PROSPECTS FOR TPEs IN A SHIFTING MARKETPLACE

PRESENTED BY:
Robert Eller
Robert Eller Associates LLC
Phone: +1-330-670-9566
Email: bobeller@robertellerassoc.com
Web Site: www.robertellerassoc.com

PRESENTED AT:
INTERNATIONAL ELASTOMER CONFERENCE 2017
CLEVELAND, OH USA
October 9, 2017
• TPE industry dynamics and effects of maturing markets (including commoditization)

• Examine how the TPE market and industry structure are changing

• Identify market demand drivers

• TPE inter-material competitions
  - intra-TPE
  - TPE vs. rubber

• Identify and examine future-oriented innovation strategies for TPEs

• Examine effects of globalization
TPE FAMILIES . . . CHANGING COMPOSITION, POEs AS MODIFIERS BROADENED PROPERTY FOOTPRINTS

- H-SBC
- SIS
- SBS

- SILICONE
- ACRYLATES
- NEW ENTRANTS(d)
- POLYAMIDE AS MATRIX RESIN

NEW LOW MW GRADES OPEN NEW APPLICATIONS

PP/WHMW EPDM BLENDS ENTERING

Notes: = Production dominated by resin suppliers
(a) Recyclate-based TPV
(b) e.g. Dow Infuse™ olefin block copolymers
(c) Specialty grades of TPE produced by independent compounders or in-house via reactive compounding
(d) e.g. Hipex from Kraiburg®
(e) e.g. COPE, COPA, TPU; PVC-based TPEs not shown

SOURCE: ROBERT ELLER ASSOCIATES LLC, 2017
AUTOMOTIVE TPE MATURITY CURVE

INTRODUCTION

SOURCE: ROBERT ELLER ASSOCIATES LLC, 2017
TPE INDUSTRY DYNAMICS CHANGE WITH MATURITY

- **DOMINATED BY MAJORS**
  - Technology proliferates

- **GROWTH**
  - Overcapacity in compounding and some raw materials
  - Prices decline: competitive intensity
  - Western transplants to Asia learn quality/price tiering → re-shape product line

- **MATURITY**
  - Some majors reduce participation or sell
  - Some majors seek specialties

- **DECLINE**
  - Smaller compounders enter
  - Distribution channels broaden

**SOURCE:** ROBERT ELLER ASSOCIATES LLC, 2017
TPE INDUSTRY STRUCTURE

• Supplier types: both forward-integrated resin companies and independent compounders are present in the TPE supplier chain

• Forward-integrated resin companies: are dominant in polyolefin based TPEs and condensation polymer-based TPEs. Examples are:
  - Borealis (TPOs)
  - DSM (COPEs)
  - ExxonMobil (TPVs)
  - Kraton (SBC resin supplier, sold some portions of compounding business to PolyOne)
  - Lubrizol (TPUs)

• Independent compounders: typically offer a range of TPE types. Examples are:
  - Hexpol
  - Kraiburg
  - PolyOne
  - TeknorApex (recently acquired o-TPV compounding business from DSM)
  - Washington Penn

SOURCE: ROBERT ELLER ASSOCIATES LLC, 2017
## WHAT CUSTOMERS WANT FROM TPEs (EXAMPLES)

