

# OPSIM

## Optimisation de SIMulations pour la conception



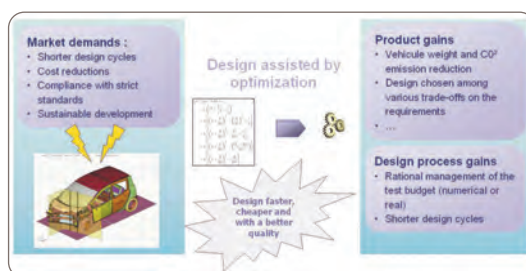
Numerical optimization and robust design techniques become a prerequisite for vehicle design projects. The mass is a major constraint when limiting CO<sup>2</sup> emissions is a challenge. Reducing the mass has to be done considering the service to provide the customer (safety, acoustic, endurance ...). Optimization is a way of dimensioning innovation on the car body and its equipment : innovative solutions are often rejected by decision makers because they are not fully accomplished and not economically viable like already proven solutions.

The project will work on the 4 following axes:

- ▶ Computation efficiency improvement of PAM-CRASH;
- ▶ Increase the pertinence and precision of finite elements models;
- ▶ Improvement of optimization tools as design of numerical experiments;
- ▶ Reduce the security margins taken while developing the specifications.

### TECHNOLOGICAL OR SCIENTIFIC INNOVATIONS

- ▶ Increase of PAM-CRASH speedup and global performance (reduction by 20% on RENAULT midsize car model);
- ▶ Precision improvement of crash model: include stamping properties into crash simulation, improve the numerical spot weld behavior;
- ▶ Improvement of genetic algorithm (taking into account new kind of parameters like qualitative variables for combinatorial optimization) integration in RENAULT optimization tools available for all partners;
- ▶ Improvement of analysis tools (clustering and ELECTRE methods in order to visualize the optimization results, help to select a good compromise in a multi-physics problem);
- ▶ New optimization tool for robust design in crash analysis: detect and explain the failure mode of a solution in comparison with the standard solution, propose minimal modifications to improve the robustness;
- ▶ Reduce the security margins taken while developing the specifications, application on an ALSTOM case-study;
- ▶ Improvement of the RENAULT global optimization tool for mass saving on the car-body (multi-physics optimization with more than 200 parameters).



### STATUS - MAIN PROJECT OUTCOMES

- ▶ A mid-term meeting held in september 2009.
- ▶ Three other corporate meetings held in january 2009, may 2009 and february 2010.
- ▶ The end of the project is planned on september 2010.
- ▶ Main outcomes:
  - improvement of numerical crash simulation (duration, speed-up, quality ...);
  - new optimization tools especially on mult-objective and robust design, decision making;
  - new method to design by numerical optimization (using the tools above), demonstration on ALSTOM & RENAULT case-studies.

### CONTACT

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### PARTNERS

Large companies:  
 ALSTOM, BULL, RENAULT

Intermediate size enterprise:  
 ESI

SMEs:  
 EURODECISION

Research institutes, universities:  
 ECOLES CENTRALES DE LYON,  
 LILLE ET PARIS,  
 UNIVERSITE DE VERSAILLES  
 SAINT QUENTIN

### PROJECT DATA

Coordinator:  
 RENAULT

Call:  
 FUI5

Start date:  
 September 2008

Duration:  
 24 months

Global budget (M€):  
 4

Funding (M€):  
 1.6

Related Systematic project(s):  
 ACTIVOPT