A New Aliphatic Polyurea Chain Extender for Improved Processability and Advanced Performance

Part II
Application Results

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Applications
Applications
Applications
• Lens 3:
  – 41 g disc
  – 3-inch diameter
  – .312 inch thick curved lens

• Shot 3:
  – 1225 fps
  – 2.0 grains of powder
Specific Applications with \textit{Baxxodur}^{TM} PC 136 = \textit{Polyclear} 136

Aliphatic Hard Coat for replacing Polyester Gel Coats
A Paradigm Shift in Composite Fabrication

\textbf{No VOC's}
Video Demonstrations

Baxxodur™
PC 136
System
Toughness
Creating a Console Part with Baxxodur™ PC 136 System

**Prepping of Mold**
Waxing and taping

**Spraying Baxxodur™ PC 136 Gel Coat**
1 1/2 minutes

**Spraying Backer**
7 1/2 minutes

**Demolding**
Let sit for 15 minutes and demolded

A Console Part from Beginning to end in less than 25 minutes
Inherent Issues with Polyester Gel Coats

These are typical cosmetic & labor cost issues laminators face with current Polyester Gel Coat technology:

- Long Cure Times
- Cracking & Brittle
- Solvents (flammables) & VOC’s
- Radius Air Voids
- Blistering
- Cosmetic Porosity
Issues with the Current Polyester Technology

1. EPA Restrictions with Polyesters and Styrene

2. Length of Cure time (catalyst dependent)

3. Weather factors:
   • slow to cure when cold or rainy
   • long demold times
   • yellows when over catalyzed

4. Blistering, Porosity & Air Voids

5. Cracking & Brittle Gel Coats
With an Aliphatic Polyurea system made with Baxxodur™ PC 136, you can reduce your emission VOC’s, reduce rejects and speed your demolding times.
Strength of Using Baxxodur™ PC 136

**ZERO ("0") VOC’s**
- No organic solvents released from Gel Coat
- Reduced FLAMMABLES in the Plant
- OSHA and EPA will be your friends

**Independent of Weather**
- Same cure at 20F, 50F, 80F or 100F
- Same cure in Arizona or South Florida or Minnesota
- Same cure rate when sunny & dry, 75% RH, or down pouring rain

**Durable**
- 12% elongation of gel coat
- Hi Impact resistance of gel coat parts
- Much longer UV resistance
Strength of Using Baxxodur™ PC 136

Clean up of Molds is Easy
- No midnight shift demolding and cleaning molds
- Can prep molds, spray multiple parts, demold and reprep molds in 1 shift versus 2 shifts

Less Workers
- One sprayer can make many parts in one shift
- Can build up a months worth of nuissance parts in one week

Lower Overall Overhead
- Less molds = less space required (sq. ft.)
- Lower electric & utilities with 1 shift vs. 2
- Less rejects
- No flammables (insurance)
<table>
<thead>
<tr>
<th>Baxxodur™ PC 136 System</th>
<th>ASTM D648 Heat Deflection</th>
<th>ASTM D648 Heat Deflection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>96.0 °C</td>
<td>204.8 °F</td>
</tr>
</tbody>
</table>
### Blister / Accelerated Aging Test

The Gel Coat side of the panel is constrained against a glass cylinder filled with water. The water is heated to 65°C (150°F) and is left to condition the panel for 500 hours. During that time, the apparatus can be open to evaluate the panels. The panels are evaluated for blisters.

<table>
<thead>
<tr>
<th>Material</th>
<th>ANSI Z124 Blister Test 100 hours</th>
<th>ANSI Z124 Blister Test 250 hours</th>
<th>ANSI Z124 Blister Test 500 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polyester Gel Coat with CSM</td>
<td>Blisters</td>
<td>Hundreds of small Blisters</td>
<td>Hundreds of small Blisters</td>
</tr>
<tr>
<td>Baxxodur™ PC 136 System</td>
<td>No Blisters</td>
<td>No Blisters</td>
<td>No Blisters</td>
</tr>
</tbody>
</table>
Technical Data

