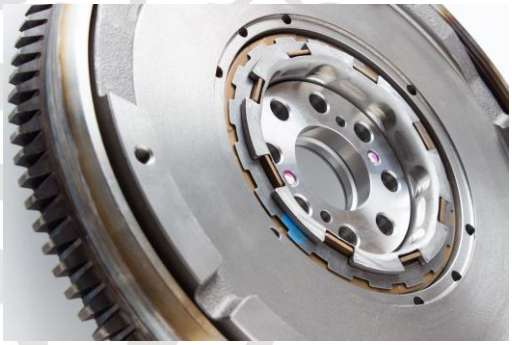

PUTTING FLYWHEELS TO WORK IN SOLAR ENERGY SYSTEMS

Magdy Salama

From steam engines to spaceships, humans have been using flywheels for centuries. These simple wheels serve as batteries by stockpiling excess energy as mechanical motion, spinning faster the more energy they store.

Now, WISE researchers suggest this tried-and-true technology could give photovoltaic systems a boost, addressing two of the key challenges involved in tapping the sun's energy.

Challenge number one is that the sun doesn't always shine when we need energy, creating a mismatch in supply and demand. Problem number two is that passing clouds create rapid voltage fluctuations that can wreak havoc on everything from light bulbs to laptops. Automatic voltage regulators can be used to curb those fluctuations, but they reduce the amount of electricity reaching the grid.

Magdy Salama, Ayman Eltantawy and their colleagues at Natural Resources Canada and PowerStream Inc. have proposed a different approach, using a flywheel to store excess electricity during off-peak periods and also reduce voltage fluctuations.

The system consists of a flywheel, a permanent magnet synchronous machine and three-phase back-to-back converters. The researchers put it to the test in a simulation of a residential distribution network that includes photovoltaic panels.

The model worked. Their simulation revealed that incorporating a flywheel energy storage system can compensate for the fluctuations in output power, thus reducing the need for an automatic voltage regulator. As a result, more electricity produced by solar panels is actually used, extracting maximum benefit from each ray of sunshine.

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