

proven performance

Santoprene™ TPV general introduction

Energy lives here®

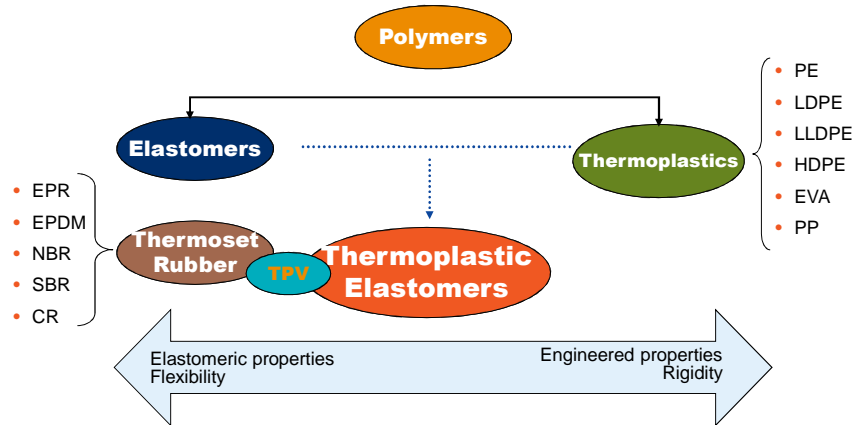
Global Polymers Technology
Shanghai Technology Center, 2014

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Outline

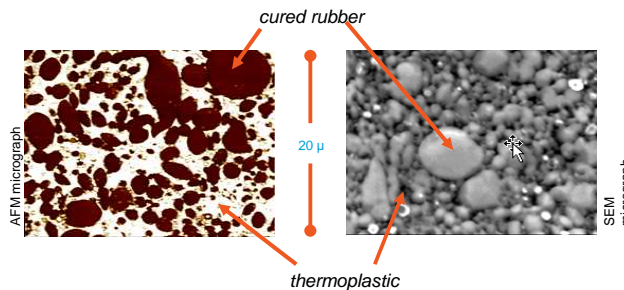
- Santoprene™ thermoplastic vulcanizate (TPV) – the engineered TPE
- Santoprene TPV product portfolio
- Santoprene TPV typical markets
- Conclusions

Overview of polymer categories



What is Santoprene™ TPV?

- Chemically crosslinked (vulcanized) rubber encapsulated in thermoplastic matrix
- Properties like thermoset rubber but melt-processable like thermoplastic
- Homogeneous dispersion of small particle-size rubber provides good tensile strength
- Locked-in morphology provides stable physical properties



Santoprene™ TPV - key benefits

- Enhanced performance
 - Durable sealing performance combined with upgraded aesthetics of the finished part
- Reduced part/system costs
 - Simplified processing and design flexibility, allowing for the manufacture of complex parts
- Sustainability opportunities
 - Through part weight reduction, end-of-life recycling and sustainable manufacturing

Santoprene TPVs are engineered TPVs that have proven to be the most dependable polymer of choice for flexible part applications requiring long term performance

