



DSM Somos[®]

The Part We Play

April 2008



DSM Somos[®] Leads the Way in IMPACT TESTING

DSM Somos measures all of its stereolithography resins via Izod notched and un-notched impact tests. But with increased development of SL resins that behave more like thermoplastics —such as DMX-SL™ 100—Somos has also begun conducting impact tests traditionally reserved for engineered plastics. What's the value of these tests in creating and evaluating tougher SL materials? See inside...



"X-Factor Challenge"
Design Contest Winners

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NanoTool™ for
RP and Rapid Tooling



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DSM Somos® Leads the Way in Impact Testing

An interview with DSM Desotech materials scientist Dr. Satyendra Sarmah sheds some light on methods of impact testing for SL materials. For the complete interview, log on to: www.dsmsomos.com.

Q: What does impact testing actually tell us about a plastic?

Impact testing provides engineers with important information about a plastic's toughness. The tests measure the relative susceptibility of plastics to fracture under stresses applied at high speeds.

impact tests belong to the pendulum family, while Gardner and falling dart methods belong to the latter. These traditional tests measure energy required to cause failure. However, they do not provide good information about the mechanism or nature of failure, such as brittle or ductile failure, because these tests are generally not instrumented to measure stress and strain in the specimen during the test.

The better way to measure impact resistance is through an instrumented

Q: How do impact strength values translate to real-life applications?

Impact tests such as Izod and Gardner allow designers to compare the relative impact resistance under controlled laboratory conditions and, consequently, are often used for material selection or quality control. These test results generally don't translate, however, into explicit design parameters and thus cannot reliably predict how a part will behave in a typical real-life impact situation.

Though part performance may not always be predictable, impact testing at different temperatures can provide information on brittle to ductile failure transition. For example, toughness tends to decrease at lower temperatures (the plastic becomes stiffer and more brittle below glass transition temperature), therefore impact testing at lower temperatures becomes more critical. In automotive applications, the low temperature impact at -30 or -40°C is important to measure.

How does DSM Somos use impact test information to develop better plastics?

DSM Somos measures all of its stereolithography resins via Izod notched and unnotched impact tests. However, as we focus on the development of SL resins that behave more like thermoplastics, we've begun adding impact testing normally reported for engineered plastics but not SL resins—such as the instrumented drop weight test (a more advanced version of the Gardner test) . By understanding more about failure modes, DSM Somos is well equipped to develop tougher SL resins.

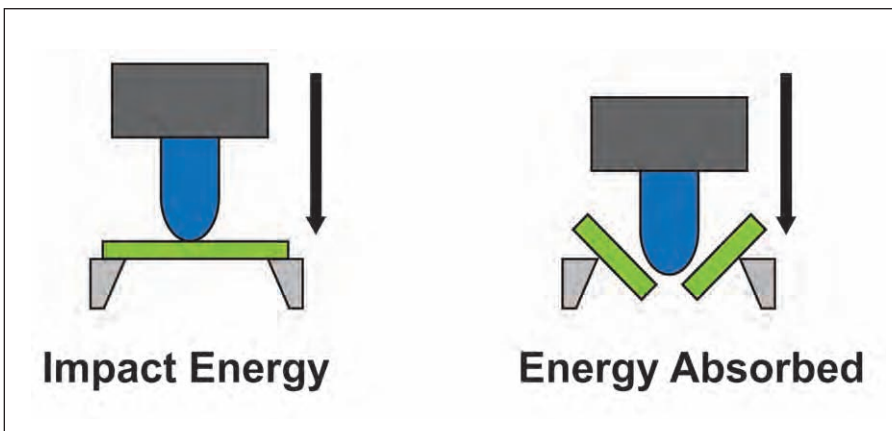


Figure 1

Q: What is the value of having multiple test methods for measuring impact strength?

While all impact tests measure stresses applied at various high speeds, there are significant differences in equipment, specimen geometry and results interpretation. The common impact test methods can be divided into two categories: impact by a swinging pendulum, or by a falling weight (Figure 1). Charpy, Izod and tensile

impact tester which includes load and velocity sensors, along with a high speed data acquisition system that provides information on variation of force, energy, velocity and deformation during the time of the test. Data can be utilized to obtain information regarding energy needed for crack initiation and propagation to failure, failure sensitivity to strain rate, and distinction between brittle, ductile or transition failure modes.

Somos Announces Winners of the “X-Factor Challenge.”



At the 2007 3DSUG show in Daytona, FL, DSM Somos unveiled the “X Factor:” DMX-SL™ 100. Based on a patented new chemistry platform, DMX-SL is a breakthrough stereolithography (SL) material which combines SL’s high accuracy with sintered-like durability. To draw attention to this unique performance combination, Somos issued the “X-Factor Challenge” late last year.

