F.V.E.A.A. NEWSLETTER

November 1992

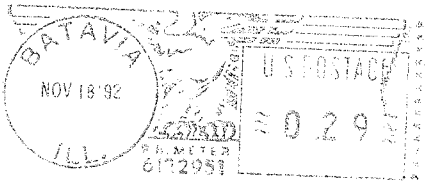
NEXT MEETING

November 20th @ 7:30
College of Dupage
Student Resource Center
Room 1046
Use Lambert Rd. Entrance, Lot 7 at the Southeast corner of 22nd & Lambert
Nonmembers are always welcome!

THIS IS YOUR LAST ISSUE!

This is the last issue of the year. Please renew your membership as soon as possible. Membership to the Fox Valley Electric Auto Association is open to the public. Anyone interested in electric vehicles or electric transporation are encouraged to join. The cost to join is $15 per year from November to November. If joining in the middle of the year the cost is $1.25 for every month remaining til November of that year. The cost for new members joining this month is $15.00.

FOX VALLEY 17:16 11/18/92 #2



Fox Valley Electric Auto Association
336 McKee Street
Batavia, IL 60510

First Class

ADDRESS CORRECTION REQUESTED

John Emde
6542 Fairmount Avenue
Downers Grove , IL 60516
USA

PREZSEZ

This newsletter ends another year, and what better way to end it then with the talk given by Philip Eidler from Johnson Controls. It is certainly encouraging to hear of such technology on the horizon. Particularly since Johnson Controls just received funding from the United States Advanced Battery Consortium (USABC). Rear the Minutes of the October meeting to get a brief overview of his talk if you were unable to attend.

This is also the time of year that we elect new officers. At the November meeting we will take nominations and vote in December. Please! If you are at all interested in becoming an officer or if you would like to help out in any way please contact one of the current officers.

I would also like to remind everyone to renew your membership. I feel it is a bargain at $15.00 a year. While the all other electric vehicle clubs in the country are $25.00 dollars a year and a bimonthly newsletter, ours is monthly.

I would also like to emphasize the need for newsletter material and suggestions. I do not want to loose the local feel of the newsletter by only publishing national news clips, and at the same I do not want to miss the national news. Don't assume that "I must have seen that article in the Trib." More than likely I didn't.

Sincerely,

Douglas F. Marsh

MINUTES OF SEPTEMBER 17, 1992 FVEAA MEETING

The meeting was called to order at 7:40 PM at the College of DuPage by Vice-President Woods in the absence of President Marsh. Seventeen members and two guests attended.

Treasurer Corel reports $ 1997.54 in the savings account and $ 930.99 in the checking account. The report was approved.

Minutes of the August meeting were approved.

Ken Woods announced a solar house tour on September 26 in Elgin. He distributed tour information to the members.

Members were asked to report on the status of their electric cars:

1. Jerry Mitchell has two electric cars, a VW Dasher which he uses regularly to drive about 10 miles per day and has accumulated over 7000 miles on electric power. His second is a Fiat 128.
2. John Stockberger's rehab of his Bradley has been on hold due to other commitments. He is about to relocate the charger.
3. Member Vana's Audi 90 still suffers from inadequate acceleration. He is planning a motor replacement to see if this will improve it.
4. John Emde's 74 Suburau conversion from 36 to 72 volts is still work-in-progress.
5. Jack Cahill commented on his 74 Hornet conversion.
6. Two members, Dale Corel and Tom Kaminski have Citicars.
7. Member Tom Cartwright from Dixon has 4 Triumph TR-7 cars in various states of repair. He plans to convert one to electric power when he finds the time and place to do the work.
8. Member Steve Clark reported on his Unique Mobility vehicle which needs a brake job after its tranportation to the Wisconsin events.
9. Bill Shafer described slow acceleration from standstill with his Mazda conversion. The locked-rotor current was measured by putting the car in 3rd gear and using the brakes to prevent movement. The current is only 50 amps, probably due to PMC controller design which was meant for series-wound motor application. Several alternatives for correcting this were discussed by the members. Included were a relay to bypass the

controller when the accelerator pedal is full-on, additional tests to determine the effect of the inductance coil in series with the motor lead, increasing the field voltage to well above the saturation point, motor replacement with a series-wound type, and replacement of the controller with the power transistor 36-volt unit from his DAF - upgraded to function at 72 volts.

