Whirlpool water turbine

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The future of energy, most sustainability experts believe, is diverse, distributed, and decentralized. As part of the trend towards microgeneration, a Belgian company has been installing innovative vortex turbines in waterways around the world.

Designed by Turbulent, vortex (whirlpool) turbines are micro-hydro power plants that can be installed in small waterways and are ideal for powering remote or off-grid communities.

Depending on the size of the turbine, each vortex can generate 120,000 to 560,000 kWh per year, which is equivalent to powering 50 to 500 households. If the conditions are right, a network of multiple turbines can be installed in a single stretch of waterway.

Unlike traditional hydropower projects, micro-hydro plants are designed to work in waterways with a low flow (minimum 35 cubic feet per second) constantly available over at least nine months of the year and a drop or inclination of 5 to 16 feet. This means that hydropower can be harnessed from small rivers and canals that were never viable in the past.

The turbines can be installed by unskilled workers, with the process taking about one week. Land next to the waterway is dug up, and a concrete basin is poured. The turbine, which can be transported on a small truck, is then lowered into the basin, and water is allowed to enter the basin and turn the turbine.

So long as the water continues to flow and does not freeze over, vortex turbines produce limitless, free energy 24 hours per day — providing an advantage over intermittent solar and wind power. Each turbine has an operating life of 30 years and features remote monitoring for predictive maintenance and system updates.

Vortex turbines are a type of dam-less or run-of-the-river hydroelectric generator that do not obstruct the flow of water and do not require water storage to operate, minimizing environmental impacts and the risk of flooding.

However, the absence of a body of stored water means the technology has no capacity for energy storage and will stop producing energy if the river flow drops too low during drier months. In this case, micro-hydro plants can be combined with other energy sources such as solar and battery for increased uptime.

What about fish? Turbulent claims that the turbine is fish-friendly due to its low RPM impeller creating low shear stress. This results in a low-pressure vortex that allows fish and other aquatic life to pass through unharmed. Debris up to 10 cm is allowed to pass through without harming the blades, although a trash rack is included to catch larger objects.

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Vortex turbines can provide a return on investment between four and eight years, with a faster payback period where the turbines are used to replace diesel generators in remote communities. Starting at $60,000, their cost is competitive to a solar plant with batteries.

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Web: https://www.hollanddutchtours.nl/contact-us/
Email: energystorage2000@gmail.com
WhatsApp: 8613816583346