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# FVEAA NEWSLETTER

*Fox Valley Electric Auto Association*

An Independent Not-For-Profit Corporation associated with the National Electric Auto Association



August 2005

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Meeting Location: Triton College, River Grove, Illinois  
Industrial Careers Building, (East Campus) Room 108

Next Meeting: Friday, August 19, 2005  
8:00 PM

## MEMBERSHIP INFORMATION

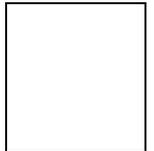
Any person interested in electric cars and alternative energy systems is welcome to join the Fox Valley Electric Auto Association. The cost for a full year's dues is \$20.00 which entitles members to receive our monthly Newsletter that contains useful information about electric car conversions, construction, news, policies and events. These member dues are prorated on a monthly basis for NEW members (not renewing members) joining after the beginning of the club's fiscal year.

Membership is not required to attend our monthly meetings.

**Annual Member Dues of \$20.00 for 2005 are due and payable prior to January 2005.**

***\$5.00 discount if Newsletter is sent in electronic format only.***

FVEAA Newsletter Publishing Office  
12305 S. New Avenue  
Suite N  
Lemont, Illinois 60439



Mail To:

1. Introductions
2. Approval of July 2005 Meeting Minutes, as posted in this Newsletter
3. Treasurer's Report – *Report by Dale Corel*
4. Alternative Fuel Vehicle Event update – *Report by Kevin Zak*
  - a. Event Name Voting Results
  - b. Meeting with JTHS administration, Ray Oviyach and Route 66 Raceway
  - c. Meeting with JTHS auto shop instructors and Route 66 Raceway
5. EAA Chapters Meeting update – *Report by Todd Dore*
6. 501c Tax Status Evaluation – *Report by George Gladic*
7. Committee Reports – **Reports limited to 5 minutes each**
  - a. Event Invitation Committee – *Report by Kevin Zak*
  - b. Student Guidance Counselor Committee – *Report by Ray Oviyach - Inactive*
  - c. Safety Inspector Committee – *Report by George Gladic - Inactive*
  - d. Meeting Planning Committee – *Report by Steve Grushas*
  - e. Public Relations Committee – *Report by Laddie Vitek*
  - f. Website Committee – *Report by Ted Lowe*
  - g. Membership Committee – *Report by Rob Glowacki*
8. GUEST SPEAKER  
Bob Anderson – All Cell, Corp.
9. New Business

WOW ... look at the evening's agenda above.

I think we are on track to breathing a lot of excitement in to the club. I know several of our past meetings have run long because of our growing pains, but with so many club members putting forth so much effort, the meetings should run much smoother and more quickly.

We should not forget to acknowledge the efforts of so many people who volunteered for some very time consuming activities ... so, "Thank You" to all of the club members who are taking active roles in bettering our club.

To those members who will be making committee reports at this and future meetings, please remember your time constraints. In order to be fair to everyone and allow us to enjoy the meetings, please stay on topic and limit committee reports to five minutes. If you require additional time for your report – contact me in advance of the meeting and we will schedule additional time in the agenda.

As you can see, we will have a guest speaker at our next meeting. Ray DeBoth has been proactively communicating with me about a group of IIT professors and professionals who put a company together to produce new Lithium batteries. I am personally familiar with several of the people involved and saw prototype lithium batteries at IIT about 3 years ago. Bob Anderson will discuss his company's new Lithium battery technology and their intended markets. They are already pursuing Hybrid Electric vehicles and Plug-in Hybrid Electric vehicles. With us, they hope to explore the possibility of incorporating these Lithium batteries in pure Electric Vehicles as well.

President Kevin Zak called the meeting to order at 8:09 with over twenty people in attendance, including five guests. Kevin asked for the approval of the minutes and they were approved with an amendment to the checking account total. Dale Corel was not in attendance so there was no treasurer's report. .

The alternative fuel event/ race/ seminar at Joliet Speedway dominated the meeting again. Kevin informed us that this coming Tuesday July 19<sup>th</sup> will be the meeting with the school, faculty and the race track.

