ECO-FLEX™ RTPV

General Purpose Presentation

Recycling with ECO-FLEX™ RTPV Thermoplastic Elastomer

An Opportunity to Cut Costs!

SYNESIS

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Market Definition

- **Elastic Polymers (Rubber)**
- **Thermoset Rubbers (TS)**
- **Thermoplastic Rubbers (TPEs)**

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TPE Family

- TPU –BF Goodrich, 1950s
- SBS Block Copolymers –Shell, 1960s
- Copolyester Block Copolym. –DuPont, 1970s
- TPO –Uniroyal, 1970s
- TPV –Monsanto, 1980s
- RTPV –SYNESIS, 2000s

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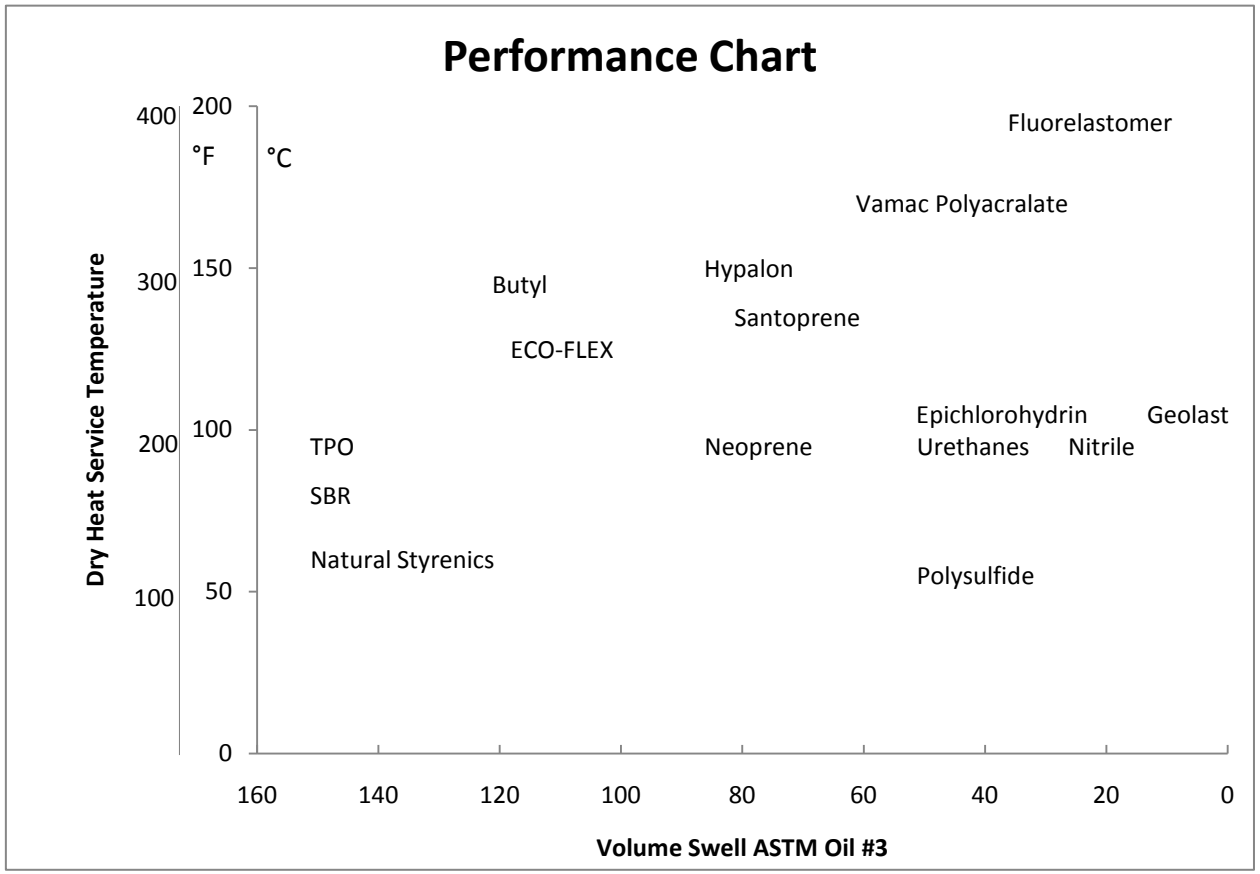
Thermoset and Thermoplastic Rubbers



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What is ECO-FLEX™ RTPV?

