

The Part We Play

Quarter 1, 2004



Now life is getting interesting! New material capabilities continue to propel the growth of stereolithography as both a rapid prototyping and, increasingly, a digital manufacturing option. Competition in the U.S. equipment market promises new innovations in process capabilities. This spring is filled with opportunities to explore all the new possibilities:

DSM Somos Regional Technical Focus Seminar

April 13th and 14th, 2004
 Detroit, Michigan
www.dsmsomos.com/detroitseminars

3D Systems North American Stereolithography and Selective Laser Sintering Users Group Meeting:

April 25th - 29th, 2004
 Anaheim, California
www.3DSNASUG.com

SME's Rapid Prototyping and Manufacturing Show

May 10th - 13th, 2004
 Dearborn, MI
www.SME.org

Please be sure to take advantage of these opportunities and experience first hand DSM Somos' new material options and "The Part We Play" in growing the solid imaging market.

Jim Reitz
 Business Director, DSM Somos

DSM Somos® Introduces NanoForm™ 15120

ProtoComposites™ and Nanoparticle Technology Combined

At December's Euromold show in Frankfurt, Germany, DSM Somos introduced the pre-commercial status of Somos NanoForm™ 15120—our first composite stereolithography material to incorporate nanoparticle technology.

NanoForm is a composite material exhibiting many properties similar to fused deposition materials and glass-filled polyamide sintering materials, with the accuracy and precision inherent in stereolithography. NanoForm is "pour and play" technology—a capability largely due to the nanoparticle size of the filler.

"The composite technology of NanoForm contributes to exceptional dimensional stability, low shrink, and low coefficient of thermal linear expansion," says DSM Somos Application Development & Technical Service Manager Matt Cantwell. "Mechanical performance includes an exceptionally high tensile modulus of >5,000 MPa, and an elevated temperature performance (HDT) of >132°C."



NanoForm is the second addition to DSM Somos' ProtoComposites™ product line. Full commercialization of the material is expected in early 2004. For more information on NanoForm, log on to www.dsmsomos.com or contact your DSM Somos account representative.

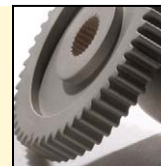


Introducing:
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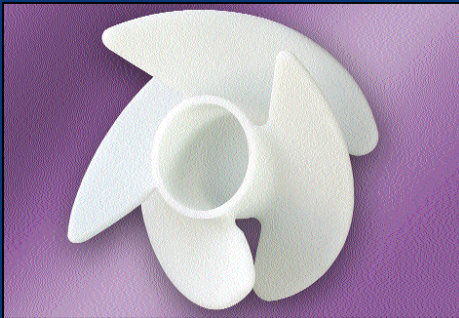
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You Asked for It ... Introducing "Somos White"



In response to recent customer requests, Somos has introduced a new, white stereolithography resin with a chemistry similar to its popular WaterShed™ 11100 Series.

Somos 14120—simply called "Somos White"—is water resistant, offers mechanical properties similar to ABS and PBT, and can be used for a variety of prototyping applications in which white plastic prototypes are desired. To view a preliminary product data sheet for Somos 14120, log on to www.dsmsomos.com.

Tech Tip Alert

Q: I've recently upgraded to Lightyear 1.4 and have been experiencing build issues. What do you suggest?

A: The problem could be with your recoat styles. Using older style files with Lightyear 1.4 may cause improper adjustment of the blade gap for layers above 0.004". For help with this issue or any other technical questions please contact your DSM Somos account representative.

ProtoTool™ 20L Molds Injection Molded Parts

Over the past fifteen years, many rapid prototyping technologies and materials have been evaluated for producing injection molded plastic parts. In general, the results have been unsuccessful. Mold life has been short, tolerances were not maintained, and mold post-processing added significant time to the process.

