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ecoTECHNOLOGY for Vehicles  
an ecoACTION initiative

Canada

Summer 2009

Test drive the future with eTV



## WELCOME TO eTV's *green* WHEELS

Welcome to the summer edition of *eTV's Green Wheels*, the quarterly newsletter for Transport Canada's ecoTECHNOLOGY for Vehicles program.

As you can see from the variety of activities included in this month's newsletter, eTV staff have been busy forming partnerships, testing and evaluating new vehicle technologies, and sharing results with the public.

As you read through some of the articles in this edition, click on the links to eTV's website, where you will find many more articles about green vehicle technologies and four new videos recently added to our green vehicle technology series.

### *Mitsubishi i MiEV ride-and-drive*

On June 25, 2009, eTV hosted representatives from Environment Canada, Natural Resources Canada, Industry Canada and Mitsubishi Motor Sales of Canada at Transport Canada's Vehicle Programs facility in Ottawa. Tomoki Yanagawa, Vice-President, Sales, Marketing and Corporate Planning for Mitsubishi, provided a technical briefing and demonstrated their "Mitsubishi Innovative Electric Vehicle" or i MiEV to federal government officials responsible for regulating vehicle emissions, researching and developing electric vehicles, and promoting fuel-efficient and low emissions vehicle technologies. David Moroz and Paul Simmonds from Mitsubishi were also on hand to answer questions. The highlight of the morning, however, was the

ride-and-drive, during which government officials could test-drive the i MiEV, one of the world's first fully electric production vehicles, as well as the iCar, a small, rear-engine, fuel-efficient gasoline vehicle.

Electric vehicles like the i MiEV can help reduce the environmental impacts of transportation. The i MiEV produces zero tailpipe emissions and is capable of high torque at low speeds. As well, its regenerative braking captures a portion of the vehicle's energy normally lost as heat during braking. The i MiEV also contains several innovative technologies, including high-capacity lithium-ion batteries and a high-performance compact motor. With a range of up to 120 kilometres (75 miles), the i MiEV

could interest people who commute daily in urban or suburban neighbourhoods.

Mitsubishi Motors plans to launch the vehicle in Japan later this year, and is currently studying a potential North American release.



Tomoki Yanagawa (Mitsubishi Motor Sales of Canada) points out the merits of the i MiEV to some of eTV's staff

## Meeting the automotive press

On May 27, 2009, the eTV team hosted a technical briefing and ride-and-drive event on advanced technologies. The AUTO123 journalists who attended the event at Transport Canada's Blainville Motor Vehicle Test Centre, north of Montréal, got far more than just information about the program. They actually got to drive some of eTV's energy-efficient vehicles such as the Volkswagen BlueMotion Polo, the A123Systems Hymotion plug-in hybrid vehicle conversion, the Smart Crossblade, as well as the Vectrix electric motorcycle and the Bionx power-assisted bicycle system.



AUTO123 journalists prepare for the drive portion of the event

To learn more about the event, visit the Auto123 website, which features a photo gallery, articles on various green technologies and a video (French only).

## Environmental benefits of a hydrogen pickup truck

eTV is evaluating the environmental and performance benefits of a particular kind of hydrogen vehicle – a hydrogen internal combustion engine pickup truck. The 2006 hydrogen-powered GMC Sierra was acquired from the Integrated Waste Hydrogen Utilization Project (IWHUP). Like most vehicles on the road today, it runs on an internal combustion engine. However, this V-8 engine has been modified to burn hydrogen gas instead of gasoline or diesel fuel. This has many environmental benefits because vehicles burning hydrogen fuel produce no hydrocarbon or carbon dioxide emissions by-products.



eTV's Marc Belzile gets a lesson in fuelling the GMC Sierra at Natural Resources Canada's Booth Street Hydrogen Refuelling Station, in Ottawa

Over the coming months, eTV plans to evaluate the vehicle's environmental benefits. We will look at its fuel consumption and emissions characteristics in various conditions. Check the eTV website for regular updates on the test plan and test results.

## ZEM – Displaying an interesting idea

The four-cyclist ZEM bicycle (zero emission machine) was acquired to evaluate its viability in Canada. A two-cyclist model is also available. It is an example of a class of vehicles called power-assisted bicycles (PAB). Equipped with hydraulic brakes, 2-point safety belts, a rear-view mirror and adjustable seats and pedals, the ZEM is classified as a Restricted-Use Motorcycle under the Canadian Motor Vehicle Safety Act and Regulations.

The ZEM offers an alternative to motor vehicle transportation, reducing traffic congestion, greenhouse gas emissions and fuel consumption. It can be used as a bicycle or be propelled by a combination of an electric motor and the power of the four cyclists. Pedalling assistance reduces the effort required to travel long distances.