Next there was a redefining of the committee for the alternative fuel vehicle event. Student counseling committee was agreed to be headed by Ray Oyvicach and assisted by Tim Moore. The website development committee headed by Ted Lowe was to meet after the regular meeting. Rob Glowacki heads up the membership information committee and Ted Lowe volunteered to assist and expand the membership with more information signs and brochures. George Gladic will head the safety inspection committee with John Emde assisting before, but not on the day of the event.

There were five guests in attendance Andrew Sawa, Todd Allen, John Attila, Walter Malick and Rich Hirschberg. Rich made a suggestion to have name tags for those in attendance to show members status and names. Rich also spoke on his upcoming 2005 Alternative Fuel Vehicle event at Elgin Community College August 27<sup>th</sup>. The event will be featuring alternative fuel vehicles, as well as classic cars, muscle cars, custom motorcycles & trucks, as well as new car dealerships, and antique military vehicles. President Kevin Zak put his support to the event by committing the dragster and asked all available members to try to attend, as this could be a good dry run to our May 2006 event.

Tedd Lowe made a suggestion to have a meeting program person to have the responsibility to lineup member and outside speakers to give 15 minute talks that would be advertised on our website and any possible flyers. This suggestion drew a lot of attention. It was agreed that Steve Grushas, Todd Dore and Peter Hartel would be on the program committee with Steve Grushas as the chair. Laddie Vitek agreed to be chair of the publication relations committee.

In a similar vain Tedd Low showed several advertising items, including business cards, brochures, and leaflets displaying examples of each. Ted reminded members of the August 13<sup>th</sup> and 14<sup>th</sup> Oregon Illinois alternative energy seminar. Tedd also spoke on the possible new website with the same address, but hosted by a paid service and with manipulation possibility from members to update their pages on their vehicles or other related interests. A motion was made to change the website and it was seconded and approved by the group.

George Gladic spoke on 501c while displaying the huge packet of information and mentioning the \$150 fee. George believed a lawyer would be require to fill out and file the forms. After much discussion Dave Aarvold said he would be willing to do the historical research portion for the 501c and that he would bring to the August meeting a bullet point of pros and cons for a 501c.

Frank Delmonico's car, was removed from the Delmonico home and now resides as Ken's house.

After the members introduced themselves to the guests and visa versa the meeting adjourned to the garage.

1. Doug Mather was contacted and our planned changes were shared. He of course was not happy to see us move off his server. He spent a lot of effort to setup fveaa.org for us and to install and operate the framework for a very good site. I propose that we honor Doug's great contribution with a lifetime FVEAA membership!
2. A new domain registration account was created on godaddy.com that belongs to the FVEAA (using treasurer Dale Corel's address and contact information). This will be the registrar account that owns the fveaa.org domain once the existing registrar, Doug Mather, releases it.

Ford Electric Rangers

*Ford Motor Company*

Ford Motor Company invites you to read this information and, if you are interested in purchasing a pre-owned Electric Ranger and meet the eligibility requirements, to enter the Electric Ranger Pre-Owned Purchase Lottery.

Background: Pre-owned Electric Rangers will be refurbished by Blue Sky Motors (BSM), an independent and unaffiliated company, to such a level of operability and performance that these vehicles will be fully compliant with all applicable federal and state laws governing motor vehicle operation.

Cost: Each vehicle will be sold directly by BSM for \$6,000.00 (six thousand dollars) per vehicle excluding taxes and final transportation to customer's location or a PCS charging station.

Eligibility Requirements: To enter, you must be a former Ford Electric Ranger lease holder and supply the vehicle identification number for verification. Maximum of one entry per former Ford Electric Ranger lease holder or company. Entries should be submitted on a standard size postcard and include former lease holder's name, current address, telephone number and the vehicle identification number from the expired lease contract. This information should be mailed to Ford Motor Company ? Electric Ranger Lottery, 15050 Commerce Drive North, Dearborn, MI 48120. Entries will be verified for accuracy and must be postmarked no later than August 31, 2005.

Lottery Rules: Winners will be chosen in a random drawing from all entries. The drawing will be held September 23, 2005, and participants will be notified in writing as vehicles become available. Vehicles will be provided on an availability basis, "as is". Participants will have 15 days from notification to complete the EV purchase. This lottery is set to expire December 31, 2006. For additional EV Lottery information please visit [www.RangerEVLottery.com](http://www.RangerEVLottery.com).