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ECO-FLEX™ RTPV
PATENTED TECHNOLOGY

Combines ground rubber from post-consumer thermoset rubber products with thermoplastics. Compatibilizers are added to improve the mechanical properties of the blend

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Why Choose ECO-FLEX™ RPTV?

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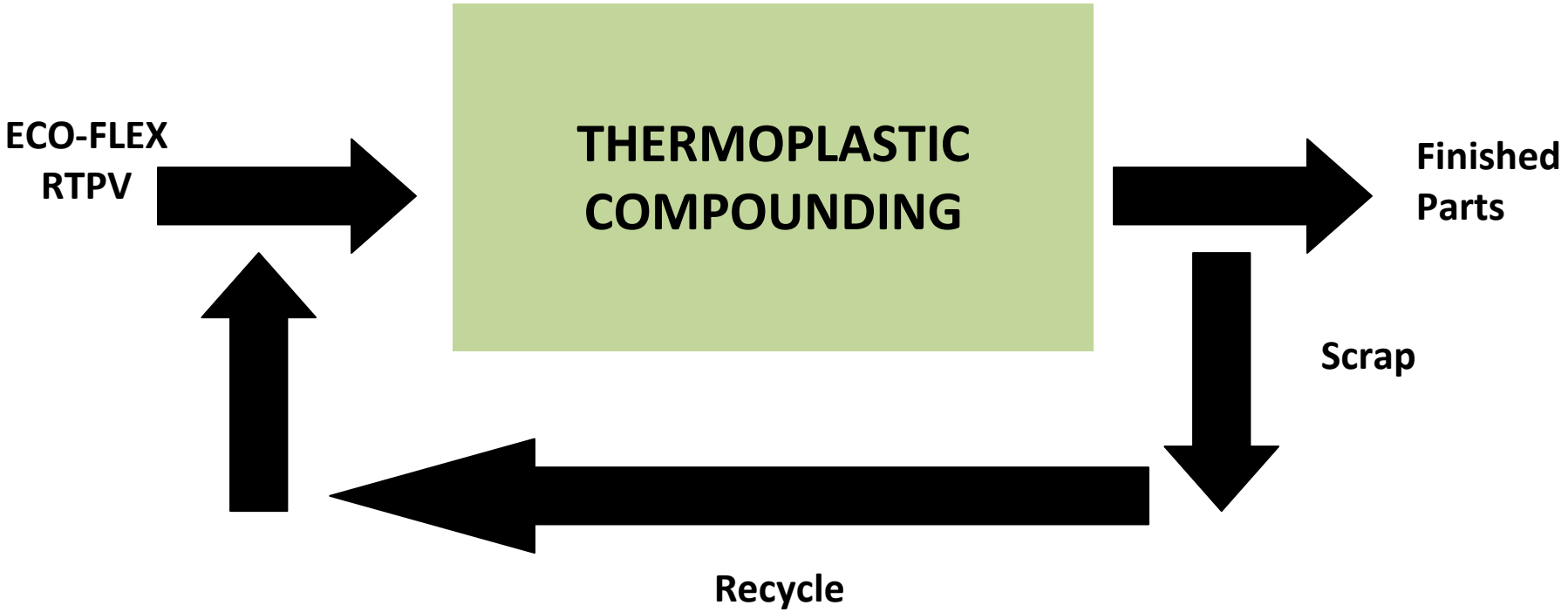
No Compounding Required



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Rubber Performance Properties

- COLOR: BLACK
- SHORE HARDNESS: 45A -40D
- GOOD MECHANICAL PROPERTIES
- GOOD CHEMICAL RESISTANCE
- EXCELLENT UV AND OZONE RESISTANCE

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Lower Finished Part Cost

- **Faster Cycles**
- **Recyclability of Scrap**
- **Lower Specific Gravity**

Cost/Performance Comparison
12” Trash Can Wheel

Item	Virgin SBR	ECO-FLEX
Hardness, Shore A	80	80
Wear Test, 50k Cycles	Pass	Pass
Cold Drop Test, -20 °C	Pass	Pass
Specific Gravity	1.4	1.00
Tread Weight, g	985	240
Cycle Time, Sec	360	40
Scrap Rate, %	15	<1
Finish Wheel Cost, $ per Wheel	2.87	1.52

