

FOX VALLEY ELECTRIC AUTO ASSOCIATION NEWSLETTER FOR OCTOBER , 2001

**NEXT MEETING: Saturday, October 20 at 9 AM in the Triton INDUSTRIAL
CAREER BUILDING, (East Campus), Room 108**

DISCUSSION TOPICS: 1. Motor Failure. 2. Triton Project Analysis 3. Open Topics.

MEMBERSHIP INFORMATION

Any person interested in electric cars is welcome to join the FVEAA. The cost for a full year's dues is \$ 20 which will entitle members to receive our monthly Newsletter that contains useful information about electric car conversions, construction, news, policies, and events. Membership is not required to attend our meetings. Dues for NEW members joining in October will be \$ 2.

To obtain info about the FVEAA you may contact either Past-President Ken Woods or President Shafer

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PRESEZ for October, 2001

The Triton Project is nearing completion. The schedule plans clean-up items on our meeting date. We plan to turn over the vehicle to Triton on October 27th if everything goes well. I ask our members to drive their conversions to Triton for the turnover ceremony.

The project was conceived and supported by Triton President Dr. George Jorndt. He had a heart attack about midway through the Project and was succeeded by Patricia Granados. Triton Trustee Steve Kubiczky has been a strong supporter since inception. Associate Dean Tom Menzel has been my Triton contact for the project. He has quickly responded to the many requests made of Triton. Triton Staff have been most cooperative.

The participants recruited by Triton have been outstanding. Four were college-age persons and four were older members from the community. We had two father-son teams.

Member and Project Leader John Emde has been an essential participant in the undertaking, contributing his design skills, facilities and over \$ 5000 of his time exclusive of the Saturday work sessions. The Ranger really is "John's Project".

The FVEAA welcomes three new members who joined after being our guests at working sessions:

1. Todd Dore who lives in Brookfield.
2. Howard Hanson living in Forest Park,
3. Nat Pozorski also from Forest Park.

FVEAA Past President Ken Woods had open-heart surgery two weeks ago and is recovering at home

Former FVEAA President Dana Mock died on October 5th. I am informed he asked that FVEAA members attend a memorial party for his remembrance. An E-mail will be sent giving details when arrangements have been made.

MINUTES OF THE SEPTEMBER 15TH MEETING

The September meeting was a picnic hosted by Member Ed Meyer in his hangar at Clow Airport. Fifteen members and nine guests attended. Treasurer Corel reports no change in the checking or savings accounts. President Shafer gave a brief presentation for the benefit of the guests on the reasons for converting a car to electric drive and the conversion process. President Shafer noted that five members have conversion projects in process. Member Alan Wagner drove his (unconverted) Berkley to the picnic to give us an idea of the donor vehicle for his conversion. He reported it is about completed. Member Ken Simmermon reported that Member Mark Thole of Savanna bought and picked up the Subaru conversion. The meeting was adjourned at 9:30 PM.

Submitted by
Secretary Dick Ness

From other EV Newsletters and articles affecting EV's

DEVC, the Denver Group in their September Newsletter reports that Emotion Mobility and Panoz Motors are collaborating to import DaimlerChrysler *SMART* car to the US, convert them to electric power, and offer the vehicles for lease at selected Atlanta locations. Editor's note – Another emission-credit ploy ala Lee Iacocca ? They report that at the Las Vegas Advanced Automobile Battery Meeting *Panasonic* reported developing a Valve Regulated Lead Acid Battery (VRLA) with a specific power of 360 watts per kilogram and a claimed 150,000 cycle life.

Rick Woodbury (Commuter Cars Corp) offers the *Tango*, a narrow-width fully enclosed vehicle with tandem seating for two. Try his website rick@commutercars.com for information.

EV Circuit, the Ottawa Group had an article by Rick Lane, their Newsletter Editor, about his trip to Chicago for the American Solar Challenge Race. He had conversations with Ted Lowe, who was there with his bright yellow Chevy S-10, and other FVEAA members. The race was won by the University of Michigan entry. This could be predicted during the exhibit. I noted that GM was a principal sponsor of the entry. The entry included a very sophisticated race support vehicle that was used to tailor race tactics and charging strategy. GM probably spent a million dollars on the effort.

The issue also notes that GM has a two-part approach to drop battery EVs. The first is bringing hydrogen vehicles to market using fuel cell technology and on-board production of the gas from gasoline. The second is on-board cryogenic storage of hydrogen for the fuel cell.

The issue had a full-page ad; for WarP series-wound motors manufactured for Net Gain Technologies..

FVEAA Member Lew Gulick, the editor-in-chief of **EV News** , provided the August issue of the magazine. The lead article concerned a study that concluded that plug-in hybrids would be the best option for these vehicles. The Davis Branch of the University of California has shown in the *Future Truck*

length for a California driver is 11.8 miles, and 90% of trips are under 60 miles, the engine is seldom-
from 30 to 8.

