

**RTP** COLOR • CONDUCTIVE • FILM/SHEET • FLAME RETARDANT  
STRUCTURAL • THERMOPLASTIC ELASTOMERS • WEAR

## RTP Company

Your Global Compounder of Custom Engineered Thermoplastics

**David Poinar**, RTP Sales Engineer  
612-325-8998  
dpoinar@rtppcompany.com

**Jeff Pedersen**, Application Development Engineer – Upper Midwest Region  
612-900-9104

rtppcompany.com • rtp@rtppcompany.com

Copyright 2019 RTP Company

---

---

---

---

---

---

---

---

**RTP** PRODUCT DEVELOPMENT / R&D

RTP Company has **50+** development engineers worldwide, including regional engineers for local support.

At RTP Company, our development engineers:



- apply the most current
- aggressively seek new resins and additives
- have a passion for creating the best solution for you

---

---

---

---

---

---

---

---

**RTP** PRODUCT DEVELOPMENT / R&D

Our **development services** are available in each region of the world, and include:



- Application development
- Product development
- Process development
- CAE support
- Pilot Plant production

---

---

---

---

---

---

---

---

**RTP TECHNICAL SERVICE**



RTP Company has **20+ Technical Service Engineers and Specialists** worldwide, that provide...

- Plastic processing trials  
Injection, extrusion, compression, film, and blow molding trials
- Process optimization
- Problem resolution
- Customer trials and samples

---

---

---

---

---

---

---

---

**RTP PRODUCT FAMILIES**

Compounds formulated to meet performance requirements, from one property to multiple technologies

 Color	 Conductive	 Flame Retardant	 Thermoplastic Elastomers
 Structural	 Wear Resistant	 Film - Wiman	 Sheet - ESP™

---

---

---

---

---

---

---

---

**RTP COLOR COMPOUNDS**

- Precolors
- Masterbatches
- Cube blends
- Functional additives




Custom Color Matches



LED Light Diffusion



Hueforia  
Color Development Team of RTP Company

Hueforia brings together RTP Company's color experts, technicians, resources, and shared color database to serve designers and OEMs.

[Hueforia.com](http://Hueforia.com)




---

---

---

---

---

---

---

---

**RTP CONDUCTIVE COMPOUNDS**

**Broadest range in the industry:**

<p><b>Anti-static Compounds</b></p> <p>Prevents accumulation of static charge</p>	<p><b>Conductive Extrusion Compounds</b></p> <p>Prevents accumulation of static charge</p>	<p><b>Conductive Compounds</b></p> <p>Near instantaneous charge decay</p>
<p><b>Static Dissipative Compounds</b></p> <p>Controlled dissipation of static charge</p>	<p><b>EMI/RFI Shielding Compounds</b></p> <p>Absorbs/reflects electromagnetic energy</p>	<p><b>Thermally Conductive Compounds</b></p> <p>Absorbs/reflects electromagnetic energy</p>

---

---

---

---

---

---

---

---

**RTP FLAME RETARDANT COMPOUNDS**

<p><b>Broad Technology Platform</b></p> <ul style="list-style-type: none"> <li>• Halogen free technology</li> <li>• Halogenated technology</li> <li>• Technology for over 30+ thermoplastic resins</li> </ul>	<p><b>Meet flammability performance specifications</b></p>	<p><b>Obtain Regulatory Compliance</b></p> <ul style="list-style-type: none"> <li>• UL</li> <li>• Transportation</li> <li>• Building and Construction</li> <li>• Support global standards</li> </ul>
---	--	--

---

---

---

---

---

---

---

---

**RTP THERMOPLASTIC ELASTOMERS**

<p><b>Product Offering:</b></p> <ul style="list-style-type: none"> <li>• RTP 2700 Series (SEBS)</li> <li>• Permaprene™ (TPV)</li> <li>• Polabond™ and Nylabond™ TPE</li> <li>• Specialty TPE</li> </ul>	<p>RTP Company provides the broadest TPE product portfolio in the market...</p> <p>...driving solutions, customization, and service to our customers.</p>
---	---

