

UNIROYAL

7/15-07/14-07/12
UNIROYAL CHEMICAL
Division of UNIROYAL, Inc.
Spencer Street
Naugatuck, Connecticut 06770



84948000112

600120
RROA (UNIROYAL Name)

CAS Number: 3081-01-4
CAS Name : N-(1,4-dimethylpentyl)-N'-phenyl-
1,4-benzenediamine

447 A

1. No specific product literature is available for this substance. It is sold mostly in blends with other alkylated phenylene diamines.
2. Our annual production is under 1M lbs. No major trends are forecasted in production volume.
3. Up to 30 people may be involved in the production of this substance. These same people are also involved in other related manufacturing operations.

The process is essentially a closed system. The product is a low volatility liquid and there is no significant, routine worker exposure. Protective equipment and engineering controls are used as warranted. Our Industrial Toxicology Department regularly monitors the entire manufacturing operation.

4. The product is used alone or in mixtures with related products as a stabilizer/antidegradant for various hydrocarbon rubbers.
5. There are no waste streams from the manufacturing process. No significant product is released to the environment by any route.
6. We have not generated any toxicological data on this substance.

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UNROYAL CHEMICAL
Division of UNROYAL, Inc.
Spencer Street
Hartford, Connecticut 06170

REDA (UNROYAL Name)

IR-447

CAS Number: 3081-01-4
CAS Name : N-(1,4-dimethylpentyl)-N'-phenyl-
1,4-benzenediamine

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UNIROYAL CHEMICAL
Division of UNIROYAL, Inc.
Spencer Street
Naugatuck, Connecticut 06779

FLEXZONE® 7L/7F (UNIROYAL Name)

CAS Number: 61931-82-6
CAS Name : N-(1,3-Dimethylbutyl)-N'-phenyl-
1,4-benzenediamine

1. Enclosed are our current Sales Specifications, Material Safety Data Sheet, and Technical Bulletin.
2. Our annual production is in the range of 1-10M lbs. We don't foresee any major trends in production volume.
3. Up to 30 people may be involved in the production of this product. These same people are also involved in other related manufacturing operations.

The process is essentially a closed system. The product is low in volatility and there is little significant, routine exposure. With the "7F" (flaked) form there is some physical exposure during the flaking process. Protective equipment and engineering controls are used as warranted. Our Industrial Toxicology Department regularly monitors the entire manufacturing operation.

4. The product is used as a stabilizer/antidegradant for various hydrocarbon rubbers.
5. There are no waste streams from the manufacturing process. No significant product is released to the environment by any route.
6. Our MSDS (enclosed) summarizes toxicology information from various industry sources. A summary of the chronic data on this substance from "The Toxicologist" is also enclosed. There is general agreement that there may be some sensitization or cross-sensitization potential associated with this product.



UNIDYAL CHEMICAL CO.
Division of UNIDYAL, Inc.
Spencer Street
Naugatuck, Connecticut 06770

UNIDYAL Emergency Phone 203/723-3670
CHEMTREC Transportation Emergency Phone: 800/424-8300

MATERIAL SAFETY DATA SHEET

I. IDENTIFICATION

Trade Name: Flexzone[®] 7F and 7L CAS Number: 61931-82-6
Chemical Name(s): N-phenyl-N'-(1,3 dimethyl-butyl)-p-phenylenediamines Chemical Family: Phenylenediamine
DOT Ident. No.: NA
DOT Hazard Class: NA
DOT Proper Shipping Name: NA

II. PHYSICAL DATA

Appearance: Purple flake or liquid to semisolid Melting Point: 50°C (122°F)
Odor: Characteristic Boiling Point: 260°C (500°F)
Solubility: Specific Gravity (H₂O = 1): 1.07 @ 25°C
Water: Slightly soluble Vapor Pressure @ 20° C: ND
Other: Soluble in most organic solvents Vapor Density (Air = 1): ND
pH: ND Volatility @ 70° F: Low
Other Data: -

III. FIRE AND EXPLOSION HAZARD DATA

Flash Point: 204°C (400°F) TCC Autoignition Temp: 227°C (440°F) Fire Pt.
Extinguishing Media: Water fog, foam, CO₂ Flammable Limits in Air: ND
Special Fire Fighting Procedures: Protect against inhalation of combustion products.
Universal Hazards: None known

IV. REACTIVITY DATA

Stability: Stable at ambient temperatures and pressures.

Incompatibility: Strong oxidizers.

Decomposition Products: Thermal: ammonia, aniline, hydrogen and mixed aliphatic/aromatic amines. Combustion: oxides of carbon & nitrogen.

Unidyal makes no representation or warranty with respect to the information in this Material Safety Data Sheet. The information is however, as of this date, the best information available to the best of Unidyal's knowledge. This information is not intended to be all inclusive. Actual conditions of use and handling

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V. SPECIAL PROTECTION INFORMATION

Engineering Controls: Sufficient ventilation to minimize vapor/dust exposure.

Personal Protection Equipment: Avoid all personal contact. Observe good personal hygiene. Impervious gloves and goggles should be worn when handling. In the absence of adequate ventilation, NIOSH certified respiratory protection for dust and/or vapors should be used.

