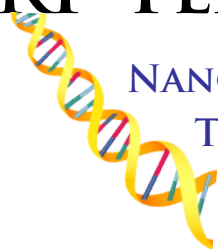


RP TEMPERING™ TECHNOLOGY NEWS



NANO-COMPOSITE
TECHNOLOGY

VOLUME 4

SOLID FREEFORM ADDITIVE TECHNOLOGY
& PATENTED ENGINEERING TECHNIQUE

JUNE 2006

Large RP Tempered SL Assembly Take Punishment at Trade Show

Mark Jones – Laser Reproductions--
www.laserrepro.com

We recently had an opportunity to help one of our customers with a concern he had with his SLA parts. These were show parts that were a large assembly. The parts had been bonded together and painted. The main concern was that the lid to this assembly would be opened and closed, by potential clients, numerous times over the duration of the show. Added strength was necessary to assure the functionality of the display. A more convention method like RTV cast urethanes might have been an option if time and cost were not a factor. Since we are an approved RP Tempering™ Licensed Bureau we could offer our customers a viable option.

Using the RP Tempering™ process, we were able to assure the customer that his parts would be able to withstand any rough handling it may encounter. The clear RP Tempering™ Compound was used for esthetics. It was applied to the backside of the parts for added strength. The painted show side was not affected in any way. Our customer reported that his project was a success! The RP Tempered™ SL parts made at Laser Reproductions

performed well.

We have much interest from our customers for higher heat deflection and resistant properties from our SL parts. With the RP Tempering™ engineered compounds like Proto-Plasma-Rx™ and the Hi-Temp Protoplass© we are able to meet their needs. Customers like the SLA process for the detail and quick turn around of their designs. The Proto-Plasma-Rx™ adds a great deal of amenities to the SLA process, such as resistance to heat, fuel, oil & chemicals. This is huge in the industry. More demand are being placed on us (Laser Reproductions) from OEM's wanting more performance out of an SL part. Parts are actually seeing stringent, complex applications, as well as life cycle fatigue testing, to prove the design. This saves money for our customers and will keep them coming back.

Earl Dunlap P.E. came for a meeting at Laser Reproductions to speak with our sales and marketing people. Imagine his surprise



when he arrived seeing us throwing RP Tempered™ SL parts across the parking lot and up against the

wall. The first time we used the Proto-Plasma-Rx™ we applied it to a test bottle made of WS11120 with a .030" inch wall thickness. We proceeded to throw this bottle around all day,

Discussion from RP Tempering™ Training in St. Charles, IL

Earl Dunlap P.E. – Manufacturing by Design, Inc. (MBD)

Manufacturing by Design, Inc. would like to thank everyone in attendance at our training in St. Charles, Illinois. During the two training sessions 11 companies were represented. We were presented with

a magnitude of constructive questions about the RP Tempering™ technologies. Feedback was positive even though we were presented with one application that did not work during the seminar. Companies who attended were asked to bring an actual RP part to temper during this FREE training RP Tempering™ seminar. Eight out of eleven companies represented brought parts to temper ranging from:

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Upcoming Training -
RP Tempering™
July 10 - Louisville, KY
July 18 - Southern
California
See page 3 for details

including outside in the parking lot. At days end the bottle did have some fractures but was in one piece. Tempered SL bottles can be made fully functional now to include squeezing the sides and holding fluids. We were impressed!

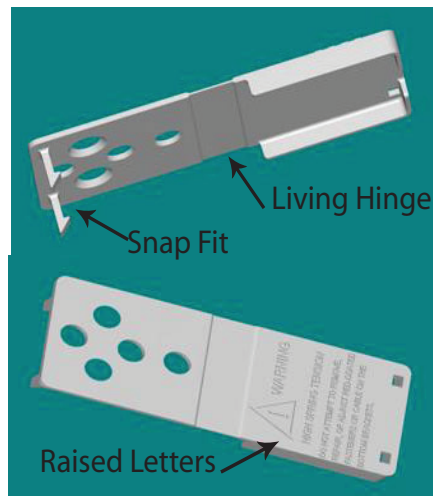
- SL parts with different SL resins
- LS parts with two different systems and multiple powders
- 3D Printed parts
- RTV cast part
- FDM ABS living hinge part
- Painted SL Part for Proto-Plasma-Rx™

See ST. CHARLES, Page 2

ST. CHARLES from page 1

Since the initial commercialization of RP Tempering™ we have been presented with applications that challenges us on a daily basis with a high rate of success. As with any new technology, there are applications that are more challenging than others. We want to maintain open communications so we will share one of our more difficult challenges. Do to confidentiality we cannot disclose any of the companies names that attended the seminar. We did however, receive permission from the company to write about and show the parts we will discuss below.