---

---

---

---






---

---

---

---

**RTP STRUCTURAL COMPOUNDS**

<p><b>VLF</b> Very Long Fiber reinforcements</p> 	<p><b>Fibers</b> Glass, carbon, and natural fibers</p> 	<p><b>Fillers</b> Talc, mineral, beads, and powder fillers</p> 
	<p><b>Blends &amp; Alloys</b> Blends, alloys, and melt processable performance additives</p>	<p><b>Density Modified</b> Light or heavy, 0.7 g/cm<sup>3</sup> to 11.0 g/cm<sup>3</sup></p> 

---

---

---

---

---

---

---

---

---

---

---

---

**RTP WEAR RESISTANT COMPOUNDS**

**Our Wear and Friction Resistant compounds provide solutions for a number of common issues, including:**

<p><b>External Lubrication</b> Eliminate messy secondary operations and costs with internally lubricated plastics</p> 	<p><b>Stiction</b> Reduce stick-slip phenomenon by selecting materials based on Glide Factor<sup>SM</sup> data</p> 	<p><b>Buzz-Squeak Rattle (BSR)</b> Reduce noise caused by part movement and vibration with economical compound technologies</p> 
<p><b>Scratch and Mar</b> Enhance product quality and increase customer satisfaction using Surface Protection (SPR) compounds</p> 	<p><b>Abrasion</b> Manage catastrophic third party abraders with UHMW-PE modified technology for injection molding</p> 	<p><b>Extreme Conditions</b> Withstand high temperatures, pressure, velocity, chemicals, and demanding tolerances with extreme solutions</p> 

---

---

---

---

---

---

---

---

---

---

---

---

**RTP ADDITIVE TECHNOLOGIES**

<p><b>PTFE</b></p> 	<p><b>Silicone</b></p> 	<p><b>PFPE</b></p> 
<p><b>Graphite</b></p> 	<p><b>MoS<sub>2</sub></b></p> 	<p><b>Fibers</b></p> 

---

---

---

---

---

---

---

---

---

---

---

---

**RTP FILM / WIMAN CORPORATION**

WIMAN

- 50+ years of experience manufacturing custom, flat die extruded film
- Film-to-fabric, and film-to-film
- Laminations up to four layers
- Zero pinholes

Films can be produced in thicknesses ranging from 0.0005" to 0.1870" and widths up to 60".

Wiman has extensive expertise with polymer films including, but not limited to:

- Rigid and Flexible PVC
- Polyolefins
- TPU
- Copolyester
- PMMA
- ABS
- PC
- Custom Color, Conductive & ESD, UV Stabilized, and Anti-Microbial properties

[www.wimancorp.com](http://www.wimancorp.com)

---

---

---

---

---

---

---

---

---

---

**RTP SHEET / ESP™**

ESP

Manufactures specialty engineered thermoplastic sheet for:

- Thermoforming
- Machining
- Flat stock assembly

Sheets can be produced in thicknesses ranging from 0.020" to 0.250", widths from 8" to 56", and lengths up to 8'.

[www.engineeredsheetproducts.com](http://www.engineeredsheetproducts.com)

---

---

---

---

---

---

---

---

---

---

**RTP RESMART**

RESMART

Looking for unfilled plastic resins?

We partner with ResMart to fulfill your needs!

[www.resmart.com](http://www.resmart.com)

**ResMart Resins:**  
Ultra, Plus, and Utility grades:

- Polypropylene
- Nylon 6, 6/6
- Clear Nylon (Amorphous Nylon)
- Polycarbonate
- SAN
- ABS
- Polystyrene
- Clear ABS (MABS)
- ACETAL
- PBT
- Polyethylene
- ASA
- Black Masterbatch
- TPU

Specialty grades:

- Solvay Udel® PSU
- Solvay Radel® PPSU
- Solvay Ketaspire® PEEK

---

---

---

---

---

---

---

---

---

---

**RTP MARKETS**

Appliances	Automotive	Business & Cash Machines	Construction & Agriculture
Consumer	Defense & Aerospace	Energy	Electrical/Electronics
Electronic Packaging & Data Storage	Industrial	Medical	Sports & Leisure

---

---

---

---

---

---

---

---

**RTP** COLOR • CONDUCTIVE • FILM/SHEET • FLAME RETARDANT  
STRUCTURAL • THERMOPLASTIC ELASTOMERS • WEAR

**RTP FR Products**

Derek LaRock, Flame Retardant Products  
cell: 507-429-4080  
dlarock@rtpcompany.com

rtpcompany.com • rtp@rtpcompany.com

---

---

---

---

---

---

---

---

**RTP TABLE OF CONTENTS**

- **FR 101**
  - Definition
  - Technologies
  - Mechanisms
- **Regulatory Landscape**
  - RoHS
  - Halogen Restrictions
- **Underwriters Laboratories (UL)**
  - Overview
  - Testing
- **Product Portfolio**
  - Product highlights
- **Specialty Markets**
  - UL2043

