CarbonNeat

SUSTAINABILITY IS NOW THE KEY DRIVER TO

INNOVATION

HOW ARE YOU HELPING YOUR CUSTOMERS ACHIEVE THIER SUSTAINABILITY GOALS?

Neat90

New Tool. New Possibilities.

CO_2 NEUTRAL - HIGH PURITY - RENEWABLE - LIGHT WEIGHT MATERIAL - ECONOMICAL

Neat90; A renewable amorphous carbon material derived from sustainable biomass feedstock utilizing a proprietary, C02 neutral, auto-thermic technology.

engineered for **FKM** *compounds*

Neat90

“It’s not carbon black,
it’s clean black carbon.”

TDS

Description	Neat90	UNITS	ASTM
N2SA	55.0	m2/g	D 6556-07
STSA	30.5	m2/g	D 6556-07
DBP Absorption Number	52.8	cm3/100g	D 2414-14, B
Iodine Adsorption Number	62.4	g/kg	D 1510-16
Ash (typical)	1.75	%	D1506-15, A
Moisture (as packaged)	0.5	%	D 1509
Volatiles (typical)	3.0	%	D 1509
pH	9-10	——	D1512
Heating Loss	N/D	Weight/%	D1509-12, A
Relative Specific Gravity	1.35	——	D 792-13
Bulk Density	150	kg/m3	at 20 C

PAH

PAHs	ppb (ug/kg)	PAHs	ppb (ug/kg)
Acenaphtene	<5	Chrysene	<5
Acenaphthylene	<5	Dibenzo(a,h)anthracene	<5
Anthracene	<5	Fluoranthene	<5
Benzo(a)anthracene	<5	Fluorene	<5
Benzo(a)pyrene	<5	Indeno(1,2,3-cd)pyrene	<5
Benzo(b)fluroranthene	<5	Naphthalene	<5
Benzo(g,h,i)perylene	<5	Phenanthrene	<5
Benzo(k)fluoranthene	<5	Pyrene	<5

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Neat90

N772

(80 nm)

N990

(280 nm)

Neat90

(5.5 microns)

Neat90 has an average particle size distribution of 5.5 microns compared to medium thermal black N990 with an average particle size distribution of 280 nanometers.

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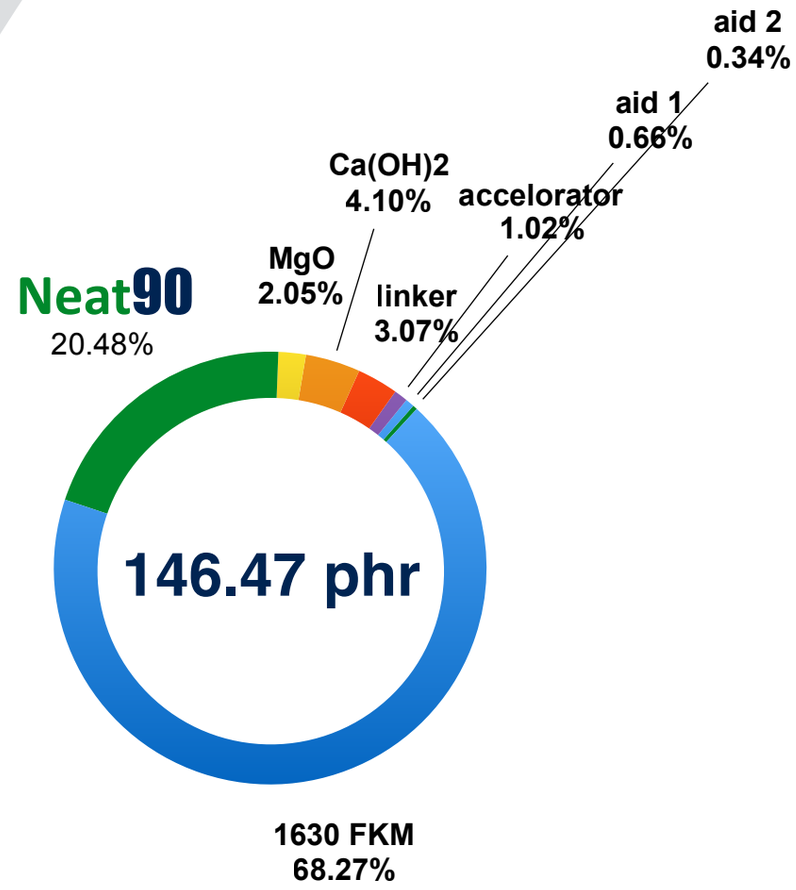

Every Part Counts.

Technical Development:
Increasing the sustainability value of an FKM o-ring compound by 20% by replacing MT N990 with a renewable filler, **Neat90**.

Abstract:

A study to evaluate MT N990 and the renewable alternative filler, Neat90, in a fluoroelastomer compound to assess the difference in physical properties. Fluoroelastomer FC 1630 was used as the polymer. Neat90 exhibited better compression set in all press and post cure buttons, lower specific gravity, lower percent weight loss, and higher tensile strength compared to N990.