From other EV Newsletters and articles affecting EV's – Continued.

The UC-Davis conclusion was supported by an EPRI study of hybrids. The two-year study also found that consumers would prefer to plug in their vehicles at home with a 120-volt supply.

The issue had an extensive report by Mike Bianchi on the *2000 Tour de Sol* event.

The issue noted that the Electric Vehicle Association of America (EVAA) has a new publication, *EVs for Work or Play 2001* that lists over 100 electric vehicles. You can get a copy for \$ 15 by calling Ray Fitzgeralds, EVAA Director, at (202) 508-5995.

EEVC, the Eastern Club in their September issue covered their annual *Duryea Days* event. It featured a record turnout of exhibits, mostly from the Boyertown Auto Museum. The facility has on display over 75 vehicles, some dating back to a 1902 curved-dash Oldsmobile. A 1919 Detroit Electric was used to transport visitors.

They also report that Electric Fuel has completed electric transit bus testing using their zinc-air energy source. Bus future demonstrations are planned at Las Vegas later this year.

They note that Toyota and DENSO of Southfield Michigan are working on a belt-driven integrated starter-generator for hybrids. The 216-volt, 140-amp unit weighs 10.6 kg and can deliver 2.1 kw as a motor or absorb 6.1 kW during regenerative braking.

VEVA, the Vancouver Group, in their September issue reported on the July Electrathon in Corvallis Oregon. The winner completed 52 and 49 laps in the two runs. They also reported that several members went to the Woodburn electric drag race event. An interesting vehicle was an electrified motorcycle using a Chinese Lynch "pancake" motor.

I screwed up Frank Delmonico's phone number in the item about stuff he has for sale in the August issue. His number is **(708) 544-6312**. He still has the following items:

Two marine surplus 200-amp, 30-volt, Hercules water-cooled engine-driven generator. - \$ 250 each.

Homelite, 110-volt generator. Needs a carburetor - \$ 60.

Two-cycle engine-driven 50-amp, 30-volt army tank battery charger. - \$ 150.

Japanese WW II dual-voltage communications generator - \$ 150.

Tecumseh, propane-fueled, 7 horsepower engine-generator - \$ 300.

1979 Chevy Mailbu Station Wagon. Garage kept -1200 miles on odometer.

Motor, coupling, and adapter plate for converting a VW Beetle. \$ 200.

Motor with coupling, adapter plate, motor hangar plate for converting a front-wheel drive car. \$ 225.

Sorry Frank

BILL

GEORGE GLADIC'S MOTOR FAILURE IN HIS NISSAN

George acquired the converted Nissan about a month ago. He removed the motor, had it rebalanced and the commutator turned. These measures did not contribute to the failure of the Advanced DC 9" series-wound motor installed when the car was converted as a club project in 1996. Ed Meyer submitted the winning bid for the completed car and regularly used it until he sold it to George.

Last Thursday George smelled burning and the motor quit. He removed the motor and brought into John Emde's shop where it was disassembled. The motor armature was badly burned. The failure cause was apparently an armature winding failure on the end opposite the commutator. One turn arced to the armature steel (ground) and an adjacent turn. The resulting arc spread to the commutator end and damaged most segments. Brush holder springs were destroyed, and the brushes ground up.

George obtained a replacement WarP 9 motor, installed it, and was back on the road in four days. Photos of the damaged motor were taken. John Emde hopes to show these at the October meeting where George will relate his experience.

REPLACEMENT BATTERY CHOICES FOR BILL SHAFER'S MAZDA

The present Trojan T-875 batteries that have been in my Mazda for 3 ½ years will soon have to be replaced. The pack no longer accepts a full charge. Three units show signs of battery case swelling. The voltmeter now falls below 70 volts on acceleration after about 10 miles of travel. This is unacceptable performance and provides evidence the pack should soon be replaced.

The first of each month I add water and equalize the pack to the gassing point. This month the water level in four cells was below the plate level. The specific gravity of all cells before equalization measured 1.225, with four exceptions that were about 1.100. After equalization each cell reading was 1.250. After equalization a load check during acceleration was made of each battery. Terminal voltage readings were 8.4 volts on open circuit and 7.3 volts during acceleration. New batteries read 9.3 and 7.6 volts when this test was performed.

The following table lists the replacement choices I have.