<table>
<thead>
<tr>
<th>FEATURE</th>
<th>TPE</th>
<th>STATUS</th>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft touch</td>
<td>SBC, TPO</td>
<td>Current(a)</td>
<td>Auto</td>
</tr>
<tr>
<td>Silky feel</td>
<td>SBC, s-TPV(b)</td>
<td>- Silicone-based</td>
<td>- Mobile electronics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- s-TPV was first</td>
<td>- Auto interiors</td>
</tr>
<tr>
<td>Wet grip</td>
<td>SBC</td>
<td>Available</td>
<td>Multiple markets</td>
</tr>
<tr>
<td>Improved compression set</td>
<td>SBC, o-TPV</td>
<td>Still targeting</td>
<td>- Seals, gaskets</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Multiple markets</td>
</tr>
<tr>
<td>Lower hardness w/o compromise</td>
<td>TPU, TPO, SBC</td>
<td>- TPO starting</td>
<td>- Coated fabrics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- TPU difficult</td>
<td>- Grips</td>
</tr>
<tr>
<td>Higher temp resistance</td>
<td>o-TPV, s-TPV, COPE</td>
<td>Battleground at &gt;150° C</td>
<td>Auto under-hood</td>
</tr>
<tr>
<td>Controlled cell size in foams</td>
<td>SBC, TPU(c), o-TPV</td>
<td>O-TPV and SBC limited success</td>
<td>- Vibration damping</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Footwear</td>
</tr>
<tr>
<td>Scratch Resistance</td>
<td>TPO</td>
<td>Improvement needed</td>
<td>Has been long term objective</td>
</tr>
<tr>
<td>Sealing like butyl rubber</td>
<td>New s-TPV?</td>
<td>Seeking</td>
<td>Medical stoppers, septums</td>
</tr>
</tbody>
</table>

Note:
(a) Via coatings in auto
(b) Via silicone-based s-TPV. Note combination of soft touch and silky feel
(c) TPU’s recent entry via bead foam (see slide)

SOURCE: ROBERT ELLER ASSOCIATES LLC, 2017
AUTO BODY GLAZING SEALS: o-TPVs AND SBCs CHALLENGING EPDM

Window encapsulation (wincap)
Door seals
Hood seals
Glass run channels (GRC)
Inner belt/outer belt seals
Upper reveals/appliques
Auxiliary seals
Rear compartment seals

SOURCE: HENNIGES AUTOMOTIVE
BODY/GLAZING SEAL CHALLENGES/DEVELOPMENTS

• Dominant Incumbent: EPDM

• TPE Challengers: o-TPV, SEBS

• Dynamic vs. static requirements differ:
  - Dynamic seals require low compression set
  - Acoustic/wind noise performance (requirements increasing)
  - Adhesion (to glass, polycarbonate)
  - Parts integration opportunities
  - Surface friction properties (controlling COF)
  - Meeting regional performance differences
  - Overcoming institutional resistance
  - Small cars (lower requirements, profitability challenge)

• Movement into:
  - primary door seals
  - trunk seals
INTRA-TPE COMPETITION: CASCADE EFFECT TO LOWER COST TPEs WHERE FEASIBLE

r-TPO \(\rightarrow\) TPO(a) \(\Leftarrow\) COMPETE \(\rightarrow\) PP COPOLYMER

COMPETE

r-TPO(a) \(\rightarrow\) SEBS \(\rightarrow\) COMPETE \(\rightarrow\) O-TPV \(\Leftarrow\) p-TPV;

PP/UHMW-EPDM(b);

OR TPVs BASED ON UHMW-EPDM/PA

- LIMITED AUTO APPLICATIONS TO DATE:
- NEW APPLICATIONS
  - ACOUSTICS/DAMPING
  - SKINS

Note:
(a) Reactor TPO and SBS attacking SEBS
(b) e.g PP/UHMW EPDM (xlinked) blends

SOURCE: ROBERT ELLER ASSOCIATES LLC, 2017
## COMPETITION INCREASING BETWEEN TPEs AND RUBBERS

<table>
<thead>
<tr>
<th>THERMOSET RUBBERS</th>
<th>TPE COMPETITORS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SBC’s</td>
</tr>
<tr>
<td>Styrene Butadiene (SBR)</td>
<td>X</td>
</tr>
<tr>
<td>Natural Rubber (NR)</td>
<td>X</td>
</tr>
<tr>
<td>Butyl (IIR)</td>
<td></td>
</tr>
<tr>
<td>EPDM (Key o-TPV ingredient)</td>
<td>X</td>
</tr>
<tr>
<td>Chloroprene (CR)</td>
<td></td>
</tr>
<tr>
<td>Chlorosulfonated PE (CSM)</td>
<td></td>
</tr>
<tr>
<td>Nitrile NBR)</td>
<td></td>
</tr>
<tr>
<td>Epichlorohyrin (ECO)</td>
<td></td>
</tr>
<tr>
<td>Acrylate</td>
<td></td>
</tr>
<tr>
<td>Fluoroelastomer</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** ROBERT ELLER ASSOCIATES LLC, 2017
## THE THERMOSET RUBBER/TPE INTERFACE

