Wind turbine to heat water

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Heat generating windmills convert rotational energy directly into heat by generating friction in water, using a so-called "water brake" or "Joule Machine". A heat generator based on this principle is basically a wind-powered mixer or impeller installed into an insulated tank filled with water.

The Eddy Current of Water Heating (ECWH) system introduces a pioneering approach for converting wind energy into heat, marking a significant step in renewable energy technology. The current study focuses on refining the ECWH system by evaluating eight distinct heat generator models.

In the present work, computational studies are carried out to examine the wind turbine driven heat pump system to produce hot water, where four wind speeds analyzed to determine the COP of a heat pump system and outlet water temperature from the condenser.

By Kris De Decker, originally published by Low-Tech Magazine

Renewable energy production is almost entirely aimed at the generation of electricity. However, we use more energy in the form of heat, which solar panels and wind turbines can supply only indirectly and inefficiently.

Solar thermal collectors skip the electricity conversion and supply renewable thermal energy in a direct and efficient way. Much less known is that a mechanical windmill can do the same in a windy climate — by eliminating electricity conversion and by oversizing its brake system, a windmill can generate lots of heat through friction.

Given the right conditions, a mechanical windmill with an oversized brake system is a cheap, effective, and sustainable heating system.

On a global scale, thermal energy demand corresponds to one third of the primary energy supply, while electricity demand is only one-fifth. [1] In temperate or cold climates, the share of thermal energy is even higher. For example in the UK, heat counts for almost half of total energy use. [2] If we only look at households, thermal energy for space and water heating in temperate and cold climates can be 60-80% of total domestic energy demand. [3]

In spite of this, renewable energy sources play a negligible role in heat production. The main exception is the traditional use of biomass for cooking and heating - but in the "developed" world even biomass is often used

to produce electricity instead of heat. The use of direct solar heat and geothermal heat provide less than 1% and 0.2% of global heat demand, respectively [4] [5]. While renewable energy sources account for more than 20% of global electricity demand (mostly hydroelectric), they only account for 10% of global heat demand (mostly biomass). [5] [6]

Electricity produced by renewable energy sources can be - and is being - converted to heat in an indirect way. For example, a wind turbine converts its rotational energy into electricity by the use of its electrical generator, and this electricity can then be converted into heat using an electric heater, an electric boiler, or an electric heat pump. The result is heat generated by wind energy.

In particular, the electric heat pump is promoted by many governments and organisations as a sustainable solution for renewable heat generation. However, solar and wind energy can also be used in a direct way, without converting them to electricity first - and of course the same applies to biomass. Direct heat production is cheaper, more energy efficient, and more sustainable than indirect heat production.