

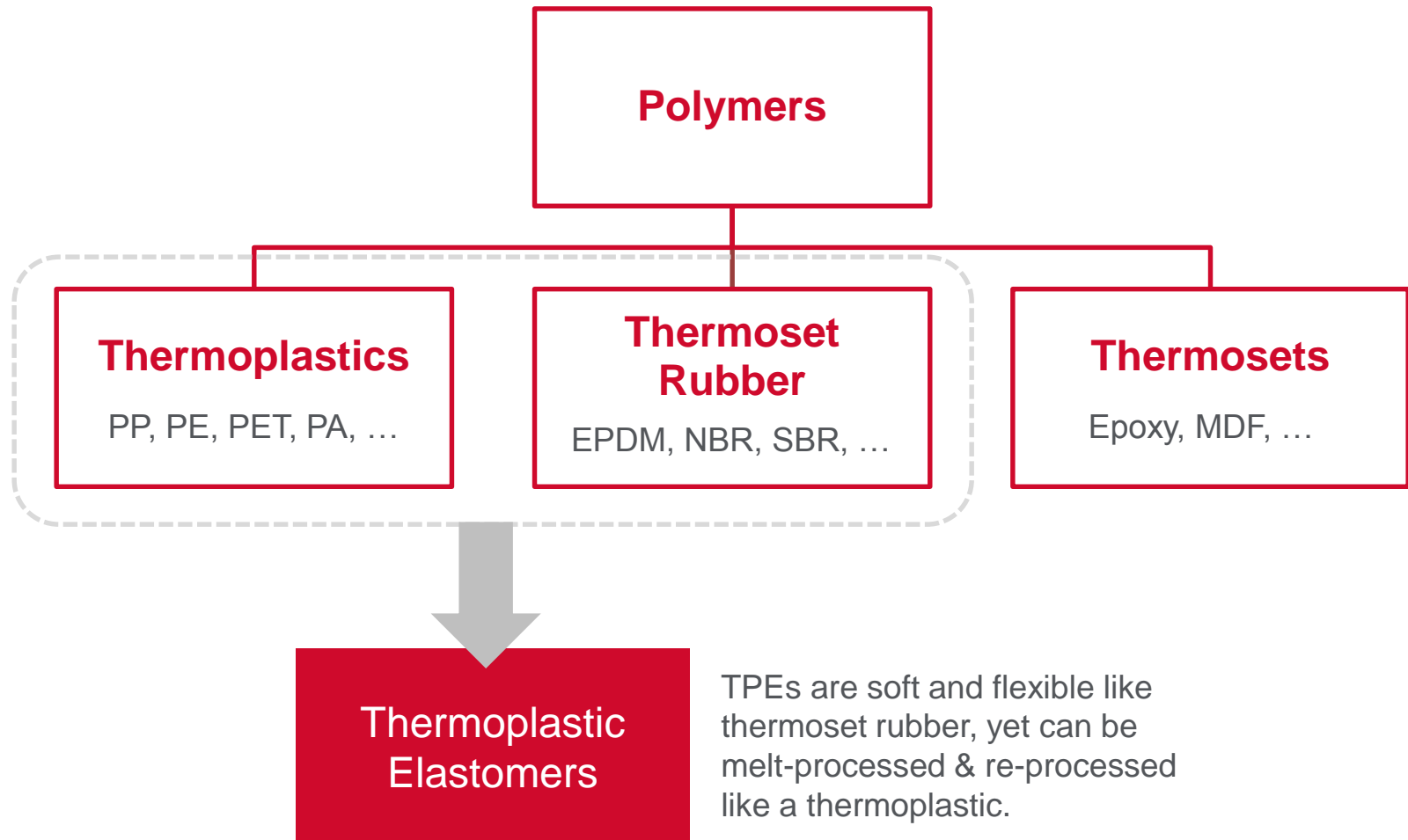


Everything You Need To Know About TPE Compounds, Chemistry, and Capabilities

