

Analysis Pushes The Envelope

Tom Shelley reports on how advanced analysis has turned projects that might otherwise not be feasible into business successes. British-designed water pumps for Chinese trucks, 80mph model cars and a flying car are all projects that would be unlikely to succeed without use of advanced analysis.

Chinese trucks might be expected to use Chinese-designed water pumps, but they would not be as efficient as those designed by Haldex Concentric, which is based in Birmingham.



The pumps are being made in a Haldex Concentric's plant in Suzhou and supplied to the Chinese National Heavy Truck Group in Jinan. Key to best performance is the use of ProMechanica from PTC to analyse the stresses within pump components and also their natural frequencies to avoid engine-excited resonances.

Ansys CFX has been used for computational fluid dynamic (CFD) analysis in order to design an inlet that comes in from the side of the pump and achieve efficiency comparable to that of an inlet that comes straight into the impeller. In addition, CFD has been used to optimise the cavitation performance and impeller geometry, while AMESim, a one-dimensional modelling tool, has been used to design out any hydraulic resonance conditions and reduce pressure losses.

On a smaller scale, but no less important for the Northampton-based business concerned, is the use of Root Solutions-supported Pro/Engineer by Schumacher Racing Cars, which makes model cars that go at up to 80mph for customers in what Root Solutions' managing director Roger French describes as the 'high-end hobbyist market'.

The 80mph car has a 3.5cm³ nitro engine capable of producing 2.85hp at 33,000rpm; a level of performance possible due to its level of engineering. Says French: "It uses Pro/Engineer Wildfire 4 for the work because it is multi-disciplinary, allowing the company to do mechanism design, interactive surface design and stress analysis." In other words, the model cars are engineered like full-sized racing cars.

Perhaps most extraordinary of all is the Terrafugia 'Transition Roadable aircraft'. The company, based in Woburn, Massachusetts, has demonstrated that a proof of concept machine can fly up to 450 miles at more than 115mph as well as drive at highway speeds on any road.

Although the original design was done in SolidWorks, the design of the prototype is being assisted by the use of CATIA Analysis and CATIA Composites Design (CPD). Says Ben Zelnick, engineer at Terrafugia: "CATIA is a great complement to our SolidWorks solution. Being able to have a full digital model of a ply-by-ply layout will allow us to conduct accurate structural analyses, which is invaluable in reducing the weight of the Transition. In fact, we recently correlated an analysis of a CATIA model of a portion of the structure closely to a sample tested in our facility.