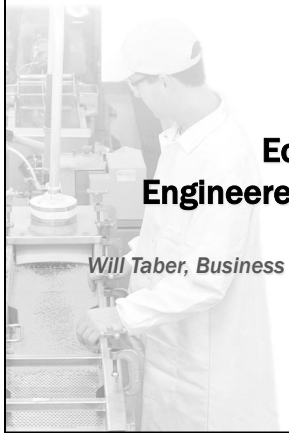
THERMOPLASTIC ELASTOMERS • STRUCTURAL • WEAR
CONDUCTIVE • COLOR • FLAME RETARDANT



Eco-Friendly, Engineered Plastic Solutions

Will Taber, Business Manager–Emerging Technologies

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ISO 9001

Agenda

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- RTP Company
- What are Eco Solutions?
- What is green?
- Bioplastic compounds
- Recycle content compounds
- Cellulose Fiber Reinforced PP
- Future development work
- Economics
- Summary

Agenda

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Profile

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- RTP Company is an <u>independent</u>, privately owned custom compounder.
- Global manufacturing and engineering support
- Worldwide sales representation/distribution
- Established in 1982
- 1000+ employees
- $400+ million annual sales

Custom Solutions

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- **High-tech specialty compounder**
  - 60+ engineering resins
  - 100+ modifiers
- **Annual production**
  - 6000+ commercial products
  - 1750+ new products each year

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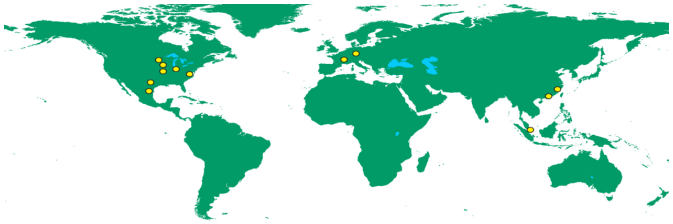
Your GLOBAL Compounder

OF CUSTOM ENGINEERED THERMOPLASTICS

Global Manufacturing



United States • Mexico • France • Germany • China • Singapore

Agenda

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- RTP Company
- **What are Eco Solutions?**
- What is green?
- Bioplastic compounds
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Eco Solutions "Green" Compounds

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

Our Eco Solutions portfolio consists of compounds that utilize

- Renewable or biobased content
- Recycled content
- Halogen-free additives
- Natural fibers
- Combinations of bioplastic, recycled, halogen-free, natural fiber

Eco Solutions Compounds

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

Bioplastic Compounds

- **Polylactic Acid**: Impact Modifed, Glass Reinforced, Alloys
- **Biobased PE:** Mineral filled, Glass Reinforced
- **Biobased Nylon:** Glass Reinforced, Flame Retardant

Recycled Content Compounds

- PP, Nylon, PC, PET
- Glass Reinforced, Flame Retardant, Mineral, Wear Additives
- Pre- and Post- Consumer Recycled

Natural Fibers

- **Cellulose PP:** Homopolymer, Copolymer, Glass, Combinations, Recycled Content
- **Diced Wood, Recycled Fibers**

Agenda

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- RTP Company
- What are Eco Solutions?
- **What is green?**
- Bioplastic compounds
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Eco Solutions "Green" Compounds

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

What does "green" mean?

- Depends on industry, products, and capabilities
- Infers that a product is more environmentally friendly
  - Examples: less energy consumed, less CO_2 produced, made from a renewable resource etc…
- Eco Solutions are our products (capabilities) we can utilize to help your customers produce a "green" product

"Green" Products

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- Lots of people say they want 'em…
- Lots of companies say they make 'em…
- **How are you going to prove that?**

"Green" Products

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- **Product certifications provide credibility**
  - USDA BioPreferred, EPEAT (US)
  - Vincotte, C2C (Europe)
  - Japan BioPlastics Association (Japan)
  - BIFMA (Business and Institutional Furniture Mfg. Assoc.)
  - All of the above value and or certify recycle content, biobased content or both
- **Certifications provide proof a product meets a set of "green" criteria**

Agenda

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- RTP Company
- What are Eco Solutions?
- What is green?
- **Bioplastic compounds**
- Recycle content compounds
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RTP Company Eco Solutions

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

Bioplastic Compounds

- **Definitions**
- **Types**
- **Strategy**
- **Product portfolio**
- **Applications**
- **Information**
- **Limits of use**

Bioplastics – Defined

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- **Bioplastics** are a form of plastics derived from renewable (annually) biomass sources such as corn, wheat, sugar cane, and sugar beets rather than traditional plastics derived from petroleum
- Some, but not all, bioplastics are designed to biodegrade.