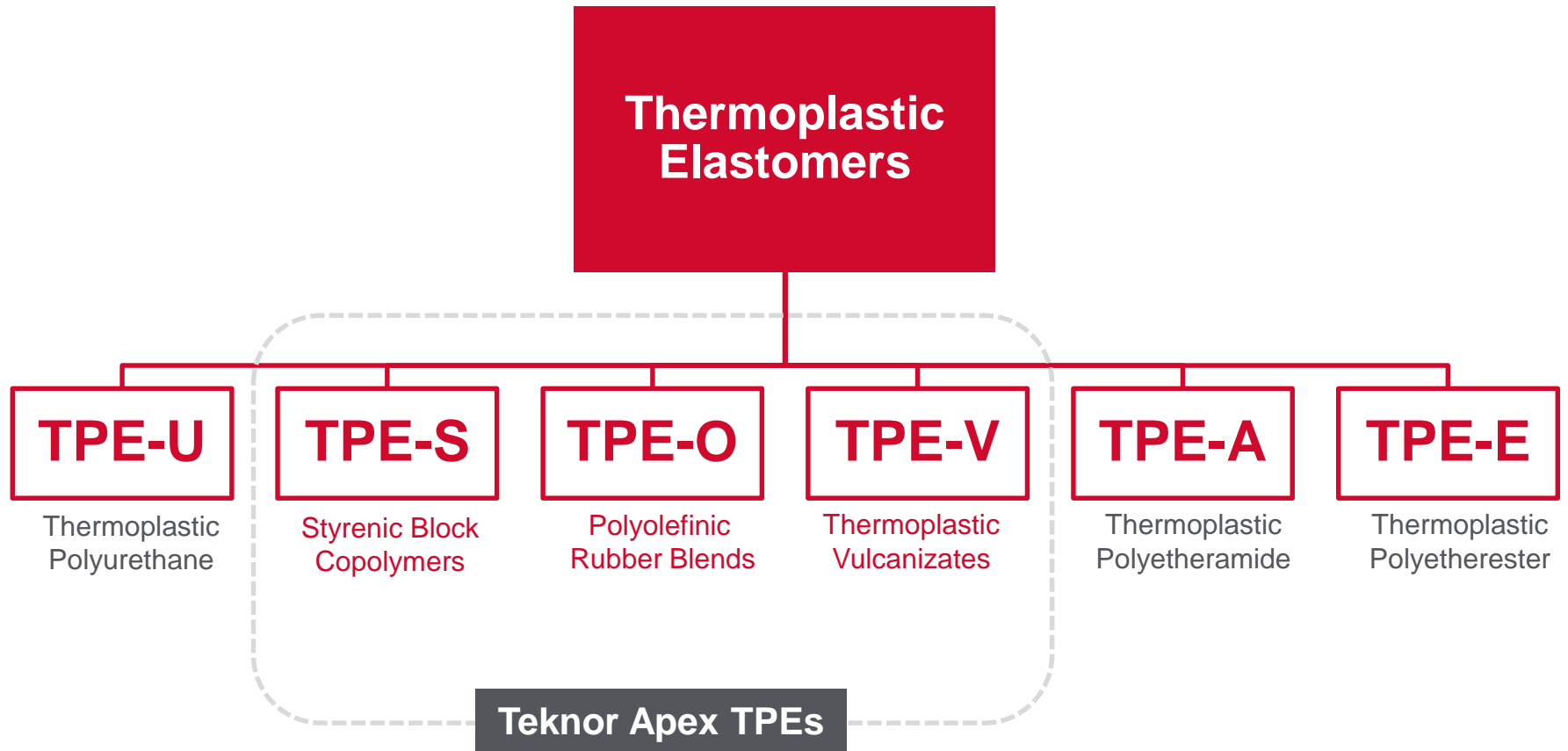
An Overview of Thermoplastic Elastomer Families



