliminated the time-consuming and expensive mechanical guide procurement process associated with conventional shapers, greatly simplified changeover part to part, and made lead angle corrections fast and easy.

"Our customers are seeking faster production of ever larger gear units, while at the same time expecting continuous improvement in reliability, noise level and delivery," concludes Mr. Hellinx. "Equipped with Gleason technology, we're well positioned to meet the world's needs, today and into the future."

Gleason's Electronic Guide (ES) technology enables Hansen to shape helical gears without the expense and changeover time required for conventional shaping with mechanical guides.



Special-design Gleason-Pfauter grinding head, used on Gleason-Pfauter profile grinders to speed production of internal ring gears.



Gleason

Gleason Corporation

1000 University Avenue
Rochester, NY 14607-1282 USA
Tel: 585-473-1000
Fax: 585-461-4348

The Gleason Works

1000 University Avenue
P.O. Box 22970
Rochester, NY 14692-2970 USA
Tel: 585-473-1000
Fax: 585-461-4348
e-mail: sales@gleason.com

Gleason Cutting Tools

CORPORATION

1351 Windsor Road
Loves Park, IL 61111 USA
Tel: 815-877-8900
Fax: 815-877-0264

Gleason - PFAUTER

Maschinenfabrik GmbH
Daimlerstraße 14
D-71636 Ludwigsburg, Germany
Tel: +49 (0)7141 404 0
Fax: +49 (0)7141 404 0 500
e-mail: pfauter@gleason.com