Economics, availability, and performance has placed an emphasis on

Polylactic Acid (PLA)

Biobased versus Biodegradable

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

Biobased

- PLA
- Nylon (11, 6/10)
- PTT
- PHA
- PE
- PBS
- Thermoplastic starch

Biodegradable

- PLA (via industrial composting)*
- PBS
- PHA (via "backyard" composting)
- Thermoplastic starch

* Not biodegradable in household waste sanitary landfill

How Do We Report Biocontent?

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- Renewable resource content (weight%)
  - Tells how much of the compound by weight is a renewable or biobased plastic (ie 30% PLA and 70% PC)
- Biobased carbon content
  - Per ASTM D 6866 – Distinguishes "new" carbon vs "old"
  - Reports renewable carbon content as a % of total carbon content
  - Does not consider product weight
  - Does not measure biodegradability
  - Does not take into account non-organic (carbon) elements such as oxygen, hydrogen or silicon (glass)
  - Can provide different results vs weight%

Where Does RTP Fit?

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

Base Resins	• PLA, Nylon 11, Nylon 6/10, PTT, PE.
Semi-durable and durable applications	• Office furniture, appliance, consumer electronics, niche "green" electronics in controlled environments.
Custom Compounds	• Structural, impact modified, mineral, FR, conductive, wear, recycled content.
Current Focus PLA	• Good economics, good supply, easy to modify, advancements in compounding and polymerization.

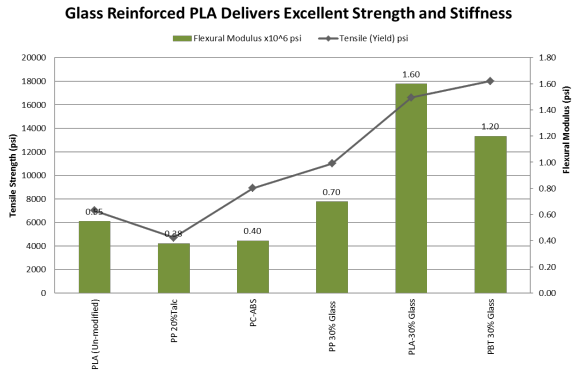
PLA Compound Portfolio

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- Glass reinforced
- Impact modified – Performance (high HDT)
- Impact modified – Translucent
- Impact modified – Opaque
- Impact modified – FDA compliant
- Alloys

Glass Reinforced PLA

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS



Glass Reinforced PLA Application

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

Market: Consumer

Application: Scissors Handle

Problem: Biobased material to replace glass reinforced PP

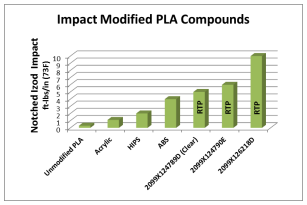
Solution: RTP 2000 Series 30% glass reinforced PLA

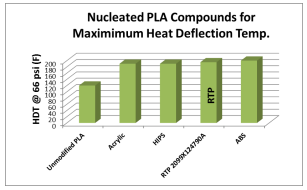
Benefit: Superior strength and stiffness vs 30% glass PP. Nucleated for improved cycle time. 68% renewable resource content

Impact Modified PLA

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- Nucleated
- Mineral reinforced
- FDA compliant ingredients
- Opaque or translucent
- Colorable and glossy
- Injection or extrusion
- Balance cost, properties, biocontent





Impact Modified PLA Portfolio

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

Extensive portfolio can be modified to meet specific economic and performance targets