Legal Disclaimer and Advisory: Entering this lottery does not assure you a vehicle. Odds of winning will depend on the number of entries received and vehicle availability. Applicants are strongly encouraged to live within 100 miles of an approved Ford electric vehicle service center. Ford will not be a party to the contract of sale between BSM and winners of the lottery drawing. Vehicles will be sold "as-is", with no warranty from either Ford or BSM. Payment in full is expected at time of purchase. Lottery winners must obtain own financing if necessary.

*With this month's guest speaker, I felt it was appropriate to share some of the information about batteries and other tidbits from the: **Electric Vehicle Discussion List**.*

**Sealed Lead Acid Cycle Life - 250 cycles???** Yea I know that's the published life span of AGM and Optima Yellow tops to be really clear. OK Why am I in the 7th year of my Yt life, and lost count of the cycle count, about .....3 times. My current Emeter shows +347 cycles, This is about %20 of what they really have. They have been raced, neglected, tortured... and I get them to come back every time.

Clearly... If you have a decent charger, AGMs are a really cost effective way to go. My Yts have always had Regs on them. John's Yts never had Regs, but he always recharges them quickly after a run and lets the charger tamper off for 15 minutes after the batteries are full. Simple stuff. Put it away full and happy, every time, and you will have incredible life and performance from Sealed AGM batteries.

Run them empty every time, use a third world charger on them, let them set for days semi charged... and have those wonderful "Events" that variac chargers do from time to time, and you will kill your AGMs in less than 200 cycles. I am sure there are some folks on this list that have had a pack go away in less than 150 cycles. I can hear the Regs playing with the charger right now.... kicking the old lead back into line. Just like they are supposed to.

Even better long life stories, Johnson control Dynasty batteries... Joe finally killed 4 by leaving his main breaker on for months... Yea Even us pros have those issues from time to time. These are 4 of the 16 that Damon Crockett got for us in about 1996, They ran in Goldie at Woodburn 1...Ran the Raptor test string, Ran many other test packs and small Evs, Ran in Joe's Silverado...48 volt street machine for a couple of years... and now 3 of them have kept my Fork truck kind of alive for the last couple of months.

These batteries just don't want to die, given a fighting chance, they keep coming back. Out of the 16 I think only 2 have been deemed beyond recovery. 8 are in known service; the other 6 are waiting for rebirth or.... recycle.

Don't believe the 250 cycles....for some of us that's the break-in number.... Proving again, most battery death is murder....not old age.

\$2K for a charger is really a bargain if you burn up 2 packs of batteries with a lesser charger. OK I will keep the blatant sales to a low rumble here... But the charger is the MOST important piece of gear for battery health and life.

Rich Rudman

**Vehicle Range and Horsepower** Range is all about pounds of batteries. To get an X-mile range will require Y pounds of lead-acid batteries. It doesn't matter what the pack voltage is or what type of battery you use (flooded, sealed AGM, etc.).

Say you want a 20-mile range to be 50% discharge. The truck will use about 300 wathours per mile if driven conservatively. 20 miles x 300wh/mile = 6000 wathours.

Lead-acid batteries deliver about 12 wathours per pound.  $6000wh / 12wh/\# = 500$  pounds. If we want that 20-mile drive to use only 50% of your charger, then you need 1000 pounds of batteries. Optimas or floodeds; it doesn't matter for range.

6v floodeds weigh about 62#, so 1000# of them is 16 batteries. That makes a 96v system. Since they are good for about 500 amps peak, your peak power is  $96v \times 500a = 48kw$  or about 48 horsepower.

Optimas weigh about 45#, so 1000# of them is 22 batteries. All in series is 264v, which is pretty high for a first EV. Wired in two parallel strings of 11 will give you 132v which is quite reasonable. Each Optima is also good for 500 amps; the two strings in parallel give you  $132v \times 500a \times 2 = 132kw$  or about 132 horsepower. That's considerably more power, if your motor and controller are up to it.