---

---

---

---

---

---

---

---

**FLAME RETARDANT (FR) MATERIALS**

**Definition**

Materials that do not ignite readily or propagate flames under small to moderate fire exposures

- Materials are combustible
- Fire retardants reduce the intensity and spread of fire
- Reduces smoke and toxic by-products of combustion

**Fire Triangle**

---

---

---

---

---

---

---

---

**GOALS OF FLAME RETARDANT COMPOUNDS**

- Increase resistance to ignition
- Reduce rate of flame spread
- Reduce rate of heat release
- Reduce smoke emission

**End Goal:**

- Meet FR specifications

**\*\*Products ARE Combustible\*\***

---

---

---

---

---

---

---

---

**MARKETS FOR FR THERMOPLASTICS**

**Segmentation of FR Consumption by Value**

Market Segment	Percentage
E&E	39%
Building	34%
Transportation	12%
Coating	15%

- Electrical Parts
- Electronic Enclosures
- Wire and Cable
- Appliances
- Transportation
- Building and Construction

---

---

---

---

---

---

---

---



**RTP** COLOR • CONDUCTIVE • FILM/SHEET • FLAME RETARDANT  
STRUCTURAL • THERMOPLASTIC ELASTOMERS • WEAR

## FR Technologies

rtpcompany.com • rtp@rtpcompany.com

---

---

---

---

---

---

---

---

**RTP** COMMON TYPES OF FR ADDITIVES

### Halogenated FR's

- Brominated
- Chlorinated

### Halogen Free FR's

- Metal hydroxides
- Phosphorous Based
- Melamine Based

---

---

---

---

---

---

---

---

**RTP** HALOGENATED FR MECHANISM

- Halogenated technology inhibits the chemical reaction in the gas/vapor phase
- Various molecules that efficiently get large amounts of free radicals to the gas phase

Additive Type	Polymeric Type
<ul style="list-style-type: none"> <li>• Higher Halogen Content</li> <li>• Lower Loadings</li> <li>• High Thermal Stability</li> </ul>	<ul style="list-style-type: none"> <li>• Melt Blendable</li> <li>• Less effect on physical properties</li> <li>• Enhanced Flow</li> </ul>

Halogenated flame retardants are compatible in most resin systems with the exception of Acetal

---

---

---

---

---

---

---

---



**RTP NON-HALOGEN MECHANISMS**

Phosphorous	Hydrated Minerals	Melamine Cyanurate
<ul style="list-style-type: none"> <li>• Various forms</li> <li>• Contributes to the condensed phase char formation</li> </ul>	<ul style="list-style-type: none"> <li>• Produce water during combustion process, dilute flammable vapors</li> <li>• Insulative char formation</li> </ul>	<ul style="list-style-type: none"> <li>• Endothermic decomposition</li> <li>• Physical removal of flame from surface</li> </ul>
<b>Resin Systems</b>		
Polyolefins, Polyamides, Polyesters, Polycarbonate and alloys	Polyolefins, Polyamides	Polyamides, used as a synergist for other Phosphorous technologies

---

---

---

---

---

---

---

---

---

---

**RTP HALOGEN VS. HALOGEN-FREE**

Halogenated	Halogen Free
<ul style="list-style-type: none"> <li>• Lower Cost</li> <li>• Better Processing</li> <li>• Better Efficiency</li> <li>• Better Physical Properties</li> </ul>	<ul style="list-style-type: none"> <li>• Evolving Economics</li> <li>• Improved Processability</li> <li>• Wide Variety of Products</li> <li>• Low Smoke</li> <li>• Lower Toxicity</li> <li>• Less Corrosive</li> <li>• Lower Specific Gravity</li> </ul>

---

---

---

---

---

---

---

---

---

---

**RTP IMPACT OF HALOGEN-FREE**

- Resin Limitations
- Physical Properties
  - Strength/Impact
  - Flow
  - Heat Resistance
  - Resin Dependent
- Flammability
- Cost
- Reduction in Specific Gravity