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Design Flexibility

- **INJECTION MOLDING**
- **INSERT MOLDING**
- **EXTRUSION**
  - **SHEET/PROFILE**
  - **CO-EXTRUSION**
- **THERMOFORMING**

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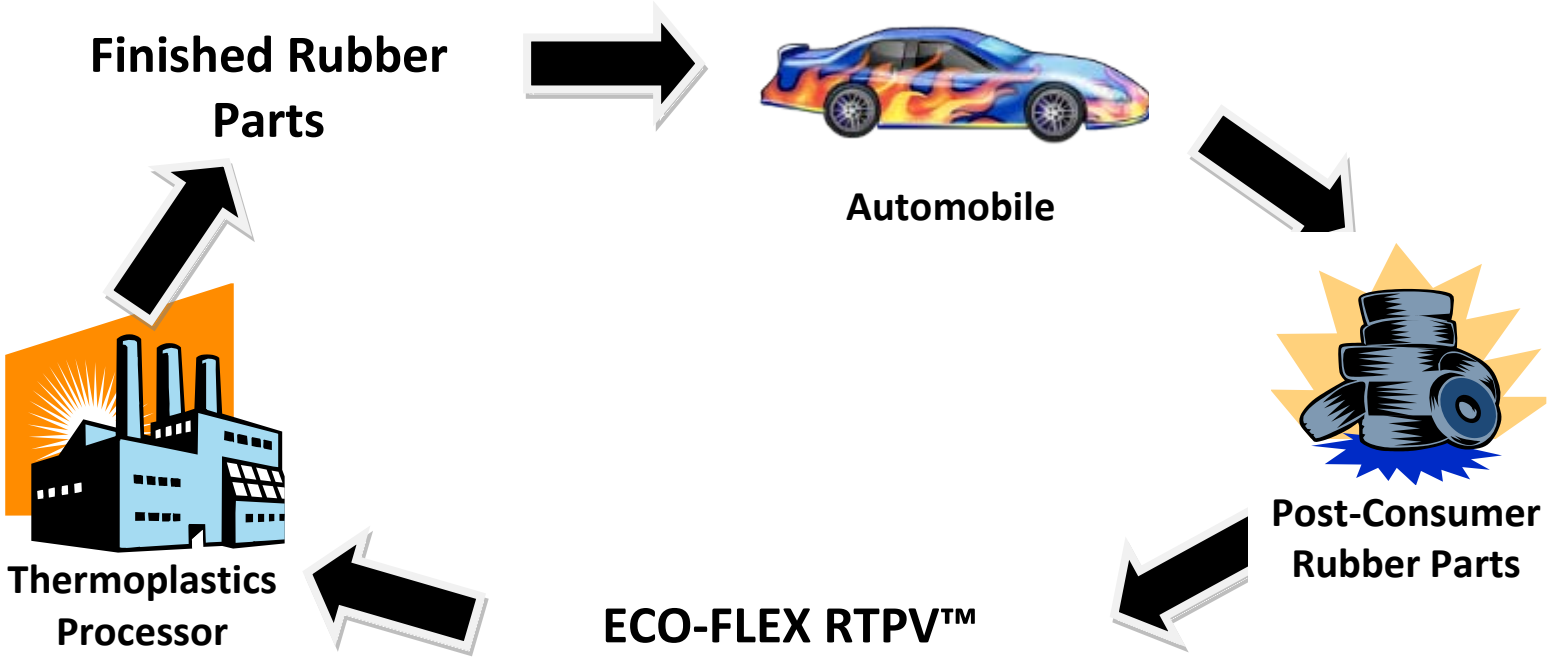
Use of Post-Consumer Recycled Rubber

Environmental Benefits
Recycling vs. Landfill/Stockpiling

- Prolongs Life of Landfills by Reducing Solid Waste
- Protects the Environment from the Fire and Health Hazards of Scrap Rubber Stockpiles



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Where Does It Fit?