Lee A. Hart

**Battery Recommendations** Here's the problem, if you're on a budget and accordingly, choose lead acid type batteries over, say a lithium type pack, you can have one or the other, that is good range but so-so performance or good performance but so-so range, but it's hard to end up with both. It's easy to get stunning performance from that tough little pickup...simply drop in a set of 20 either Exide Orbitals, Optimas, or Hawkers (choosing batteries that weigh between 40 - 45 lbs. each), and you've got a 240V pack that weighs 800-900 lbs. and batteries that love dishing out high currents over and over. This pack teamed up with a Zilla Z1K controller and a nine inch DC motor would flatten you back into the seat and smoke the rear tires at will, and absolutely blow away that stereo type of your EV being 'a glorified golf cart'. The problem is that even though this pack would definitely get you 30 miles, maybe even 40 mile down the road, such a trip is an 80-90% discharge. Deep discharges like this daily will cycle the pack to death in a year or so. If you drove it 15 -20 miles regularly, with occasional longer trips, then you'd have many years of good service. On the other hand, a 1250-1300 lb. pack of 6 volt golf car batteries would give your truck sedate performance but a range of up to 75 miles in warmer weather.

Driven easily, as in keeping max battery amps to the 250-400 amp side of things, this pack might last you 5-7 years. The Zilla controller will allow you to dial up 1000 amps of current into the motor, while you can still limit the battery pack's current to 400 - 500 amps. This setup works well to wring out the most performance from a heavy, low voltage (120V) wet cell pack, in that it will make the 0-30 mph performance as strong as it can be...after that, the current limit imposed on the pack will come and bite you with 30-60 mph coming in at a slower rate of acceleration.

You can have a shorter range but very high performing EV with a high voltage light weight pack of 12V AGMs, or you can have a longer range but lower performing EV with the standard fare of a lower voltage heavier pack of 6V wet cells. Each version will give you years of trouble free driving, as long as you stay within the restrictions of both designs. The high voltage light weight AGM pack will allow you to blatantly have acceleration fun as long as you don't try to get longer range while doing so, and the lower voltage heavier wet cell pack will allow you to drive longer distances as long as you don't try to pull BIG amps and accelerate well while doing so.

Downsides for the AGM pack are much higher initial cost, the absolute need for a smart charger and BMS, and shorter range mostly due to the lower pack volume and weight when compared to the wet cell pack. Positives are super clean, corrosion free, and maintenance free batteries, the ability to place them anywhere and even sideways or upside down, and damage free high amperage power delivery that with 1000 amps @ 240V for high hp figures, will continually give you that BIG EV grin.

Downsides for the wet cell pack are gassing and venting that cause corrosion and require watering and cleaning maintenance, the requirement of having to place them in locations where they are accessible, the heavy weight that a 120V pack brings, the absolute need to keep their amp draws to 500 amps and lower, and the lower hp figures that come with 500 @ only 120V. Positives are much lower initial cost, the ability to use an inexpensive charger and no need for a BMS, very good range per charge that comes with a 1250-1300 pack, and long cycle life if the pack is set up to restrict current draws. This setup can also return a BIG EV grin in terms of flying by gas stations and having enough range to satisfy most of your driving needs.

John Wayland

**Battery Storage** Cold storage is no problem. The lower the temperature, the slower the self discharge rate and the longer it can sit without charging.

The freezing point for a lead-acid battery depends on its state of charge. It is approximately

-60 deg.F at 100% SOC (specific gravity over 1.250)  
-15 deg.F at 50% SOC (specific gravity over 1.200)  
+20 deg.F at 0% SOC (specific gravity over 1.100)

The real problem with cold is that it slows down the charging and discharging reactions. It takes much longer to charge a cold battery; you need to charge it at a higher voltage, and it will draw less current. If you try to drive, the voltage sag will be worse and you can't draw nearly as much current.

If you expect to drive your EV in winter, put the batteries in an insulated box, and provide a heater.

