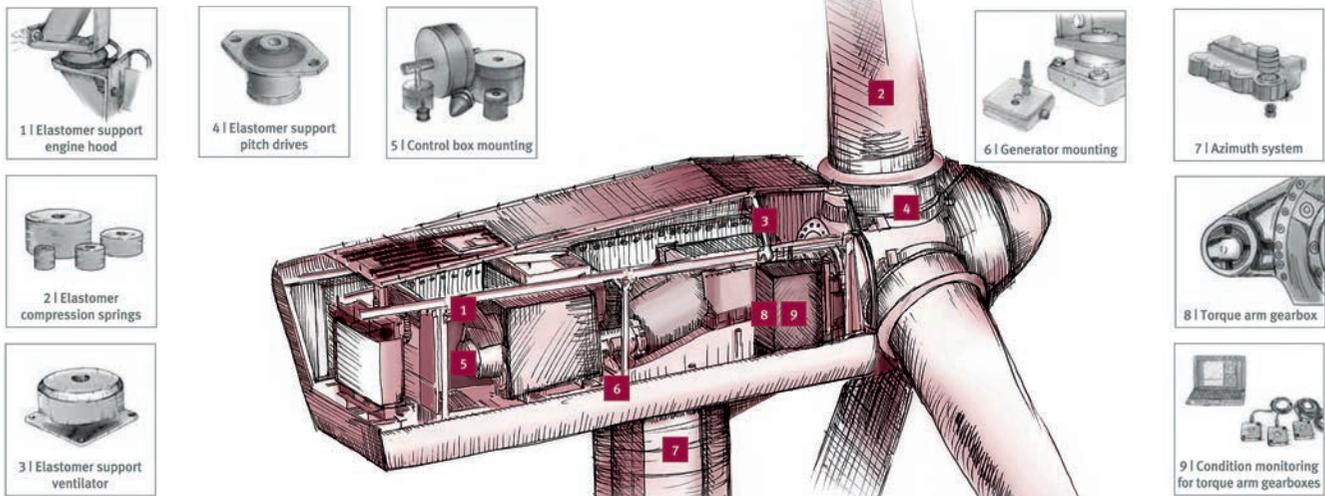


EFFBE: High-performance Urelast® elastomer components with integrated sensors help reduce wind farm maintenance costs

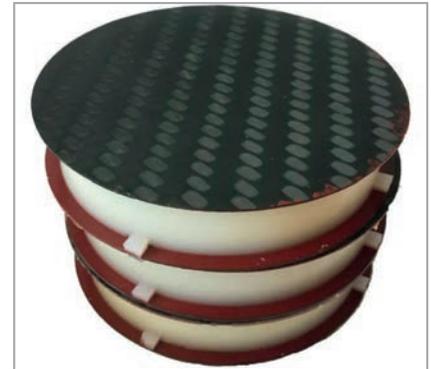
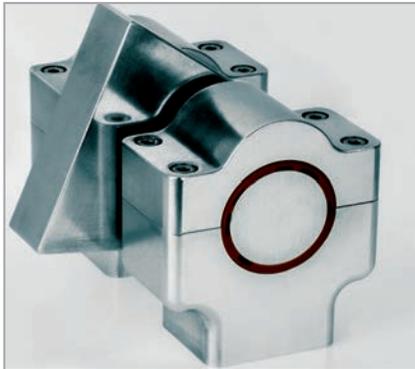
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Model of torque arm support element for 3-point gearbox mounting :
The elastomer mounting made of EFFBE Urelast® UN 90 satisfies all requirements for load-bearing capacity and rigidity for each area axis while requiring little space.

Retrofit kit for gearbox mounting:
EFFBE Urelast®-spring with spring seat for 4-point gearbox mounting

EFFBE Urelast® UN90 components coated with CFRP: high load-bearing capacity, long service life and increased break resistance. Used in the brakes of wind turbine azimuth systems as an alternative to spring disks.



EFFBE GmbH, based in Bad Soden-Salmünster, Germany, has been supplying highly durable elastomer components for wind farms for nearly twenty years. Well over 35000 wind turbines have been fitted with more than 500 000 high-performance elastomer EFFBE Urelast® components. Urelast® components are used as elastomer support elements in the entire drive shaft, including the azimuth brakes and azimuth drive systems, the rotor bearings and the rotor hub, gearbox mountings, generators, control cabinets, couplings, ventilators and ventilation systems, torque arms for gearboxes and drive shafts, weight elements, mass dampers and damping systems.