Santoprene™ TPV - global presence

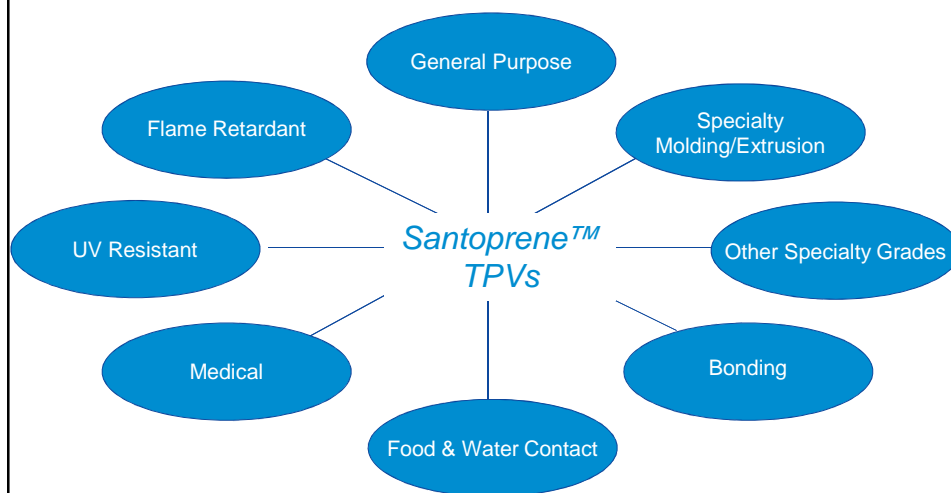


We can support you wherever you need it

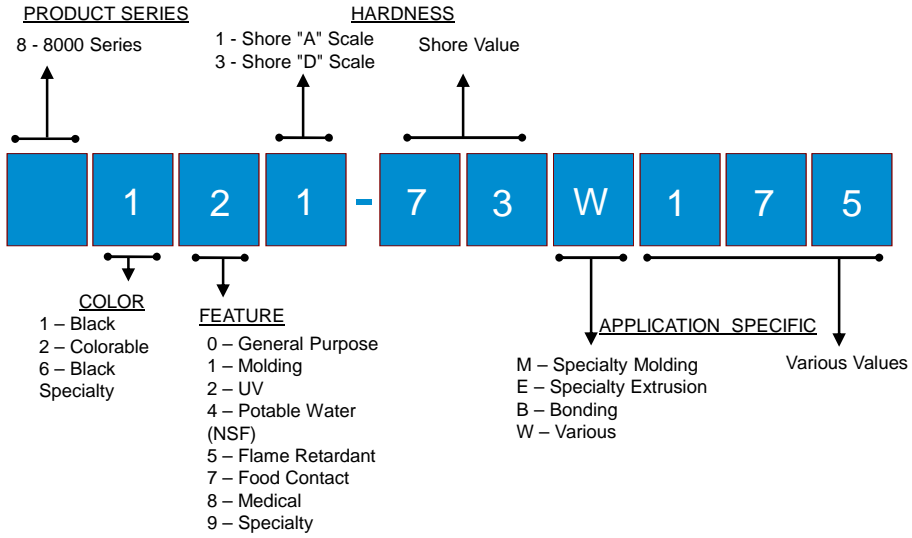
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Broad product portfolio



Santoprene™ TPV product nomenclature



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Santoprene™ TPV automotive end-uses

Interior

- Door trim skins
- Flapper door seals
- Steering column cover
- Mats and cup holders
- Handles and grips
- IP to windshield gap fillers

Exterior

- Air guides and dams
- Fuel filler housing seals
- Electrical housing seal
- Head light seals
- Wiper systems
- Spoilers and trims



Weatherseals for:

- Glass run channel
- Encapsulated quarter light
- End cap and corner molding
- Inner belt line
- Outer belt line
- Cowl vent/Hood to cowl
- Cut line
- Gap filler
- Tailgate trunk
- Windshield
- Sunroof
- Roof line

Under Chassis

- Steering boots
- Suspension boots
- Control cables

Under Hood

- Air duct systems
- Plugs, bumpers and grommets
- Tubes and connectors
- Fuel line systems

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Santoprene™ TPV industrial and consumer end-uses

Industrial



Appliance Seals & Rings



Syringe Plunger Tips



Wiring Connectors



Solar Panel Elements

Consumer



Mouse Grip



Power Tools



Garden Tools



Consumer Electronics

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Outline

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Santoprene™ TPV: your flexible material of choice

- Expanding global presence of sales, marketing and technical service capabilities
- Strong commitment to automotive and renewable industries
- High dedication to continuous improvement in quality consistency and reliability
- Integrated cross-regional value chain coverage
- 30 years of commercial successes in increasing number of automotive weatherseals systems/parts
- Experienced technical resources
 - Part development and design assistance
 - Processing support
 - Troubleshooting

Santoprene™ TPV: your flexible material of choice (cont.)

- Broad range of engineered properties
 - Cost effective part solutions
 - Good sealing performance
 - Weight reduction and design flexibility through function integration
 - Low specific gravity vs. TSR
 - Long term aging durability
 - Excellent UV and ozone resistance
 - Chemical/fluid resistance
 - Faster cycle times compared to TSR and tighter tolerances



Tell us what you need...

