



Electronics

## Stereolithography and Simultaneous Engineering Speed Products to Market

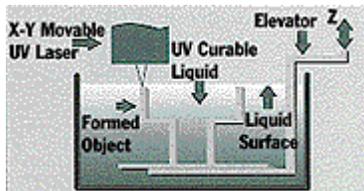
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Stereolithography is a handy tool not only for speeding a design to market but also in giving customers an early edge. By allowing a form-and-fit sample to be quickly made from a computer model, stereolithography coupled with simultaneous engineering allows customers to see product models early in the design cycle. And if a picture is worth a thousand words, what's a tangible sample worth?

### How it works

A 3D CAD model is broken into a finite-element model. Based on this model, the stereolithography computer controls an ultraviolet laser as it traces out the part on the surface of a vat of liquid plastic. The UV-curable polymer solidifies in layers set as thin as 0.004 inch thick. An elevator table lowers the part, and each new layer of resin is bonded to the last until the part is complete.

While turnaround varies according to size and complexity, most designs can be built and cured in under 24 hours -- still much faster and less costly than a model-shop prototype. Even parts that are impossible to mold or machine can be made quickly and accurately.

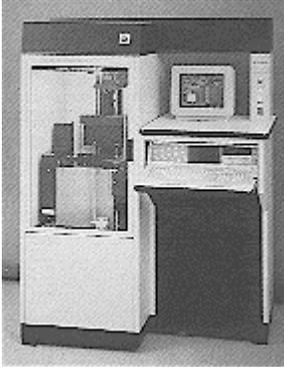


*The laser traces a thin cross section of the part onto the surface of a vat of liquid polymer, selectively hardening it. As the elevator table drops, the part is formed layer by layer.*

The part may be finished by painting, sanding, or gluing to other parts. The result is a conceptual model that is much easier to evaluate than a CAD drawing, and more accurate than a traditional model-shop prototype. Human error is eliminated because the part is replicated directly from CAD data, not interpreted by a model-maker.

The technology is most complementary to simultaneous engineering, a technique Tyco Electronics is adopting to meet the needs of rapidly decreasing design cycles. This process emphasizes a team approach in which engineers, designers, manufacturing and marketing personnel, and suppliers work together to develop the product and bring it to market on time.

Simultaneous engineering is driven by the end product and process, not the design. Instead of waiting for the design to be finalized, the manufacturing process and tooling are developed concurrently.



*Using a computer, ultraviolet laser, and vat of UV-curable polymer, stereolithographic models are produced in a fraction of the time and cost.*

With a stereolithography sample in hand, designers can verify form and fit before a final prototype is built. Errors are easier to detect when looking at the actual product, not just prints or CAD files. Costly mistakes and unnecessary iterations are prevented.

Stereolithography encourages design optimization because alternative design scenarios can be evaluated without holding up the development process or adding to expenses. Product quality is ultimately enhanced.

Process engineers can review the product design for its ability to be easily manufactured, evaluating such characteristics as moldability and robotic handling.

Suppliers given a form-and-fit model can provide more accurate mold quotes and recommend any modifications for final tooling. From this information, a manufacturing plan and cost model can be developed far earlier in the design cycle.



*Customers can see a realistic representation of the product at an early stage. Shown are both stereolithographic models and actual products of an appliance connector and AMPSEAL connector. The inset shows the detail possible with stereolithography.*

**Customers Benefit, Too**

A stereolithography model aids customers in visualizing the finished product long before production begins. Being able to look, see and feel the product provides tangible evidence that development is progressing and increases confidence that the product will be delivered on time and without error. Having a sample in hand may also spur suggestions for additional product features and capabilities. Refinement of the design can be made quickly and inexpensively. Finally, the form-and-fit model can be incorporated into the customer's product, providing a head start on their own design cycle.

Stereolithography and simultaneous engineering speed new products to market and into customer's hands. They help cut design and manufacturing costs, and improve product quality by facilitating better designs. A shortened time to market and enhanced product quality -- both benefits add up to help Tyco Electronics' customers compete more efficiently and effectively in today's global market.