

## Polyurea Elastomers

### 3.6.1

### What is a Polyurea Elastomer?

A **polyurea** is a polymer based on the reaction of an **isocyanate** with a **polyamine**. It is mixed at **high temperature** (around 80°C) to initiate rapid polymerization. The resulting polymer is highly **elastomeric** – that is, it has a high capacity to deform (stretch) and recover. Coatings based on **polyurea elastomer** also exhibit extraordinary **toughness** and resistance to impact, tear and abrasion.

Furthermore, polyurea polymers cure at **lower temperatures**, and operate at much greater **extremes** of temperature than other polymers.

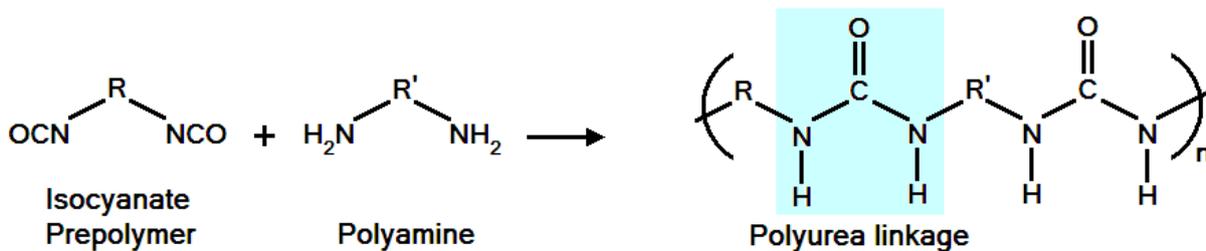
**Polyurea elastomer coatings** are **100% solids**, and contain no volatile organic components (zero VOC) and are therefore virtually **odourless**. They cure within **minutes**, so flooring and equipment can undergo maintenance with minimal disruption.

This combination of properties offers unique opportunities for true **polyurea elastomer coatings** in the protective coatings industry.

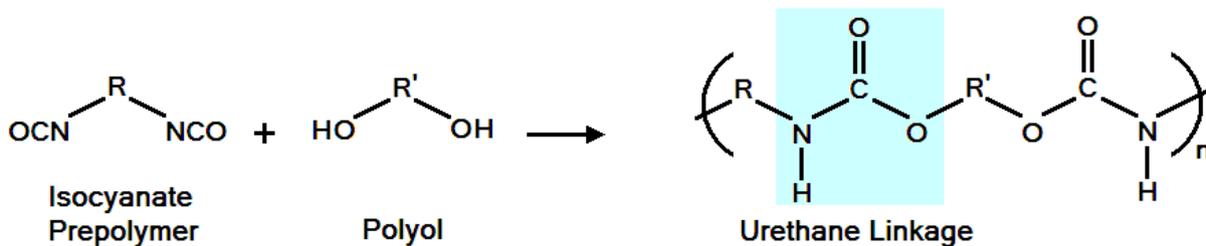


### What is a Polyurea Hybrid?

A **true polyurea elastomer** is the product of the reaction of a poly-isocyanate component and an **amine-terminated resin** (polyamine).



A **polyurethane** is the product of the reaction of a poly-isocyanate component and a **polyol**.



Polyurethanes have significantly different properties from **polyurea elastomers**. A polyurethane is generally hard and of low flexibility and therefore an ideal finish coat as part of a protective coating system over steelwork, car bodies and other rigid, dimensionally stable substrates not normally exposed to high mechanical impact.

A **polyurea hybrid** is the product of the reaction between an isocyanate and a mixture of **polyol** and **polyamine** reactants. The resultant hybrid behaves as a **blend** of polyurea and polyurethane and thus its properties are a **compromise** between the two. A **polyurea hybrid** therefore **does not** have the strength, flexibility, elasticity or recovery characteristics nor the temperature tolerance of a **true polyurea elastomer**.

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### Uses

#### Where Would You Use A Polyurea Elastomer?

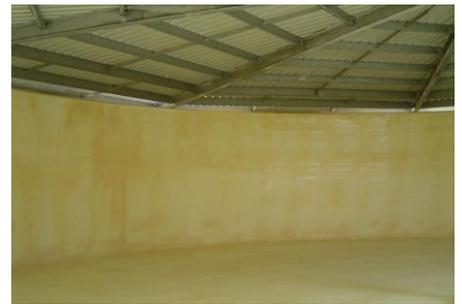
A **true polyurea elastomer** is designed for use in mining and process industries as a **resilient lining** for hopper cars, conveyors, tanks, slurry systems and various equipment parts, which are subject to **extreme abrasion**. It is also suitable for use in water and waste treatment plants on walls, and rake arm assemblies in settling tanks, clarifiers and filters. Due to its excellent chemical resistance, it also finds service in chemical plants and storage bunds.

#### Where Would You Use A Polyurea Hybrid?

Polyurea **hybrid** coatings are **lower in cost** than **true polyurea elastomer** coatings and are generally used on “**non-critical**” items that do not require high impact resistance, immersion conditions or extreme temperatures during application or in commission. If cost is a factor, however, a range of other, lower cost products may be considered.

### Mixing Issues

Whilst good mixing of any two-pack product is important, it is essential when mixing **polyurea elastomer coatings**. Good mixing efficiency will result in maximum tensile strength, tear resistance and elongation values. Poor mixing will result in darker spots or lines in the coating due to unreacted amines, and dramatically reduced tensile strength and other properties.



### Application Issues

Normal paint spray equipment cannot be used to apply **polyurea elastomer coatings**. High temperature and pressure are required during application, and therefore **specialised spray equipment** needs to be purchased, along with necessary application **training**.

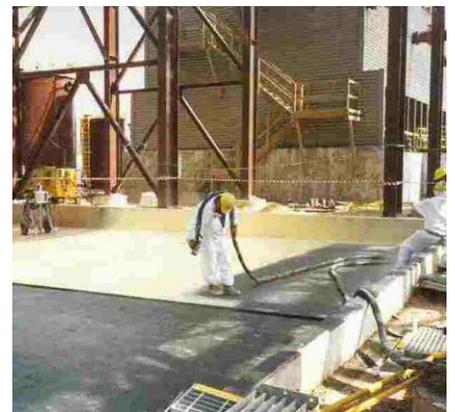
### Application of Polyurea Elastomer Coatings

#### Advantages

- *2 component, 100% solids*
- *Very fast cure, even at temperatures around 0°C*
- *Maintains high elasticity, even in low temperatures*
- *Very good resistance to most mineral acids*
- *Very high film builds possible*
- *Very high tensile and tear strengths*
- *Very high elongation and recovery*
- *Very high abrasion resistance*

#### Disadvantages

- *Fast cure can present application difficulties*
- *High reactivity and short cure time can limit effective substrate wetting and result in poor adhesion*
- *Specialized application equipment specifically for polyurea is required*
- *High degree of applicator skill is required*
- *Sensitive to many organic solvents*



For more information, please contact your Dulux Protective Coatings Technical Consultant.