



HME - Report “Experience from operating a fleet of FCV SUVs
in Oslo and Copenhagen and during the European Hydrogen
Vehicle Demonstration Tours”

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Report - "Experience from operating a fleet of FCV sedans in Oslo and during the
European Hydrogen Vehicle Demonstration Tours"

1 Experience from Daily Operation

HME has deployed two ix35 FCEVs in Denmark and Norway, respectively since the middle of May 2011. The customers of ix35 FCEV were an organization related to hydrogen in Denmark and Norway. The customers of ix35 FCEV have operated the vehicle for promoting the fuel cell vehicle and improve public awareness on daily basis. The customers have also participated in many events to obtain the political supports in the local area. The overall average mileage was approximately 25,000 km during the official project period: one and half years. The mileage of ix35 FCEV under the project was similar to the conventional vehicle. From this, we can notice that the customers have used ix35 FCEV as normal daily vehicle. There were many reactions from customers during the project. The followings are the selected reactions related to ix35 FCEV.

1.1 Battery Discharging

Battery discharging occasionally happened after drive & ride event at the early stage of deployment in Denmark and Norway. There were many reasons for battery discharging. Turning on the head lamp and opening the door during the shut down of the vehicle in the event are some of the major causes. As time passed, the battery discharging phenomena is diminished.

1.2 “Cold Shut Down (CSD)” Function

Cold Shut Down (CSD) function is installed in the ix35 FCEV. The fuel cell generates water as generating electricity by an electrochemical reaction of hydrogen and oxygen. Generated water should be removed in the system especially in the winter time because water tends to freeze at sub-zero condition. For anti-water freeze at sub zero condition, the ix35 FCEC was installed CDS which automatically operates at sub-zero condition. When CSD is operated, it makes some blowing noise. Some customers reported that the vehicle made some blowing noise after shut down especially inter-temporal phase from summer to winter. In contrary, customers asked that the vehicle is not working as there was no sound at start up and shut down in the phase from winter to summer. This reaction is caused by not well understanding of fuel cell vehicle characteristics.

1.3 Virtual Engine Sound System (VESS)

For the safety of pedestrian, EU regulates that an electric vehicle should make an artificial sound. For satisfying this regulation, Virtual Engine Sound System (VESS) is installed in the ix35 FCEV. However, some customers requested to remove VESS for better driving environment. HMC are working on making a better sound for VESS for next generation FCEV.

1.4 "Emergency Shut Down (ESD)" Button

Emergency Shut Down (ESD) button is installed in the ix35 FCEV. This button looks very similar to emergency button. Due to shape and color of ESD button, many customers occasionally pushed the button. From this experience, we have decided to remove ESD button from the ix35 FCEV manufactured under series production process.

1.5 Acceleration Limit caused by Cold Start

There are several control logics to protect the fuel cell stack in the ix35 FCEV. To protect the fuel cell stack, control logics limits the stack current depending on system temperature. Due to this, there is an acceleration limit at cold start. Some customers complained about low acceleration performance in the winter time. We have improved the control logics as to enhance the acceleration performance and protect the fuel cell stack in the same time.

1.6 Brake and suspension

The ix35 FCEV deployed in Denmark and Norway under the project was developed and manufactured for Korean domestic operation. For this reason, the brake and suspension system is not suitable for European customers. HMC has tuned the brake and suspension system for European application for the ix35 FCEV manufactured under series production process.

2 Experience from Road Tour

2.1 Tour from Oslo to Monte Carlo

Two ix35 FCEV operated in Norway has been driven from Oslo to Monaco without carrying extra hydrogen tank. The total mileage of trip was approximately 2,200 km. They only used the existing hydrogen refueling station during the journey. They have stopped only 6 hydrogen refueling stations during the journey. Owing to the lack of hydrogen refueling stations at the early stage of commercialization, long driving range is very important for long distance travel. From this point of view, ix35 FCEV is well satisfied the long driving range. During the journey, the refueling hydrogen was succeeded but only by the manual refueling. The refueling nozzle connection between the vehicle and station was standardized but communication between the vehicle and station was not standardized yet.

2.2 European Hydrogen Vehicle Demonstration Tour

HME has also participated in the EU Road Tour organized by Hydrogen Sweden with other automotive OEMs: Daimler, Toyota and Honda. During the tour, all partners have visited 5 countries and 9 cities for almost a month. From EU Road Tour, we have experienced several things related to the hydrogen refueling system. During the tour, some of hydrogen refueling station was not well maintained for refueling. It is understandable that it is difficult to well maintain the hydrogen refueling system without frequent refueling. To resolve this problem, it is necessary to deploy more FCEVs and operate the hydrogen refueling station more often. The second thing we have experienced is that more hydrogen refueling stations are need for customer satisfaction. More hydrogen refueling station should build to connect the major cities to widespread the fuel cell vehicle in Europe. The last is as stated previously that the hydrogen refueling method such as IR communication. SAE J2799 guides the protocol for the communication between the vehicle and HRS. Even under SAE J2799 guideline, each HRS and vehicle could have different communication program and this could lead to mismatch of the communication between the vehicle and HRS. The industry might need more detailed guideline for the programming of communication logic. We have also experienced through EU Road Tour that it is needed to educate the public to understand the fuel cell and hydrogen technology. The education would lead to change the public awareness of fuel cell and hydrogen technology and step into the commercialization.