



In medium- and high-speed wind turbines, a torsional damper, the Geislinger Vdamp® is integrated directly to the gearbox and effectively reduces noise emission from wind turbines

Powertrain technology for enhanced wind drivetrains

With the Geislinger Compowind® coupling the Austrian-based company sets new standards for the wind drivetrain technology. Lightweight, fatigue-resistant, and maintenance-free composite membranes virtually absorb all bending moments and allow the gearbox to be rigidly attached to the main frame. Therefore, not only is the gearbox relieved from unnecessary loads, but the dynamic system behaviour of the wind turbine is also enhanced beyond comparison.

Gearbox loads become predictable and fatigue loads are virtually eliminated. This results in the highest reliability and availability of the wind turbine and increases their profitability. Since 2016, several European offshore wind farms have been equipped with a Compowind® coupling and wind power has become an important business segment for Geislinger.

Gearbox load

The use of flexible low-speed shaft (LSS) couplings in wind turbines is still an innovation, normally, the gearbox is mounted in such a way as to compensate for structural deflections, in marine propulsion it is state-of-the art: to safeguard the drivetrain and prevent the gearbox from unnecessary

loads, the gearbox is always rigidly attached to the hull, whereas an elastic coupling absorbs offsets, stemming from flexible mounted engines.

The restoring force, the magnitude of force, which a coupling applies to the gearbox shaft during every misalignment, is key to low gearbox loads in order to avoid

parasitic non-torque loads. In order to obtain the lowest possible restoring forces, Geislinger developed elastic couplings over 25 years ago. These are based on durable membranes and made of advanced fibre composites and called the Gesilco® product line. Compowind® was developed based on this vast experience in development, engineering and calculation of the length of life of torque-transmitting composite elements.

Founded in 1958 by L. R. Geislinger, the young engineering consultancy firm developed a torsional, elastic coupling, along with calculation methods for the reproduction of torsional vibrations in internal combustion engines. Back then, the tuneable, all-steel torsional elastic coupling was a game changer in the marine propulsion industry.

Ten years later, in 1969, the Geislinger torsional damper was introduced to the market. Both products have been continuously developed and still represent the backbone of the Austrian technology company.

In the early 1990's Geislinger developed a lightweight, fatigue-resistant and maintenance-free elastic coupling based on advanced composites. The first product was introduced to the market in 1995, followed by the first composite shaft to propel fast light-weight vessels. Today, the composite product line is known to the marine propulsion industry as Geislinger Gesilco® couplings and shaft lines.

Innovation and engineering expertise were the foundation of Geislinger and still today, research and development play a vital role for the philosophy of the company: Approximately 10 percent of the turnover is reinvested in this key segment year after year. The company, headquartered in Salzburg, Austria, is being run by the third

generation, Cornelius and Matthias Geislinger, together with Torsten Philipp. Adrian Geislinger, the fourth generation joined the company in April last year.

Proven technology

Compowind® has been developed from over 25 years of experience in engineering and manufacturing composite marine propulsion couplings and shaft lines, including a reliable lifetime prediction of torque transmitting elements made of advanced compounds. Specific work on the LSS coupling began in 2012. This included verification of calculated results, against comprehensive measurements on a scaled prototype and the development of product specific process technologies.

Striving for deep vertical production integration and having full control over key technologies and processes has always been a major aim for Geislinger: the huge factory in Bad Sankt Leonhard in the South of Austria provides a production area for its steel parts, Geislinger couplings and torsional dampers, as well as dedicated halls and areas for composite production.

All components are manufactured in house, only blanks, standard parts and commodities are from other suppliers. All key components are manufactured, produced and shipped to the headquarters in Salzburg for final assembly. Composite production, special mould, for cost effective resin-to-mould, processes were developed and manufactured in-house.

€50m investment

On its 60th anniversary Geislinger announced a €50 million investment within three fiscal years in the two facilities in Austria and into the operations in South Korea. Thus, strengthening the competitiveness of

Geislinger on the global markets, to pave the way for increasing commercial demands, and also to serve new customers with new applications. Part of this investment into Geislinger's future was also to double the composite production area.

Sustainability is a real aim at Geislinger: the company has its own solar energy supply to the modern and energy efficient facilities and offices. Thus reducing its CO₂ emissions. By using 100% electricity from renewable energy sources in Austria, the company supports all available ways to protect our valuable environment.

Reusable transport packaging is used, or it is made from renewable materials for worldwide shipments. Modern and efficient LED lights have been installed in all office and production areas to further reduce the energy footprint. Wastewater is treated and re-used, which significantly reduces the amount of fresh water required.

The production area was increased and the company also followed the latest standards for bright working areas with large windows. Likewise, the office buildings at the factory in Bad Sankt Leonhard were renewed. The new, innovative office building was opened with a big celebration in 2016.

The concept of the headquarters in Salzburg is open space, and aims to be vibrant and dynamic, it was integrated into the spatial experience of the new office building. 'The bold and daring architecture of our new office building is in keeping with our mission statement 'Leaders in Engineering' and gives the location a distinctive look,' explains Cornelius Geislinger. It is important for management to create working areas that meet the most up to date standards and provide employees with a space where they feel comfortable.



Geislinger Compowind® is a fatigue-resistant, maintenance-free LSS coupling for next-generation integrated medium-speed drivetrains



The courtyard roofed by a glass dome reaching across all floors is part of the ecologically sustainable climate concept of the new building

Noise and tonality

Another innovation underlining their pioneering spirit are products for the sound attenuation of drivetrains. In marine propulsion, structure-borne sounds originate from the engine and the gearbox and is transferred through the powertrain into the structure of the ship. One part of Geislinger's acoustic toolbox is an elastic coupling based on the Gesilco® product line, optimized to minimize the transfer of the structure-borne sound.

Another part is formed by traditional steel products, the torsional elastic Geislinger coupling and the torsional damper. The linear dynamic stiffness of the coupling together, with specific tuning, reduces vibratory torque, resulting in reduced excitation of the structure. Both, couplings and dampers in the gear drives help to attenuate structure-borne engine noise. Geislinger has been developing and supplying solutions for the highest acoustic requirements to such applications for many years.

Transferring this vast experience from internal combustion engines to wind drivetrains, unlocks uncharted opportunities for them to be tonality-free. The first evaluations were carried out with turbine and gearbox OEMs, to assess the potential of different products to be applied to the wind drivetrain, mainly integrated into the gearbox.

Stricter regulations for noise emittance from European onshore wind parks force OEMs to investigate new technologies to reduce noise radiation. Growing wind turbine structures and the need for energy production at low wind speeds, including during night hours, increases the demands on tonality measures. The reduction of the masking energy, thanks to enormous advances in blade

aerodynamics, create new requirements on reduced noise transfer originating from the drivetrain.

This gives rise to new opportunities with operators, gearbox and wind turbine OEMs, as well as project developers and wind park owners to develop gearbox-integrated solutions to reduce drivetrain noise at its origin. More often than not, turbines for future wind parks are selected before the first prototype has been built. This means considerable uncertainty for the project developer, especially for the large onshore

turbines, at wind sites with strict noise regulations.

Using a carefully selected and tuned gear-integrated powertrain component, a tonality-free drivetrain will make sure that every turbine platform fulfils all kinds of site-specific noise codes. Geislinger, with these contributions to the latest requirements, once again demonstrates its leading position in the development of highly innovative and tailored solutions for high performance powertrains.

www.geislinger.com



Impressive structural expansion of Geislinger's location in Bad St. Leonhard, Carinthia – two new production halls, as well as an improved infrastructure for delivery, enhance the efficiency of the production site