PRODUCT APPLICATIONS MANUAL POLIMIX AMBIENTAL

POLIMIX
AMBIENTAL

Summary

Applications and Products

	Products	
Application	**PX300**	**PX500**
TIRES REFORMING	●	
SOLID TIRES	●	
TIRES	●	●
TIRES SIDEWALLS	●	●
EXTRUSION GENERAL		●
SEALS		●
SOLES	●	●
AUTOMOTIVE BELTS	●	●
TRANSPORTER BELTS		●
HOSE		●
PROFILES GENERAL		●
BUFFER	●	●
PLASTICS		●
MASTERBATCH	●	●
PIGMENTATION / PAINTS		●
EBONITE	●	
BAQUELITE	●	●

PX300

Table 1: Carbon Black parameters N339, N220 e PX300

Carbon Black	ASTM N339	ASTM N220	PX300/1000	PX300/2000	Test Method
Iodine Adsorption (g/Kg)	84-96	116-126	77-96	100-125	ASTM D1510
Oil Absorption OAN (cm^3/100g)	114-126	109-119	85-95	85-95	ASTM D2414
Density (Kg/m^3)	312-376	-	320-460	320-460	ASTM D1513

PX500

Table 2: Carbon Black parameters N550, N660 E PX500.

Carbon Black	ASTM N550	ASTM N660	PX500/1000	PX500/2000	Test Method
Iodine Adsorption (g/Kg)	37-49	30-42	94-114	200-300	ASTM D1510
Oil Absorption OAN (cm^3/100g)	115-127	84-96	75-90	115-135	ASTM D2414
Density (Kg/m^3)	320-384	392-456	320-460	200-300	ASTM D1513

Industry applications

Tire Treads

Introduction

Tread is the part of the tire that comes directly in contact with the ground , therefore, is made of a special rubber compound that offers high resistance to wear. The tread is designed to offer better performance and security to the vehicle in different driving conditions. Therefore, consists of raised portions of rubber known as blackheads and grooves.

Technical information

To study the substitution of carbon black N339, most commonly used type in treads, by the carbon black PX300, manufactured by the Polimix Ambiental, the formulation present in Table 3 was made. In her, partial replacements were performed to assess any change on the properties.

Table 3 – Tire treads formulations.

TREADS FORMULATIONS				
	F1	F2	F3	F4
	0% PX	10% PX	20% PX	30% PX
NR (GEB-1)	75	75	75	75
BR-45	25	25	25	25
Zinc Oxide	4	4	4	4
Stearic Acid	2,5	2,5	2,5	2,5
PX300	0	6	12	18
N339	60	54	48	42
Naphthenic Oil	10	10	10	10
6PPD	1,5	1,5	1,5	1,5
IPPD	1,5	1,5	1,5	1,5
TMQ	2	2	2	2
Paraffin Wax	1,5	1,5	1,5	1,5
Sulphur	1,5	1,5	1,5	1,5
CBS	1,5	1,5	1,5	1,5

The values obtained in physical and rheometryc tests are presented in Table 4.

Table 4 – Tire treads results.

	F1	F2	F3	F4
	0% PX	10% PX	20% PX	30% PX
RHEOMETRYC PROPERTIES				
Maximum torque(dN.m)	16,84	15,60	15,44	15,04
Minimum torque (dN.m)	2,73	2,67	2,87	2,77
Ts1 min	0,12	0,81	0,75	0,61
Ts2 min	0,85	0,96	0,91	0,81
T50 min	1,02	1,19	1,13	1,04
T90 min	1,38	1,64	1,59	1,47
ORIGINAL MECHANICAL PROPERTIES				
Tensile Strength at Break (Mpa)	17,39 ± 0,76	19,22 ± 0,34	21,89 ± 0,94	18,95 ± 2,25
Elongation (%)	446,40 ± 14,61	508,92 ± 8,65	571,00 ± 27,95	539,93 ± 46,53
Module 100% (Mpa)	2,96 ± 0,05	2,83 ± 0,06	2,33 ± 0,58	2,37 ± 0,03
Tear Strength (N/mm)	46,40 ± 1,46	53,00 ± 2,14	88,95 ± 5,43	51,56 ± 2,20
Hardness (Shore A)	66,0	64,0	64,2	63,5
Abrasion Loss (mm^3/40m)	114,41 ± 5,5	111,07 ± 4,2	101,03 ± 5,3	110,40 ± 2,9
MECHANICAL PROPERTIES AGED BY 70°C FOR 70 HOURS				
Tensile Strength at Break (Mpa)	14,86 ± 3,02	16,54 ± 0,49	17,74 ± 1,54	19,93 ± 0,67
Stretch (%)	402,82 ± 31,87	457,40 ± 19,23	498,27 ± 28,78	540,82 ± 70,63
Module 100% (Mpa)	2,87±0,06	2,51±0,59	2,51±0,08	2,63 ± 0,10
Tear Strength (N/mm)	66,0	64,8	65,5	63,8
PERMANENT DEFORMATION BY COMPRESSION				
PDC, % 22 horas a 140°C	18,12 ± 0,94	17,28 ± 0,57	17,82 ± 1,15	16,36 ± 1,11