VI. STORAGE, SPILLS, AND DISPOSAL INFORMATION

Storage: Store in a cool dry area. Keep containers closed.

Spills: Sweep or vacuum up. Absorb on inert material. Shovel into secure containers. Use personal protective equipment as outlined above.

Disposal: In accordance with any applicable local, state or federal regulations regarding organic waste.

Environmental Information: Environmental effects have not been determined for this product.

VII. HEALTH RELATED DATA

Specific Hazard(s): Irritant potential for the skin and eyes.

First Aid Procedures: If eye contact occurs, flush with water for 15 minutes, get medical attention. For skin exposure wash thoroughly with soap and water.

Toxicology Information: Oral LD₅₀ (rats): > 2500 mg/kg
Dermal LD₅₀ (rabbits): > 2000 mg/kg
Eye Irritation (rabbits): slight
Dermal Irritation (rabbits): slight

Administration up to 1000 ppm in the diet of rats for 24 months produced no significant adverse effects. A three generation rat reproduction study at 1000 ppm in the diet also produced no significant compound related effects.

Although Flexzone 7L is not a strong sensitizer, people sensitized to other p-phenylenediamines may react to this compound.

For further information, contact Uniroyal Industrial Toxicology Department. (203/723-3492)

ND: Not Determined

NA: Not Applicable

Date: March 18, 1983

UNIROYAL CHEMICAL
Division of UNIROYAL, Inc.
Spencer Street
Middletown, Connecticut 06770

FLEXZONE® 7L/7F (UNIROYAL Name)

CAS Number: 61931-82-6
CAS Name : N-(1,3-Dimethylbutyl)-N'-phenyl-
1,4-benzenediamine

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Lou?*

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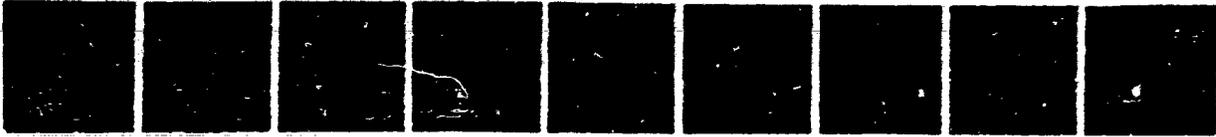
The process is essentially a closed system. The product is low in volatility and there is little significant, routine exposure. With the "7F" (flaked) form there is some physical exposure during the flaking process. Protective equipment and engineering controls are used as warranted. Our Industrial Toxicology Department regularly monitors the entire manufacturing operation.

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UNIROYAL CHEMICAL

Division of UNIROYAL, Inc.
Naugatuck, Connecticut 06770

Naugatuck[®] Chemicals



SALES SPECIFICATION

FLEXZONE* 7P

N Phenyl N'1-3 Dimethyl Butyl P-Phenylenediamine

<u>TEST</u>	<u>MINIMUM</u>	<u>MAXIMUM</u>	<u>TEST METHOD</u>
p-Amino Diphenylamine, %	-	5.0	RC-115
Diphenylamine, %	-	0.5	RC-121
Acetone Insolubles, %	-	0.5	G-68
Heat Loss, % (3 hr. @ 70°C)	-	0.5	G-24-A
Color and Appearance	Dark purple flakes		
Odor	Characteristic		

*UNIROYAL, Inc. reg. trademark for its antiozonant

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The recommendations for the use of our products are based on tests believed to be reliable. However, we do not guarantee the results to be obtained by others under different conditions. Nothing in this brochure is intended as a recommendation to use our products so as to infringe on any patent.



Issued 7/21/65
1st Rev. 1/5/68

SALES SPECIFICATION

FLEXZONE* 7L

N Phenyl N'1-3 Dimethyl Butyl P-Phenylenediamine

<u>TEST</u>	<u>MINIMUM</u>	<u>MAXIMUM</u>	<u>TEST METHOD</u>
p-Amino Diphenylamine, %	-	5.0	RC-115
Diphenylamine, %	-	0.5	RC-121
Acetone Insolubles, %	-	0.5	G-68
Heat Loss, % (3 hr. @ 70°C)	-	0.5	G-24-A
Color and Appearance	Dark purple liquid to semi-solid mass.		
Odor	Characteristic		

*UNIROYAL, Inc. reg. trademark for its antiozonant

DJH:brs
1/5/68

UNIROYAL

UNIROYAL CHEMICAL Co.
Division of UNIROYAL, Inc.
Spencer Street
Naugatuck, Connecticut 06770

UNIROYAL Emergency Phone 203/723-3670
CHEMTREC Transportation Emergency Phone 900/424-9300

MATERIAL SAFETY DATA SHEET

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Chemical Name(s): N-phenyl-N'-(1,3 dimethyl-butyl)-p-phenylenediamines Chemical Family: Phenylenediamine
DOT Ident. No.: NA
DOT Hazard Class: NA
DOT Proper Shipping Name: NA

