PROJECT

CASTOR

Car multi propulsion integrated power train

Funding: European (7th RTD Framework Programme)

Duration: Jun 2010 - Nov 2013

Status: Complete

Total project cost: €5,315,615

EU contribution: €3,400,000

Call for proposal: FP7-2010-ICT-GC

CORDIS RCN : 95586

Background & policy context:

The European Commission has been actively supporting the introduction of electric mobility.

Electric mobility is currently a top priority in the US, Japan, China, Korea and EU. It promises to introduce a radical industrial change in our society, as new technologies and infrastructure is put in place over the next two decades.

The transition phase is now starting, with a general growing awareness that the underlying technology to implement electrical mobility has gained a sufficient level of maturity. There is now a push at many levels (global, EU, national, organisational) to refine and implement enabling technologies and systems so as to effect a platform for fundamental change to our road transport paradigms and to embrace the possibilities promised by the transition to electrical vehicles.

The driving forces behind the move to electrical mobility are:

• Reduction in oil consumption
- “well to wheels” energy efficiency is the key factor
- Potential economic benefits are significant
- In Europe 73% of all oil is consumed by transports of which road transportation alone accounts for over 85%.

• Reduction in emissions and noise produce by road transport
- Environmental benefits, including mitigation of climate change risks
- Public health benefits
- according to the WHO, noxious gas emissions emitted by cars cause an even higher number of deaths. Embedded systems is a critical issue to move forward to the electrical mobility which eliminates noxious gas emissions in cities

• Improved safety of road transport
- there are 5 lethal accidents every hour, and road accidents are the main cause of death in the under-45 age group, besides
- electrification offers the opportunity to incorporate radical new safety paradigms with innovations in system designs and communication structures.

Objectives:

CASTOR explored the architectures of the fully integrated power train electronics for distributed propulsion systems that should enable future generations of EV’s and personal propulsion systems. The following objectives are highly important to the project:

• Advancements in efficiency will be achieved by implementing a multi propulsion power train based on the integration of the energy storage with the propulsion unit based on the related synergies and by removing unnecessary redundancy.
• The future concept is not only based on the integration of the component functionalities also considering a holistic approach for the thermo management which leads to lower power consumption and more robust systems.

• The Integration of the thermo management for the inverter and accumulator will enable high efficient decentralized thermo systems.
• The research will focus on the EV-power train consisting of the drive inverter, accumulator and engine.
• Advancements in functionality and robustness will be made by the Integration of the accumulator (Battery, Super cap) and Inverter together with the engine. Based on integration synergies this will enable less complex power conversion, storage and distribution concepts in order to reduce the amount of active switching components and the related control overhead.

Methodology:

The main technological innovations of the CASTOR project are related to the development of a modular, highly integrated propulsion unit for distributed EV traction, reference designs for energy storage component, power conversion topologies and technologies, direct-drive traction machine, and system integration and thermal management. The CASTOR project addresses these reference designs and architectures in order to offer common multi-propulsion power train architectural approaches (standardised and interoperable) for future efficient electrical vehicles and will focus on the following topics:

- Definition of specifications and design constrains for each subsystems via a systematic analysis and global optimisation
- Development of high energy and high power dense energy storage unit (accumulator) by exploring complimentary characteristics of battery and super cap.
- Development of high power dense, high efficient DC/DC and DC/AC converters and inverters for traction control and energy management using ultra-low resistance MOSFET technology.
- Development of high power dense, high efficient direct drive traction motor
- Integration of the accumulator, converters, and traction motor into a modular propulsion unit with cost-effect cooling system and appropriate thermal management strategies.
- Comparison, selection and exploitation of a multitude of solutions for optimising wiring and harnesses, aiming at preserving and enhancing safety and integrity in order to safeguard possible EMI emissions
- Standardisation of architectures, hardware components and software in compliance with AUTOSAR guidelines, to shorten time-to-market and reduce cost-to-market of car model developments.

Parent Programmes:

FP7-ICT - Information and Communication Technologies

Institute type: Public institution

Institute name: European Commission

Funding type: Public (EU)

Lead Organisation:

Imarine Deniz Teknolojileri Ve Arastirmalari Sanayi Ve Ticaret Anonimsirketi

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Organisation Website:
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EU Contribution: €1,100,430

Partner Organisations:

The University Of Sheffield

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Organisation Website:
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EU Contribution: €488,160

Centro Ricerche Fiat - Societa Consortile Per Azioni

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Italy

Organisation Website:
http://www.crf.it

EU Contribution: €442,499

Stiftelsen Sintef

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7034 Trondheim
Norway

Organisation Website:
http://www.sintef.no

EU Contribution: €481,625

Magnomatics Limited

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Park House Bernard Road - Sheffield
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United Kingdom

Organisation Website:
http://www.magnomatics.com

EU Contribution: €233,108

Ficomirrors Sa

Address:
GRAN VIA DE CARLES III 98
08028 BARCELONA
Spain

EU Contribution: €456,140

Volkswagen

Address:
Berliner Ring 2
1894 WOLFSBURG
Germany

Organisation Website:
http://www.volkswagen.de

EU Contribution: €198,038

Technologies:

Road vehicle propulsion
Efficient and compact hybrid powertrains

Development phase: Research/Invention

Documents:
6-phase Fault-Tolerant Permanent Magnet Traction Drive for Electric Vehicles (Other relevant documents)

STRIA Roadmaps: Transport electrification

Transport mode: Road transport

Transport sectors: Passenger transport

Transport policies: Digitalisation, Decarbonisation, Environmental/Emissions aspects

Geo-spatial type: Other