Recently, however, in trials evaluating the use of **Somos ProtoTool™ 20L molds** for plastic injection molding, the resin proved successful in offering fast delivery of prototype or low-volume production plastic parts.

The ProtoTool molding trials were conducted as a joint effort of American Precision Prototyping, Vintage Industries and DSM Somos. A number of materials, including Santoprene®, ABS and Xenoy® were injection molded at Vintage, and processing parameters were developed for each material.

"About thirty Santoprene parts and sixty ABS parts were produced using one set of inserts," says DSM Somos Senior Account Manager Charlie Kaufmann, "with 100 Xenoy parts produced on a second set of inserts. The inserts showed little evidence of wear, and we suspect that many more parts could have been produced with each mold set."

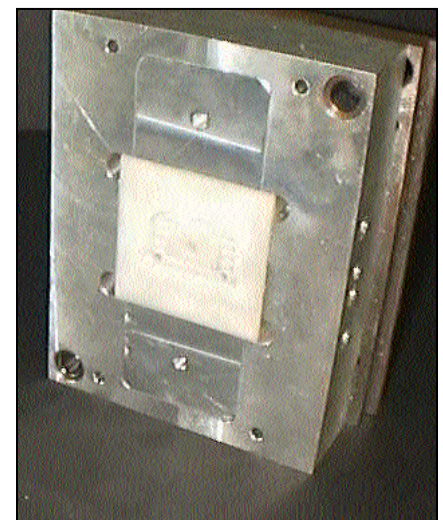
Trials began by using high temperatures and low pressures until confidence was gained with the ProtoTool inserts. Gradually, temperatures were reduced and pressures increased. "Conditions were similar to those used in molding with conventional steel and aluminum molds," says Kaufmann.

Between shots, the open mold faces were cooled using a compressed air gun (precise surface temperature

monitoring with an infrared temperature sensor is recommended). Cycle times for most materials were approximately one minute. "This is longer than those typically encountered when using aluminum and steel molds," says Kaufmann, "but acceptable for prototyping and short run production.

The recent molding trials proved Somos ProtoTool 20L to be a viable solution for producing significant quantities of detailed, close-tolerance injection molded parts in just a few days' time. They also demonstrated that the use of stereolithography to make a mold allows for the creation of features that cannot be machined into metal tools. This allows end users to produce parts to an exact design rather than having to compromise on detail or spend additional time and money to have features added by secondary operations, such as electrical discharge machining (EDM).

Companies interested in testing ProtoTool for tooling applications are encouraged to contact DSM Somos for more information.



Above: ProtoTool™ 20L insert in mold frame.

Successfully Produce

ProtoTool™ Helps Bring "Revolutionary" Idea to Market...

Entrepreneur Steve Katsaros has an idea that he believes will revolutionize the bicycling industry and he's looking to bring it to market as quickly and cost-effectively as possible.

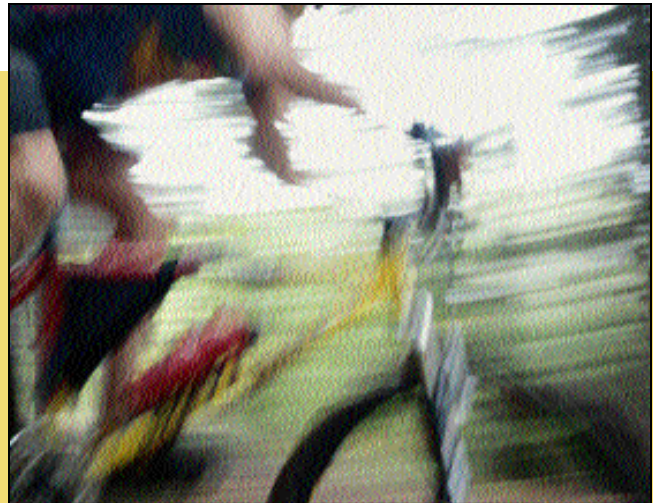
His company, RevoPower, Inc., has designed "The Revolution Motor™"—a self-contained motor to fit in the hub of a standard bicycle wheel. Designed to power a bicycle to speeds of 20 mph and travel at least 200 miles on one gallon of gasoline, The Revolution Motor uses an internal combustion engine to drive a novel gear train that is currently being engineered with the help of patterns created from Somos ProtoTool 20L composite stereolithography resin.