See EPA report has just the opposite

II. PHYSICAL DATA

Appearance: Purple flake or liquid to semisolid Melting Point: 50°C (122°F)
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Water: Slightly soluble Vapor Pressure @ 20° C: ND
Other: Soluble in most organic solvents Vapor Density (Air = 1): ND
pH: ND Volatility @ 70° F: Low
Other Data: -

III. FIRE AND EXPLOSION HAZARD DATA

Flash Point: 204°C (400°F) TCC Autoignition Temp: 227°C (440°F) Fire Pt.
Extinguishing Media: Water fog, foam, CO₂ Flammable Limits in Air: ND
Special Fire Fighting Procedures: Protect against inhalation of combustion products.
Unusual Hazards: None known

IV. REACTIVITY DATA

Stability: Stable at ambient temperatures and pressures.
Incompatibility: Strong oxidizers.
Decomposition Products: Thermal: ammonia, aniline, hydrogen and mixed aliphatic/aromatic amines. Combustion: oxides of carbon & nitrogen.

Uniroyal makes no representation or warranty with respect to the information in this Material Safety Data Sheet. The information is however, as of this date provided, true and accurate to the best of Uniroyal's knowledge. This list of information is not intended to be all inclusive. Actual conditions of use and handling may require consideration of information other than as in addition to that which is provided herein.

V. SPECIAL PROTECTION INFORMATION

Engineering Controls: Sufficient ventilation to minimize vapor/dust exposure.

Personal Protection Equipment: Avoid all personal contact. Observe good personal hygiene. Impervious gloves and goggles should be worn when handling. In the absence of adequate ventilation, NIOSH certified respiratory protection for dust and/or vapors should be used.

VI. STORAGE, SPILLS, AND DISPOSAL INFORMATION

Storage: Store in a cool dry area. Keep containers closed.

Spills: Sweep or vacuum up. Absorb on inert material. Shovel into secure containers. Use personal protective equipment as outlined above.

Disposal: In accordance with any applicable local, state or federal regulations regarding organic waste.

Environmental Information: Environmental effects have not been determined for this product.

VII. HEALTH RELATED DATA

Specific Hazard(s): Irritant potential for the skin and eyes.

First Aid Procedures: If eye contact occurs, flush with water for 15 minutes, get medical attention. For skin exposure wash thoroughly with soap and water.

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Administration up to 1000 ppm in the diet of rats for 24 months produced no significant adverse effects. A three generation rat reproduction study at 1000 ppm in the diet also produced no significant compound related effects.

Although Flexzone 7L is not a strong sensitizer, people sensitized to other p-phenylenediamines may react to this compound.

For further information, contact Uniroyal Industrial Toxicology Department. (203/723-3492)

ND: Not Determined

NA: Not Applicable

Date:

March 18, 1983

UNIROYAL CHEMICAL
Division of UNIROYAL, Inc.
Naugatuck, Connecticut 06770

Naugatuck® Chemicals



FLEXZONE® 7F

A Flaked Form Antiozonant-Antioxidant

FLEXZONE 7F is another member of the FLEXZONE family of antiozonants which has been designed for those rubber users who prefer a flaked form of antiozonant in their factory operations.

FLEXZONE 7F is equivalent in properties to its chemical counterpart FLEXZONE 7L. These outstanding properties such as excellent ozone protection, safer handling and an excellent margin of processing safety are unaltered in the flaked form.

Like the other FLEXZONE antiozonants, FLEXZONE 7F gives outstanding dynamic flex protection both indoors as well as outdoors. It also offers excellent protection from ozone weathering, oxygen aging, heat and copper deterioration.

FLEXZONE 7F causes no significant skin irritation or sensitization when used at normal levels in rubber compounds. Patch tests indicated that stocks containing FLEXZONE 7F provide maximum freedom from possible dermatitis. This is particularly important for those who must handle the compounded stock frequently during fabrication.

FLEXZONE 7F has less effect on processing scorch time than other p-phenylene diamine derivatives.

Like other p-phenylene diamines, FLEXZONE 7F is a discoloring antiozonant. Rubber stocks containing FLEXZONE 7F may produce a grey contact stain, but very little migration stain or halo.

Additional compounding information on this type of antiozonant can be found in Compounding Research Report 200-B53.

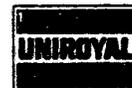
GENERAL INFORMATION

FLEXZONE® 7F

Chemical Composition:	N-Phenyl N'-(1, 3-dimethyl butyl) p-phenylene diamine.
Physical Form:	Dark Purplish Flakes.
Specific Gravity:	1.07 at 25°C (77°F) 1.00 at 60°C (140°F)
Typical Physical Properties:	Melting Point 50°C (122°F) ✓ Flash Point 204°C (400°F) ✓ Fire Point 227°C (440°F) ✓
Soluble in:	Acetone, Toluene, Benzene, Xylene, Solvent Naphtha, Ethylene Dichloride.
Insoluble in:	Hexane, Kerosene, Water.
Storage Stability:	Good, but should be stored away from heat to prevent sintering.
Handling:	Normal precautions such as avoidance of unnecessary personal contact and exercise of good personal hygiene is recommended as with any organic chemical. In compounded stocks, FLEXZONE 7F causes no significant skin irritations.
Recommended Amounts:	As a compounding ingredient, FLEXZONE 7F is added in these proportions: 1 to 3 parts of FLEXZONE 7F per 10 parts of RHC, in combination with 1.0 to 2.0 parts of SUNPROOF® EXTRA or SUNPROOF IMPROVED Wax.

