ENLIGHTENED SOLUTIONS

Reducing part weight using

THERMOPLASTIC TECHNOLOGIES
RTP Company provides innovative thermoplastic compounds for companies that are challenged with producing light weight components and reducing component cost.

Our Enlightened Solutions represent a range of practical thermoplastic options that can reduce part weight in different ways. We can help you through the material selection process, providing options and guidance to ensure that you have the precise solution to fit your requirements.

Our Enlightened Solutions are designed and manufactured worldwide, but supported locally by our expert sales and engineering staff. We use the full capabilities and resources at RTP Company to help launch your project faster… and lighter!

Explore the potential of our Enlightened Solutions, and feel free to contact us for more information.
Enlightened Solutions:

Compounds that are specifically formulated by RTP Company to reduce the weight of parts and components.
The pursuit of energy conservation and the optimization of its use has led to many innovations, and has motivated market leaders to refine part designs for performance at a lighter weight.

Lightweighting — the result of creating components that are lighter in weight — is an important goal and the outcome of part consolidation, reduction of wall thickness, and choosing lighter materials without compromising performance.

Our Enlightened Solutions are practical examples of our weight reduction capabilities; we look forward to applying them toward your goal of lightweighting.

When lightweighting is your goal, Enlightened Compounds from RTP Company are your solution!
Light and Tough (LT) Compounds

LT Compounds are great for reducing weight in products that require human energy, such as handheld tools, sporting goods, and appliances.

Product Details:
- Resin systems: PE, PP, PA, PBT, PPA, and PEEK
- Short Glass or Very Long Fiber-based Compounds
- Cosmetic and colored options available

Benefits:
- Drop-in solution with similar performance
- Not dependent on wall thickness, unlike foaming concentrates

Our LT Compounds are lower density, glass-fiber-reinforced compounds that can reduce part weight between 5 – 10% vs. Glass Fiber Compounds. With mechanical properties and shrinkage values that are similar to standard glass-filled compounds, LT Compounds can be used as a drop-in replacement with no tooling modifications.
Very Long Fiber (VLF) Polypropylene Compounds

Our VLF PP compounds are light, strong, and exceedingly tough, making them ideal materials for replacing heavier and higher cost short fiber compounds like Nylon or PBT. VLF PP compounds are resilient in demanding environments, and can provide up to 15% weight savings vs. Short Glass Nylon Compounds without sacrificing performance.

Product Details:
- Resin system: Polypropylene
- 30 – 50% VLF reinforced compounds
- Cosmetic and colored options achievable

Benefits:
- High modulus and impact strength
- Non-hygroscopic
- Lower mold and processing temperatures
- Minimal or no pre-drying required

Lightweight Capability vs. Short Glass Nylon Compounds
Up To
15%

VLF Polypropylene Compounds are an ideal drop-in solution for reducing weight in products that are currently made with Short Glass Nylon Compounds.

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Lightweight Capability vs. Glass Fiber Compounds

Up To

25%

Carbon Fiber (CF) Compounds

CF Compounds are ideal for reducing weight in products that are powered by fuel or human energy, such as automobiles, recreational vehicles, and sporting goods.

Product Details:
- Resin systems: PP, PA, PPA, PES, PPS, PEI, PEEK, and more
- Up to 50% Carbon Fiber-filled Compounds

Benefits:
- Not dependent on wall thickness
- No loss in strength or stiffness performance
- No tooling modifications needed

Our Carbon Fiber Compounds are lighter, stiffer, and stronger than traditional glass filled compounds. As such, they can improve mechanical performance, while also reducing part weight by up to 25%. In addition, Carbon fiber can be loaded at lower levels into less expensive base resins to help offset costs and provide a marketable benefit.
Gravity Modified Compounds

Our Gravity Modified Compounds are formulated with glass bubbles, allowing us to customize the specific gravity to your needs and provide as much as a 30% total reduction in weight vs. unfilled resin. In addition, these compounds can reduce shrinkage and warpage, and provide better density control than chemical foaming in thin or thick part wall sections.

Gravity Modified Compounds are perfect for products that have complex geometries and require a precise density, such as household appliances, aerospace components, handheld tools, sporting goods, and more.

