FVEAA NEWSLETTER

December 1984

PERSONAL FROM THE PRESIDENT

An assessment of our club at the present time presents a big challenge to present members. We have a hard core of loyal members, and we do get some things done in due time, but attendance is low and activities are at a low ebb.

It appears that much can be done to generate interest in club activities.

In order to accomplish the above, I am asking anyone with suggestions for improving the club to contact me at home or "the office" at 759-8033. Many members are not involved in any way and that is a shame to waste these talents.

I would like to suggest some areas of activity we might explore, some of which will be brought up at the December 21st meeting.

First we could use a test stand for controllers, equipped with a motor and instrumentation, which could be transported easily.

Secondly, we should attempt to raise funds to carry out projects that require considerable funding such as our motor, already designed by John Newton.

Thirdly, we should have a project to develop an a.c. drive system for 400 or 60 cycle motors. (Modern aircraft use 35-40 h.p. 400 cy. generators.)

Fourth we should be considering the use of variable ratio transmissions coupled to constant speed motors, which I recall is an objective of the kit car committee. This becomes all the more practical now that G.M. and Ford and the Japanese plan to use them in European cars.

The fifth item could be the development of a controller using FET's.

The sixth item on my list is the compilation of a manual for use by those constructing E.V.'s (using as a basis "EV Engineering Guidebook" by Paul R. Shipps) with a small booklet for answering mail inquiries.

The seventh suggestion on my list is that we have a short lecture on electricity and electronics to take place before, or after, or during each meeting.

If you are not tired by now, we might look toward better do-it-yourself battery chargers.

I hope that every member will contribute something to our car club. Please do not be bashful about writing an article for our newsletter. Bill Schaffer has gotten us off to a good start. Let's not quit now.

Dana Mock

MEETING NOTICE

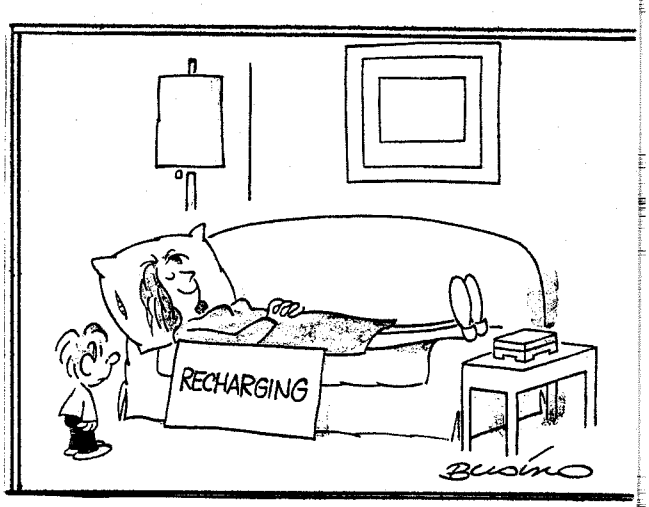
The Fox Valley Electric Auto Association will meet on the third friday of December. (Dec. 21) at 7:30 p.m. in the Mid-America Federal Savings building located at 250 E. Roosevelt Rd. in Wheaton, Ill.

Membership renewal time.

Bill Shafer will continue his discussion on batteries.

John Newton will tell us about his trip to Europe.

Show & Tell - plus more



FVEAA

fox valley electric auto association inc.

624 Pershing St. Wheaton, Ill. 60187

FIRST CLASS

Rev. Dec. 1984

FVEAA

fox valley electric auto association inc.

MEMBERSHIP

A membership in the Fox Valley Electric Auto Association (FVEAA) is open to everyone. Currently there is only one grade of membership regardless of the members degree of participation in association activities. Membership in the FVEAA is contingent upon payment of the annual membership fee. The membership fee can only be waived by special vote of the Board of Directors. Each member in the FVEAA receives a copy of the FVEAA Newsletter each month. They are also entitled to attend and vote at all association meetings.

All memberships in the FVEAA run from November 1 to October 31 of the following year. The dues are $15.00 per year payable at the November meeting. New members joining after November shall pay $1.25 for each month remaining before the following November.

