

MID-MOD



Mid-frequency vibro-acoustic modelling tools – Innovative CAE methodologies to strengthen European competitiveness

■ Motivation and Objectives

Noise and vibration have a very large impact on the competitiveness of transportation vehicles, not only driven by the increasing customer demand for vibro-acoustic comfort, but also by the tightening legal regulations regarding noise and vibration emissions and immissions. Since noise and vibration as functional performance attributes often conflict with other attributes, such as weight and CO₂ emission, concurrent design and analysis procedures are required. Such processes involve multi-attribute optimisation and are facilitated by the use of Computer Aided Engineering (CAE) tools. Also, there is an increasing trend towards virtual prototyping to reduce costs and development times. As a result, good CAE tools are essential in modern vehicle design.

■ Project Plan, Milestones and Deliverables

MID-MOD research activities involve studies towards what is needed to lift these technologies out of their academic environment and to apply them for real-life engineering problems in the transportation industry. These are problems, for which currently industrial CAE tools are lacking.

In the second half of the project, which is now almost finalised, these innovative methodologies will be validated extensively with respect to component level, subsystem level and, finally, full vehicle level validations. As such, the industrial partners will be trained in the use of the novel methodologies and can increase their competitiveness by obtaining state-of-the-art knowledge of their application.

Focal areas are:

- Enlargement of the applicable frequency range: bridging the mid-frequency gap for interior transportation applications (i.e. the 200Hz – 1 kHz gap) and
- Increasing the upper frequency limit of exterior calculations;
- Increasing the prediction accuracy in the low-, mid- and high-frequency range;
- Pursuing a 3dB absolute accuracy;
- The reduction of computational loads.

■ Technical Approach

The goals of the proposed project are depicted briefly as “triple digit performance improvements”.

Starting point involves a profound comparative study between five deterministic technologies (Wave Based Method, Fast Multipole Method, Domain Decomposition Method, Stabilized Method and Higher order Wave Based Integration Schemes), carried out by LMS, ViF, KTH, UNIFI, KUL. Next step involves a similar comparative study focussing on five high frequency probabilistic methodologies are studied (ISVR, KTH, UNIFI, KUL).

Validation strategy, applied to truck applications (Volvo) and for automotive applications (CRF, VW). Additionally, Bombardier will investigate applicable methods for a rail application (Bombardier Transportation). Validation measurements activities are led by IKA, with the aid of TU Warszawa, and all the OEMs.

An important objective is the dissemination of the innovative mid-frequency research results within the broad European engineering community. The dissemination will be a crucial point in training a sufficient number of people with the proper vibro-acoustic skills (UNIFI, ISVR, TUW).

The final project report and all the deliverables will provide a valuable overview of both MID-MOD technological innovations and MID-MOD industrial validation studies, which will form a reference work for the consortium partners with respect to mid-frequency vibro-acoustic issues.

The overall goal for MID-MOD is to be able to predict vibrational and acoustical behaviour both faster and more accurate, in order to aid in a faster product development loop and, hence increase competitiveness.

Budget	3.8 M€	Funding	2.6 M€
Duration	36 months	Start	January 2009
DG	Research / SST	Contract n°	218508
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Partners	12 partners, among them CRF, Volvo, VW		
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