Product Details:
- Resin systems: PE, PP, PA, PBT, PPA, PPS, and PEEK
- Suitable for injection molding or extrusion
- Improved surface finish and color options

Benefits:
- Ability to customize density independent of wall thickness
- More design flexibility for complex parts
- Improved manufacturing efficiencies

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Metal Replacement

RTP Company has extensive expertise in formulating thermoplastic compounds that can replace common metals such as Steel, Zinc Alloy, and Aluminum; by doing so, part weight can be decreased by up to 80% while maintaining part performance and regulatory compliance, and decreasing overall system cost.

There are many advantages to using plastic parts and components over metal ones. In fact, plastic parts are often preferred to metal because they:

- provide the opportunity to consolidate multiple parts, thereby saving on costs and assembly
- can reduce the weight of the part
- reduce costs by eliminating finishing, painting, and machining
- can be produced quickly and economically
- are corrosion resistant
- provide vibration and sound dampening
- can be molded in aesthetically pleasing colors
7 STEPS: A Metal-to-Plastic Conversion Guide

Metal-to-plastic conversion doesn’t have to be a difficult decision or a drawn-out process. Here are 7 steps to make the conversion process as seamless and effortless as possible:

1. IDENTIFY PARTS
   a. High volume justification
   b. Part consolidation opportunities

2. DEFINE PART REQUIREMENTS
   a. Part operating environment
   b. Structural performance

3. SPECIAL CONSIDERATIONS
   a. Regulatory requirements (UL, FDA, NSF)
   b. Unique characteristics and attributes

4. COST ANALYSIS
   a. Raw material costs
   b. Tooling and processing
   c. Cycle times
   d. Assembly steps and labor
   e. Secondary operations

5. PROJECT DESIGN REVIEW AND SUPPORT
   a. Part, tooling, process, and design reviews
   b. Computer Aided Engineering Support

6. PROTOTYPE MOLDING AND PART VALIDATION
   a. Material sampling
   b. On-site technical service

7. TRANSITION TO PLASTIC PRODUCTION
   a. Production molding process optimization
   b. Material release specifications
   c. Supply chain support

For more information about the 7 Step process, please visit www.rtpcompany.com.
Our CAE experts provide valuable insight on material data, structural analysis, and filling and warpage analyses utilizing Moldflow® software.

In addition to providing lightweight materials, we firmly believe in providing all the support you need to achieve the lightweight goals that you have outlined for your part or component.

For more information about CAE Support and Technical Support Services, please contact your local RTP Company representative.

**Computer Aided Engineering (CAE) Support Services**

Our team of experienced Computer-Aided Engineering (CAE) analysts can assist you with product design review, mold design review, product testing recommendations, and more to further ensure that your new lightweight solution is successful! Some lightweight concepts supported by CAE analysis include:

- Reducing wall section thickness
- Metal replacement
- New part design evaluation and implementation
- New material evaluation and implementation

**Technical Support Services**

Our Technical Support Services Team is well-versed in thermoplastic processing and can assist your team with start-up manufacturing of your new lightweight parts. This team offers the following services:

- Tooling design support
- On-site mold trials and processing support
- Sampling support
- Scale-up and process implementation
RTP Company…
Your Plastics Solutions Provider
Whether your lightweighting goals include part consolidation, better efficiency, conserving energy, exceeding regulations, or simply creating better parts, Enlightened Solutions from RTP Company can reduce the weight from 10 – 80% while still maintaining the necessary properties required by your application. In addition, we offer the design and technical support you need for a successful lightweighting project.