The values presents in the table show how N339 is perfectly replaceable by PX300, generating, even, higher in some important properties required for tread bands. The results show that there is a decrease in the loss by abrasion. Furthermore, elongation percentage and the tensile strength at break increases when the PX300 is add, which means cost reduction and performance increase.

Another formulation using PX300

Component	Amount (phr)
GEB 1	60,00
SBR1500	40,00
Zinc Oxide	10,00
Stearin	2,00
TMQ	2,00
6PPD	2,00
IPPD	1,00
Microcrystalline Wax	2,00
PX 300	30,00
N220	40,00
Naphthenic Oil	10,00
Phenolic Resin A80	5,00
Struktol WB 212	2,00
Sulphur	1,50
Santocure CBC	1,50
TMTD	0,15

EPDM Extrusion

Introduction

EPDM rubbers are composed of styrene-propylene-diene. Currently the EPDM compounds are formulations for artifacts shaped by extrusion and vulcanized by continuous systems such as hot air tunnels, salt bath, glass beads, etc. Their properties depend on the type of EPDM employed and the system of vulcanization (sulfur or peroxide). Generally have good resistance to heat and aging, good resistance to low temperature and sunlight, good elasticity, good insulating power, excellent power to ozone and weathering, as well as good chemical resistance.

EPDM is used in the automotive industry (pipes, liming, hoses, radiator, profiles for sealing windows and doors), window frames industry, in addition to typical applications such as: rubber membrane roofing, distribution of drinking water (hot and/or cold), tire sidewalls, various seals, cables, conveyor belts, roller coverings and isolators.

Technical Information

To study the effect of replacing carbon black ASTM N660, which is normally used for EPDM extruded articles, the present formulation was carried out and is presented in Table 5.

Table 5 – EPDM extrusion formulation.

EPDM Formulations				
	F1	F2	F3	F4
	0% PX	30% PX	50% PX	70%PX
EPDM (Keltan 5508)	100	100	100	100
Zinc Oxide	10,5	10,5	10,5	10,5
Stearin	1,05	1,05	1,05	1,05
PX500	0	56,84	94,74	132,63
Unilene A 80	5,26	5,26	5,26	5,26
WB 250	4,21	4,21	4,21	4,21
N 660	189,47	132,63	94,74	56,84
Flexpar 848	73,68	73,68	73,68	73,68

Table 5 – EPDM extrusion formulation (continuation)

Sulphur	1,16	1,16	1,16	1,16
MBTS	1,26	1,26	1,26	1,26
TMTD	0,53	0,53	0,53	0,53
ZBDC	1,58	1,58	1,58	1,58

The physical and rheometryc results are listed in Table 6.

Table 6 – EPDM extrusion results.

