TRANSPORT RESEARCH ARENA

VIENNA 2018

A digital era for transport

solutions for society, economy and environment

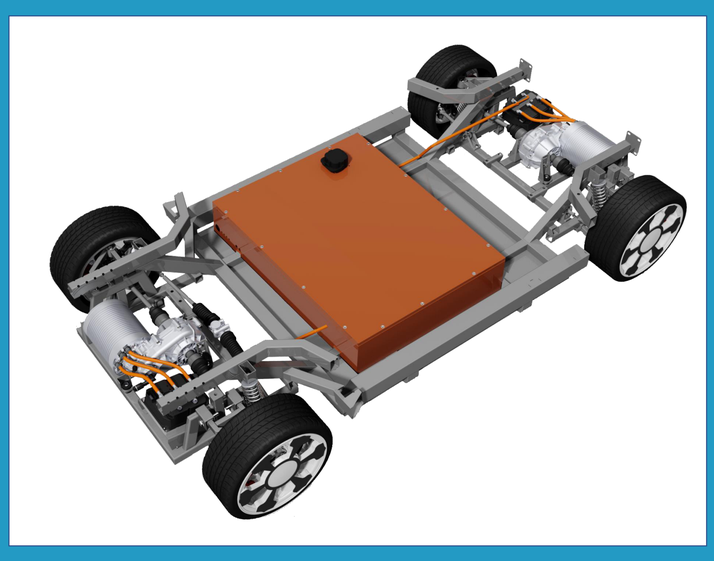
Demobase: DEsign and MOdelling for improved BAttery Safety and Efficiency

Headline

Converging the efforts of the GV7 call, which is addressing efficiency and cost reduction on the integration related aspects of motors, power electronics and transmission, DEMOBASE aims at the generation of the necessary tools and technology solutions that will drastically reduce price differences between conventional and electric vehicles while assuring much lower operational cost, higher efficiency, higher availability, increased driving range as well as improved comfort and attractiveness. In DEMOBASE, cost reduction activities, higher car performances and availability, mainly on the key battery system component, will be achieved through incremental and breakthrough research activities and demonstrated in a dedicated demonstration vehicle. The EV demonstration focuses on the sector of electro-mobility with the highest growth, i.e. four wheels urban vehicles. These activities will be supported by highly advanced multi-level and multi-domain simulation. A key aspect will be gateway development to ensure the seamless process effectiveness for a variety of software environments.

Specific objectives:

- Cost reduction of batteries: will be tackled by a seamless development chain with drastically reduced development time and costs, enabling as an additional benefit also faster integration of new cells. An innovative seamless development process from cell and from active material to vehicle using multi-level modelling integrating battery management, ageing, safety, recycling and availability will cut down development time by at least factor 2.
- Cost reduction of chassis: The methodology developed with the FP7 PLUS MOBY project ended December 2016 will be further advanced in DEMOBASE making it (ubiquitous) parametric and applicable to most vehicle categories. DEMOBASE will develop and demonstrate breakthrough methodology that allows the design and development of novel safe chassis in less than one tenths the usual time and at a small fraction of the usual cost.
- Battery safety: improved without additional expense, battery risks will be addressed by a fail aware concept to ease vehicle fleet management. DEMOBASE develops new safety approach based on tests at cell level and innovative battery model to manage fire risk, gas flammability, gas toxicity at vehicle level.
- Battery availability: The new battery system functionalities make it immune to thermal runaway events. Residual fire or thermal runaway risk will be managed inside the vehicle without stop of service, which is the today's standard fail safe management, with fail operational concept supported by specific battery architecture and innovative safety components.
- Accelerated battery ageing modelling: Innovative characterization technics are used to develop battery ageing models within 4 months.
- Battery recycling as part of the process: To close the life cycle, tools and recommendations for safe and efficient recycling will be elaborated. DEMOBASE develops End to End safety activities from active material to recycling where recycling is part of the overall development process. Moreover the novel approach for chassis design leads to radical reduction of the large quantity of adhesives currently used in the automotive world, easies disassembling of the elements composing the full vehicle; it is another mind shift in auto world. This will reduce the recycling costs by up to 25%.
- Radical reduction of the necessary investments: Process capability for a variety of different vehicle architectures derived from a single chassis will be demonstrated.
- Scalability of design for both vehicle and battery system: a parametric methodology to design and developed batteries and a new chassis will be demonstrated for different vehicle classes.
- The efficiency of e-drivetrains under real conditions will be increased by 20%. For this purpose, the project will develop and demonstrate wheel-tire design with lower manufacturing costs, reduced weight and lower rolling resistance as well as improved handling stability.
- EV extended range and efficiency: DEMOBASE uses most advanced battery technologies with a specific energy higher than 250 Wh/kg. Cell design is adapted according to passenger car or fleets expected lifetime, respectively 400 000 km or more than 1 000 000 km. The European battery manufacturer provides its latest high energy cell prototypes for the project.
- EV with low price: low investment flexible microfactories can be made fully operative to produce from 50 to 75 urban electric vehicles a day. Following the same automotive grade production criteria while meeting all EUroNCAP crash tests, the full return of the investment is assured after few months of operations and for few thousand vehicles only. The large investment necessary by using conventional stamping-moulding is the main reason why the take up of electromoblity is slowed down in that it is prohibitive to newcomers and does not allow the traditional OEMs to generate profits until the demand will remain limited.
- EV with much lower operational cost than conventional vehicle with particular low maintenance cost and much lower depreciation than conventional vehicles in the first 10 year of life further advancing what it is currently made in state of-the-art electric buses. The aim is the design of a battery pack keeping its capacity at above 90% its original value after the first ten years of life, with that the maintenance costs of the EV powertrain would be limited to an average 150€ per year for regular inspections against the average 400€ maintenance cost per year that can be attributed to the powertrain of a conventional compact ICE based vehicles.
- Virtual development of all EV major building blocks: batteries, vehicle design, wheel-tire system design, recycling. Implementation and refinement of state-of-the-art processes an software tools for virtual development. DEMOBASE uses and develops software allowing collaborative work and widely shared model bricks.



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