

# Eastman **plasticizers**

*in polyurethane applications*



## *Flexibility and strength in a versatile market*

Polyurethanes are some of the most advantageous polymers in the marketplace today. Diverse polyurethanes are found in so many applications—from sealants to bowling balls, from shoe soles to mattresses, and from skateboard wheels to automotive dashboards.

Because polyurethane chemistry is one of the most versatile classes of polymer chemistry, applications vary drastically. Proper design of the polyurethane backbone yields hardness levels from hard (80 Shore D) to quite soft (60 Shore A).

Many polyurethane applications require an added plasticizer to achieve the required final properties, and Eastman plasticizers can offer the ideal solution.

## *A plasticizer portfolio to meet your needs*

Eastman has one of the broadest plasticizer portfolios in the industry. Our portfolio includes several plasticizers for polyurethane applications, all of which are non-phthalate. These solutions may prove vital when operating under regulatory restrictions.

Benzoflex™ 9-88 SG plasticizer is specifically designed for 2K polyurethane systems. It has lower cure interference in these types of reactions due to lower hydroxyl and water content.



Benzoflex TPU-405 plasticizer is also intended for 2K polyurethane systems, and it has lower color than Benzoflex 9-88 SG and is a low-odor plasticizer. Therefore, it is specifically intended for applications in which less color or high transparency is a critical property.

Benzoflex 9-88 plasticizer has a higher hydroxyl content and, therefore, is normally used in 1K polyurethane systems or in processes where the isocyanate component has already been fully reacted.

Eastman TXIB™ formulation additive is our lowest viscosity additive for polyurethanes. This product enables better flow in molded applications, providing increased mold definition and decreased density of molded parts.

Although polyurethane chemists hold many tools at their disposal, designing a polyurethane to meet specific requirements is a challenging task. This is especially true when targets for final properties compete against each other.

When creating polyurethanes for specific applications, it is important for the formulator to understand how plasticizers will impact each of these key properties.

## *Which plasticizer is right for you?*

Because plasticizer choice is critical in PU systems, understanding the difference between each plasticizer is key. Figures 1 through 6 showcase Eastman's primary offerings for polyurethanes (Benzoflex 9-88 and Benzoflex 9-88 SG) compared to a common phthalate choice—butyl benzyl phthalate (BBP). Key performance parameters (hardness, tear resistance, and resilience) are compared in both polyether- and polyester-based thermoplastic polyurethanes (TPUs). Keep in mind that Benzoflex 9-88 SG and Benzoflex TPU-405 should provide similar performance properties.