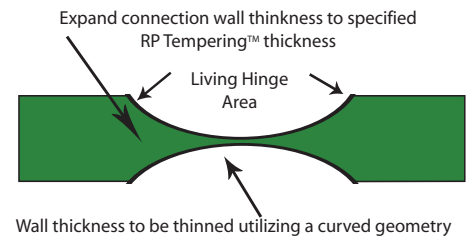
During the training seminar we had a living bend over hinge part made from multiple SL materials from one of the companies attending. This potential client brought the same part made out of multiple SL resins for evaluation. The attending company that supplied the SL parts did everything ask of them however, MBD, Inc. engineering specified the wrong engineering technique. Tempering worked on the part in one area and failed to work in two other areas. This



Challenging Part from Training

part was an "SL" living bend-over hinge application similar to ones we have made several times before and seen in the April newsletter. The part also had snap features and text on the cavity side.

We applied a single tunnel in each snap feature that will enhance the snap feature flex strength by 300%. When we tempered the living hinge area it broke at 15 to 20 degrees according to the end user. During the session we observed it broke about 30 to 40 degrees after curing longer and slowly bending the hinge area. In the living hinge areas a "V"



"U" Wall Technique

Groove tempering technique was used which was incorrect. We now know that the "U" wall technique should have been used as seen in the diagram above. We are currently making another part with the company using this tempering technique. We will report the outcome in our July RP Tempering™ Technology News.

Also, we had tiny microscopic bubbles around the lettering/font on the part when we sprayed Proto-Plasma-RX™. We have since identified that we had an out of spec spray coating. We quarantined the lot of spray and found out that the toluene content was out of specifications causing this effect. Proto-Plasma-Rx™ will not bridge like paint with its lowered VOC content. It comes out in a mist following tight corner and then forms a moisture barrier protecting RP parts from heat, temperature and humidity.

RP Tempering™ Development Team Looking for New Applications

Marty McGough - Total CS Team, Inc
www.totalcsteam.com.

As users of RP Tempering™ know the technology significantly improves the durability of plastic parts produced with Rapid Prototyping and Solid Freeform Fabrication technologies. This application is what really caught the attention of the market place and is adding excellent value for those who are using the process. MBD and TCST are continually developing enhancements to this core technology that will be expanding applications into new market areas. The research effort is an ongoing activity that will lead to many new innovations in the future including many short run-manufacturing applications. The following is a list of a few of the technologies that we are currently working on:

- High temperature coatings aimed at increased heat deflection temperatures
- Optimizing the process for adding

Tunnels and "V" Grooves

- Optimizing the RP Tempering™ process for specific applications
- Increasing the stability of part material over time
- Optimizing the compatibility of the RP Tempering™ process with specific OEM materials

The RP Tempering™ technology can be advanced further through a collaborative effort between the development team, the OEM suppliers of equipment and materials, the academic world, and most importantly the users of this process. The MBD and the TCST staff have a wealth of experience in innovation and process development/control. We are here to support your efforts to use this technology in creative ways to add value to existing applications, and open up new markets using Rapid Prototyping and Solid Freeform Fabrication technologies. Please do not hesitate to call on us with any new ideas, requests for further testing, process support or suggestions for the future.

As one additional note, I would like to comment about the general industry goal to

push RP and SFF technologies further into the manufacturing sector. We believe that the RP Tempering™ process can provide an avenue to increase the effectiveness of these technologies to produce end use parts that meet the requirements of more manufacturing applications. From our standpoint, we are very interested in doing our best to bring manufacturing process controls and best of class analytical methods to this industry to support this effort. Please feel free to advise us if you would like to discuss opportunities to work together in this or any other area.

For more information on TCST or to learn more about the RP Tempering™ process, please contact Marty McGough at mmcgough@totalcsteam.com, or visit our website at www.totalcsteam.com. RP Tempering™ information is also available at www.rptempering.com or by contacting info@rptempering.com.

