



### Millathane® Urethane For Fuel Bladders

Millable urethanes, especially polyester urethanes such as Millathane 5004, have good resistance to oils and fuel as seen by the immersions in JP4 and JP8 fuels, below. Polyether urethanes such as Millathane CM have less resistance to fuels but have improved water resistance and improved low temperature properties.

	<u>CM</u>	<u>5004</u>
Millathane® CM	100	-----
Millathane® 5004	-----	100
Zinc Stearate	0.5	-----
Stearic Acid	-----	0.25
N330 black	30	35
TP90B plasticizer	-----	10
MBTS	4	-----
MBT	2	-----
Thanecure® ZM	1	-----
Sulfur	2	-----
DiCup 40C	-----	5
	<u>139.5</u>	<u>150.25</u>
 <b>Mooney Viscosity</b>		
ML(1+4)/100°C	200	56
 <b>MDR, 160°C</b>		
ML, lb-in (dNm)	3.6 ( 4.1 )	0.8 ( 0.9 )
MH, lb-in (dNm)	41.1 ( 46.4 )	19.3 ( 21.8 )
ts2, min.	2.1	2.7
t90, min.	5.5	16.4
 <b>Original Physical Properties</b>		
Cure time at 160°C, min.	15	20
Hardness, Shore A	70	67
300% Modulus, psi (MPa)	2580 ( 17.8 )	1370 ( 9.4 )
Tensile Strength, psi (MPa)	3420 ( 23.6 )	2460 ( 17.0 )
Elongation, %	370	670
Tear Die C, lb/in (kN/m)	350 ( 61.3 )	360 ( 63.0 )
 <b>Oven Aged 70 hr/125°C</b>		
Hardness Change, Pts	+7	+11
Tensile Strength, % Change	+6	+34
Elongation, % Change	-38	-27
 <b>Aged in JP4 Fuel, 70 hr/88°C(190°F)</b>		
Hardness Change, Pts	-7	0
Tensile Strength, % Change	-52	+1
Elongation, % Change	-51	+15
Weight Change, %	+26	-1.7
Volume Change, %	+42	-0.2

The recommendations for the use of our products are based on tests believed to be reliable. However, we do not guarantee the results to be obtained by others under different conditions. Nothing in this literature is intended as a recommendation to use our products so as to infringe on any patent. Millathane and Thanecure are registered trademarks of TSE Industries, Inc.



**Millathane® Urethane For Fuel Bladders, continued**

Millathane grade:	CM	5004
<b>Aged in JP8 Fuel, 70 hr/88°C (190°F)</b>		
Hardness Change, Pts	-5	+3
Tensile Strength, % Change	-54	+4
Elongation, % Change	-49	+7
Weight Change, %	+18	-4.6
Volume Change, %	+28	-4.8
<b>Aged in Water, 70 hr/100°C</b>		
Hardness Change, Pts	-10	Too Soft
Tensile Strength, % Change	-56	To
Elongation, % Change	-35	Test
Weight Change, %	+12	+7
Volume Change, %	+14	+8
<b>Compression Set</b>		
70 hr/70°C, % set	54	----
22 hr/100°C, % set	----	61
<b>Brittle Point, °C</b>		
Unaged	-61	-57
JP4 Aged	-57	-52
JP8 Aged	-61	-57
<b>Temperature Retraction, °C</b>		
TR-10	-45	-38
TR-30	-39	-23
TR-50	-24	-18

**Summary**

Millathane 5004 (peroxide cured) had better resistance to JP4 and JP8 fuels than Millathane CM (sulfur cured), but Millathane CM had better low temperature properties and hot water resistance.

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