

MATISSE



Modelling And Testing for Improved Safety of keycomposite StructurEs in alternatively powered vehicles

MOTIVATION AND OBJECTIVES

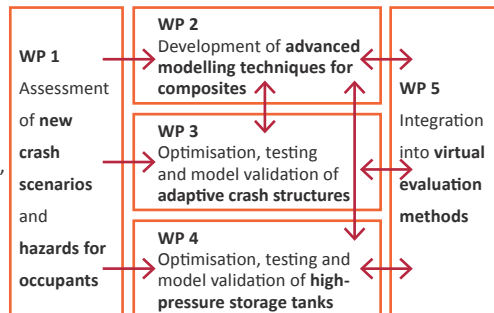
With increasing energy costs and stringent emission targets aiming for 95 g/km CO₂ emissions for the year 2020, material efficient lightweight design and alternative propulsion systems play an important role in today's vehicle research and development activities. Furthermore, the security of occupants is a core demand on passenger vehicles. MATISSE addresses both, electric and compressed natural gas (CNG) storage systems and an extensive use of light fibre reinforced structures.

For the reliable application of fibre reinforced polymers (FRP) in a vehicle structure the accurate prediction of the material behaviour using the finite element method (FEM) is crucial. MATISSE focuses on advancing the modelling, simulation and testing capabilities for FRP structures under dynamic loading (crash impact safety). Crash modelling tools used in the automotive industry currently do not adequately address a number of issues specific to FRP structures under these load conditions.

PROJECT PLAN, MILESTONES AND DELIVERABLES

The main research results are:

- Prognosis of future crash scenarios and hazards for occupants,
- Advanced modelling techniques for composite materials,
- Novel adaptive composite crash structures,
- Enhanced type IV CNG storage tanks,
- Proposal for virtual evaluation methods for composite structures.



TECHNICAL APPROACH

MATISSE aims to develop an integrated, validated approach to the modelling, simulation and testing of safety-critical pressurised FRP structures. MATISSE assures that these advances will be applicable to automotive applications like adaptive, expandable FRP structures and FRP CNG tanks.

ACHIEVEMENTS

WP1: Analyses of future traffic scenarios show that the highest share of accidents is assumed to be taken by frontal collisions. Especially in alternatively powered vehicles (APV) the locations need to be protected where a potential for electrical, chemical or thermal hazards exists.

WP2: For the generation of modelling techniques for fabric reinforced structures, suitable modelling approaches were analysed and finally selected. For the modelling of the materials to be examined the necessary values for the implementation of material cards were generated based on coupon testing and validations took place.

WP3: The development of adaptive (shape changing by pressurisation) fibre reinforced beams by simulations and testing with different geometries and materials was proceeded. Thermoset and thermoplastic materials reinforced with GF or CF were examined. Successful expansion tests of initially folded thermoset beams were carried out. In addition, impact tests with a 60 kg drop weight were successfully executed with the expanded beams.

WP4: The development of a virtual testing procedure of type IV CNG tanks was done. Based on the impact on the CNG tank determined in full vehicle rear crash simulations, different load cases for a component testing were derived. In parallel, the model of the tank was developed from the stage 0 (rough) over the stage 1 and the stage 2 (very detailed composite model) to stage 3 (for full vehicle simulations). Several impact tests on the tank were carried out and build the basis of a future validation for a virtual testing methodology.

WP5: The development of evaluation criteria for the safety of APVs, the assessment of possible cost and weight saving potentials of APVs and the compiling of guidelines for the application of the new modelling tools as well as for safety requirements were done. This tool chain allows designers to predict the safety performance of parts and of the whole vehicle prior to hardware testing.

Budget 3.3 M€

Duration 36 months

DG Research & Innovation

Coordinator Roland Wohlecker, fka

Partners 11 partners, among them CRF, Daimler, TU Graz, Autoliv, Chalmers, TU Munich

Website www.project-matisse.eu

Funding 2.2 M€

Start October 2012

Contract n° 314182

Contact info@project-matisse.eu

