Volume 20, Issue 1 EVAOSD Newsletter January 2010

# Charged Up

**ELECTRIC VEHICLE ASSOCIATION OF SAN DIEGO (EVAOSD)**
**An affiliate of the Electric Auto Association (EAA)**
**2755 Dos Aarons Way, Suite A, Vista, CA 92081**
**Ph: (760) 670-3388 Fax: (760) 266-9505 Email: EVAOSD.Newsletter@DriveGasFree.com**
**Website: www.evaosd.com**

## Officers:

President: Joseph S. Gottlieb

Vice President: Wistar Rhoads

Treasurer: Lloyd Rose

Program Chairman: Joseph S. Gottlieb

Newsletter Editor: Staff

Webmaster: Russ Lemon

Librarian & AV: Lloyd Rose

**Regular Meetings:** 4th Tuesday of every month (January thru November), at 7:00 p.m.

**Location:** California Center for Sustainable Energy
8690 Balboa Ave., Suite 100 · San Diego, CA 92123

**Place:** Main Conference Room

**Next Meeting:** Tuesday, Jan. 26, 2008 @ 7:00 p.m.

**Program:** General Topics

## Inside this issue:



## WE ARE MOVING!

The Eco-center we have grown to love is no longer. They lost their funding and thus their lease. So our meeting location has changed. For January and Feburary meetings, we are going to be located at the California Center for Sustainable Energy (CCSE) at 8690 Balboa Ave., Suite 100 · San Diego, CA 92123.

We will be at this location for the next two meetings. After that, we are moving again (probably the San Diego Auto Museum) then back to the CCSE when available. The CCSE has been very gracious with their space. They have ample parking and a easy location to get too.

## Presidents Message:

No rant this month. I want to start off this year on a high note. All major auto manufacturers have announced electric cars! Let's see if they really put rubber to the road. I know my checkbook is burning up at the chance to buy one of many electric cars in the next two years. I might be setting myself up for disappointment, but the rumblings are starting to look REAL and I want one!

Also, it's that time of year! the time to contribute. Write me something, send me a picture, do something to help us out!

## San Diego Auto Show

Thank you to all the people that helped with the San Diego International Auto Show! It was a great success. Even though the turnout was a bit light, we had good exposure in our location and a lot of interested people. We had a great range of vehicles from classics to speed deamons to economical workhorses. A special thanks to the following: Heinz Lorentzen, Vikki Randle, Michael Kadie, David Grove, David Crowe, Abran Quevedo (Mr. Q), Vince, Lloyd and Flux Power for providing cars and people to get information about electric cars and our club to the public. A special thanks to Lee Campbell for getting our new table banner done, and Tom Delahny for use of his trailer. Oh, and suzette as our guard dog. I am sure I forgot a few.

These shows are the ONLY way the general public get exposed to electric vehicles. They are an integral part of spreading the word. So if you have an EV or have time to spare, help us this year be the best show year yet! Let's keep showing detroit how it's done by real people.

## From the Treasurer:

*Trexa platform lets you develop your own Electric Vehicle!*

Trexa electric vehicle development platform

Yes, I am one of those people who believes that, when it comes to developing an electric vehicle, I could do it better than others. Perhaps I'm just tired of waiting for a product that keeps getting Re-Designed and Re-Delayed !

Well, now you can build your own vision of automotive perfection starting with the new lithium-powered all-wheel-drive platform from "Trexa". Given the scalable nature of this substructure, you can develop a whole range of vehicles! The team that brought us the EDrive Prius has taken that whole "skateboard" idea and combined it with the iPhone app concept and there you have it, a blank "mobile" canvas awaiting your imagination.

Built with carbon steel tubing, aluminum and fiber-reinforced thermoplastics, the modular Trexa platform can contain enough lithium iron phosphate battery modules to carry you 105 miles with dual motors capable of reaching 60 miles per hour in eight seconds. Top speed is said to be 100 mph.

It has impact-absorbing front, rear and side safety structures to help protect you whether you have it outfitted as a city commuter or have it adorned for the weekend with a pickup truck app. There is a 6 kW charger built-in that allows it to go from flat to full in four hours but they also allow access to the main power bus so you could plug into a more powerful off-board rapid charger or, if you want to get fancy, attach a range-extender.

I hope we should see an actual prototype of the platform sometime later this year and I suspect some equally imaginative start-ups are already planning world vehicular domination via the concept.

If you want to keep close tabs on developments yourself, they're already Twittered, Facebooked and have a very cool website ! I wouldn't mind giving it a drive !

# HISTORY Corner by Al Hodges

Supercapacitors or Ultracapacitors

The electric double-layer capacitor effect was first noticed in 1957 by General Electric engineers experimenting with devices using porous carbon electrode. It was believed that the energy was stored in the carbon pores and it exhibited "exceptionally high capacitance", although the mechanism was unknown at that time.