“The goal was to solicit designs that would capture the accuracy of SL with the durability of either the laser sintering, fused deposition modeling or cast urethane process,” says DSM Somos Marketing Manager Eva Montgomery. “Not an easy challenge.”

The contest was split into two categories. Category 1 designs represented the replacement of cast urethane or laser sintered parts. Category 2 was reserved for innovative, creative or fun designs.

“We were delighted with the response we received” says Montgomery. “Entries came from OEMs, service bureaus and universities throughout the U.S. and also from Europe.”

Winners of the ‘X-Factor Challenge were announced in February 2008. Judging the entries was a panel of experts chosen for their knowledge of rapid prototyping and rapid manufacturing: Tom Sorovetz, RP Manager, Chrysler Corp, Detroit, MI; Tom Mueller, Co-Owner Express Pattern, Vernon Hills, IL; and Tim Gornet, Manager, RPC Operations, University of Louisville, Louisville, KY.

Replacement Part Category

The Replacement Part category judging criteria required entrants to: satisfy the demands of a laser sintered or cast urethane part; demonstrate the advantages of using SL; demonstrate the capability of DMX-SL to stretch the conventional limits of the SL process in terms of stiffness and toughness; use an actual industrial part; and simulate the properties of the material intended to produce the final part (if a prototype).

First Place: A Discharge Chute (pictured above, left & middle) for a small ride-on tractor submitted by Mark Horner of Technology House, Solon, OH. This part would typically have been made from cast urethane, but

Technology House was able to save some steps by making it directly from DMX-SL. “What impressed the judges is that the discharge chute went through extensive real world testing without shattering,” says Horner. “No other SL resin could have survived.”

Creative Part Category

Creative category parts were required to clearly demonstrate the advantages of SL and optimize the stiffness/toughness properties of DMX-SL, but with creativity not typically found in industrial applications.

First Place: Foosball Man (pictured above, far right) used in the game of foosball, or table football as it’s known outside North America, submitted by Vince Anewenter of the MSOE Rapid Prototyping Center.

“We were really impressed by the variety of entries received for this competition”, says Montgomery, “It truly demonstrates the ingenuity and creativity of designers working in the RP sector. These parts will be displayed at DSM Somos’ booth during upcoming trade shows this year.

Advancing RP: Have you Tried Our Newest Materials?

The last two years have seen significant advancements for the rapid prototyping materials market. In 2007, DSM Somos® introduced an exciting new line-up of new products that's giving users more accurate, more durable, stiffer and clearer SL performance than ever before. *Have you tried the newest line-up of high-performance Somos materials?*

DMX-SL™ 100

A breakthrough high-impact resin delivering the accuracy of stereolithography with sintered-like durability. Based on an entirely new chemistry platform, DMX-SL is moving stereolithography beyond traditional applications, toward those previously reserved for cast urethanes and laser sintering.

WaterClear® Ultra 10122:

The clearest SL resin available on the market today, based on colorimeter comparison testing. WaterClear Ultra closely mirrors the behavior of high-clarity acrylic and demonstrates higher clarity than commercial grade polycarbonate. It's the resin of choice for automotive lens and packaging applications.

WaterShed® XC 11122

A near colorless version of Somos' best-selling ABS-like WaterShed® 11120 material, with high stiffness, good elongation and exceptional water resistance. WaterShed XC exhibits an improvement of 5 DE units over the original WaterShed resin (>1 unit being noticeable with the human eye), and is already widely used for lenses, housings, flow modeling, and investment casting patterns.

ProtoGen™ 18120 (translucent) & 18420 (white):

Extremely accurate, all-purpose ABS-like SL resins offering high dimensional stability, low water absorption and high green strength. Other advantages: faster processing speeds with higher accuracy and heat deflection temperatures (HDT of 70°C with UV-only post-treatment and >100°C with thermal post-treatment).

Somos ProtoCast™ AF 19120:

Targeted for the investment casting industry as the only antimony-free

(heavy metal free) casting resin. ProtoCast has extremely low ash content and is ideal for use with both fused silica and alumina refractory shell systems.

NanoTool™:

A third-generation reinforced ProtoComposite material for conventional rapid prototyping as well as SL rapid tooling applications. NanoTool combines high-temperature-resistance and exceptional stiffness with low thermal expansion and low shrinkage characteristics. Enhanced processing speeds (>30% increase) shown in head-to-head testing with competitive SL materials, as well as ease of secondary processing make this composite resin ideal for applications such as wind tunnel testing, rapid tooling and metal plating of structural composites.

Interested in trying one of these advanced RP materials? Log onto www.dsmsomos.com to find a service bureau near you.

