F.V.E.A.A NEWSLETTER

AUGUST 1991

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Newsletter items should be submitted to the Editor by the first Friday of the month.

Nonmembers are always welcome

NEXT MEETING
AUGUST 16th 7:30 P.M. SHARP
Room 157, doors open @ 7:00
Use northest entrance of
Building K, College of DuPage
22nd & Lambert, Glen Ellyn

THE PREZSEZ

A subject to be discussed at the August meeting is the lack of new starts on auto recycling and conversion. While seeking members with cars to participate in the Naperville event, I find we must rely on cars that were converted some time ago. What are the major barriers to new starts? Is it the lack of components, conversion costs, scarcity of candidate cars, or adjustment to $1.20/gallon gasoline and the availability of petroleum supplies major factors? What should the FVEAA provide its members?

Bill

FOX VALLEY ELECTRIC AUTO ASSOCIATION
1018 Jackson Street
Aurora, IL 60505

SOUTH SUBURBAN IL 60459
PM
20 AUG
1991

FIRST CLASS

ADDRESS
CORRECTION
REQUESTED

John Emde
6542 Fairmount Avenue
Downers Grove, IL 60516

MINUETS OF FVEAA MEETING ON JULY 19, 1991

The meeting was convened by President Shafer at 7:35 PM. There were 17 members present and 3 guests attending for the first time, including Douglas Marsh who has moved to Batavia from his former location in Maine. Doug furnished a copy of his book ,"Unplugging Detroit" to the FVEAA and will have copies available at the August meeting for a concession price of only $5.

Treasurer Vana reported a balance of $ 958.68 in the savings account and $ 1940.21 in the checking account.

Members Oviyacht, Stockberger, E.Harris, Woods, Meyers, & Emde reported on FVEAA participation in the Midwest Alternative Energy Fair June 21-23. Fair attendance was about 6000 persons. It was noted that driving requirements for many of the persons attending the FVEAA Exhibit exceeded the range capabilities of the urban cars we displayed. The question of our participation in next year's Fair was not finally resolved and will require further discussion. President Shafer will provide comments to the Fair management.

Vice-President Woods reported on the Naperville event next Labor Day. President Shafer will submit a participation application.

Rod Antrim of RMA Associates, a representative of Advanced DC Motors Co of Syracuse New York, provided a description of series wound DC motors available that company. He noted that two motors are usually used for electric cars; including a 10 horsepower, 72-volt, 6.7-inch diameter unit used for small vehicles and a 19 horsepower, 72-volt, 9.1-inch diameter motor for conversions. He presented a history of the company which evolved from the former Prestolite company which has gone out of business and presented slides showing the manufacturing procedures.

Members questioned the lack of a compound-wound motor with a shunt field, lack of commutating fields in the motor design, their 90% full-load efficiency ratings, and the relatively low rated 5000 rpm with a torque of 10 ft-lbs. His response indicated that they offer a limited choice of motors that are selected for manufacturing standardization, quality, and low price. These motors are available from a number of distributors. If there were a group purchase of at least 25 motors, there might be an opportunity to buy these motors at a price below distributors listings.

Bill Shafer

William H Shafer
Secretary, Pro-Tem

ELECTRIC AUTO ASSOCIATION
CURRENT EVENTS
July 1991 Promoting the Use of Electric Vehicles Since 1967 Vol. XXIII No. 7

Discovered: The Perfect EV Battery

by Paul H. Brasch

How about a $3,000 retail battery that would give you a 200+ mile range per charge (30kwhr) and deliver 300-1,000 cycles yielding more than 50,000 miles of life. You could pull 150-200 Hp out with only about a 10% voltage drop, and it has greater than 90% voltage efficiency (charge/discharge efficiency).

It would weigh less than 500 lbs. and be less than 8 cubic feet in volume, including insulation. It runs at 150 to 200 degrees F (slightly more than hot coffee) and could be recharged in as little as 1 hour, but 6 hours would be reasonable as you can only get about 5 kw from a 220v outlet at 23 amps.

In addition to all of the wonders above - it has the toxicity of the caffeine in coffee and is biodegradable. It has no liquid in it and is self-healing if internally shorted. It is made like a capacitor in the electronics industry.

What is this magic battery? It is not a Zn-air system. (see Zn-air story, pg. 4). It is called a Lithium-polymer battery, and was discovered at Lawrence Berkeley Laboratories (LBL) over two years ago. This is the story of the battery that in my opinion will change the world.

It started about 4 years ago at LBL where researchers who had been working on high energy sodium sulphur battery systems, realized that even if they became operational, they still worked at very high temperatures. They thought for themselves - would they like driving a car that had 450 to 700 degree F molten salts in large quantities in it? Their answer told them to look into lower temperature systems.

