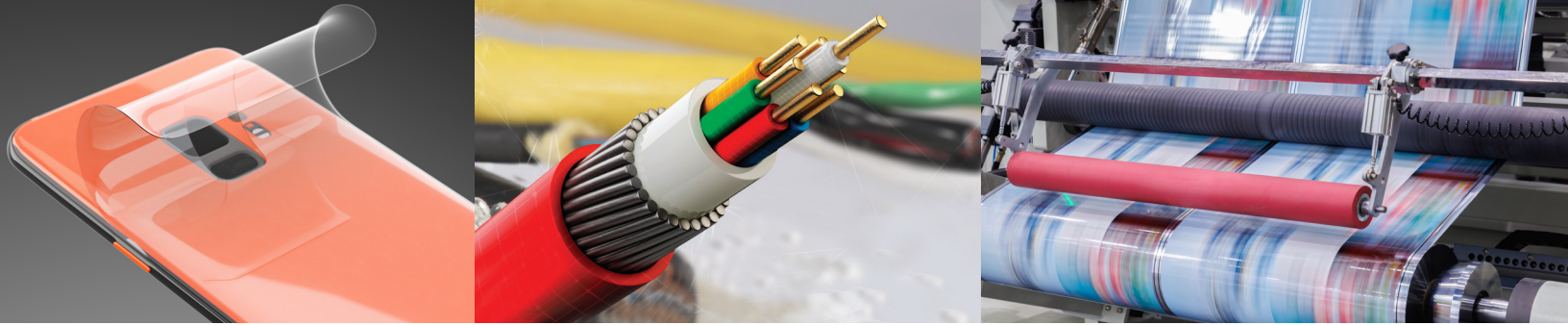


Lubrizol

Imagined for Life. Enabled by Science.™

Lubrizol TPU – The Sustainable Alternative to Rubber





Lubrizol TPU Specialties Offer Advantages Over Traditional Rubber



APPLICATIONS

- **Industrial Parts**
 - wheels
 - cables
 - foam pads
 - seals
 - hoses
 - belting
 - printing blankets
- **Automotive Parts**
- **Footwear**
- **Sporting Goods**
- **Electronics**
- **Consumer Goods**

LUBRIZOL TPU

Lubrizol offers thermoplastic polyurethane (TPU) under different brand names in a very extensive portfolio with a broad range of chemistries and hardnesses. **ESTANE®**, **Pearlthane™**, and **Pearlcoat™** TPUs offer a unique combination of flexibility, strength, environmental resistance (UV and ozone exposure), durability (longer service life), and faster and more efficient manufacturing, allowing rubber to be replaced by a high-performing alternative as will be shown below.

New market trends towards energy efficiency, regulatory changes and/or sustainability also provide new opportunities to apply Lubrizol TPU. One example is cable jacketing.

Cables with insulation rubber that use plasticizers may generate toxic fumes when exposed to elevated temperatures. ESTANE® TPU for cables is plasticizer-free, flexible in a wide temperature range and demonstrates an excellent abrasion resistance. Part of the ESTANE® portfolio is an extremely broad range of non-halogenated flame-retardant materials that meet the specific needs for all different cable and wire applications within the field of automation, EV-charging or optical fiber.

ABRASION RESISTANCE

Lubrizol TPU is known for its excellent abrasion resistance which means it can withstand wear and tear better than rubber in many applications (see figure 1).

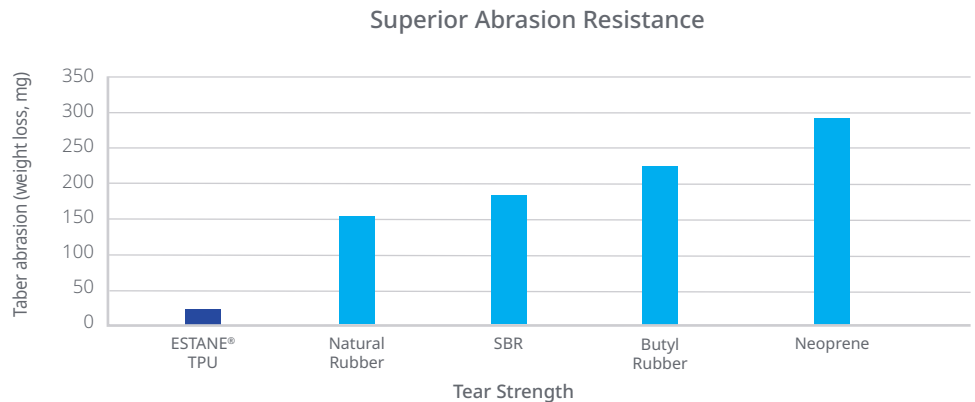


Figure 1: ESTANE® TPU shows superior abrasion resistance vs other polymers



FLEXIBILITY

It provides high rebound and remains flexible even at low temperatures where rubber might become brittle due to the plasticizers within its formula.

