THE FUTURE OF THE AUTOMOBILES IN SRI LANKA

Dr. Rohitha Weerasinghe
Thermo-Fluids and Energy Group
Department of Mechanical Engineering
University of Moratuwa, Sri Lanka

ABSTRACT

The features of the modern automobiles are reviewed and its probable future is discussed. The problem of the limited fossil fuels directs the car manufacturers to look for alternative sources and machines for generating power. In the Sri Lankan context, even though presently the country is merely a vehicle importer, the present demand allows the entrepreneur to manufacture/assemble cars and light vehicles. The capabilities of the academia are reviewed and the possible interaction between the academia and the industry is highlighted.

1.THE MODERN MOTOR VEHICLE

The present day automobile is quite a sophisticated machine and it is far more comfortable and safer than that were produced three or four decades ago, but some of the advanced technologies that are used today date back to the same era. For example, ABS were introduced in the 1970s by Mercedes. BMW used EFI in 1980s. Turbo-charging dates back even to 1930s. Nevertheless, the difference is that the 'advanced futuristic features' of the previous decades are standard technology today. Some of the advance technologies that are used in the modern vehicles are described below.

ABS and Traction Control

ABS prevents wheels from locking during braking and increases stability. Individual wheel speeds are measured, fed into a real time computer and accelerations and decelerations are calculated. If any particular wheel or a set of wheels exceeds or drops below predetermined velocity and acceleration rates, a corrective control for slipping or locking of each wheel is applied to the wheels hydraulic braking system.

ESP

ESP stands for Electronic Stability Program, which stabilizes the car. If the car is about to spin, the system intervenes and puts the car back on track safe. ESP has been introduced 'the greatest breakthrough' in active safety systems. An on-board computer constantly extends its feelers and controls torque on wheels for the vehicle not to slip or crash onto a barrier.

Drive-by- wire

Drive by wire systems have replaced heavy and inaccurate mechanical systems with advanced and precise electronic sensors. Certain Formula 1 cars and some Toyota and Honda cars use electronic throttle controls.

Usually, hydraulic and mechanical connections have been replaced by servo motors and switching systems. The 2001 Toyota Corolla for example is fitted with an electrically operated power steering.

GPS

Global positioning systems allow the driver to locate his vehicle on an on-board electronic map and obtain traffic and direction data on the screen. The positioning signals are obtained via satellites. The complete integration of GPS, collision avoidance and drive by wire brings about the concept of 'a driverless vehicle'.

Collision Avoidance

'Proximity controlled cruising' allows cars to keep the distance between the car in front using radar signals. The capabilities have been enhanced using video technology and image processing to identify lane markings, road curvatures etc.

CAN

CAN (Controller Area Network) is a communication bus that is present in vehicles which provides the communication channels for the microprocessors and controllers in the vehicle.

Bluetooth

Voice activated controls for entertainment and communication enables hands-free operation of controls.

The above technologies along with the drive train and other conventional controls need powerful on-board computers. Most of the above technologies are 'standard' equipment in present day cars, but the future of automobile is not just sophistication, safety and fuel economy.

2. THE FUTURE VEHICLE

The main concern about the future vehicles is 'what the power source would be'. The limited fossil fuel resources has lead the researcher to look for alternatives to fuels and at the very extreme alternatives to the internal combustion engine. The present choices are electric vehicles and hybrid vehicles. Also the Zero Emission Vehicle (ZEV) mandate has directed the manufacturers to look for greener fuel technologies.

The limitations of electric vehicles at present are the shortcomings of battery technology. The power requirement of an electric vehicle is obviously much higher than that of an IC engined vehicle. The technology has developed recently, but batteries are still too heavy to become a viable replacement to the IC engine. Another problem is the establishment of charging stations. One possibility is to replace the existing fuel pumps with 'electricity pumps' on forecourts. A more viable alternative is a hybrid vehicle which replaces a bulky battery with lighter add-ons. According to one author, a hybrid vehicle consists of some combination of reciprocating or rotary IC engine, an electric motor, and perhaps a turbine, if not also fuel cells, and human pedal power and roadway linear induction motors.