The recommendations for the use of our products are based on tests believed to be reliable. However, we do not guarantee the results to be obtained by others under different conditions. Nothing in this brochure is intended as a recommendation to use our products so as to infringe on any patent.

Form No. 200B-139
ASP-3279
Printed in U.S.A.



that hepatic effects were prominent in the series.

- 210 **CHRONIC TOXICITY AND REPRODUCTION STUDIES IN RUBBER PARTICIPANTS (SUBSTITUTED PARA-PHENYLENEDIAMINES)**. M.W. Stevens, G.J. Levinthal, and P.R. Graham, Dept. Med. & Environ. Health, Monsanto Co., St. Louis, MO 63166

4,4'-[3,3'-Dimethylbutyl-N'-phenyl-p-phenylenediamine (I)] AND N,N'-bis-(1,4-dimethylpentyl)-p-phenylenediamine (II) are antioxidants for rubber. Two-year rat chronic toxicity studies were conducted with groups of 50 male and 50 female Charles River CDE strain albino rats. Dietary levels were 0, 100, 300, and 1000 ppm for (I), and 0, 30, 100, and 300 ppm for (II). Hematology, clinical chemistry, and urinalysis were conducted at 3, 6, 12, 18 and 24 months. There were no unusual reactions, and no treatment-related effects on survival rates with (I) or (II). The highest dietary levels of (I) and (II) depressed body weight gain but decreased food consumption only during the first few weeks. At 1000 ppm, (I) decreased erythrocytes, hemoglobin and hematocrit at some interim intervals, but not at the end of the study. Neither (I) nor (II) induced organ weight or gross or microscopic tissue changes.

Three-generation reproduction studies were conducted with (I) and (II) at the same dietary levels as the chronic study. Each F₀ group contained 8 male and 16 female albino rats. Reproduction was not impaired by (I) or (II). (II) reduced the number and survival of weanlings at 100 and 300 ppm and body weight at 300 ppm. There were no compound related tissue changes in parental animals or F_{3b} pups.

- 211 **EFFECTS OF DIETARY METHYLCELLULOSE IN THE RAT: LYSOSOMAL STORAGE IN THE MONONUCLEAR PHAGOCYtic SYSTEM AND HEPATOSPLENOMEGALY**

K.H. Mby, R.F. Manke and R. Abraham
Institute of Experimental Pathology & Toxicology
Albany Medical College, Albany, NY 12208

Thirty male Long-Evans rats (280-420g) were divided into groups of 10 each and fed a diet containing methylcellulose in concentrations of 0, 5, or 10% (w/w) for up to 3 months. Animals were observed daily for symptoms of toxicity. Body weights were recorded bi-weekly and at necropsy. Feed consumption was measured weekly. At necropsy, the weights of liver, spleen, and kidneys were recorded. Specimens of liver, spleen, and gastrointestinal tract (colon and cecum) were secured in appropriate fixative for histology and lysosomal enzyme histochemistry. The carcass was inspected for gross lesions. No differences in feed consumption were observed. One death occurred in the group fed 10% methylcellulose. At necropsy, the animal had gross hepatosplenomegaly and ascites were seen. Liver and spleen weights were significantly increased in

this group compared to the control. No difference in body weights were observed.

At the 10% level of methylcellulose, no deaths occurred nor were there any significant differences in the parameters measured as compared to the control values. Lysosomal acid phosphatase activity in Kupffer cells and macrophages of the liver, spleen, colon and cecum were markedly enhanced at the 5% and 10% levels. Cells of the mononuclear phagocytic system (MPS) were vacuolated and some were necrotic. Dietary methylcellulose is absorbed from the gastrointestinal tract of the rat and stored in lysosomes of the mononuclear phagocytic system with deleterious effects. Supported by grant #4732ES07058-03.

- 212 **EFFECTS FROM LOW LEVELS OF DIMETHYL (DMP) AND DIETHYL (DEP) PHTHALATES UPON ISOLATED PERFUSED RABBIT HEARTS AND L-CELLS IN CULTURE**.
M.H. Lawrence, R.R. Rajc, E.O. Dillingham and John Autian, Materials Science Toxicology Laboratories, University of Tennessee Center for the Health Sciences, Memphis, TN 38163.

DMP and DEP are present in a number of commercial products. In addition to their solvent properties, DMP is an insect repellent found in many topical preparations, while DEP serves as a fixative for perfumes and a denaturant for alcohol, particularly for cosmetics. DEP has also been reported as a leachable from certain plasticized polyvinyl chloride blood tubing sets, and implicated as a possible cause of hepatitis in some hemodialysis patients. ¹⁴C-DEP has also been shown to penetrate the intact skin of rabbits.