General Electric did not immediately follow up on this work, and the modern version of the devices were eventually developed by researchers at Standard Oil of Ohio in 1966, after they accidentally re-discovered the effect while working on experimental fuel cell designs. Their cell design used two layers of activated charcoal separated by a thin porous insulator, and this basic mechanical design remains the basis of most electric double-layer capacitors to this day.

Standard Oil also failed to commercialize their invention, licensing the technology to NEC, who finally marketed the results as “supercapacitors” in 1978, to provide backup power for maintaining computer memory. The market expanded slowly for a time, but starting around the mid-1990s various advances in materials science and simple development of the existing systems led to rapidly improving performance and an equally rapid reduction in cost.

The first trials of supercapacitors in industrial applications were carried out for supporting the energy supply to robots.

In 2005 aerospace systems and controls company Diehl Luftfahrt Elektronik GmbH chose ultracapacitors Boostcap (of Maxwell Technologies) to power emergency actuation systems for doors and evacuation slides in passenger aircraft, including the new Airbus 380 jumbo jet. Also in 2005, the ultracapacitor market was between US $272 million and $400 million, depending on the source.

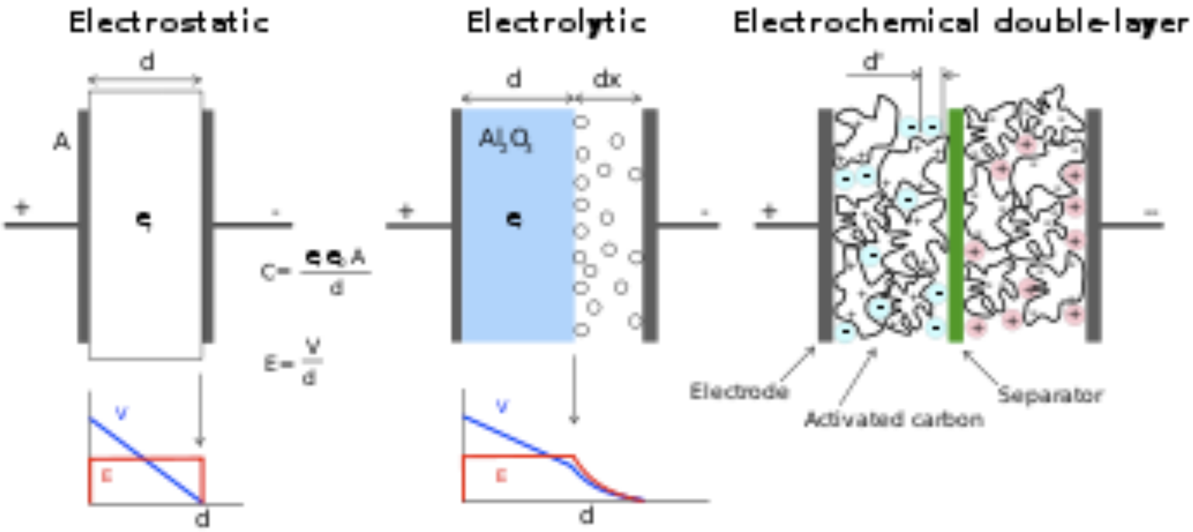
In 2006, Joel Schindall and his team at MIT began working on a "super battery", using nanotube technology to improve upon capacitors. They hope to put them on the market within five years.

----- -

Electric double-layer capacitors, also known as supercapacitors, electrochemical double layer capacitors (EDLCs), or ultracapacitors, are electrochemical capacitors that have an unusually high energy density when compared to common capacitors, typically on the order of thousands of times greater than a high capacity electrolytic capacitor. For instance, a typical D-cell sized electrolytic capacitor will have a capacitance in the range of tens of millifarads. The same size electric double-layer capacitor would have a capacitance of several farads, an improvement of about two or three orders of magnitude in capacitance, but usually at a lower working voltage. Larger, commercial electric double-layer capacitors have capacities as high as 5,000 farads. The highest energy density in production is 30 Wh/kg.

Electric double-layer capacitors have a variety of commercial applications, notably in "energy smoothing" and momentary-load devices. Some of the earliest uses were motor startup capacitors for large engines in tanks and submarines, and as the cost has fallen they have started to appear on diesel trucks and railroad locomotives.[3] More recently they have become a topic of some interest in the green energy world, where their ability to store energy quickly makes them particularly suitable for regenerative braking applications, whereas batteries have difficulty in this application due to slow charging rates. New technology in development could potentially make EDLCs with high enough energy density to be an attractive replacement for batteries in all-electric cars and plug-in hybrids, as EDLCs are quick charging and exhibit temperature stability.

Comparison of construction diagrams of three capacitors.