Polymer Classifications



TPE Classifications



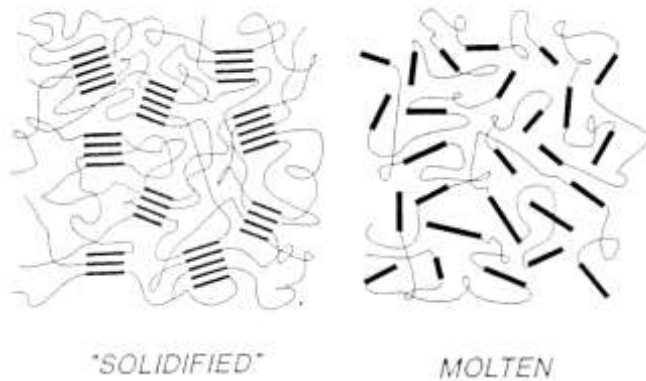
Property Comparison: TPEs

	TPE-O (TPO)	TPE-V (TPV)	TPE-S (SBC)	TPE-U (TPU)	TPE-E (COPE)	TPE-A (COPA)
Density (g/cm ³)	0.9-1.15	0.9-1.0	0.9-1.3	1.1-1.34	1.05-1.4	1.0-1.2
Shore Hardness	65A-70D	25A-55D	5A-70D	70A-70D	35D-70D	65A-70D
Low Temperature Limit (°C)	-60	-60	-70	-50	-65	-40
High Temperature Limit (°C)	110	115	100	135	150	170
Compression Set at 100°C	Poor	Good / Excellent	Good / Excellent	Fair / Good	Fair	Good
Resistance to Hydrocarbon Fluids	Poor	Fair / Good	Poor	Fair	Good / Excellent	Good / Excellent
Resistance to Aqueous Fluids	Good / Excellent	Good / Excellent	Good / Excellent	Fair / Good	Poor / Fair	Fair / Good

TPE Structure

TPEs are Hard Phase/Soft Phase Systems, that can be divided into 2 categories:

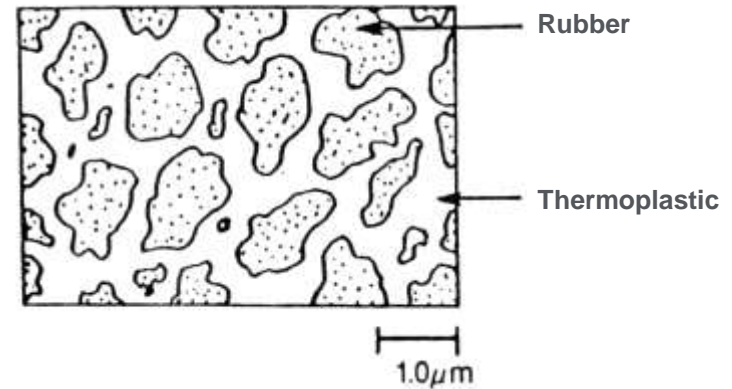
Block Copolymers



Block Copolymer

Composed of discrete blocks of crystalline and amorphous domains within the same polymer chain