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Santoprene™ TPV portfolio for injection molding

Santoprene™ TPV Grade	Color*	Hardness Reference	Features	Target Application/Process
101-xx/103-xx 201-xx/203-xx	B C	55A – 50D 55A – 50D	<ul style="list-style-type: none"> General purpose grades Highest level of elastomeric properties (e.g., lowest compression/tension set) 	<ul style="list-style-type: none"> Basic molding Hard grades (>85A) ideal for blow molding
8201-xx	C	60A – 90A	<ul style="list-style-type: none"> Enhanced colorability 	<ul style="list-style-type: none"> Basic molding Hard grade (90A) ideal for blow molding
121-xxM100	B	50A – 85A	<ul style="list-style-type: none"> Improved flow for easier processability 	<ul style="list-style-type: none"> Specialty molding
121-xxM200	B	60A, 75A	<ul style="list-style-type: none"> Best flow for superior aspect parts Higher gloss which can be tailored with mold surface 	<ul style="list-style-type: none"> Glass encapsulation
8211-xx	C	35A – 75A	<ul style="list-style-type: none"> Improved flow for easier processability Enhanced colorability 	<ul style="list-style-type: none"> Specialty molding
8221-xxM300	C	55A – 30D	<ul style="list-style-type: none"> Improved flow for easier processability UV resistant 	<ul style="list-style-type: none"> Automotive interior
121-70M350	B	70A	<ul style="list-style-type: none"> Improved scratch and mar resistance 	<ul style="list-style-type: none"> Specialty molding
8211-85M350	C	85A	<ul style="list-style-type: none"> 'Comfort touch' Improved scratch and mar resistance 	<ul style="list-style-type: none"> Interior skins

* Black/Colorable

Santoprene™ TPV portfolio for extrusion

Santoprene™ TPV Grade	Color*	Hardness Reference	Features	Target Application
101-xx/103-xx 201-xx/203-xx	B C	55A – 50D 55A – 50D	<ul style="list-style-type: none"> General purpose grades Highest level of elastomeric properties (i.e. lowest compression/tension set) 	<ul style="list-style-type: none"> Basic extrusion
8201-xx	C	60A – 90A	<ul style="list-style-type: none"> Enhanced colorability 	<ul style="list-style-type: none"> Basic extrusion
121-xxW175	B	58A – 50D	<ul style="list-style-type: none"> Designed and released against specific extrusion performance criteria 	<ul style="list-style-type: none"> Automotive weatherseals
123-52W242	B	52D	<ul style="list-style-type: none"> Low coefficient of friction 	<ul style="list-style-type: none"> Auto weatherseals slip coat
9101-80E	B	80A	<ul style="list-style-type: none"> Optimal system cost performance 	<ul style="list-style-type: none"> Automotive glass run channel foot
121-50E500	B	50A	<ul style="list-style-type: none"> Controlled rheology for robotic extrusion 	<ul style="list-style-type: none"> Robotic extrusion
691-xxW175	C	65A, 73A	<ul style="list-style-type: none"> Designed and released against specific extrusion performance criteria 	<ul style="list-style-type: none"> Residential seals

* Black/Colorable

Santoprene™ TPV bonding grades

Santoprene™ TPV Grade	Color*	Hardness Reference	Features	Target Application/Process
121-xxW233	B	65A, 79A	<ul style="list-style-type: none"> Bonds to EPDM 	<ul style="list-style-type: none"> Automotive corner molding
121-65B200	B	65A	<ul style="list-style-type: none"> Bonds to EPDM Higher gloss for surface matching 	<ul style="list-style-type: none"> Dynamic automotive corner molding
121-xxB230	B	65A, 79A	<ul style="list-style-type: none"> Bonds to TPV, EPDM and PP Lower CoF to reduce friction 	<ul style="list-style-type: none"> Automotive corner molding
8211-55B100 8191-55B100 291-xxB150	C B C	55A 55A 60A, 75A	<ul style="list-style-type: none"> Bonds to PC, ABS, PS and other engineering thermoplastics (ETPs) B100 grades also bond to PP 	<ul style="list-style-type: none"> Insert or 2 shot molding
8291-85TL	C	85A	<ul style="list-style-type: none"> Bonds to metal and PP 	<ul style="list-style-type: none"> Extrusion

