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Hydrogen Driven Municipal Vehicle

Scope of project

A fuel cell driven cleaning vehicle is investigated in this project. The three main tasks are the development of a dynamic computer model of such an application, based on the system performance in its practical use. The second task is integration of the fuel cell system into the hydraulic drive, including the development of the control strategies needed and as third task the development of a market introduction strategy and the demonstration and field testing across Europe. The vehicle will be operated at 2 – 3 geographical locations during different seasons.

Goals and activities

Within the first project phase the following work has been completed in July 2007.

System analysis of existing vehicle

The drive train of the actual diesel version of the CityCat2020 was analysed in detailed tests. Different efficiency maps were recorded for the diesel engine as well as for the three different hydraulic systems of the vehicle. The efficiency of the hydraulic system that propels the vehicle is between 20 and 60 % giving a maximum power of 28 kW to the wheels while the diesel engine is giving 55 kW. In cleaning operation, the vacuum ventilator consumes more energy than the vehicle actuation.

Out of this analysis it was decided to replace the two main hydraulic systems by electric drives to increase efficiency.

Simulation of fuel cell drive train

A simulation tool was built such that different concepts of fuel cell drive trains can be analysed and optimised for efficiency, size, performance and efficiency of all components mainly fuel cell system and battery but also motors, DC/DC converters, etc., were varied to find energy optimal solutions for the given daily load patterns.

For different assumptions concerning battery loading and actual driving strategy simulations were run to optimise fuel cell and battery size to achieve optimally low fuel consumption. As final design freeze a fuel cell size of 20 kW, a battery size of 12 kWh and a main voltage of 148 V was chosen.

Vehicle build up

For all components appropriate products need to be found and chosen and detailed construction work takes place to incorporate them in the vehicle.

In parallel the automatic control that manages all the components and signals of the electric drive train as driver input, state of charge, fuel cell output and status etc. is built up. This also includes the monitoring logic necessary to observe the vehicles usage and fuel cell ageing.

The vehicle should be on its wheels in July 2008 and possibly be delivered after the testing phase to the first city in November 2008.

The CityCat 2020.

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