EUROPRENE® N / GRN / NOZO

NBR

Elastomers

The elasticity you need
Background

In the early ’80s Versalis decided to relocate the production of acrylonitrile (ACN) - butadiene copolymers (also called Nitrile Rubber or NBR) in Porto Torres, Italy plant. An intense R&D activity allowed great improvements on the original performance of the polymer setting the benchmark for excellent compositional homogeneity of the polymer chain and for extremely low mould fouling. The current NPC is 33 KTPa.

Process

The reaction is a continuous free-radical copolymerisation taking place in a water emulsion and at low temperature. This process results in high molecular weight copolymers and a random distribution of monomers. Before coagulation a non-staining antioxidant agent is added to the latex, in order to protect the polymer during drying and subsequent storage.
Main properties
The main property of Europrene® N is its excellent resistance to aliphatic hydrocarbons, gasoline, oils and greases, as well as to a wide variety of chemical products, in a temperature range from -50 to +130 °C. This significant property depends upon the ACN content: the higher the ACN content the lower is the gas permeability, and the higher is the resistance to oils and grease and compatibility with polar plastics. Increasing ACN content a worsening of cold flexibility is observed. Thanks to its backbone high compositional homogeneity Europrene® N shows the best possible trade-off between oil and low temperatures resistance.

Grade selection
The key criterion to be taken into account is the desired level of non-polar fluid resistance (or fluid permeability) that is a direct consequence of the ACN content. The second criterion is the transformation technique: in case of injection moulding a low Mooney grade will be preferred, while for extrusion and calendering a higher Mooney will be chosen instead. If we are dealing with mass productions or complicated injection moulded items, mould fouling is the first thing to be avoided, then Europrene® N GRN grades become the right choice. During the vulcanisation stage these grades show also fast speed and high cure state allowing effective cycle time reductions. If we are talking about outdoor items cracks may be caused by ozone and environmental condition, but prevention can be achieved by Europrene® N OZO grades. These grades are blends of NBR and PVC ‘fluxed’ property to obtain the final properties required. Europrene® N N GRN grades are identified by a numerical code (XXYY), where XX stands for the ACN content and YY for the Mooney viscosity. ACN content typical range is from 19% to 45% while Mooney viscosity typical range is from 30 up to 80 MU. Europrene® N OZO grades are identified by a numerical code (XXYY) where XX shows the percentage of NBR in the blend, and YY the ACN content of the NBR base. NBR content ranges from 50% to 70%, while ACN content in NBR is between 28% and 39%.

Europrene® N, N GRN grades are identified by a numerical code (XXYY), where XX stands for the ACN content and YY for the Mooney viscosity. ACN content typical range is from 19% to 45% while Mooney viscosity typical range is from 30 up to 80 MU. Europrene® N OZO grades are identified by a numerical code (XXYY) where XX shows the percentage of NBR in the blend, and YY the ACN content of the NBR base. NBR content ranges from 50% to 70%, while ACN content in NBR is between 28% and 39%.
## Grade list

### Acrylonitrile - butadiene rubber (NBR) - normal type

<table>
<thead>
<tr>
<th>Grade</th>
<th>Acrylonitrile content %wt</th>
<th>Mooney viscosity ML (1+4) 100 °C</th>
<th>Main applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europrene® N 2845</td>
<td>28</td>
<td>45</td>
<td>Application requiring good processability, elasticity at low temperature and oil resistance</td>
</tr>
<tr>
<td>Europrene® N 2860</td>
<td>28</td>
<td>60</td>
<td>Application requiring elasticity at low temperature, oil resistance and high mechanical performances</td>
</tr>
<tr>
<td>Europrene® N 3350</td>
<td>33</td>
<td>50</td>
<td>Wide range of oil-resistant technical articles requiring good processability</td>
</tr>
<tr>
<td>Europrene® N 3345</td>
<td>33</td>
<td>45</td>
<td>Wide range of oil-resistant technical articles</td>
</tr>
<tr>
<td>Europrene® N 3360</td>
<td>33</td>
<td>60</td>
<td>Technical goods with high mechanical properties</td>
</tr>
<tr>
<td>Europrene® N 3380</td>
<td>33</td>
<td>80</td>
<td>Technical goods with high mechanical properties very good compression set and oil resistance</td>
</tr>
<tr>
<td>Europrene® N 3945</td>
<td>39</td>
<td>45</td>
<td>Wide range of technical articles requiring good processability and very high oil and fuel resistance</td>
</tr>
<tr>
<td>Europrene® N 3960</td>
<td>39</td>
<td>60</td>
<td>Application requiring very high oil and fuel resistance and excellent mechanical properties</td>
</tr>
<tr>
<td>Europrene® N 3980</td>
<td>39</td>
<td>80</td>
<td>Application requiring very high oil and fuel resistance and excellent mechanical properties</td>
</tr>
<tr>
<td>Europrene® N 4560</td>
<td>45</td>
<td>60</td>
<td>Technical goods with good mechanical properties and excellent oil and fuel resistance</td>
</tr>
</tbody>
</table>