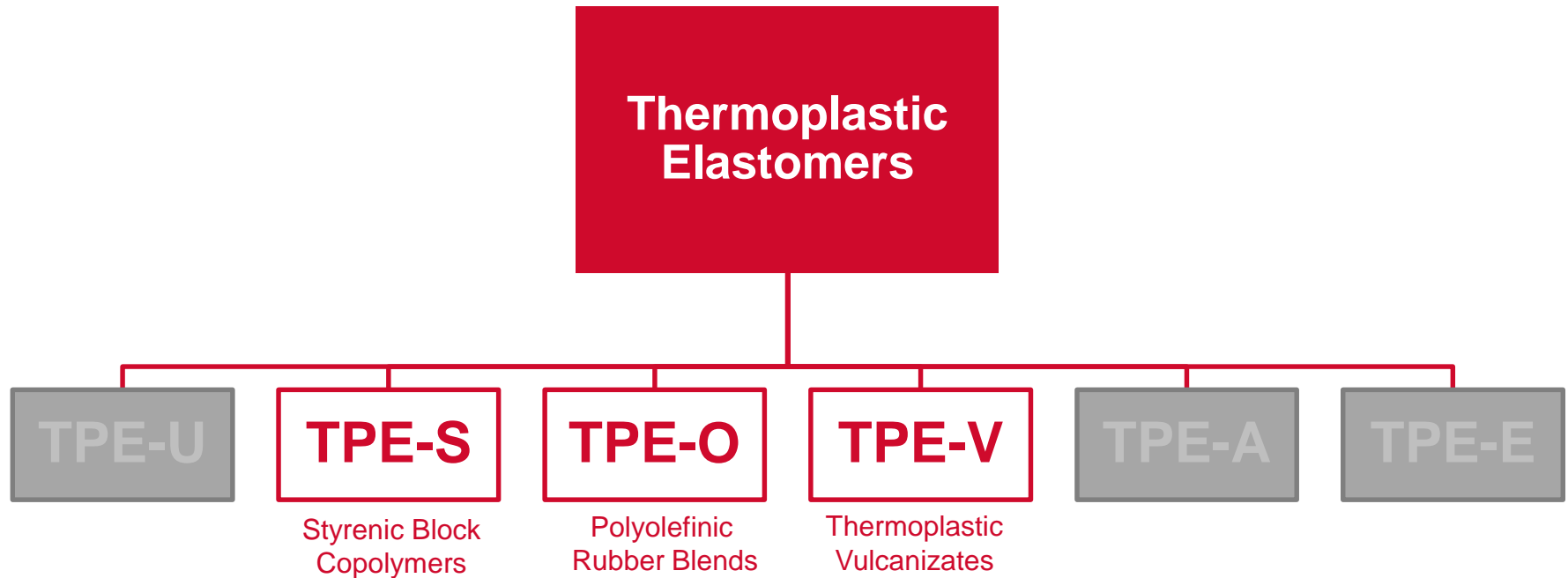
Elastomeric Blends



Blend

Mechanical mixture of semi-crystalline and amorphous polymers

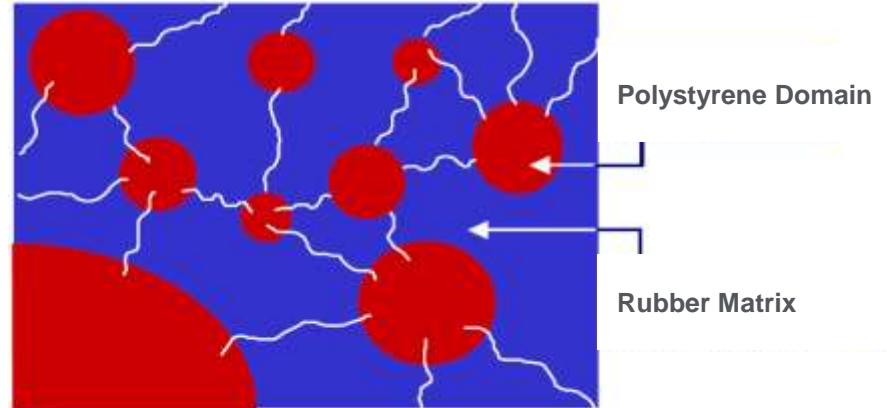
Teknor Apex TPE Technologies



TPE-S: Styrenic Block Copolymer Compounds

Physical Blends of Polyolefin, SBC, Oil, and Additives

- Numerous formulations are possible by varying the ratios and types of these ingredients; thus a wide range of hardnesses and properties are achievable



SBC: 2 Phase Structure

- Styrene end blocks act as physical “cross-links” provide strength & hardness properties
- The rubber mid-block provides elastic properties

TPE-S: Styrenic Block Copolymer Compounds

Advantages

- Compounding versatility
- Clear, translucent, and opaque grades
- Matte to glossy finish
- Broad hardness Range: soft gel to Shore D
- Good processability
- Excellent colorability
- Low odor
- Good elasticity, tear strength and compression set at low to medium temperature ranges
- Bondability to many substrates

