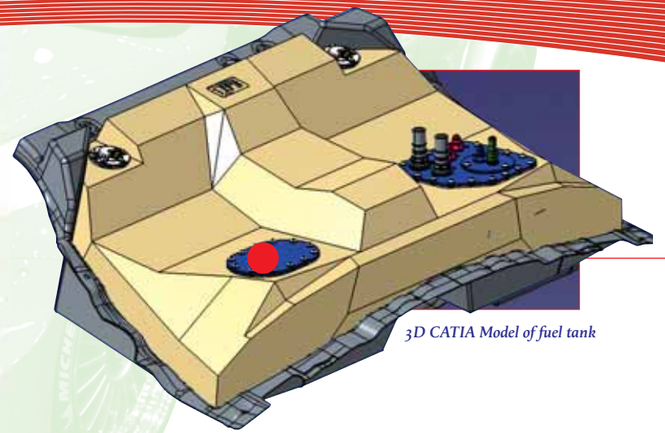
Alpina racing car



3D CATIA Model of fuel tank

Clash detection with CATIA

Soft Cell

By **Nick Lerner**

Working closely with UK VAR, Desktop Engineering DTE, Aero Tec Laboratories Ltd has implemented Dassault Systèmes (DS) PLM and developed unique design and production methodologies to reap immediate business benefits.

ATL designs and produces fabric-based collapsible or flexible fuel tanks called fuel cells, and fuel systems, for all F1 teams as well as for DTM German touring cars, World Rally Championship teams and 33 of the current 55 Le Mans entrants. From its UK facility in Milton Keynes and in the US the company also services aerospace, NASA, (water and waste cells in space) the marine sector and the rapidly growing UAV (unmanned aerial vehicle) market.

The company's products are complex structures that conform not only to the rigours of use in extreme conditions but also accord to the complex strictures of racing competition rules. They must also operate with constantly changing and often-secret fuel formulations including ethanol-based bio-fuels that can affect bonding and degrade the plastic construction materials.

Lotus GT3 car tank

A STORY UNFOLDS

More complexity arises because the cell must be inserted into a metal or carbon fibre fabrication through the fuel filler aperture. But the real problem is that in the design process curves must be made from straight lines. Craig Dawson explained, "In the past we dealt with the designs as very much a two dimensional problem, and from CAD data constructed a mock up from card and used that to check the template as a pattern to cut the actual cell fabric. This worked, but only as a physical process, it did not translate well into digital design until we selected Dassault Systèmes PLM as our digital development platform. We needed a single integrated PLM system to accommodate the entirety of our design to manufacture processes including design, structural analysis and data management. Desktop Engineering (DTE) helped us to specify a system that incorporates CATIA, SIMULIA and ENOVIA software. This is entirely future-proof since it can grow beyond anything we will ever need and incorporates the most advanced available technology."

Craig continued, "Together with DTE we have developed methods that allow us to change digital models from 3D to 2D. This allows us to design the fuel cell and add all the components such as fillers valves and plates as well as internal details, then unfold the design to represent the flat pieces of material that we use for construction."

> Much of our work is highly confidential and ENOVIA SmarTeam ensures that it stays that way.

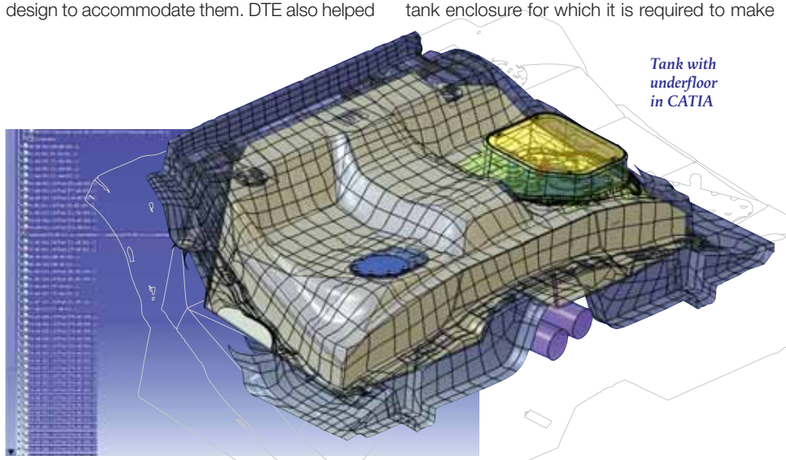
The software allows ATL to digitally build a complete fuel cell with its additional components and hardware accurately represented, and place it within the design envelope of the recipient vehicle. This provides ATL with the power to optimise fuel cells. Craig explained, "The ability to develop a parametric 3D representation in situ lets us produce fuel cells that offer better performance to our customers and to fine tune them to their individual needs. The software allows us to make better use of fuel with less equipment in the tank and for the tank to have the best possible fit to the vehicle."

"Much of our work is highly confidential and ENOVIA SmarTeam ensures that it stays that way. This element of PLM not only brings organisation to our work and maintains and orders data, bills of materials and parts families, but also offers traceability and the assurance that IP is retained correctly."

NOBODY'S FUEL

DTE introduced ATL to Dassault Systèmes Abaqus software from the DS SIMULIA brand, for simulating realistic structural stress. This Unified Finite Element Analysis software allows ATL to analyse the mechanical stresses in fuel tanks and accurately calculate moments of force, and design to accommodate them. DTE also helped ATL develop a method of using clash detection that allows the designers to develop cells that fit the vehicle perfectly while making the best use of available fuel. This can be crucial in a race where the difference between winning and losing can depend how much fuel can actually be pumped from the cell. In many cases poor designs make considerable amounts of fuel unavailable. This represents a waste, because extra unused weight is carried and a vehicle can run out of fuel while still having plenty on-board. Using DS PLM, ATL is able to minimise this waste ensuring maximum fuel delivery and winning potential.

In many cases ATL is provided with a physical fuel tank enclosure for which it is required to make a cell that fits optimally. This complex problem is solved using various reverse engineering techniques to build a 3D digital model that is used as the basis for creating the cell design. DTE has helped ATL understand and deploy, within the PLM solution, reverse engineering techniques that have resulted in an ability to use a unified software platform to solve all the design-to-production issues that they face.



Tank with underfloor in CATIA

> We are saving money, time, resources and materials while making better products that help teams win more races.

Craig Dawson commented: "We are developing new techniques and exploring novel application areas for PLM. Working with DTE we have been able to draw on their considerable experience across diverse industry sectors as well as their long-term involvement with many aspects of the motorsport business. The ability to make a flat plan from a 3D model and accurately fit ancillary components, optimise the design and use clash detection to fit it to its reverse engineered host, is all new and gives us a massive advantage in our industry sector."

"We are saving money, time, resources and materials while making better products that help teams win more races. This give us great standing in our industry and has produced directly beneficial effects for us and our customers"

For more information:
www.atlltd.com
www.dte.co.uk