<table>
<thead>
<tr>
<th><strong>THERMOSET RUBBERS</strong></th>
<th><strong>THERMOPLASTIC ELASTOMERS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Requires curing (xlinking) in the tool</td>
<td>Melt processable</td>
</tr>
<tr>
<td>Formulation: fabricator</td>
<td>Formulation: compounding</td>
</tr>
<tr>
<td>High scrap with little value (disposal costs)</td>
<td>Recyclable/reprocessable</td>
</tr>
<tr>
<td>Dirty (formulation in plant)</td>
<td>Clean (formulation at compounding)</td>
</tr>
<tr>
<td>Any color as long as it is black</td>
<td>Colorable</td>
</tr>
<tr>
<td>Rubber vulcanizing equipment</td>
<td>Plastics process equipment</td>
</tr>
<tr>
<td>Aged capital base</td>
<td>Less energy intense</td>
</tr>
<tr>
<td>Labor intense</td>
<td>High productivity/less flash scrap</td>
</tr>
<tr>
<td>Lower raw material costs</td>
<td>Lower part cost</td>
</tr>
<tr>
<td>Better foaming technology</td>
<td>Improved material uniformity</td>
</tr>
<tr>
<td>Better compression set properties</td>
<td>Improved dimensional control</td>
</tr>
<tr>
<td>Better hysteresis properties</td>
<td>Lighter weight</td>
</tr>
<tr>
<td>Less design flexibility</td>
<td>Shorter cycle times</td>
</tr>
</tbody>
</table>

Source: Robert Eller Associates LLC, 2017
TPVs HAVE HIGH CONCENTRATIONS OF EPDM

<table>
<thead>
<tr>
<th>INGREDIENT</th>
<th>phr</th>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPDM(a)</td>
<td>150</td>
<td>- Ultra high molecular weight semi-crystalline type</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Contains 5.5%ENB(b)</td>
</tr>
<tr>
<td>Oil</td>
<td>50</td>
<td>To improve processability</td>
</tr>
<tr>
<td>PP (MFI=0.3)</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>ZnO</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Phenolic cure agent</td>
<td>2</td>
<td>Peroxides also (less commonly) used</td>
</tr>
<tr>
<td>Tin Chloride</td>
<td>1.25</td>
<td></td>
</tr>
<tr>
<td>Irganox 1010</td>
<td>1</td>
<td>Antioxidant</td>
</tr>
<tr>
<td>Talc</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>250.25</td>
<td></td>
</tr>
</tbody>
</table>

For typical 70 Shore A with compression set (24hr/70C of 48%): SOURCE: ARLANXEO
(a) For example K9565Q from Arlanxeo(UHMW-EPDM)
(b) For adequate cure rate
EPDM: GROWING AND IMPROVING IN TPVs BUT CHALLENGED IN POLYMER MODIFICATION MARKETS BY POEs

TPV

PP(b) + EPDM(a) + X-linker

Crosslinked

GROWTH

EPDM

TPO

(PP + EPDM)

PP + POE

Non-crosslinked

DECLINE

PP + EPDM/POE

Note:
(a) Recent introduction of high MW EPDMs (Keetan 9565Q, for example) yields TPVs with improved low temp flexibility, low permanent set
(b) Polyamides can also be used as the matrix resin

