

Dr Yoshio Kimura

Thank you, Mr. Chairman. Good afternoon, ladies and gentlemen. I am working for Toyota, being involved with the development of the fuel cell and electric propulsion. But today, representing Japan Automobile Manufacturers Association, I would like to briefly introduce what is going on in the field of environmentally friendly vehicles in Japan.

From my consideration, the requirements of the environmentally friendly vehicle are low exhaust gas emissions, low carbon dioxide emissions and low energy consumption. Then, we have to assume that the electrical vehicle, hybrid vehicle and fuel cell vehicle can be the candidates of the environmentally friendly vehicle, and those are my background, too.

Today, I'd like to introduce the current status of these three types of vehicles in Japan. This viewgraph shows one of the typical environmental performance of these technologies or vehicles. Gasoline engine hybrid can reduce the carbon dioxide emission by 30 percent.

The electrical vehicle has a potential to be the vehicle with the least emission of carbon dioxide. However, if the charging control is not appropriate, it can be easily likely to increase the emission.

I'd like to start with the electric vehicle. As you all know and listed here, the electric vehicle has many good points and has been developed since a long time ago.

This table shows the list of the electrical vehicles sold in Japan for this decade.

Although the technologies of the electric vehicles have been advanced drastically and the EV performance has been improved by the 1990s, the total number of the electric vehicles in use in Japan is less than 5,000. With such a few number of vehicles, which could be the perfect environmentally friendly vehicle, we can't expect enough impact on the environment.

Same thing in the U.S. too. Today, the total number of electric vehicles sold or leased in the United States is less than 5,000. We can say the same thing in the European countries.

On the other hand, hybrid vehicle has rapidly increased its market in a very short period and exceeded already 70,000 in use in Japan. I'd like to insist again that with small number of products, which could be excellent for the environment, we cannot expect enough impact on the environment.

Here is the future figure of what we expect of the electric vehicles. One of the ways in which electric vehicle will survive is to create a niche market of the very

personal transporter through the development of super mini electric vehicles. There are some manufacturers who are very interested in this category in Japan.

Another way toward the bright future for the electric vehicle is to develop a social system, where electrical plays a major role.

I'd like to get into the hybrid vehicle. Hybrid vehicle is defined by ISO as a vehicle with at least two different kinds of either or both of power trains and stored energy. Hybrid vehicle is assumed to realize high fuel economy and clean emission by recovering the breaking energy and operating the engine only in the high efficiency and the low emission mode.

This viewgraph shows schematically how the hybrid vehicle increases energy efficiency, in other words, saves energy. Owing to the battery engine peak power, which is shown by the red line, can be reduced and the breaking energy can be recovered for the transaction power at the following stage.

This viewgraph shows the comparison of total energy efficiency from well to wheel among electric vehicle, hybrid vehicle and IC engine vehicle. Total efficiency of the hybrid vehicle is calculated and measured, actually, almost twice as high as conventional IC engine vehicle.

The electric vehicle shows high efficiency as is well known. However, the efficiency of electricity generation is rather poor and the total efficiency is resultantly lower than the hybrid vehicle.

The hybrid concept is classified into three categories shown here. Each technology has its own inherent advantages and disadvantages. Currently, each technology is still being studied for ultimate future, including its variations.

This table shows the list of hybrid vehicles in the marketplace in Japan. Sales volumes are widely varied from volume sales to a few experimental sales. Every kind of hybrid system is studied with a wide variety of vehicle categories, from super mini-passenger cars to large commercial vehicles.

I'd like to glance at the photos of those vehicles since a member of Japan Automobile Manufacturers Association, which means each manufacturer wants me to show you its own vehicles. Suzuki hybrid, Toyota hybrid, Nissan Neo hybrid, Honda hybrid. Again, Nissan diesel hybrid truck. Hino hybrid bus, again Hino hybrid truck. Mitsubishi hybrid bus.

Then, I'd like to get into the fuel cell vehicles. As well known, the fuel cell vehicle has the potential for high energy efficiency, cleaner exhaust emission and the essential technology for the future hydrogen era.

Since all of you know well about fuel cell, I guess I'd like to introduce the technology very briefly. A fundamental unit of the fuel cell is a thin cell with a thickness of several millimeters. Laminating multi-cells become the fuel stack, which is the basic unit for vehicle application. The core unit of the cell is the electrolyte and there are many types of electrolytes known. For vehicle applications, polymer electrolyte is now considered to be the only one candidate.

Again, I'd like to show you quickly all fuel cell vehicles under development in Japan, according to the requests from the manufacturers. Here's Toyota, Suzuki, Nissan, Honda, Mitsubishi, Toyota hybrid bus, the Yamaha fuel cell scooter.

This viewgraphs shows the current program in Japan, Japan hydrogen and fuel cell demonstration program, which has started supplying hydrogen to the fuel cell vehicles at seven experimental hydrogen stations as of the end of the last year in the area of Tokyo and its vicinity from March 2003 under the cooperation among governments, academies and industries.

Three additional stations will be in service this year. The purposes of the project are to find out the real issues for the practical use of the fuel cell vehicle and to accumulate knowledge and data for cost and standards.

Here is the summary of the issues for the fuel cell vehicles to be commercially viable. Though all of them are not easy to solve, the issues with red color is especially essential. I believe they will be able to be solved in the near future, provided that proper direction of research is given. However, I am personally afraid that hydrogen storage could be the ruin of the future of the fuel cell vehicle. Much more efforts should be addressed to the development of the hydrogen storage.

I'd like to finish my presentation by introducing a vehicle market feature in the future. This is prepared by Toyota executives. Automotive industries believe that there will be no termination of the IC engine in the near future.

Thank you very much.