### Acrylonitrile - butadiene rubber (NBR) - green type

<table>
<thead>
<tr>
<th>Grade</th>
<th>Acrylonitrile content %wt</th>
<th>Mooney viscosity ML (1+4) 100 °C</th>
<th>Main applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europrene® N 1945 GRN</td>
<td>19</td>
<td>45</td>
<td>Technical goods requiring oil resistance and very good low temperature flexibility. Food contact application</td>
</tr>
<tr>
<td>Europrene® N 2830 GRN</td>
<td>28</td>
<td>30</td>
<td>Grades with faster cure rate compared to Normal Types. Suitable for injection applications (low-mould fouling)</td>
</tr>
<tr>
<td>Europrene® N 2845 GRN</td>
<td>28</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Europrene® N 2860 GRN</td>
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<td>60</td>
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<tr>
<td>Europrene® N 2875 GRN</td>
<td>28</td>
<td>75</td>
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<tr>
<td>Europrene® N 3330 GRN</td>
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<td>30</td>
<td></td>
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<tr>
<td>Europrene® N 3345 GRN</td>
<td>33</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Europrene® N 3360 GRN</td>
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<tr>
<td>Europrene® N 3380 GRN</td>
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<tr>
<td>Europrene® N 3945 GRN</td>
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<tr>
<td>Europrene® N 3960 GRN</td>
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</table>

### NBR - PVC - BLEND

<table>
<thead>
<tr>
<th>Grade</th>
<th>NBR/PVC</th>
<th>Acrylonitrile content %wt</th>
<th>Mooney viscosity ML (1+4) 100 °C</th>
<th>Main applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europrene® N OZO 7028</td>
<td>70/30</td>
<td>19.5</td>
<td>75</td>
<td>Wide range of technical articles requiring good ozone and oil resistance</td>
</tr>
<tr>
<td>Europrene® N OZO 7028/60</td>
<td>70/30</td>
<td>19.5</td>
<td>60</td>
<td>Wide range of technical articles requiring good ozone and oil resistance. Enhanced processability</td>
</tr>
<tr>
<td>Europrene® N OZO 7033</td>
<td>70/30</td>
<td>23</td>
<td>75</td>
<td>Ozone resistant articles requiring higher oil resistance</td>
</tr>
<tr>
<td>Europrene® N OZO 7033/60</td>
<td>70/30</td>
<td>23</td>
<td>60</td>
<td>Ozone resistant articles requiring higher oil resistance. Enhanced processability</td>
</tr>
<tr>
<td>Europrene® N OZO 7039</td>
<td>70/30</td>
<td>27</td>
<td>75</td>
<td>Applications requiring very high oil and new gasolines resistance</td>
</tr>
<tr>
<td>Europrene® N OZO 5033</td>
<td>50/50</td>
<td>16.5</td>
<td>70(1)</td>
<td>Special NBR/PVC grades for extrusion and injection moulding applications. Outstanding ozone resistance</td>
</tr>
</tbody>
</table>

