



## SPECIALTY LUBRICANTS BOOST EFFICIENCY AND RELIABILITY AT LOW TEMPERATURES

*Enhanced properties can benefit rim/pinion drives on pitch and yaw bearings*

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The rapid expansion of wind energy throughout the world has been accompanied by a significant growth in wind power plant size. Rotor diameters of more than 120 meters (nearly 400 feet) and nominal outputs as high as 3 MW have become standard. However, the continuous increase in output and efficiency has not automatically resulted in higher reliability of plants. Rather, it often results in increased maintenance efforts and higher operating costs. Today's specialty lubricants can help ensure machine efficiency and trouble-free operation, even at low temperatures.

The reliability of modern wind tur-

bines and their components can be enhanced by using lubricants designed to meet specific requirements. New specialty lubricants for gear rim/pinion drives on pitch and yaw bearings can offer good pumpability and metering in central lubrication systems to temperatures as low as -30°C (-22°F), thus contributing to the increased reliability of turbines.

### **IT ALL DEPENDS ON WHICH WAY THE WIND IS BLOWING**

A wind power plant can only be fully effective if it is permanently and perfectly aligned to the direction of the wind. Consequently, changes in wind

direction need to be compensated by aligning the yaw system at the proper angle. Electric motors adjust the yaw bearing via gear rim/pinion drives. In addition, to ensure maximum energy yield at varying wind forces, rotor blades are adjusted by means of gear rim/pinion drives.

Often, the prevailing wind direction is constant in many locations which keeps only some of the gear teeth in mesh. For the teeth in mesh, lubricants of extremely high load-carrying capacity offer elevated and reliable protection against wear. Also, the gear teeth which are not in mesh must be protected against corrosion. Another challenge is adhesion. The lubricant on the tooth flanks of open gears might be displaced from the surface, drop off and lead to increased wear.

### **LUBRICANT PROPERTIES**

In order to meet the requirements for lubrication of yaw and pitch bearings, including those noted above, lubricants need the following properties:

- Good adhesion

- Low consumption
- Good wear protection
- Long service life
- Good corrosion protection
- Long-term priming
- Pumpable via central lubrication systems

Lubricants must retain these properties when the weather is cold.

### OVERALL PROPERTIES

A special combination of mineral or synthetic base oils and white solid lubricants ensures high load-carrying capacity and reliable wear protection. Good adhesion properties and light color of a specialty lubricant can reduce consumption, extend maintenance intervals of a wind turbine, and significantly decrease unsightly contamination of a plant. In addition, lower disposal and storage costs ensure further cost savings in plant operation.

### A CLEAN SOLUTION

The black lubricants previously used for yaw and pitch bearings often contained graphite, thus causing contamination inside and outside the wind turbine. Occupational safety for the maintenance staff is at risk due to slippery floors in the plant. In addition, excess grease leaking from the tower and blades can pollute the surrounding area. White, adhesive lubricants without graphite limit these problems.

### LUBRICATION AT LOW TEMPERATURES

Most open gears of wind power plants are still lubricated by hand. However, maintenance can be reduced to keep downtime to a minimum. For example, central lubrication systems are increasingly being used for the relubrication of open gears. Traditionally, adhesive lubricants are very viscous and difficult to pump at low operating temperatures. The latest developments present open gear lubricants that can be pumped in automatic lubrication systems at a temperature of  $-30^{\circ}\text{C}$  ( $-22^{\circ}\text{F}$ ).

### ADJUSTING THE NACELLE

The sliding layers, e.g., PETP, of a yaw plain bearing can be lubricated with a specialty lubricant in order to prevent stick-slip and wear, thus ensuring a reliable and trouble-free operation. Low friction coefficients minimize the force required to adjust the nacelle. Drive units are protected and energy consumption is reduced during adjustment. The slight difference between static friction and sliding friction values ensure a uniform adjustment movement between start-up and normal operation.

### MANY REQUIREMENTS – ONE SPECIALTY LUBRICANT

Specialty lubricants offer significant advantages that meet the increasingly demanding requirements of wind power plants, including:



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# MAINTENANCE

- Reduced lubricant consumption
- Minimized turbine contamination due to light color
- Reduced cleaning costs
- Low disposal costs for used lubricants
- No lubricant drop-off in case of vertical gears
- Trouble-free operation due to wide service temperature range with good pumpability and metering

- via centralized lubrication systems, down to -30°C (-22°F)
- Increased machine efficiency
- Effective corrosion protection, even after extended periods of standstill
- Suitable for gear rim/pinion drives, as well as yaw plain bearings ↵

## HEADLINES

### Availon marks 2 GW turbine service milestone

Availon recently announced that its portfolio of wind turbines-under-maintenance has reached the 2 GW milestone since its foundation in 2007.

Availon has experienced steady growth and currently employs a workforce of around 300 employees. In addition to focusing on its core market of Germany, the company is also steadily expanding its global strategic position in the U.S., Italy, Spain, and Poland.

In 2013, Availon added 134 wind turbines to its portfolio in the U.S. and 105 in the Italian wind market. Much of the over 2 GW output is made of GE 1.5 and Vestas V80/V90 wind turbines as well as wind turbines from Gamesa.

“Over the last six years, we have successfully built up a great deal of expertise regarding the system types we operate and want to consistently expand upon this to our customers’ benefit,” Availon joint Managing Director Ulrich Schomakers said. “We regard the fact that we provide full

maintenance for almost 40 percent of the 2 GW portfolio as confirmation that we have chosen the right path.”