Somos' newest product line-up is exciting design engineers and service bureaus alike with SL performance that is

- **more accurate,**
- **more durable,**
- **stiffer**
- **and clearer**

than ever before....



Somos NanoTool™ Delivers

for both **Rapid Prototyping** and **Rapid Tooling**

Somos NanoTool™, a third-generation ProtoComposite material, delivers the high-precision physical properties and surface qualities needed for both RP and Rapid Tooling applications, generating significant savings in both lead times and cost.

Working together with European molding company, Pichot, leading French service bureau Axis (www.axishello.com) recently used NanoTool™ to successfully create production tools for the injection molding of pill dispensers for the medical industry. With more than 1,000 parts already produced in both ABS and POM (Polyoxymethylene)—from a NanoTool mold that still works perfectly—Axis Technical Manager Ludovic Martin considers SL rapid tooling with NanoTool to be an ideal approach.

“Where conventional metal tools would have taken 4-6 weeks to produce, the use of stereolithography has enabled us to complete the entire process from CAD drawing to fitted injection molds in just eight working days. NanoTool is proving especially useful for applications where low series, small parts and precise tolerances are required.”

Axis also believes that tooling produced on SL systems offers a number of key technical advantages over conventional methods. “SL offers more opportunities to build complex geometries and tight tolerances,” says Martin. “In rapid tooling, this is significant for the design of the part as well as for the technical aspects of the mold. For example, with SL we can really optimize the design of the cooling channels—allowing them, if necessary, to follow the contours of the part. This helps optimize both quality and productivity.”

But rapid tooling is only one application area where NanoTool is getting its chance to shine. In RP applications,

Martin says, “NanoTool is the best material we’ve found for high temperature resistant prototypes such as automotive lamp assemblies.”

In a process developed together with Thierry Fleurence, Prototype Manager at Valeo Lighting Systems, Signal Lamp Europe Division in Sens, NanoTool was used to create a base for metal coating. “The surface quality of the NanoTool parts produced on our SLA 250 is so good that there are absolutely no visible build lines,” says Martin. “For any one who knows RP processes, this is truly amazing.”

He continues, “Axis also has SLS processes in-house, but we prefer NanoTool for complex shapes, particularly where accuracy, detail and surface quality are critical.”

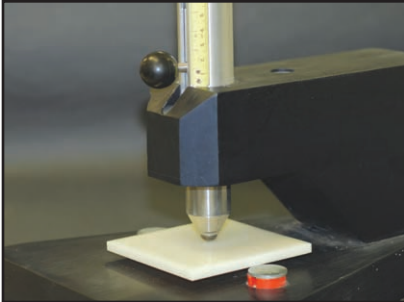
Leading French service bureau Axis, has relied on Somos NanoTool's combination of strong, stiff, high-temperature resistance and smooth surface quality to successfully create injection molds for rapid tooling (top), as well as metal coated automotive lamp assemblies (middle, bottom).



Somos NanoTool™

NanoTool is a third-generation Somos ProtoComposite material producing strong, stiff, high temperature resistant composite parts on conventional stereolithography machines. NanoTool is heavily filled with noncrystalline nanoparticles, allowing for faster processing. It exhibits superior sidewall quality, along with excellent detail resolution as compared to other composite SL materials. The smooth surface quality and high initial modulus of NanoTool make it an excellent resin for metal plating, a growing application which saves time and money as an alternative to true metal prototypes. It's also ideal for applications where strength, stiffness and high temperature resistance are key— including wind tunnel models for aerospace and automotive applications. A third major application area is rapid tooling for injection molding. Learn more: www.dsmsomos.com

Somos Impact Test Demonstrations at Rapid 2008

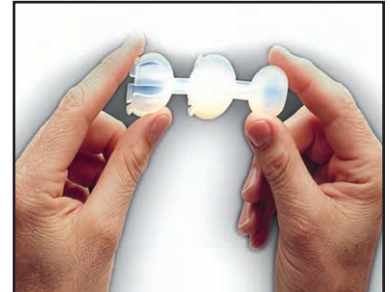


At this year's Rapid 2008 show in Orlando, FL, DSM Somos® will perform live demonstrations of the Instrumented Drop Weight Test at their booth. "We'll put DMX-SL™ 100 up against other SL resins, laser sintering materials and fused deposition modeling resins," says Somos Marketing Manager Eva Montgomery. Stop by Somos booth #301 for the demonstration.



Somos Welcomes New Global Sales Manager

On February 4, Craig Robertson joined the DSM Somos team as Global Sales Manager. After spending 22 years in the technical and commercial plastics industries, Craig succeeds Myron Bezdicek, who has been appointed Somos Market Development Manger.



Kim Axiotis
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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