Dose-response (concentration-dependent) data were obtained for DMP and DEP using two sensitive biological test systems, the isolated perfused rabbit heart and inhibition of cell growth in culture. These tests have been utilized by us for detection of biologically active leachables from biomedical materials and devices. Perfusate concentration of DMP which would produce 50% inhibition of inotropic activity after 30 minutes of perfusion was estimated to be 146 µg/ml (7.5×10^{-4} M/L) and for DEP the value was 29 µg/ml (1.3×10^{-4} M/L). When mouse fibroblast cells were grown for three days in nutrient media containing varying concentrations of DMP or DEP, it was found that 6.5×10^{-4} M/L of DMP, or 2.8×10^{-4} M/L of DEP would produce a 50% decrease in growth (ID₅₀) of cells. It is significant that isolated heart responses occur in the same general concentration range as the ICG responses, although it is not always the more sensitive of the two.

- 213 **SUBCHRONIC TOXICITY OF TRINITROTOLUENE (TNT), CYCLOTRIMETHYLENE TRINITRAMINE (RDX) AND TNT/RDX MIXTURES IN F344 RATS**. B.S. Levine, E.M. Furedi, D. Gordon and P.M. Lish. Life Sciences Division, IIT Research Institute, Chicago, IL (M.C. Henry).

This study was conducted to evaluate the toxicity of the munitions compounds, TNT and RDX, and their potential toxic interactions in F344 rats when administered in the diet for 13 weeks. Groups of 10 rats per sex received TNT at doses of 1, 5, 25, 125, 300 mg/kg/day; RDX at doses of 10, 30, 100, 300, or 600 mg/kg/day; and 5 combinations thereof. Thirty rats

Flexzone 7L is an effective antiozonant with many premium features.

Flexzone 7L is a member of the Flexzone family designed for use both as a polymer stabilizer and as a compounding ingredient.

Compared to other p-phenylene diamines, Flexzone 7L features improved protection, safer handling, and an excellent margin of processing safety.

BETTER PROTECTION. Like other Flexzones, Flexzone 7L gives outstanding dynamic flex protection. It also offers excellent protection from ozone weathering, oxygen aging, heat and copper deterioration.

Flexzone 7L has proven its superior protective value in several years of exhaustive comparative testing. When intensive outdoor weathering tests were conducted in California and Connecticut, Flexzone 7L gave better dynamic protection than competitive p-phenylene diamines while maintaining equivalent or improved static protection. Similarly, in oxygen aging tests with natural rubber compounds, Flexzone 7L gave much improved percent retention of tensile and elongation.

A full report of these comparative tests is given on pages 6-9 of this booklet.

SAFER HANDLING. Independent laboratories report that Flexzone 7L causes no significant skin irritation or sensitization when used at normal levels in rubber compounds. Patch tests indicated that stocks containing Flexzone 7L provide maximum freedom from possible dermatitis. This is particularly important for those who must handle the compounded stock frequently during fabrication.

LOW ACTIVATING EFFECT. As every compounder knows, certain antiozonants exhibit a powerful activating effect which, in turn, causes premature cure (scorch).

To combat this activating effect, compounders have been forced to use the slower curing, greater delayed action accelerators.

This is not necessary with Flexzone 7L. Where other p-phenylene diamines show a substantial activating effect, Flexzone 7L is relatively neutral. As the tables below show, Flexzone 7L gives satisfactory scorch times with Delac[®]S. This can be especially important in natural rubber treads where all extrusions are relatively thick and can easily scorch if not handled properly.

Natural rubber tread (with Delac S)	Mooney Scorch @270°F	Cure Rate
Flexzone 7L	10½'	1¾'
Antiozonant A*	8'	1½'
Antiozonant B**	8½'	1¾'

SBR/polybutadiene passenger tread (with Delac S)

Flexzone 7L	18'	4'
Antiozonant A	13'	6'
Antiozonant B	15½'	3'

Typical passenger black sidewall (with Delac S)

Flexzone 7L	12'	1¾'
Antiozonant A	10½'	1¾'
Antiozonant B	10½'	2'

SBR/BR passenger tread (with Delac S)

SBR/BR passenger tread (with Delac S)	Mooney Scorch @320°F***	Cure Rate
Flexzone 7L	19¾'	5½'
Antiozonant A	14¾'	4'
Antiozonant B	16'	4¾'

SBR/BR passenger tread (with N-oxydiethylene-2-benzothiazole)

Flexzone 7L	29'	6¼'
Antiozonant A	23'	5½'
Antiozonant B	24½'	5¾'

*N,N' bis (1,4-dimethylpentyl)-PPD **Competitive N-Phenyl, N-Alkyl-PPD
***Scorch-minimum + 1 lb.

Flexzone 7L is a powerful polymer stabilizer.

Flexzone 7L is an excellent polymer stabilizer, and because of its low melting point, it can be easily handled with existing equipment in polymer plants. Flexzone 7L melts to a low viscosity liquid at 122°F.

ADDED PROTECTION. Like other members of the Flexzone family, Flexzone 7L imparts excellent protection against heat, oxygen and ozone attack. As a polymer stabilizer it can be used in conjunction with Flexzone 3C, Flexzone 6A, or Flexzone 5L to yield a compounded stock with increased ozone resistance. This additive effect now per-

mits polymer manufacturers to supply part of the customer's antioxidant requirements at no extra cost.