Item	# 1 (96 volts) Trojan T-875	# 2 (104 volts) Trojan T-875	# 3 (96 volts) Optima YT	# 4 (108 volts) Optima YT	# 5 (120 volts) Optima YT
Number of batteries	12	13	8	9	10
Pack weight – Lb.	756	763 (Note 1)	352	396	440
Battery cost - \$	720	780	920	1035	1150
Charger Change \$	0	0	0	0	450
Regulator \$	0	0	240	270	600
DC-DC Converter	0	420	0	0	0
12-volt battery \$	0	20	0	0	0
Option cost \$	720	1220	1160	1305	2200
Expected life, yrs.	5	5	10	10	10
Energy kWh (Note 2)	10.5	11.4	5.7	6.5	7.2
Expected Range – miles (Note 2)	21	22	11	13	14

REPLACEMENT BATTERY CHOICES FOR BILL SHAFER'S MAZDA – Concluded

Note 1. For the 12 volt system there is a marine battery with its own 12-volt charger. These could be replaced with another T-875, a DC-DC converter and a small 12-volt sealed lead-acid battery. Battery pack weight adds a T-875 and subtracts the marine battery weight.

Note 2. A T-875 battery weighs 63 pounds. It is rated according to golf-cart requirements that determine the number of minutes the battery will deliver a constant 75-amp load. The T-875 will do this for 87.5 minutes. Twelve batteries will store $(75\text{amps})(8\text{volts})(87.5/60)(12) = 10.5 \text{ kWh}$. The car requires 0.5 kWh/mile and the calculated range is 21 miles. Actual performance was about 25 miles.

It requires 36 pounds of batteries to move the car one mile. The figure for Trojan T-105 6-volt batteries is 21 pounds of batteries per mile of travel. T-105 units will deliver 75 amps for 105 minutes.

Each Optima YT weighs 44 pounds. Its rating is different than the Trojan, delivering 65 amps-hrs at the standard 20-hour discharge rate. The table lists the energy-storage capability for each option shows the calculated energy storage ability using this rating.

Discussion

I do not wish to replace my Curtis 1221C- 7401 that has a maximum 144 volts rating. This limits my choices to the five shown by the Table. Other choices would require significant changes in the car.

My previous experience with Trojan T-105 batteries produced a 5-year replacement cycle, 20% better than the T-875. I used 8-volt units to raise the system voltage from 72 to 96 volts. This gave me better acceleration, while staying within the Mazda battery weight and space limitations. Acceleration is an important factor for my driving in an urban area with a traffic control device every few blocks that requires constant acceleration and braking. This type of driving also causes more-often replacement of the pads on my front brake calipers.

There would be advantages to replace with Optima batteries. No watering and higher peak power. Twelve Optimas would reduce vehicle weight by 347 pounds. However it is likely that two strings of Optima batteries would be required to avoid exceeding a 300-amp current limit on each string. Optimas would have twice the useful life of the flooded batteries but are twice the cost. Optimas would also need Rudman Regulators to limit the charging of these series-connected units to avoid venting.

Send me an e-mail or write a note on the choice you would make and list your reason(s). I will summarize the replies in a future Newsletter.

Bill Shafer
October 9, 2001

Using the automatic transmission in the Ford Ranger

Triton had the Ranger pickup truck with an automatic transmission available for conversion. FVEAA members are familiar with conversions using standard transmission. It was a matter of applying this experience to the Ranger. The transmission control is electronic, not vacuum.

A preliminary examination of the vehicle produced a consensus that there was an 80% probability that we could successfully make the conversion using the automatic transmission. We were aware there would be extra losses not encountered with stick shift. These are not expected to be significant since Triton plans to use the pickup on-campus. A number of challenges have been identified as we have studied the problem.

A transmission is required for an electric car conversion for two reasons; it provides a convenient connection point to replace an engine with an electric motor and it is necessary for acceleration. Although a series motor has maximum torque at stall, the controller's 600 amps limit is insufficient to produce satisfactory acceleration.

IC engine cars produce maximum torque with an engine speed of 4-5000 rpm so an automatic transmission is designed with this in mind. Transmission gear ratios are selected to coordinate and optimize engine speed-torque. A stick-shift transmission doesn't have this problem because the user can select any gear at any time to meet his driving preference. This is a tribute to the versatility of the human brain.

Four solenoid valves that control bands on three planetary gear sets accomplish transmission shifting. The gear ratios are; 2.474:1 in low, 1.474:1 in intermediate, 1.000:1 in direct drive, 0.75:1 in overdrive, and .1:1 in reverse. An electronic power control module (PCM) controls switching of the solenoids and other functions. The PCM has many other inputs and outputs to the engine and other items tailored to the application.

The work session on July 16th was devoted to a tutorial on the Ford automatic transmission given by Gabriel Murphy, the transmission specialist at Triton. The control strategy consensus was to first try to fool the PCM into thinking the engine was still there. A second choice would be to directly apply 12 volts to the switching solenoids from the four-position the shifting lever in accordance with the decision table applying to the mechanism.

It was necessary to first complete all other conversion work. We needed the motor, energized by the controller, to operate the transmission for in-car tests. We expect to first try the "fooler" system on October 20th after the rest of the work is completed.

If it works we plan to turn over the vehicle to Triton on October 27th. This will be later if we need to then try the second choice approach.