---

---

---

---

---

---

---

---

---

---




---

---

---

---

---

---

---

---

**RTP ROHS DIRECTIVE**

**Restriction of Hazardous Substances (RoHS)**

- EU Directive in effect as of July 2006

**Impacts Flame Retardants and Pigments**

**Banned Substances**

- Lead (Pb)
- Mercury (Hg)
- Cadmium (Cd)
- Hexavalent Chromium (CrVI)
- Polybrominated Biphenyls (PBB) and Polybrominated Diphenyl Ethers (PBDE)

---

---

---

---

---

---

---

---

**RTP ROHS II DIRECTIVE**

**Restriction of Hazardous Substances (RoHS)**

- EU Directive in effect as of June 2011

**Banned Substances**

- Bis(2-ethylhexyl) phthalate (DEHP)
- Butyl benzyl phthalate (BBP)
- Dibutyl phthalate (DBP)
- Diisobutyl phthalate (DIBP)Mercury (Hg)

**RoHS does NOT mean Halogen Free**  
**No halogen restrictions globally, any ban would be OEM based**

---

---

---

---

---

---

---

---

**RTP EVOLUTION OF HALOGEN-FREE TECHNOLOGIES**

- More "self-policing"/customer driven bans
- New FR standards
- Green Movement
- More Effective/Economical FR Chemicals
- Increased Performance
- Competition in the Market

---

---

---

---

---

---

---

---

**RTP COLOR • CONDUCTIVE • FILM/SHEET • FLAME RETARDANT  
STRUCTURAL • THERMOPLASTIC ELASTOMERS • WEAR**

**UL and Testing**

[rtpcompany.com](http://rtpcompany.com) • [rtp@rtpcompany.com](mailto:rtp@rtpcompany.com)

---

---

---

---

---

---

---

---

**RTP RTP'S UL PRODUCTS AND CAPABILITIES**

**RTP Company has 600+ UL Yellowcards**


- Continuous expansion of UL listed products
- Various combinations of ratings for all resin systems

**RTP Winona: UL Certified Laboratory under Client Test Data Program**

- Short term properties to UL94
- Long term thermal aging (RTI)

**RTP Company offers custom UL certifications**

- Quick turnaround
- **Compress Time to Market!**




---

---

---

---

---

---

---

---

### RTP UL94 HB

Horizontal burning test for HB classification

**Classification Criterion**

3.0 mm to 13.0 mm thickness	< 3.0 mm thickness
– slower than 40 mm/minute	– slower than 75 mm/minute
OR	OR
– combustion ceases prematurely	– combustion ceases prematurely

\*\* In general most thermoplastics meet this criteria\*\*

---

---

---

---

---

---

---

---

---

---

---

---

### RTP UL94 VERTICAL BURN

Classification Criteria	V-0	V-1	V-2
Number of bar specimens	5	5	5
Maximum flame time per specimen per flame application, sec	10	30	30
Maximum total flame time 5 specimens, 2 ignitions, sec	50	250	250
Specimen drips, ignites cotton	No	No	Yes
Maximum afterglow time per specimen, sec	30	60	60
Burn to holding clamp	NO	NO	NO