POWERFUL STABILIZATION. Flexzone 7L has proven itself to be the ideal stabilizer for many kinds of polymers. It is equivalent to the other Flexzones for raw polymer protection and superior to other widely used antioxidants.

As the tables below illustrate, Flexzone 7L is a very powerful stabilizer for SBR, and polybutadiene. In SBR and BR it is even more active than BLE-25. (BLE-25 does not effectively stabilize polybutadiene.)

1712 type polymer	BLE-25 (1.25 parts)	FLEX 7L (.5 parts)
Mooney Viscosity	45	50
Delta Mooney	-15	-12.5
Change in Mooney Viscosity after 7 days aging @ 158°F.	-26	-13
Hours to resinification @ 130°F.	52	60
Gel Formation after 300°F milling for 30 minutes	None	None

1500 type polymer	BLE-25 (1.25 parts)	FLEX 7L (.5 parts)
Mooney Viscosity	55	58
Delta Mooney	-15	-14
Mooney Viscosity after 9 hours aging @ 130°C.	46	51
Hours to resinification @ 130°C.	18	52
Hours to resinification @ 100°C.	12	816
Gel Formation after 12 hours aging @ 130°C.	None	None

Polybutadiene	FLEX 3C (.5 parts)	FLEX 7L (.5 parts)
Mooney Viscosity	55	54
Mooney Viscosity after aging @ 100°C		
after 8 hours	56	57
after 16 hours	58	57
after 24 hours	60	57
after 48 hours	60	57
after 64 hours	62	60
after 80 hours	65	60
Gel formation after aging @ 100°C		
after 8 hours	None	None
after 16 hours	"	"
after 24 hours	"	"
after 48 hours	"	"
after 64 hours	2.5%	"
after 80 hours	5.8%	"

Flexzone 7L in a typical passenger black sidewall.

SBR 1712 OZ	68.75
SBR 1500	25.0
BR	25.0
655 Reclaim	67.0
N550 (FEF) Black	60.0
Zinc Oxide	3.5
Stearic Acid	1.25
Paraflex	7.0
SUNPROOF*IMPROVED	1.5
DELAG S	1.2
DPG	0.4
Sulfur	2.9

	2.0 FLEXZONE 7L	2.0 Anti-ozonant A*	2.0 Anti-ozonant B**
Mooney Scorch at 270°F	12	10.5	10.5

Unaged physical properties cured at 320°F

300% Modulus—psi	15'	990	990	1010
	30'	1030	1020	1100
Tensile Strength—psi	15'	1900	1920	2000
	30'	1850	1980	2010
Elongation—%	15'	530	530	520
	30'	515	540	520

*N,N'-bis (1,4-dimethylpentyl) p-phenylene diamine **N-Phenyl,N'-Octyl-p-phenylene diamine

Appearance rating chart



VVS RATING



VS RATING



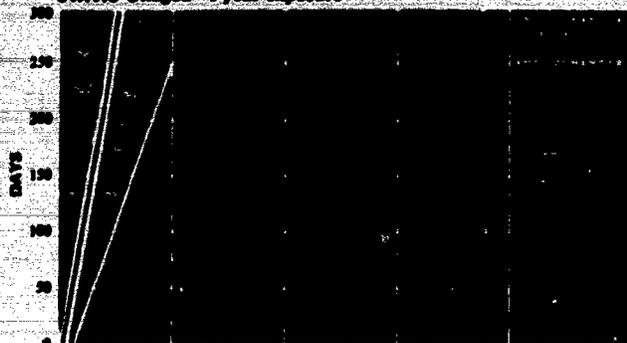
S RATING



C RATING

OUTDOOR TESTING (NAUBATUCK, CONN.)

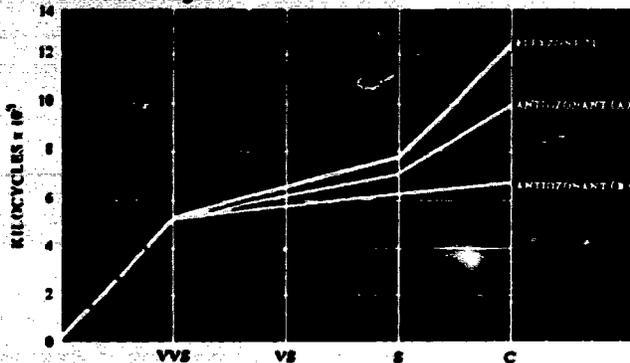
STATIC Unaged - 1 year exposure



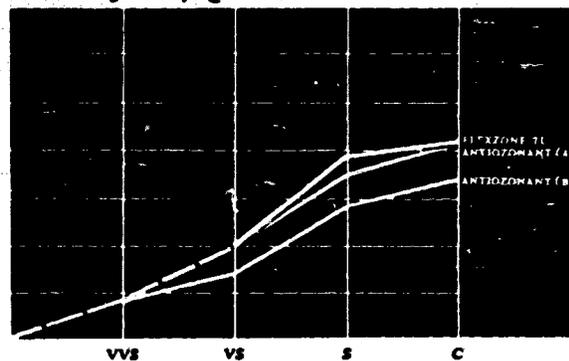
STATIC Aged 48 hours @ 158° F - 1 year exposure



