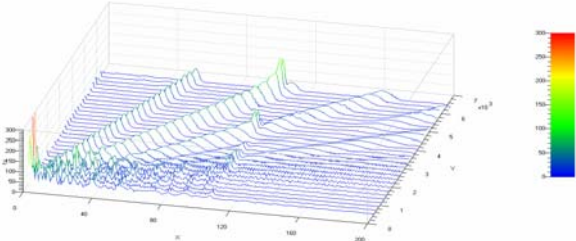


DEVICE

**Downsized hybrid Diesel Engine for
Very low fuel consumption and
CO₂ Emission**



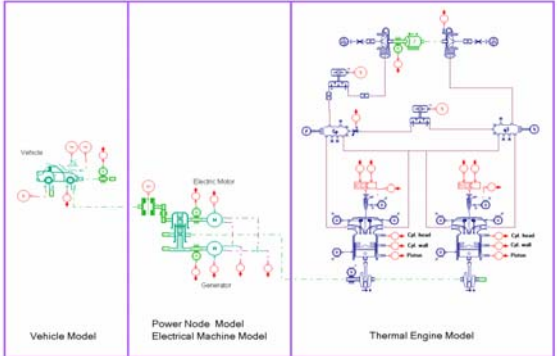
Critical speed analysis of a line shafting in torsional vibration

Starting date: 2009 / 11

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Objectives of the project and challenges

The objective of this project is to build up and validate a virtual concept for innovative small capacity Diesel powertrains applied to passenger cars with ultra-low CO₂ emissions, using a simulation-based and efficient integrated methodology. The innovating approach consists in combining "mild hybrid" type hybridisation with a strongly downsized 2-cylinder engine, not only to further reduce the CO₂ emissions by recovering energy during use, but also to use electric traction force (in pure traction or to assist the thermal engine) to considerably attenuate or even eliminate current technological locks of specific 2-cylinder vibrations and supercharging deficit. Further on, the project targets new methods for coupled simulation of combustion process and engine mechanics.



Vehicle and powertrain simulation with AMESIM IFP-Drive® and IFP-Engine® tools

Creation of long-term strategic French-German alliances

By mixing complementary fields of combustion and mechanics, DEVICE promotes from now networking between IFP-MOTEURS and Fraunhofer LBF organizations, universally recognized for their research skills, and VOLKSWAGEN, one the leading passenger cars manufacturer in the world. Complementary activities in engine design of IFP-MOTEURS (combustion, system simulation, hybridisation), LBF (system dynamics, material, structure) and VW (reference database, powertrain requirements) is perfectly well adapted to further sustainable strategic alliances to answer powertrain key issues for future vehicle applications in industrial context, as high thermal stresses (for downsizing) or friction reduction (for better efficiency).

Expected results and market opportunities

The worldwide increasing demand for limited resources of fossil energy, and the sensitivity for environment are currently also strongly interacting in the automotive market : a trend towards very efficient smaller engine as well as hybridisation can be observed and is one of the key issue to strongly lower worldwide transport CO₂ emission. In the DEVICE project, the targeted vehicle application is a light vehicle weighing about 1000 kg or below. Emissions below 75 g CO₂/km for the downsized hybrid 2-cylinder concept (engine displacement lower than 1 litre), compared with the current figure below 100 g (4 cylinders, swept volume 1.6 litre Euro 5) - this means a 25 % reduction in CO₂ emissions - is claimed, as well as Euro 6 type pollutant emissions, and compatibility with customer expectations in terms of vibrations and performance. Moreover, the project targets methodological improvements consisting in the implementation of a method for holistic concept analysis and optimisation of new engine concepts. By developing an integrated methodology mixing mechanical and combustion simulation tools, partners offer a promising way to reduce development time and cost for challenging powertrain concepts.