TPE APPLICATIONS AND TECHNOLOGIES RESPOND TO RECESSION AND GLOBALIZATION

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PREPARED FOR:
TPE 2009
Frankfurt, Germany
November 11, 2009
mydox/papers/TPE 2009 ppt 110509.ppt
OUTLINE

• Macroeconomics/Globalization: Effects on TPE Markets and Technologies
• Western/Asian Differences
• China TPE Market
• Global Automotive Market
• TPE Growth Applications: Evolving Market Dynamics
• Summary
TPE(d) FAMILIES . . .
CHANGING STRUCTURE, INCREASED INTRA-TPE COMPETITION

- OBC(c) AND NANO CRYSTALLINE OLEFIN ELASTOMER(b)
  - OLEFINIC (o-TPEs)
    - COMMODITY
      - TPO *
    - s-TPO o-TPV
    - r-TPV (a)
      - p-TPV(d) (PARTIAL CROSS-LINKED)
      - f-TPV(d) * (FULLY CROSS-LINKED)
  - HYDROGENATED (H-SBC)
    - ISOPRENE-BASED MID-BLOCKS
  - f-TPV(d) *
    - p-TPV(d) (FULLY CROSS-LINKED)

- STYRENIC (SBCs)(f)
  - SBS
  - NEW ENTRANT (e.g., KRAIBURG)
  - SILICONE
  - ACRYLATES

- SUPER-TPVs
- OTHER E-TPEs
- PVC TPEs
  - COPE *
  - COPA *
  - TPU *
  - OTHERS

Notes: * = Production dominated by resin suppliers
(a) Recyclate-based TPV
(b) e.g., Notio™ from Mitsui Chemicals
(c) e.g., Dow's Infuse™
(d) In Asia, the term "TPE" is often used to describe styrenic TPEs
(e) Sometimes referred to as TPE-V
(f) Sometimes referred to as TPE-S

SOURCE: ROBERT ELLER ASSOCIATES LLC, 2009
• At Least 2-year Trough

• Global Mfg. Rebound Since April ‘09:
  - Government subsidies
  - Auto scrappage programs
  - Slowed unemployment claims
  - Slowed GDP declines

• Manufacturing Shift: West → Asia
MFG. PURCHASING MANAGERS' INDICES (PMIs)

EARLIER START TO RECOVERY IN CHINA/INDIA

RECOVERY START U.S./EUROPE

GROWTH INDEX
(<50 = CONTRACTION)

SOURCES: FINANCIAL TIMES; ROBERT ELLER ASSOCIATES LLC, 2009
WESTERN/ASIAN DIFFERENCES

• Asia (Esp. China) Rebound:
  - Faster recovery than Western regions
    -- Large, government stimulus programs
    -- Western downturn hurting exports
    -- Deep interest rate cuts

CHINA GROWTH

<table>
<thead>
<tr>
<th>Year</th>
<th>GDP Growth, %</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>11.9</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>10.0</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>7.8</td>
<td>Growth due to gov’t. programs and some gain in the domestic economy</td>
</tr>
<tr>
<td>2010</td>
<td>9.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Robert Eller Associates LLC – Asia Div., 2008
WESTERN/ASIAN DIFFERENCES (Cont’d.)

• TPE Market Sectors:
  - Europe and U.S. similar demand distribution
  - Auto applications dominate (~40% of demand)
  - Broad demand distribution amongst other mkts.

• TPE Demand in West Impacted By:
  - Recession conditions
  - Severe auto production downturn
  - Consumer end market production shift to Asia
GERMAN MANUFACTURING AS % OF GDP

SOURCES: UNICREDIT RESEARCH; ROBERT ELLER ASSOCIATES LLC, 2009
b/mydox/TPE Frankurt 2009/TPE sectors.xls
GLOBAL AUTOMOTIVE MARKET

- Largest single market for olefinic and styrenic TPEs, even in China
- Global automotive vehicle production fell sharply in 2008/2009
- Global recession/high fuel prices/carbon footprint awareness create new auto TPE paradigm:
  - Fleet composition shift to smaller vehicles
  - Extensive use of government incentives (scrappage/CO₂) → short-term sales stimulus
  - Strong support for electric drive/battery vehicles
  - Moderate fuel economy (CAFE) shift in U.S.
DEMAND SHARES FOR TPE COMPOUNDS
BY SECTOR FOR SPECIALTY TPEs

