

Application of Results from CFD-Simulations on a Race Car

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Inspiring young people for vehicles and innovative technologies is a task of the Institut fuer Krafftfahrzeuge (ika) of the RWTH Aachen University. In 2007 the idea was born to built up and run a race car for long distance races on the Nuerburgring. This vehicle, an Audi A4 quattro with a 3.0 l TDI engine, was designed by students and scientific employees of the ika in cooperation with the Tuning Akademie Ingolstadt.

For the optimisation of the vehicle body, software supplied by Altair was used. One of these steps contained the layout of an engine hood in carbon fibre reinforced plastics (CFRP) Therefore the original engine hood made from aluminium was re-engineered with the target to reach the same mechanical performance and to improve the cooling system of the car with the new CFRP hood.

After the digitalisation of the hood all surfaces were meshed in HyperMesh. The stiffness of the hood was evaluated for three different load cases in OptiStruct. These results were used as a reverence for the evaluation of the new hood.

To find the optimal design for the air-outtake in the hood, Computational Fluid Dynamic (CFD) simulations were completed with SC/Tetra. Therefore a special CFD-model of the car was designed. After a general design the position for the air-outtake was identified in the simulations. The result was implemented in the aluminium hood for a test in the first race in 2009.

In further iterative steps the outtake will be improved in the simulation and on the test hood to lower the water temperatures of the engine. Following the last test race with the test aluminium engine hood in August 2009, ika will manufacture the CFRP hood with the integrated air-outtake in cooperation with the Institute of Plastics Processing (IKV) at RWTH Aachen University. The optimised CFRP hood will contain all the improvements gained with the results of stiffness- and CFD-simulation of the Altair software.