### Property Comparison
(of a few practical examples)

<table>
<thead>
<tr>
<th>Nomenclature</th>
<th>Polymer</th>
<th>Primary Additive</th>
<th>Specific Gravity</th>
<th>Tensile Strength ASTM D638 (psi)</th>
<th>Flexural Modulus ASTM D790 (MPa)</th>
<th>Notched Izod Impact ASTM D256 (kJ/m²)</th>
<th>Notched Izod Impact ASTM D256 (ft-lb/in)</th>
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</thead>
<tbody>
<tr>
<td><strong>Short Glass Fiber (GF) Compounds vs. Light and Tough (LT) Compounds</strong></td>
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<tr>
<td>RTP 205</td>
<td>PA/66</td>
<td>30% GF</td>
<td>1.36</td>
<td>26,000</td>
<td>179</td>
<td>1.30</td>
<td>9,000</td>
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<tr>
<td>RTP 299 X 149328 A</td>
<td>PA/66</td>
<td>30% LT</td>
<td>1.23</td>
<td>26,100</td>
<td>180</td>
<td>1.45</td>
<td>10,000</td>
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<td><strong>Short Glass Fiber (GF) Compound vs. Very Long Fiber (VLF) Compounds</strong></td>
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<td>179</td>
<td>1.30</td>
<td>9,000</td>
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<tr>
<td>VLF 80107 CC</td>
<td>PP</td>
<td>40% VLF</td>
<td>1.21</td>
<td>18,850</td>
<td>130</td>
<td>1.25</td>
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<td><strong>Short Glass Fiber (GF) Compounds vs. Carbon Fiber (CF) Compounds</strong></td>
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<td>RTP 207</td>
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<tr>
<td>RTP 283</td>
<td>PA/66</td>
<td>20% CF</td>
<td>1.22</td>
<td>32,000</td>
<td>221</td>
<td>2.00</td>
<td>13,800</td>
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<tr>
<td>RTP 199 X 138502 H</td>
<td>PP</td>
<td>40% CF</td>
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<td><strong>Unfilled vs. Gravity Modified Compounds</strong></td>
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<td>RTP 600</td>
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<td>Unfilled</td>
<td>1.06</td>
<td>6,600</td>
<td>46</td>
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<td>RTP 699 X 138528 A</td>
<td>ABS</td>
<td>Glass Bubbles</td>
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<td>17</td>
<td>0.41</td>
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<td><strong>Metal Replacement</strong></td>
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<td>ZAMAK 3</td>
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<td>N/A</td>
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<td>AL (A380)</td>
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<td>N/A</td>
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<td>VLF 80209 EM HS</td>
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<td>15,200</td>
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<tr>
<td>RTP 4085</td>
<td>PPA</td>
<td>30% CF</td>
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<td>41,000</td>
<td>283</td>
<td>3.20</td>
<td>22,000</td>
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</tbody>
</table>

*Yield strength

[www.rtpcompany.com](http://www.rtpcompany.com)
RTP COMPANY is committed to providing you with solutions, customization, and service for all of your thermoplastic needs. We offer a wide range of technologies available in pellet, sheet, and film that are designed to meet even your most challenging application requirements.

**COLOR**
Color inspires, energizes, and builds brand recognition, and choosing the right supplier is as important as selecting the right color. We offer color technology options in standard precolored resins or custom compounds, UniColor™ Masterbatches, or cube blends.

**STRUCTURAL**
Our reinforced structural compounds can increase strength, stiffness, and provide resistance to impact, creep, and fatigue. Ideal for metal or other material replacement, our formulas can be customized to meet cost and performance targets.

**CONDUCTIVE**
We offer compounds for electrostatic discharge (ESD) protection, EMI shielding, or PermaStat® permanent anti-static protection. Available in particulate and all polymeric-based materials, these compounds can be colored, as well.

**TPE**
Our thermoplastic elastomers provide rubber-like performance with the processing benefits of thermoplastic resin. We offer a wide range of options, from standard, in-stock resins to custom compounds designed to meet your specifications.

**FLAME RETARDANT**
Whether you are developing a new product or need to reformulate due to ever-changing regulations, we can custom engineer a flame retardant material with the exact properties you require.

**WEAR RESISTANT**
Our wear resistant thermoplastic compounds can incorporate internal lubricants to reduce wear and friction, thereby lengthening the service life of your application and reducing your processing costs.

No information supplied by RTP Company constitutes a warranty regarding product performance or use. Any information regarding performance or use is only offers as suggestion for investigation for use, based upon RTP Company or other customer experience.

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Please contact your local RTP Company Sales Engineer by calling 1-507-454-6900 1-800-433-4787 (U.S. only), by Email at rtp@rtpcompany.com, or visit www.rtpcompany.com