RTP PRODUCT	RENEWABLE CONTENT	NOTCHED IZOD ASTM D 256	TENSILE STRENGTH ASTM D 638	FLEXURAL MODULUS ASTM D 790	HDT @ 66 psi (455 kPa) ASTM D 648
RTP 2099 X 124790 A Medium Impact, Fast Cycle, High HDT, 10% Talc	78%	1.8 ft-lbs/in • 96 J/m	7,000 psi • 48 MPa	0.60 psi x 10⁶ • 4,137 MPa	195 °F • 90 °C
RTP 2099 X 124790 B High Impact, Fast Cycle, High HDT, 10% Talc	68%	3.5 ft-lbs/in • 187 J/m	5,900 psi • 38 MPa	0.50 psi x 10⁶ • 3,448 MPa	160 °F • 71 °C
RTP 2099 X 124790 C Medium Impact, Standard Cycle, 10% Talc	78%	1.5 ft-lbs/in • 80 J/m	6,500 psi • 45 MPa	0.60 psi x 10⁶ • 4,137 MPa	180 °F • 82 °C
RTP 2099 X 124790 D High Impact, Standard Cycle, 10% Talc	68%	3.4 ft-lbs/in • J/m	5,200 psi • 36 MPa	0.50 psi x 10⁶ • 3,448 MPa	150 °F • 65 °C
RTP 2099 X 124790 E High Impact, Fast Cycle, 10% Calcium Carbonate	73%	6.0 ft-lbs/in • 192 J/m	5,700 psi • 39 MPa	0.45 psi x 10⁶ • 3,103 MPa	145 °F • 63 °C
RTP 2099 X 124790 F Medium Impact, Fast Cycle, 30% Calcium Carbonate	53%	1.5 ft-lbs/in • 80 J/m	4,600 psi • 32 MPa	0.60 psi x 10⁶ • 4,137 MPa	165 °F • 74 °C
RTP 2099 X 124789 A Impact Modified, Lower Cost, Clear	94%	0.5 ft-lbs/in • 27 J/m	9,000 psi • 62 MPa	0.48 psi x 10⁶ • 3,379 MPa	124 °F • 51 °C
RTP 2099 X 124789 B Impact Modified, Clear	89%	0.9 ft-lbs/in • 48 J/m	8,000 psi • 55 MPa	0.44 psi x 10⁶ • 3,034 MPa	124 °F • 51 °C
RTP 2099 X 124789 C Medium Impact, Clear	84%	1.5 ft-lbs/in • 80 J/m	7,000 psi • 48 MPa	0.41 psi x 10⁶ • 2,827 MPa	124 °F • 51 °C
RTP 2099 X 124789 D High Impact, Clear	79%	5.0 ft-lbs/in • 267 J/m	6,000 psi • 41 MPa	0.37 psi x 10⁶ • 2,551 MPa	124 °F • 51 °C
RTP 2099 X 125211 Z Impact Modified, FDA Compliant, Clear	89%	0.8 ft-lbs/in • 43 J/m	6,700 psi • 46 MPa	0.44 psi x 10⁶ • 3,034 MPa	124 °F • 51 °C
RTP 2099 X 125218 A Impact Modified, Lower Cost, Opaque	94%	0.6 ft-lbs/in • 32 J/m	8,500 psi • 59 MPa	0.47 psi x 10⁶ • 3,241 MPa	124 °F • 51 °C
RTP 2099 X 125218 B Medium Impact, Opaque	89%	1.0 ft-lbs/in • 53 J/m	7,300 psi • 50 MPa	0.44 psi x 10⁶ • 3,034 MPa	124 °F • 51 °C
RTP 2099 X 125218 C High Impact, Opaque	84%	3.5 ft-lbs/in • 187 J/m	6,400 psi • 44 MPa	0.39 psi x 10⁶ • 2,689 MPa	124 °F • 51 °C
RTP 2099 X 125218 D Super High Impact, Opaque	79%	10.0 ft-lbs/in • 534 J/m	5,500 psi • 38 MPa	0.35 psi x 10⁶ • 2,413 MPa	124 °F • 51 °C
RTP 2099 X 125217 Z Super High Impact, FDA Compliant, Opaque	79%	12.0 ft-lbs/in • 641 J/m	5,700 psi • 39 MPa	0.36 psi x 10⁶ • 2,482 MPa	124 °F • 51 °C

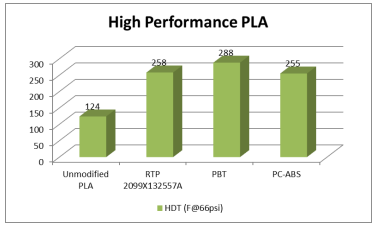
Glass fiber reinforced compounds and thermoplastic alloys using PLA are also available from RTP Company

High Performance PLA

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

Increased rate and degree of crystallization yields:

- Reduced cycle time
- Higher HDT with lower cost nucleators
- Improved hydrolysis resistance?



