RP Tempering™ Technology News

Nano-Composite Technology

Solid Freeform Additive Technology & Patented Engineering Technique

Volume 31

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RP Tempering™ Year in Review

PAR3 Technology, Inc. and RP Tempering™ products and services set another record in growth for its fourth year in a row! The reason for that successful growth is our conservative effort to educate the industry about our products, application techniques, and engineering services. To boast of some of our progress, RP Tempering™ Technologies is now part of the curriculum at 4 Universities. Our United States Government users include the FBI, CIA, Home Land Security and the Department of Defense. Oversees in France and the UK, their Department of Defense uses RP Tempering™ as well. RP Tempering™ has at least one service bureau user on almost every continent in the world and continues to grow globally.

RP Tempering™ Products include:

- Proto-Plasma™ Spray
- RP Tempering™ Compound
- Proto-Reinforcement© Infiltrate Coating
- Hi-Temp Protoplass© Spray
- Fire Retardant Protoplass© Spray
- Insultemp© Spray and/or Coating
- EMI Shiedling
- FRI Shielding
- Conductemp©
- RF C13 Absorb

Par3 Technology In-House Services include:

- Design
- Technical Research
- Mechanical Engineering
- 3D CAD Services (software: ProE & SolidWorks)
- Manufacturing Engineering Consulting and Program Management
- Multiphysical Analysis Services
- FEA Analysis (software: Ansys & Comos)
- CFD Analysis (software: Fluent, CFX & CFDesign)
- Electrical Emag Analysis (software: Ansys Emag Multiphysic Analysis)
- Testing
- Cost Reduction

In This Issue

Product Review: Proto-Plasma-Rx™Spray

Proto-Plasma-Rx™ Spray is a tight tolerance, engineered coating for mechanical property enhancement. When used with Proto-Reinforcement© Infiltrate Coating and sometimes RP Tempering™ Compound, it will enhance the mechanical properties when applied to an SFF/RP part. Like all RP Tempering™ compounds, it is very fast drying, cost effective and easy to apply. The following colors are available in 12oz. cans:

Black Clear Blue Yellow White Red

Proto-Plasma-Rx™ Spray enhances parts made from FDM, SLA, SLS, Digital Printing and others. Depending on the base SFF/RP material used, the typical mechanical property enhancements are: Increased Impact Strength, Torsion Durability & 3 Point Flex Strength. Tensile Strength will not change and Flexural Modulus will stay within 3% of its original specification depending on the RP Tempering™ Engineered Layering Technique and materials used.

Other Physical and Typical Property Enhancements to be expected are: Seals Porosity to a Microscopic Level, Excellent Chemical Resistance (Moisture, Water, Humidity & more), Thermal (Heat Deflection, Heat Resistance, UV Resistance, Insulative), Electrical Insulative, and Vibration.

Multiple materials equaling hundreds of samples have been tested with Proto-Plasma-Rx™ using RP Tempering™ Engineered Layering Techniques. Test Data can be found on the Proto-Plasma-Rx™ Test Data Sheets. ASTM industry test standards were followed whenever possible.

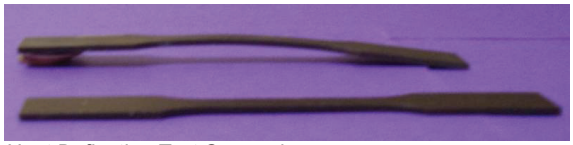
RP Tempering™ Technologies and Patented Engineering Techniques were developed to enhance Rapid Manufacture parts made from SFF systems. SFF technology presents OEM's with an opportunity to create and design geometric pre-engineered shapes within the wall of the physical part. RP Tempering™ internal wall geometry technology and additive materials science will enhance SFF parts either in combination or individually.