Availon GmbH is the first independent wind turbine service provider which has been fully certified by Germanischer Lloyd for all processes required for service provision. Its proactive, all-inclusive service for wind turbines covers the entire operational value creation chain, ranging from remote monitoring, maintenance and spare part supply through to troubleshooting and turbine optimization.

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## SIEMENS TO OPEN REMOTE DIAGNOSTICS CENTER AT SERVICE HQ IN DENMARK

*When online, the new facility will monitor more than 7,500 turbines globally*

Siemens Energy Service has broken ground on a highly-advanced remote diagnostics center for wind turbines, located at the company's wind service headquarters in Brande, Denmark.

Upon completion, scheduled for autumn 2014, the 1,400 square-meter facility will be one of the most advanced wind turbine remote diagnostics service (RDS) centers in the world. It will host advanced diagnostic operations and monitoring services for more than 7,500 installed Siemens wind turbines worldwide to proactively keep the units operating at their optimum levels of performance.

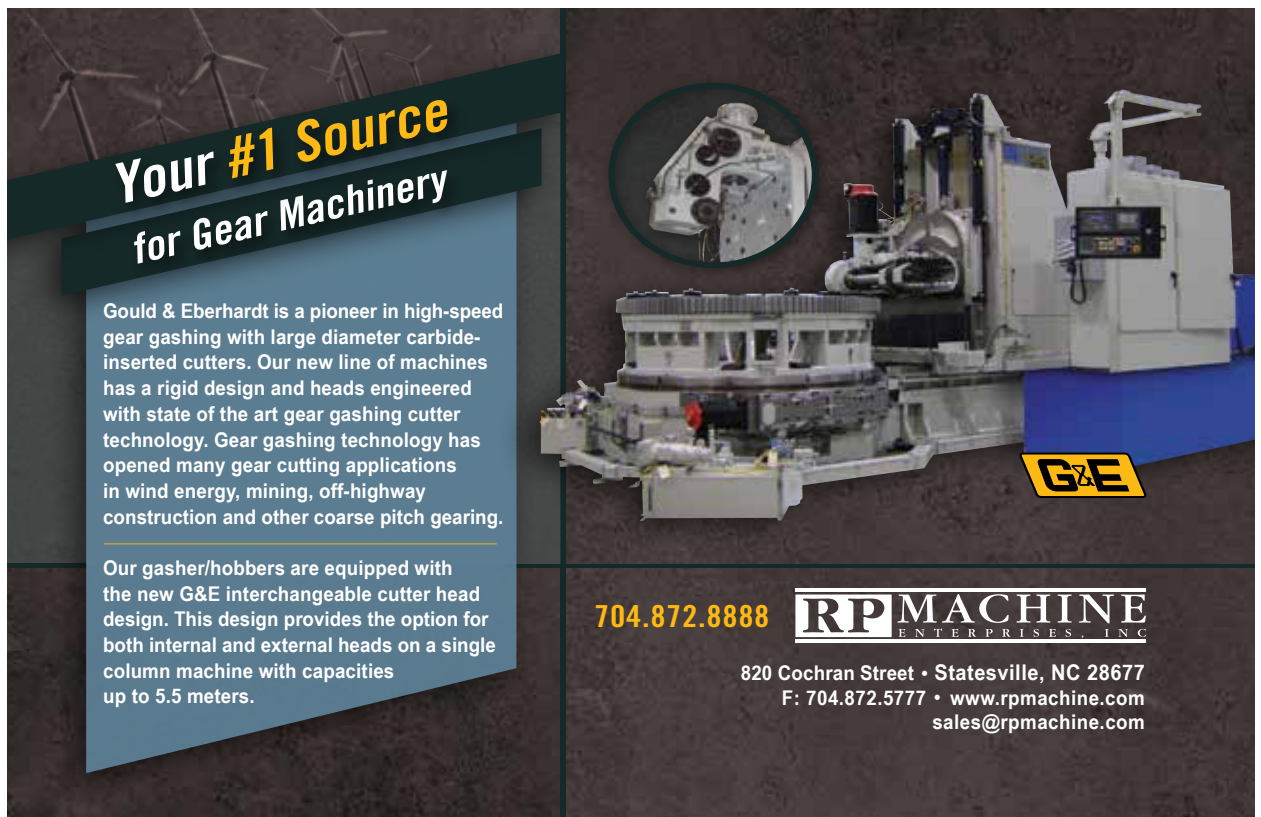
"As a global leader in the operation and maintenance of wind power plants, it is important for us to continue to advance our services and innovations to meet our customers' needs," said Torben Bang, Head of Siemens

Wind Power Service. "Our highly advanced, industry-leading RDS operations enable us to support those efforts by monitoring our global Siemens fleet 24/7/365 and flagging potential issues before they become serious. Remote diagnostics is a key component of a smarter and integrated service approach that helps our customers lower the overall cost of energy.

Remote diagnostics is an important part of Siemens' portfolio of value-added services. Monitoring experts can solve more than 85 percent of all alarms remotely without a service team doing trouble-shooting onsite. Reduced downtime and lower number of turbine visits result in a higher energy output. With vibration diagnostics Siemens can find even the smallest indicator that something may not be operating normally and follow up by

recommending proactive solutions before the issue becomes serious. Furthermore, we are able to analyze the data collected to draw trends on individual turbines as well as the overall fleet. The results contribute to enhanced current and future designs and improves existing turbine performance over the long term, thereby lowering the cost of energy.

After testing in 1998, Siemens installed the first condition monitoring system for wind turbines in 2000. Since then the company's expert team in Brande has continuously developed the technology. In establishing the new remote diagnostics center, Siemens further advances its monitoring and diagnostic capabilities and bundles expert knowledge in one place. The new building will also include a dedicated customer area.



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