Reduction in footprint and weight thanks to EFFBE Urelast®
When compared to ordinary rubber-metal

bonds frequently used in wind turbines for gearbox mountings, Urelast® can withstand four times higher loads at comparable dimensions. This is why the size of components made of Urelast® can be reduced by 30 to 40 percent. Furthermore, a reduction in component weight by more than 80 percent is possible due to the elimination of the otherwise necessary metal inserts for conventional laminated rubber-metal parts.

CFRP rather than metal

It is state-of-the-art practice to connect the support areas of elastomer elements to sufficiently rigid bodies in order to influence the spring characteristic. This is an area where EFFBE has also successfully applied weight reduction measures: Rather than using metal parts, EFFBE has combined Urelast® with CFRP materials for the first time. Compo-

nents designed in this way are an alternative to metal disk springs for example. Of further advantage: whereas the breakage of a single disk spring can result in the immediate loss of the entire spring package, Urelast® components are characterized by their "Emergency operation" properties. Even if the elastomer body of the Urelast® springs or dampers is damaged, no sudden drop in force occurs due to the visco-elastic properties of the Urelast® material. This increases the operational reliability of the machines and reduces unplanned maintenance work. Maintenance work becomes more calculable, e.g., for critical areas such as azimuth drive systems and azimuth brakes.

Smart solutions: intelligent elastomer components from EFFBE.
Monitoring with integrated sensors

EFFBE has integrated innovative, yet cost-effective sensors into the elastomer components in the smallest possible space, thus facilitating the monitoring of the loads occurring in the wind turbine. While the recording of actual operating hours and the time the component was installed allow verification to be made regarding time-dependent aging, it is difficult to collect data concerning the physical aging process due to the exposure to dynamic and static loads. Experience gained from long-term field trials involving gearbox support elements for wind turbines has led to findings not only relevant to the acquisition and analysis of data but also to the assessment of data.

Data relevant to the Urelast® spring load transmitted by the sensors allow conclusions to be drawn about the load and the change in position, and hence the wear behavior of adjacent machine parts in the wind turbine.

Conclusive data form an important basis for automated machine control and condition monitoring systems.

Integrated sensors from EFFBE provide additional and above all, conclusive data for proactive machine control systems - the basis for Industry 4.0.

Retrofit kit for 4-point gearbox mounting

Damage to torque arm support elements and gearbox mountings of wind turbines can often be attributed to excessive load peaks as a result of excessive spring stiffness associated with conventional laminated rubber-metal springs.

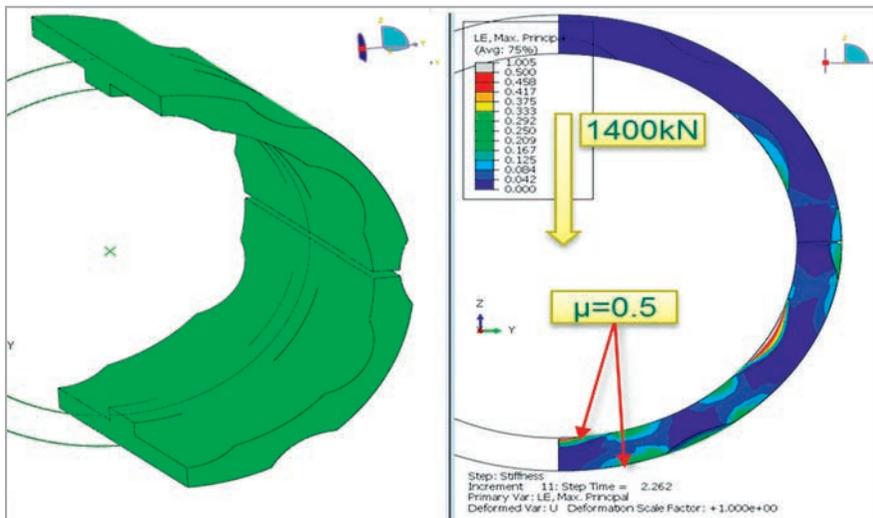
EFFBE has developed a treated, bound Urelast® spring as part of a retrofit kit for a 4-point gearbox mounting. Benefits: Extended service life, reduced wear, improved vibration reduction, reduced spring stiffness owing to as much as 1.5 to twice the spring deflection.