In research into organo-sulphur compounds that melt at lower temperatures, they found intriguing polymers. When they applied these polymers to battery technology about 2 years ago, they got ENORMOUS energy and power densities. They quickly patented the invention. DOE and the University of California have licensed the technology to the inventors so that it will not be bought and shelved.

The inventors have formed a private corporation to develop this technology into marketable products. The company is already in place and is called PolyPlus Inc., located in Berkeley, CA. Their first product will be a room temperature battery for lap-top computers.

There are two variations to this Lithium-polymer technology. One is the 180 degree F high power EV form and the other is a low power - though still high energy - room temperature form. This latter is what PolyPlus is working on now for a commercial product. Eventually, given money and proof of market, they will build an EV type and size battery for testing. This is one of only 3 battery systems under consideration for backing by the U.S. Advanced Battery Consortium (USABC) and the first to be looked at.

▶ Continued on page 2

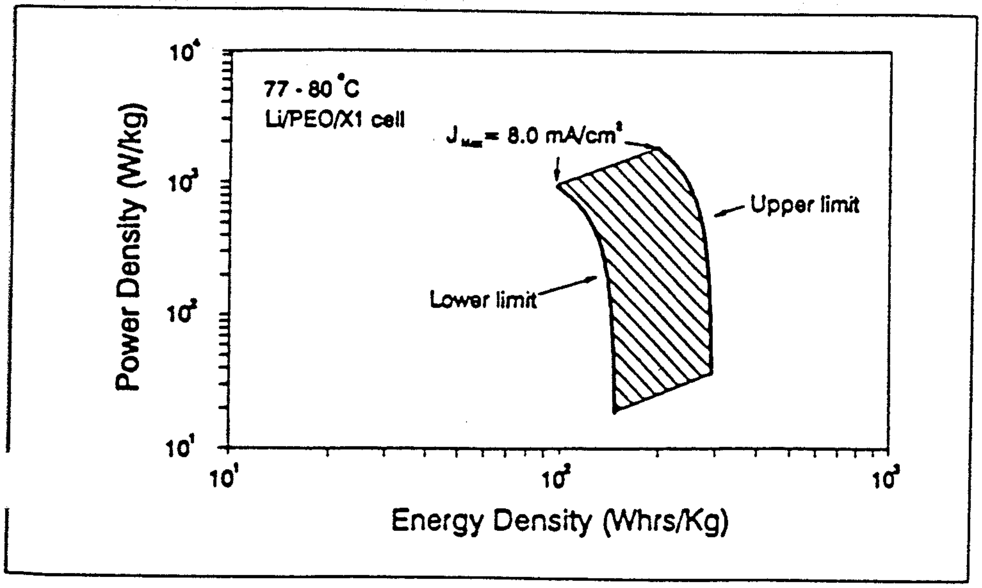

Figure 3 Energy density versus power density

WOW!

Here is a plot of power vs energy densities for the Li-polymer battery

LIPoly

continued from front page

Now lets talk about the details. (See fig. 1)

First of all, there are the current collectors. These make contact with the negative and positive electrodes and conduct the current out of the battery. They are made of metallized mylar, like you see inside a potato chip bag. This is very cheap and made in very large quantities around the world.

The first electrode is the negative, which is a thin film of lithium metal. This is basically non-toxic and environmentaly benign even in landfill. Lithium is used in some medications and is the 6th or 7th most abundant element in the earth's crust.

Then comes the solid electrolyte - Poly-Ethylene Oxide (PEO). This material conducts the ions between the electrodes, just as the acid in a conventional lead-acid cell does, enabling current flow for charge or discharge. This material is biodegradable and is easily made. It dissolves in water and many years ago was used to wrap laundry detergent. You would just drop a packet into your washer - I think it was called Salvo.

Lastly comes the positive electrode, which is the new breakthrough discovered at Lawrence Berkeley Laboratories. Operating on an entirely new principle for energy storage, they developed a novel class of solid-state, organic electrodes. This material uses a protein folding mechanism to store the energy. This is a natural biochemical reaction, but has never been used for energy storage before. These new electrodes are called SRPE (solid redox polymerization electrodes).

This is where the energy is stored - in the making or breaking of molecular bonds (polymerization/depolymerization). When in the charged state, the electrode is a polymer. When discharged, it is a monomer. This is a highly reversible reaction in the right chemical configuration.

This battery uses thin film technology - like Saran Wrap is made. That equipment typically makes 1,000 ft/min. An EV cell is only 4.4 thousandths of an inch thick. All of the materials are cheap and they are mouldable. Although it could be made like a capacitor, it also could be moulded into shapes to fit body cavities. Of course you still have to keep it warm.