SOURCE: ROBERT ELLER ASSOCIATES LLC, 2017
<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th></th>
<th>2016</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NA/E  China</td>
<td>India</td>
<td>NA/E  China</td>
<td>India</td>
</tr>
<tr>
<td>EPDM Kg/veh</td>
<td>7-8  4.5-6  4-5</td>
<td></td>
<td>5.5-6  4-5  4</td>
<td></td>
</tr>
<tr>
<td>TPV Kg/veh</td>
<td>2.6  2.0  1.4</td>
<td></td>
<td>3.5-4  3.0-3.5  2.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Larger cars - Smaller cars - Average car size - Smaller cars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Higher penetration  Lower TPV penetration increases in seals penetration increases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(high growth potential)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: In NA and Europe auto represents ~ 40% of EPDM demand and ~ 50-60% of o-TPV demand
- Largest sector for both EPDM and TPV
- Battleground
- Growth sector for o-TPV (especially in China and India)

Source: Robert Eller Associates LLC 2017
GROWTH MARKET FOR SBC-TYPE TPEs: FLOOR MATS

- Early-mid growth stage
- OEMs entering to capture market
- Ability to add styling cues
- Post consumer, post industrial recycle
- High value–add
- An aftermarket product
- Key enabler: laser mapping

- Based on SEBS/SBS formulations
- Typical hardness 50-75 Shore A
- Non slip, scratch /abrasion resistant
- Can be used in multiple positions
- Easily colored
- High capital investment for molding equipment

PHOTO: THERMOFLEX CORP; HEXPOL TPE; COMMENTS: ROBERT ELLER ASSOCIATES LLC, 2017
TPE type: o-TPV
Fabrication process: Injection mold
Incumbents: SEBS, thermoset rubbers
Benefits: non-hygroscopic (no pre drying, easily colored)
High temp stability: vs SEBS
Compound supplier: Teknor Apex (Medalist MD-23100 series)

PHOTO: TEKNOR APEX
## TYPICAL o-TPV MARKETS/TRENDS IN NAFTA

<table>
<thead>
<tr>
<th>MARKET</th>
<th>SHARE (%)</th>
<th>DRIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto</td>
<td>50</td>
<td>Growth in body/glazing seals. Minor challenge by SEBS</td>
</tr>
<tr>
<td>Fluid handling</td>
<td>7-8</td>
<td>Hose/tube</td>
</tr>
<tr>
<td>Appliance/Tools</td>
<td>7</td>
<td>Tool portion shift to Asia</td>
</tr>
<tr>
<td>Building/construction</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Wire/cable</td>
<td>4</td>
<td>Some auto W/C. Challenge by COPE for high temp app’s</td>
</tr>
<tr>
<td>Personal care</td>
<td>4</td>
<td>Some shift to patient care</td>
</tr>
<tr>
<td>Food/Pharma</td>
<td>3</td>
<td>Losses to SEBS</td>
</tr>
<tr>
<td>Medical</td>
<td>3</td>
<td>Losses to SEBS. Growth of bButyl rubber based TPV?</td>
</tr>
<tr>
<td>Consumer/H’swares</td>
<td>2</td>
<td>Major shift to Asia</td>
</tr>
<tr>
<td>Electrical/electronic</td>
<td>2</td>
<td>Major shift to Asia</td>
</tr>
<tr>
<td>Sports/Leisure</td>
<td>&lt;2</td>
<td>Strong shift to Asia</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
- Most sectors have SEBS challenge
- Note importance of automotive