*2099X132557A:
standard impact mineral reinforced

Impact Modified PLA Application

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

Market: Sporting Goods
Application: Bicycle Helmet
Problem: High biobased content. Good durability, gloss and color. Option to paint.
Solution: RTP 2000 Series Impact Modified PLA
Benefit: 79% renewable content, excellent balance of strength and toughness. Good flow for thin walls. Glossy and colorable

Impact Modified PLA Application

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

Market: Sporting Goods
Application: Promotional Divot Tool
Problem: High biobased content. Good durability, gloss and color
Solution: RTP 2000 Series Impact Modified PLA
Benefit: 84% renewable content, excellent balance of strength and toughness. Good flow for thin walls. Glossy and colorable

PLA Alloys

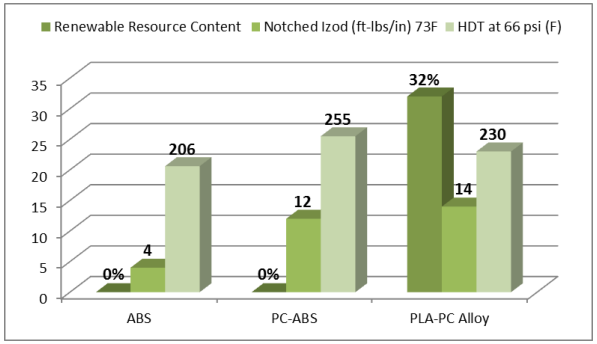
YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- PLA/PC
- PLA/PC (recycled PC)
- PLA/PC FR (non-hal V-0)
- PLA/PC FR (non-hal V-0, recycled PC)
- PLA/PMMA (clear and impact opaque)
- PLA/PE

PLA/PC Alloys

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- **PLA-PC Alloys Balance Renewable Content With High Impact Strength and Heat Deflection Temperature**



PLA/PC Alloy Application

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

Market: Consumer Electronics

Application: Portable Electronics Housing

Problem: Biobased content with good balance of stiffness, impact and heat deflection temperature. Moldable in existing tooling

Solution: RTP 2000 Series PLA/PC Alloy

Benefit: 32% renewable resource content. 14 ft-lbs/in notched izod with a 240°F (115°C) HDT. Processed in existing tooling with added benefit of being overmoldable with soft touch elastomer

PLA Compounds Limits of Use

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- **Suitable for applications requiring:**
  - High impact and stiffness
  - High gloss and colorability
  - FDA compliant ingredients
  - Products with renewable/sustainable resource content
  - Moldability in existing tools
  - Use in a controlled environment, ie: home, office

PLA Compounds Limits of Use

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- **Not suitable for applications requiring:**
  - Extended exposure to high heat and humidity. Consult with R&D to determine limits for your particular application
  - Applications requiring biodegradability in landfill at ambient temps

New PLA Products

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- High gravity
- Permanently anti-static
- PLA/acrylic sheet compound
- Improved FR PLA/PC
- Recycle content

PLA Compounds – Information

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- Updated bio-compounds innovation bulletin
- Glass reinforced bulletin
- Impact modified bulletin
- USDA product listings
- Processing guide
- Regrind studies
- Sample plaques
- Product data sheets

USDA CERTIFIED BIOBASED PRODUCT
PRODUCT 99%

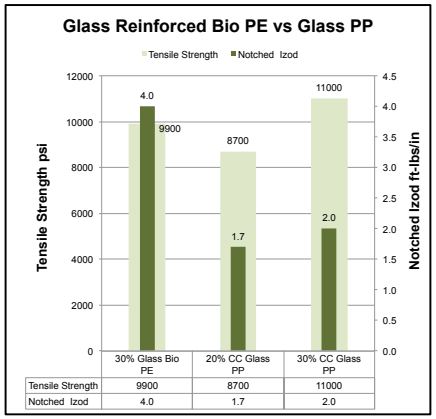
Biobased PE Compounds

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- Advantages
  - Biobased
  - Recyclable
  - Compostion..same as Petroleum PE
  - Properties, and processing
  - Cost relative to other biobased plastics
- Disadvantages
  - Some unknowns in supply
  - Compostability

