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What Do We Know about Supercapacitors and Why We Need to Know More

For most of us when we think of capacitors we think of the external capacitors used on older Delco and Motorcraft alternators, or the small capacitors on the outside of Denso and some Mitsubishi regulators. Supercapacitors, however, share some of the traits of these older technology capacitors but are a world apart in what they can do.

As an automotive electronics manufacturer Regitar and Mobiletron will be watching the future development of these "mighty minis" very closely. The definition of a Supercapacitor is a device that is a double layer capacitor that has very high capacitance but low voltage limits. They are rated in Farads (F) and store large amounts of energy; this makes them somewhat like a battery but much more efficient. At the present rate of the improving technology they will soon be better choices in some applications for energy storage then the popular Lithium-Ion batteries.

These mighty minis have many advantages of the storage batteries; for example

- They can maintain a long cycle life.
- They can be cycled hundreds of thousands of times with minimal change in performance.
- A life span can be as long as 10 to 20 years!
- Over the service life they will only degrade about 20% from new performance!
- Due to their low series resistance they can deliver high power and load currents to achieve almost instantaneous charging.
- Temperature performance is also strong at both high and low extremes.

For automotive applications they are generally used in groups connected in a series. Some of the current automotive applications are:

- Voltage stabilization in start/stop systems
- Regenerative braking systems

There are many examples of Electronic companies now actively making Supercapacitor vehicle applications.

Skeleton Technology new supercapacitors will be featured in a new transport fleet trial in the UK. They will turn diesel trucks into hybrids through power from regenerative braking systems. During braking, the unit will become a generator recovering energy that normally is lost as heat. This is accomplished by a bank of five high power supercapacitors.

Another company has developed a high power supercapacitor module that provides energy storage for frequent charge/discharge systems in hybrid electric vehicles. The module requires no monitoring because it uses built-in cell balancing.

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Yet another company has developed 48 Volt modules being used in subway cars and trains for regenerative braking systems.

Mazda has their i-ELOOP technology and it performs three functions: 'regeneration,' 'storage' and 'use.' A big focus of the development was how to generate and store electricity as efficiently as possible because the opportunity to do this is only the period when a car is braking or decelerating. In order to develop a system which efficiently recaptures kinetic energy, generates electricity, quickly stores that electricity, Mazda has utilize variable voltage alternator and low-resistance, high-capacity electric double layer capacitor (EDLC).

Unlike a battery that works via chemical reaction, capacitors store energy as electricity and for this reason it can charge and discharge large amounts of electricity very quickly. Using capacitors as electricity storage devices in brake energy regeneration systems not only improves fuel economy, it is also expected to prolong the life span of the vehicles lead-acid battery.

As you can see Supercapacitors will soon be showing up in new vehicles. Since this technology is in its infancy there is no standardization of tests that are used to assure customers of the reliability of Supercapacitors. This will soon change as the usage of them increases.

Advances made in Supercapacitors and energy storage will ultimately lead to more presence of these devices throughout the automotive market. Based on all their inherent advantages, Supercapacitors will help reduce the costs to the customer by minimizing the amount of batteries needed, as well as the frequency of battery replacement.

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