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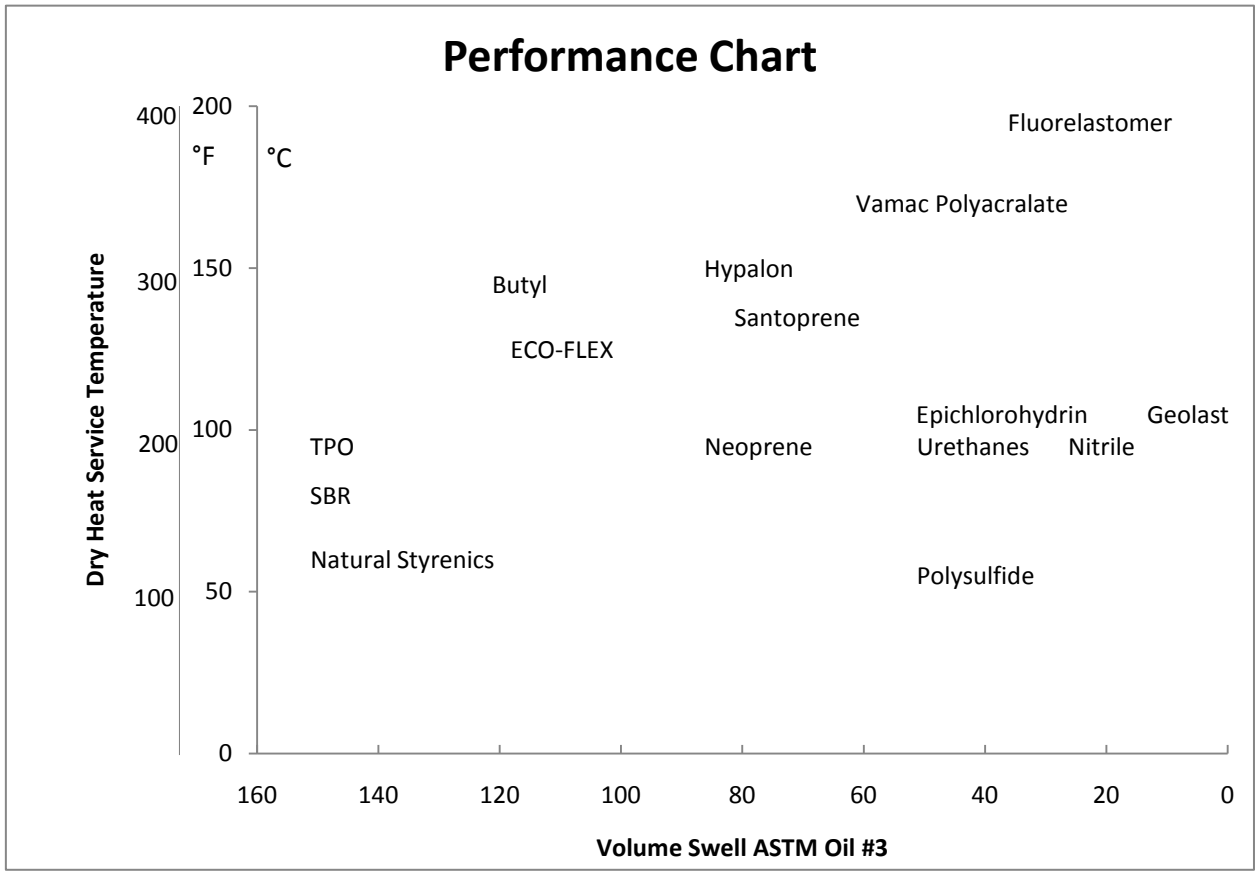
Thermoset and Thermoplastic Rubbers



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Comparison to Thermoset Rubbers

Property	ECO-FLEX	SBR	Natural Rubber	EPDM	Neoprene
PCR Content	50% +	No	No	No	No
Durometer Shore A	40 – 90	40 – 90	40 – 90	40 – 90	50 – 90
Specific Gravity	1.0 – 1.04	1.4	1.2	1.2	1.4
Compression Set	F	F	F	E	G
High Temp Service (°F)	250	175	175	275	250
Low Temp Service (°F)	-50	-50	-50	-65	0
Ozone	E	F	P	E	G
Acid	E	G	F	E	G
Alkalis	E	G	F	E	G
Weather (UV)	E	G	F	E-G	G
Lubricating Oil	P	P	P	P	F

E = Excellent G = Good F = Fair P = Poor

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Comparison to Other TPE's

Property	ECO-FLEX	Kraton	TPO	Santoprene
Tensile Strength	500 – 1,500	400 – 1,500	500 – 3,000	400 – 2,300
Elongation, %	200 – 400	300 – 900	300 – 500	300 – 500
Tear Strength, psi	100 – 200	100 – 200	100 – 200	100 – 200
Abrasion Resistance	G	P	F	G
Compression Set at 70°C, %	50 – 75	50 – 80	50 – 80	25 – 45
Continuous Use Temp., °C	125	70	100	125
Chemical Resistance	G	P	F	G
Cycle Time	Same	10-15% Higher	Same	Same

E = Excellent G = Good F = Fair P = Poor

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What Properties Does it Offer?