Lee A. Hart

**Battery Life Expectancy** The Optimas in Blue Meanie are now about 5 years old, and yes, they are in the autumn of their life, but as John Westlund points out, they're still alive and delivering enough range for me to still use the car for most of my running around needs. The 250 cycle thing is if one does heavy 80% discharges on each cycle, and at that rate, Philip is correct about the 7500 miles bit. Optimas have proven over and over, however, to be able to far exceed that cycle life rating when they are discharged at 40-50% instead. The ones in my car probably have 800 cycles or so on them with the typical depth of discharge at 40-50% for those often used 10-12 mile runs here and there with opportunity charging between runs. In cases where a 20-30% depth of discharge can be adhered to, they last and last, probably over 2000 cycles.

If one needs 80% depth of discharges on a daily basis, any lead acid battery, with the exception of large and heavy industrial tubular plate type batteries, will suffer a shorter life. 6V golf car batteries last so long because: (1) The packs are very big at 1200-1400 lbs. (2) The batteries are discharged at much lower currents as installed in low performance EVs. (3) Because of the enormous weight and mass of the battery pack as installed in an EV, they give 60-75 miles range per charge, so the typical 10, 15, or 20 mile runs amount to very low depth of discharges. Even a fairly long 40 mile run is only about a 70-80% discharge.

If you design your EV to use a small and light weight pack of AGM style sealed batteries, then do 80% depth of discharges often, plan on a low 7000-8000 mile life. However, if you keep daily runs to the 30-50% depth of discharge area, you can expect much better results in miles driven per pack life. John Bryan's Ghia's Optimas under lighter depth of discharges have delivered incredible cycle life, so did Al Godfrey's Optima powered 914 Porsche, so have my EVs, and so have many, others. Under a higher performance application where instead of depth of discharge, the focus is the ability to deliver 1000+ amps often for stunning acceleration and power delivery, the better quality AGMs will far out cycle the flooded type batteries, hands down. Drop a wet cell pack down to the same lower weight levels as the AGM packs, say in the 600-700 lb. area, and you end up with a fraction of the hp level and batteries that while being beat up and tortured by very high currents as they struggle to try and make the delivered power level as AGMs can, will be ruined in as low as 100 cycles....I know, been there, done that.

John Wayland

**Avoid Battery Failure** Start with floodeds for your first pack of batteries. They are more tolerant of accidental over/under charging, which as a beginner you will probably do. They are also cheaper and last longer... for most vehicles the batteries will only be about \$1000-\$1500 Use a timer to shutdown the charger if the charge cycle takes too long.

Measure individual battery voltages on a frequently and keep a logbook of how much energy per trip you use. Get good instrumentation (E-meter) and understand how to use it. Don't leave the garage without verifying your last charge is completed.

Make sure your average trip length is well inside of your worst case range. A 35 mile range EV driven 5-10 miles a charge will have much longer battery life than when the same EV is driven 30 miles per charge. Additionally as batteries age they will still perform, but your range will lessen. A EV used for very short trips (5 miles) will be able to drive on batteries that would be considered "Dead" on an EV that requires 30 miles.

If possible figure out a way to charge at work, keeping the batteries charged as much as possible will really help their life. With care batteries can last a long time... but beginners often drive too far or don't pay attention when charging and shorten their life.

Mark ?



**Avoid Battery Failure** This isn't a question of trying to scare anybody; rather it's experience speaking. Most people are pretty much ignorant about what goes on under the hood of a car, but they drive them successfully anyway.

It was not always so. In the early years of the automobile, the driver had to also be something of a mechanic. Cars needed careful adjustment (set the choke; feather the spark) and frequent maintenance. Often they stopped working on the road, and had to be fixed on the spot.

Today, cars are highly automated. Drivers need no longer understand how they work and maintain them on a daily basis. The cars have extensive computerized safeguards to protect themselves against abuse. To some extent they are self-diagnosing and even sometimes self-repairing. The systems that perform these tasks are remarkably complex. They've been made cheap enough to put in a \$12,000 "economy" car by aggressive cost-cutting and serial production.

Now consider the typical conversion EV. It uses components that are either modified versions of industrial EV parts, or hand-built specialty bits from other EV hobbyists who design and manufacture them as a labor of love. There are few off the shelf equivalents of the failsafe devices in "normal" cars. (I'm thinking particularly of battery maintenance systems now, but this really applies to all functional systems in an EV.)