Biobased PE Compounds

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS



Agenda

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- RTP Company
- What are Eco Solutions?
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RTP Company Eco Solutions

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

Recycled Content Compounds

- RTP Company Strategy
- Source Certification
- Portfolio
- Considerations

Recycled Content Strategy

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- Provide a means for customers to "green" their product via recycle content
- FTC guidelines – type/amount, substantiation
- Utilize pre- and post-consumer:
  - PP, Nylon6, Nylon 6/6, PC, PET

- Pursue "one off" opportunities as presented
- RTP Company is a compounder who can utilize recycled content to add value.... not a recycler

Recycled Content – FTC Guidelines

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

Type and Amount

Product Data Sheet &
General Processing Conditions

RTP 199 X 126273
Polypropylene (PP)
40% Talc Filled
60% Post Consumer Recycled Content

PROPERTIES & AVERAGE VALUES OF INJECTION MOLDED SPECIMENS

PERMANENCE	English	SI Metric	ASTM TEST
Primary Additive	40 %	40 %	
Specific Gravity	1.23	1.23	D 792
MECHANICAL			
Impact Strength, Izod			
notched 1/8 in (3.2 mm) section	0.8 ft-lbs/in	43 J/m	D 256
unnotched 1/8 in (3.2 mm) section	7.0 ft-lbs/in	374 J/m	D 4812
Tensile Strength	4200 psi	29 MPa	D 638
Tensile Elongation	> 10.0 %	> 10.0 %	D 638
Tensile Modulus	0.70 x 10^6 psi	4826 MPa	D 638
Flexural Strength	7500 psi	52 MPa	D 790
Flexural Modulus	0.55 x 10^6 psi	3792 MPa	D 790

PROPERTY NOTES

Data herein is typical and not to be construed as specifications.
Unless otherwise specified, all data listed is for natural or black colored materials. Pigments can affect properties.

Recycled - Source Certification

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

UL Environment™
YOUR PARTNER IN SUSTAINABILITY

UL Environment Inc.
333 Pfingsten Road, Northbrook, IL 60062-2096 USA
T.: 888.4UL Green (888.485.4733) / F.: 360.817.6263
W.: ulenvironment.com

February 11, 2010

[redacted]

Our Reference: 09CA50720

Subject: Validation of environmental claims for recycled content in Greentron and Greenlon

[redacted]

All testing, auditing and analysis work associated with the product listed above under Project number 09CA50720 has been completed. Please refer to the following page for all environmental claims that were validated and the methods used for validation.

Please be informed that in some cases, UL Environment Inc. did not select the samples. Auditing conducted to validate environmental claims was performed on a sample of available documentation, products and materials.

Recycled Content - Considerations

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- Supply and pricing is dynamic
- Can be difficult to verify source
- Post Consumer is more highly valued than Pre Consumer but generally more variable in properties and higher levels of contamination
- Post Consumer compounds limited to black
- Consider tradeoffs between recycle content and performance…RTP can help to overcome limitations!
- Opportunity for cost parity with complex compounds and provide a "green" angle… ie impact modified, FR, wear, conductive.

Recycled Content Product Portfolio

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- Post-consumer content
- Limited to black
- Can provide lot COA with type and amount of recycle
- Directed at applications where PCR recycle content is key
- Not necessarily lowest cost
- Limited feedstock availability in Europe/ Asia