The following form may be used to apply for membership or to renew one.

Date _____

APPLICATION FOR MEMBERSHIP OR RENEWAL

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

☐ Just interested in Electric Vehicles
☐ I have an Electric Car
☐ I wish to build an Electric Car

Amount enclosed $ _____ for _____ months.

Make checks payable to : FOX VALLEY E A A.

Mail to : Mr. Vladimir Vana, FVEAA Tres.
5558 Franklin
LaGrange, Ill. 60525

WHAT DETERMINES BATTERY LIFE

Purchase of a battery for an EV is an important part of a project's cost. The number of 6-volt modules used vary from 6 for a single-string, 36-volt system to 16 for a double-string, 48-volt arrangement. Battery cost can vary from $300 to over $800.

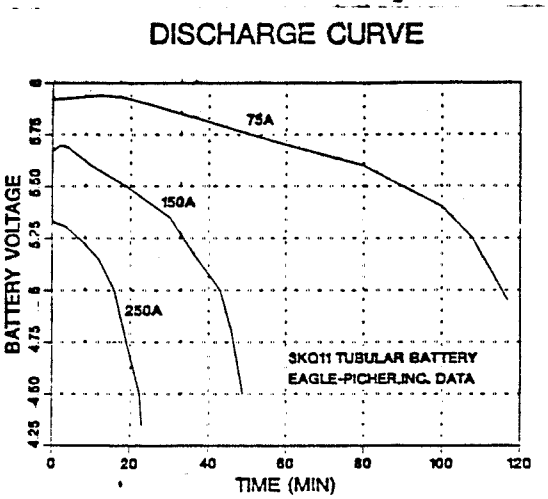
Amortization of the battery during use is the most-costly operating cost, exceeding the 5-6 cents per mile for electricity. Under test conditions to an 80% depth-of-discharge, the usual commercially-available EV battery (Golf cart style) achieves about 200-300 charge-discharge cycles. A 10-unit battery system would have an amortization of 7-10 cents per mile depending on energy consumption per mile of travel.

The EV owner has an economic incentive to extend battery life. To do this, listed are the following factors which contribute to battery deterioration .

Peak Current

The EV battery is designed to maximize stored energy, unlike the more-familar automobile starting-lighting-ignition (SLI) type used in conventional cars. The EV battery is not designed to deliver high currents. The most-frequent application is the golf cart where the vehicle must cover 36 holes in a single day and starts are relatively infrequent (depending on the handicap).

The standard test for golf-cart batteries determines the number of minutes the battery will deliver a constant 75-amps until voltage cut-off of 5.2 volts (Per 6-volt battery). The accompanying chart illustrates how increasing peak currents reduce battery energy delivery.



In an EV, the battery is required to deliver high peaks during acceleration. These can be 3-6 times higher than the rated steady-state value of 75-amps. Repeated high peak currents will cause more-rapid battery deterioration by raising local temperatures in each cell, causing material shedding, and accelerating grid corrosion.

The EV driver can avoid many high peak currents by utilizing the transmission gears to start. An electrical system that incorporates parallel battery strings will reduce cell peak currents.

Deep Discharges

The EV battery will last much longer if the car is not repeatedly driven to its extreme range, especially in the winter. Tests indicate when depth-of-discharge exceeds the 80% design level, battery life is reduced to less than 100 cycles. At extreme discharge levels, differences develop between cells that can only be corrected by extensive overcharging. Also, at these levels there is a risk of cell reversal.

Immediate Recharging & Idle Time

Battery life can be extended by commencing a recharge immediately following discharge. Immediate recharge prevents the growth of sulfate crystals which are formed during discharge. If a discharged battery is allowed to stand, large, hard-sulfate crystals form which are impossible to transform back to lead and lead oxide during recharge. It should be noted that regenerative braking is a type of immediate partial recharge.

Battery life will be increased if it is charged whenever the car is parked. A 1-amp trickle charge is recommend to maintain a fully-charged battery. If you can negotiate "plug-in" approval at work for your EV, your battery life will be extended. Not much you can do about recharging while your EV is parked at the train station parking lot.

