

Tech Brief: Efficient small wind power, without turbines

Humdinger Wind Energy, LLC has successfully demonstrated the first efficient turbine-less wind generator on the small scale.

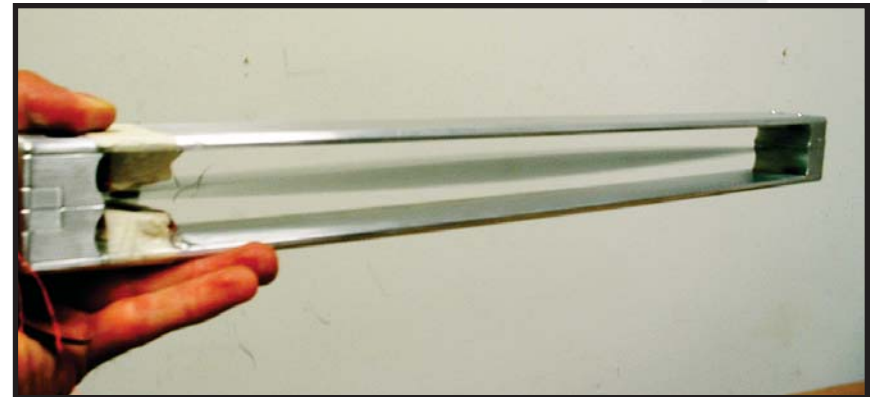
Shawn Frayne, founder of Humdinger, explains, “For the past thousand years, wind power has centered around rotation. Rotating dutch wind mills for pounding grain, rotating sail designs for pumping water, and most recently rotating turbine-based generators for creating electricity. These approaches work well for large-scale applications. However, on the small-scale, rotating systems are very inefficient -- close to 1% efficiency. That’s why there is nothing on the wind power market in the milliwatt through the 100-watt range. Can you imagine if there was nothing in the sub 100-watt range for solar! The reason for this hole is that most research groups are stuck on shrinking turbines, but they are finding that doesn’t work so well.”

Humdinger is taking a different approach. If traditional turbines are like spinning airplane wings, Humdinger’s technology is more akin to the vibrating bow of a stringed instrument.

The new technology is known as a “windbelt”™. The invention was originally developed to provide very low-cost electricity to off-grid, rural areas of Haiti, with other applications coming more recently.



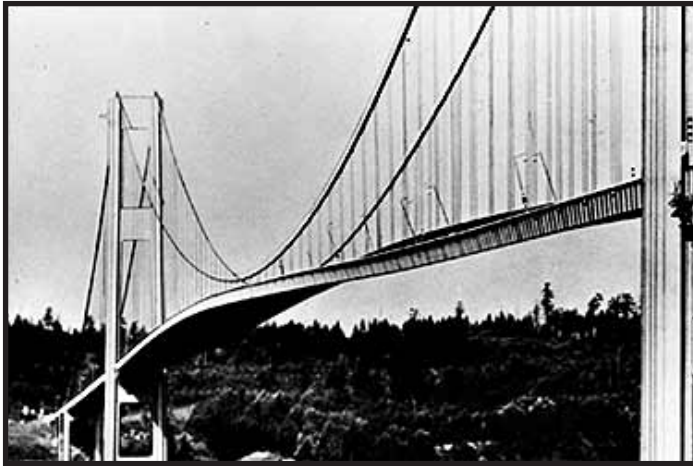
The next generation of wind power?



A prototype designed for powering wireless sensors, white LEDs, cell phones, and radios, in 10mph wind.

“The original goal was to make a very small-scale wind power and WLED system that could compete with kerosene lighting,” Frayne recalls. “Basically, I wanted to power several white LEDs with a system that was under US\$10. Surprisingly, turbine-based generators couldn’t meet the economic and manufacturability benchmarks. It turns out that’s a fundamental limitation for turbines, they don’t scale down well. And that’s what forced the development of the windbelt, these difficult constraints.”

Humdinger’s new wind technology works by capitalizing on an effect known as aeroelastic flutter, most famously exhibited in the Tacoma Narrows bridge collapse. Typically, and for obvious reasons, this flutter instability is something that engineers aspire to eliminate from a bridge, or a wind turbine.



Tacoma Narrows Bridge, 1940

However, Humdinger has shown that this flutter phenomenon can be reformed to help harvest the wind. In laboratory tests, small, flat windbelt prototypes have produced 30-40 mW in a 10 mph wind, for hundreds of hours. At the scales and wind speeds concerned, this translates into the windbelt technology being 10X more efficient than the published state of the art in micro-turbines. The windbelt has also demonstrated its ability to run radios, power transmissions from wireless sensors, re-charge cell phones, and light white LEDs, in low wind speeds of 5-14 mph.

Moreover, this new wind power technology could conceivably be manufactured anywhere in the world. “There aren’t any specialized materials or manufacturing processes required to make windbelt generators. All of the components are off-the-shelf,” Frayne explains. “It’s not like photovoltaic technologies that required the development of large silicon processing plants before anyone could even think of mass-manufacturing solar cells. Because of this unique advantage, I think in three to five years windbelts of the scale needed for rural lighting will be produced within Haiti and in other developing countries. When the manufacturing process is fully worked out, I don’t think it will be any more complicated a process to make a windbelt than it is to print a newspaper.”

Humdinger estimates that the unit cost of production-level quantities of the technology will be between US\$1-5, for a windbelt that is scaled to power a couple of high-intensity white LEDs or charge a cell phone. Field trials are planned in the U.S. (for wireless sensor applications) and in Haiti (rural lighting, radio, cell phone charging) for early 2008.

Humdinger Wind Energy, LLC is based out of Honolulu, HI and Mountain View, CA. Humdinger is a company founded on the principle that the key technologies of the next fifty years will be invented in developing countries. Harder problems, better inventions.

Any questions and comments should be directed to:
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Legal Notice:

The windbelt technology has U.S. and PCT patents pending. The intent is to license the intellectual property within the US, Germany, and Japan in the new sector of “consumer” level wind power – using wind power to run applications such as wireless sensor nodes. This will generate the funds necessary to travel the much longer road of building an international business for the windbelt in developing countries.

However, because of the one-nation nature of patents, anyone working outside of these patent pending countries is free to refine, use, manufacture, and sell the technology.
For the work that IDDS is focused on, this means the technology is open source and free to replicate, improve, sell, etc. in virtually all developing countries.