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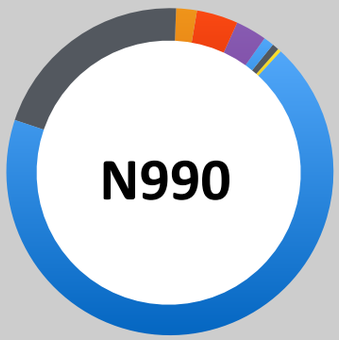
Material	MT N990 PHR	Neat90 PHR
Dyneon™ FC 1630 *(Mooney Viscosity 26)*	100	100
MT N990	30	0
Neat90	0	30
MgO	3	3
Ca(OH)2	6	6
VC30 50% active (Dihydroxy cross linker)	4.5	4.5
VC20 33% active (Phosphonium accelerator)	1.5	1.5
VPA1-process aid	0.97	0.97
WS280-process aid	0.5	0.5
Total PHR	146.47	146.47

Experimental Procedure:

The compounds were made up of 100 PHR FKM polymer, 30 PHR carbon black filler, 3 PHR magnesium oxide (MgO), 6 PHR calcium hydroxide (Ca(OH)2), 4.5 PHR VC 30, 1.5 PHR VC 20, 0.97 PHR VPA-1, and 0.5 PHR WS 280. The compounds were internally mixed in a 1.5 liter mixer and milled on a standard 12-inch two-roll mill.



0% Sustainable

20% Sustainable

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	MT N990	Neat90
MDR @ 177 °C (350 °F), 12 minute test	1630	
Minimum Torque, ML, in/lb	0.74	0.94
Maximum Torque, MH, in/lb	23.04	27.02
TS2, minutes	2.01	1.54
T10, minutes	2.05	1.62
T50, minutes	2.66	2.19
T90, minutes	4.92	4.28
tan @ MH	0.047	0.025
tan @ ML	1.108	1.074

MDR:

A moving die rheometer (MDR) was used to measure cure rheology at 350°F for 12 minutes. Six by six inch sheets and half inch compression buttons were press cured at 350°F for 10 minutes and 15 minutes, respectively. The sheets and buttons were post cured at 450°F for 16 hours. Type A hardness was measured and physical properties (tensile strength, percent elongation, and 100% modulus strain) were measured using a tensometer with a rate of extension of 20 inches per minute and ASTM Type A Dumbbells.

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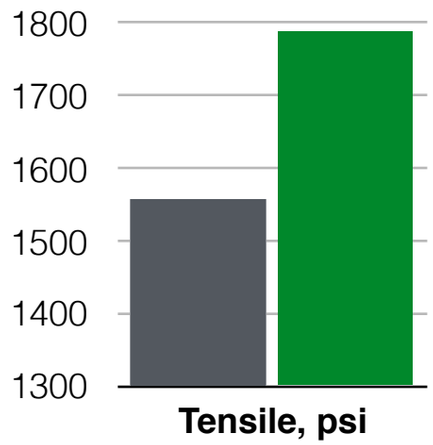
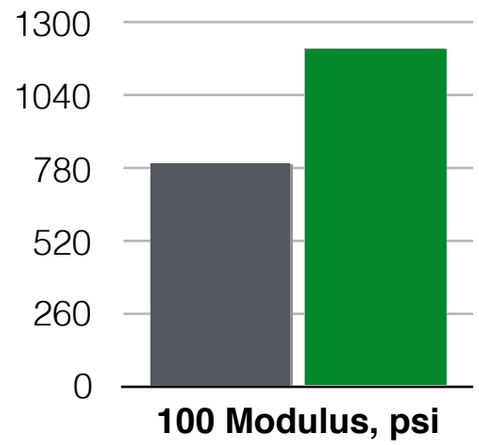
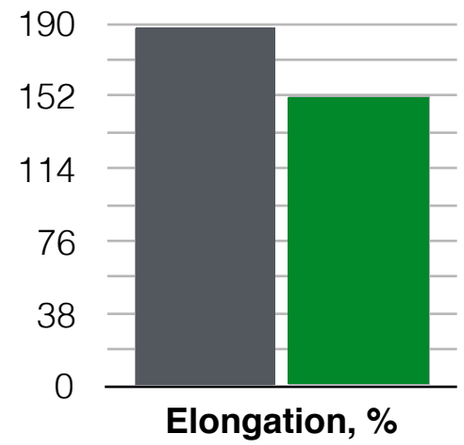
Physicals, post cured 16 hrs @ 232 °C (450 °F)	MT N990	Neat90
	1630	
Durometer, Type A	77	76
Tensile, psi	1556	1786
Elongation, %	188	152
100% Modulus, psi	794	1203

Post Cured:

The compounds were formulated to achieve a 75 hardness approximately after post cure. The Neat90 sample showed higher modulus and tensile values than the N990 sample after post cure.







