

TPE opportunities in a recessionary shifting automotive interior environment

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Recessionary conditions will affect both the supply and demand sides of the auto sector and disrupt/reconfigure the auto interior supply chain. The composition of auto sales is changing. Some segments (e.g. compact utility vehicles, CUVs) are becoming saturated, EVs and hybrids will show strong gains in market share, especially in North America.

1 Introduction

Auto interiors, a significant TPE market, must accommodate and can benefit from changes in:

- drive train, especially electrification and hybrids
- space configuration shifts
- internal and external electronic signal sending and receiving
- product differentiation in saturated segments (e. g. CUVs).

New opportunities for TPEs in auto interiors will result from new technologies such as:

- 5G communications
- signal sending/receiving performance (smart materials)
- acoustic requirements
- enhanced cleanability requirements.

2 Smart interiors

The evolution of smart auto interiors with the ability to handle massive amounts of

data and image projection will increase demand for TPEs that are able to incorporate or encapsulate devices responsive to external stimuli (stress, temperature, moisture, electric or magnetic fields, light, or the growing need to participate in 5G systems).

Incorporation of these capabilities can be either:

- internal to the TPEs via compounding (smart fillers that are electro-active, conductive, photochromic/photosensitive, piezoelectric), or
- external via lamination or insert molding of plastronics.

3 The evolution of auto interior or TPE components

As shown in **figure 1**, auto interior TPEs have evolved via versatile new fabrication technologies, from simple monolithic structures to systems that integrate a range of smart capabilities.

As shown in **figure 2**, plastronics are structures that incorporate electronic components into rigid or flexible plastic components where sensing, sending or display functions are required.

The smart TPE function can be either external to the molded part (via laminates or insert molding) or internal to the molded part via smart fillers or additives as illustrated in **figure 3**.

4 COVID effects on TPEs and auto interiors

The COVID threat will likely remain for several years beyond the steep 2020 vehicle sales decline and slow recovery starting in 2021. Interiors will be a target for sensing, sending, display, and vehicle positioning leading to an increased need for data (via both available and new technology). 5G systems will have a role in accelerating data requirements. Cleanability will be a more important functional value for skins, trim pan-

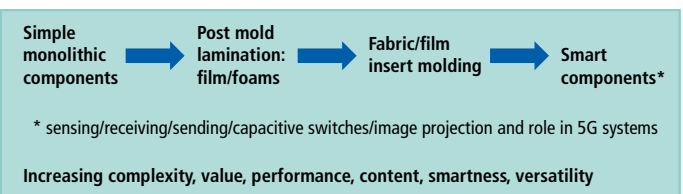


Fig. 1: Evolution of auto interior TPE components interior smart TPEs

Targets: Where sensing, sending or display functions are required

Definition: Incorporating electronic components/sensors into rigid plastics and TPEs

Includes: Use of flexible electronics

Benefits: -allow lightweight, flexible devices that can be integrated
→ complex geometries
-low cost compared to silicon-based components
-scalable to high volume production

Structure: On the substrate (e.g. capacitive switches) or incorporated into the TPO/ TPE

Fig. 2: Plastronics

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els, seating and floor mats). **Figure 4** provides a summary of how COVID is affecting auto interiors and the TPEs used therein.

5 COVID supply chain effects

COVID will impact both the supply and demand sides of the auto interior supply chain and therefore on TPEs in auto interiors:

- There will be supply chain dropouts and consolidation.
- Highly leveraged interior suppliers will not survive.
- Investment will be more cautious, thereby affecting R&D, product development and place increased emphasis on labor cost reduction/automation.
- There will be increased re-shoring, targeting more efficient, shorter supply chains, thereby favoring local TPE compounders.
- Pressure will increase for interiors differentiation via design and personalization, especially in saturated sectors (e.g. CUVs).

- zones, cleanability
- Floor mats (cleanability, share gain for SEBS, reactor-TPO)
- Seating with smart surfaces and heating/

- cooling concepts
- Sound systems (potential for using interior surfaces as speakers, e.g. pillar trim)
- Door trim panels with displays and lighting

Fig. 3: Paths to auto interior smart TPEs

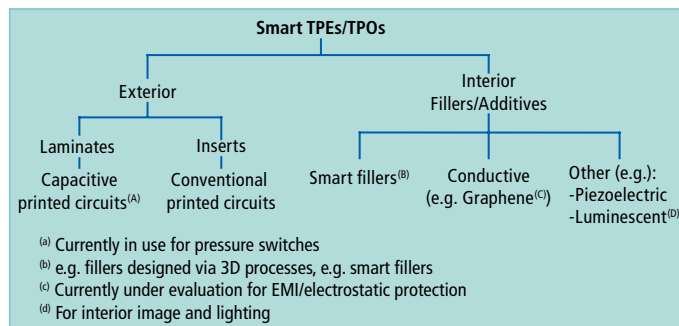
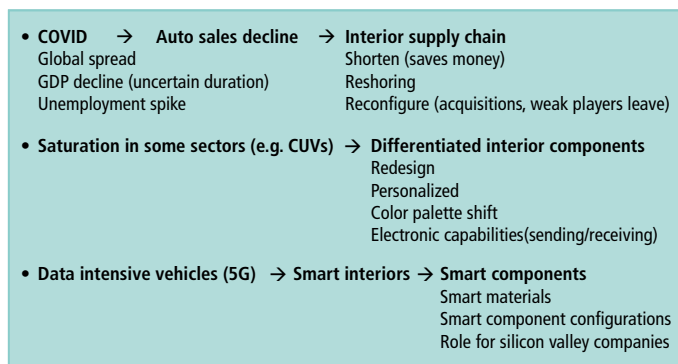