Retrofit kit, D200 x d45 x H40

- Elastomer spring made of EFFBE Urelast U90, embedded in steel spring collar.
- Replacement torque arm support elements for gearboxes for V66RCC, V66VCS, V80/2MW, V90/1.8MW, V90/2MW, G90, G80, G87.
- Vibration damper, D205xd45xh40 for V52 and G5.X

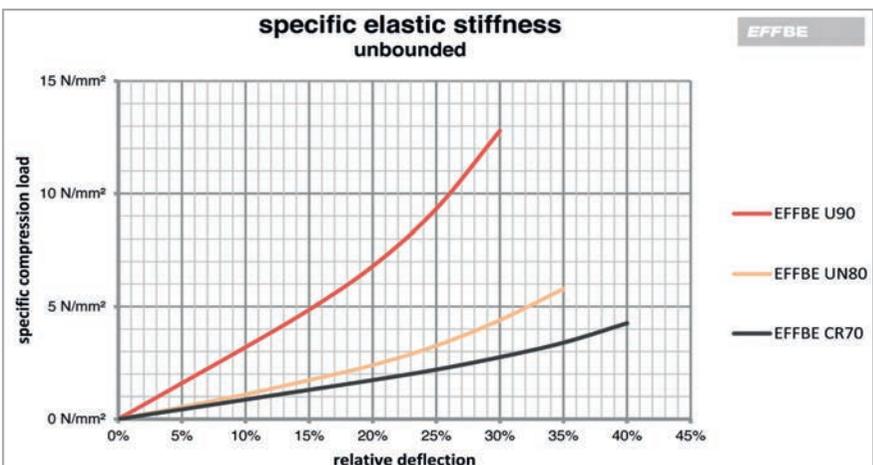
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At top: Using FEM calculations, the design of EFFBE Urelast® components is being optimized and tension peaks are reduced to a minimum, as shown in the example for determining the torque arm bearing for a 3-point gearbox mounting. This type of design does without additional metal inserts in the elastomer and therefore drastically reduces the component weight.

The outstanding elasticity of EFFBE Urelast® U90, even under high loads, is shown in the diagram below. In order to achieve a spring deflection of 15 percent, EFFBE Urelast® U90 components can be subjected to a 5 N/mm² load, whereas rubber parts of 70 Sh A hardness grade can only withstand a load of 1.3 N/mm². EFFBE Urelast® U90 components can thus be sized a lot smaller to significantly reduce the required footprint. Photos / Illustrations: EFFBE



EFFBE GmbH, as a subsidiary of Woco Group, is a reliable business partner for antivibration technology, insulation against acoustic emissions, damping and sealing solutions made of high-performance polymer materials: gearbox mountings, generator mountings, torque arm support elements, mass dampers, clamping bushings, decoupling elements, rubber-metal and rubber-polymer compounds, rubber & PUR, molded parts of rubber and polyurethane as well as diaphragm pressure cylinders. EFFBE and WOCO Group are well-established in the wind turbine industry by offering material-independent, function-relevant solutions and by designing and implementing components that involve a variety of polymers, elastomers and metals. In addition to providing solutions relevant to the core areas of powertrains and sealing and damping applications, WOCO offers further wind turbine specific solutions for acoustic and sealing applications, as well as customer-specific structural parts based on in-house developed materials. Manufacture takes place in company-owned factories according to state-of-the-art standards; inspections and tests are conducted on the in-house test floor (automotive test standard) for virtually all application areas (vibration, insulation against acoustic emission and airborne sound).

EFFBE will showcase new developments in wind power technology at the Wind Energy 2018 exhibition in Hamburg, Germany.

The globally engaged Woco Group, based in Bad Soden-Salmünster, Germany, is a medium-sized supplier of automotive parts and a sustainable, family-owned company with currently well over 5000 employees. The core product range comprises powertrain technology and polymer technology. In the non-automotive area, Woco focuses on anti-vibration systems for industrial applications and rail technology, as well as on functional solutions for measurement, control and pipeline systems.