

SORBOTHANE® Material Properties

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INTRODUCTION

Sorbothane® is a proprietary, visco-elastic polymer. Visco-elastic means that a material exhibits properties of both liquids (viscous solutions) and solids (elastic materials).

Sorbothane is a thermoset, polyether-based, polyurethane material.

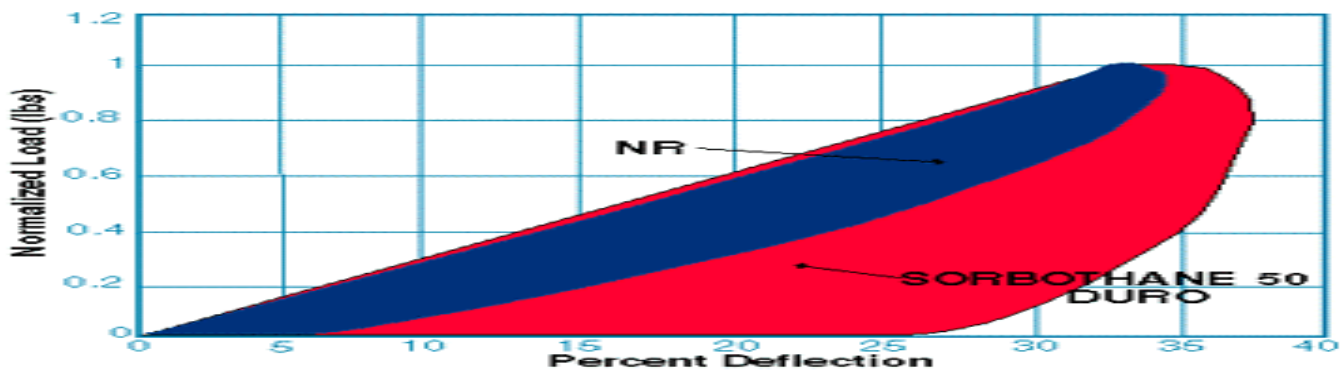
Sorbothane combines shock absorption, good memory, vibration isolation and vibration damping characteristics. In addition, Sorbothane is a very effective acoustic damper and absorber. While many materials exhibit one of these characteristics, Sorbothane combines all of them in a stable material with a long fatigue life.

- Sorbothane has a low creep rate compared to other polymers (rubber, neoprene, silicone, etc.)
- Sorbothane has a superior damping coefficient, over a very wide temperature range, compared to any other polymer.
- Unlike fluid-based shock absorbers or foam products, Sorbothane absorbs shock efficiently for millions of cycles.
- Sorbothane eliminates the need for metal springs to return the system to its equilibrium position after absorbing a shock.

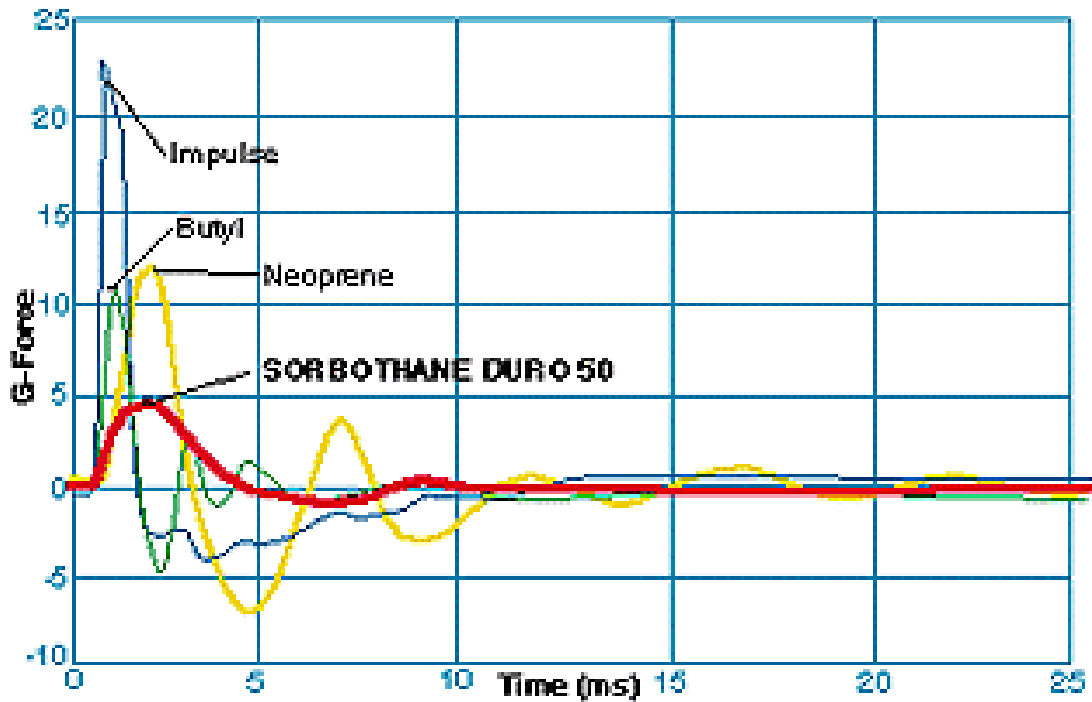
Material Properties of Sorbothane®					
Property	Durometer (Shore 00)			Units	Notes
	30	50	70		
Tensile Strength at break,	83.39	122.61	206.06	psi	ASTM D412 92
Elongation at break,	582	568	399	%	ASTM D412 92
Tensile Elastic Stress at 100% Strain	17.86	25.47	66.18	psi	ASTM D412 92
Tensile Elastic Stress at 200% Strain	36.28	54.86	127.02	psi	ASTM D412 92
Tensile Elastic Stress at 300% Strain	54.88	80.13	165.95	psi	ASTM D412 92
Compressive Stress at 20% Strain	6.4	12.0	30.0	psi	ASTM D575 91
Compressive Stress at 50% Strain	86.1	105.0	232.0	psi	ASTM D575 91
Tear Strength	43.62	48.73	65.26	lb/inch	ASTM D624 91 Die C
Bulk Modulus		2.86		gPascal	
Static Coefficient of Friction	15.8	10.4	4.1		ASTM D1894 on polished steel
Kinetic Coefficient of Friction	3.3	2.6	2.5		ASTM D1894 on polished steel
Density	85.5	85.0	84.9	lb/ft ³	ASTM D792
Specific Gravity	1.372	1.364	1.363		ASTM D792
Optimum Performance Temperature Range	-20° to +160°	-20° to +160°	-20° to +160°	F	Reduced strength and damping up to 200°F. Increased spring rate down to glass transition temperature.
Glass Transition	-38.7°	-37.4°	-34.7°	C	ASTM E1640 94 by peak Tangent Delta
Flash Ignition Flammability		570°		F	
Self Ignition Flammability		750°		F	
Flammability Rating with Flame Retardant Added	V2	V2	V2		Underwriters Laboratory 94 compatibility

