A Paper presentation on Pure Polyurea vs. Hybrid polyurea / Polyurethanes & Epoxies

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By:

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1983
VIP Founda
German
y
1990 – 1999
Expansion into industrial applications of innovative adhesive technologies
Trading company for Adhesives for the automotive aftermarket

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2000
2004
Polyurea Coating Systems
Market Launch Intl. Expansion

Specialization and in-house R&D of 2K adhesives, sealants & coatings

2009
VIP India
Sales team, distribution & Applicator network

2010
VIP Middle East LLC local Manufacturing of Polyurea Systems in Dubai

2011
VIP SE Asia
Sales team, distribution & Applicator network
What is POLYUREA?

- A high reactive performance coating
- 2 liquid components (Part A + B)
- Mixing Ratio 1:1 (volume)
- Part A - Isocyanate Pre-Polymer
- Part B - Amine terminated resin blend
- Rapid cure from liquid to plastic coating
- Flexible
- Waterproof
- Has outstanding properties
- Designed to protect various surfaces

POLYUREA beats traditional coatings…
What is POLYUREA?

- Definition of Polyurea by the Polyurea Development Association (PDA), 2000

A pure polyurea coating/ elastomer is derived from the reaction product of an isocyanate component and a resin blend component such as amine-terminated polymer resins, and/or amine-terminated chain extenders. The isocyanate can be aromatic or aliphatic in nature. It can be a monomer, a polymer, or any variant reaction of isocyanates, a quasi-prepolymer or a prepolymer. The prepolymer, or a quasi-pre polymer, can be made of an amine-terminated polymer resin.
**What is POLYUREA?**

- Definition of Polyurea by the Polyurea Development Association (PDA), 2000

The resin blend must be made up of amine-terminated polymer resins, and/or amine terminated chain extenders. The amine-terminated polymer resins will not have any intentional hydroxyl groups. Any hydroxyls are the result of incomplete conversion to the amine-terminated polymer resins. The resin blend may also contain additives or nonprimary components. These additives may contain hydroxyls, such as pre-dispersed pigments in a polyol carrier. Normally, the resin blend will not contain a catalyst.
Polyurea is an elastomer made from two reactive components

**A-component**
- Isocyanate prepolymer (MDI based for aromatic systems, HDI- or IPDI-based for aliphatic systems)

**B-component**
- Amines (polyether amines)
- Amine chain extenders
- Additives (e.g. pigments, defoamers, flame retardants, etc.)

In case of pure polyurea B component is made up of amine-terminated polymer resins, and/or amine terminated chain extenders as more than 80% of the total content of component B.
Amine chain extenders

- Faster film property development
  With high strength.
- Excellent UV and color stability of
  the film Easy to formulate with various
  amine systems.
- Slows down gel time allowing for
  better adhesion.
- Flow and leveling maintains better film stability
  at elevated temperatures.
Polyetheramines

- Used as curing agents.
- Films hardening agents.
- If very high hardness is desired the trifunctional Polyether amine is required for a stronger cross linking.
- Polytetrahydrofuran amine leads to reduced moisture uptake and swelling as well as to improved abrasion resistance.
Additives