Post-Consumer Recycle Content Compounds

PP	Nomenclature
20% cc glass	RTP 199X128064 B Black
40% cc glass	RTP 199X128064 D Black
20% talc	RTP 199X128065 B Black
40% talc	RTP 199X128065 D Black
non-halogenated V0	RTP 199X128515 Black
30% glass non-halogenated V0	RTP 199X128508 Black
Nylon 6	
20% glass	RTP 299AX128066 B Black
30% glass	RTP 299AX128066 C Black
Impact modified	RTP 299AX128067 A Black
Nylon 6/6	
20% glass	RTP 299X128068 B Black
30% glass	RTP 299X128068 C Black
Impact modified	RTP 299X128069 A Black
PC	
10% glass	RTP 399X127989 A Black
20% glass	RTP 399X128070 B Black
PET	
30% glass	RTP 1199X126220 A Black
45% glass	RTP 1199X128071 A Black
25% glass 15% mineral	RTP 1199X126220 C Black
20% glass 15% mineral	RTP 1199X126220 B Black

Recycled Content Application

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

Market: Sports and Recreation
Application: Kayak Paddle
Problem: Very high strength and rigidity with good surface finish
Solution: RTP 200 A Series carbon fiber reinforced compound
Benefit: Excellent balance of properties and surface finish while utilizing recycled carbon fiber content

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Cellulose Fiber Reinforced PP

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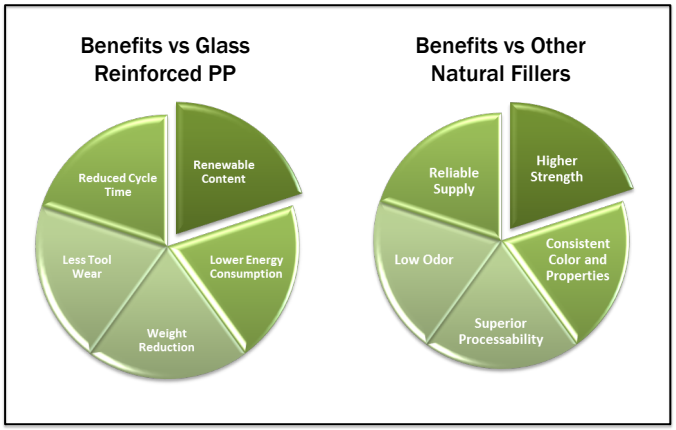
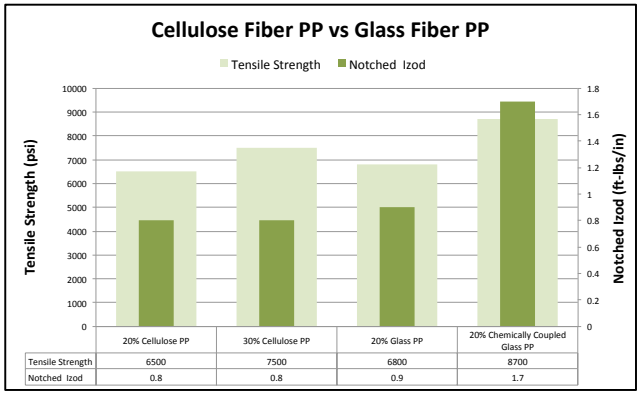


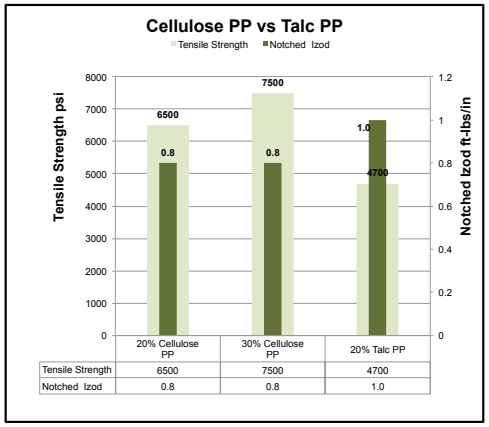
Cellulose Fiber Reinforced PP

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS



Cellulose Fiber Reinforced PP

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS



Cellulose Fiber PP Compounds

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- **Base Resin**
  - Homopolymer (standard and high flow)
  - Copolymer
  - Recycle content
- **Fiber**
  - Cellulose (5% - 40%)
  - Cellulose + glass
- **Other**
  - Color (precolor or concentrate)
  - Elastomer overmold