Disadvantages

- Poor high temperature performance
- Poor oil resistance

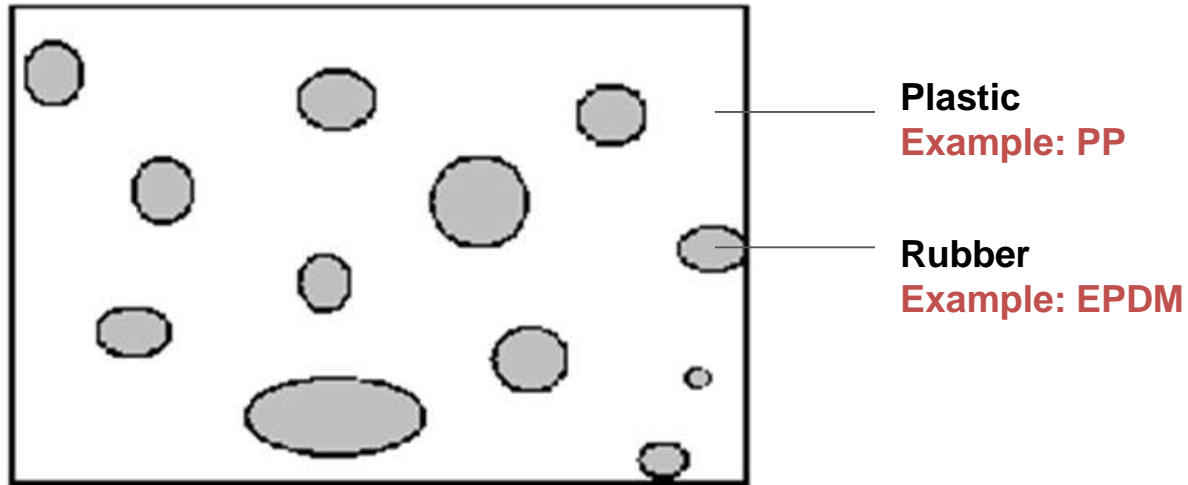
Typical Applications

- Over-molded grips and handles from toothbrushes to power tools
- Medical tubing, films, and bags
- Footwear
- Food contact & housewares
- Personal Electronics

TPE-O: Polyolefinic Rubber Blends

Elastomer-modified polyolefins

Small amount of finely dispersed regularly shaped rubber particles in a thermoplastic matrix



TPE-O: Polyolefinic Rubber Blends

Advantages

- Low cost
- Good processability
- Good UV resistance
- Good heat aging properties
- Good dimensional stability
- Good impact strength

Disadvantages

- Poor high temperature resistance
- Hardness on the higher end
- Poor elastic properties
- High compression and tension set
- Poor adhesion to polar substrates
- Poor scratch resistance