Patricia Procter, Vehicle Programs Manager, hands over the ZEM to John Bouza, Executive Director of the CSTMC Foundation

Since eTV works with a variety of partners to promote sustainable modes of transportation, we donated the ZEM to the Canadian Science and Technology

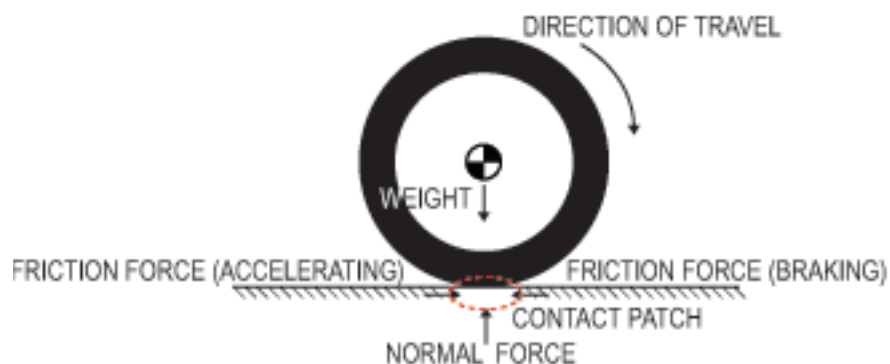
Museum Corporation (CSTMC) Foundation, which will showcase the ZEM as an example of an alternative transportation throughout the National Capital Region, particularly on Sunday mornings when some of the major roadways are reserved for cyclists.

## Lowering the resistance to new tire technologies

Did you know that, for most vehicles:

- More than 80% of fuel energy is wasted by various thermal, frictional and standby losses (*Tires and Passenger Fuel Economy*, National Academy of Sciences, 2006);
- Between 1.5% and 4.5% of total fuel use could be saved if all replacement tires had low rolling resistance (*Green Seal's Choose Green Report*, Green Seal, 2003).

What is rolling resistance, and how can it help reduce a vehicle's fuel consumption?



When a rubber tire makes contact with the road, it creates frictional forces that make traction, cornering, acceleration and braking possible. To maintain this contact, a tire continually deforms and reshapes itself as it rolls over the road – requiring energy. Contact with the road creates an opposing force called rolling resistance. The more energy needed to deform and reshape the tire, the higher the rolling resistance. And the higher the rolling resistance, the more fuel must be burned to replace the lost energy. This results in higher fuel consumption and more tailpipe emissions.

Many vehicle manufacturers already install low rolling resistance tires on their vehicles. But if drivers replaced their worn out tires with low rolling resistant ones as well, it could have an impact by reducing fuel consumption and greenhouse gas emissions in Canada.

eTV is studying the link between lowering rolling resistance and reducing fuel consumption and carbon dioxide emissions. Our tests take into account different light-duty vehicle sizes, tire widths, tire profiles, rim sizes, manufacturers and availability in Canada.

For more information and study results, check out the article and the technical sheet on low rolling resistance tires on the eTV website.

## Hydrogen fuel cell vehicles – a safe alternative?

eTV works hard to help get clean technologies put into light-duty vehicles sold in Canada. To do this, we work with industry partners to help remove barriers to the market for emerging technologies.

Hydrogen fuel-cell vehicles (HFCV) are a case in point. They have a greater range than electric vehicles. They also produce much fewer greenhouse gas emissions than conventional gasoline-powered vehicles. Despite these obvious benefits, however, the general public still knows very little about hydrogen, and may even have some misconceptions about its safety.

The Vancouver Fuel Cell Vehicle Program (VFCVP), one of three demonstration projects of the Canadian Hydrogen and Fuel Cell Association (CHFCA), is working with eTV to assess the regulatory barriers of using hydrogen-powered vehicles in Canada, and to show how hydrogen can safely power motor vehicles.

Specifically, the partnership is studying what might happen in the unlikely event that a vehicle begins to leak hydrogen in an enclosed parking garage.

A preliminary study commissioned by the VFCVP reviewed two scenarios involving a hydrogen leak from a fuel-cell vehicle parked in an underground 20-vehicle garage with no ventilation system. Of particular interest was the hydrogen concentration by volume for two simulation scenarios – a hydrogen leak four seconds after start-up, and a steady-state release eight seconds after start-up.

The study showed that:

- Within the hydrogen clouds formed in both scenarios, the potentially flammable area is small;
- Because these clouds dissipate quickly, even without ventilation, neither scenario presented any serious hazard;
- There was very little difference in the hydrogen clouds formed in enclosures with and without mechanical ventilation.

This study is a step towards developing a practical resource to address public safety concerns. By clearly showing the actual level of risk posed by hydrogen-powered vehicles, we can establish a process for getting permission from authorities across Canada to allow hydrogen-fuelled vehicles to park wherever other vehicles may park.

The next step will be to conduct a probability and risk analysis and to broaden the scope of the hydrogen leak modelling so results can be applied on a national scale. As well, eTV and the VFCVP will work with appropriate officials to develop recommendations for response strategies if a hydrogen leak from a parked vehicle ever occurred in an enclosed structure.

## Parting Thoughts

Vehicle manufacturers are introducing new technologies that address growing concerns over fuel prices and environmental regulations faster than ever. The many technologies on the horizon offer some interesting choices for the eTV program. The challenge, however, is to focus on providing Canadians with information on new technologies so that they can make greener choices.

Check the eTV website periodically over the coming months to learn more about the technologies that eTV plans to add to its fleet. These include the Smart Micro-Hybrid, the Renault Mégane, the Subaru Forester PZEV and the BMW 118d.

We hope that you share our excitement about these promising new green technologies and will visit our website at [www.tc.gc.ca/eTV](http://www.tc.gc.ca/eTV) to read more about how eTV is *driving the future!*

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