Figure 1. Shore A hardness in MDI/polyether-based TPUs

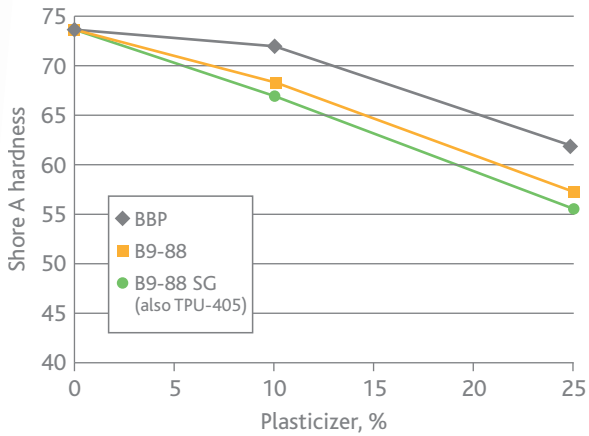


Figure 2. Tear resistance in MDI/polyether-based TPUs

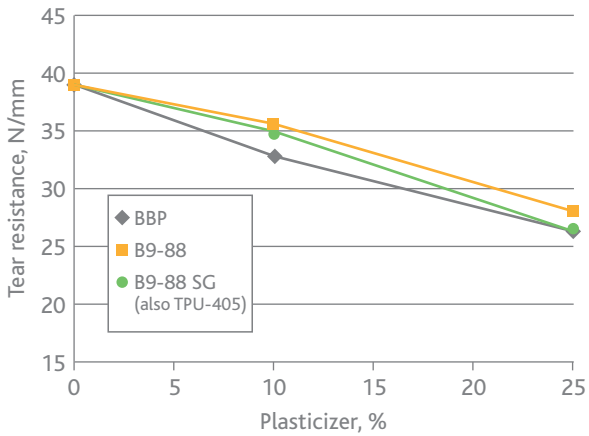


Figure 3. Bashore resilience in MDI/polyether-based TPUs

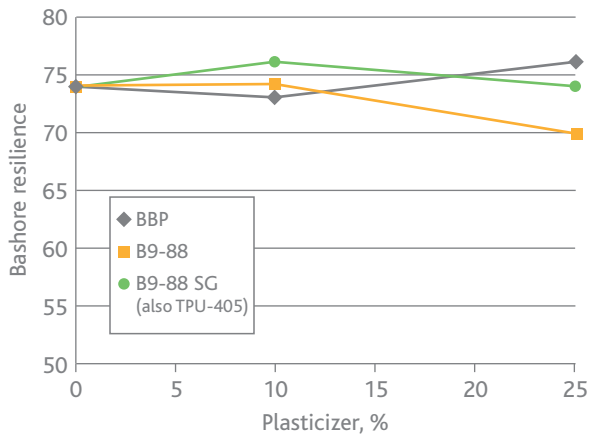


Figure 4. Shore A hardness in MDI/polyester-based TPUs

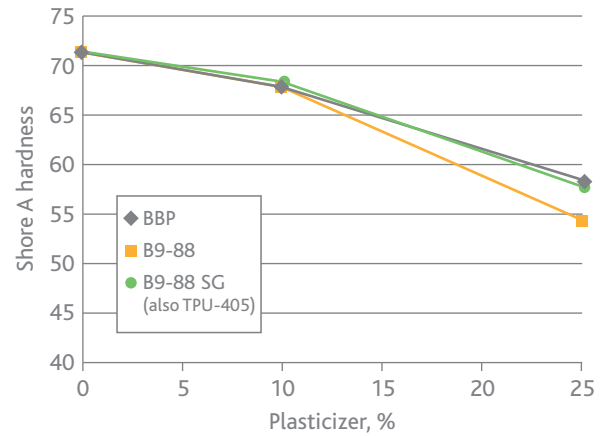


Figure 5. Tear resistance in MDI/polyester-based TPUs

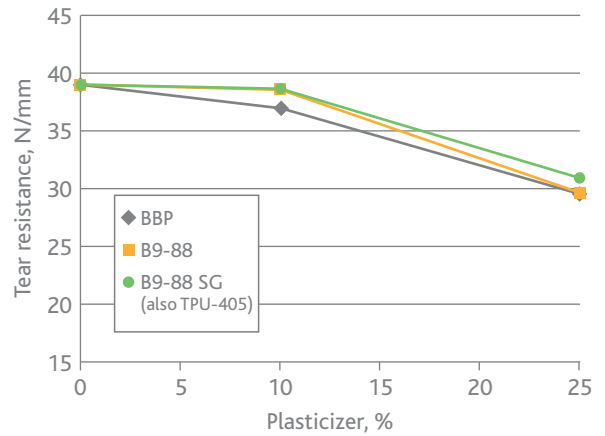
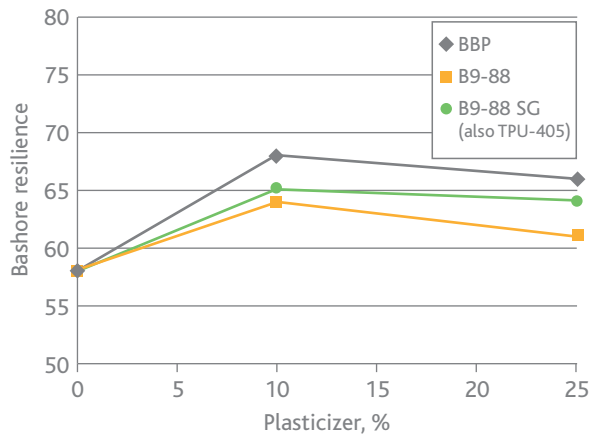


Figure 6. Bashore resilience in MDI/polyester-based TPUs



## Benzoflex products excel in PU systems.

Benzoflex 9-88 and Benzoflex 9-88 SG are extremely efficient at reducing hardness because they interact with the soft segments in the polyurethane matrix. These plasticizers demonstrate improvement compared to other plasticizer chemistries in polyether systems. As a result, lower plasticizer levels can achieve the same target performance, resulting in increased cost efficiency. Concurrently, these Eastman plasticizers benefit mechanical properties as seen in the results for tear resistance.

## Benzoflex TPU-405: The clear choice

When tackling challenging applications that require very low color, consider choosing Benzoflex TPU-405. As this product is virtually identical to Benzoflex 9-88 SG except for color, its property performance remains the same. Benzoflex TPU-405 enables you to achieve transparent products or ultralow color differences for light-colored products.

## Going with the flow

Molding parts with high-definition features continues to be a challenge with polyurethanes. To achieve better mold definition, Eastman TXIB formulation additive can be added in small amounts, allowing lower viscosity and better flow. For an example, see Figure 7.

Figure 7. Standard PU formulation vs. same formulation with 5% Eastman TXIB



A = Standard formulation based on TDI-terminated polyester prepolymer/ aromatic diamine system

B = Same formulation with addition of 5% Eastman TXIB formulation additive

## Work with a leader. Shape a market.

Are you looking for superior plasticizer and additive choices for polyurethanes? Choose Eastman as your go-to supplier.

With a long history of innovation, a reliable global supply, and 24/7 technical support, Eastman remains committed to meeting our customers' long-term needs and addressing the shifting regulatory landscape of the industry.

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To learn more about Eastman plasticizers in polyurethane applications, contact your Eastman representative or visit [www.EastmanPlasticizers.com/polyurethane](http://www.EastmanPlasticizers.com/polyurethane).

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