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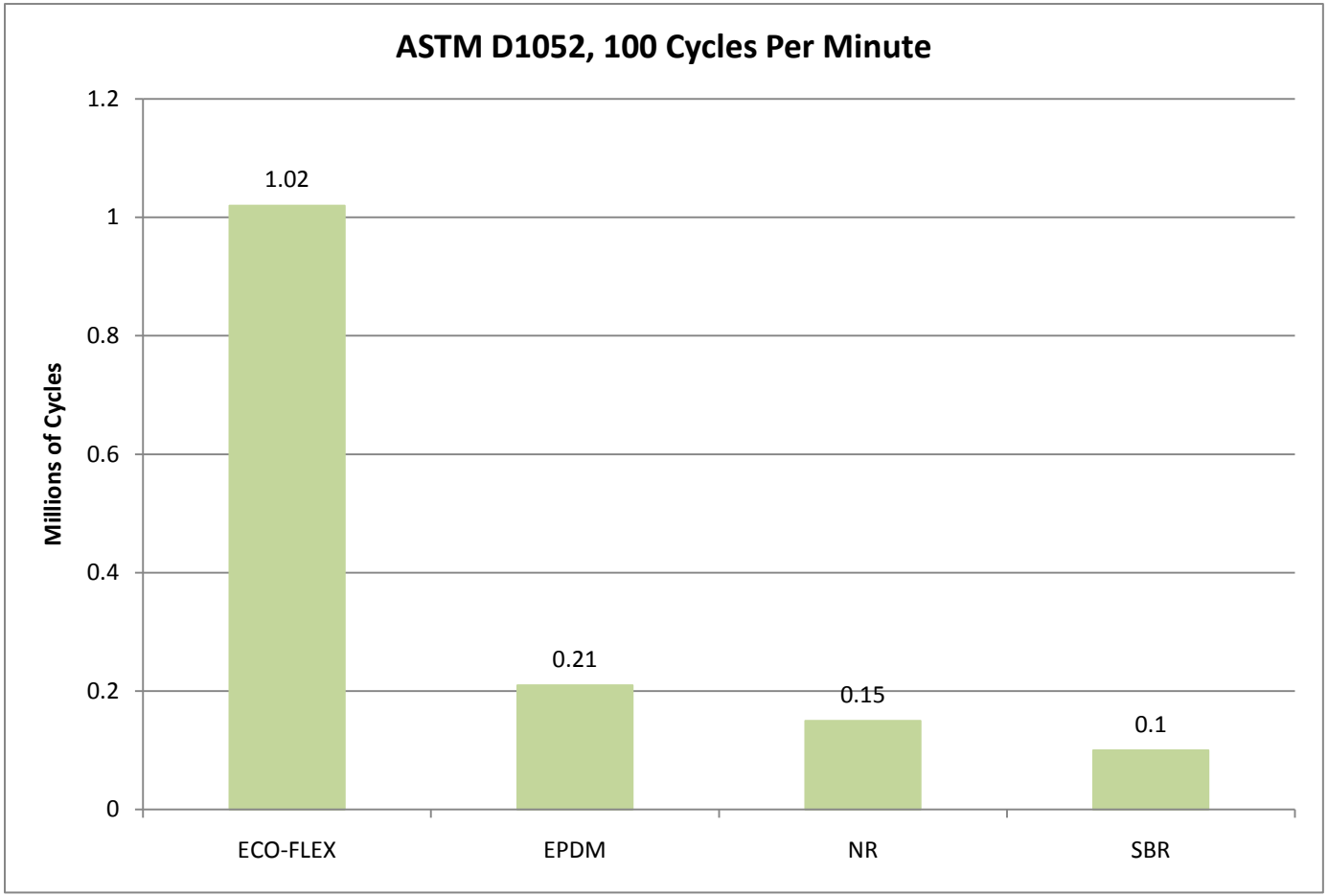
Flex Fatigue – Ross Flex



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Fluid Resistance (ASTM D471 at 46 Hrs)