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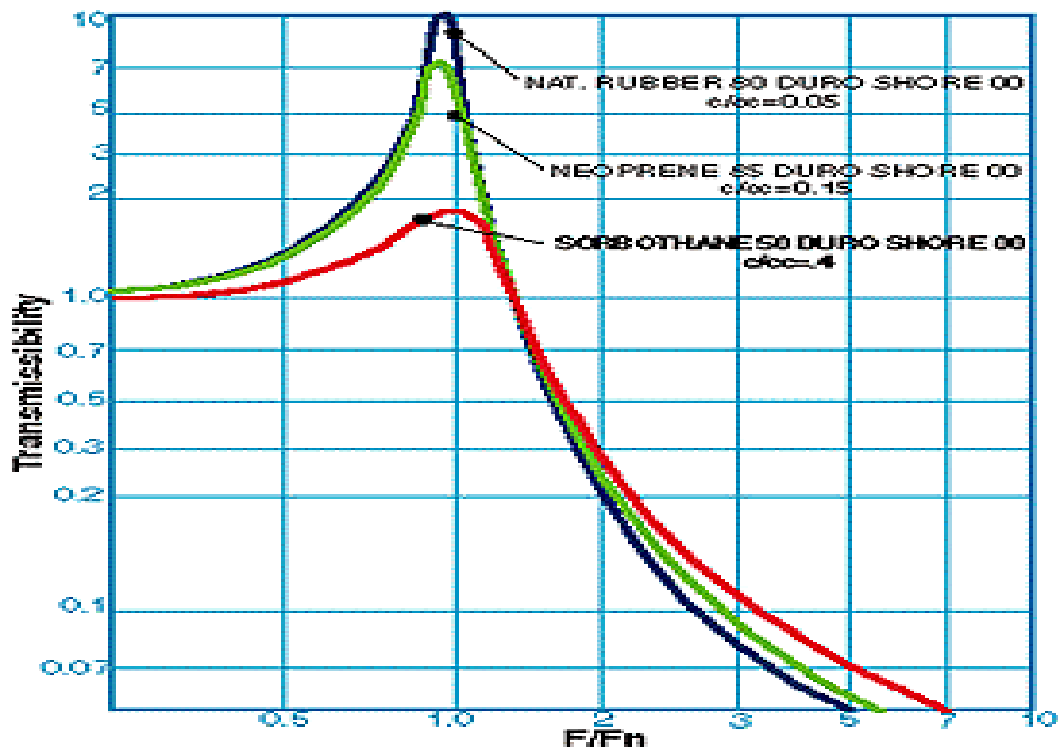
Property	Durometer (Shore 00)			Units	Notes
	30	50	70		
Resilience Test Rebound Height	2	11	22	%	ASTM D2632 92
Resilience Test Rebound Height	16	18	25	%	ASTM D2632 92 modified for the effects of material tack
Dielectric Strength	241	256	261	V/mil	ASTM D149 97
Dynamic Young's Modulus at 5 Hertz	90	105	120	psi	
Dynamic Young's Modulus at 15 Hertz	135	150	162	psi	
Dynamic Young's Modulus at 30 Hertz	186	210	237	psi	
Dynamic Young's Modulus at 50 Hertz	246	270	300	psi	
Tangent Delta at 5 Hertz excitation	0.30	0.56	0.56		
Tangent Delta at 15 Hertz excitation	0.38	0.58	0.60		
Tangent Delta at 30 Hertz excitation	0.45	0.57	0.59		
Tangent Delta at 50 Hertz excitation	0.35	0.50	0.55		
Bacterial Resistance	No growth				
Fungal Resistance	No growth				
Heat Aging	Stable				72 hours @ 158°F No change in size, appearance or durometer
Ultraviolet	Good				
Ozone					Can be compounded for resistance
Chemical Resistance to Hydraulic Fluid	-1.4			% wt change	ASTM D543, 7-day immersion
Chemical Resistance to Kerosene	4.3			% wt change	ASTM D543, 7-day immersion
Chemical Resistance to Diesel	6.4			% wt change	ASTM D543, 7-day immersion
Chemical Resistance to Soap Solution	5.0			% wt change	ASTM D543, 7-day immersion
Acoustic Properties: transmission loss in Air	greater than 40			decibels/cm	at 50 Hertz. Transmission loss increases with frequency.



Hysteresis Response of Sorbothane and Natural Rubber



Response of Sorbothane and other materials to an Impulse



Transmissibility of Sorbothane and other Materials as a function of the Excitation Frequency/Natural Frequency Ratio