Product Review: Hi-Temp Protoplass© Spray

Hi-Temp Protoplass© Spray, when used with Proto-Reinforcement© Infiltrate Coating, will enhance the thermal properties including heat deflection and heat resistance when applied to an SFF/RP part. This is achieved by using our base tempering formula, micro blended plasticizers, alumina, ceramic and inhibitors. Like all RP Tempering™ compounds it is very fast drying, cost effective and easy to apply. The following colors are available in 12oz. cans:

Black Clear

The following picture shows a heat deflection test that called for a tensile bar to be cantilevered with 1.81 MPa of weight on top of tensile bar at the end while in 80% humidity. It is important to remember that on the heat deflection test the parts were cantilevered with weight out on the free end. In most real world applications this would be attached, which should result in a high heat deflection value. The bar in the back ground is the Standard SLA WS11120 that has a heat deflection of 110 degrees F. The bar in the foreground is the Tempered SLA WS11120 that had a heat deflection of 405 degrees F.



Heat Deflection Test Comparison

The average Heat Deflection enhancement over the base material specification when tempering is applied is 3 times the base. The average heat resistance enhancement over the base material specification when tempered is 4 times the base.

Multiple materials, equaling hundreds of samples, have been tested with Hi-Temp Protoplass© using the RP Tempering™ Engineered Layering Technique. Thermal Property Test Data can be found on the Hi-Temp Protoplass© Test Data Sheets. ASTM industry test standards were followed whenever possible. The test data will include: Heat Deflection (1.81 Mpa & Dwell Time), Heat Resistance, Thermal Conductivity, T/g, Coefficient of Thermal Expansion/Contraction, Melting Point, Insulation Heat, & Insulation Cold. The Hi-Temp Protoplass© will result in a smooth finish and a layering thickness of .0013". Other inherent enhancements are chemical resistance, mechanical properties and resistance to hot wax for use in casting molds.

Product Review: Insultemp© Electrically Insulating Technology

Insultemp© is a monomer blend, synthetic rubber, engineered compound that provides electrical insulation properties including excellent dielectric resistance. Like all RP Tempering™ compounds it is very fast drying, cost effective and easy to apply. This product is suitable for high volume production use and can be applied by brushing, spraying (aerosol) or injection. Brush on and injectable compound colors are available in Red and Black with stock container sizes of 4oz, 1 gallon and 5 gallon. Aerosol spray cans are 12 oz and are available in the following colors.

Black Clear Red

Insultemp© reduces vibration with its viscoelastic dampening properties and reduces the chances of terminals and other connections coming loose. It also demonstrates excellent resistance to alkalis, moisture, water, acids and will not degrade or dry-out even when exposed to extreme environmental conditions.

RP Tempering™ Technologies and Patented Engineering Techniques were developed to enhance Rapid Manufacture parts made from SFF systems. SFF technology presents OEM's with an opportunity to create and design geometric pre-engineered shapes within the wall of the physical part. RP Tempering™ internal wall geometry technology and additive materials science will enhance SFF parts either in combination or individually to include: Mechanical Properties, Electrical Properties, Thermal Properties and Chemical & Environmental Resistance Properties.

Please see the Insultemp© Technical Data Sheet for test result details on all Electrical Properties, Physical & Typical Properties or just click on the following link - Insultemp Data Sheet. The dielectric strength is 1400 v/mil (volts per 1/mil).

<u>Electrical Insulation Enhancement Opportunities:</u>

- Dimensionally thinner coats of Insultemp© can be applied when compared to competitive coating and the same 50kv result.
- RP Tempering™ patented engineering technique, if used, can reduce your part thickness by 70% plus when compared to applying the Insultemp© on the outside of the part geometry. This engineering technique teaches us to create supported cylindrical voids at 40% to 55% of the total wall thickness and core out most of the internal wall area in the SFF part. Next Insultemp© is injected into the voids backfilling the internal geometry. Insultemp© will achieve the same insulating properties as applying the materials to the outside wall geometry. Benefits include:
  - o NO thickness will be added to the physical part design.
  - o Part will weigh less
  - o By using this tempering technique we can reduce the size of a part
  - o Natural protection of the insulating material from abrasion
  - o Increase impact strength
  - o Increase flex strength
  - o Enhance part torque durability.

