The thermoplastic rubber that resists oil and heat

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Because

replacing cross-linked rubber

with a thermoplastic material will

significantly reduce costs.
DuPont™ ETPV
engineering thermoplastic vulcanizates

The thermoplastic rubber that resists oil and heat

a high performance cross-linked elastomer dispersed in a high performance thermoplastic elastomer

Recycling code (ISO 11469) > AEM + TPC - ET <

AEM = ethylene acrylic elastomer
TPC - ET = thermoplastic ether ester elastomer
Thermoplastic elastomers

DuPont™ ETPV

Shore A  Shore D

SBC  TPO - C & R  TPO - V  TPU  COPE

DuPont™ ETPV

Performance
ASTM D2000 / SAE J200 Specifications. N.b. The purpose of this chart is to give a general overview. Formulation may affect compound performance.
**DuPont™ ETPV advantages vs rubber**

- Fast thermoplastic processing
- Uses standard thermoplastic processing techniques
- No post mould curing of parts
- Supplied in ready to use compounded form
- No plasticisers
- Lower density
- Often lower material price vs high performance rubbers
- Recyclable

**Customer benefits**

- Significantly lower production costs
- Allows thermoplastic processors to enter new markets
- Higher productivity
- Higher quality consistency
- No shelf life issues
- Part performance not changed by plasticiser migration & no contamination
- Lighter components
- Lower production costs
- Allows use of regrind
- Meets environmental requirements
The target is applications where oil and / or heat (130 - 170°C) resistance are required.

The focus is on replacing cross-linked high performance rubber in applications including:

- Extruded hoses
- 2K seals and gaskets
- Automotive ignition coil boots and body plugs
- Blow molded air ducts
- Inner CVJ boots
### Standard grades

<table>
<thead>
<tr>
<th>Grade</th>
<th>Shore A</th>
</tr>
</thead>
<tbody>
<tr>
<td>60A01L NC010</td>
<td>60</td>
</tr>
<tr>
<td>70A01 NC010</td>
<td>70</td>
</tr>
<tr>
<td>80A01 NC010</td>
<td>80</td>
</tr>
<tr>
<td>90A01 NC010</td>
<td>90</td>
</tr>
<tr>
<td>95A02 NC010</td>
<td>95</td>
</tr>
</tbody>
</table>

### Heat stabilized grades

<table>
<thead>
<tr>
<th>Grade</th>
<th>Shore A</th>
</tr>
</thead>
<tbody>
<tr>
<td>60A01HSL BK001</td>
<td>60</td>
</tr>
<tr>
<td>90A01HS BK001</td>
<td>90</td>
</tr>
<tr>
<td>95 A02HS BK001</td>
<td>95</td>
</tr>
</tbody>
</table>

### Concentrates

<table>
<thead>
<tr>
<th>Concentrate</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB80L NC</td>
<td>Lubrication, natural colour, add ~10%</td>
</tr>
<tr>
<td>MB80L BK</td>
<td>Lubrication, black, add ~10%</td>
</tr>
<tr>
<td>Hytrel® 40CB</td>
<td>Black, add ~2%</td>
</tr>
</tbody>
</table>
## Typical properties of different elastomers

<table>
<thead>
<tr>
<th>Product</th>
<th>Specific gravity (g/cm³)</th>
<th>Tensile stress 100% strain (MPa)</th>
<th>Strain at break (%)</th>
<th>Compression set 22 h at 100°C after annealing (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DuPont™ ETPV 60A01L</td>
<td>1.1</td>
<td>5</td>
<td>400</td>
<td>35</td>
</tr>
<tr>
<td>DuPont™ ETPV 90A01</td>
<td>1.1</td>
<td>8</td>
<td>350</td>
<td>55</td>
</tr>
<tr>
<td>Hytrel® 5555HS</td>
<td>1.2</td>
<td>15</td>
<td>500</td>
<td>60 at 70°C for 22h</td>
</tr>
<tr>
<td>EPDM/PP 64 shore A</td>
<td>1.0</td>
<td>2</td>
<td>400</td>
<td>40 at 70°C for 168 h</td>
</tr>
<tr>
<td>EPDM/PP 87 shore A</td>
<td>1.0</td>
<td>7</td>
<td>530</td>
<td>40 at 70°C for 168 h</td>
</tr>
<tr>
<td>Cross - linked ECO rubber</td>
<td>1.5</td>
<td>5</td>
<td>300</td>
<td>20</td>
</tr>
<tr>
<td>70 shore A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### DuPont™ ETPV 60A01L NC010

