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How a Design Concept Becomes an Automotive Reality
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Clay to Car Automotive styling is an art form that springs from the heart. It portrays a vehicle's soul and gives the viewer an immediate and tangible idea of what the automobile is designed to do.

The designer's job is one of style and purpose, and ideally these goals should go hand in hand. Translating automotive dreams from sketches into a full-sized, three-dimensional prototype is a skill that transcends the comprehension of many people. Since new automotive shapes are designed and developed in secrecy, the public sees little or nothing of the process used by design studios to develop ideas into the next generation of street cars. Many automotive shapes are still generated on a sketch pad and translated into a computer for a cad cam work up. These sketches become quarter-scale models for further analysis then contour tape drawings, and eventually full-size clay models.

The last process would seem simple; you take a batch of clay and mold it into an automotive form. In actuality, this exacting science needs the talents of a modern-day Leonardo da Vinci. A modern autophile must be an artist, sculptor, bodyman, engineer, showman, and visionary. He or she also needs to comprehend every federal automotive safety and design regulation in the book.

Well, you might ask, 'Where do you find a person like that?' It may be difficult, but the automotive companies seem to discover these people and pay them considerable amounts of money for their talents. Among all this talent is Stephen Stringer, a da Vinci who has worked with the major manufacturers, injecting a refreshing air of 21st-century thinking into the mass.

Stringer is an expert in automotive clay modeling. His work rolls on the world's roads with styles and designs that he executed for Ford, Austin Rover, General Motors, Nissan, AC Delco, and Ogle Design.

After 20 years of experience in automotive design and clay modeling, Stringer opened house as Alternative Automotive Design in Westminster, Maryland, two years ago. His company offers design services including concept art, master modeling, total vehicle design, and working prototypes. He also offers instructional videos and training in clay modeling.

With Stringer's help we got a good look at automotive clay modeling. He has seen many projects founder for lack of foresight and planning. Money spent at the wrong time on the wrong part has killed many automotive projects. He mentioned several recent projects he has seen that will fail because they can- not possibly meet federal design rule criteria.

Stringer told us about his part in the process: 'Designing automobiles is no longer just a heart and soul dream. You must have the technology, rules, and requirements lined up before you can even put a pencil to paper-headlight height, door intrusion beam specifications, rear taillight requirements, impact zonation, DOT glass approval-these are just a small part of the design process that affect not only the shape of the vehicle but its under-structure.' The clay modeling process gives the designer a great deal of flexibility. He or she can follow a preplanned design and immediately change the contours should the shape not turn out as envisioned.

Harley Earl, the famous GM stylist, is credited with being the first person to form automotive shapes from clay. Clay modeling has progressed enormously since Earl first dug his own clay from a California stream bank over 60 years ago.

The clay part of the prototype is akin to mounting a skin on an automobile. When the clay is applied on a substructure-, referred to as an armature, its depth is not much thicker than one inch in any spot.

On this armature the designer forms the wheelbase and track specifications, forms the wheel arches in wood, plastic, or metal, and builds a sub-strata of wood or 'Erector-set" metal framing to support the clay surface. The steel and aluminum framing system uses a set of indexing pins and punched holes to allow rapid framing with little fabrication.

The underbelly is mounted so that the wheel arches clear the mounting plate and allow for easy placement of the wheels and the lower body moldings. The armature needs to be built with a fine degree of accuracy, because it sits on a calibrated surface plate that is used to mount a coordinated measuring system, or a Chief Dimensional Measuring system. This system allows all points on the clay to be measured to a tolerance of a 1/10,000 of a inch. The basic calibrations start with near-perfect axes at the wheel hubs, inner fender height, and roofline.

The surfaces of the wooden framework are open just like lath plaster work or are drilled, allowing for penetration of the clay around the base material. Before the clay is applied, the complete armature is painted with shellac so that the clay will adhere firmly to the frame. Also, a series of cardboard templates are taken from either computer-generated mockups or full- scale tape drawings that are usually pinned to the wall beside the project for instant verification of dimensions and shapes.

Blueboard polystyrene foam is laid and shaped to get a closer form for the clay to be worked over. This material is cut down so that a one- inch thickness remains, and then the clay layer is applied to it and worked.

Stringer generally starts on the bottom lines and works to get the baseline correct first. From this point he can work up, shaping bumpers, grilles, rockers, doors, window frames, and the roof. The clay is rubbed into the sub-strata (wood or foam), and shaped roughly by hand using modeling sweeps. The templates and measuring sys- tem are moved into place and the shape worked on to get pinpoint accuracy at each working site with a series of cutters, scrapers, and clay- shaping hand tools.

The system then repeats itself as Stringer works on each section of the vehicle. The front bumper and grille are worked on in one piece, then the rockers are aligned down the sides and the rear bumpers are completed.

The upper side surfaces are worked with special clay modeling sweeps to form vertical flat surfaces. Contour profile patterns cut eom the tape drawings are used to check shape and form as all work progresses. The actual forming of the clay is as much a scientific building system as it is a creative work.

The same formula applies as Stringer works into the roof, hood, and glass areas of the vehicle. The basic shape is built and roughed out. He then carves his way down or builds up the predetermined shape from the full-size drawings.

The clay itself is a highly refined mixture of materials that blend to a silky smooth texture. Stringer uses and recommends Chavant modeling clay that is manufactured for worldwide use in Red Bank, New Jersey.

The clay is quick and easy to form and reform. Using Chavant's Clay Casting Compound, a basic female mold can be cast directly from the prepared clay surface three hours after the last handwork has been completed. Polyester and epoxy tooling can be taken directly from the clay surface following the application of sealers, moisture barriers, and surface primers.

From this point a composite plastic or fiberglass mockup can be made from the mold. If a working vehicle is required, a second series of detailed sectional models is needed to complete the project, including doorjambs, window frames, and separate hood, trunk, and roof sections.

The sophisticated way in which Detroit uses a clay model is to put it through a computer-driven scanner. This scanner digitizes the completed three-dimensional model. With this data, the computer can be used to mill out further development shapes, or make prototype pieces of sections like grilles, bumpers, doors, doorjambs, and trim.

When a shape has been built in clay, it can be easily changed if the idea and its three-dimensional model do not have the feel or form the designer intended. The grille work may look too bulky or the wheel opening too

large. Either of these problems can be changed and reformed in the clay, generally in a matter of hours. A clay model may go through dozens of changes before the final form is completed.

Stringer built a full-size, two-seat performance road car called the Qui Moto to demonstrate just how clay modeling is accomplished. Not intended for production, the car was built as a theme for a sports tourer of the future that would lean into a turn like a motorcycle. It would use active suspension, a motorcycle engine, and a Kevlar and carbon fiber composite body over a honey-comb and aluminum monocoque chassis tub.

Stringer has toured many of the national automotive and hot rod shows demonstrating the use of Chavant clay. He talks about the clay's flexibility and unlimited freedom of expression in surface development. He also discusses its precision and uses in computer scanning and milling.

Building a clay model is not just a Detroit thing. It's a system that any small kit car company can use to facilitate the design process. Whether it's through a service like Stringer's AAD or in-house, the flexibility and speed in which a master model can be built is astounding.

Stringer feels that working this way can offer a 60-percent savings in time alone. Using this system, a full-scale mockup can be built from tape drawings in as little as 700 hours or about 10 weeks of studio time. He estimates that a large four-door sedan needs about 1500 hours and the interior would need another 1000. The clay modeling system has been with us for over 60 years, and even with the advent of computer-generated design and imaging, the craftsman working with clay continues to help form shapes that will take us into the next century.

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