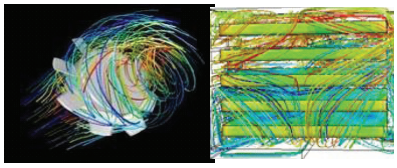
PAR3 Technology In-House Services: CFD Analysis

CFD is Computational Fluid Dynamics otherwise known as Flow Modeling. This kind of analysis is crucial in providing a robust design that will last the life cycle of the product. PAR3 has a high level of experience and competence in comparative analysis and analytical testing.

Our Analysis Driven Design© Process includes using the right tools early in the process to identify design issues and change them before costly prototype builds and testing.

Software: Fluent - CFX & CFDesign (Multiphase)

- Airflow
- Fluids
- Numeric, Grids & Parallel Processing
- Turbulence
- Acoustics
- Dynamic Mesh Movement
- Heat Transfer
- Phase Change
- Radiation
- Reacting Flow

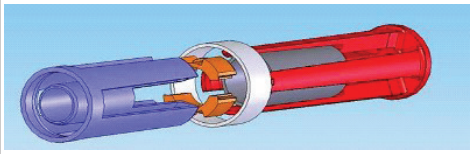


PAR3 Technology In-House Services: FEA

FEA stands for Finite Element Analysis also know as structural modeling. The PAR3 design and analysis professionals use numerous tools which aid in creating the best solution to meet your needs.

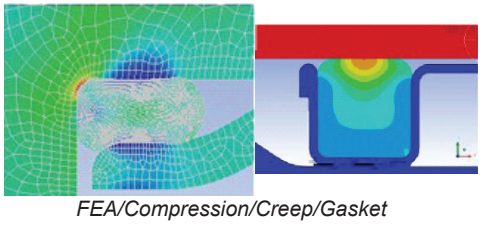
Software: CosmosWorks - Ansys & Emag

Linear Analysis

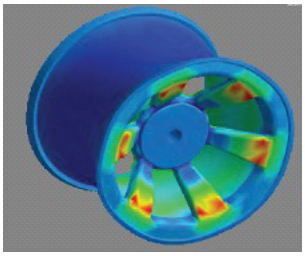


Motion Analysis

- Non-Linear Analysis
- Non-Linear Materials Behaviors
  - Plastic, Rubber & Metals
- Comparative Analysis
- Structural Stress/Strain Analysis
- Thermal Analysis
- MVH Mechanical Vibration
- Creep
- Fluid Dynamics
- Heat Transfer Analysis
- Dynamic & Static Loading
- Modal Analysis
- Vibration Analysis (Modal Vibration)
- Impact Analysis
- Fatigue Analysis



FEA/Compression/Creep/Gasket



PAR3 Technology In-House Services: 3D CAD

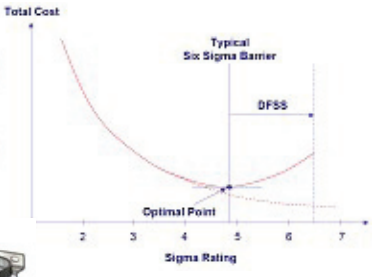
Mechanical and Electro-Mechanical Engineering using 3D Computer Aided Design (CAD) provides a platform to create functional designs. Our focus is to create a solid design that can meet and exceed the criteria and expectations of our clients.

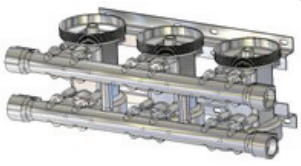
Software: ProEngineer (ProE) & Solidworks

Mechanical Engineering

Electro-Mechanical Engineering

- Complex Assemblies
- High Level Surfacing
- 3D CAD Services
- System Synthesis
- Product Drawings
- Design for Six Sigma "DFSS"
- Robust Design
- Statistical Tolerancing
- Reverse Engineering
- Virtual Prototyping
- Rapid Ideation© Cost Reduction System
- Design for Manufacture & Consulting





"3D CAD Surfacing"

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