MotorBrain

Nanoelectronics for Electric Vehicles Intelligent Failsafe PowerTrain

MOTIVATION AND OBJECTIVES

The intention of the MotorBrain project was to develop sustainable drivetrain technologies and control concepts / platforms for inherently safe and highly efficient Electric Vehicle (EV) powertrains of the 3rd Generation.
The objective was to develop a powertrain which is not dependent on rear earth magnets, having highly competitive dimensions, with substantial material savings, which is fault tolerant due to built-in redundancy, which is safe due to utilization of ISO 26262 concept, coming with better than state-of-the-art efficiency and lowering down its overall cost by 25 percent.
MotorBrain aimed to achieve mechanical simplicity by increasing electrical complexity. The proposed methodology was planned to be well suited to support automotive ASIL D certification.

PROJECT PLAN, MILESTONES AND DELIVERABLES

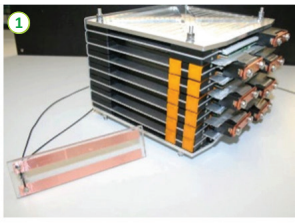
The progress of work followed the V-cycle systematic based on the matrix structure of work packages and supply chains. Therefore the time line of the project plan, milestones and deliverables were driven by the needs of the value chains led by OEMs and Tier 1 Suppliers.
The project was subdivided into six technology related work packages. And another two dedicated on standardisation, dissemination and exploitation as well as project management.
The MotorBrain project planned to develop electronic components and hardware to support four main application areas: motor and inverter, battery system, sensors and control platform. These application areas inspired the 8 supply chain definitions with their unique demonstrators.

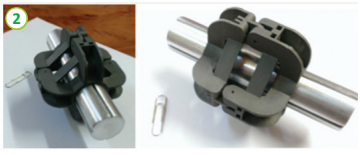
TECHNICAL APPROACH

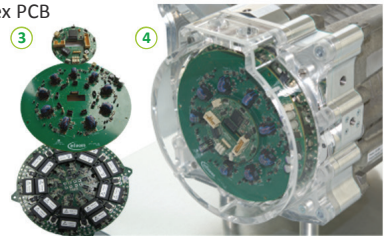
The technical approach was based on the expertise of 32 partners among the whole value chain in order to develop smart miniaturized electronic systems including subsystems, and vehicle demonstrators. The cross functional team enabled research on all powertrain system layers. The top priority goals were set on increasing energy efficiencies, system compactness, reliability and safety combined with significant cost reductions and opening up of the standardisation potentials for different levels of control.

ACHIEVEMENTS

- 15kWh battery pack with advanced electronics (1)
  Based on commercially available cells, volume reduction.
- Angle sensors
  Two different types of sensors were developed and delivered, one end-of-shaft and a second one out-of-axis.
- Current sensor
  Hall-based sensor in integrated form having dimensions of common ICs, 50 A range, investigation of 200 A sensor.
- Torque sensor (2)
  Development of a new torque sensor which fulfills requirements of automotive applications.
- Multicore control unit
  Based on a newly developed Infineon TriCore AURIX TC27x, software written according to ISO26262.
- 9 phase inverter design (3)
  A lower phase currently enables design of a less complex PCB and utilisation of low cost connections without screws.
- Five concepts of propulsion systems:
  - Modulated pole machine based on SMC,
  - Electric powertrain based on AC induction motor,
  - Smart integrated electric vehicle powertrain, (4)
  - Electrical Variable Transmission (EVT),
  - Synchronous reluctance motor based powertrain with inverter integrated charger.







Budget	36.6 M€	**Funding**	16 M€
Duration	43 months	**Start**	April 2011
DG	ENIAC-2010-1 SP1	**Contract n°**	233826
Coordinator	Reiner John, Infineon	**Contact**	reiner.john@infineon.com
Partners	32 partners among them VW, FIAT, Infineon, STI, Siemens, ZF, QinetiQ, BUT, TUD		
Website	www.motorbrain.de		