Instead of conventional brakes, inertial energy will be recovered and stored in either a battery, a flywheel or an ultra capacitor.

Other futuristic views include, complete change in the present infrastructure, construction of new guide-ways and on the other extreme going back to horseback.

3. AUTOMOBILES IN SRI LANKA

The number of vehicles that enters Colombo during an average week day is around 600,000. The total number of vehicles registered in the year 2000 with the Registrar of Motor Vehicles is approximately 96,000.

Almost all the vehicles are imported to the country at present with the exception of a few buses that are assembled in Sri Lanka. The law permits to import reconditioned and used vehicles up to three years old (cars) and up to five years old (light vehicles). Effectively the average newly registered vehicle is at least two years old. With appropriate technologies and entrepreneurship it is possible to produce new cars to replace the cheap imports. Since the global automotive industry is on a changing phase, it is now the right time to invest in new technologies as alternatives to the conventional IC engine.

4. AVENUES FOR RESEARCH

The discussion above reveals that the immediate areas of research are battery technology, use of alternate fuels and renewable and solar energy. The present battery technology is still inadequate to use as a direct means of power. The most advanced Nickel metal Hydride (NiMH) batteries are still two heavy and costly to be used as the single power source. The size of the battery should be somehow reduced to the size of the present engines or smaller. New chemicals, charging methods and the motors that consume low electricity are consequently the desired development.

Also, there are specific problems in the Sri Lankan context; the emission regulations are not in par with the current European or international standards. Most of the vehicles that are imported to the country come from Japan. Fuels that are used and the road conditions do not yet match with the Japanese standards. This mismatch has increased the cost of maintaining vehicles considerably. It is an immediate requirement that proper vehicle emission standards are imposed. There are point measurements of emission levels in Colombo, but vehicle specific data have to be collected and analysed.

The present demand for cars suggests that it is possible to manufacture cars for domestic use and may be for export. Since the internal combustion engines are at the end of its life cycle the viable alternative is to develop an alternative fuel powered and/or hybrid vehicles. The modern hybrid vehicles produced by Toyota *et.al.* are still too expensive for domestic use. Therefore, if produced, a cheap hybrid will be both economically technologically successful.

In view of producing an automobile manufacturing culture in the future in Sri Lanka, the engineering education has to absorb several attributes. At present, Sri Lanka has an adequate number of technical craftsmen to carry out routine maintenance of vehicles. Nevertheless, a professional community to involve in designing is yet to develop. Universities should play a leading role in grooming the future automobile engineers. In the development of such a concept, the academia has few strengths.

- The universities produce about 200 mechanical, electrical and chemical engineering graduates
- Labour oriented production processes in Sri Lanka will be economically profitable at least for the next decade.
- The theoretical and computational strengths are already present in the universities in the form of computational modeling of vehicle dynamics, aerodynamics and production processes.

To obtain the full use of these strengths highlighted, the Automobile Engineering curricular of the Universities must be aimed to find solutions for the present problems. The curricular should accommodate the streams automotive technology and automobile engineering design. The former is aimed at obtaining the basic knowledge whereas the latter is aimed to groom the students for designing. This designing phase has to start at the end of the undergraduate period and continue at postgraduate level. There should be specific projects that are aimed at innovative new technologies. A part of the present energy related studies can be streamlined for automobile power plant designing.

In the light of the above discussion, and the economic trends in the Western world the manufacturing of the next generation vehicles in Sri Lanka is not a impossibility.

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W.M.S.R.Weerasinghe graduated from University of Moratuwa Sri Lanka in 1994. Then he joined the same University as a Lecturer. He read for his Ph.D. at Imperial College of Science Technology and Medicine,London in Combustion and obtained his Ph.D. from the University of London in 2000.

Dr. Rohitha Weerasinghe is working in the University of Moratuwa at present as a Senior Lecturer and his areas of research are Automobile Engineering, Combustion and Computational Modelling.