Member Carl Chapman presented slides of the alternative-fueled vehicle demonstration drive which he attended last month. Four vehicles participated, with only one covering the entire distance without being trailered. One particular problem was obtaining fuels. Propane gas supply along the course had highway use tax complications. One car carried a supply of ethyl alcohol on a chase car trailer. Several cars required repairs during the event which indicates they are far from a mature, acceptable product for consumer use.

The meeting was adjourned at 10:15 PM.

Submitted by

William H Shafer
Secretary

MINUTES OF FVEAA MEETING 16 October, 1992

The meeting at the College of Dupage was called to order at 7:40 PM by President Marsh. There were 20 members and 5 guests present.

Treasurer Corel reported no change since the last meeting in the checking or savings accounts. This was accepted by the membership.

President Marsh covered information received since the last meeting. This included the new issue of Solar Mind, Alternative Transportation News, Proceedings of the October Solar/Electric Vehicle Symposium where he spoke, the Electric Grand Prix Newsletter, The Eco-Scoot which can be purchased for $ 2000, The Australian EV Newsletter, and data relating to the 406-mile range accomplishment of BAT Industries which apparently used silver-zinc batteries to achieve this single-charge distance.

Member Stockberger reported on information received from the California EAA regarding 1800 new Saturn cars whose engines were ruined by installation of the wrong antifreeze. Evidently these cars are going to be crushed. The EAA is hoping to convince Saturn Co to save these cars for electric conversions. They want to get at least 200 persons willing to acquire and convert these cars to electric power.

Member Kranovitch announced he is willing to sell his URBA car and convert his Dodge Caravan which is rapidly approaching engine failure. An offer will appear in the November Newsletter.

Guests introduced themselves and announced their interests. The technical presentation was made by Philip Eidler, Advanced Battery Division of Johnson Controls in Milwaukee. His topic was their development of a Zinc-Bromine (Zn-Br) battery. Operation of this electrochemical system involves plating Zn on a porous carbon electrode at the same time bromide is converted into bromine in the electrolyte. An organic complexing agent is used in the electrolyte to capture and hold bromine molecules during the process. The battery has an energy density of 70-80 Wh/Kg, about 3 times the usual 20-23 Wh/Kg for deep discharge lead acid batteries. The power density for Zn-Br is about 200 watts/Kg. At the present state of development, the battery has a life of about 300 deep discharge cycles, about the same as lead-acid, and requires a periodic stripping of Zn from the electrode after about 25 use cycles. Each cell
produces an open-circuit voltage of 1.8 volts and is charged at 1.6 volts. Smoothness of zinc deposition is dependent on charge rate. This is a factor to prevent dendritic zinc from penetrating the separator and shorting a cell. The battery has a usable temperature range from 0-60 degrees C. A 30 Kwh battery contains about 150 liters of electrolyte. Mr Eidler reported on use of a developmental battery during this year's Phoenix event. The battery was placed in a Geo Metro converted by Solectria. Although the battery was designed for an 86 mph top speed, the vehicle was limited to 71 mph due to handling difficulties. In the race, the car ran for 91 minutes @ 60.3 mph. A T-fitting came loose after 91 minutes allowing a discharge of electrolyte on the track surface which was at about 125 degrees F in the hot sun. At this temperature, the organic complex was broken down resulting in release of gaseous bromine. There were no serious or permanent injuries from the incident which caused an immediate termination of the race. Mr Eidler stated Johnson Controls will not appear in the 1993 event but intends to continue development.

Members asked many questions about the battery of Mr Eidler. Of particular interest was the projected cost of $ 100/Kwh, twice what FVEAA members are now paying for deep discharge lead-acid batteries for a Zn-Br system that has three times the energy storage ability. The key to reaching this objective is a significant order that will allow manufacturing facilities to be built.

The meeting was adjourned at 10:10 PM.