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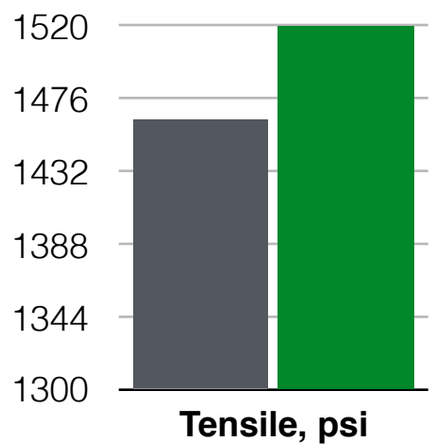
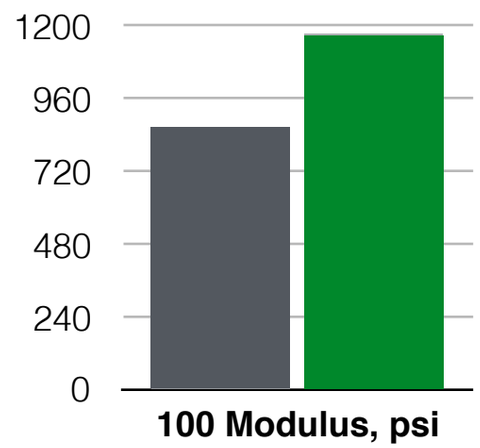
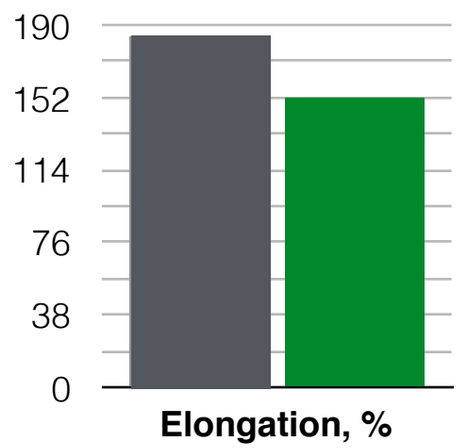
	MT N990	Neat90
Post Cure Heat Aged @ 270 °C / 168 hrs	**1630**	
Durometer, Type A	**85**	**83**
Tensile, psi	**1463**	**1520**
Elongation, %	**184**	**152**
100% Modulus, psi	**865**	**1169**

Heat Aged:

All compounds showed an increase in hardness after heat aging 168 hours at 270 °C. After 70 hours at 270 °C, the Neat 90 compound exhibited a lower percent of weight loss when compared to N990 compound.







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Neat90

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	MT N990	Neat90
Compression Set, 70 hours @ 200 °C	1630	
Press - 15 min @ 177 °C	81.7%	67.7%
Post - 16 hrs @ 232 °C	26%	20.9%

Compression Set:

Compression set results in the Neat90 compound were better than the N990 compound in both press and post cured buttons.

	MT N990	Neat90
	1630	
Specific Gravity	1.84	1.76

Specific Gravity:

The Neat90 compound exhibited a lower specific gravity (1.76) than the N990 (1.84) compound.

engineered for **FKM** *compounds*

VOLUME RESISTIVITY TEST, ASTM D 257-14

Specimens tested at 20 in./min.

Sample Preparation: The Samples were conditioned for at least 40 hours at 23 °C and 50% relative humidity.

Test Procedure: Place sample into the guarded ring electrode configuration. Apply approximately 500 VDC for one minute. Measure the applied voltage and the resultant current.

Electrode Dimensions: The guarded electrode has a diameter for 76 mm and the guard electrode has an inner diameter of 80 mm and an outer diameter of 100 mm.

Test Conditions: The test was conducted at 74 °F (23 °C) and 48 % relative humidity.

Results:

Sample	Thickness		Voltage		Current		Resistance		Resistivity	
N990	2.20	mm	500.1	VDC	2.97×10^{-10}	A	1.68×10^{12}	Ω	3.64×10^{14}	Ω*cm
NEAT90	2.27	mm	500.1	VDC	2.32×10^{-10}	A	2.15×10^{12}	Ω	4.51×10^{14}	Ω*cm

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Neat90 handles well and is fluffier in appearance than the coarse appearance of N990. During mixing, there were no dispersion issues, no blistering and the Neat90 gave a smoother sheen to the compound after milling, whereas N990 had no shine after milling. Neither Neat90 or N990 had an effect on the cure rate of the compounds studied. Neat90 showed better compression set results in the press and post cured buttons. The Neat90 compound also had lower specific gravity and lower percent weight loss compared to the N990 compounds.

Increased Sustainability - Lower Specific Gravity - Excellent Dispersion

Lower Compression Set - Improved Aesthetics - Reduced Cost

ISO 9001* - REACH - RoHS - FDA* - NSF*

**pending, due Q2 2018*

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Scan To Request Sample:

CarbonNeat - Monticello, Arkansas, U.S.A.

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We do not inherit the earth from our ancestors,
we borrow it from our children.

- Native American Proverb