



### Compression Deflection of Millathane® Compounds

Compression deflection is the amount of force required to compress material to a specific percentage of its original thickness. Compression deflection data are useful in comparing stiffness of rubber materials in compression and can be used by engineers and rubber technologists in development of materials for compressive applications. Several Millathane® millable urethane compounds were tested for compression deflection to provide end users and engineers with this information on typical compounds.

For this study, compounds were made of three different Millathane® grades, polyether grade E34 and polyester grades 76 and 5004. Two different N330 black/plasticizer levels were used with each polymer, giving a range of compound hardness and tensile stress (“modulus”) values. Millathane® E34 and Millathane® 76 compounds were sulfur cured, while the 5004 compounds were peroxide cured. Formulas for the compounds and the physical properties are shown on the following charts.

Millathane® Grade (100 parts)	Millathane® E34		Millathane® 76		Millathane® 5004	
Hardness, Shore A	65	55	61	50	63	45
Zinc Stearate	0.5	0.5	0.5	0.5		
Stearic Acid					0.2	0.2
N330	30	20	30	20	30	20
TP-95	5	15	5	15	5	15
Struktol WB222	1	1	1	1	1	1
MBTS	4	4	4	4		
MBT	2	2	2	2		
Thanecure® ZM	1	1	1	1		
Sulfur	1.5	1.5	1.5	1.5		
DiCup 40C					5	5
<b>Total</b>	<b>145</b>	<b>145</b>	<b>145</b>	<b>145</b>	<b>141.2</b>	<b>141.2</b>

### PHYSICAL PROPERTIES

	Millathane® E34		Millathane® 76		Millathane® 5004	
Mooney Viscosity, ML(1+4)/100°C	62	38	37	14	62	33
Hardness, Shore A	65	55	61	50	63	45
Press Cure, t90 at 160°C, min.	7	9	7	7	11	10
TSE-100*, psi (MPa)	425 (2.9)	260 (1.8)	295 (2.0)	185 (1.3)	365 (2.5)	140 (1.0)
TSE-200*, psi (MPa)	1040 (7.2)	580 (4.0)	655 (4.5)	410 (2.8)	935 (6.4)	285 (2.0)
TSE-300*, psi (MPa)	1790 (12.3)	1080 (7.4)	1170 (8.1)	795 (5.5)	1730 (11.9)	560 (3.9)
Tensile Strength, psi (MPa)	4310 (29.7)	3040 (21.0)	4060 (28.0)	3730(25.7)	3800 (26.2)	1840 (12.7)
Elongation, %	530	535	675	690	595	665
Tear, Die C, lb/in (kN/m)	245 (42.9)	168 (29.4)	205 (35.9)	141 (24.7)	216 (37.8)	145 (25.4)
Bashore Resilience, %	55	59	18	25	45	46

\*TSE-xxx = Tensile Stress at xxx% Elongation

The properties show excellent physical properties for all the compounds, although the softer 5004 compound turned out to be softer and lower tensile strength than expected. Millathane® E34 showed the highest resilience and Millathane® 76 showed the lowest resilience, as is typical for compounds made from these polymers.



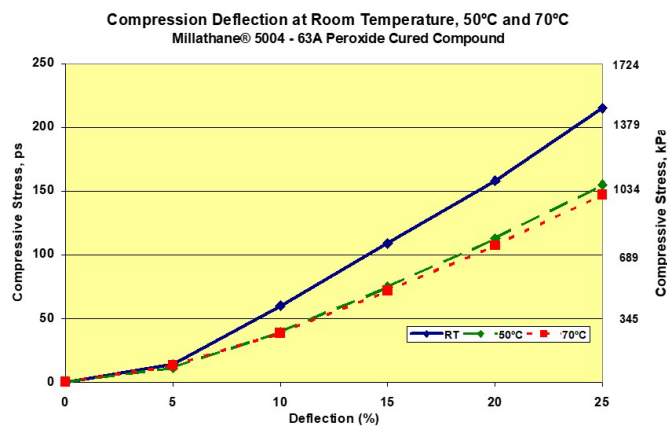
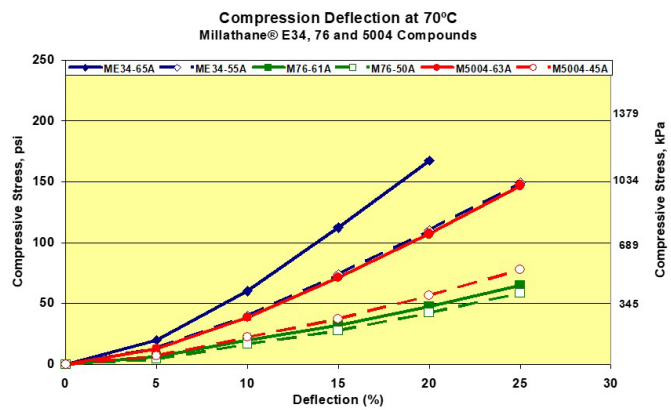
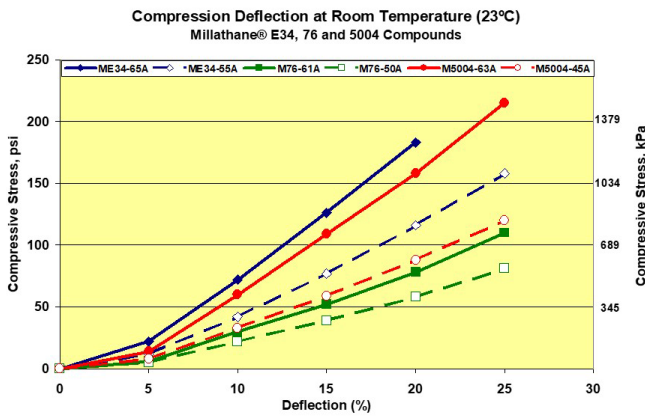
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#### COMPRESSION DEFLECTION RESULTS

Testing of compression deflection was conducted per ASTM D575 Method A, using a TechPro TensiTECH machine. The compression deflection samples had a shape factor of 0.5 (cylinders 1 inch (25.4 mm) in diameter and 0.5 inch (12.7 mm) high). Compression deflection was tested at room temperature (23°C), 50°C and 70°C.

The data, plotted in the charts below, show the softer compounds having lower compression deflection curves than harder compounds. Also, the Millathane 76 compounds show the lowest compression deflection values, while the Millathane E34 and Millathane 5004 compounds had somewhat similar compression deflection, when comparing the compounds at similar hardness.

The compression deflection results at higher temperatures show the expected trend of less stress required to deflect the samples. This is shown in the plotted 70°C data for all compounds and the 63 Shore A Millathane 5004 compound tested at all three temperatures.



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