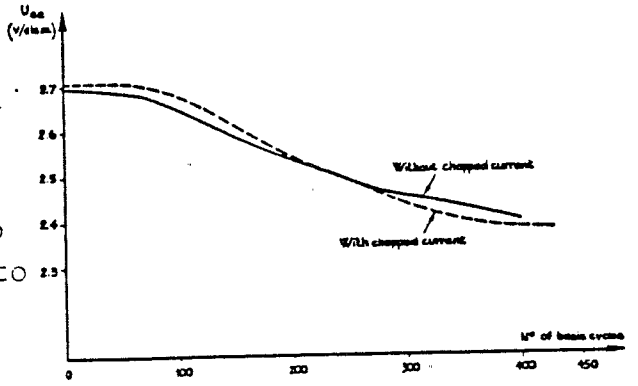
Weekends are made for equalizing and watering. This will bring those weak cells back into line.

Charger Design & Management

Careful attention to the design of the charger and its use will pay big dividends in extended battery life. A charger should contain more than a transformer and rectifier bridge.

End-of-charge voltage declines as a battery ages, therefore the charger should be equipped to adjust voltage. The accompanying curve shows voltage decline with age.

The charger voltage should also be adjusted for temperature. Refer to the two curves included with the previous low temperature discussion.



End of charge voltage versus the number of basic cycles (from Laboratory tests on flat-plate batteries).

Some end-of-charge gassing is necessary as previously discussed. Gassing causes electrolyte stirring within each cell and is necessary also to bring all series-connected cells to a full charge level. Too much gassing will cause sludging, electrode passivation, and transformation of lead to lead sulfate as the higher-density electrolyte is moved upward. This was discussed in last months's stratification article.

Recharge should be complete. Any lead sulfate crystals formed during discharge and not transformed by recharge will act as a starting point for additional crystallization during the next discharge. Residual lead sulfate also favors the growth of large crystals which cannot be eliminated by recharging.

One way to manage an unsophisticated charger is to keep track of the AC energy input (Kwh) and trip mileage driven. The charger can then be timed to return about 115% of the energy consumed between charges and then revert to a 1-amp trickle charge for maintenance. This technique requires observation of gassing onset and a log of data. The amount of charge must be temperature-compensated.

Thermal Management

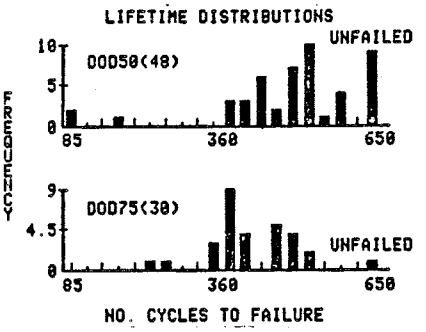
A battery delivers its best performance and has the longest life when cells are around +40C. Design measures that maintain this operating temperature will pay off.

Uneven distribution of cell temperatures is a major cause for different performance from each cell. Keeping each cell at the same temperature is a major design challenge. If all battery units are packed together in one area, the center cells will be warmer than those on the outside during operation and charging. If cells are distributed in the car, front and rear for weight balancing, they will also experience temperature differences.

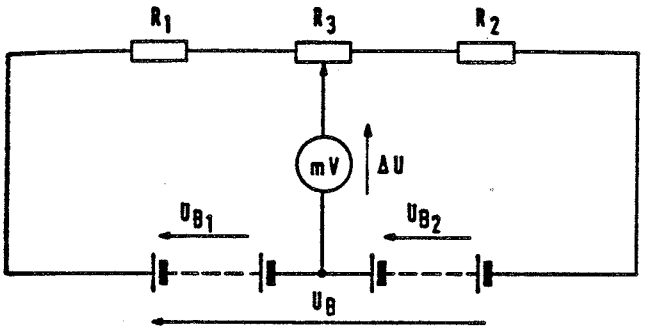
Some suggestions for cell temperature management are forced cooling for the interior batteries, keeping all units in the same location, and enclosing the assembly in a styroform package with controlled ventilation.

