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How much power from MEMS windmills?

January 20, 2014 // Peter Clarke

A University of Texas Arlington research team has enjoyed considerable publicity for its development of a MEMS windmill that the developers have said could, when produced in array, provide energy for a mobile phone or be used for home energy generation.

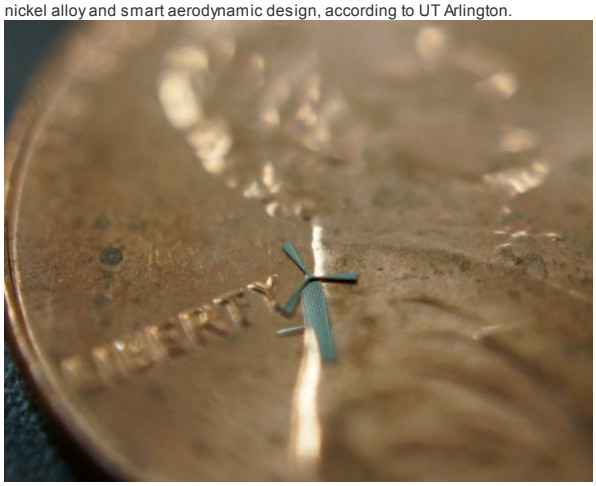
But is that reasonable?

The one thing that is conspicuous by its absence from any of the photographs or the Youtube video of the prototype MEMS windmill, is any electrical wiring. Similarly conspicuous by its absence from the UT Arlington website posting, is any discussion of how much electrical power could be drawn from a millimeter-scale windmill.

In fact it is a general consideration that the efficiency of conversion from wind to electrical power increases the larger the system. Hence the desire to create wind turbines that are hundreds of feet high. So how efficient would an array of thousands of millimeter-scale windmills be? Would it be practical as a source of significant amount of electrical energy?

Nonetheless Smitha Rao and J.-C. Chiao at UT Arlington have designed and built a windmill that is about 1.8-mm at its widest point using a recently formed foundry, WinMEMS Technologies Co. Ltd. (Guishan, Taiwan). The blades are made from nickel alloy using planar multilayer electroplating techniques.

"The problem most MEMS designers have is that materials are too brittle," Rao said, in a statement on the website. MEMS are typically made from silicon. The micro windmills were tested in September 2013 and operate under "strong artificial winds" without any fracture in the material because of the durable nickel alloy and smart aerodynamic design, according to UT Arlington.



Tiny windmills and tiny amounts of power. But how much?

WinMEMS likes the idea and has struck an agreement with UT Arlington whereby the university gets to hold the intellectual property while WinMEMS is licensed to explore commercialization opportunities.

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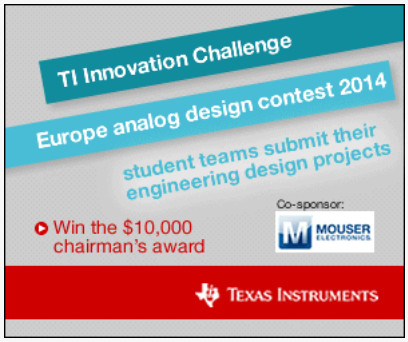

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It is clear that MEMS windmills could be easy to make at the wafer scale and could be produced in very thin redundant structures.

Researcher Chiao said that flat panels with thousand of MEMS windmills could be mounted on the walls of buildings to harvest energy for lighting, security or environmental sensing and wireless communication.

There may be some issues about the most efficient MEMS structure and its orientation within a wall-mounted panel – where the wind passes over the surface rather than through it – but such a discussion can only be had in the context of how much electrical power can be drawn from the system.

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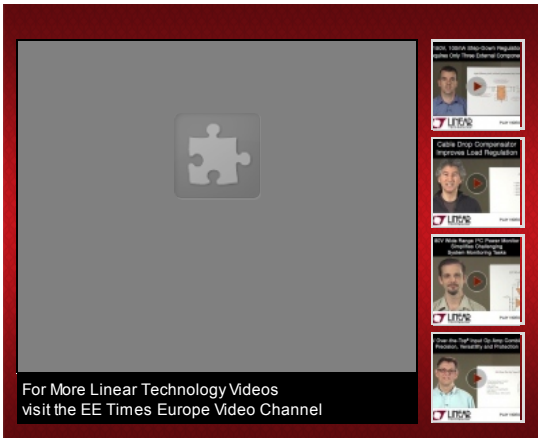

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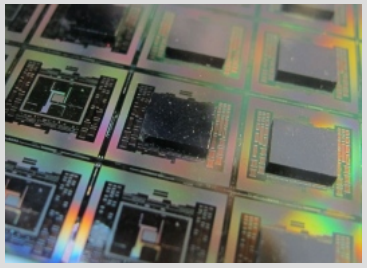

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