**Oil resistance at 150°C**

<table>
<thead>
<tr>
<th>Oil - Time</th>
<th>Tensile strength retention (ISO527)</th>
<th>Strain at break (ISO527)</th>
<th>Hardness shore A (ISO868)</th>
<th>Volume increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM #1 - 70 h</td>
<td>96%</td>
<td>216%</td>
<td>55</td>
<td>5%</td>
</tr>
<tr>
<td>ASTM #1 - 168 h</td>
<td>98%</td>
<td>106%</td>
<td>54</td>
<td>4%</td>
</tr>
<tr>
<td>IRM 902 - 70 h</td>
<td>92%</td>
<td>210%</td>
<td>47</td>
<td>26%</td>
</tr>
<tr>
<td>IRM 902 - 168 h</td>
<td>92%</td>
<td>96%</td>
<td>48</td>
<td>20%</td>
</tr>
<tr>
<td>IRM 903 - 70 h</td>
<td>69%</td>
<td>161%</td>
<td>41</td>
<td>54%</td>
</tr>
<tr>
<td>IRM 903 - 168 h</td>
<td>69%</td>
<td>170%</td>
<td>35</td>
<td>60%</td>
</tr>
<tr>
<td>Cecilia 20 - 1000h</td>
<td>82%</td>
<td>160%</td>
<td>47</td>
<td>22%</td>
</tr>
<tr>
<td>Oil - Time</td>
<td>Tensile strength retention (ISO527)</td>
<td>Strain at break (ISO527)</td>
<td>Hardness shore A (ISO868)</td>
<td>Volume increase</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------------------------------</td>
<td>--------------------------</td>
<td>---------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>ASTM #1 - 70 h</td>
<td>102%</td>
<td>200%</td>
<td>83</td>
<td>2%</td>
</tr>
<tr>
<td>ASTM #1 - 168 h</td>
<td>107%</td>
<td>245%</td>
<td>80</td>
<td>3%</td>
</tr>
<tr>
<td>IRM 902 - 70 h</td>
<td>103%</td>
<td>207%</td>
<td>74</td>
<td>20%</td>
</tr>
<tr>
<td>IRM 902 - 168 h</td>
<td>105%</td>
<td>228%</td>
<td>79</td>
<td>14%</td>
</tr>
<tr>
<td>IRM 903 - 70 h</td>
<td>76%</td>
<td>144%</td>
<td>72</td>
<td>38%</td>
</tr>
<tr>
<td>IRM 903 - 168 h</td>
<td>87%</td>
<td>181%</td>
<td>70</td>
<td>35%</td>
</tr>
<tr>
<td>Cecilia 20 - 1000h</td>
<td>83%</td>
<td>170%</td>
<td>79</td>
<td>16%</td>
</tr>
</tbody>
</table>
DuPont™ ETPV

Fluid resistance 1000h at 150°C

DuPont™ ETPV 60A01L NC010
- Stress at break
- Strain at break

DuPont™ ETPV 90A01 NC010
- Stress at break
- Strain at break

DuPont™ ETPV 60A01HSL BK001
- Stress at break
- Strain at break

DuPont™ ETPV 90A01HS BK001
- Stress at break
- Strain at break
Tensile strength after ageing in air at 150°C

![Bar chart showing tensile strength for different DuPont™ ETPV materials over 0 h, 1000 h, 2000 h, and 3000 h.]
Heat resistance

Strain at break after ageing in air at 150°C
Time to 50% retention of original strain at break in hot air

**DuPont™ ETPV 60 shore A**

- **Time (h)**
  - 10 000
  - 10 000
  - 1 000
  - 1 000
  - 100
  - 100
- **Temperature (°C)**
  - 120
  - 150
  - 180

- **60A01HSL BK001**
- **60A01L NC010**
Time to 50% retention of original strain at break in hot air

[Graph showing the relationship between time (in hours) and temperature (in °C) for DuPont™ ETPV 90 shore A, with two curves indicating different materials: 90A01HS BK001 and 90A01 NC010.]
DuPont™ ETPV can be processed by standard thermoplastic processing techniques including:

- Injection molding
- 2K Injection molding
- Extrusion
- Blow molding
DuPont™ ETPV can be injection molded on conventional injection molding machines.

When injection molding soft thermoplastic materials including DuPont™ ETPV, the following elements needs to be considered:

- Sprues and gating (angle & size)
- Mold surface treatment (matte)
- Injection speed (slow)
- Shrinkage (cross & in flow)

DuPont™ ETPV needs to be dried before injection molding.
Typical melt temperature is 250°C
DuPont™ ETPV needs to be dried before extrusion. Typical melt temperature is 220°C

DuPont™ ETPV can be extruded with conventional equipment into:

• Hose and tubes
• Profiles
• Sheets and laminates

When extruding DuPont™ ETPV, the following elements needs to be considered:

• Melt temperature
• Screw speed
• Draw-down ratio

DuPont™ ETPV needs to be dried before extrusion. Typical melt temperature is 220°C
Extrusion in combination with Hytrel®

DuPont™ ETPV provides heat and chemical resistance

Hytrel® provides strength
DuPont™ ETPV provides an opportunity to make automotive air ducts with excellent flexibility, oil and chemical resistance, and NVH performance at 150°C... for Less.
Welding DuPont™ ETPV to Hytrel®

Weld quality is good.
Fuel ventilation tube

Formed to fit, this fuel vent tube is scheduled for production in a 2005 model North American car.

Better Fuel Vent Tubes... for Less.
Better Air Brake Hoses… for Less.
Ignition coil boot

Better Ignition Coil Boots... for Less.
Body plug

Better Body Plugs… for Less.
Oil reservoir cover with integrated seal

"The 2K molding of the ETPV seal and cover of Zytel® nylon simultaneously brought quality improvements and also significant overall cost savings of around 50 percent to the manufacture of the unit."

Mauro Filippini, Technical Director, CEL.

Zytel® 70G30
DuPont™ ETPV 90A01 NC010

Better Integrated Seals... for Less.
Crank case ventilation hoses

DuPont™ ETPV provides an opportunity to make crank case ventilation hoses according to major automotive OEM requirements for resistance to blow-by gas... for Less.
Oil cooler hoses

DuPont™ ETPV provides an opportunity make oil cooler hoses with excellent flexibility and oil resistance... for Less.
DuPont™ ETPV
engineering thermoplastic vulcanizates

*The thermoplastic rubber that resists oil and heat*

• Properties like high performance rubber
• Processes like a thermoplastic
• Offers great cost savings
• Where do you see opportunities?