Fluid	Rating	Fluid	Rating
Alcohol (Isopropyl)	E	Hydraulic Oil	G
Animal Fat	G/E	Kerosene	P
Anti-Freeze	E	Motor Oil	G
ASTM Ref. Fuel B	VP	Water - Distilled	E
Diesel Fuel	F	Water - Salt	E
Gasoline	P	Water – Swim Pool	G/E
Grease	G	Vegetable Oil	E

E = Excellent G = Good F = Fair P = Poor VP = Very Poor

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Weatherability

Excellent Resistance to Ozone and UV Radiation

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Taber Abrasion vs. SBR Rubber

Cumulative Weight Loss (Grams)

Wear	ECO-FLEX 65 A	ECO-FLEX 75 A	SBR 68 Shore A
Total Weight Loss (Mg)**	283.5	222.7	392.7
Taber Wear Index***	540	424	566

** H-22 Wheel, 1,000 gm Load, 500 Cycles

*** The Lower Number Indicates Better Abrasion Resistance

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Target Markets and Applications

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TARGET MARKET SEGMENTS

- Automotive
- Consumer Goods
  - Appliances
  - Hardware
  - Lawn & Garden
  - Recreation
- Sheet Goods
- Polymer Blends

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TARGET APPLICATIONS

Automotive

- Air Dams, Chin Spoilers, Bumper Extensions
- Radiator Air Deflectors, Splash Shields, Mud Flaps
- Grommets, Bumpers, Body Plugs, Brake Pedal Pads
- Cowl Screens, Gap Hiders, Weather Seals
- Hood Hinge Covers, Strut Cover Caps, Dust Covers

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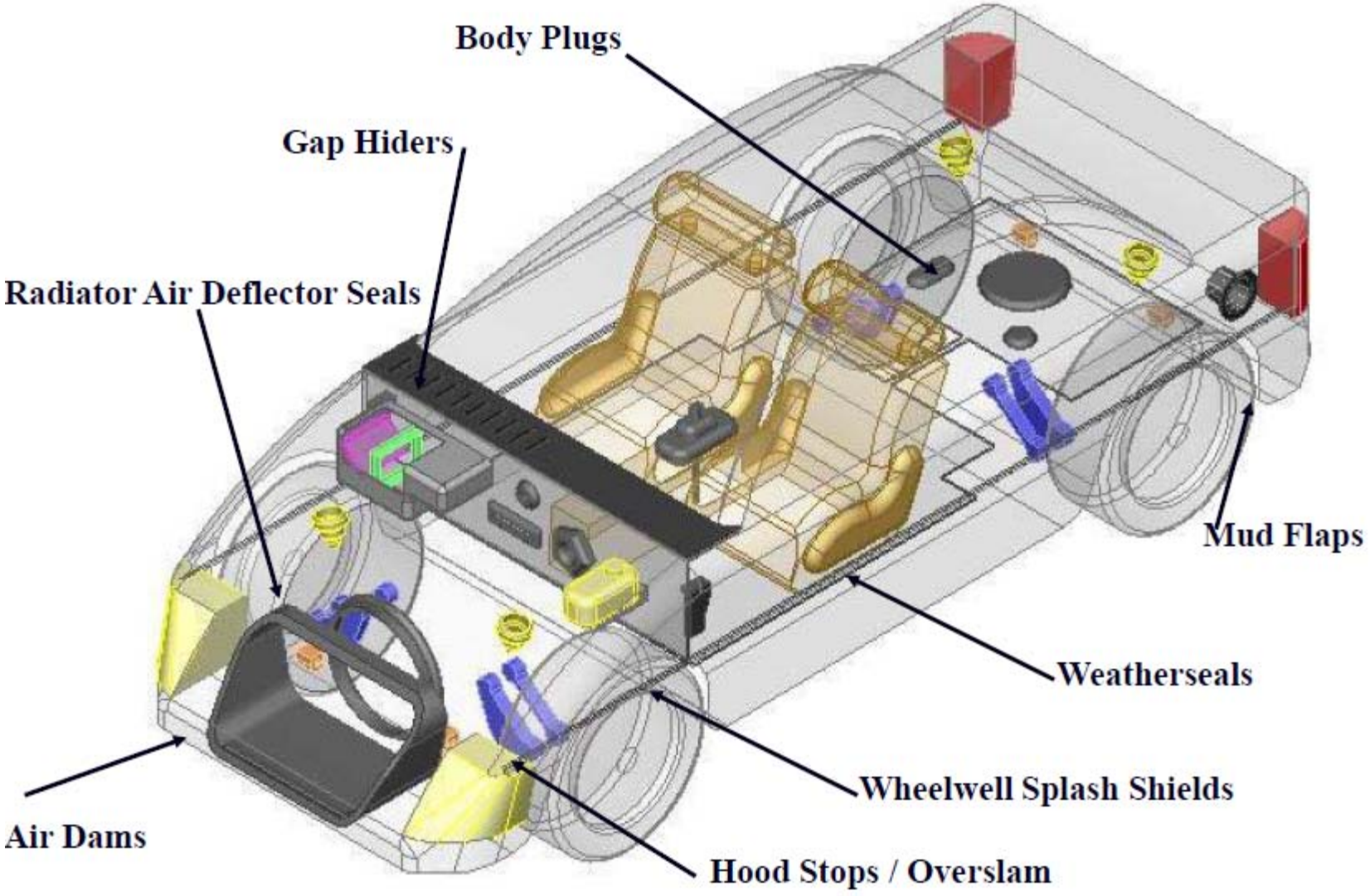
ECO-FLEX RTPV TARGET APPLICATIONS