Once the patterns are made, they are metal coated to create a sealed, non-stick, surface. A mold is then formed around them using uncured silicone rubber that has a consistency similar to that of clay.

Next, the mold is put into a frame and placed in a hydraulic vulcanizing press for curing. The combination of heat and pressure forces the silicone into all crevices and around all details of the patterns. During this process, the mold and patterns can reach 450°F—a temperature exceeding the capability of conventional stereolithography resins.

After the vulcanization process, the patterns are removed from the silicone rubber molds, and the molds are placed in a spin-casting machine. Molten metal is poured into the mold, and spinning the mold forces the metal into all the details of each mold cavity. After the metal solidifies, the parts are removed, cleaned and assembled.

ProtoTool 20L was chosen for The Revolution Motor project because of its ability to withstand high temperatures and pressures, as well as its excellent



accuracy and dimensional stability. RevoPower was pleased with its performance.

"The ProtoTool parts were incredible," states Katsaros. "I was amazed by their strength and rigidity and would definitely recommend using sealed versions again in this process."

In order to get The Revolution Motor to market by the first quarter of 2005, four different sets of prototypes have been planned—the first to verify engineering principles, the second for a feasibility study, the third to address manufacturing concerns and the last for the pre-production tooling of prototypes.

During the product development stage, Katsaros' concept won the 2003 Design Award from Design News Magazine as well as the University of Colorado's Business Plan competition at the Bard Center for Entrepreneurship. More information about the project can be found at www.revopower.com.

Metal Coating Process Substantially Improves RP Applications



Photo courtesy of FineLine Prototyping

A continuous goal of rapid prototyping is to transform itself into a rapid manufacturing process. As materials improve, new processes are developed and optimized along with them to further extend key properties. One such process, marketed by FineLine Prototyping as SLArmor™, involves the nickel plating of stereolithography parts.

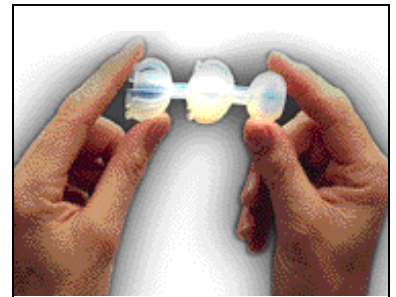
Plating stereolithography parts with metal achieves better mechanical properties than the RP process can produce on its own. Nickel coated parts made from Somos® ProtoTool™ 20L resin showed a 30% increase in flexural strength, a 100% increase in flexural modulus, and a 540% improvement in impact resistance. In practical

terms: a greater strength-to-weight ratio and much higher stiffness than those of many metals. Chemical and abrasion resistance were also significantly enhanced.

An obvious application for the metal coating processes is to produce low-volume production parts without having to first manufacture expensive, long-lead-time tooling. Another real world application includes coating prototypes of intake manifolds for automotive engines, where increased temperature resistance and thermal conductivity reduces susceptibility to thermal shock (the plating spreads heat more quickly).

In high-speed wind tunnels, such as those used to test aircraft parts, plating will significantly increase stiffness and carry heat away from the leading edge. In low speed wind tunnels, such as those used to test automotive parts, increased stiffness is also a key advantage.

Processes such as SLArmor are moving rapid prototyping steadily toward the rapid manufacturing arena. For more information, contact us today.



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Editor

The Part We Play is published by DSM Somos as an information resource for the rapid prototyping industry. Reader inquiries and suggestions for content are welcomed and should be directed to:

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