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In a bid to increase efficiency and reduce costs, wind turbine developers have produced a number of interesting, and perhaps radical, designs for new turbines, as well as further developed the capabilities of conventional models. This pattern of innovation has examined areas such as materials design, aerodynamics, rotor size and form, and durability. Here are six of the more interesting designs to have appeared recently.

Vortex Bladeless is a company that has developed a bladeless wind turbine that it says has the potential to be more efficient, less visually intrusive and safer for wildlife, particularly birds, than conventional turbines. The RSPB and the Campaign to Protect Rural England (CPRE), both vocal critics of the wind industry, have welcomed the new turbine, which contains no moving parts and is virtually noiseless while also reducing vibration.

The turbine uses the energy of vorticity in which wind bypasses a fixed structure, generating a cyclical pattern of vortices which then causes the structure to oscillate. The new turbine captures this energy via a fixed mast, power generator, and a hollow, lightweight cylinder. There are no moving parts, thereby eliminating the need for lubrication and reducing wear and tear. It is also cheaper and more environmentally friendly.

Dutch tech firm The Archimedes has developed the Liam F1 Urban Wind Turbine for domestic use, generating as much as 80 percent energy from the wind while also being considerably quieter than conventional turbines, compact and affordable. It can also capture wind energy from multiple directions. The turbine features a front-facing rotor but is designed along the lines of the Archimedes screw pump which was used in Ancient Greece to pump water.

The blade is shaped like a spiral, enabling it to swivel and collect wind energy at angles up to 60? from the central axis. The turbine can generate energy from wind speeds of up to 5 meters per second, delivering up to 1,500-kilowatt-hours per year, thereby enabling the supply of about a third to half the electricity of an average Dutch home.

Invelox has been developed by Sheerwind, a company based in Minnesota, USA. It is shaped like a funnel with an omnidirectional intake area that allows wind collection from multiple directions. The wind is funneled through the system and concentrated and further accelerated in the Venturi Effect section of the system.

The Venturi Effect is a phenomenon that occurs when a fluid flowing through a pipe is forced through a narrow section, thereby resulting in a decrease in pressure and an increase in velocity. The wind is then

delivered to the turbine/generators and converted into electricity. The technology utilizes current turbines and rotors but brings them down to ground level, enabling easier and cheaper operation and maintenance.

This is actually a type of rotor blade that can be used in both wind turbines and marine energy devices, developed by a company called Whalepower, whose founder, Dr. Frank E. Fish, noticed that humpback whales use strange bumps on the leading edge of their fins to utilize the fluid dynamics of their marine environment. The company created versions of these bumps on the leading edge of its rotors to overcome the limitations of fluid dynamics. This, in turn, increases efficiency performance and reliability while also reducing noise.

The 2.5-120 wind turbine is a conventional model designed for high performance, reliability and availability and building on the performance of its predecessors. The turbine features a 120-meter rotor with single-blade pitch control incorporating the latest enhancements in load management controls, low acoustic emissions, efficient electrical power conversion, and robust performance.

It was designed for forested areas and low to medium wind sites and offers a 25 percent increase in capacity factor and a 15 percent increase in Annual Energy Production (AEP). This, in turn, increases full load operating hours, improving project economics for wind farm developers.

The DW61 (Direct Wind 61) has been developed by EWT, building on the experience of the DW54. The turbine has been designed to significantly increase output through a larger rotor diameter, resulting from the latest aerodynamic blade designs and advanced control technologies.