



## Bonding of Millathane® Millable Urethane Compounds to Metal For Rubber Covered Rollers and Other Applications

Bonding studies were conducted by suppliers of adhesives to the rubber industry, Lord Corporation<sup>1</sup>, Chemical Innovations Ltd.<sup>2</sup> and H.M. Royal (supplier of Dow Chemical adhesives<sup>3</sup>) to determine the best adhesives to bond two Millathane compounds, a peroxide cured Millathane 5004 compound<sup>4</sup> and a sulfur cured Millathane E34 compound<sup>5</sup>, to steel. The test results are below.

Note that the testing by the three companies was done under different conditions, with different steel grades and different test sample preparation and adhesion test protocol, so the test results should be used only as a guide to recommended adhesives and should not be used as a comparison between the three companies' adhesives. Samples showing "Rubber Failure 100%" had excellent bond strengths that exceeded the strength of the rubber.

### Lord Corporation Adhesives

Millathane 5004 Compound	Adhesion	Failure
Ty-Ply BN	117 lb/in [20.5 N/mm]	Rubber Failure 100%
Chemlok 8116	127 lb/in [22.2 N/mm]	60% Rubber/40% RC Failure
Millathane E34 Compound		
Ty-Ply BN	111 lb/in [19.4 N/mm]	Rubber Failure 100%
Chemlok 218	128 lb/in [22.4 N/mm]	Rubber Failure 100%

### Chemical Innovations Adhesives

Millathane 5004 Compound	Adhesion	Failure
Cilbond 49SF+Cilcure B	200 lb/in [35.0 N/mm]	Rubber Failure 100%
Millathane E34 Compound		
Cilbond 49SF+Cilcure B	115 lb/in [20.2 N/mm]	Rubber Failure 100%

### Dow Chemical Adhesives

Millathane 5004 Compound	Adhesion	Failure
Thixon 715-1/720 <sup>6</sup> baked <sup>7</sup> 10'/100°C	70 lb/in [12.3 N/mm]	Rubber Failure 100%
Millathane E34 Compound		
Thixon 715-1/720:MEK 1:1	106 lb/in [18.6 N/mm]	Rubber Failure 100%

Other adhesives that have been recommended and/or used successfully for bonding Millathane compounds:

**Chemical Innovations:** Cilbond 89ET and Cilbond 12E/80ET

**Dow Automotive Systems:** Megum 508, Megum 3276, and Megum 15637.

**Lord Corporation:** Chemlok 213, Chemlok 218, Chemlok 219 and Chemlok 8600

Chemlok 250 and Thixon 405 may be good for bonding during injection molding.

<sup>1</sup> <http://www.lord.com> <sup>2</sup> <http://cilbond.com/> <sup>3</sup> <http://www.dow.com>

<sup>4</sup> Millathane 5004 Compound: Millathane 5004 – 100, Stearic Acid – 0.2, Ultrasil VN3 – 25, Silquest A-172 – 0.5, DBEEA (TP-95) – 5, Millstab™ P – 1.5, Struktol WB222 – 1, DiCup 40C – 5;

<sup>5</sup> Millathane E34 Compound: Millathane E34 – 100, Zinc Stearate – 0.5, Ultrasil VN3 – 25, Silquest A-189 – 0.5, DBEEA (TP-95) – 5, Struktol WB222 – 1, MBTS – 4, MBT – 2, Thanecure® ZM – 1, Sulfur – 1.5

<sup>6</sup> In Europe, Thixon 715-1 and Thixon 720 are sold as Thixon 715EF and Thixon 715B, respectively.

<sup>7</sup> Values for non –baked samples gave slightly lower adhesion values (66 lb/in, 11.6 N/mm) but failure was still 100% in rubber