



## **Bertone uses Geomagic technologies to deliver seven car designs in seven days**

Bertone, renowned for its unique sense of Italian automotive style, recently bolstered its international reputation with a new claim to fame: the ability to deliver a greater number of customized design alternatives to customers in much less time.



At the center of this new flexibility and speed is digital shape sampling and processing (DSSP) enabled by Geomagic Studio software. In a recent project, Bertone used Geomagic Studio to present seven car design alternatives to a customer in seven days.

### ***From sketch to digital model***

Bertone is known for a timeless sense of style expressed over nearly a century in car models from Alpha Romeo and Aston Martin, to Volkswagen and Volvo. The company prides itself on being able to take a car design from original conception to the production line. This makes it the perfect company for implementing DSSP, which enables designers to capture physical entities such as prototypes and production parts, and transform them into 3D digital models residing on the computer.



The styling process at Bertone begins as it has for nearly a century – a sketch is drawn, revised and then finalized. After customer approval, the sketch is digitally photographed. The resulting JPEG is imported into Alias StudioTools. Image planes and cross-sections of the photograph are used to interrogate the surfaces in Alias StudioTools, enabling Bertone to create the 3D envelope, or external shape, of the car.

**Sketch start**

The CAD file is transferred to Tebis, a CAM system used by major automakers for tool, die and mold manufacturing. The software automatically programs the numerical control (NC) path for milling a clay or foam model.



**Sketch finish**

“We use clay or foam for scale models because these materials are easy to modify,” says Gianni Lucco, CAM manager for Bertone. “When changes are requested by the customer or result from an internal design review, we manually reshape the model.”

Bertone seeks to create as much realism as possible in its physical models, typically producing prototypes in 2.5:1 and even 1:1 scale. This gives customers the luxury of being able to review a prototype that is more representative of the final product, and eliminates the need for large-scale data extrapolation once the prototype is scanned.



Bertone designers add or remove material to change key body design attributes, such as curvature, thickness, and features such as headlights. Once the client is satisfied with the clay or foam model, it is ready to be duplicated into digital form for further iterations.

**Bertone mold-making**

### ***Into the digital realm***

The first step in the digital process is scanning the clay or foam prototype with GOM's ATOS scanner and TRITOP photogrammetry camera. The ATOS scanner projects patterns onto the surface of the prototype using a white-light projection unit. The pattern is captured with two integrated cameras at either side of the sensor head. The ATOS software can calculate the precise 3D coordinates of up to 4 million object points in seconds. TRITOP is used in conjunction with the ATOS scanner to accurately measure discrete object points and features.



**Bertone mold**

The ATOS and TRITOP results are merged into a common object coordinate system and saved as an STL file. The STL file is imported into Geomagic Studio digital reconstruction software. Geomagic Studio is used by automotive manufacturers worldwide for automated reconstruction of CAD models from scanned physical parts, and to produce the most accurate models possible for downstream CFD, FEA and other analyses. For Bertone, it is the tool around which much of its new styling process revolves, making it possible to quickly turn around design modifications and present new large-scale physical prototypes to customers.

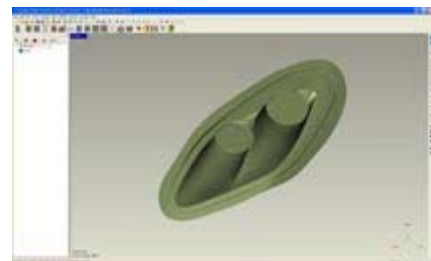
“In very little time and without the need of engineering experts, we can use Geomagic software to recreate an entire digitized object, capturing features such as the points at which a windshield is affixed,” says Lucco. “Even if a curve is irregular, it can be easily optimized within Geomagic for smooth transfer to a CAD system. Geomagic accelerates the design iteration process tremendously.”



**Duplication to digital form**

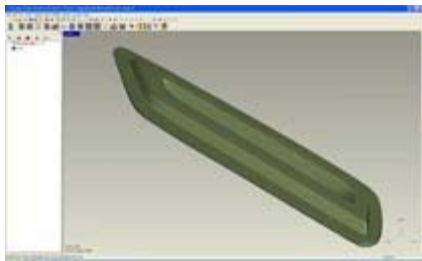
Bertone relies on Geomagic because traditional CAD systems are not designed to easily convert physical objects into accurate digital models, according to Valerio Vezzari, account executive at Microsystem, the Geomagic distributor that supports Bertone.

“Traditional CAD systems have a couple of major problems with tasks that are critical to Bertone,” says Vezzari. “They cannot easily process the massive amount of data that comes from a high-resolution scanner, and they cannot accurately model the free-form surfaces that are characteristic of Bertone designs.”



**Geomagic Studio**

Bertone uses Geomagic Studio to automatically generate an accurate polygon model from the scan data, fixing imperfections and patching holes in places the scanner cannot capture.



**Geomagic Studio**

Once the Geomagic model is completed, it is saved as an STL file, brought into Tebis software to create a new clay or foam prototype, and the process of customer review and revisions is repeated until the design meets the customer's satisfaction.

Once the final design is decided upon, Bertone can engage in an abbreviated form of mass customization, tweaking the look of the car within Geomagic to offer customers a wide range of variations based on the approved design elements.

### ***Added engineering value***

By uniting physical and digital worlds, Geomagic Studio delivers another key benefit to Bertone customers: more accurate engineering analysis. Automakers worldwide use Geomagic models for engineering analysis because they provide an exact duplicate of an as-built part, assembly or prototype. This is a major improvement over conducting analysis with a CAD model, which often does not reflect design changes made to accommodate tooling and other manufacturing processes.

Bertone uses Geomagic Studio to automatically transform the polygon model into an accurate NURBS surface model that can then be used by customers for structural analysis, interference checks, CFD analysis, volume studies and other virtual testing. The ability to do accurate computer simulations saves time and money by reducing the number of physical prototypes and improving the credibility of results.

"Our customers are interested in the value of the design," says Lucco. "Geomagic Studio provides that. It is possible, in just a few days, to create a complete surface model of the car and analyze all parts of the design."

### ***Richer designs, more flexibility***

Lucco estimates that the combination of GOM and Geomagic has reduced scanning and processing time by 60 percent over Bertone's previous method, which involved a coordinate measurement machine and a scanning head capturing data and feeding it into a CAD system.

Because of the time savings, Bertone can create more design iterations to present to the customer, who can in turn request changes and have them turned around quickly by Bertone without significant delays in the design cycle.



**Final Design**

"Now that customers see how easy it is to make changes, there might be too many changes," laughs Lucco. "But the process gives customers much greater freedom of choice, leading to a design that perfectly fits their aesthetic and functional needs."