Cellulose Fiber PP Compounds

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

** View technical data sheets: www.rtpcompany.com/info/data/bioplastics*

PRODUCT NUMBER	DESCRIPTION
RTP 199 X 124797 A	20% Cellulose, Standard flow PP homopolymer
RTP 199 X 124797 B	30% Cellulose, Standard flow PP homopolymer
RTP 199 X 132495 A	20% Cellulose, High flow PP homopolymer
RTP 199 X 132495 B	30% Cellulose, High flow PP homopolymer
RTP 199 X 130883 A	10% Glass, 20% Cellulose, PP homopolymer
RTP 199 X 130883 B	10% Glass, 30% Cellulose, PP homopolymer
RTP 199 X 132474 A	20% Cellulose, High-impact PP copolymer
RTP 199 X 132474 B	30% Cellulose, High-impact PP copolymer
RTP 199 X 125445 A	20% Cellulose, Post-consumer recycled PP
RTP 199 X 125445 B	30% Cellulose, Post-consumer recycled PP

** Custom formulations available to meet your application requirements.*

Solutions For:

Material Handling

Furniture

Automotive

Appliance

Sporting Goods

Lawn & Garden

Cellulose Fiber PP Application

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

Market: Furniture

Application: Chair

Problem: Produce an eco-friendly product with that has mechanical properties similar to 20% glass reinforced PP that can be molded via gas assist

Solution: RTP 100 Series 30% Cellulose fiber reinforced Homopolymer PP

Benefit: Superior properties and processing versus wood flour PP with equivalent stiffness to glass reinforced PP and good colorability. Molded via gas-assist with improved cycle time versus glass PP

Cellulose Fiber PP Application

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

Market: Lawn and Garden

Application: Weeding Tool

Problem: Produce an eco-friendly product with that has good mechanical properties and "natural" look

Solution: RTP 100 Series Cellulose fiber reinforced PP

Benefit: Superior properties and processing versus wood flour PP with good colorability

Agenda

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- RTP Company
- What are Eco Solutions?
- What is green?
- Bioplastic compounds
- Recycle content compounds
- Cellulose Fiber Reinforced PP
- **Future development work**
- Economics
- Summary

Development Work

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- **Higher HDT (crystallinity) PLA**
- **Lower cost nucleators**
- **Improved stabilization of PLA**
- **Biobased olefin compounds**
- **PCR feedstreams**
- **Lower cost FR PLA/PC**

Agenda

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- RTP Company
- What are Eco Solutions?
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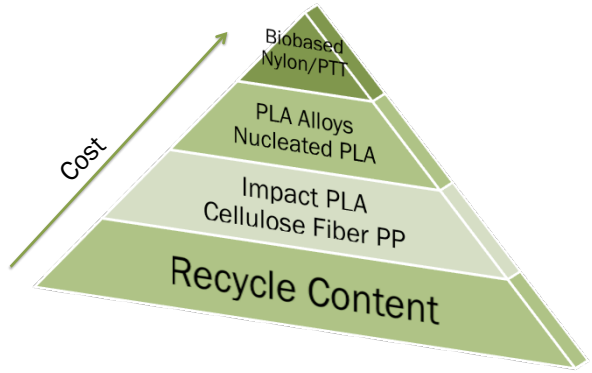
- Natural fibers
- Future development work
- **Economics**
- Summary

Eco-Friendly Compound Economics

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

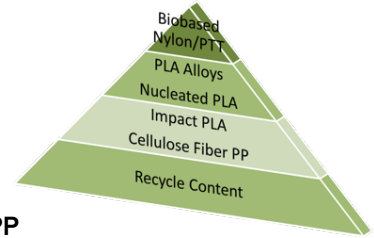


Economic Fits

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

Yes:

- Recycle content
- PLA compounds
  - (antistatic, lubricated, precolor)
- BIO PE compounds
- Cellulose PP vs Glass PP



No:

- Commodity PP, HIPS, ABS

Agenda

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- RTP Company
- What are Eco Solutions?
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Summary

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- The "green" movement is approaching a "tipping point"
  - Knowledge of "green" products and benefit
  - Technical feasibility
  - Economic viability
  - Visibility via first movers

Summary

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- RTP Company has many hard to replicate assets that can be used to achieve your "green" initiatives
  - Formulation and compounding knowledge
  - Key supply relationships
  - Worldwide mfg., tech service, and R&D
  - An entrepreneurial spirit
  - How can we help you meet your sustainability objectives?

Questions & Contact Info

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

Questions?

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