Submitted by,

William H Shafer
Secretary

EV Parts for Sale

Dear Folks,

I've had to discontinue work on an electric car conversion and there are a number of items I'd like to find a home for either sold separately or as a unit. The converted car is a 1983 Olds Firenza S/Coupe. The drive motor is a nominal 12 HP 64VDC 4-Pole unit made by G.E. It is coupled to a 5-speed transaxle via a machined adaptor connected to the clutch assembly. The controller is a Curtis PMC 1221 mosfet unit operating at 72-120 VDC. A 12 VDC motor runs a Sanyo vacuum pump for the power brakes. A manual steering rack was installed. All drive wiring is 4/0 stranded copper. Racks were installed to hold 1/4 of the batteries in the engine compartment and 3/4 behind the front seats, leaving lots of storage space and optimizing weight distribution.

The car was configured as a series hybrid using a 5500 watt, 11HP, Briggs and Stratton I/C engine generator in the engine compartment. Electric starting of the generator from the dash is via the normal steering-post keyswitch with choke, fuel valve, magneto, and output to the batteries controlled from the dash. Also available is a Lestronic 32 VDC 25-30 amp charger. The main reason for discontinuing the project (besides lack of funds, time, or continuing space) was the poor performance of the reconditioned nickel-iron cells used in the battery banks. 68 cells were linked in 4 sets of 17 for charging at 32 volts using the 120 volt charger or solar panels. The cells were switched to full series for normal operation and onboard engine charging. Despite repeated cycling the 75ah cells apparently couldn't provide sufficient amperage for the car to climb hills without suffering a large drop in voltage.

I'm willing to "parts out" the project for the amounts shown below but would prefer finding someone interested in continuing the project as a whole, perhaps using lead-acid cells. I've found a home for the solar panels and nickel-iron cells in a friend's off-grid remote home.

5500 watt Generator
(purchased new, used 10 min)
$1050.00/b.o.

32VDC Lestronic Charger
(purchased new, used 18 hours)
$300.00/b.o.

12 HP G.E. Motor
(purchased new, used less than 1 hour)
$350.00/b.o.

Machined adaptor for GM transaxle
(up to 1990)
$550.00/b.o.

Curtis PMC 1221 Controller
(purchased new, used < 1 hour)
$700.00/b.o.

Entire car as a unit, as is, including the above.
$4336.00/b.o.

Thanks for your attention.
Any help you can offer in spreading the word on this would be greatly appreciated.

Sincerely,

Bob Dahse
Rt. 3 Box 163A
Winona, MN 55987
(507)-452-4990

EVs As Alternative to Total Ban in Amsterdam

The European Community is very concerned with the effects of car pollution in their centuries-old city centers. Cities in Italy want to eliminate the noise and smog coming from internal combustion engines; the UK is considering environmental regulations to restrict the use of gasoline and diesel fuel; and, in the city of Amsterdam last month, a public referendum for the banning of all cars in the city's historic center was put up to vote.

According to as spokesman, a slight majority voted for a 50% reduction of the number of vehicles. The City Council is scheduled to confirm the outcome of April 15 and to announce a plan of action. The main threat of the referendum is alleviating the massive congestion problem in the Amsterdam city center for both traffic and air quality reasons. A 50% reduction in the number of vehicles would only put a large dent in the congestion problems (There are 130,000 cars fighting for 17,000 parking spaces each working day), but the fight for improved air quality might be more effective if the referendum also considered action to mandate that a large portion of the remaining 50% of cars in the city center must be electric.

Much of the concern in European cities is about traffic congestion, but vehicle-generated air and noise pollution is something that cities can begin to alleviate now, without pushing for an often impractical ban on cars altogether from city areas. A first step could be restricting combustion engines vehicles and encouraging, or requiring, electric vehicle use. Pollution from exhaust fumes in Amsterdam not only threatens citizens' health but it threatens the life spans of some beloved landmarks. The Dutch capital estimates that pollution from vehicles has caused $7 million worth of damage to some of the buildings in the city center. EVs could help the city hold off deterioration.

European cities may turn to electric vehicles as a means to take back their air and their ambiance.

Staff Photo by Ann Marie Maloney

Electric wheel inventor Jon Edwards uses a protoype to show how his device is intended to improve the efficiency of the electric car.