\*\*Thickness dependent ratings\*\*

---

---

---

---

---

---

---

---

---

---

---

---

### RTP UL94 5VA/5VB

**Panel burn and Vertical Burn**

**Flame applied to bottom of bar**

- Larger flame compared to VB/HB
- 5: 5 Sec. Flame Applications

**Requirements:**

**UL94 5VB:**

- Afterflame times <60 sec
- No ignition of cotton below
- Panel Burn through

**UL94 5VA:**

- Afterflame times <60 Sec
- No ignition of cotton below
- No Panel Burn through

36

---

---

---

---

---

---

---

---

---

---

---

---




---

---

---

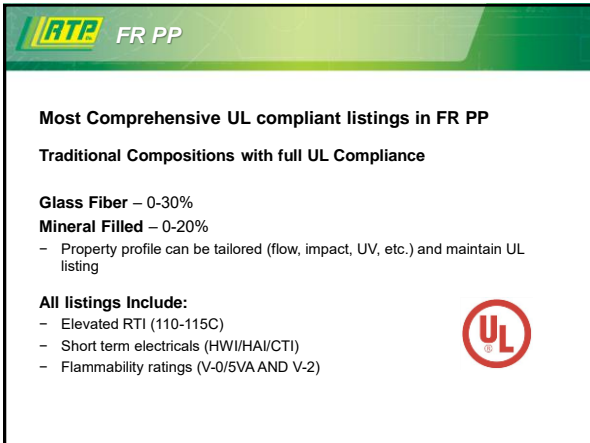
---

---

---

---

---




---

---

---

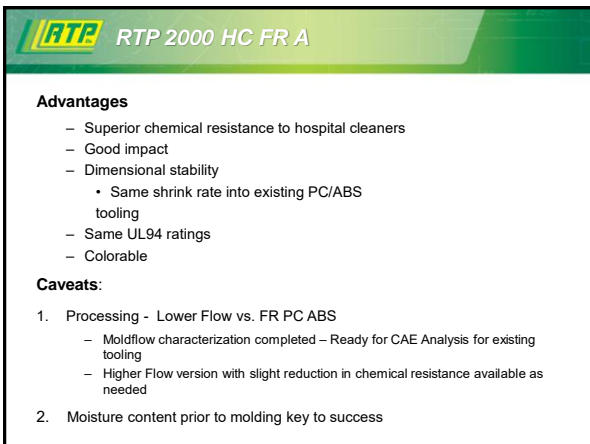
---

---

---

---

---




---

---

---

---

---

---

---

---

**RTP** COLOR • CONDUCTIVE • FILM/SHEET • FLAME RETARDANT  
 STRUCTURAL • THERMOPLASTIC ELASTOMERS • WEAR

## Specialty Markets

rtpcompany.com • rtp@rtpcompany.com

AP ESP Hueforia Wiman

---

---

---

---

---

---

---

---

**RTP** UL 2043

**UL 2043** is an end product standard relating to non-continuous products in the plenum space.

Requirements to pass are centered around low heat and smoke production

Plenum—Air handling space between floors of a building structure.

---

---

---

---

---

---

---

---

**RTP** RTP PLENUM PRODUCTS

**Applications include:**

Wireless access housings, radomes, connectors, condensate pump housings, electronic housings, air handling components (diffusers, return grates, connectors, moisture sensors)

**Common Materials**

Polypropylene:	Nylon:
Homo and CoPP grades	6 and 6/6 grades available
Glass reinforced, Unfilled, Mineral	Glass reinforced

V-0 and 5VA grades available if needed!

---

---

---

---

---

---

---

---

**Conductive Extrusion**

Eli Grant, Conductive Business  
Development Engineer  
cell: 715-293-3885  
egrant@rtppcompany.com

rtppcompany.com • rtp@rtppcompany.com

AP ESP Hueforia Wiman

---

---

---

---

---

---

---

---

**CONDUCTIVE PRODUCTS FOR EXTRUSION**

There are **differences** in conductive products for extrusion, compared to products used for injection molding applications.

**RTP Company** has a clear product structure for both applications. These applications require many different properties such as:

- viscosity
- conductivity
- excellent dispersion of conductive carbon black

---

---

---

---

---

---

---

---

**PROPERTY COMPARISON**

**Viscosity**  
Products for injection molding typically require a high melt flow, which is not workable for extrusion. The melt strength is too low and will not be stable for sheet, pipe and profile extrusion.

Polypropylene carbon black for bins/boxes /totes	Polypropylene carbon black for extrusion
230°C/2.16 kg	230°C/10 kg
5 - 20	1 - 10

**High Viscosity Advantages**  
Better mechanical properties for extrusion, including:

- impact
- tensile strength
- pressure resistance

*Bins/Boxes*

*Pipes*

---

---

---

---

---

---

---

---




**RTP PROPERTY COMPARISON**

**Conductivity**  
 Products for injection molding typically require a higher concentration of filler to get the same conductivity/resistance compared to extrusion products. Exception: excessive stretching during extrusion.

High impact polystyrene carbon black for injection molding	High impact polystyrene carbon black for sheet extrusion
Loading level of standard CB	Loading level of standard CB
20 – 25%	15 – 20%

**Lower Loading Level Advantages**  
 Better mechanical properties for extrusion, including:

- impact
- tensile strength
- lower specific gravity



*Thermal formed trays*

---

---

---

---

---

---

---

---

---

---


---

---

**RTP PROPERTY COMPARISON**

**Conductivity**  
 It is also possible to achieve higher conductivity in the extrusion products. Higher loading levels of carbon black can be used by starting with a reasonable viscosity resin. The higher loading and lower sheer in the extrusion process results in lower resistance.

