

TECHNOLOGY USED:

The electric vehicle developed by the university has adopted the following technology:

Motor drive:

We use the latest motor drive techniques. The high frequency inverter is used to reduce the drive size and improve the efficiency. The control of the motor drive is using WPM method and managed by microprocessor or Digital Signal Processor. The controllability is also improved significantly as compared with the conventional electric drive.

Battery charger:

We have developed a bridge converter technique that is based on a phase-shifted control method. The charge is of high power density and soft-switching. The 3-stage of charge is used for fast charging and temperature control is also implemented. Two modes of fast and slow charge are available for users' selection. The slow charge mode provides battery maintenance and prolongs the battery life time. The fast mode provides quick charging. The battery charger can be built in the vehicle or portable.

Lighting:

We have developed the high performance HID and LED lighting systems for the illumination in the vehicle. The HID lamp is used for the front-lighting. A high performance electronic ballast is used that provide instant startup and smooth current conditioning. The LED is used in the tail, signal and braking lighting. A power electronic controller was designed to provide power conditioning. It provides high performance lighting level control. The energy efficacy has been

designed for both HID and LED lamps and they provides high percentage of energy saving.

Motor design:

The motor are selected and designed with our motor specialists with detail finite element analysis. The motor are using DC or AC electric machines that the selection depends on the cost and the performance needed. Both motor of high efficiency and high life time.

Electric safety:

All vehicles are implemented the current monitoring and temperature monitoring. All faults will be detected. A manual power control is available for users shut down of power.

In-wheel motor:

The motor is now integrated with the wheel and the combined system is a module unit. The technology can be used for direct and 4-wheel drive. New control method has been adapted for the 40wheel control.

Batter management system:

State of charge, stage of health and overall safety control and management are developed for the monitoring, power management and the control of the battery system. The technology can be used for normal car, hybrid electric vehicle and electric vehicle.

Environmentally Friendly Electric Vehicle

At The Hong Kong Polytechnic University



Three electric vehicle developed
(from left: EV-3, EV-20, MyCar)



In-wheel motor



Development of electric motorbike

Latest News

The university has developed three types of electric vehicle: EV3, EVG3 and EV20

The EV 3 is an electric vehicle with power rating 3kW and it is town car style. EVG3 is also with power rating 3kW but is based on a golf-car style. EV20 is an electric vehicle with a Mercedes Benz Smart™ body and has been converted to a 20kW motor drive.

The vehicles are all electric including traction drive. All the other associated electronics are all electric. The battery is using lead-acid, or NiMH that depends on the users' need.

Three electric vehicles have been developed for the project. We have used the power electronics techniques for the power conversion, drives, power management and reliability.

The EMI and EMC signature for the electric vehicle is now developing and model of the all electric device and its prevention techniques. The new development is very important for the safety and the lifetime of the electric parts of the vehicle.

Contact person – Professor Eric Cheng



Prof. Eric Cheng is a professor in the Dept. of Electrical Engineering of the Hong Kong Polytechnic University. He is the group leader of Utilization of the Department and Director of Power Electronics Research Center of the University.

His research interests cover all aspects of power electronics, magnetics, machines, EMI and drives. He has published over 200 papers and 7 books. Since he joined the Department in 1997, he has been working on 31 research and development projects as a Principal Investigator with total funding of more than \$35 Million. He also has been Principal Investigator for 4 CERG projects.

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The following is the information of one of the models we developed for the electric vehicle.



Model: EV-3

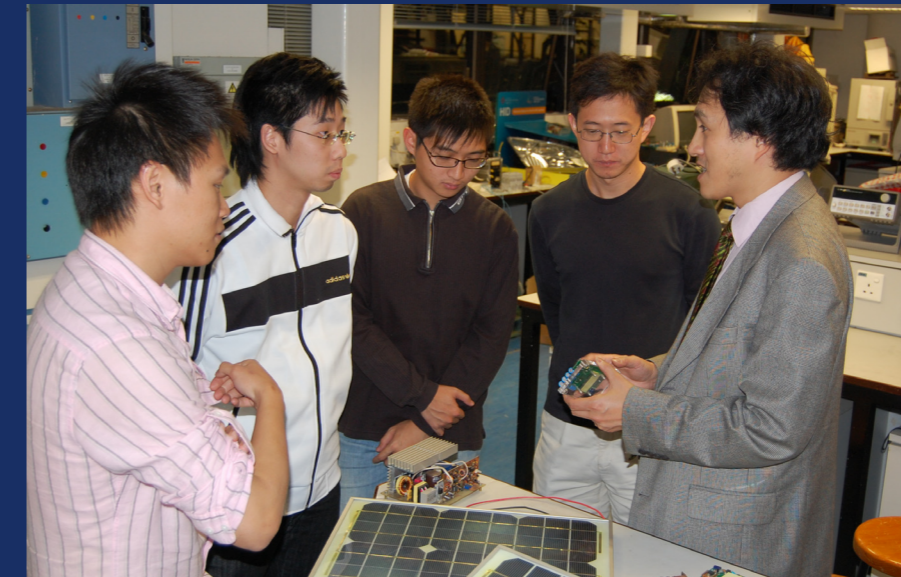
Description of parts and components of the charger electric vehicle