	F1	**F2**	**F3**	**F4**
	0% PX	**30% PX**	**50% PX**	**70% PX**
RHEOMETRYC RESULTS				
Maximum torque(dN.m)	14,96	10,68	12,59	16,39
Minimum torque (dN.m)	3,3	3,02	3	2,7
Ts1 min	0,58	0,72	0,69	0,88
Ts2 min	0,73	0,87	0,83	1,03
T50 min	1,52	1,12	1,2	1,78
T90 min	7,28	5,88	8,27	8,81
ORIGINAL MECHANICAL PROPERTIES				
Tensile Strength at Break (Mpa)	10,95 ± 0,22	8,72 ± 0,15	7,95 ± 0,08	8,14 ± 0,08
Elongation (%)	341,94 ± 14,88	343,32 ± 21,73	352,24 ± 17,26	391,16 ± 55,83
Module 100% (Mpa)	4,61 ± 0,14	4,17 ± 0,05	3,80 ± 0,05	2,93 ± 0,79
Tear Strength (N/mm)	30,70 ± 1,21	29,68 ± 0,78	28,89 ± 0,98	30,62 ± 0,63
Hardness (Shore A)	79	80,3	80,3	72
MECHANICAL PROPERTIES AGED BY 70°C FOR 70 HOURS				
Tensile Strength at Break (Mpa)	10,51 ± 3,02	12,88 ± 1,76	11,57 ± 1,09	10,97 ± 0,28
Stretch (%)	50,97 ± 35,59	78,57 ± 15,13	75,92 ± 12,69	131,06 ± 7,76
Module 100% (Mpa)	-	-	-	9,49 ± 0,45
Tear Strength (N/mm)	90,8	92,8	90,2	84,5
PERMANENT DEFORMATION BY COMPRESSION				
PDC, % -22 horas a 140°C	44,74 ± 0,76	42,10 ± 0,82	63 ± 1,31	68,63 ± 1,30

The values presented in Table 6 show that replacement is very interesting. Important properties for this type of product are little, or nothing, changed and the mechanical properties of rubber when aged (140 °C for 70 hours) were higher than that was used 100% of N660 in its formulation. Furthermore, increase in properties such as elongation and tear, means drop in the amount of scraps generated during the process.

Another formulations using the PX500

Formulation Extrusion product using PX500.

Component	Amount (phr)
EPDM 5508	100,00
Zinc Oxide	5,00
Stearin	2,00
PX500	50,00
N550	50,00
Paraffin Oil	20,00
Micron 3CD	30,00
Struktol WB 42	2,00
Sulphur	1,50
ZBCD	2,00
TMTD	0,30
DPG	0,50

Formulation Drum seal using the PX500.

Component	Amount (phr)
EPDM 1712	100,00
Sulphur	1,21
MBT	0,93
TMTD	0,64
Zinc Oxide	5,71
Stearin	1,43
Naphthenic Oil	71,43
PX500	157,14
Kaolin	200
Flow Agent	2,86
Dissecting	8,57
Wax antiozonant	2,86

Formulation Frames using PX500

Component	Amount (phr)
EPDM 5508	100,00
N550	85,71
PX500	85,71
Paraffinic Oil NP	100
Flow Agent	2
Zinc Oxide	5
Stearin	1
MBT	2
TMTD	1
Tetrone	1
Dissecting	10

NBR extrusion

Introduction

Nitrile rubber belongs to the class of special rubbers resistant to oil and is a copolymer of butadiene and acrylonitrile. Nitrile rubber (NBR) provides a good balance between low-temperature resistance (-10 ° C and -50 ° C), oil and solvents. These characteristics combined with good resistance to high temperature and abrasion resistance, makes the rubber NBR be recommended for a variety of applications, such as membranes, diaphragms, tubes and hoses, conveyor belts, friction material, roller cover, between others.

Technical Information

The PX500 shows low viscosity when compared with N550, this indicates he offers better processability when is added to formulation.

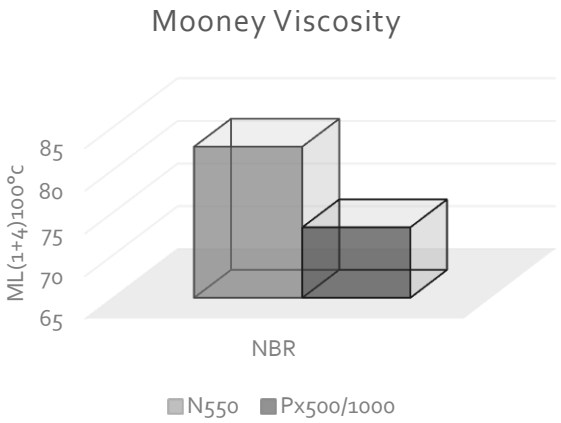

Figure 1: Mooney viscosity between N550 e PX500.

