CADLM

TRANSFORMING DATA INTO INTELLIGENCE

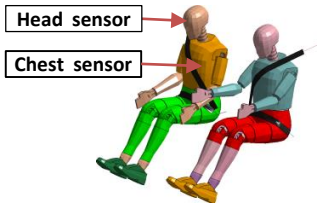
Case study – Frontal crash simulation for virtual testing approach

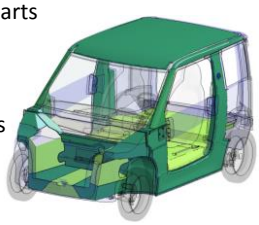
Abstract

ECOSHELL, is a Seventh Framework research program (agreement 265838) European project, grouping private companies and research institutes. The target is to design an electrical urban vehicle (category L7e) called "CITI-ZEN", only composed of bio composite and foam parts, with a weight under 400kg (excluding power and drive train).

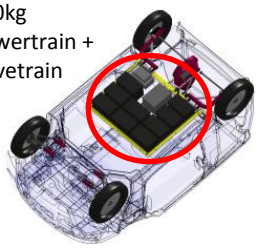
In this 3-year project, which started in September 2011, CADLM and Cranfield University have jointly realized the materials identification, and are responsible for crash worthiness design of the vehicle. Material samples are provided by Mahytec.

Skin Non-woven flax/epoxy composite parts





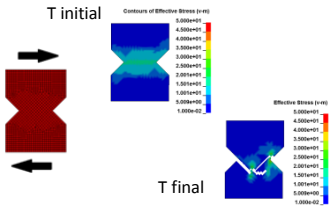
Foam parts

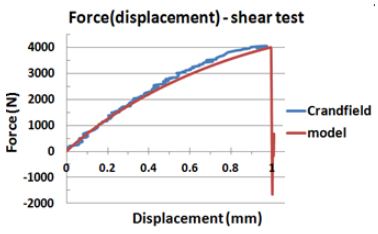


200kg powertrain + drivetrain

Validation of material characterization in LS DYNA software:

Target: identify the material properties for LS DYNA code based on experimental tests in tensile, compression and shear.





CADLM company

With our 25 years of experience, CADLM is specialized in modelling, numerical simulation, optimization and decision support systems using machine learning techniques. Our modelling expertise allows our customers to improve their development process with methods of optimal and robust design, enhanced via the techniques of Machine Learning, Data Mining, Pattern recognition, prediction of behavior in real time, creation of business model using automatic learning.

Know-how exclusive

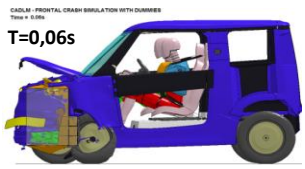
CALM has developed advanced proprietary techniques in:

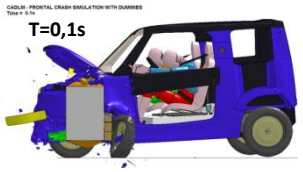
· Optimization of complex systems
· Reduced models for crash / safety applications
· Reduced Complexity Based Robust Optimization
· Early warning systems for real time risk analysis

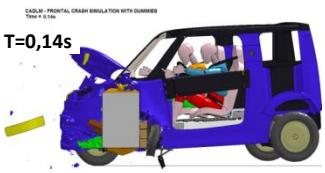
Frontal Crash Simulation

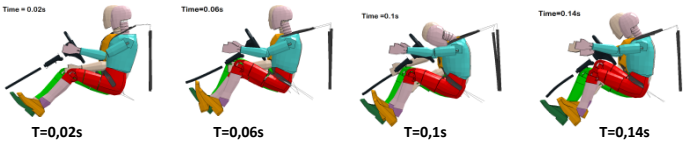
With the material characterization, CADLM developed a frontal crash model on LS DYNA software based on the ECE-R94 regulations using a frontal deformable barrier ODB) positioned at 40 % offset. The initial velocity is at 56Km/h.

Bio-composite material		Glue
E = 15000 MPa, G = 2000 MPa		
Stress at failure	Compressive : 104.2MPa	
	Tensile : 72.3MPa	200MPa
	Shear : 130MPa	200MPa

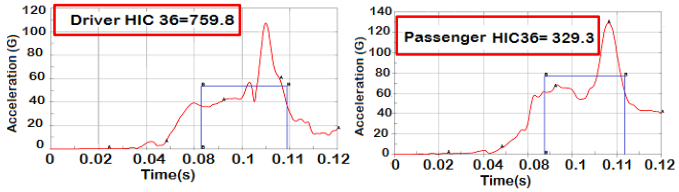




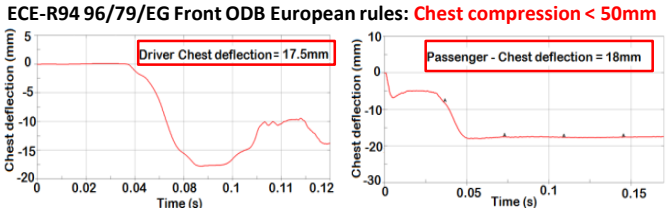




ECE-R94 96/79/EG, Front ODB European regulations: HIC < 1000



ECE-R94 96/79/EG Front ODB European rules: Chest compression < 50mm



Conclusion

The bio-fidelity dummy criteria are verified. Future work, consist in pedestrian safety aspects as well as human model based evaluation of the injury thresholds. A reliability analysis of the vehicle based on innovative reduced complexity based optimal design developed by CADLM will be published in October 2013.

Partners : Cranfield University, Fraunhofer, GRM, CSIC, Université de Lorraine, efficient, MAHYTEC, VTT, ALTRAN

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