

TECHNICAL Bulletin

Subject: SBR Bead Wire

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MEDIUM THERMAL BLACK N990 IN SBR BEAD WIRE INSULATION COMPOUNDS

Thermax® N990 medium thermal carbon black is characterized by its large particle size and low level of particle agglomeration. Thermax® is widely used in applications that require excellent dynamic properties and heat resistance. The large particle size (low surface area) and low structure allow for high rebound, low tan delta and low hysteresis, thereby maintaining the inherent elastomeric properties of the rubber compound. Thermax® N990 is also used in applications such as bead wire insulation because the inactive surface chemistry of the carbon black helps to prevent degradation of the adhesion of the bead wire to the rubber insulation.

Table 1: Effect of Carbon Black Particle Size in SBR

Particle Size Iodine Absorption, g/kg	N110 145	N220 121	N339 90	N351 68	N550 43	N660 36	N762 27	N990 9
Physical Properties								
300% Modulus, MPa	13.4	12.9	15.7	14.3	12.4	9.9	7.8	3.6
Tensile Strength, MPa	27.4	27.5	25.6	25.6	20.2	21.4	22.5	12.6
Elongation (%)	500	530	440	470	480	540	630	730
Hardness, Shore A	60	61	60	59	57	53	50	44
Dynamic Testing								
Rebound, Zwick (%)	44	46	50	53	58	60	61	63
Heat Build-up, C, Firestone	137	134	116	117	112	107	108	104
E', MPa	9.8	8.7	8.2	7.8	6.6	5.8	5.2	4.4
E'', MPa	2.4	2.1	1.7	1.4	1.1	0.9	0.8	0.6
Loss Factor, tan delta	0.25	0.24	0.2	0.19	0.17	0.15	0.15	0.14

Compound: Plioflex 1500C SBR – 100; carbon black – 50; Oil – 10; zinc oxide – 3; Stearic acid – 2; sulphur – 2; Agerite Stalite S – 1; Vanax NS – 1

Source: Concarb Division of Witco Corporation, D.T. Norman, Chapter 3, The Vanderbilt Handbook, Volume 13, 1990

Thermax® N990 was evaluated in an SBR bead wire insulation compound, at loadings of 40 phr and 70 phr.

Formulation

SBR 1712	100.00
Thermax® N990	40/70
N660 GPF Carbon Black	35.00
Rheogen E	10.00
Stearic Acid	5.00
Zinc Oxide	10.00
TMQ	0.75
Gum Rosin N	5.00
Rosin oil	5.00
Sulphur	6.00
MBTS	1.75

Properties		
Thermax® N990 Loading	40 phr	70 phr
Mooney Viscosity, 100°C		
ML, Initial	36.78	40.81
ML + 4 minutes	22.01	27.13
Mooney Scorch, ASTM D 1646 – 96, 125°C, ML		
Minimum Torque	14.93	16.29
ts1, minutes	22.92	12.08
ts5, minutes	28.42	27.08
ts10, minutes	30.58	31.08
ts35, minutes	35.25	36.17
ODR, Monsanto R 100, ASTM D 2084 – 95		
Minimum, dN-m	2.6	3.1
Maximum, dN-m	33.2	35.6
Tc50%, minutes	9.23	9.38
Tc90%, minutes	21.39	21.93
Tensile Strength, MPa	10.91	11.42
Hardness	62	68
100% Modulus, MPa	3.38	4.72
200% Modulus, MPa	7.73	9.82
Elongation at Break (%)	306	260
BFGoodrich Flexometer Model II, ASTM D 623 – 93, 100°C, 25 minute run time		
Flexing Compression Set (%)	2.1	4.0
Static Compression Set (%)	22.3	19.0