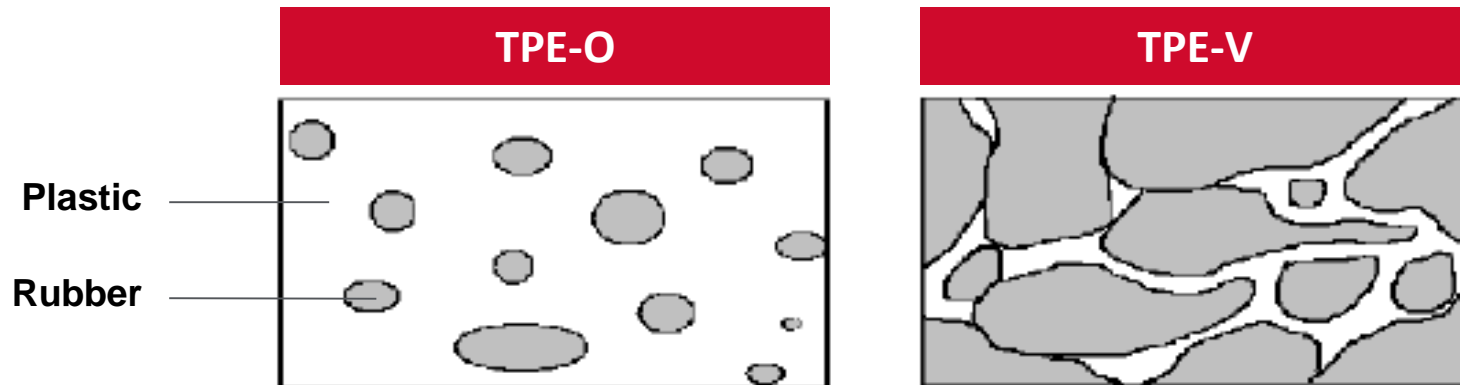
Typical Applications

- Used where there is a requirement for increased toughness and durability over conventional PP copolymers

TPE-V: Thermoplastic Vulcanizates

2 Phase Composition of PP and EPDM

Large amount of less spherical, cross-linked rubber domains in a continuous PP matrix



Dynamic Vulcanization: Rubber is vulcanized during compounding process

TPE-V: Thermoplastic Vulcanizates

Advantages

- Good elastic properties (i.e. low compression and tension set)
- Good processability
- Good chemical and fluid resistance
- UV resistant
- Good heat aging properties
- Good flex fatigue
- Broad end use temperature and hardness ranges

Disadvantages

- Poor tensile and tear strength at low hardness
- Poor abrasion and scratch resistance
- Low resilience
- Poor colorability vs. SBC's

Typical Applications

- Used where elasticity and flex fatigue is required: automotive sealing systems, weather stripping, industrial seals and gaskets

Teknor Apex TPE Technical Specifications Comparison

	TPE-S (SBC)	TPE-O (TPO)	TPE-V (TPV)
Density (g/cm ³)	0.9-1.15	0.9-1.15	0.9-1.0
Shore Hardness	5A-70D	65A-70D	25A-55D
Low Temperature Limit (°C)	-70	-60	-60
High Temperature Limit (°C)	100	110	115
Compression Set at 100°C	Good/ Excellent	Poor	Good/ Excellent
Resistance to Hydro Carbon Fluids	Poor	Poor	Fair/Good
Resistance to Aqueous Fluids	Good/ Excellent	Good/ Excellent	Good/ Excellent
Advantages	<ul style="list-style-type: none"> Compounding versatility: <ul style="list-style-type: none"> Clear, translucent, and opaque grades Matte to glossy finish Broad hardness Range: soft gel to Shore D Good processability Excellent colorability Low odor Good elasticity, tear strength and compression set at low to medium temperature ranges Bondability to many substrates 	<ul style="list-style-type: none"> Low cost Good processability Good UV resistance Good heat aging properties Good dimensional stability Good impact strength 	<ul style="list-style-type: none"> Good elastic properties (i.e. low compression and tension set) Good processability Good chemical and fluid resistance UV resistant Good heat aging properties Good flex fatigue Broad end use temperature and hardness ranges
Disadvantages	<ul style="list-style-type: none"> Poor high temperature performance Poor oil resistance 	<ul style="list-style-type: none"> Poor high temperature resistance Hardness on the higher end Poor elastic properties High compression and tension set Poor adhesion to polar substrates Poor scratch resistance 	<ul style="list-style-type: none"> Poor tensile and tear strength at low hardness Poor abrasion and scratch resistance Low resilience Poor colorability vs. SBC's
Typical Applications	<ul style="list-style-type: none"> Over-molded grips and handles from toothbrushes to power tools Medical tubing, films, and bags Footwear Food contact & housewares Personal Electronics 	<ul style="list-style-type: none"> Used where there is a requirement for increased toughness and durability over conventional PP copolymers 	<ul style="list-style-type: none"> Used where elasticity and flex fatigue is required: automotive sealing systems, weather stripping, industrial seals and gaskets

Project Needs?

Let's Talk.

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