



Rotor made of light alloy with a ring coil (grey) for offshore application with additional protection by means of a polymer compound (black).

■ **Light Windmills**

As wind power plays a larger part in the renewable energy scene, it is inevitable that innovations in the design and manufacture of wind turbines will appear. And with demand for energy rising, increased efficiency in producing electricity from a turbine is essential. Germany has made a commitment to generate 10,000 megawatts of wind-power on the German coast by 2020. That's why the breakthrough announced last summer by the University of Bremen and the Bremen firm Lloyd Dynamowerke is so remarkable. The university announced a new 50 kilowatt high torque unit (8700 Nm) that weighs up to 75 percent less than previous designs. This is largely because of a radical new design approach within the generator itself, installing more powerful magnets made of lighter materials. According to Lloyd project leader Norbert Götschmann, the results are impressive.

"With this, we can lower the weight of a five-megawatt turbine from, on average, 370 to 100 tons, using a direct drive without gearbox." This lower weight not only impacts on the functioning of the turbine unit, but it makes it far easier to transport, creating further energy savings.

So far, the units have only been tried out on land, but the potential for using them at deep sea locations is obvious, as a lowered susceptibility to interference is chief among the improvements made. An EU research project called Upwind is currently engaged in designing smaller housings and more aerodynamic blades for sea-based wind farm turbines.

The intensity of research around wind power brings new innovations to the market almost daily, and this has also stimulated another sector of the industry, i.e. the firms that will have to manufacture the parts. Add onto that the benefits from the clean power, and it becomes clear that this is a win-win technological solution.

■ **Quiet Windmills**

Wind turbines for electrical power can be controversial additions to the landscape. Some local residents complain that they are aesthetically harmful to the natural environment, but there is another problem solidly based in fact: giant windmills are noisy. The turning of the blade structure to face the wind produces a deep rumbling sound that can be heard at some distance from its source.

This problem has alerted the Fraunhofer Institute for Machine Tools and Remodeling Technology in Dresden to come up with a way to acoustically isolate the gondola - the part which carries the blades and turns - from the tower, which holds it and which transmits the vibrations to the ground. The solution they've come up with involves ceramic pickups (piezoelectric crystals), which expand when connected with an electrical source, using a counter motion to erase the waves detected by a frequency meter. The basic idea, scaled down, also has wider applications for the automotive industry, as it allows the sound of the engine to be isolated from a car's interior.



The round vibration exciter (left), suspended from a crane, induces vibrations in the rectangular iron platform that are similar to those of a wind energy converter. The active damper - located at the center of the platform - reduces these vibrations.

Photos: Lloyd Dynamowerke GmbH and Co. KG; Fraunhofer IWU