DYNAMIC Unaged

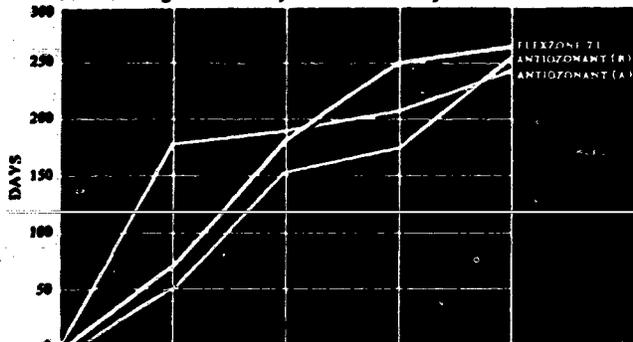


DYNAMIC Aged 7 days @ 158° F

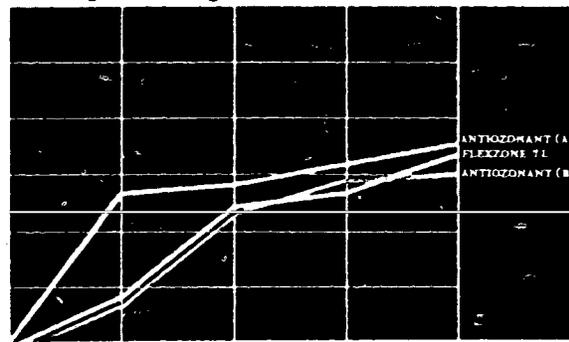


OUTDOOR TESTING (LOS ANGELES, CALIF.)

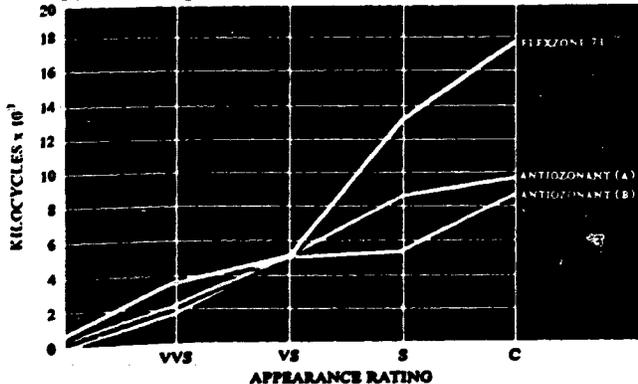
STATIC Unaged - February to November exposure



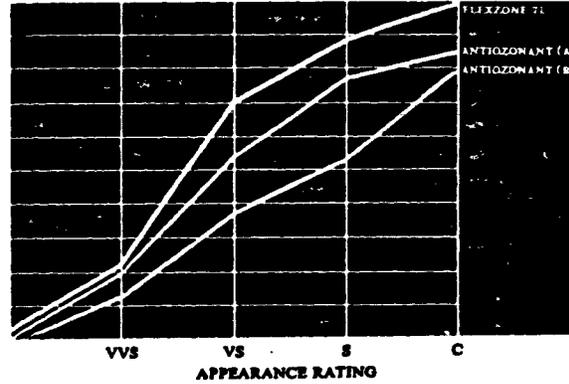
STATIC Aged 48 hours @ 212° F



DYNAMIC Unaged



DYNAMIC Aged 7 days @ 158° F



Flexzone 7L in a typical natural rubber tread stock.

Smoked Sheets	100.0
N220 (ISAF) Black	45.0
Zinc Oxide	5.0
Stearic Acid	3.0
Pine Tar	4.0
SUNPROOF IMPROVED	1.0
Antiozonants	2.0
DELAC-S	0.5
Sulfur	2.5

Mooney Scorch at 270°F

	2.0 FLEXZONE 7L	2.0 Anti- ozonant A*	2.0 Anti- ozonant B**
Scorch Time	10'30"	8'	8'30"
Cure Rate	1'45"	1'30"	1'45"

Unaged physical properties—cured at 320°F

300% Modulus—psi	15'	1450	1430	1590
	30'	1250	1250	1350
Tensile Strength—psi	15'	4450	4450	4390
	30'	3970	4100	3600
Elongation—%	15'	600	590	565
	30'	580	595	565

Aged 96 hours in oxygen—Physical properties—cured at 320°F

300% Modulus—psi	15'	1630	1400	1810
	30'	1530	1450	1820
Tensile Strength—psi	15'	2900 (63%) ***	2100 (47%)	2500 (60%)
	30'	2380 (63%)	1880 (47%)	2250 (60%)
Elongation—%	15'	475 (77%)	435 (70%)	400 (67%)
	30'	435 (77%)	395 (70%)	365 (67%)

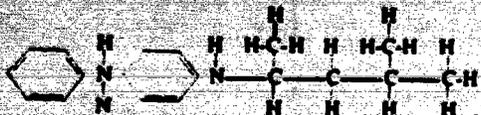
Aged 7 days at 158°F—Physical properties

300% Modulus—psi	15' @ 320°F	1920	1920	2000
	30'	1580	1780	1850
Tensile Strength—psi	15'	4030	4100	3950
	30'	3810	3950	3900
Elongation—%	15'	520	500	485
	30'	540	535	510

*N,N'-bis (1,4-dimethylpentyl) p-phenylene diamine **N-Phenyl,N'-Octyl-p-phenylene diamine
***Percent retention, average of two cures

Flexzone 7L—General Information.