EFFICIENT PROCESSING AND PART DESIGN

Generally, TPU articles are lighter than rubber, and for a step further: low-density **Pearlthane** grades can be beneficial in applications, like footwear and automotive parts, where weight reduction is important. Additionally, TPU can be easily molded or extruded into complex shapes, allowing for process flexibility and optimization leading to reduced process-energy consumption.

DESIGN FREEDOM

We provide transparent resins that are color stable even outdoors. And with the use of masterbatches or the easy paintability of our TPU, it is possible to achieve excellent aesthetics in assorted colors. Our polymer's ability to reproduce high-quality print details is one more reason this customization allows for a broader range of uses compared to rubber.

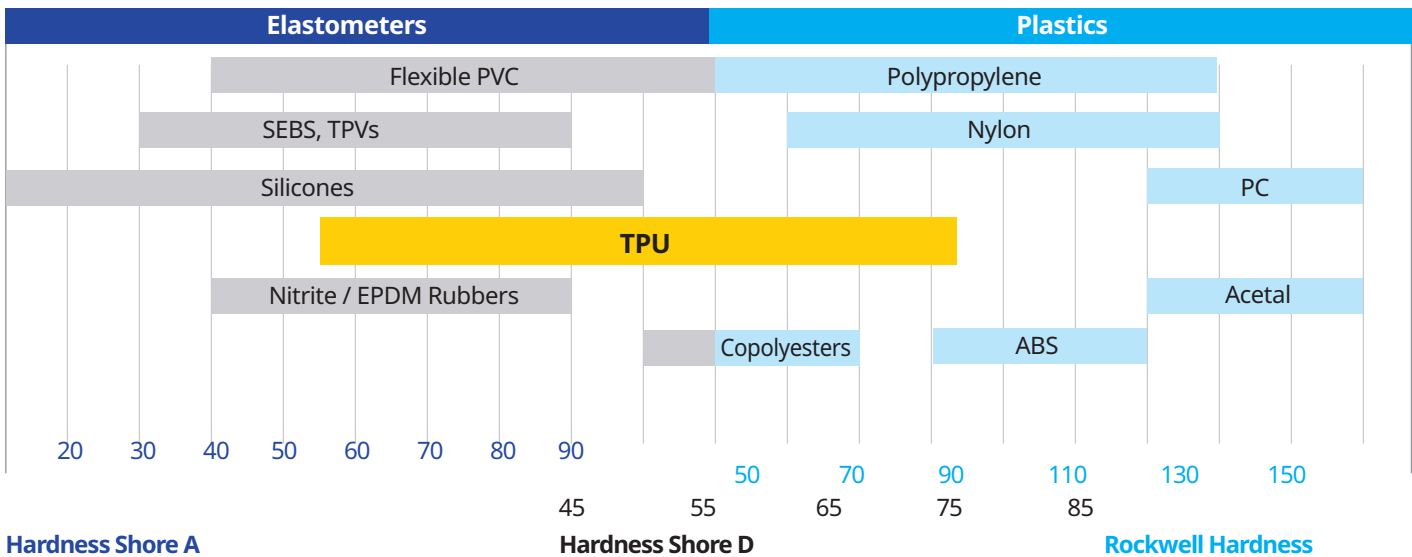
SUSTAINABILITY

Unlike rubber, Lubrizol TPU is plasticizer-free and recyclable*. Lubrizol has a broad package of bio-based and mass balance materials which complete the sustainable TPU offering that delivers a lower carbon footprint on top of providing the above technical benefits.

TPU is a unique type of plastic bridging the gap between rubbers and plastics. The key to its versatility is that its hardness can be highly customized, TPU can be as soft as rubber or as hard as rigid plastics. There are other benefits of Lubrizol TPU depending on the specific end use. When bonding to other substrates is a requirement, we provide adhesive grades that include color stability. The look and feel of TPU is just as versatile.

* Recyclability is based on access to a readily available standard recycling program that supports such materials. Products may not be available in all areas.

Figure 2: TPU bridges the gap between elastomers and plastics



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Since the invention of Bio TPU** almost twenty years ago, Lubrizol has been evolving to provide more sustainable solutions in the TPU market, our Engineered Polymers expert team is well positioned to help other markets start the journey to sustainability without losing any high-performing product properties. By leveraging cross-technological innovations, our specialties help us to empower our clients to thrive in a rapidly evolving landscape. Rubber replacement is one of the areas Lubrizol solutions can make an impact in, to make the future more sustainable.

For more detailed information on our offering, you can visit the Lubrizol Engineered Polymers website: <https://go.lubrizol.com/EP>

**Bio-based content as certified in accordance with ASTM D6866

Lubrizol



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