They do exist - or rather they "have" existed. Some sophisticated EV management systems have been designed for the very small number of limited-production EVs from such makers as GM, Ford, Chrysler, Peugeot, Renault, and so on. However, these are highly integrated systems and usually can't be used on any other vehicle. Even if they could be, most EV hobbyists wouldn't buy them: because of limited production, they'd cost many thousands or tens of thousands of dollars per copy.

Heck, most EV hobbyists won't even spend an extra \$3000 for an extra-smart charger which would probably lengthen the life of two \$1500 battery packs, and that's the other part of the problem. EV hobbyists (and that includes me) want to have a vehicle made of hand-built parts, but without spending the price of a Lamborghini for it. So they omit the BMS and scrimp on the charger.

This means that many hobbyist EV drivers have vehicles that need almost as much babysitting as the early 20th century ICE cars did, at least where charging is concerned. But some of them are too busy and too accustomed to having a "sit and drive" car. Inevitably these folks forget to monitor the charging closely enough. Maybe they don't water the batteries, or check individual modules' capacity periodically. They don't watch for weak cells, and thus they over-discharge the battery and reverse cells, which finish them off. Or they plug the not-quite-smart-enough charger in, then go inside and get involved watching the game on television, and go to bed. The next morning at best the battery is overcharged; at worst it's gone into thermal runaway and literally melted or even caught fire (yes, this has happened).

Of course all this could be prevented, either by careful supervision or better BMS design. Most EV hobbyists (and that again includes me) have to learn this the hard way, by damaging at least their first battery pack.

Some don't learn. These are the ones who build or buy conversions, run them until the batteries fail, and then advertise them for sale as "needs batteries." (Sometimes they actually replace the pack a time or two before deciding that EVs "aren't ready for prime time.")

But others do. These are the ones who drive EVs successfully and economically for many years. They are also the ones who buy (cheaply!) the rejected conversions from the former type, and make them successful!

In the end, it comes down to "you".

If you're the tinkerer sort, a person who likes to learn about technical issues, one who rather enjoys being "one with the machine," and you don't mind devoting a Saturday afternoon to your EV once a month or so, then you have a much better chance of getting good service from your EV's battery.

If you are also at peace with the idea that you may still have to learn the hard way, then you won't give up on EVs just because your first battery lasts only, say, 18 months.

I know some here will disagree with me, and that's fine. But if you're a class A gear head, an EV just might work out for you. But if what you're really looking for is a "sit and drive" vehicle that's more economical, or has a more environmentally benign profile than the typical ICE, I suggest you rethink EVs and instead look into the quasi-hybrids such as Toyota Prius and Honda Civic and Insight.

Author unknown.

## **Avoid Battery Failure** "Everyone WHO IGNORES EXPERT ADVICE will murder their first battery pack."

- What most people \*think\* they know about batteries is wrong.
- What most battery salesmen say (the guys behind the counter at Pep Boys or Sears) is wrong.
- Most of what you see about battery care on the internet is wrong.
- Most battery chargers sold to the general public are near-junk.
- Most EVs come with nearly worthless instrumentation to tell what is going on with the batteries.

The result is that most EV battery packs don't die of old age; they are murdered from abuse. The folks who really know how to care for batteries are the ones who drive and maintain EVs, and have done so long enough to have learned the consequences of bad behavior. These include the people on the EV list, as well as those using EVs in applications like fork lifts and golf carts.

### **Here are some of the common mistakes:**

**1. Using the wrong battery** EVs are hard on batteries. If you try to use regular car starting batteries or "marine" batteries, they will have very short life. You need to use a battery specifically designed for EVs, \*and\* one that others have already demonstrated that it actually works. Salesmen will claim anything to make the sale -- look for documented proof that the battery actually works in EVs. Batteries that \*do\* work include golf cart batteries and high-quality AGM batteries (Hawker, Optima). Anything else and you're taking a chance, and had better know what you're doing.