**SOURCE:** ROBERT ELLER ASSOCIATES LLC, 2017
<table>
<thead>
<tr>
<th>NAFTA/EUROPE</th>
<th>FLOW</th>
<th>ASIA</th>
<th>NOTE/EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 OEMs</td>
<td></td>
<td>TO BENEFIT FROM HIGH GROWTH POTENTIAL</td>
<td></td>
</tr>
<tr>
<td>2 RESIN SUPPLIERS/ COMPOUNDERS/MOLDERS</td>
<td></td>
<td>TO FOLLOW OEM CUSTOMERS</td>
<td></td>
</tr>
<tr>
<td>3 TECHNOLOGY FLOW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>DOMESTICS ESTABLISH SUPPLY CHAIN TO SERVE WESTERN TRANSPLANTS</td>
<td>TECHNOLOGY BARRIERS ARE POROUS</td>
</tr>
<tr>
<td>5 VIA ACQUISITION/ GREENFIELD</td>
<td></td>
<td>ASIAN OEMs</td>
<td>TOYOTA, KIA</td>
</tr>
<tr>
<td>6 SERVE WESTERN OEMs:</td>
<td></td>
<td>ASIAN RESIN SUPPLIERS AND COMPOUNDERS</td>
<td>IS COST ADVANTAGE TRANSFERABLE?</td>
</tr>
<tr>
<td>- BUSINESS WON IN ASIA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- EXPLOIT COST ADVANTAGE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- VIA ACQUISITIONS?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SOURCE: ROBERT ELLER ASSOCIATES LLC, 2017
HOW IS THE NAFTA TPE MARKETPLACE SHIFTING?: SUPPLY SIDE

• Increased number of compounders

• Inflow of compounders from Europe and Asia

• Reverse globalization from Asia

• Over-expansion of supply of some raw materials, especially SEBS

• Commoditization of some sectors ➔:
  - downward price pressures
  - search for specialty applications
  - target higher value sectors (medical for example)

• Entry of POEs, PP blends

• Downward cascade to lower priced TPE for over-engineered applications

SOURCE: ROBERT ELLER ASSOCIATES LLC, 2017
HOW IS THE TPE MARKETPLACE SHIFTING?: DEMAND SIDE

• Global demand growth for all TPEs ~ 5%/yr thru 2020

• Globalized marketplace/Asia the largest TPE market (~ 50 % of demand)

• Maturing of some applications → increased competitive intensity

• Competitive intensity at the rubber interface increasing/favors TPEs

• Automotive is the largest market for most TPEs (~ 40% share, dominated by TPO, TPV)

• Continued challenge to rubbers based on inherent benefits of TPEs

• Continuing demand for broadened TPE property footprint

• “Smart” applications stimulating the marketplace

SOURCE: ROBERT ELLER ASSOCIATES LLC, 2017
• Tie with electric vehicles
• Shift of some instrument panel/cockpit functions → computers vs gauges
• “Windows”/transparent sections in the surface
• Improved acoustics
• Improved EMI Shielding
• Image projection
• Sensing
• Conduction
• Signaling/data transmission

SOURCE: ROBERT ELLER ASSOCIATES LLC, 2017
SELECTIVE 3D MOLDING (ADDITIVE MFG): ROLE IN AUTO?

- Weight save potential
- Putting resin where structural requirements dictate
- Tailoring fillers
- Deposition via sintering (suited for some TPEs (e.g. SEBS, PP powders?) or from filaments

SOURCE: PLASTICS TECHNOLOGY MAGAZINE 042017; COMMENTS: ROBERT ELLER ASSOCIATES LLC, 2017
Ceramic cube:
- 50 micrometers per side, ultralight - mostly air
- strong, not brittle

Precise control of structure at nanoscale
- increased energy density of batteries with weight save
- space at nanoscale to precisely control flow of heat and light

SOURCE: MIT Technology Review, vol. 118 no. 2, Caltech
ADDITIVE MFG (AM OR 3D MOLDING): OPP’Y FOR TPEs

• Allows tailored (at nanoscale)/partially hollow (lightweight structures):
  - competes with foam? (advantage: tailoring to structural requirements)
  - conductives (circuitry, carbon nanotubes)

• Currently process-oriented:
  - sintering
  - fusion of filaments
  - direct polymerization
  - production speed has increased

• Materials potential just starting (not fully exploited):
  - TPUs, polyamides
  - SEBS, TPOs starting
  - silicones
  - fiber-reinforced?
  - suitable for lightweight fillers

SOURCE: ROBERT ELLER ASSOCIATES LLC, 2017
NEW OPPORTUNITIES FOR AUTOMOTIVE TPEs

- Sensing
- Display
- EMI shielding
- Increased soft touch
- Smart functions
- Continued pressure for lightweight solutions
- Touch functions
- Role in lighting
- Increased pressure for acoustics solutions
- Increased pressure for leather-like look
- Pressure for processing cost save
- Selective transparency

SOURCE: ROBERT ELLER ASSOCIATES LLC, 2017
PROSPECTS FOR TPEs IN A SHIFTING NAFTA MARKETPLACE?