SOURCE: ROBERT ELLER ASSOCIATES LLC, 2009
b/mydox/TPE Frankfurt 2009/TPE sectors/xls
GLOBAL VEHICLE SALES OUTLOOK

42% in 15 emerging markets; 58% in Europe/U.S./Japan

Annual Growth
1990-2000 2.4%
2000-2005 3.6%
2005-2015 1.3%

2000: 57
2009: 9% DECLINE FOLLOWED BY RECOVERY IN 2010/2011
2015: 77MM

SOURCE: ROBERT ELLER ASSOCIATES LLC, 2009
r/mydox/Auto Industry/Global Ind Volume TW 081209.xls
U.S. AND EUROPE LIGHT VEHICLE SALES

SALES, MM UNITS

SOURCE: DEUTSCHE BANK, 2009

B/mydox/auto industry/NA and EUR sales.xls
THE OIL PRICE ROLLER COASTER: AUTOMOTIVE TPE DEMAND

Have the 2008 fuel price spike and tipping point permanently shifted:

- fleet composition?
- lightweighting incentives?
- break-even volumes?

**REGIONAL DIFFERENCES IN \( \text{o-TPV} \) USAGE IN AUTOMOTIVE**

**o-TPV Penetration in Auto Still Low in China/India**

<table>
<thead>
<tr>
<th></th>
<th>kg/Vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Global</td>
</tr>
<tr>
<td>2005:</td>
<td>2.1</td>
</tr>
<tr>
<td>2010:</td>
<td>2.6</td>
</tr>
</tbody>
</table>
AUTO TPE GROWTH APPLICATIONS

• China/India auto o-TPV growth opportunity

• Auto lightweighting:
  - Driven by fuel price increases
  - TPO growth in exterior panels (e.g., Ford Kuga)

• Rubber challenge continues
  - High heat and oil resistance
  - Body/glazing seal substitution continues

• Reduced cost luxury auto interiors (small car effects)

• TPO solar opportunities (PV roof/wall shingles)

• Halogen-free, flame retardant (mobile electronics)
W. EUROPEAN VEHICLE MARKET SHARE SHIFT

SALES SHARE, %

2005
2009 (EST)

FLEET MARKET SEGMENT

A/B
C/D

Sources: JD Power; Deutsche Bank; Robert Eller Assoc. LLC, 2009
NEW AUTO PARADIGM: TPE EFFECTS

• Drives up the value of weight savings: 10% wt. reduction → 7% fuel economy improvement

• Further restructuring of auto supply chain

• Encourage parts consolidation

• Encourage PP compound demand (esp. glass fiber/PP) → stimulates use of olefinic TPEs

• Favors TPE systems applications
MACROECONOMIC DRIVERS, NEW PARADIGMS, & AUTO TPE OPPORTUNITIES

GLOBAL RECESSION
- AUTO SALES DECLINE, SLUGGISH RECOVERY
- OEM MARKET SHARE SHIFT
- SHIFT OF TECHNICAL CHOICES
- AVOID CAPEX
- MAXIMIZE EXISTING TECHNOLOGY
- IN-MOLD DECORATION SURFACING METHODS
- DIRECT COMPO'DG.(a)
- 2-SHOT MOLDING
- IN-MOLD FOAMING
- TPV, SEBS BODY/GLAZING SEALS

ENERGY/ENVIRONMENTAL DRIVERS
- FUEL EFFICIENCY
- CO₂ DISCHARGE LEGISLATION
- ELECTRIC DRIVE
- HYBRIDS
- INCREASED VALUE FOR LIGHTWEIGHT SOLUTIONS
- BATTERY RELATED SUBSTITUTES
- LGF-PP BODY STRUCTURE
- TPO OUTER SKINS
- WIRE/CABLE JACKETING
- SOFT TOUCH VIA SEVERAL TECHNOLOGIES

FUEL PRICE INCREASE (DEMAND, TAXATION)
- GLOBAL FLEET COMPOSITION SHIFT TO SMALLER VEHICLES
- INCREASED VALUE FOR PERCEIVED INTERIOR LUXURY
- TPO DEMAND SHIFT TO EMERGING REGIONS
- THERMO-FORMED TPO SHEET, LOW COST TOOLING

EMERGING MARKET SHIFTS
- EMERGING MIDDLE CLASS
- ECONOMICALLY TRAILING CLASS
- LOW COST VEHICLE DESIGNS
- 2-WHEELERS

Note: (a) DIRECT COMPOUNDING = D-LFT, AT-PRESS FILLER ADDITION, ETC.