**2. Using a cheap charger** Most consumers will pay thousands for their EV batteries, and then get the cheapest charger they can find. This is a false economy -- a cheap charger will RUIN the batteries! If you don't have the experience to manually charge the batteries correctly, get a "smart" automatic charger. Ignore the marketing claims; they are almost always exaggerations. Look at what the charger actually DOES. A smart charger will:

- \* Start with a "bulk" charging mode, where it holds the current roughly constant. This charges as fast as possible without burning up the charger or your house wiring.
- \* As the battery nears full, the charger should switch to a "finishing" charging mode, where it limits the voltage to a safe level. This prevents the battery from overcharging which would cause excessive heating, gassing, water loss, and shortened life.
- \* When the battery is full, the charger should detect it and turn itself off. Not just run forever!
- \* Have plenty of safeguards to prevent minor problems from causing major damage. It should be isolated for safety. It should detect bad or damaged batteries, wrong voltages, or reversed polarity packs. It should sense temperature and act accordingly.

**3. Excessively deep discharges** It is BAD to fully discharge a battery before recharging it. People do this to compensate for cheap chargers that aren't smart enough not to charge a fully charged battery. Best battery life is 50% DOD before recharging.

**4. Letting batteries sit around in a discharged state** Lead-acid batteries last longest when fully charged. If you run them down and let them sit for days (or just leave them sitting unused for months), they will go bad.

**5. Drawing too much current** A lead-acid battery can deliver very high currents for a brief time. But if you try to do it for more than a few seconds, you will pull down its voltage and it will die young. The goal is not to pull its voltage under 1.75 volts per cell; that's 10.5 volts for a 12 volt battery, for example. AGMs will deliver a lot more current before this happens, which is why they are preferred when speed matters more than range.

**6. Skipping maintenance** Flooded batteries use water. Check often and add it as needed. Use pure distilled water. water. Floodeds also vent at the end of a charge cycle. This produces a slight amount of acid mist, which wets the tops of the batteries. Clean this off occasionally, or it corrodes terminals and wiring. It also causes shorts to ground, which can be a safety hazard. You also need to occasionally check the terminals to be sure they are clean and tight. Battery terminals carry very high currents, the terminals are usually weak lead, and there is a lot of vibration and temperature extremes in a vehicle. So, the terminals work themselves loose, and need to be tightened before they cause a breakdown.

**7. Bad (or no!) instrumentation** If you have no instruments, you can't tell what's wrong. It's like driving a regular car with no gauges. You won't know there's a problem until it's too late! Good instruments are expensive; so many EV builders leave them out. That means they can't tell they're murdering their batteries until it's too late. At the least, you need a voltmeter marked with the minimum voltage allowed (1.75v/cell). An ammeter will tell you when you are drawing too much current. An E-meter is much better, as it can also act as a "fuel" gauge. A hydrometer (for flooded batteries) lets you assess their true state of charge.

# FVEAA MEMBERSHIP APPLICATION

November 2004 thru October 2005

Any person interested in electric cars and alternative energy systems is welcome to join the Fox Valley Electric Auto Association. The cost for a full year's dues is \$20.00 which entitles members to receive our monthly Newsletter that contains useful information about electric car conversions, construction, news, policies and events. These member dues are prorated on a monthly basis for **NEW** members (not renewing members) joining after the beginning of the club's fiscal year.

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*Please Print Clearly*

Name: _____	Date: _____
Address: _____	Phone: _____
City: _____	Fax: _____
State, Zip: _____	Email: _____

*Newsletter Option (Check One)*

<input type="checkbox"/> Send the newsletter by mail	<input type="checkbox"/> Send the newsletter by Email	<input type="checkbox"/> Send Both
<i>\$20.00 Annual Dues</i>	<i>\$15.00 Annual Dues</i>	<i>\$20.00 Annual Dues</i>

### Prorated Membership Dues

FVEAA annual membership is \$ 20.00. The fiscal year begins November 1 <sup>st</sup> .											
Dues for <b>NEW</b> members (not renewing members) joining after that date is adjusted according to the following schedule:											
Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
\$ 20.00	\$ 19.00	\$ 18.00	\$ 17.00	\$ 16.00	\$ 14.00	\$ 12.00	\$ 10.00	\$ 8.00	\$ 6.00	\$ 4.00	\$ 2.00

Make your check payable to the FVEAA and mail to:

Dale Corel, FVEAA Treasurer  
 595 Gateshead North  
 Elk Grove Village, IL 60007-3433

**Please List Any Comments, Questions, Suggestions or Discussion Topics Below**

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