* Black/Colorable

Santoprene™ TPV other specialty grades

Santoprene™ TPV Grade	Color*	Hardness Reference	Features	Target Application/Process
251-xxW232	C	70A – 92A	<ul style="list-style-type: none"> Flame retardant (UL 94 V-0 rated) 	<ul style="list-style-type: none"> Electrical
151-xxW256	B	70A	<ul style="list-style-type: none"> Flame retardant (UL 94 5VA rated) 	<ul style="list-style-type: none"> Electrical
101-xxW255 201-55W255	B C	45A,55A 55A	<ul style="list-style-type: none"> Stabilized for protection against copper and other metal-catalyzed degradation NSF certified 	<ul style="list-style-type: none"> Residential dishwasher
241-xx 241-xxW236	C C	55A, 64A 73A,80A	<ul style="list-style-type: none"> W236 grades stabilized against copper and other metal-catalyzed degradation 	<ul style="list-style-type: none"> Potable water contact
8221-xx	C	60A, 70A	<ul style="list-style-type: none"> UV resistant 	<ul style="list-style-type: none"> Residential seals
201-67W171	C	67A	<ul style="list-style-type: none"> Water or chemical foaming agents can produce low density foam 	<ul style="list-style-type: none"> Low density foamed profile extrusions
201-xxW222	C	73A, 80A	<ul style="list-style-type: none"> Low CoF (coefficient of friction) 	
171-xx 271-xx	B C	64A, 73A 55A – 87A	<ul style="list-style-type: none"> FDA non-fatty food contact NSF 51 Food Contact 	<ul style="list-style-type: none"> Non-fatty food contact
8281-xxMED	C	35A – 90A	<ul style="list-style-type: none"> USP Class VI certified 	<ul style="list-style-type: none"> Medical

* Black/Colorable

Santoprene™ medical grades

ExxonMobil Chemical selected PolyOne GLS to be its primary marketing specialist for thermoplastic vulcanizate (TPV) medical products made using ExxonMobil Chemical's Santoprene™ TPV. ExxonMobil Chemical supplies Santoprene TPV feedstock to PolyOne GLS Thermoplastic Elastomers for the manufacture of customer compounded medical grade formulations marketed and sold globally by PolyOne under its GLS brands. PolyOne GLS has also been appointed the authorized distributor for ExxonMobil Chemical's medical grades. View www.polyone for more information.

Santoprene™ TPV Grade	Color *	Hardness Reference	Features	Target Application/Process
181-55MED	B	55A	<ul style="list-style-type: none"> Meets USP Class VI requirements for plastics Drug master file maintained with the FDA 	<ul style="list-style-type: none"> Medical soft touch grips Seals and gaskets Tubing
281-55MED	C	55A		
8281-xxMED	C	35A - 90A		

* Black/Colorable

Bonding grades - licensed technology

Additional bonding products based on Santoprene™ TPVs are available. View the manufacturers' website for more information.

RTP Company Grade Designation	Features	Corresponding Discontinued Santoprene™ TPV grade
RTP 6091-55A BLK	Bonds to nylon 6, nylon 6 (30% glass filled), nylon 6,6 and PP	191-55PA
RTP 6091-70A BLK		191-70PA
RTP 6091-85A BLK		191-85PA
RTP 6091-55A NAT		8291-55PA
RTP 6091-70A NAT		8291-70PA
RTP 6091-85A NAT		8291-85PA
RTP 6091 B-60A BLK	Bond to nylon 6, nylon 6 (30% glass filled), nylon 6,6, and nylon 12	8191-60B500
RTP 6091 B-60A NAT		8291-60B500
RTP 6091 B-85PA12 BLK	Bonds to nylon 12, nylon 6, nylon 6 (30% glass filled), nylon 6,6 and PP	191-85PA12

Electrical grades – licensed technology

Additional products for the electrical market based on Santoprene™ TPVs are available. Contact the manufacturers' website for more information.

T&T Marketing Grade Designation	Features	Corresponding Discontinued Santoprene™ TPV grade
TPE 5187	Flame retardant, stabilized against copper and other metal-catalyzed degradation UL QMTT2 cable jacket (105°C) and wet-location (75°C) listed	8451-87W232
TPE 5345	Flame retardant, stabilized against copper and other metal-catalyzed degradation UL QMTT2 cable jacket (90°C) and wet-location (75°C) listed	8453-45W232
TPE 6187	Stabilized against copper and other metal-catalyzed degradation UL QMTT2 cable jacket 105°C listed	8261-87
TPE 453-45	UL QMTT2 cable jacket (105°C) and wet-location (75°C) listed UL 94 V-0 rated	453-45