SOURCE: ROBERT ELLER ASSOCIATES LLC, 2009
• China: Key role in global TPE demand/demand growth

• Unique Characteristics:
  - Largest regional TPE market
  - Highest regional growth rate (’09 – ’14)
  - Western transplant compounders/resin suppliers must compete with domestic suppliers
    -- Significant domestic cost/market access advantage
  - Highly export oriented
  - Rapid domestic market growth (limited focus to date by Western transplant compounders)
EXHIBIT 4: DURABLE GOODS OWNED PER 100 URBAN HOUSEHOLDS IN CHINA

SOURCES: CHINA NATIONAL BUREAU OF STATISTICS
ROBERT ELLER ASSOCIATES LLC 2009

DURABLE GOODS OWNED PER 100 URBAN HOUSEHOLDS IN CHINA

Motorcycle
Refrigerator
Air Conditioner
Color TV
Computer
Mobile Telephone
Car

UNITs/100 HOUSEHOLDS


SOURCES: CHINA NATIONAL BUREAU OF STATISTICS
ROBERT ELLER ASSOCIATES LLC 2009

r/mydox/China/China Durable Goods 09.ppt
CHINA TPE MARKETS: QUALITY TIERING

• Accommodates Different Target Market Segments

• Domestic Quality Tiers (Global/Local): Substantially under-served by Western TPE compounders
CHINA TPE MARKETS: GLOBALIZATION AND LOCALIZATION COMPETITION

• Globalization:
  - Meet global specifications and quality standards
  - Serve global OEMs from China
  - Mfg. base starting to shift to other regions

• Localization:
  - Global compounders in China localize raw materials supply chain
  - Target domestic Chinese OEMs and transplant OEMs
  - (Often) using different TPE compounds for domestic customers
CHINA DOMESTIC TPE COMPOUNDER ADVANTAGES vs. TRANSPLANTS

• Utilize local raw materials; broader range of raw material types and sources

• Lower labor costs than Western transplant compounders

• Lower capital depreciation costs (by factor of 4-10X)

• Lower packaging costs

• Lower shipping costs

• Government subsidies

• Government funded R&D institutes
## QUALITY/PERFORMANCE TIERING IN THE CHINA TPE MARKET

<table>
<thead>
<tr>
<th></th>
<th>QUALITY</th>
<th>PERFORMANCE</th>
<th>SERVICE</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Glocal</td>
<td>Near Global</td>
<td>Near Global</td>
<td>Moderate</td>
<td>Near Global</td>
</tr>
<tr>
<td>Local</td>
<td>Local standards</td>
<td>Local requirements</td>
<td>Low</td>
<td>Local</td>
</tr>
<tr>
<td>Low End</td>
<td>Low</td>
<td>Low</td>
<td>None</td>
<td>Low</td>
</tr>
</tbody>
</table>

Source: Robert Eller Associates LLC, 2009
## QUALITY TIERING OF CHINA MARKETS

<table>
<thead>
<tr>
<th>MARKET SEGMENT</th>
<th>PRODUCT/QUALITY DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global</td>
<td>Products produced for global market, meeting global quality and performance standards at global pricing</td>
</tr>
<tr>
<td>Glocal *</td>
<td>Products produced for domestic and export markets with near global quality and performance standards, with near global pricing</td>
</tr>
<tr>
<td>Local *</td>
<td>Products produced for the local market, meeting local performance, quality, and price requirements</td>
</tr>
<tr>
<td>Low End *</td>
<td>Products marketed based solely on price, with low concern for quality and performance</td>
</tr>
</tbody>
</table>

