

Mechanical Properties

IMPACT RESISTANCE:

Northane Polyurethane has substantially better impact resistance than structural plastics. Values for Northane 75D composition compared with several other plastics are shown in figure 1. All standard compounds of Northane Polyurethane exhibit good low temperature impact resistance and low brittle points.

ABRASION RESISTANCE:

In applications where severe wear is a problem polyurethanes offer outstanding durability when compared with rubber, plastics or even metals.

Many products such as solid tires, rolls and roll covers, gears, sprockets and bearings have outworn rubber and metal many times over. It should be emphasized, however, that abrasion resistance is a complex property. Selection of the proper formulation of polyurethane should be based on actual experience or simulated service tests.

FLEX PROPERTIES:

Northane Polyurethanes resist cracking under repeated flexure. Once nicked or cut they show excellent resistance to cut-growth under repeated flex conditions. Unlike other elastomers, polyurethane can be utilized in very thin sections because of its exceptional strength and toughness.

CONTROLLABLE REBOUND or RESILIENCE:

Resilience in rubber is generally a function of hardness. This often undesirable relationship does not hold true with polyurethanes. Formulations are available in a wide range of resilience, from heavy shock-absorbing uses to high frequency vibrations or where quick recovery from deflection is required.

Typical applications are shock pads and aircraft landing gear shock absorbers, load springs for railway use and metal forming dies and machine mounts.

COLD RESISTANCE:

Northane Polyurethanes remain flexible at very low temperatures. Some as low as -80°F. This low temperature impact resistance has led to many applications in the far north.

HEAT RESISTANCE:

Products of Northane Polyurethanes can be employed in many dry heat applications - operating up to 200°F. Holding a typical compound at 250°F for one week causes only minor decreases in physical properties. Continuous uses above 200°F is not recommended.

MACHINABILITY:

The machinability of hard compounds of polyurethane approaches that of some metals and is similar to many plastics. It can be drilled, routed, sawn or turned and shaped on standard metalworking equipment by experienced operators familiar with the normal procedures for handling plastics.

IMPACT RESISTANCE IZOD, J/m (FT.-LB./IN.) (ASTM D256)				
	Nylon	Acetal	Acrylic	Urethane
Hardness (Rockwell or Durometer)	Rockwell R108	Rockwell R120	Rockwell M103	Durometer 75D (Rockwell R90)
Notched 75°F	2.0	1.4	0.3	19.0
Notched -40°F	0.5	1.2	0.3	1.1

Figure 1.

