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EXPERIMENTAL STUDY ON DIRECT KINETIC TO THERMAL ENERGY CONVERSION

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ABSTRACT

Modern wind turbines are generally used for electricity generation; however, the final form of energy required by many users is thermal energy. Although electrical energy conversion to thermal energy is a high-efficiency process, electricity generation efficiency from wind turbines is usually low. A wind-powered heat generator is proposed that would convert the kinetic energy directly into thermal energy through the process of viscous dissipation; this process is achieved through the agitation of the working fluid inside a container. This heat generator uses an optimized flat blade turbine (FBT) impeller and a fully baffled configuration. For the experimental study, an electric motor is used to provide the kinetic energy input to the heat generator. A torque sensor, tachometer, and thermocouples are used to measure torque, rotational speed, and temperature rise of the fluid, respectively. Using the measured quantities, the efficiency of energy conversion from kinetic energy to sensible heat energy is determined. Experiments are conducted at different rotational speeds and for different working fluids. The experimental results indicate that the heat generator is up to 90% efficient in energy conversion, and the temperature rise rate increases with an increase in the impeller's diameter and the rotational speed. Furthermore, experiments indicate that changing working fluid does not impact heat generator's performance. A wind turbine can power this heat generator to provide heat to a house or a commercial building. This innovative renewable energy technology would benefit remote areas with cold weather and rich in wind energy.

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