Left: "normal" capacitor, middle: electrolytic, right: electric double-layer

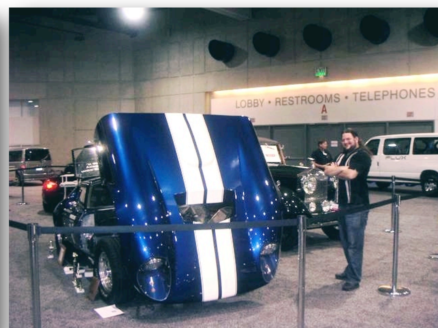
In general, electric double-layer capacitors improve storage density through the use of a nanoporous material, typically activated charcoal, in place of the conventional insulating barrier. Activated charcoal is a powder made up of extremely small and very "rough" particles, which in bulk form a low-density volume of particles with holes between them that resembles a sponge. The overall surface area of even a thin layer of such a material is many times greater than a traditional material like aluminum, allowing many more charge carriers (ions or radicals from the electrolyte) to be stored in any given volume. The downside is that the charcoal is taking the place of the improved insulators used in conventional devices, so in general electric double-layer capacitors use low potentials on the order of 2 to 3 V.

Activated charcoal is not the "perfect" material for this application. The charge carriers are actually (in effect) quite large - especially when surrounded by solvent molecules - and are often larger than the holes left in the charcoal, which are too small to accept them, limiting the storage. Recent research in electric double-layer capacitors has generally focused on improved materials that offer even higher usable surface areas. Experimental devices developed at MIT replace the charcoal with carbon nanotubes, which have similar charge storage capability as charcoal (which is almost pure carbon) but are mechanically arranged in a much more regular pattern that exposes a much greater suitable surface area. Other teams are experimenting with custom materials made of activated polypyrrole, and even nanotube-impregnated papers.

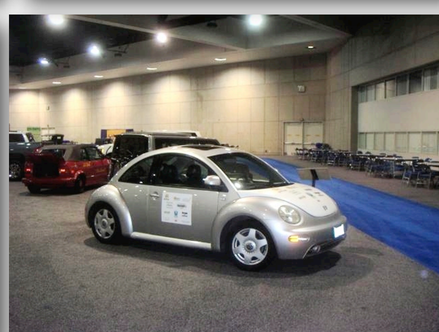
In terms of energy density, existing commercial electric double-layer capacitors range around 0.5 to 30 W·h/kg, with the standardized cells available from Maxwell Technologies rated at 6 W·h/kg and ACT in production of 30 Wh/kg. Note however that ACT's capacitor is actually a Lithium ion capacitor, known also as a "hybrid capacitor". Experimental electric double-layer capacitors from the MIT LEES project have demonstrated densities of 30 W·h/kg and appear to be scalable to 60 W·h/kg in the short term, while EEStor claims their examples will offer capacities about 400 W·h/kg. For comparison, a conventional lead-acid battery is typically 30 to 40 W·h/kg and modern lithium-ion batteries are about 160 W·h/kg. Also, gasoline has a net calorific value (NCV) of around 12,000 W·h/kg, which in automobile applications operates at 20% tank-to-wheel efficiency giving an effective energy density of 2,400 W·h/kg.

Additionally, electric double-layer capacitors offer much higher power density than batteries. Power density combines the energy density with the speed that the energy can be drawn out of the device. Batteries, which are based on the movement of charge carriers in a liquid electrolyte, have relatively slow charge and discharge times. Capacitors, on the other hand, can be charged or discharged at a rate that is typically limited by current heating of the electrodes. So while existing electric double-layer capacitors have energy

## Picture Gallery - San Diego Auto Show







**EVAOSD Newsletter (Charged Up)** is Monthly, covering San Diego County and Southern California Subscription rates: $12.50 per year ($15 foreign, via sea mail) Additional newsletter items can be found on the E-newsletter at www.evaosd.com

**EAA Newsletter (Current EVents)** is a Bi-monthly newsletter of the Electric Auto Association Subscription rates: $39 per year ($45 foreign), **includes** a subscription to the EVAOSD Newsletter. **Please send directly to EAA** using form found at membership@eaaev.org and **indicate** EVAOSD or San Diego Region

Current subscribers have borrowing privileges for the association's video tape and publications library.
Subscribing to the newsletter is optional and is not a requirement for membership.
EVAOSD meetings are always open to any and all interested parties.
New Subscribers, please use this form to register to receive the EVAOSD Newsletter.
Current Subscribers, please use this form to send us any change in your details.

**PLEASE PROVIDE ALL INFORMATION AS YOU WANT IT TO APPEAR FOR MAILING**

*(Please print clearly.)*

NAME ____________________ ____________________ ____________________
First Middle Last

Title(optional)________________________________________

Company (optional)________________________________________

Address 1________________________________________

Address 2________________________________________

City________________________________________

State________________________________________

Zip________________________________________

Home Phone (optional) ( __________) ______________- __________

Work Phone (optional) ( __________) ______________- __________

Cell Phone (optional) ( __________) ______________- __________

Email address________________________________________

Please make check or money order payable to: EAA and reference EVAOSD. Send this form and payment to: Lloyd Rose, EVAOSD Treasurer; 2755 Dos Aarons Way, Suite A, Vista, CA 92081

EVAoSD Newsletter
2755 Dos Aarons Way, Suite A
Vista, CA 92081

STAMP

First Last
Other Street
Other City, Other State Other ZIP

Address Correction Requested