Note:  * = Will gain share in global recession

Source: Robert Eller Associates LLC, 2009
# EXAMPLES OF TPE QUALITY TIERING

<table>
<thead>
<tr>
<th></th>
<th>GLOBAL</th>
<th>GLOCAL</th>
<th>LOCAL</th>
<th>LOW END</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toothbrush Supplier</td>
<td>Colgate Palmolive</td>
<td>San Xiao</td>
<td>San Xiao</td>
<td>1-time use (e.g., hotel amenities)</td>
</tr>
<tr>
<td>SEBS Compound Supplier</td>
<td>GLS Thermoplastic Elastomers/ PolyOne</td>
<td>Hotai</td>
<td>TSRC</td>
<td>Not used</td>
</tr>
<tr>
<td>Typical Compounding Extruder Supplier/Type</td>
<td>Coperion ZSK: designed &amp; mfd. In Germany</td>
<td>Coperion STS: designed &amp; partially made in Germany, remainder made in China; Cost ~40% of ZSK</td>
<td>Coperion CTE: designed &amp; mfd. In China; Cost ~15% of ZSK</td>
<td></td>
</tr>
<tr>
<td>SEBS Resin Supplier</td>
<td>Kraton</td>
<td>TSRC</td>
<td>Baling</td>
<td>Wide spec</td>
</tr>
<tr>
<td>o-TPV Supplier</td>
<td>-ExxonMobil (Santoprene)</td>
<td></td>
<td>Shandong Dawn-BH Elastomer Co. (Dawnprene)</td>
<td></td>
</tr>
</tbody>
</table>

Source: Robert Eller Associates LLC, 2009
CHINA INVESTMENT BY WESTERN COMPOUNDERS

• Accelerated prior to recent downturn

• Some majors elected not to invest in local manufacturing facilities:
  - Kraton
  - Dynasol
  - ExxonMobil
  - DSM

• Recent lifting of import duties from Singapore into China suggests Singapore will continue to see investment by Western (and Japanese) TPE suppliers
TPE GROWTH APPLICATIONS RESULTING FROM EVOLVING MARKET DYNAMICS

- Automotive Lightweighting
- The Rubber Challenge Continues
- Solar Opportunities
- Halogen-free, Flame Retardant (HFFR)
- Bio-based TPEs
- Breathability
### EXAMPLES OF RECENT NEW TPE APPLICATIONS

<table>
<thead>
<tr>
<th>SECTOR</th>
<th>APPLICATION</th>
<th>TPE TYPE</th>
<th>KEY TPE PROPERTIES</th>
<th>SOURCE/NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto</td>
<td>Tailgate spoiler</td>
<td>SEBS</td>
<td>- Injected adhesive to bond engineering plastic layers</td>
<td>- Kraiburg for BMW</td>
</tr>
<tr>
<td></td>
<td>Windshield seal</td>
<td>SEBS</td>
<td>- Glass bonding with single component overmolding - High flow properties</td>
<td>- SEBS TPEs challenging EPDM in this high performance application - o-TPVs also challenging EPDM</td>
</tr>
<tr>
<td></td>
<td>Triple co-</td>
<td>o-TPV</td>
<td>- Compression set - Dimensional stability - Foamability? - Surface quality</td>
<td></td>
</tr>
<tr>
<td></td>
<td>extruded glazing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>profiles</td>
<td></td>
<td>- Uses 2-3 co-extruders to produce o-TPV/PP compound, rigid/flexible profiles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-&gt;3 coextrusions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fiber reinforced</td>
<td>TPO</td>
<td>- Soft touch with sufficient stiffness/impact</td>
<td>- From LyondellBasell, Dow, ExxonMobil</td>
</tr>
<tr>
<td></td>
<td>soft touch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heat/Oil resistant applications, gaskets, etc.</td>
<td>super TPVs</td>
<td>- Heat and oil resistance</td>
<td>- DuPont, Multibase, Nippon Zeon, - Kraiburg (recently) - COPE challenge?</td>
</tr>
<tr>
<td>Wire/Cable</td>
<td>SEBS, TPO/TPV, TPU</td>
<td>- High temperature, flame retardant requirements</td>
<td>- XLPE, PVC are key incumbents</td>
<td></td>
</tr>
<tr>
<td>Mobile Electronics</td>
<td>Wire/Cable</td>
<td>SEBS</td>
<td>- Meet HFFR regulations - Low smoke - Low oxygen index</td>
<td>- f-PPE is key HFFR incumbent - Meet RoHS/WEEE requirements - See REA database</td>
</tr>
<tr>
<td></td>
<td>Earplugs, cell phones</td>
<td>super TPV</td>
<td>- Silky touch</td>
<td>- e.g., TPSiV (Dow Corning)</td>
</tr>
<tr>
<td>Solar Modules</td>
<td>Wire/Cable</td>
<td>SEBS, o-TPV</td>
<td>- Meet HFFR regulations - Heat resistance</td>
<td>- Solar is growth sector</td>
</tr>
<tr>
<td></td>
<td>Gaskets</td>
<td>o-TPV</td>
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<td></td>
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(Cont’d.)
### Examples of Recent New TPE Applications (Cont’d.)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Application</th>
<th>TPE Type</th>
<th>Key TPE Properties</th>
<th>Source/Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar Modules</td>
<td>Shingles</td>
<td>TPO</td>
<td>-PV on TPO substrate</td>
<td>- Example of TPO expanding from auto</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-PVC substitution</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>-Kink resistance</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>-Low modulus</td>
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<td></td>
<td></td>
<td></td>
<td>-Processability</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-Heat sterilization</td>
<td></td>
</tr>
<tr>
<td>Medical</td>
<td>-IV sets</td>
<td>SEBS, TPO</td>
<td>-Compression set</td>
<td>- Highly dependent on government regulations</td>
</tr>
<tr>
<td></td>
<td>-other applic.</td>
<td></td>
<td>-UV resistance</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-Processability</td>
<td></td>
</tr>
<tr>
<td>Building/ Construction</td>
<td>Gaskets</td>
<td>SEBS, o-TPV</td>
<td>-Compression set</td>
<td>- More advanced in Europe than U.S.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-UV resistance</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-Processability</td>
<td></td>
</tr>
<tr>
<td>Multiple sectors</td>
<td>Bio-based TPEs</td>
<td>TPU, SEBS</td>
<td>-Food contact</td>
<td>- Merquinsa</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Kraiburg</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- GLS/PolyOne</td>
</tr>
<tr>
<td></td>
<td>Improved grades for PP modification</td>
<td>SEBS</td>
<td>-Fine dispersion/ transparency</td>
<td>- Kraton</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-Impact modification</td>
<td>- Film/sheet applications</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-Avoid oil</td>
<td>- Notio™ (Mitsui Chemicals) competes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-Scratch resistance</td>
<td></td>
</tr>
<tr>
<td>Consumer Disposables</td>
<td>Biodegradable TPEs</td>
<td>SEBS? TPU?</td>
<td>-Biodegradability</td>
<td></td>
</tr>
<tr>
<td>Membrane, Breathable</td>
<td>-Desalination</td>
<td>modified (sulfonated) SBC</td>
<td>-Breathable/impermeable</td>
<td>- Kraton</td>
</tr>
<tr>
<td></td>
<td>-Breathable fabrics</td>
<td></td>
<td></td>
<td>- TPU is major incumbent</td>
</tr>
</tbody>
</table>

