

Fluid optimisation workflows for highly effective automotive development processes

Motivation and Objectives

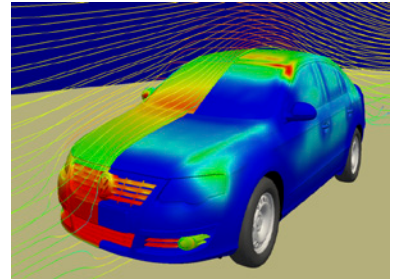
FlowHead aims to develop fast gradient-based optimisation methods using adjoint sensitivity analysis for automotive design. The key steps are:

- Developing and enhancing a range of adjoint solvers, including commercially licensed solvers, open source solvers and research codes,
- Developing automated shape parametrisation methods to deliver sensitivities for the complete design chain,
- Developing topology optimisation methods for industrial applications,
- Integrating the optimisation tools into the design workbench and the product development process.

Project Plan, Milestones and Deliverables

The project runs for 3 years from Feb 2009 to Jan 2012. Key milestones are:

- M6:** Partners receive first versions of adjoint sensitivity codes,
- M12:** Concepts completed for CAD and DMU data-based design space definition and manufacturing constraints,
- M24:** Integration of the optimisation workflows into the PDP completed,
- M30:** Software implementation and integration completed,
- M36:** Evaluation and benchmarking completed.



Technical Approach

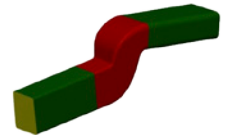
- Development of adjoint flow solvers for fast gradient-based optimisation.
- Large scale shape optimisation using adjoint sensitivities
- Industrial application of topology optimisation.
- Integration of fast gradient-based optimisation tools into an industry standard workbench environment.
- Linking of the optimisation workbench into the Product Development and Management (PDM) environment.

Achievements

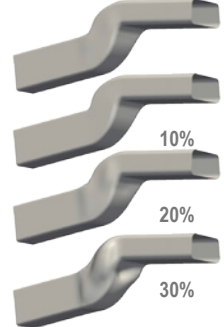
Key deliverables met so far are:

- M6:** First versions of adjoint sensitivity codes,
- M12:** Concepts completed for CAD and DMU data-based design space definition and manufacturing constraints,
- M24:** Integration of the optimisation workflows into the PDP completed,
- M30:** Software implementation and integration completed.
- **Successful optimisation of large cases with many design variables has been demonstrated.**
- **Prototype software and technical support is available, integration into PDP is possible.**

Design space



Initial Shape



Pressure drop improvement

Budget	3.2 M€	Funding	3.2 M€
Duration	36 months	Start	February 2009
DG	Research / SST	Contract n°	218626
Coordinator	Jens-Dominik Müller, QMUL	Contact	j.mueller@qmul.ac.uk
Partners	11 partners, among them Renault, VW, ESI, CD-Adapco, FE-Design		
Website	flowhead.sems.qmul.ac.uk		