Pressure Sensitive Adhesive Tape Applications in The Automotive Industry

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Interior Adhesives

• Up to 1980’s, interior adhesives, and processes completely controlled by OEM

• 1980’s to 2005, interior adhesives, and processes selected by Tier to meet Performance specification.

• 2005 to present, control of some interior adhesives, and processes returning to OEM
INTERIOR ADHESIVES (cont.)

• Direct-coated pressure sensitive adhesives
• Adhesive transfer tapes
• Double-coated tapes
• Other adhesive types – hot melts, butyl rubber based, powder, heat activated films, and webs, liquids – thermoplastic, and thermoset
• Current substrates – ABS, PP, Nylon
• Future substrates – less ABS, more PP
EXTERIOR ADHESIVES

• Exterior adhesives, and processes OEM controlled
• Direct coated PSA’s
• Adhesive transfer films
• Double-coated tapes
• 1k, and 2k structural adhesives – urethanes, acrylics, and epoxies
• 1k silicone RTV’s
• Current substrates – TPO, PP, ABS, PC, ASA, ASA-PC, ABS-PC
• Future substrates – more TPO
Pressure Sensitive Adhesive Tapes

Adhesive Transfer Tape

Unsupported: There is no carrier. There is nothing to hold the adhesive together except for its own internal strength. Also know as ‘Transfer’ Tape. These are used for applications where you need flexibility and stretch and for bonding to irregular surfaces.

Double Coated Tape

Double Coated: PSA coated on both sides of a carrier protected by a release liner. Provides capability to put the same or different PSA on each side of carrier. Coating weight on each side of carrier can also be varied.
Pressure Sensitive Adhesive Tapes (cont.)

Double Coated Foam Tape

Single Coated Tape

Single Coated: PSA coated on one side of a flexible carrier and may be protected by a suitable release liner. Used where there is only one substrate to be bonded. It is also useful for wet laminating.
Pressure Sensitive Adhesive Tapes
Pressure Sensitive Adhesive Tapes

- Vibration
HSE and LSE PLASTICS

Metal Surfaces (High Surface Energy)

<table>
<thead>
<tr>
<th>mJ/m²</th>
<th>Surfaces</th>
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<tbody>
<tr>
<td>1103</td>
<td>Copper</td>
</tr>
<tr>
<td>840</td>
<td>Aluminum</td>
</tr>
<tr>
<td>753</td>
<td>Zinc</td>
</tr>
<tr>
<td>526</td>
<td>Tin</td>
</tr>
<tr>
<td>458</td>
<td>Lead</td>
</tr>
<tr>
<td>700-1100</td>
<td>Stainless Steel</td>
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<tr>
<td>250-500</td>
<td>Glass</td>
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High Surface Energy Plastics (HSE)

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<td>Kapton® Industrial Film</td>
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<tr>
<td>47</td>
<td>Phenolic</td>
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<tr>
<td>46</td>
<td>Nylon</td>
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<tr>
<td>45</td>
<td>Alkyd Enamel</td>
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<tr>
<td>43</td>
<td>Polyester</td>
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<tr>
<td>43</td>
<td>Epoxy Paint</td>
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<tr>
<td>42</td>
<td>Polyurethane Paint</td>
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<tr>
<td>42</td>
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<td>39</td>
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<tr>
<td>38</td>
<td>PVC Rigid</td>
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<tr>
<td>38</td>
<td>Noryl® Resin</td>
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<tr>
<td>38</td>
<td>Acrylic</td>
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Low Surface Energy Plastics (LSE)

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<td>PVA</td>
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<td>Polystyrene</td>
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<td>28</td>
<td>Polyvinyl</td>
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<tr>
<td>18</td>
<td>Fluoride Film</td>
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<tr>
<td></td>
<td>PTFE Fluoropolymer</td>
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APPLICATIONS

• Body side moldings
• Emblems and nameplates
• Exterior graphics
• Labels
• Foam gaskets
• Acoustic materials – absorbers, barriers, and dampeners
• Weatherstrips, and seals
• Stone protection films
• Solid rubber seals, and bumpers
• Sill plates
• Removable protective films
• Inner door water deflection film
• Harness wrap
• Thermal materials
• Roof ditch moldings
• Claddings
• Appliques
• Other miscellaneous applications
SUBSTRATES

• Exterior and interior paint
• High surface energy (HSE) plastics
• Low surface energy (LSE) plastics
• Elastomers
• Foams
• Glass
• Metals
• Acoustic materials – absorbers, barriers, vibration dampeners
• Solid Rubber
SUBSTRATES, GLASS - LIKE

- Glass, ceramic, stone, other siliceous material
- Hydrophilic (water loving)
- Water, humidity undercuts the bond
- Need silane coupling agent

SUBSTRATES, POROUS

- Open surface not well suited for tape bonding
- Require sealing to provide a unified surface
- Apply coating
- Apply liquid adhesive
SUBSTRATES, METALS (uncoated)

- Uncoated metals prone to oxidation, and weakening of the bond
- Iron, aluminum, magnesium, copper, brass, bronze
- Apply coating

SUBSTRATES, (that contain plasticizers)

- Flexible PVC contains plasticizers
- Some rubber compounds (e.g. EPDM, neoprene) can contain plasticizers, and oils
- Plasticizers, and oils can migrate into the tape, and affect adhesion
- Use plasticizer resistant adhesive
- Apply adhesion promoter/plasticizer barrier
EXTERIOR PAINT

• Up to 80’s - solution, and dispersion lacquers
• 80’s and beyond – high solids enamels, and base coat/clear coats.
• Recently - etch resistant base coat/clear coats
• Chemistries – acrylic/silane, 2k urethanes, 1k acid/epoxy, and 1k carbamate
• 1k carbamate (urethane/epoxy hybrid) most difficult to bond
• Future – more difficult to bond 1k’s, ceramic based (?)

ELASTOMERS

• Past – nitrile, neoprene, EPDM (ethylene, propylene, diene monomer)
• Future – less EPDM, more Santoprene and TPV’s
• EPDM – thermoset
• Santoprene and TPV’s – thermoplastic matrix – polypropylene continuous phase with dispersed phase of EPDM particles
SILANE COUPLING AGENTS AND ADHESION PROMOTERS

SILANE COUPLING AGENTS

ADHESION PROMOTERS