Investigation of the Performance of Home-Made Flywheel Energy Storage Systems

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As fossil fuels become increasingly scarce, the need for alternative eco-friendly renewable energy sources is becoming important. For domestic energy needs, one option is to extract solar energy using photovoltaic solar panels. Most solar-electric systems make use of an expensive battery bank for energy storage. These batteries need to be replaced every 5-10 years, and contain environmentally unfriendly chemicals. The purpose of this project was to research different methods of energy storage that could be used to replace a battery bank in solar-electric and other applications. A flywheel energy storage system utilizing rotational kinetic energy was identified as the most promising candidate. The engineering goal of this project was to build and test a prototype flywheel energy storage system. After initial experimentation, a prototype flywheel was built from components salvaged from old computer hard drives. The discs from several hard drives were stacked on top of one another to create a heavier disc to store kinetic energy when spun at high speed using an electric motor. In order to extract the stored energy, the motor was disconnected from the power source and connected to a resistive load. It then functioned as an electric generator. The flywheel prototype was found to have a relatively high efficiency. Tests showed that the device could deliver more than 50% of the stored kinetic energy into the load resistor. The efficiency was shown to increase when the surrounding air was replaced with helium or a vacuum. The prototype device can be scaled up in size and made more efficient using low-friction bearings in order to increase its storage capacity.

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