- Pigments for coloration
- Flame retardants
- Defoaming or deaerating agents
- Other processing auxiliaries
<table>
<thead>
<tr>
<th>Properties</th>
<th>Polyurethane</th>
<th>Epoxy</th>
<th>Pure Polyurea VIP QuickSpray</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working times</td>
<td>Fast</td>
<td>Slow</td>
<td>Extremly fast (5 seconds to 15 seconds)</td>
</tr>
<tr>
<td>Atmospheric Moisture sensitivity</td>
<td>Yes</td>
<td>Yes</td>
<td>No, moisture insensitive</td>
</tr>
<tr>
<td>Elongation</td>
<td>1000%</td>
<td>Tend to get brittle</td>
<td>Upto 1000% (Flexible with high tensile strength so does no crack)</td>
</tr>
<tr>
<td>Colour stability</td>
<td>Average, yellowing</td>
<td>Average, yellowing</td>
<td>Aromatics: average Aliphatics: 100% UV resistant and colour stable</td>
</tr>
<tr>
<td>Abrasion resistance</td>
<td>&gt;15 mg, 500g/1000 cycles (ASTM D-4060)</td>
<td>&lt; 6mg, 500g/1000 cycles (ASTM D-4060)</td>
<td>&lt; 6mg, 500g/1000 cycles (ASTM D-4060)</td>
</tr>
<tr>
<td>Superior tensile strength</td>
<td>About 8-10 N/MM2</td>
<td>15-20 N/MM2</td>
<td>More than 20N/MM2</td>
</tr>
<tr>
<td>Chemical resistance</td>
<td>Good</td>
<td>Very Good</td>
<td>Excellent (Can resist upto 20% H2SO4 also)</td>
</tr>
<tr>
<td>VOC free</td>
<td>No</td>
<td>No</td>
<td>Yes (Ecofriendly)</td>
</tr>
<tr>
<td>Temperature resistance</td>
<td>From -30°C to +120°C</td>
<td>From -20°C to +110°C</td>
<td>From -50°C to +150°C</td>
</tr>
<tr>
<td>Seamless</td>
<td>No</td>
<td>No</td>
<td>Yes, unlimited mil thickness with one layer</td>
</tr>
<tr>
<td>Coverage</td>
<td>Different</td>
<td>Different</td>
<td>Average 1L = 1m² = 1mm</td>
</tr>
<tr>
<td>Durability</td>
<td>Good</td>
<td>Average</td>
<td>Excellent</td>
</tr>
<tr>
<td>Solid Content</td>
<td>50-100%</td>
<td>50-100%</td>
<td>100%</td>
</tr>
<tr>
<td>Properties</td>
<td>Hydrid polyurea</td>
<td>Pure Polyurea VIP QuickSpray</td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td>----------------------------------</td>
<td>---------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Working times</td>
<td>Fast</td>
<td>Adjustable (5 seconds to 8 mins)</td>
<td></td>
</tr>
<tr>
<td>Moisture sensitivity</td>
<td>Sensitive to atmospheric moisture</td>
<td>Atmospheric moisture insensitive</td>
<td></td>
</tr>
<tr>
<td>Film quality</td>
<td>May have pinholes</td>
<td>Free from pin holes</td>
<td></td>
</tr>
<tr>
<td>Abrasion resistance</td>
<td>Average</td>
<td>Very good &lt; 6mg (C17,500gms/1000 cycles)</td>
<td></td>
</tr>
<tr>
<td>Superior tensile strength</td>
<td>Good</td>
<td>Excellent (23 N/mm sq)</td>
<td></td>
</tr>
<tr>
<td>Chemical resistance</td>
<td>Good</td>
<td>Very Good</td>
<td></td>
</tr>
<tr>
<td>Temperature resistance of film</td>
<td>From -30°C to +120°C</td>
<td>From -50°C to +150°C</td>
<td></td>
</tr>
<tr>
<td>Temp resistance during application</td>
<td>From 5°C to +45°C</td>
<td>From -10°C to +70°C</td>
<td></td>
</tr>
<tr>
<td>Shel life Duration</td>
<td>6-9 months</td>
<td>12 months</td>
<td></td>
</tr>
<tr>
<td>Film life</td>
<td>Approx 4-5 years</td>
<td>Can go from 10 to 20 years easily</td>
<td></td>
</tr>
<tr>
<td>Solid Content</td>
<td>80-100%</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>
POLYUREA
The System

Primer

POLYUREA Coat (aromatic)

Top coat (aliphatic)

Substrate
Applicable without having any influence on curing time

Thermal resistance

Resists thermal shocks

The coating is widely used over polyurethane foam for wall and roofing insulation systems in building, residential housing and temperature controlled containment tanks (wine, oil or chemicals).
Superior tensile & structural strength

- Excellent adhesion on steel, aluminium, GRP, plastics, concrete, wood, isolating foams
- High tensile strength (3000psi/ ≥ 20MPa) while still having excellent elongation

Deformation from moving substrate shifts will be reduced
Thick Polyurea adapts to sonic & vibratory attack for e.g. earthquakes

Polyureas will bridge hairline cracks in concrete it act as shock absorber as well because of high tensile strength along with flexibility & elongation.
Superfast reaction times

- Polyurea's fast reaction time (5-15 seconds) leaves polyurethane and epoxy materials in the proverbial dust.

Tremendous savings because of minimum downtime for facilities.

Especially important for traffic, manufacturing industry, energy and petrochemical market.
High abrasion resistance & flexibility

- High abrasion resistance (ASTM 4060-90)
- Superior elongation (upto 700%) soft, elastic and extremely flexible
- No cracking when exposed to constant pounding

Tremendous savings because of much longer maintenance intervalls. Epoxies crack and have to be repaired and re-coated. Polyureas guarantee a lifetime of 10 years and more after proper application.
Moisture insensitivity

- Pure Polyurea does not contain polyols or catalyst
- Pure Polyurea does not contain –OH groups
- The reaction of component A and component B (polyamines) is so fast that the moisture reaction cannot occur

Polyurea is unbeatable in climates or regions with high humidity and moisture

No pinholes, less costs: No further measures for deaeration and set-up of a closed-porous surface

NOTE: Surface preparation is always necessary!
High chemical resistance

- Polyurea is the choice of facility managers for storage of diluted acids, alkali, salt solution, organic solvents and oils.
- Polyurea provides a strong barrier to spills from reaching the environment.
- Ideal for petrochemistry, chemical processing facilities, (potable) water systems, reservoirs, sewage processing, manholes, holding tanks, secondary containment protection...
Environmentally-friendly

- No VOC’s (Volatile Organic Compounds)
- No solvents
- No fumes
- No styrenes
- 100% solids
- Less overspray
- Little to no odor
- certified for potable water

Ideal for the food industries

corresponding to strikt styrene emission laws Europe-wide

Pure POLYUREA
Properties

Water Regulations Advisory Scheme (UK)
United States Department of Agriculture (US)
Coatings Systems

Water and Waste Water Industry
Power & Energy Markets
Petrochemical Industry
Roofing & Waterproofing
Industrial Flooring & Car parks
Airports & Heil decks
Ship building Industry
Infrasructure, Tunnels & Bridges
Automotive, Trucks & Transport
Leasure & Theme Parks
Swimming Pools & Ponds
Furniture and foam Industry
Thanks for your kind attention!!!