Waters Wind Turbine

The Waters Wind Turbine represents a revolutionary breakthrough in wind energy.

Conventional wind turbines are limited by an industry wide assumption regarding aerodynamic efficiency. This has led to the most efficient designs looking like propellers with long thin blades. Most of the work is performed by the tips where the blades have the most optimized airfoils and the most leverage. The inner half of the blades obviously produce very little torque and the center region produces no torque at all. The result is that energy is not extracted from most of the wind that passes through the wind turbine blades. This is still recognized worldwide as the most efficient design.

So how can the Waters Turbine be third party tested by both a NASA aerodynamicist and a thermodynamic physicist at over 120 times more efficient than the most efficient wind turbines in the world? If this was possible it would revolutionize the wind industry.

To quote a former Vice President of **Vestas**, one of the largest wind turbine manufacturers in the world,

"For years we worked on improving efficiency by a few percent by improving airfoils, materials and tip design. After seeing the Waters turbine I realized that everything we were doing was wrong".

To understand this new principle? Let's start with the Betz limit.

The **Betz limit** defines the maximum theoretical efficiency that a wind turbine can achieve at 59.3%. This is also based on the total available energy of the wind at a given speed. All current commercial wind turbines are designed based on the same assumption and most wind turbines are considered to be 34% to 45% efficient.

The Betz limit is based on the obvious assumption that extracting energy from wind will reduce the speed of the wind. What the Betz limit ignores is that you can also increase the speed of the wind prior to extracting energy with no penalty. Double the wind speed and the available energy increases by 8 times.

The ironic fact is that wind turbine **locations** often benefit from this principle but not wind turbine **designs**. Wind farms are often situated along a ridge facing a prevailing wind because a ridge increases wind speed. A ridge is an obstacle. Wind velocity is forced to increase as it flows around obstacles. In other words, a ridge uses drag to increase wind velocity.

The mistake is in assuming that wind turbine efficiency is the same as aircraft efficiency. In reality the goal is exactly the opposite. An aircraft has to penetrate air. A wind turbine is anchored to the ground. The faster an aircraft travels the more drag it creates. The faster the wind blows the more energy there is. In both cases, Drag or Energy increases roughly by the cube with velocity.

An efficient aircraft wing minimizes drag and maximizes lift. This is expressed as the lift to drag ratio or L/D. Modern sailplanes can exceed a 60/1 ratio, travelling up to 60 feet forward for every 1 foot of altitude lost by using long thin wings. In a wind turbine, L/D efficiency may still apply to how the energy is **extracted**, but does not always determine how the energy can be first **amplified**.

The mistake made by the entire global wind industry has been to assume that efficiency is only achieved by reducing drag. The Waters turbine (WWT) first **uses** drag to increase available energy prior to extracting it at high efficiency.

This is accomplished in a 3 stage compressor. The first stage creates an obstacle like a ridge, forcing and accelerating the air towards the blades which are mounted at the maximum point of leverage, using the wind turbine design itself. The second stage compresses air as it passes through the blade system, creating a high velocity jet flow that creates thrust to move the turbine at right angles to the wind flow. The third stage is the difference between the high velocity air leaving the peripheral blade disk and the low pressure created by the area behind the wind turbine. All of these regions are driven by the motion of air over and around the total system. The design simply manipulates lift, drag, temperature and pressure to maximize the energy that can be extracted. A conventional wind turbine only uses lift, while considering drag a liability..

Opportunity

The business opportunity is significant. This design can be made far smaller than conventional wind turbines. Operation is almost silent. There are no bird strikes. Manufacturing, transportation and installation is far easier and resultant cost is obviously far lower than existing designs. The greatest advantage is that since the WWT draws energy from an accelerated air stream, far lower wind speeds can be used effectively.

This means that we can upgrade existing wind turbines and wind farms, increasing profits and output across a far greater range of weather conditions. This also means that there are orders of magnitude more suitable sites for cost effective operation. Finally, the WWT does not require construction of extremely expensive molds to produce massive blades that cause a transportation and logistical nightmare for most locations.

The WWT represents a revolutionary step forward in wind turbine design (and water turbine design). There are no technical challenges remaining to take this breakthrough from prototype to manufacturing, global distribution and implementation. The process is conventional and simple.

The Waters principle works at any scale from simple rooftop designs to full-scale wind farms and existing wind farm conversion. This design represents a significant opportunity to revolutionize the economics of the entire wind industry.

Process
Small prototypes have already been built and extensively tested. CFA and wind tunnel tests have been performed by 2 3rd parties. The next step is for us to run a full CFA optimization for manufacturing. This gives us critical efficiency and design data to produce tooling and parts for various sizes and markets. It also positions us for negotiations, licensing and strategic alliances with the wind industry. The goal is to collaborate, not compete with, existing infrastructure, significantly improving wind industry market share, productivity and profit potential.

As an application example, GE launched a program called EcoROTR below. This full scale retrofit experiment yielded a 3% increase in performance by deflecting wind flow away from the hub, gaining a small amount of torque. Even this small gain is being touted as a state of the art game changer. This is important because it demonstrates the feasibility of adding our wind turbine to existing turbines. Simply replacing GE's dome hub retrofit with the WWT would obviously produce considerably higher gains, potentially more than doubling output rather than adding only 3%.

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