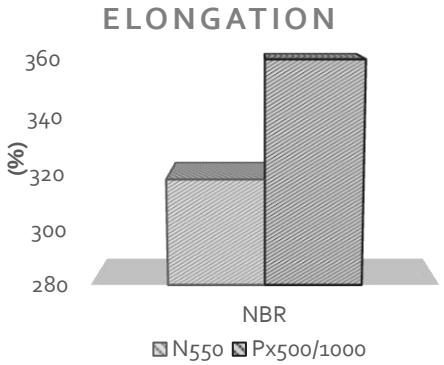

Figure 2: Elongation comparation between N550 e PX500.

When only was used PX500 in the formulation was increased the power elongation of the elastomer.

Soles

Introduction

The soles market and footwear articles require certain characteristics in the final product. Among the features we can cite: abrasion resistance, flexural and tearing, flexibility, low weight in the final footwear and durability. With this in mind Polimix Ambiental has the right solution for this product.

Technical Information

For the footwear market, the resistance that the rubber provides the bending stresses has fundamental importance. When used as a substitute for conventional carbon blacks the Polimix carbon blacks provides a good flexural strength, as can be seen in figure 3.

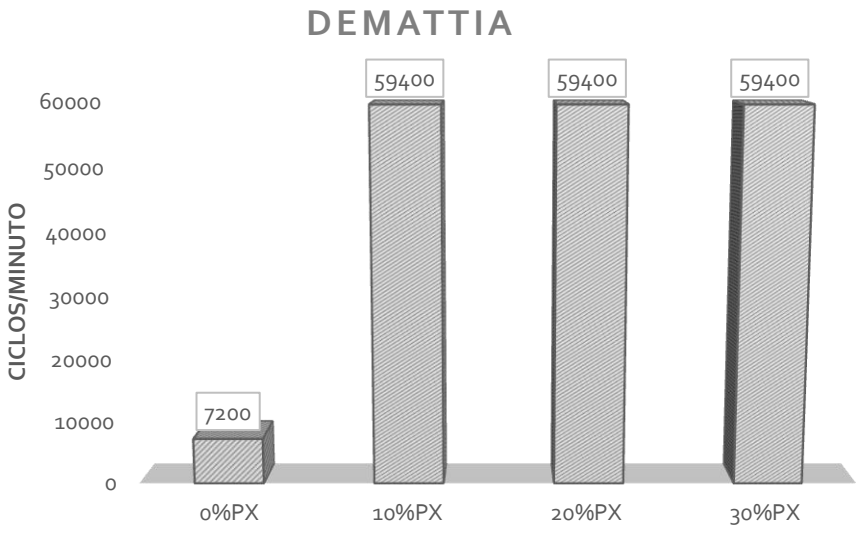

Figure 3 – Flexural strength of different formulations.

Floors

Introduction

The rubbers for floors have a wide application range and can be used for street paving and gym. However, each area requires a different characteristic, for example, for street paving is important to bear resistant plates and sound-absorbing to create an acoustic barrier. In the floor of gym the goal is to have high strength and low shock absorption.

Technical Information

Formulation pressed articles using PX500.

Component	Amount (phr)
GEB1	100,00
NR	100
Kaolin	300
PX500	240
Stearin	4
Aromatic Oil	100
Zinc Oxide	10
Sulphur	6
MBTS	1,4
TMTD	1,4
Wax Antiozonant	4

Carpets

Introduction

As the rubber flooring, carpets may be used in different applications, where each one requires a different kind of character. For example, car mat requires great impact absorption and vibration, as well as having good adhesion. However for collective protection equipment, which aims to protect workers from electric shock, the carpet needs to be a good electrical insulator.

Technical Information

Formulation for carpets using carbon black Polimix

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Component	Amount (phr)
GEB1	100,00
Rubber dust	193,18
PX300	45,45
PX500	90,91
Zinc Oxide	5,68
Aromatic Oil	79,55
Sulphur	5,11
Cz	3,18
TMTD	0,57
Antioxidant TMQ	1,14