(1) ML (1+4) 121 °C
Storage and packaging

Europrene® grades have to be stored in vented, dry areas at temperature between 20 °C and 30 °C, avoiding direct sunlight.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Packaging description</th>
<th>Crate dimension (mm)</th>
<th>Nominal net weight (kg)</th>
<th>Bale weight (kg)</th>
<th>Bale dimension (mm)</th>
<th>Bales total</th>
<th>Bales x layer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europrene® N</td>
<td>Wooden crate</td>
<td>1090x1250x h150</td>
<td>1200</td>
<td>30</td>
<td>550x350x h190</td>
<td>40</td>
<td>5x8</td>
</tr>
<tr>
<td>N and N GRN</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Europrene® N</td>
<td>Wooden crate</td>
<td>1090x1250x h100</td>
<td>900</td>
<td>30</td>
<td>550x350x h190</td>
<td>30</td>
<td>5x6</td>
</tr>
<tr>
<td>N OZO</td>
<td>Cardboard box</td>
<td>970x1145x h1050</td>
<td>750</td>
<td>25</td>
<td>550x350x h140</td>
<td>30</td>
<td>5x6</td>
</tr>
<tr>
<td>Europrene® N</td>
<td>Wooden crate (IPPC)</td>
<td>1090x1250x h150</td>
<td>1125</td>
<td>25</td>
<td>550x350x h180</td>
<td>45</td>
<td>5x9</td>
</tr>
<tr>
<td>2875 GRN</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

Versalis in the world

Versalis is focused on establishing itself as a solution provider, offering a range of increasingly market-oriented products at an international level. The company is present in the APAC region through its Shanghai-based subsidiary, Versalis Pacific Trading, in Mumbai, India, in Singapore, and in South Korea through LVE, a joint venture with Lotte Chemical. Versalis can also count on subsidiaries Versalis Americas – with offices in Houston, Texas – and Versalis Mexico. Furthermore, Versalis serves the oil and gas industry with offices in Ghana and in Congo, with its portfolio of oilfield chemicals. Thanks to a widespread sales network, distributors and sales agents, Versalis can serve all markets worldwide.

Headquarters
San Donato Milanese, Milan (Italy)

Licensing
- Algeria
- Brazil
- China
- Egypt
- India
- Iran
- Japan
- Malaysia
- Portugal
- Qatar
- Romania
- Russian Federation
- Slovak Republic
- South Korea
- Spain
- Taiwan
- USA
- Venezuela

R&D
- Italy
- Ferrara
- Mantua
- Novara
- Porto Torres
- Ravenna
- Rivalta Scrivia

Sales network
- Russia
- Belgium
- China
- Congo
- Czech Republic
- Denmark
- France
- Germany
- Ghana
- Greece
- Hungary
- Italy
- Mexico
- Poland
- Portugal
- Romania
- Russian Federation
- Singapore
- Slovak Republic
- South Korea
- Spain
- Switzerland
- Sweden
- Turkey
- United Arab Emirates

UK
- Grangemouth
- - Elastomers
- France
- Dunkerque
- - Elastomers
- - Polyethylene
- Germany
- Oberhausen
- - Polyethylene
- Hungary
- Székesfehérvár
- - Styrenics
- South Korea
- Yeosu (LVE, a joint venture with Lotte Chemical)
- - Elastomers

Plants
- Italy
- Brindisi
- - Steam cracking
- - Aromatics
- - Polyethylene
- Crescentino
- - Bioethanol
- Ferrara
- - Elastomers
- - Polyethylene
- Mantua
- - Elastomers
- - Styrenics
- - Styrenics
- Porto Marghera
- - Steam cracking
- - Aromatics
- Porto Torres
- - Elastomers
- - Renewable chemistry
- Priolo
- - Steam cracking
- - Aromatics
- Ragusa
- - Polyethylene
- - Elastomers
- Ravenna
- - Elastomers
- South Korea
- Yeosu (LVE, a joint venture with Lotte Chemical)
- - Elastomers
- USA
- - Elastomers
- - Elastomers
- - Elastomers
- Venezuela
- - Elastomers
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for EP(D)M, NBR and TPR

Social accountability system of Versalis S.p.A complies with the requirements of SA8000