Module Monitoring & Replacement

Due to manufacturing variations and other factors, cells do not have a uniform decline and failure characteristic. The accompanying histogram shows the failure characteristic for 48 EV batteries subjected to a 50% discharge depth and for 30 tested to a 75% level. Since cells do not havea "one-hoss-shay" characteristic, detection and replacement of early-failing units can extend the life of the battery as a whole.



The next diagram is a schematic of a simple monitoring system for a 2-string battery pack. Since cell deterioration is accompanied by a decline in voltage, a failing cell can be detected. A lower cell voltage will unbalance the bridge circuit indicating a need for investigation. The circuit also monitors the condition of all inter-connections so a poor connection will also be detected.



Adding Water

Almost nothing will cause more premature cell failure than neglecting to maintain the proper electrolyte level. A low level increases the cell specific gravity which accelerates sludging and grid corrosion. Water should be added before charging. It helps some to give the syringe a healthy squeeze when adding water to promote electrolyte mixing.

Cleaning

If the battery shows signs of collecting sulfate around a post, cleaning with a sodium bicarbonate solution is recommended. These deposits can cause a discharge during standing.

Extended Lay-Up

If the EV will not be used during the winter months, the battery should be fully-charged and equalized first. About once a month, the battery should be given a recharge to compensate for self-discharge. A battery will lose about 1% of its charge per day at +20C. This increases with higher temperature.

William H. Shafer
17 November, 1984

ENERGY OUTLOOK

The electric company that has logged more than 250,000 miles on its fleet of electric cars, Detroit Edison, has made a significant contribution to the development of electrics. This was evident as the International Electric Vehicle Council Conference, held this week in Dearborn, MI, highlighted the major progress made in the electric vehicle industry.

"Enthusiasm, acceptance, performance and efficiency have been high in our ongoing electric car demonstration program," said Philip J. Lenihan, Detroit Edison vice-president for marketing and customer relations. "The technical knowledge gained at our electric car service center and passed on to others in the field has been invaluable."

The utility has been successfully operating a fleet of 24 electric cars in a demonstration program funded in part by the U.S. Department of Energy (DOE) since 1981. The electric cars are driven daily by employees and their families to demonstrate how well electrics fit the urban transportation needs of the typical family.

At the conference the company displayed and reported on many electric vehicle "firsts" including a credit-card-operated "Park-n-Charge" meter that looks like an automatic teller and is designed to be used in public parking areas. Also presented were details of the first battery monitoring program resulting in increased reliability and dependability for electric vehicles.

In another first, Detroit Edison has signed a *new* contract with the DOE to conduct extensive electric vehicle component evaluation, according to Lenihan.

The company's evaluation will mark the first on-the-road testing, outside a laboratory setting, for many vehicle components.

Over the next year Detroit Edison will evaluate nickel-zinc batteries, state-of-the-art lead-acid batteries and a new electric battery monitoring system.

"The new DOE agreement gives Detroit Edison the opportunity to acquire on-the-road experience with highly advanced battery systems and components, beyond the experience gained as a result of the company's ongoing electric car demonstration program," Lenihan said. "This contract is another important step in developing the electric vehicle industry and bringing electrics closer to mass-production."

Under the new agreement, Detroit Edison is operating two electric cars fitted with nickel-zinc battery packs from the Delco-Remy Division of General Motors Corp.

In a separate demonstration, Detroit Edison also installed state-of-the-art lead-acid battery packs from Johnson Controls' Globe Battery Division in two of its electric cars.

In addition to testing batteries, Detroit Edison will examine a thermal-management system designed to keep battery packs at a uniform temperature in both hot and cold weather. The system was installed in the two Detroit Edison electric cars equipped with Globe batteries. Keeping the temperature constant, near 90 degrees Fahrenheit, will help extend the batteries' range in cold weather.

Detroit Edison also is evaluating a new electric car battery-monitoring system from Alber Engineering, Inc. This system will identify and locate weak or defective batteries *while the vehicle is being driven* and may help prevent premature battery damage or failure.