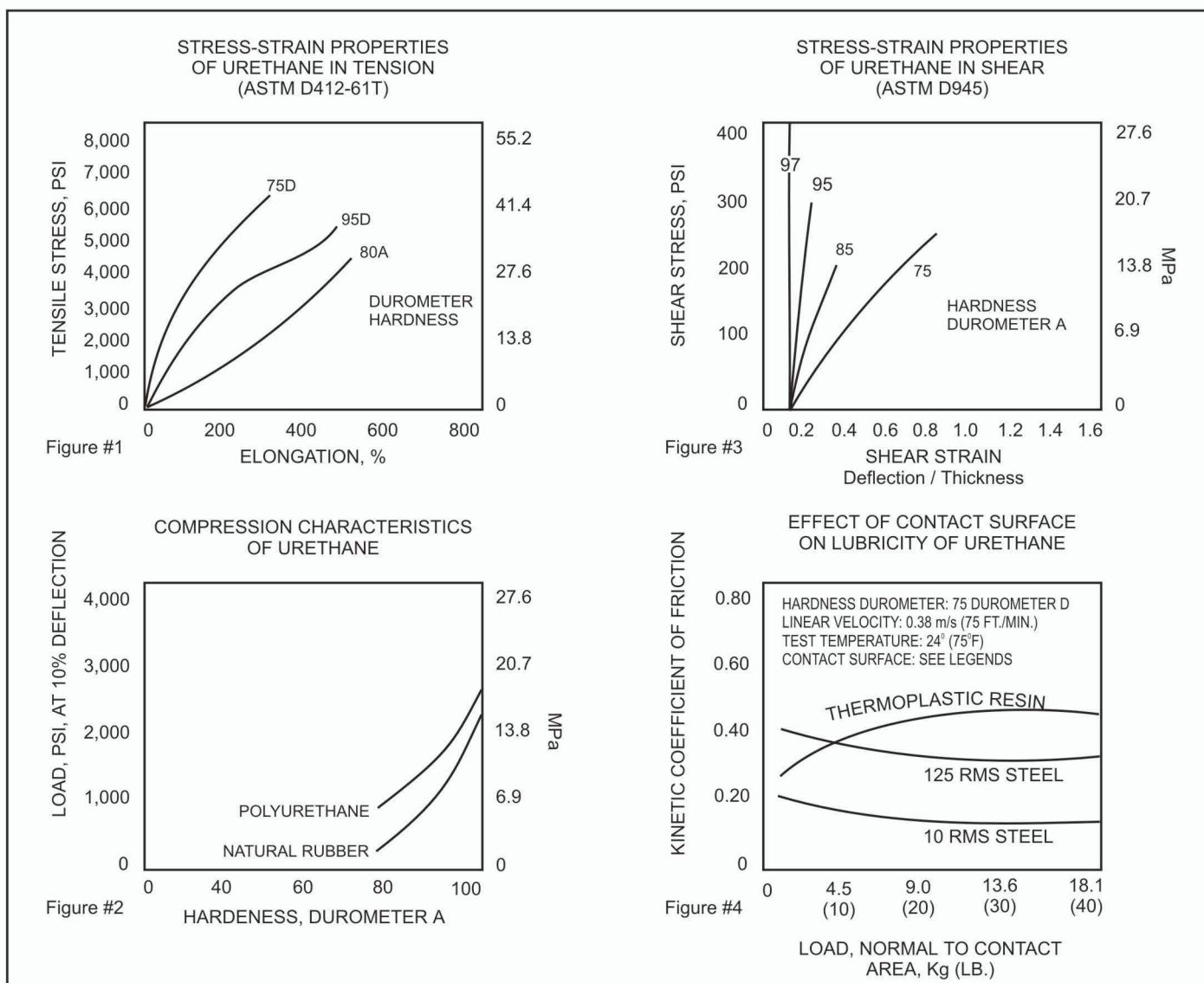
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TENSION:

Tensile strength and ultimate elongation measurements are helpful for indicating overall quality of polyurethanes. Although these measurements do not always correlate with other properties or with the performance in service, the tensile stress strain curves in. The graph below will give an example of the high strength characteristic of urethanes, especially at low elongations. Even very hard compounds exhibit good elongation.

SHEAR PROPERTIES:

Shear stress strain curves for Northane Polyurethanes ranging in hardness from 75 to 97 durometer A are given in the graph below. As a result of its high load-bearing capacity in tension and compression, Northane Polyurethane also shows a high load-bearing capacity in Shear.



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COMPRESSION PROPERTIES:

Northane Polyurethane has a far greater load-bearing capacity than conventional elastomers of comparable hardness. The graph on the previous page (figure #2) shows the compressive stresses required to make a ten percent deflection with samples of Northane Polyurethane and natural rubber of similar hardness. The high load-bearing capacity is an important advantage in some designs and in others it is the very factor that makes them possible.

COEFFICIENT of FRICTION:

Northane Polyurethane has a low coefficient of friction which decreases sharply as hardness increases (see figure 4 on previous page). This characteristic coupled with its superior abrasion resistance and load-carrying ability is a primary reason why Northane Polyurethanes are being used in bearings and bushings.

Environmental Properties

WEATHER and COLOUR STABILITY:

Polyurethane elastomers will darken and their physical properties will be reduced by prolonged exposure to ultra violet light. These effects can be reduced by adding pigmentation, UV stabilizers and anti-oxidants.

MOLD, MILDEW and FUNGUS:

Standard compounds of polyurethanes do not support fungus growth and are generally resistant to fungus attack and mildew growth. Certain formulations may be affected by fungus or mildew, but can be prevented by adding certain commercial fungicides.

WATER RESISTANCE:

Northane Polyurethanes show excellent resistance to swelling and the deteriorating effects of submersion in water and have excellent long term qualities in water at temperatures as high as 50°C. Tests indicate that after immersion in water for up to one year at 50°C, a typical compound retained 76% of it's original properties. Various polyurethanes do vary in swell characteristics and deterioration. Swell may also vary depending on the amount of time in total submersion.

OIL, CHEMICAL and SOLVENT RESISTANCE:

Northane Polyurethanes have excellent oil and solvent resistance, which makes a part produced with urethane well-suited for service in lubricating oils or fuel environments. Aromatic hydrocarbons and polar solvents have a moderate to severe effect on polyurethane.