a. Body: 2 doors; 2 seats.
b. Chassis: Steel tubular frame structure with tubular roof roll bar.
c. Breaking System: Front and rear hydraulic disc breaks
d. Suspension system: Front and rear independent suspensions with coil springs and damper
e. Wheels and tires: 14 inch Aluminum alloy wheels with 165/70R14 all weather radial tires.
f. Electric motor: 48V DC motor
g. Gearbox: single speed gearbox with integrated differential driving rear wheels.
h. Gears: electronic controlled front, neutral and reverse.
i. Battery: lead gel deep cycle type.
j. Battery charger: built-in or portable; AC mains input 100-240V, 50/60Hz.
k. Mirrors: central rear view mirror and powered side mirrors.
l. Comfort & convenience: powered central door locks with remote control, powered rear boot lock with remote control and powered windows.
m. Ventilation: Fan
n. Audio system: built-in with AUX and USB inputs, 4 speakers
o. Installation of electric motor

Electrical Specification:	
Engine:	Electric motor, 3kW
Charger:	220V input, 1.4kW fast/slow charger. Charging time 6-12 hours
Battery type:	48V 100AHr, Option of: Lead Acid or NiMH
Range per charge:	60-80km (Lead acid), 130-160km (NiMH)
Maximum speed:	60km
Wiring :	Modular harness design with weather protected connectors
Lighting:	<ul style="list-style-type: none"> • Headlights with high / low beam, brake lights, reverse warning light, • Turn signal lights; hazard warning light • Headlight has the option of: HID, Halogen, or LED • Other tail or signal light: LED or Halogen

About Power Electronics Research Centre (PERC)



Team discussion on photovoltaic system



Front lighting panel



Electromagnetic testing equipment

The two power electronics groups in the Department of Electrical Engineering (EE) and the Department of Electronic and Information Engineering (EIE) and are well-established research groups. Both groups have an impressive research track record in the areas of power converters design and modelling, power factor correction, chaotic phenomena, motor drives, motor design, energy management, magnetics, electromagnetic compatibility and application of power electronics in power system engineering. In November 2000, the two power electronics groups merged to become the Power Electronics Research Centre. This merger offers significant advantages in staffing and equipment utilisation, as well as in the promotion of large-scale collaborative research work. The Centre has

a wealth of experience in research, testing, evaluation of products and development of new technologies. In addition to conducting research and development work, the Centre provides various services to industry, such as consultancy, testing of utility system components, quality assurance evaluations and professional training. The Centre has a comprehensive range of facilities and equipment. The aims of the center are to provide high level research and development and support local and overseas industrial work. We provide technical training for local engineers who work in the field of power electronics. Regular workshops and conferences are organized by the Centre to foster the exchange of ideas among various research institutions and power electronics manufacturers.

Overall Specification:	
Emission level:	Zero
Engine noise level:	Zero
Seat capacity:	2 seats with safety belt
Body panel:	Fiber Glass
Suspension:	Front and rear independent suspension, coil spring, shock absorber
Brakes:	Front and Rear hydraulic brakes with Disc; Hand-operated parking brake
Gears:	Electronic controlled, forward, reverse, neutral
Windscreen:	Safety glass windscreen with wiper
Mirrors:	<ul style="list-style-type: none"> • Adjustable rear-view mirror inside the front windscreen, • 2 adjustable external side-mirrors
Vehicle dimension:	2.6 meters length, 1.4 meters width, 1.5 meters height
Ventilation :	Fan ventilation at front dashboard
Weight:	500kg

Vehicle size 2653(L)x1396(W)x1446(H)mm
Homologation standard: Automotive E-mark/DOT