All testing and maintenance on the electric cars will be performed at the company's Electric Car Service Center. The center, a first-of-its-kind facility, is dedicated to servicing the company's fleet of electric cars. Results from the projects will be given to the DOE.

Detroit Edison's efforts are enhanced by the recent formation of the Electric Vehicle Development Corporation (EVDC). Detroit Edison is a founding member of EVDC, the first organized effort by electric utilities to encourage the rapid development of electric vehicles, according to Lenihan.

"The purpose of EVDC is to direct a unified national effort to help put electric vehicles into commercial use where the mass-produced electric vehicle has a cost advantage for fleet operations," Lenihan said.

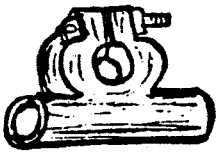
EVDC will complement the research and development activities of DOE, the Electric Power Research Institute and individual manufacturers by planning and organizing large-scale joint vehicle purchases and demonstration projects.

EVDC activities already underway include the completion of a national electric vehicle introduction strategy and business plan, specifications for an initial electric vehicle fleet and a detailed market analysis. The founders hope to initiate broad electric vehicle introduction within the next five years. □

SHOULD HAVE SOME AT DEC. MEETING

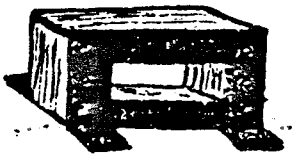
"FOR SALE" "FOR SALE" "FOR SALE" "FOR SALE" "FOR SALE" "FOR SALE"

SOLID BRASS BATTERY CONNECTORS
solder on type fits # OO & OOO
can be used on either pos. or neg. terms.



75 ¢ each

STEEL LAMINATED CHOKE CORE
can be wound with 10 turns of # 00 cable. (approx. 12 ft.)

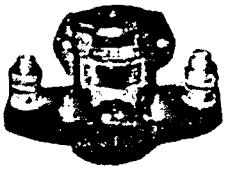


$5.00

BLACK HEAT SHRINK TUBING
use to finish end of battery cables.
shrinks from 3/4" to less than 1/2"
using a gas flame or heat gun.

50 ¢ per foot

200 AMP. RELAY



24-28 Volts D.C. U.S.A.F.

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ONLY A FEW LEFT

-ALSO- SOME HEAVY BATT. CABLE + FREE TUBING

NEW ITEM
LIMITED SUPPLY

400 AMP. RELAY

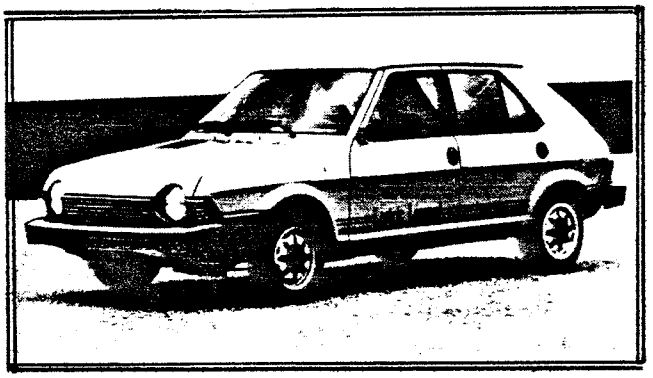
$45.00

12 V COIL

Single Pole
Single Throw

Overall Dimensions
5¼"L., 2½"W.

ITEMS AVAILABLE AT CLUB MEETINGS



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Oak Forest, Ill. 60452

FOR SALE ELCAR complete $950.00
or will seperate. Needs differential -
can use Citicar rear-end.
Chassis with fiberglass body - $175
10 Trojan batteries , 105 Amp with
less than 800 miles on them - $275
Lester batt. chgr. 48v & 12v - $135
Lambert transistor controller - $495
6 H. P. GE series wnd. 48v Mtr. - $295
Don Kubick 437 - 0453
249 Arlington Heights Rd.
Elk Grove Village, Ill. 60007