*Excellent
powerful stabilizer
for many kinds
of polymers*



N-Phenyl-N'(1,3-dimethyl butyl)-p-phenylene diamine

Physical Form	A solid which melts to a low viscosity liquid at 122°F.
Specific Gravity	1.07
Typical Physical Properties	Melting Point 122°F Set Point 50°F Flash Point 400°F Fire Point 440°F
Soluble in	Acetone, Toluene, Benzene, Xylene, Solvent Naphtha.
Insoluble in	Hexane, Kerosene, Water.
Storage Stability	Good—Heated storage tank or drum heaters should be available.
Handling	Normal precautions in handling organic liquids should be observed. In compounded stocks, Flexzone 7L causes no significant skin irritation.
Recommended Amounts	As a polymer stabilizer, Flexzone 7L is added to the latex before flocculation. The recommended ratio is .50 to .75 part per 100 full parts RHC. As a compounding ingredient, Flexzone 7L is added in these proportions: 1 to 2 parts of Flexzone 7L per 100 parts RHC, in combination of 1 to 2 parts of Sunproof® Extra or Sunproof Improved.
Analytical Method	The analytical procedure used for the determination of Flexzone 7L in polymers is based on C. I. Hilton's "Spectrophotometric Determination of Flexzone 3-C and other p-phenylene Diamine Derivatives" published in <i>Analytical Chemistry</i> , Vol. 32, pages 1554-1557. (1960). This method was not originally developed for oil-extended stocks. Modifications of this method, which eliminate the interference caused by the oil, are available.

Like other p-phenylene diamines, Flexzone 7L is a discoloring antioxidant. Stocks containing Flexzone 7L may leave a grey contact stain but very little migration stain or halo.

Two Emulsion Procedures for FLEXZONE 7L:

Flexzone 7L	100.00
Oleic Acid	10.00
Sodium Hydroxide	1.65
Water	50.00
	<hr/>
	161.65

1. Mix oleic acid and Flexzone 7L together and heat to 140-150°F., with agitation.
2. Mix water and sodium hydroxide together and heat to 140-150°F.
3. Add Flexzone 7L mixture to water with good agitation.
4. Emulsion may be diluted to desired level.

Flexzone 7L	100.0
Oleic Acid	9.3
Sodium Hydroxide	0.8
Water	290.0
	<hr/>
	400.1

1. Add approximately 6% of the water heated to 150-160°F.
2. Add oleic acid and sodium hydroxide and agitate for fifteen minutes.
3. Heat Flexzone 7L to 150-160°F. and add to soap mixture with agitation.
4. Add remaining water slowly.

*Available also as FLEXZONE 7S a powdered 50/50 blend of FLEXZONE 7L and carbon black.

Flexzone® 7L in NEOPRENE W

FLEXZONE 7L imparts good flexing cracking resistance as well as excellent antiozonant properties to Neoprene compounds.

Base Compound 17751

Neoprene W	100.0
Ex. Lt. Calc. Magnesia	4.0
N550 (FEF) Carbon Black	10.0
Hard Clay	70.0
Light Process Oil	10.0
SUNPROOF® JR.	5.0
Zinc Oxide	5.0
Antiozonant	as indicated
NA-22	1.0

	Blank Control	3.0 FLEXZONE 7L
Mooney Viscosity (ML-4 @ 212°F)		
Unaged	46	41
After 7 days @ Room Temp.	49.5	45
After 14 days @ Room Temp.	48	50.5
After 21 days @ Room Temp.	46.5	48
Mooney Scorch @ 250°F		
Scorch Time	6'	6' 30"

UNAGED PHYSICAL PROPERTIES

	Blank Control	3.0 FLEXZONE 7L
Cured 10'/307°F		
300% Modules-psi	1170	1120
Tensile Strength-psi	2170	2330
Elongation %	590	650
Shore A Hardness	67	64

OUTDOOR DYNAMIC CRACKING TEST-KILOCYCLES TO CRACKING STAGE Flexed at Naugatuck

Cracking Stage	Blank Control	3.0 FLEXZONE 7L
VVS (ASTM Rating 1)	2,539	20,861
VS (" " 2)	—	47,067
S (" " 3)	8,739	58,409
C (" " 3+)	10,971	65,465

OUTDOOR STATIC CRACKING TEST-DAYS TO CRACK @ NAUGATUCK

Cracking Stage	Blank Control	3.0 FLEXZONE 7L
OK	—	365 days
VVS	84	—
VS	175	—
S	—	—
C	—	—

OZONE BOX STATIC CRACKING TEST-HOURS TO CRACK Tested @ 300 pphm O3 -120°F

C	20	ok after 1000 hrs.
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