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# VANDERBILT

## *Technical Data*

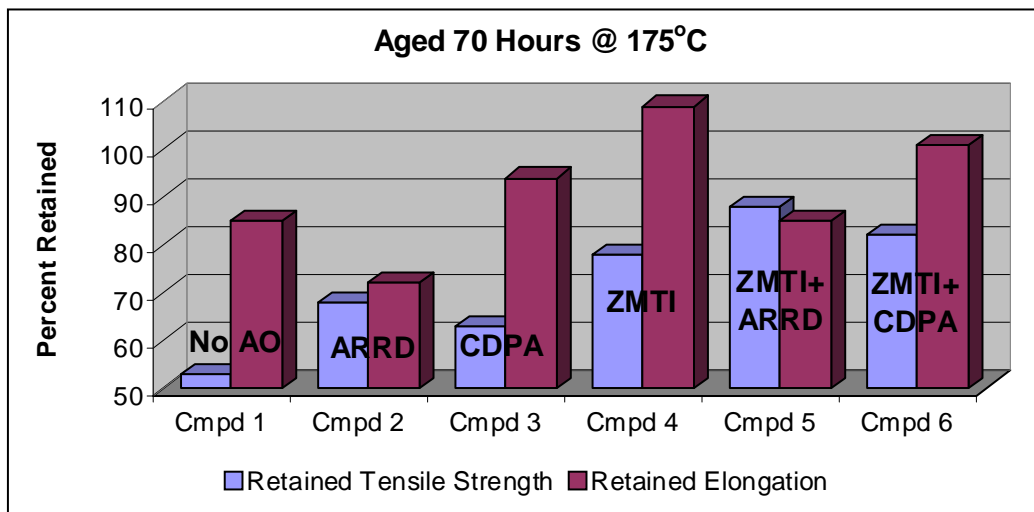
### VANOX<sup>®</sup> ZMTI Antioxidant in an EPDM Compound Study No. 1238

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## VANOX<sup>®</sup> ZMTI Antioxidant in an EPDM Compound Study

The selection of the correct antioxidant system that optimizes the physical properties of the finished product is extremely important in rubber compounding. This study compares the effectiveness of several antioxidants in peroxide cured EPDM. **VANOX ZMTI** has been shown to work synergistically with other antioxidants to greatly improve the retention of physical properties. **VANOX ZMTI** by itself was found in this study to be the best performing antioxidant having the highest heat aged retention and lowest compression set. The addition of **AGERITE<sup>®</sup> RESIN D<sup>®</sup>** (identified in the graph below as ARR) or **VANOX CDPA** to **VANOX ZMTI** provides the compounder with further high performance options.



**Figure 1: Retained Tensile Strength and Elongation**

R.T. Vanderbilt Company offers the following product options with regard to compounding requirements:

- **VANOX ZMTI** alone has the best elongation retention and compression set resistance
- **AGERITE RESIN D** alone is a good cost effective option
- **VANOX CDPA** alone has good overall results
- **VANOX ZMTI** and **AGERITE RESIN D** together provide the best tensile retention
- **VANOX ZMTI** and **VANOX CDPA** together provide the best overall results

Ingredients	Compounds (phr)					
	1	2	3	4	5	6
Vistalon™ 706 EP(D)M polymer	70	70	70	70	70	70
Vistalon 7500 EP(D)M polymer	30	30	30	30	30	30
N550 Carbon Black	110	110	110	110	110	110
Paraffinic Oil	45	45	45	45	45	45
VAROX® 802-40KE organic peroxide accelerator	6	6	6	6	6	6
VANAX® MBM accelerator	1	1	1	1	1	1
VANOX® ZMTI antioxidant	-	-	-	2	2	2
VANOX CDPA antioxidant	-	-	2	-	-	1
AGERITE® RESIN D® antioxidant	-	2	-	-	1	-
Totals	263	264	264	264	265	265

### PHYSICAL PROPERTIES

Press Cured  $t_c$  90 + 2 min. @ 177°C (350°F)

100% Modulus, MPa	3.9	4.4	3.58	4.3	4.0	3.6
Tensile Strength, MPa	14.0	14.0	12.9	13.3	13.4	12.4
Elongation, %	287	304	306	272	302	283
Hardness, Shore A	67.8	69.4	65.0	70.3	68.7	67.8

### OVEN AGED 70 HOURS @ 175°C (347°F)

Tensile Retained, %	53.0	67.8	62.6	78.4	88.3	81.9
Elongation Retained, %	84.7	72.0	93.5	108.8	85.4	101.1

### OVEN AGED 168 HOURS @ 150°C (302°F)

Tensile Retained, %	73.4	83.0	77.9	96.6	96.2	92.6
Elongation Retained, %	91.3	79.6	96.4	110.7	98.3	107.4

### COMPRESSION SET – METHOD B – 70 HOURS @ 150°C (302°F)

Set, %	30.4	26.1	32.3	27.2	31.2	32.1
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### MDR, ASTM D 5289 @ 177°C (350°F), 0.5°Arc

Minimum Torque, $M_L$ , dN·m	2.10	2.18	2.03	2.42	2.29	2.34
Maximum Torque, $M_H$ , dN·m	16.95	16.82	14.89	17.63	17.18	16.72
$t_{s1}$ , minutes	0.39	0.54	0.46	0.40	0.48	0.45
$t_c$ 90, minutes	4.01	4.82	5.04	4.03	4.44	4.53

Vistalon is a trademark of ExxonMobil Corporation.

RESIN D is a registered trademark of Emerald Polymer Additives, LLC.

AGERITE, VANAX, VANOX, and VAROX are registered trademarks of R.T. Vanderbilt Company, Inc.

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