Fig. 4: COVID pressures are reshaping auto interiors



6 TPE opportunities from auto interiors technology push

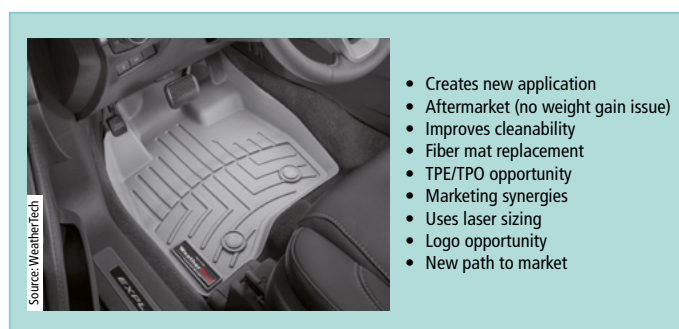
Examples of current and future auto interior technology pushes that will lead to TPE opportunities are:

- Shift away from ICEs to EVs
- Send / receive / respond to massive amounts of data
- Incorporating sensors
- How to utilize 5G
- Protection from unwanted signals
- Image projection (on interior surfaces)
- Cleanability
- Re-arrangement of interior components
- Improving acoustics
- New generation of safety features

Some of the opportunities for TPEs and their technology drivers include:

- Increased EMI shielding requirements
- Instrument panel skins with selective transparency, self-healing, improved scratch/mar, image projection, smart

Fig. 5: Example of interior innovation



Tab. 1: TPO and SBC interior penetration dynamics

Target	TPOs	SBCs	Note
Suppliers	Major PO suppliers'	Independent compounders	PO majors have captive compounding
Supply chain	Short	Longer	Longer due to role of independent compounder
Pricing	Lower		TPOs have world scale economics
Position	Incumbent	Challenger	Limited interiors penetration to date
Target market	Auto is major	Broad	
Auto recession effect	More sensitive, high % auto	Less sensitive	- Due to broad application range - Broader market range provides recession resistance
Foamability	Higher		TPO and PP foams: wide interior role
Smart interiors adaptability	Probably higher		TPOs used in broader range of interior components

- Body/glazing seals: better fit/sealing and acoustic performance.
- An example of a TPE interior innovation is the floor mat as illustrated in **figure 5**.

7 5G Systems

5G systems are being implemented and will require interiors innovations that will drive TPE opportunities:

- Increase in sensors/new on-board sensor technology → design shifts
- Smart functions via active fillers (nanoscale), inserts, add-ons
- Transparent windows in IP skins
- EMI shielding
- Image projection / displays
- Signaling / data transmission

- Instrument panel displays
- Active fillers

8 TPO and SBC auto interior penetration dynamics

TPOs and SBCs will compete for position in auto interiors as summarized in **table 1**. Specific examples of the competition are shown in **table 2**.

9 Summary

A COVID-driven auto recession will re-shape the interior supply chain. The COVID-related financial and market crises will drive out weak auto supply chain players, lead to consolidation and re-shoring.

New TPE opportunities will result from new performance requirements for interior components and associated materials to meet new functional values. Smart TPEs will add value, growth potential and a role for:

- enhanced additives/fillers
- sending / receiving signals
- displays (image projection, instrumentation)
- auto interior lighting and signaling
- plastronics.

5G will increase demand for sending / sensing, managing high data volume and further increase penetration of silicon-valley companies into the interior and TPE supply chain.

Tab. 2: SEBS vs. TPO battle in auto interiors

Part	Challenger	Incumbent	When	Note
Driver airbag covers (DABs)	TPO ^(d)	SEBS	>1990s	COPE in some high end (DABs)
Passenger airbag covers (PABs) ^(c)	TPO ^(d)	TPO, PVC	>1990s	Incorporated into IP skin
IP skin	-SEBS ^(a) -TPV	TPO ^(d) PVC ^(b)	>2020	- ^(a) SEBS via Kraton IMSS technology - o-TPV via Mitsui technology - ^(b) Via slush molding
Floor mats		SEBS	2016	Injection molded floor covering pioneered in the USA by WeatherTech
Pillar trim	-SEBS	TPO ^(d)	1980s	- Incorporate speaker into pillar trim - Also textile wrap
Acoustic barriers	TPO/SEBS	TPO/SBS TPO/POE	>2000	SEBS-based TPO → faster cycle than POE-based TPO

Note: SEBS and POE introduction into TPO formulations has blurred the boundaries between SEBS and TPOs
^(c) other previous IP skin incumbents have included TPU and PVC slush, PU spray
^(d) challenger has become or continued as dominant incumbent

+++ conferences +++ workshops +++ education +++ standardization+++ information +++ networking +++ research +++ consulting +++

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