• CONTINUED:
  - globalization of the marketplace
  - internationalization of the NAFTA market and supply chain
  - acquisitions
  - price erosion of commoditized grades
  - demand shift to Asian markets
  - growth of s-TPVs
  - “piggybacking” on new ETP developments
  - challenge to thermoset rubbers and PVC

• SHIFTS TO SPECIALTIES, WHERE POSSIBLE:
  - SEBS based on low molecular weight grades
  - COPE in higher temp applications
  - participation in high growth sensing and autonomous vehicle applications

SOURCE: ROBERT ELLER ASSOCIATES LLC, 2017
SUMMARY

• DEMAND: For the major TPEs in NAFTA (2016) was ~1850MM lbs (840 kT)

• GROWTH: For the major TPEs will average ~ 4-5%/yr driven by
  - the fundamental benefits of TPEs (e.g. thermoplastic and elastomeric)
  - extensions of current TPE benefits (soft touch for example)
  - continued substitution for thermoset rubbers
  - the fastest growth TPEs will be TPOs, SEBSs, COPEs
  - TPEs will participate in growth of specialty markets 3D molding, autonomous vehicles

• INTRA-TPE COMPETITION: Intensifying (slide 10)

• NAFTA SUPPLY CHAIN: The TPE supply chain in NAFTA is changing with shifts of compounders from Europe and Asia (reverse globalization)

• ACQUISITIONS: The wave of acquisitions in the TPE sector is likely to continue

SOURCE: ROBERT ELLER ASSOCIATES LLC, 2017
APPENDIX: LIST OF ABBREVIATIONS USED

COPE – Co-polyester type TPE. In Europe, often referred to as TPEE

COPA – Co-polyamide type TPE

POEs - Polyolefin elastomers that compete with some TPEs and are used as additives in TPE formulation. Dow’s Infuse is an example that is commonly used in SEBS formulations

PP blends – For example, ultra high molecular weight EPDM PP/UHMW EPDM)

r-TPO – Reactor TPO

s-TPV - Super TPV in which the crosslinked elastomer phase can be silicone, acrylic, EVA, butyl or other rubbers

SBC - Styrene block copolymer (includes SEBS and SBS), as well as several other types of SBCs

SBS - Styrene-butadiene-styrene copolymer, contains unsaturation (in the “B” block) hence is more susceptible to UV degradation. Sells at lower prices than SEBS but is used in some SEBS formulations
SEBS - Styrene-ethylene, butadiene-styrene copolymer based on hydrogenation of SBS. Compounds can include SBS, POEs, oils, slip additives, antioxidant, foaming agent, etc.

TPE - General descriptive term for the families of TPEs. Does not describe the TPE type, although in Asia the term “TPE” is often used to mean SBC type TPEs

TPO - Thermoplastic polyolefin. A TPE based on PP, elastomer (e.g. EPDM or POE) and various olefinic rubbers (commonly EPDM but increasingly POEs fillers (commonly talc) and (increasingly) fibrous (glass, carbon, natural fibers). Compete with PP copolymer.

TPU - Thermoplastic polyurethane-type TPE

TPV - Thermoplastic vulcanizate based on “islands” of crosslinked elastomer (usually EPDM) in a “sea” of polymer (usually PP). Compounded by dynamic vulcanization. The presence of crosslinked elastomer allows higher temperature resistance applications.
THANKS FOR YOUR ATTENTION

Robert Eller Associates LLC
CONSULTANTS TO THE PLASTICS AND RUBBER INDUSTRIES