Reinventing the Wheel

Mechanic Patents His Design To Make Practical Electric Cars

By ANN MARIE MALONEY
Enterprise Staff Writer

St. Mary's At Work

Imagine never again shelling out several hundred dollars to repair a blown gasket or an engine overhaul. Then imagine owning a car driven on wheels containing an electric motor. After a few hundred miles, you simply charge them up again and keep going.

After five years of research and tinkering, Town Creek mechanic and shop owner Jon Ed- for an electric wheel last fall. However, the thought of making a more efficient car has been in his head for 20 years.

After fixing machines that are designed "to suck up people's money, I got sick of it," he said. He said he was also inspired by the concept of a

See MECHANIC, Page A-10

Mechanic Reinvents Wheel

Continued from Page A-1

magnetic drive train while he was at Disney World.

He teamed up with business partner Bob Sheridan, and as the Electric Wheel Division of Town Creek Industries, is two months away from showing off the final prototype to car manufacturers. Edwards' invention is designed to cure what has been the biggest obstacle for electric cars to hurdle, their weight, and double their efficiency.

On his father's advice, Edwards removed the parts of the engine, piece by piece, to get the ideal weight that can allow an electric car to go as fast as 70 mph. "I got it down to where I couldn't get anymore."

After building and driving race cars for 10 years, "I got a great understanding of chassis dynamics," he said.

Unlike the traditional vehicle in which the wheels are powered by the drive system in the body of the car, Edwards' invention reverses the design by putting the force in the wheels. The rest of the car is nothing more than a shell with batteries.

"It's simplicity in itself," Sheridan said. Without the burden of parts such as transmissions, drive axles or differentials, manufacturers could also have more flexibility in design, he said.

The motors in the wheel, called pancake because of their shape, weigh about 30 pounds and can last from 80,000 to 100,000 miles. They measure only about 13 inches in diameter and 1½ inches thick each. According to Edwards, the average car owner could maintain the vehicle himself.

The entrepreneurs' dream of seeing their device eventually being mass-produced. "That's 10 years from now," Sheridan said. However, they are not naive about the huge hurdles thay have to face, convincing an auto industry that has its own mindset. For now, they estimate the price for the wheel between $750 and $1,000.

by LINDSAY BROOKE

STOP ELECTRIC CARS!

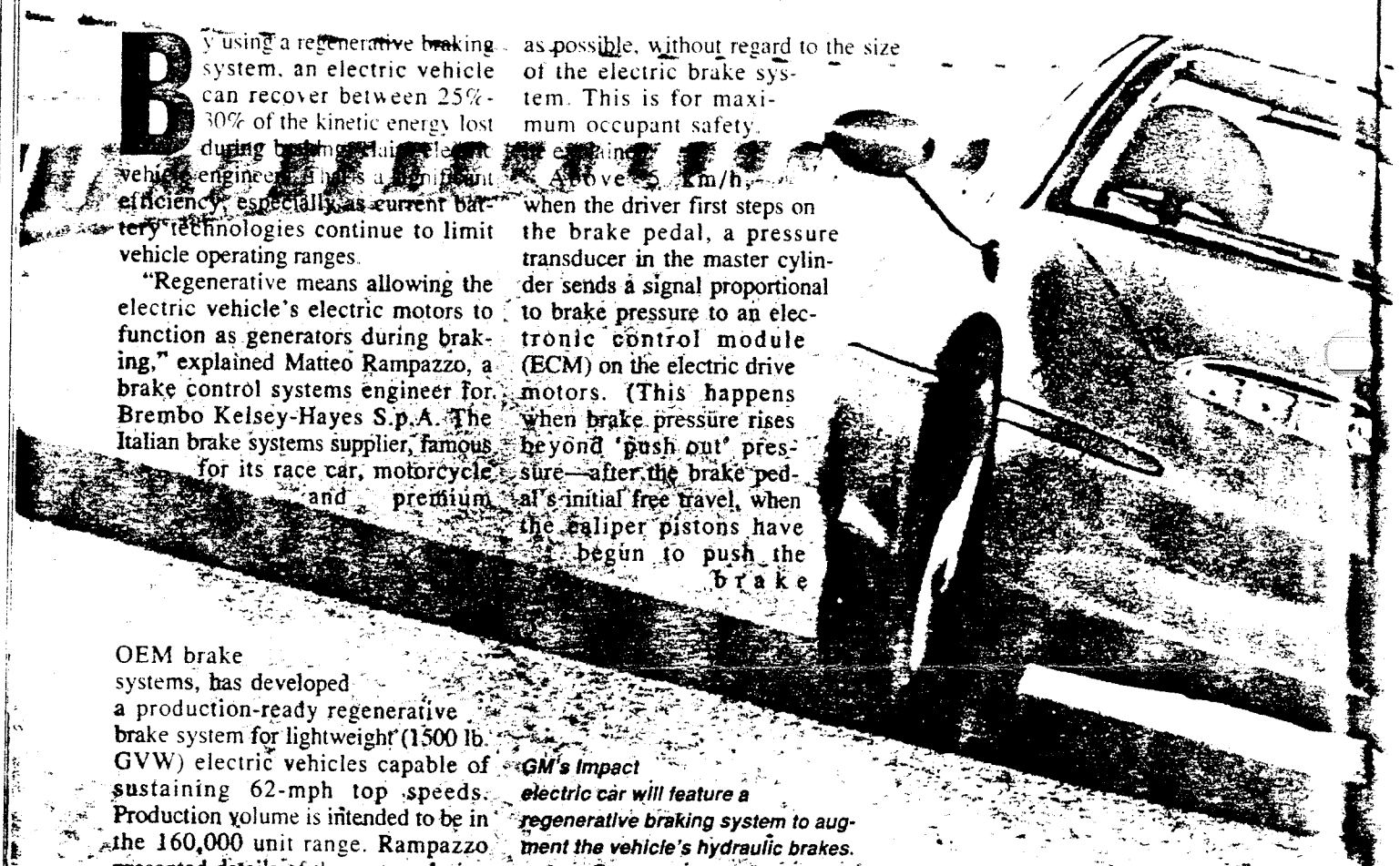
Regeneration is the key to efficient electric vehicle braking systems. Kelsey-Hayes' Brembo division already has a lightweight regenerative brake system ready for production in small electric cars.

