# Static wind generator

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Ion wind generators are not commercially available, though working prototypes and proofs of concept have been created. Several prototypes exist in the Netherlands, one of which resides in Delft University of Technology, whose researchers developed some of the underlying technology.[1] Ion wind generators are currently experimental, while conventional wind turbines are the most common form of wind energy generation.[2] But ion wind generators, which have no moving parts, could be used in urban settings where wind turbines are impractical due to vibrational noise, moving shadows, and danger posed to birds.[3]

One of the earliest examples of electrostatic energy generation is found in Lord Kelvin"s Thunderstorm, a device invented in 1867. Similar to ion wind generators, the Thunderstorm used water to carry charges and generate energy through related principles. However, the Thunderstorm relied on the force of gravity and two oppositely charged reservoirs to generate a voltage difference.[3] Though they are not identical in operation, Lord Kelvin"s Thunderstorm demonstrates the behavior of water and concepts of electrostatics that underpin modern ion wind generators.

Ion wind generators use the force of the wind to move charged particles, typically water, against the force of an electric field. This increases the potential energy of the particles, which can be likened to moving a mass upwards against the force of gravity. The method of collecting the energy varies by implementation.

The design of ion wind generators eliminates the intermediate conversion of mechanical energy undergone in wind turbines. Wind turbines use the kinetic energy of the wind to rotate several blades about a rotor. The rotor"s mechanical energy is converted into electrical energy by an electric generator.

Conversion between different forms of energy necessitates some energy loss, either to the environment or in a useless form, and fewer conversions improve theoretical output.[5]

Researchers from Delft University of Technology devised an equation to model the behavior of the water droplets as they move through the air in order to optimize the system mathematically and run computer simulations. For the purposes of the model, a simple electrode configuration and uniform electric field is assumed, wherein the electric force exerted on the particles will be directly opposite that of the wind.

Each particle is acted upon by the force of gravity,

There are two mainstream implementations of ion wind generators. The first, patented by Alvin Marks in 1977, was a twofold device comprising a charging system and separate collector. The EWICON is a derivative

of the design that allows the system to function without the need for a separate collector.

A grounded charging system produces a cloud of charged particles. The wind carries the particles toward a conducting collector. The collector is insulated by its non-conducting mechanical support. Though the collector is initially neutral, the particles transfer their charge upon contact, increasing the collector"s potential energy.

The charged particles and the collector, now also charged, form an electric field which exerts a force on the particles in the opposite direction of the wind. Though the force of the wind initially exceeds the force of the electric field, the continuous flow of particles increases the force of the electric field. The force may become strong enough to move the particles back towards the charging system, or they may simply pass by the collector. The particles which never reach the collector do not contribute to the net energy generation.

The system performs at maximum efficiency when all particles reach the collector. Adjusting variables such as wind speed and collector size can improve the performance of the system.[4]

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