

Insulated couplings – problem-free for up to 20 years.

Shaft couplings in the drive train of Wind Turbine Generator Systems (WTGS) compensate for the offset between the gearbox and the generator. These couplings must allow a high degree of displacement as the gearbox and also the generator are generally seated on resilient dampers. Coupling manufacturers offer different concepts for the design of such couplings. **ONSERVICE** provides a system solution for the WTGS of KTR Kupplungstechnik GmbH, offering more than just the transmission of torque and compensating for any displacements.

“**S**even or eight years ago, WTGS couplings still consisted of steel transition pieces with plastic sleeves or flanges providing electrical insulation. Dust, oil mist or moisture settling on these sleeves enhance electrical conductivity. Other concepts, such as steering couplings contain integrated rubber elements for electrical insulation. As rubber hardens and becomes more brittle over time, such elements must be replaced after a relatively short period, around every two to five years, which can require a considerable effort. Such rubber sleeves also only provide a relative short section of insulation so that, here too, oil or grease can cause electrical conductivity”, explained Reiner Banemann, Product Manager for Wind-Couplings Division at KTR.

With its multi-blade steel couplings the company, with registered office in Rheine, has developed a system that not only solves the insulation problem but also other challenges in the application between gearbox and generator.

The main components of the coupling are a brake disk, a flexible pack of spring-steel blades, a transition piece with an electrically insulated glass-fibre reinforced tube, housing a sliding clutch as well as a further pack of blades, so that the transition piece is doubly suspended by universal joints. “The key element of this development is the glass-fibre reinforced tube. The concept for this element was derived from the insulator construction sector and therefore represents a real

high-quality solution for electrical insulation which has been tried and tested in the construction of transformers. The glass-fibre reinforced tube has a very long insulation section of 200 to 300 mm and even longer in some cases. This provides an effective electrical insulation for the coupling, even if dust, oil mist or moisture settles on this component”, commented the Product Manager and emphasised that the insulation provided by the glass-fibre reinforced tube would also prevent leakage current on the generator side, which could cause electrical corrosion of the gear teeth. Further advantages are offered by the overload unit integrated in the coupling transition piece in order to save space. A generator short-circuit could, for instance produce consid-



SSB service technician aligning an insulated coupling.

erable torque peaks, continuing into the gearbox and damaging gear teeth. The overload unit absorbs such torque peaks and thus reduces the danger of costly damage to the gearbox to a minimum.

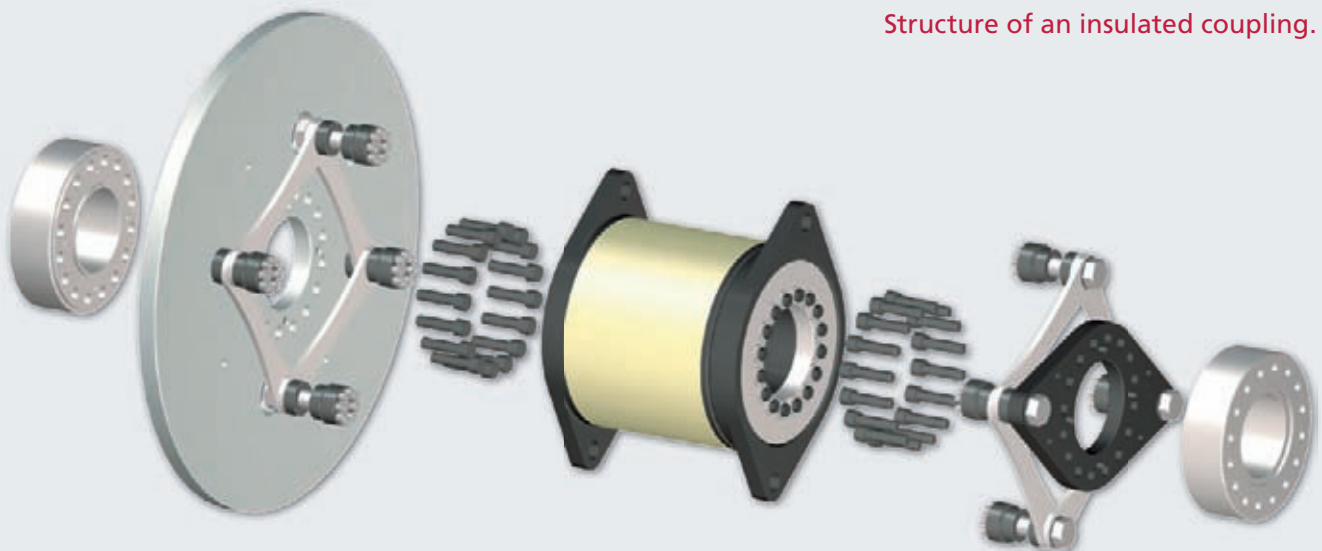
“This overload unit is also, in particular, important during a temporary disconnection from the grid. After reinstatement of the grid stability, the generator may emit a temporary surge onto the coupling when the

turbine reconnects to the grid. Such surges also bear potential risks for the gearbox. In particular in turbines installed abroad (grid stability problems) this generator behaviour has repeatedly caused problems. The slipping unit effectively absorbs such an abrupt surge.”

In general, bolts up to size M42 are used for securing the aforementioned pack of blades. For the assembly and dismantling of such large bolts, large

tools and very high torque rates are required. Because of the lack of space in the nacelle, this is not the best possible solution. Consequently, special tensioning nuts are used from thread size M24 onwards with several smaller bolts guarantying the required pretensioning. In this way, conventional tools, such as a 100Nm torque wrench can be used to manually generate the required pretensioning even for a M30 bolt.

“Our couplings are already tried and tested in over 20,000 installations worldwide and can be used in turbines producing outputs of up to 6MW. The service life of these couplings is approx. 20 years. As during maintenance carried out on WTGS worn parts are replaced anyway, depending on their working life, operators should at least consider at that point in time, whether for older systems not containing the aforementioned coupling with glass-fibre reinforced transition piece, it would not be advisable to replace the entire coupling, especially as the installation can be completed in about a day”, commented Reiner Banemann. “Where a gearbox is replaced or repaired, the risk of a current discharge should be avoided in future and non-insulated couplings should be replaced.” ■



Structure of an insulated coupling.