By using a regenerative braking system, an electric vehicle can recover between 25%-30% of the kinetic energy lost during braking. Thus, electric vehicle engineers say it's a significant efficiency, especially as current battery technologies continue to limit vehicle operating ranges.

"Regenerative means allowing the electric vehicle's electric motors to function as generators during braking," explained Matteo Rampazzo, a brake control systems engineer for Brembo Kelsey-Hayes S.p.A. The Italian brake systems supplier, famous for its race car, motorcycle and premium OEM brake systems, has developed a production-ready regenerative brake system for lightweight (1500 lb. GVW) electric vehicles capable of sustaining 62-mph top speeds. Production volume is intended to be in the 160,000 unit range. Rampazzo presented details of the system during this year's SAE Congress in Detroit.

While Brembo's regenerative system is designed to be backed up by a conventional hydraulic brake system, the idea was to use a single control point (brake pedal) to regulate both systems. According to Rampazzo, only the conventional hydraulic system is employed at speeds below 5 km/h, because the electric motors can't recover energy at such slow speeds. It's also noted that Brembo has sized the hydraulic brakes to be as big as possible, without regard to the size of the electric brake system. This is for maximum occupant safety.

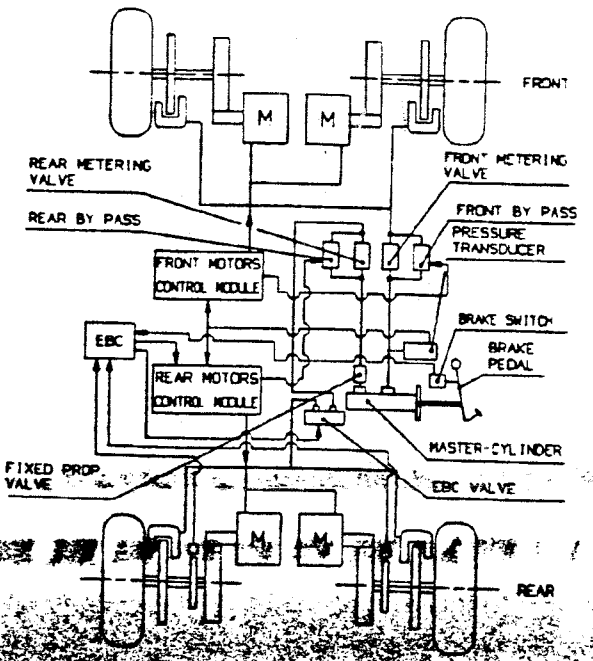
Above 5 km/h, when the driver first steps on the brake pedal, a pressure transducer in the master cylinder sends a signal proportional to brake pressure to an electronic control module (ECM) on the electric drive motors. (This happens when brake pressure rises beyond 'push out' pressure—after the brake pedal's initial free travel, when the caliper pistons have begun to push the brake pads against the rotors.) The ECM then activates a bypass solenoid, closing it and re-routing brake fluid to a metering valve, where the fluid is held off.