**Source:** Robert Eller Associates LLC, 2009
TPO/o-TPV:
MAJOR AUTO GROWTH SECTOR

• New soft touch candidates/fabrication technology

• TPO demand stimulation from reinforced PP compound growth
Application: Roof spoiler, tailgate outer panel
Grade: LyondellBasell Hifax TRC 280X
Molder: Plastal

REA Notes:
- Inner panel is LGF-PP compound
  (Stamax from SABIC)

Photo: Robert Eller Associates LLC
HATCHBACK DOOR INNER:
GROWTH APPLICATION FOR LGF-PP

Part: Hatchback door inner panel
Material: 40% LGF-PP
Status: Prototype
Molder: Plastal
Process: D-LFT (injection)
Equipment: Krauss Maffei
Note: Competes with LGF-PP compound

Photo: Krauss Maffei
r/mydioxpapers/apetpo2009pix.ppt
• Small vehicle share increase:
  - drives towards higher quality interiors without high cost of multi-step processes
  - new generation of glass fiber reinforced, molded-in color TPOs with soft touch surface for interiors:
    -- improved scratch and mar
    -- low knit line visibility
    -- low gloss
    -- compete with soft touch paints/ thermoformed or slush molded skins
MERCEDES SMART FORTWO TAILGATE: PRECURSOR FOR LGF-PP AND TPO IN BODY STRUCTURES?

- E-LF-PP gives high load bearing and impact absorbency
- Translation potential for rear seat backrest

Source: Weber Automotive; ESORO AG

- 20% stiffness increase vs. earlier version
- LGF-PP move into body structures
- Early use of E-LF-PP (endless long fiber polypropylene)
- Mineral-filled TPO exterior skin
DESIGN CONCEPT FOR E-LGF-PP BASED COMPACT CAR BODY STRUCTURE

Source: Weber Automotive; ESORO AG

Thermoset competition?
EXAMPLE OF LGF-PP & E-LF-PP DIRECT PROCESS

Source: Robert Eller Associates LLC, 2009
SOME TPE LIFE CYCLE POSITIONS

• Early Growth Auto TPOs:
  - Soft touch
  - Exterior body panels
  - Body structures?