Gloss Retention in a QUV-B after 1,000 Hours

**QUV Data 60 deg**

- GC
- GCR

**QUV Data 20 deg**

- GC
- GCR

GC – Polyester Gel Coat received from customer
GCR - Baxxodur™ PC 136 System
Gloss Retention Baxxodur™ PC 136 System in a Xenon Arc after 2,056 Hours

Gel Coat

<table>
<thead>
<tr>
<th>Gloss Units</th>
<th>60 deg</th>
<th>20 deg</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 hr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000 hr</td>
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<td></td>
</tr>
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<td>2000 hr</td>
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</table>
## Technical Data

### Color Retention Baxxodur™ PC 136 System in a Xenon Arc after 2,056 Hours

<table>
<thead>
<tr>
<th></th>
<th>After 1,000 Hours</th>
<th>After 2,000 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CIE L<em>a</em>b</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DL*</td>
<td>-1.05</td>
<td>-1.46</td>
</tr>
<tr>
<td>Da*</td>
<td>-0.56</td>
<td>-0.67</td>
</tr>
<tr>
<td>Db*</td>
<td>0.96</td>
<td>1.09</td>
</tr>
<tr>
<td>DC*</td>
<td>0.91</td>
<td>0.98</td>
</tr>
<tr>
<td>DH*</td>
<td>-0.86</td>
<td>-0.92</td>
</tr>
<tr>
<td>DE*</td>
<td>0.76</td>
<td>1.06</td>
</tr>
</tbody>
</table>

- Typically, a trained naked eye cannot see a Delta E difference of < 2.0
- A common person cannot determine a difference of < 3.0 DE
## Technical Data Summary

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<tr>
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<th>Polyester Gel Coats</th>
<th>Baxxodur™ PC 136 System</th>
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<tr>
<td><strong>Blistering</strong></td>
<td>Inherent problems with boats sitting in the water</td>
<td>Passed 500+ hours ANSI Z124 blister test</td>
</tr>
<tr>
<td><strong>UV Stability</strong></td>
<td>No guarantees, chalks, fades, loses gloss</td>
<td>Over 2,500 hours QUV with minimum change (gloss &amp; color)</td>
</tr>
<tr>
<td><strong>Brittleness</strong></td>
<td>1 to 2% elongation - Very Brittle &amp; Cracks</td>
<td>12% Elongation, High Impact Resistance</td>
</tr>
<tr>
<td><strong>VOC Status</strong></td>
<td>35% Styrene, Flammable</td>
<td>Zero (0) VOC’s – HAPS &amp; MACT Compliant</td>
</tr>
<tr>
<td><strong>Cure Rate</strong></td>
<td>2+ hours demold at 70°F (typical small part)</td>
<td>15 minute demold time at any Temp.</td>
</tr>
<tr>
<td><strong>Molds Required</strong></td>
<td>Longer time to build means more molds</td>
<td>Many parts from a single molds per shift</td>
</tr>
<tr>
<td><strong>Temperature Sensitivity</strong></td>
<td>For every 20°F below 70°F doubles the cure time – must adjust cobalt &amp; MEKP mix ratio</td>
<td>Same cure rate from 20°F to 120°F</td>
</tr>
</tbody>
</table>
Applications Opportunities for Baxxodur™ PC 136 Composites

- Light stable OEM Products that need lowered VOC’s
- Higher Impact Resistant Environments
- Faster Demold Times
- Labor Cost Reduction
- Overall Part Cost Reduction
Baxxodur™ PC 136 Applications
Baxxodur™ PC 136 Applications
New Aliphatic Diamine chain extender for Light Stable Polyureas and Polyurethanes

Baxxodur™ PC 136

- Baxxodur™ PC 136 resp. Polyclear 136 is a product that will make your aliphatic polyureas better and more affordable.
- Can be used globally
- Faster film property development (similar to aromatic polyureas)
- Better System Thermal Stability – HIGHER HDT’s
- Can be easily formulated with various amines and isocyanates making your product unique.
- Excellent UV Stability