GM's Impact electric car will feature a regenerative braking system to augment the vehicle's hydraulic brakes.

At this point, the ECM activates regenerative braking by turning the electric motors—one at each wheel, depending on whether the vehicle is front-wheel-drive (fwd) or all-wheel-drive (awd)—into generators. The generators produce a torque proportional to the transducer signal, so the

Brembo regenerative braking system on an all-wheel-drive electric vehicle. Note EBC valve and module locations for possible ABS capability.



driver can modulate pedal pressure and braking effort in the conventional manner. Thus the vehicle is in its 'electric brake' mode.

As pedal pressure increases, the system eventually reaches maximum energy recovery. Higher pressure opens the metering valve, dumping brake fluid into the vehicle's conventional braking system and adding hydraulic braking to the electric brake.

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But he noted that awd electric vehicles are much more efficient energy regenerators, because the rear axle of a fwd electric vehicle represents lost potential energy.

He said that on an awd electric vehicle, Brembo reckons that about 65% of the energy recovered is generated at the front axle and 35% at the rear.

Electric motor/generator performance specs vary according to vehicle speed.

As mentioned, there is no energy recovery or braking action in the Brembo system below 5 km/h. Between 5 km/h and 40 km/h, each motor produces a constant 11 Nm (8.1 lb-ft) of torque, which drops off progressively to 4.9 Nm (3.6 lb-ft) as the vehicle reaches 100 km/h. Above 40 km/h, each motor produces a constant 5 kW of power through the vehicle's top speed.

Maximum and minimum global torques produced by the electric motors during regenerative braking at speeds between 5 and 40 km/h, and at 100 km/h, are 440 Nm and 180 Nm, respectively.

To add an anti-lock capability to its regenerative braking system for awd electric vehicles, Brembo would employ Kelsey-Hayes' EBC-2 system, according to Rampazzo. EBC-2 is a low-cost, lightweight (about 2 lb without wheelspeed sensors), two valve ABS designed for light truck applications.

"To get ABS performance, we'd have to integrate the electronics of the vehicle's electric motors and the EBC-2," he noted.

The EBC -2 system would function as both a proportioning valve, adjusting braking action according to an ideal curve and corresponding loading condition, and as ABS, by reducing braking torque produced by the electric motors and isolating and reducing rear axle pressure. AI

Braking for 40 kW and Beyond

As electric vehicle traction ratings and performance increase, regenerative braking modes will have to be reconsidered. According to experts Floyd A. Wyczalek and Tsih C. Wang in their recent SAE paper (920648) on the subject, regeneration energy levels returned to the battery pack can range from 3.8 kW (10 Wh) in under 10 seconds in urban driving cycles, to 56.5 kW (94 Wh) in under 30 seconds in suburban cycles.

Wyczalek and Wang note that since battery life, regenerative braking may be programmed at a lower braking level commensurate with optimizing the life of a particular battery pack. They suggest three emergency braking system options for rates above 12 kW: 1. Dumping to a battery designed for lower internal resistance and forced-air cooling (as on Nissan's FEV); 2. Diverting regenerated energy to an on-board resistor bank; 3. Diverting the energy to an electric motor-driven flywheel storage system.

Wyczalek and Wang note that since battery recharging rates greater than 12 kW reduce battery —LB

Quick-recharging NiCd (nickel-cadmium) batteries in Nissan's FEV electric concept car are forced air-cooled, allow braking regeneration up to 40 kW levels. Above 40 kW, hydraulic brakes complement regenerative system.