AROMATIC AND MANNICH POLYOLS FROM CARDANOL
ExaPhen for rigid PUR Insulation

Typical Applications

Rigid PUR Spray Foam & in-continuous panels or blocks.
Excellent for cold temperature adhesion to walls and roofing. Improves significantly fire-resistance and compressive strength (see case studies on page 3).

Rigid PUR Pour in place foam & In-discontinuous panels or blocks.

PIR Panels or Blocks & In-place foam:
Maximises closed-cells content percentage and improves dimensional stability — ideal for a long-lasting and efficient insulation. It brings to the plasticisation of the final foam (lowers the stiffness and increases ductility) and reduces the resulting foam-dust. Hydrophobicity. Products: XFN 10 and 50 aromatic.

Elmira Industrial Supplies proudly distributes ExaPhen™, a family of aromatic polyols used primarily in polyurethane based rigid foams; while being applicable in durable coatings, adhesives and sealants, as well as a hardener for castings.
The ExaPhen™ products are derived from the shell of the cashew nuts (a natural sustainable feedstock).
The ExaPhen™ technology is devoted to the responsible re-use of agricultural byproducts, extracting (exa) phenolic (phen) resins from biomasses while retaining the special properties which nature has already engineered. The unique chemical structure gives our resins a high degree of formulation versatility, enhanced moisture absorption and flame resistance, low exothermic reactions, adherence to cold substrates and increased dimensional stability.
ExaPhen™ has been pioneered by Composite Technical Services LLC, Ohio, USA.
General Properties

- High Dimensional Stability
- Low exotherm
- Increased flame and temperature resistance
- Excellent adhesion to most substrates from minus °C
- Lambda from 0.22 mW/msq
- Increased resistance to moisture absorption
- High miscibility with traditional polyols, isocyanates, surfactants, catalysts, and blowing agents
- Wide range of formulations
- High Bio-content

<table>
<thead>
<tr>
<th>Aromatic Multifunctional</th>
<th>Mannich</th>
<th>Specialty</th>
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</thead>
<tbody>
<tr>
<td>XFN50</td>
<td>XFN 53</td>
<td>XFN 150</td>
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<tr>
<td>Colour</td>
<td>Amber</td>
<td></td>
</tr>
<tr>
<td>Hydroxyl Value (mg KOH/g)</td>
<td>190–200</td>
<td>190–200</td>
</tr>
<tr>
<td>Functionality</td>
<td>4–5</td>
<td>6–8</td>
</tr>
<tr>
<td>Viscosity 25°C (cps)</td>
<td>900–1,300</td>
<td>30,000–40,000</td>
</tr>
<tr>
<td>Density (g/ml)</td>
<td>0,95</td>
<td>0,99</td>
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<tr>
<td>Water Content (%)</td>
<td></td>
<td></td>
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<tr>
<td>Bio-Content (%)</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>Global Warming Potential (kg CO2/kg)</td>
<td>-5,8</td>
<td>-5,6</td>
</tr>
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</table>

1 Biobased Determination using C-14 test ASTM-D6866-08. *CALCULATED
2 GWP is the total amount of equivalents of Carbon Dioxide released. Determined through a cradle to gate LCA following ISO 14040 Series Standards.
Case Studies

Spray PIR for Walls Insulation

PIR Spray for Exterior Walls:

Volume: 1:1.8
XFN50 and XFN53 with ratio 1:0.26 (overall 30%)
Polyether Polyols
HFC/Water
TCPP
Lambda: 22.8 mW/K.m
Strength (vertical): 189 KPa
Strength (horizontal): 284KPa
Cream time: 4-5 sec
String time: 20 sec
Specific Gravity (PartB): 1084 g/l
Density (sprayed): 48 kg/m3

How we improved the performance:

Dimensional Stability (100 °C, 24h):
Avg. 0.87% vs Avg. 1.41%
DIN EN 1605 (7days @ 40KPa and 70°C):
1.5% vs 1.9%
Water Absorption:
0.037 vs 0.056 kg/m2
Anti-fire B2, DIN4102:
(12cm vs 15cm)
Spray rate:
8-9cm vs 4cm thick layer per session
Bio properties:
Final Foam Bio-content: 20.5% (calc.)
Case Studies

Spray Pipe insulation Polycard XFN-150

40 parts Polycard XFN-150 | 60 parts polyether-polyol/glycerol-based polyols.
10—20 parts phosphate ester flame retardant | 1.5—2.5 parts water 3—5 parts catalyst (tin-based and tertiary amine) | 10—14 parts blowing agent.

Cream time: 4—7 sec
String time: 12—18 sec
Density (sprayed): 56 kg/m³
Density (free rising): 35 kg/m³

Improvement in mechanical, FR & Bio properties:
Compressive strength at yield: 392.3±3.86 KPa (0.4 MPa) (↑ 24%)
Strain at yield: 3.7±0.5 (↓ 32%)
Modulus: 11.66±1.82 MPa (12 MPa) (↑ 25%)

FR Test DIN4102: B1(difficult to ignite/often self extinguishing)
Foam Bio-content: 13.5% (calculated)
DIN4102/BS 476
High Functionality Aromatic Polyols

XFN 50 is a medium viscosity polyol with a 4 of functionality that can replace aromatic polyether and polyester polyols. It is recommended for both PIR and PUR rigid foams.

XFN 53 is a high viscosity, high functionality polyol that can be used as an additive for increased flame resistance, dimensional stability and low exothermic release in rigid foam formulations.

Mannich Amine Polyols

XFN 150 is bio renewable version of the common 530-OH# manniich. Designed primarily for spray foam formulation, it offers very fast cream time and improved cell structure, thanks to its surfactant effect.

Improves fire-resistance and compressive strength.

Features a high degree of moisture resistance and is especially for 2k foam system. XFN 425 is a replacement with lower viscosity and OH# of the 150 manniich.

Other uses include amine catalyst replacement in urethane formulations.

Specialty Polyols

XFN 10 is a polyol surfactant/plasticizing with an aromatic content of about 30%.

The XFN 10 is used primarily for PIR applications for thermal insulation thanks to its plasticizing effect.

Benefits are: enhanced water resistance and low brittleness.

A plus is its very high Bio-Content.
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