Treatment of Bosses and Screw Holes in Parts

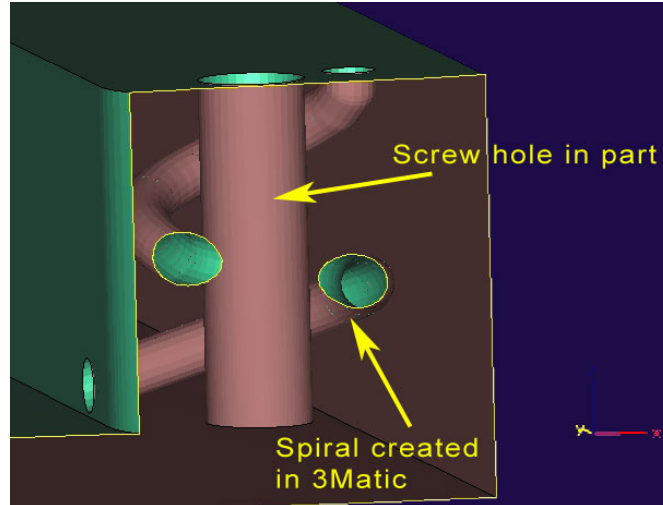
Andrew Graves - Total CS Team, Inc.
- agraves@totalcsteam.com

One of the benefits of RP Tempering™ on RP/Freeform fabricated parts is the ability to give bosses & screw-holes more durability. This allows screws or press-fit studs etc. to be inserted into parts with less chance of them breaking or cracking. The preferred method for achieving this is with a spiral tunnel around the boss or hole, which is then filled with the RP Tempering compound. Creating these spirals directly in an STL file, without the need to go back to CAD is an ideal application for Materialise's 3Matic software.

As the cross-section image shows, the spiral tunnel is created around the required hole and in the

case shown, it emerges from the top of the screw-hole and at the side, near the base. This was done to prevent the tunnel emerging on the outside, aesthetic face of the part. In a

part with multiple bosses or holes, the curve created to form the spiral tunnel can simply be copied & pasted the required number of times. The spiral function is one of the areas that we hope to automate in future releases of 3Matic.



Resistance to Tunneling and Alternatives Explained

Earl Dunlap P.E. – Manufacturing by Design, Inc. (MBD)

The RP Tempering™ Technologies include a tool chest of engineering techniques, additive and subtractive methods. Tunneling is the method that give you the maximum strength in any type RP part and/or composite. There has been a reluctance to tunnel parts so the Proto-Plasma-Rx™ spray coating and RP Tempering™ compound put on the out side of a part has become the most popular tempering methodology. These are very good methods to cost effectively increase part durability but tunneling, “V” Grooves, “U” wall technique and others can give you an even more dramatic improvement while

still being cost effective and fast. The learning curve in minimal with a 400% improvement in overall part durability.

Early in the evolution of the RP industry, honeycomb interior structures were introduced. While a honeycomb shape within the walls of a composite part increase your impact in one dimension the other 2 dimensions can actually get weaker. When tunneling a part, you work under the same principle of reducing mass, except with a tunnel you achieve a 3D dimensional result. This means you increase your impact in all 3 dimensions. Not only do you increase impact strength, you get benefits from the 3D engineering technique. The benefits include an increased 3 Point Flex by 800%(8x), torsion by 300%(3x) and while maintaining tensile or flexural modulus. The part will stay the same stiffness. Some RP Tempering™ license bureaus say they cannot

get the tunnels to drain especially in LS parts. The tunneling technique can be altered to add drain portal slots and then filled back in with RP Tempering™ Nano-Carbon Compound. You will achieve the same results within a 3% range.

Other alternatives to the tunneling technique are “V” Grooves and “U” wall engineered geometries. These techniques do not need drainage or portals. They are easily applied in an STL file before the part is built, thanks to 3Matic Materialise software for RP Tempering™. When using this technique, you will still achieve impressive improvements but it will be approximately 15% less than if the part was tunneled with the exception of torsion. Torsion will increase by 200%(2x). Upholding dramatic improvement in mechanical properties and part durability.

Live Web Forum

June 28th - All Day at

www.myRPCommunity.com

Manufacturing by Design, Inc will be hosting a live all day question and answer web forum on RP Tempering™ Technologies. The forum will start at 9:00am EST and last until 4:00pm EST. Earl Dunlap P.E. of Manufacturing by Design, Inc. and the inventor of RP Tempering™ Technologies will host the forum with the following topics of discussion: RP Tempering™, Proto-Plasma-Rx™, Proto-Reinforcement©, Hi-Temp Proto-class©, "V" Groove and

"U" Techniques, Tunneling, Patented 3D CAD Engineering Technique, 3Matic Software for Tempering, Mechanical Properties, Chemical Properties, Moisture Resistance, Accelerated Life Aging Test Results, RP Systems and Materials and Their Relationship to Tempering, News Letter, Past/Present/Future, Current Research, Partnerships, Licensing, Business Agreements, Production Application, and Prototyping Applications.