PVC for injection molding	PVC for sheet extrusion
Resistance	Resistance
100 - 1000 Ohm	5 – 50 Ohm



*Wire and cable*

**Lower Resistance Advantages**

- applications beyond ESD protection and standard applications to reduce static charge
- applications like electrical contacts that act as a ground pathway are easily achievable

---

---

---

---

---

---

---

---

---


---

---

---

**RTP PROPERTY COMPARISON**

**Dispersion**  
 Injection molding applications do not always need the highest level of dispersion. The surface can still be smooth and uniform (resin rich) through higher processing pressures and increased mold temperature, unlike extrusion applications where almost any undispersed particles are visible and the characteristics can be negatively altered.



*Blown film*

**Example**  
 Blown film application, where undispersed particles can lead to rupture of the bladder.

---

---

---

---

---

---

---

---

---

---

---

---

**RTP APPLICATIONS**



*Thermoformed tape to hold electronic chips*

**Extruded sheet and film**

- Various thickness
- Markets: Electronic, Packaging
- Requirements
  - Good carbon black dispersion
  - Consistent surface appearance
  - Low cost
  - Uniform ESD properties
  - Suitable for thermoforming

---

---

---

---

---

---

---

---

**RTP APPLICATIONS**



*Conductive extruded pipe*

**Conductive Extruded Pipe**

- Various sizes and lengths
- Used to carry liquids and gases
- Markets: Industrial, Chemical
- Requirements
  - Perfect dispersion
  - Uniform ESD properties
  - Flame retardant maybe needed
  - External testing maybe required (pressure testing)

---

---

---

---

---

---

---

---

**RTP APPLICATIONS**



*Conductive extruded hose*

**Conductive Extruded Hose**

- Used to for various applications
- Markets: Industrial, Mining
- Requirements
  - Perfect dispersion
  - Uniform ESD properties
  - Meet specified flexibility
  - Pass alternating bending test

---

---

---

---

---

---

---

---

**OTHER APPLICATIONS**

- Corrugated sheet (PP/CB)
- Geothermal Membrane (PE/CB)
- Wire and Cable (PVC/CB, PE/CB)



Conductive corrugated sheet



Conductive wire and cable

---

---

---

---

---

---

---

---

**STANDARD PRODUCTS**

Base Polymer	RTP Product #	Extrusion Thickness	Surface Resistance (Ohm)	Common Application
Polyethylene LD-PE	RTP 2600 PE90025557	> 30 $\mu$ m	$10^3 - 10^6$	Blow Film (electronic packaging)
Polyethylene LLD-PE	RTP 2600 PL90025501	> 30 $\mu$ m	$10^3 - 10^6$	Profile Extrusion for Hoses; Geomembrane films
Polypropylene PP	RTP 0100 PP90025685	> 1mm (up to 10 mm)	$10^2 - 10^6$	Sheet Extrusion masterbatch (FR version also available)
Polystyrene HIPS	RTP 0400 SH90025512	> 1mm (up to 10 mm)	$10^3 - 10^6$	Sheet Extrusion masterbatch
Acrylonitrile Butadiene Styrene ABS	RTP 0600 SB90025531	> 1mm (up to 10 mm)	$10^4 - 10^6$	Sheet Extrusion
Polyurethane TPU Ester based	RTP 1200 S GP90025530	> 1mm	$10^2 - 10^6$	Profile Extrusion for Hoses
Polyolefin Elastomer TEO	RTP 2800 GE90025003	> 1mm	$10^2 - 10^6$	Profile Extrusion
Soft PVC Heat stabilized	RTP 4899 X 136013 C	> 100 $\mu$ m	$10^2 - 10^4$	Wire & Cable Extrusion



<http://www.rtpcompany.com/products/conductive/conductive-compounds-for-extrusion-applications/>

---

---

---

---

---

---

---

---

**COLOR • CONDUCTIVE • FILM/SHEET • FLAME RETARDANT**  
**STRUCTURAL • THERMOPLASTIC ELASTOMERS • WEAR**

**Thank You!**



rtpcompany.com • rtp@rtpcompany.com



Feel free to reach out to the contacts at RTP Company. We are here to assist with any of your development or material needs.