

AESTHETICA —

MEETING HIGH PERCEIVED QUALITY TARGETS AT BENTLEY MOTORS

Styling, engineering, quality and manufacturing teams at the luxury high performance car manufacturer Bentley are using Icona Solutions' aesthetica manufacturing variation simulation and visualisation software to reach agreement on gap and flush conditions, early in the design process, helping to cut time and costs.

High perceived quality — what potential customers think about the overall look and feel, the shape, colour, material and fit and finish of a product — is an increasingly important element of the product development process. Nowhere is this more true than in the automotive industry, and especially so at the luxury end of the market.

Controlling variation in the critical dimensions of the vehicle structure is the key to achieving acceptable quality from an aesthetic standpoint. For example, in the automotive industry, gap and flush control is critical to perceived quality where the flexible plastic bumper, the pressed steel wing, the headlamp assembly and the hinged, press steel bonnet (or hood) all come together.

At its design and manufacturing plant in Crewe, Cheshire, UK, Bentley Motors, the iconic high performance luxury car manufacturer, has implemented Icona Solutions' innovative perceived quality simulation software, aesthetica, to help the company to streamline and improve the process of achieving consistently high perceived quality in its vehicles, without negatively impacting development timescales and manufacturing costs.

The software was introduced to help overcome the difficulties of getting all the stake-holders in the vehicle design and development process — styling, engineering, quality and manufacturing personnel — to agree at an early stage in the development process on an acceptable and feasible range of gap and flush conditions for the Class A surfaces development process.

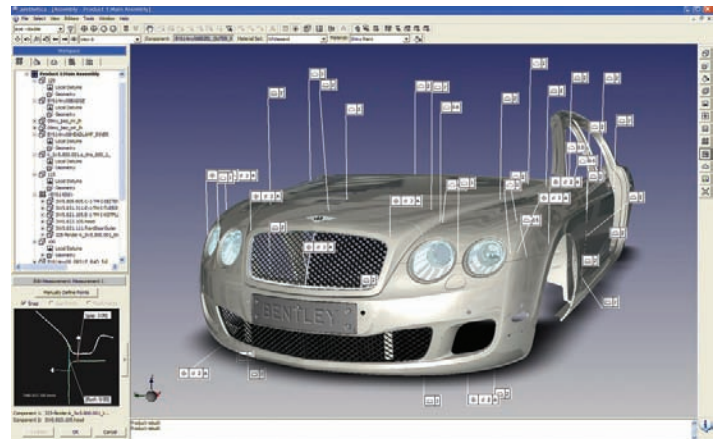
“At Bentley Motors we are constantly seeking ways to improve the design processes required to achieve quality in manufacturing,” explained Jim Shaw, Manager of Concept Engineering at Bentley Motors. “However, the practicalities of getting everyone involved in the development of a vehicle to agree the gap and flush conditions ahead of the Class A surfacing process meant there was a reluctance to commit to them early enough in the design process. This resulted in agreements only being reached after tooling prove-out models had been milled and stacked, which was leading to loops in the Class A surfacing activity that were eating into the development timeline.”

DIMENSIONAL MANAGEMENT

Following the findings of a working group that was formed to look into dimensional management throughout the development process at Bentley Motors, several new techniques were identified and justified, with the implementation of Icona Solutions' aesthetica software being the final piece of the jig-saw puzzle.

“In several pilot projects over a number of months it was clearly demonstrated that the use of aesthetica would allow us to accurately visualise the effects on perceived quality of all stake-holders' proposals, not just for edge conditions but also for the underlying fixing constraints. So the decision was made to implement the software”, says Shaw. “As a result, styling, engineering, quality and manufacturing people can now appreciate and understand each other's requirements and reach agreement at a much earlier stage in the development process than was the case before.”

The key to this is that aesthetica uniquely combines key elements of variation analysis and high-end visualisation technologies to provide immediate and accurate insight into the impact of manufacturing variation on perceived quality. Not only does this help to improve the finished product, but it also saves time,



reduces costs and improves communication and collaboration in the process.

Icona Solutions' aesthetica software is unique because it applies variation and deformation information directly to the product geometry, simulates their effects in terms of component and assembly deformation and positioning and presents the results in real time as accurate 3D visualisations using realistic light, colours and materials, exactly as customers will see the finished manufactured product.

In this important sense then, aesthetica is unlike traditional design visualisation tools because these work only on the nominal CAD model, meaning that a product can only be shown in its perfect, as-designed condition.

DELIVERING REAL BENEFITS

At Bentley Motors, users of aesthetica can now accurately visualise all possible manufacturing variations in a high quality inspection environment, early in the design process when the cost of change is lower. It enables collaborative design reviews in order to resolve the issues of fit and finish that are critical to perceived quality — and ultimately, to a customer's decision to buy.

Input parameters for aesthetica are based on the design criteria and on real manufacturing data, including materials, constraints and tolerances. Complex effects such as deformation (buckling, flexing and twisting) are represented and key contributors in problem areas are identified. The input parameters can then be varied to verify potential solutions and to quickly resolve any problems.

“Specific viewpoints that are used by the cross-functional design audit team have been set up in aesthetica so that the team reviews the virtual 3D models in the same way that they would view production cars,” explains Patrick Crutchley, senior engineer – surfacing, at Bentley Motors. “The improvement in understanding and the promotion of collaboration between departments that this brings has been of immense value,” he adds.

For example, the use of aesthetica during the design development of the Bentley Continental Flying Spur Speed enabled the variation in key areas of the vehicle that would occur under manufacturing conditions to be studied and understood, without the need for the usual manufacture and stacking of solid, physical prototype models.

Using its optional direct interface to Dassault Systèmes' CATIA V5 CAD/CAM/CAE software environment, aesthetica is now bringing real and quantifiable benefits to the Class A surfacing and dimensional management processes at Bentley Motors. However, the car manufacturer isn't resting on its laurels and is looking at how the software could be used further upstream in the design process to influence the early style development.