European Commission

ICT FOR TRANSPORT

HEMIS

Electrical powertrain **HE**alth **M**onitoring for **I**ncreased **S**afety of FEVs

Fully Electric Vehicles (FEVs) can contribute greatly to the reduction of energy consumption and CO2 emissions, but they must be safe, reliable and easy to maintain. In particular, the impact of their electromagnetic field emissions has to be taken into account.

At a Glance

Project acronym:
HEMIS

Project type:
Collaborative Project

Programme:
7th EU Framework Programme

Project coordinator:
Dr. Ainhoa Galarza, Centro de Estudios e Investigaciones Tecnicas (CEIT)
coordinator@hemis-eu.org

Project partners:
Centro de Estudios e Investigaciones Tecnicas (CEIT)
York EMC Services (2007) Limited
IDIADA Automotive Technology SA
VTT Technical Research Centre of Finland
Politecnico Di Milano
MIRA Limited
Jema Energy SA

Start date:
June, 1st 2012

End date:
November, 30th 2014

Total cost:
2,924,470.00

EU funding:
2,000,000.00

Project website:
www.hemis-eu.org

Objectives

HEMIS project has two major objectives. The first one is to design a prognostic health monitoring system for Fully Electric Vehicles (FEV). The system should provide information on the failsafe state of the electric powertrain in order to allow a condition based maintenance policy to be applied to its components, which is expected to increase the vehicle safety and to reduce the overall maintenance cost. The second objective is to provide the manufacturers of FEVs with design guidelines regarding electromagnetic compatibility and human exposure to electromagnetic fields, as well as appropriate low frequency emissions testing methods.

Description of Work

The work will be developed in three phases:
Phase 1: System analysis and specification. Physical and empirical laws that allow the definition of the failsafe state of the electric vehicle powertrain components such as the motor and its control and the prediction of their Remaining Useful Life (RUL) will be identified. Furthermore, the implications

Information Society & Media

of electromagnetic field emissions for electromagnetic compatibility (EMC) and human exposure to electromagnetic fields will be thoroughly analysed. Based on this information, specifications and requirements for the Prognostic Health Monitoring System (PHMS) will be defined and discussed with the members of the project industrial advisory panel.
Phase 2: Development of the Prognostic Health Monitoring System (PHMS).
PHMS will be based on the sensing and monitoring of key variables related to both the health state of the electric vehicle components and the electromagnetic field inside the vehicle. On the basis of the collected information, the PHMS will estimate the RUL of the FEV, assess the RAMS requirements and trigger a response when the tolerable hazard rate has been exceeded.
Finally, the tolerable hazard limits and the levels for human exposure to electromagnetic fields will be defined.
Phase 3: System integration and test.
All the subsystem technologies developed during the project will be integrated to assemble the PHMS prototype. A new test setup will also be developed to allow verification of the prototype.

MILESTONES

The main milestones of the project are:

- definition of the electric vehicle architecture;
- definition of the test cases;
- identification of causes and effects of the electric powertrain failure modes;
- identification of the physical characteristics to be monitored;
- development of the prognostic algorithm;
- definition of the electromagnetic compatibility measures and test methods;
- prognostic health monitoring system prototype;
- implementation of the test setup
- verification of the prognostic health monitoring system.

TESTING

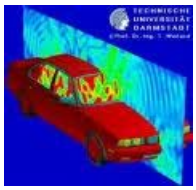
A test setup will be developed to verify the performance of the on-board monitoring system for the failsafe transition.
This test setup will integrate or emulate the electric vehicle components that interact with the prognostic health monitoring system, such as the traction motor, its control, and the driver interface.
This evaluation will allow the research team to have a first hand and real approach to practical uses of the new technology.

DISSEMINATION

Special effort will be made during this project to disseminate the findings as widely as possible.
The consortium has identified three groups of target audiences that would potentially benefit from the knowledge acquired during the project: i) standards bodies and organisations, ii) technical and scientific communities: iii) end users, such as companies both working in the area of and developing electric vehicles. A variety of dissemination approaches such as written information, electronic media and person-to-person contact will be used to disseminate the HEMIS achievements.

Expected results

The outcome of the project is twofold.
1) A prototype of an innovative prognostic health monitoring system with failsafe transition detection and the ability to predict the remaining useful life of new building blocks of FEVs, such as the electric traction motor and its control and power electronics.
2) Design guidelines regarding electromagnetic compatibility and human exposure to electromagnetic fields, as well as low frequency emissions testing methods.



For further information:
Information Desk
European Commission - Communication Networks, Content and Technology DG
Office: BU31 01/18 B-1049 Brussels
Email: cnect-desk@ec.europa.eu
Tel: +32 2 299 93 99
Fax: +32 2 299 94 99
http://europa.eu/information_society