Our desire is that the www.MyRP-Community.com website will become a regular forum and will be monitored for on going questions and/or conversations. Other representatives will also be present from Total CS Team,

Par3 Technology, Protocall and Southern Prototyping who are all involved in R&D and/or BETA houses for tempering. Please join us for the forum.

Credit Cards

Accepted

All major credit cards are now accepted for RP Tempering™ Technologies.

Training Opportunities - RP Tempering™

July 10th from 9am - 3pm in Louisville, Kentucky

Manufacturing by Design, Inc is offering a no obligation FREE training seminar in Louisville, KY at the Executive Inn West Hotel Airport location on July 10, 2006 from 9:00am to 3:00pm. The hotel phone number is 502-367-6161 for room reservation and ask for the RP Tempering™ room discount. The hotel offers a free shuttle from the airport. Lunch will be provided by MBD.

July 18th from 9am - 3:30pm in Mission Viejo, California

This West Coast RP Tempering™ training seminar will be on Tuesday July 18th from 9:00am to 3:30pm. Marty McGough of Total Customer Support Team will be conducting this training class. It will be located at: Saddleback College 28000 Marguerite Parkway Mission Viejo, CA 92692 Ed Tackett who is the Director, Advanced Technology Center will be our host.

If you are interested in attending please call Marty McGough at TCST at 661-713-5515 or Earl Dunlap 317-557-5018.

Note:

We invite everyone attending any of our training seminars to bring a prototype part(s) of your choice to temper. If our patented 3D CAD tunneling technique is needed we will provide this service for FREE. The parts can be produced from any system or material. MDB, Inc. will provide an STL file if needed for parts like living hinges, tensile bars, large panels for UPS drop test up to 8" as seen in our video.

Current and Potential Capabilities of RP Tempering™ & Your Application

Marty McGough – President - Total CS Team - www.totalcsteam.com

The RP Tempering™ process positively affects the durability of most plastic parts produced with additive Solid Freeform Fabrication or Rapid Prototyping technologies. The amount of improvement you can expect is dependent upon the degree to which you apply the process and the exact material you are using. In general, the major improvements you should expect include a much more robust part with higher impact strength and much improved torsional durability. Other improvements can be achieved in smoothing the surface of the part and significantly improving the ability of

a part to withstand much higher temperatures without distorting or degrading.

We are currently evaluating the affects of the coating on the stability of the material over time and believe there is good potential in this area. Further testing is required, but initial tests indicate that the Proto-Plasma-Rx™ Penetrating Aerosol Spray Coating may be effective at significantly increasing the usable life of parts built with some currently less stable materials. This should be helpful for all parts, but could open up many new applications for parts built using UV cure processes.

In addition to the material stabilization work, we are also working to develop more filler material, new coatings and other ways to apply this technology to increase the value of parts utilizing this process. We will be providing more information on this as we validate

specific areas of improvement.

It is also important to note what this process does not do for parts, so that the users are not expecting results that are not achievable. Please keep in mind that this process does not significantly change the tensile strength/modulus, flexural strength/modulus, elongation or stiffness of the material. Applications that require different material properties than the material you are using should be evaluated carefully before building the part and using the RP Tempering™ process to improve the part performance in the application. Please feel free to advise us if you have any questions in this area or would like us to provide our projection on the improvement you should expect from this process in a specific application.

SME Rapid Prototyping Show - St. Charles, IL

Earl Dunlap P.E. – Manufacturing by Design, Inc. (MBD)

Manufacturing by Design, Inc. attended SME Rapid Prototyping & Rapid Manufacturing Show in St. Charles, IL. Similar to the 3DSUG Conference in Arizona, we were met with both skepticism and intrigue. Industry

venues like this are invaluable when promoting companies and technologies. The SME Rapid Prototyping & Manufacturing Show out did its self this year. GREAT JOB! We would like to thank everyone that took time to speak with us about the RP Tempering™ Technologies. Manufacturing by Design, Inc., Par3Technologies and Total Customer Support Team all have received multiple emails and phone call from

people/companies that saw us and wanted to talk to us at the SME Rapid Prototyping Show. If you were unable to get all your questions answered, feel free to check out our websites or contact us. Our new website will be up soon and updated with all new information for both industry and password protected RP Tempering™ licensee areas.

Website Update:
www.RPTempering.com
will be updated in early
July. Come see all the new
features!

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