The output voltage is about 3 volts and the discharge curve is very flat for all but horrendous power drains. In figure 2 the Jd=2mA/cm2 curve (discharge at 2mA/cm2) represents 1,000 amps discharge at 100 volts for an 18,000 square foot battery, according to my calculations. This is the size of the battery mentioned in the introduction.

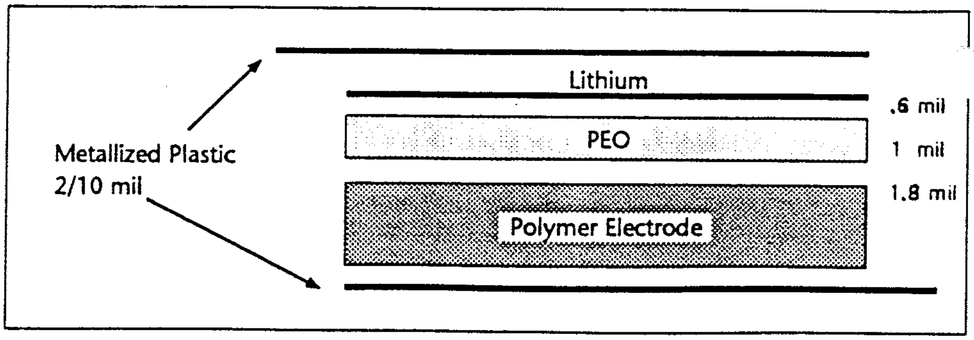

Figure 1 Polymer cross-section, 4.4 mil total

This is of course based on the laboratory cells. These have been discharged to the phenomenal rate of five minutes. (see Jd=10mA/cm2 curve) So even if the production product performed only half as well - it would still allow acceleration like the "Impact" or possibly even better.

Lastly, the estimated cost is about $70 per kwhr wholesale. This compares with about $60/kwhr for lead-acid.

Now where are the bugs? It has not been built and tested for EV use yet, but the scale-up should pose no unforeseen problems. A Canadian firm has scaled up a similar system by a factor of 2,000 from small lab cells with no problems.

On the plus side it exhibits no self-discharge so a charged battery should have a 10 year shelf life. And it can survive 180 deg C. Its only known problem is that it can't tolerate overcharge like lead-acid can. But this can easily be solved with electronics to monitor and control the charge. Also in extremely high rate discharges, thermal control could be a problem. But I feel that this could be addressed through engineering.

In summary, this battery has so much going for it that I am convinced that it or a version of it will help to save this polluted planet of ours. After personally waiting twenty years for this invention to happen I can BARELY wait for the commercial product. Just one or two more sets of lead-acid batteries should do it.

Electrics WILL NOW conquer the world. More power to them! ■

My hearty thanks to Dr. Steven J. Visco of LBL and PolyPlus for the information this article is based on. — Pb.

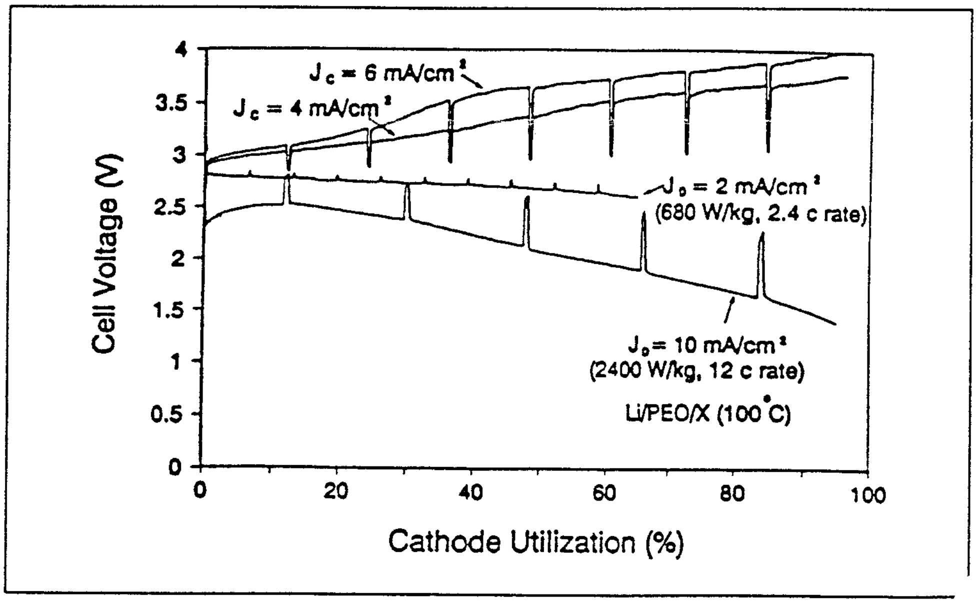

Figure 2 Charge and discharge curves