• Early Growth SBCs:
  - Bio-based (also TPU s)
  - Body/glazing seals
    (competes with EPDM and o-TPV)
  - HFFR/PVC replacement
    (mobile electronic wire and cable growth)
AUTO TPO LIFE CYCLE POSITIONS

SOURCE: ROBERT ELLER ASSOCIATES LLC, 2009

= ESTIMATED FUTURE DIRECTION

NOTES:
(a) LGF-PP = LONG GLASS FIBER PP; E-LF-PP = ENDLESS (E.G., TAPE REINFORCED) LONG FIBER PP
(b) INCLUDES THIN PP (TPO) FILM TECHNOLOGY INTRODUCED IN EUROPE (BY JCI, OTHERS)
SBC TPE LIFE CYCLE EXAMPLES

**TECH REQUIREMENTS**

- HIGH
  - SOFT TOUCH AUTO
  - BODY/ GLAZING SEALS (AUTO, B/C)
  - PVC REPLACEMENT

- MED
  - BIODEGRADABLE GRADES

- LOW

**DEVELOPMENT**

**INTRODUCTION**

**EARLY GROWTH**

**MATURE**

- HFFR

- SOFT TOUCH NON-AUTO (a)

- FOOTWEAR

**NOTE:** (a) SOFT TOUCH GROWING IN AUTOMOTIVE

**SOURCE:** ROBERT ELLER ASSOCIATES LLC, 2009
SUMMARY

- Global TPE Demand: affected by end use market shift to Asia

- Auto:
  - High share of demand and growth
  - Severe recession demand effects
  - China auto growth will stimulate demand
  - New auto paradigm
  - New applications will stimulate TPO, o-TPV, SBC
• China TPE Market:
  - Export/slowdown impacts
  - High growth domestic (glocal/local markets)
  - Western vs. domestic compouder competition

• High Heat/Oil Resistance: stimulated by new entrant?

• HFFR/Low Smoke: wire and cable stimulates several TPEs

• TPE Profitability in the New Paradigm – REA’s client focus
c-TPO – compounded TPO
CAFE – Corporate Average Fuel Economy (U.S.)
COPE – copolyester-type TPE
GDP – gross domestic product
HFFR – halogen-free, flame retardant
LGF-PP – long-glass fiber reinforced polypropylene
LGF-TP – long-glass fiber reinforced thermoplastic
MNC – multinational company or compounder
o-TPV – olefinic TPV
PP – polypropylene
r-TPO – reactor TPO
SBC – styrene block copolymer type TPE (may be SEBS or SBS)
TPE – thermoplastic elastomer (all classes of thermoplastic
elastomer; SBC, TPO, o-TPV, TPU, etc.); note in some
regions (e.g., Asia), “TPE” is used to refer to SBC-type TPEs
TPO – thermoplastic polyolefin
TPU – thermoplastic polyurethane
CHINA: STRATEGIC RIVAL OF WEST?

- Global Power Position: Emerging power, comparable to U.S. at start of 20th century
- Economic Expansion: Outpaces West
  - 8.9% in 3Q/09 vs. 3.5% in U.S.
  - Provides economic leverage
  - Will soon overtake Japan as global #2 economy
  - Larger than U.S. economy by 2040-2050
- Largest Global Exporter
  - 1 year trade surplus = US$250BN
  - U.S. largest export target
    (trade deficit = US$575BN [12% Wal-Mart])
  - Flood of cheap, Chinese-manufactured goods swamping global economies (job implications)
CHINA: STRATEGIC RIVAL OF WEST? (Cont’d.)

• Largest Creditor Nation (holding $2 trillion in USD assets)
  -Provides huge trade leverage over U.S.
  -Could threaten dollar exchange rate

• Voracious Raw Material Demand (political implications)

• Dominant Economic Player in SE and NE Asia

• Key Global Power (influence on global disputes, e.g., N. Korea and Iran)

• Massive Military Modernization Program

• Building Port Facilities in Pakistan, Sir Lanka, Myanmar → ? major global naval power