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ECO-FLEX™ RTPV TARGET AUTOMOTIVE APPLICATIONS

Brake Pedal Pad

Thermoformed Splash Shield

Mudflaps

Body Plug

Strut Dust Cover

DIE CUT/LAMINATED FOAM ACOUSTICAL PAD

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TARGET APPLICATIONS

Consumer Goods

- **Wheels (Casters/Lawn Mower/Dryer)**
- **Grips**
- **Floor Tiles**
- **Pipe couplings, Toilet Flapper Valves/ Toilet Rings/Plungers**
- **Bumpers, Gaskets, Mounts, Feet**

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ECO-FLEX™ RTPV TARGET CONSUMER APPLICATIONS

Lawn Mower Tire

Boat Lift Roller

Crowbar

Floor Tile

Toilet Flapper Valve

Plunger

ECO-FLEX RTPV TARGET APPLICATIONS

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Sheet Goods

- Roofing Membranes
- Matting (anti-fatigue, fitness, flooring)
- Die Cut Gaskets, Anti-vibr./skidPads
- Liners (Cargo, Wall, Pans)

ECO-FLEX™ RTPV TARGET SHEET APPLICATIONS

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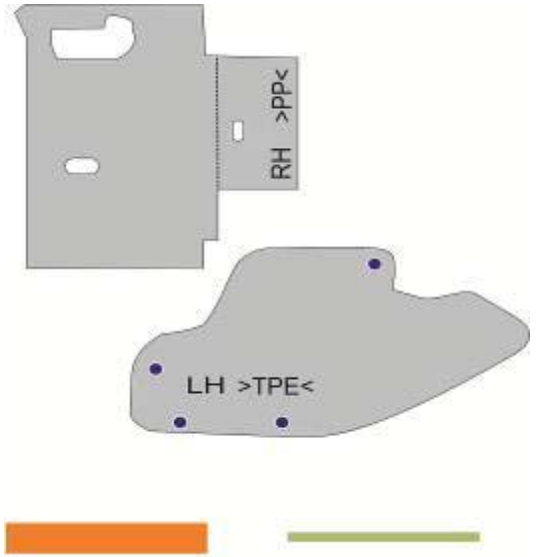
Roofing Membrane

Golf Cart Flooring

Die Cut Gaskets

All Die Cut Parts

- Benefits
- Aesthetically Pleasing
- Recycle Content Product “Green” Initiatives
- Recyclable
- Can be Thermoformed
- Reduced Part Weight 1/3 to 1/2 The Thickness with same performance as Thermoset Rubber. 3-5mm can be 1.5 -2.0mm
- Potential Impact : 30 -50% Cost Reduction Vs. Thermoset Rubber



Rubber Thickness vs. ECO-FLEX™

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ECO-FLEX RTPV TARGET APPLICATIONS

Polymer Blends

ECO-FLEX RTPV is Fully Compatible With Virgin Olefinic Polymers Such as Polypropylene and Santoprene and Can Be Blended At High Levels (30-50%). For Impact Modification and/or Cost Savings (20-50%).

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