

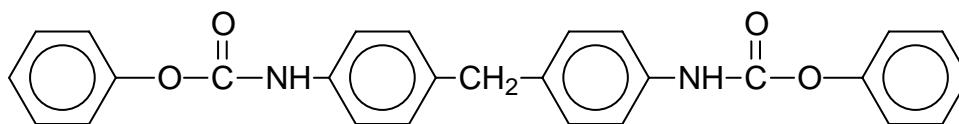
RUBBER CHEMICALS

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BONDING AGENT P-1 WETCAKE

An Adhesion Promoter for Polyester Tire Cord



4, 4' Methylene bis (phenylcarbanilate)

APPLICATIONS:

Bonding Agent P-1 wetcake was developed specifically for use in pre-dip solutioning of polyester tire and industrial cord. This treatment is used prior to a secondary dipping treatment with an RFL (resorcinol-formaldehyde-latex) system. The two-dip treatment of polyester tire cord has been tested extensively in the laboratory and commercially and has been found to provide adhesion superior to other known treatment systems.

Bonding Agent P-1 wetcake (71% active in water) provides improved handling, ease of mixing and reduced dusting compared to the discontinued Bonding Agent P-1 powder.

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ADHESIVE SYSTEM FOR POLYESTER

POLYESTER PRE-DIP FORMULATION ⁽¹⁾

	PARTS DRY	PARTS WET	BATCH SIZE 100 GAL.
BONDING AGENT P-1 MASTERBATCH			
BONDING AGENT P-1 Wetcake	33.38	47.01 ⁽²⁾	35.2 lbs
Aerosol OT-100 ⁽³⁾	1.28	1.28	1.0 lbs
Soft Water		51.71 ⁽²⁾	38.8 lbs or 4.3 gal.
Total	34.66	100.00	75 lbs

FINAL POLYESTER PRE-DIP			
BONDING AGENT P-1 MASTERBATCH	3.12	9.00	75.0 lbs
NER 010 Epoxide ⁽⁴⁾	1.20	1.20	10.0 lbs
Gum Tragacanth (2%) ⁽⁵⁾	0.04	2.00	16.7 lbs
Soft Water		87.80	733.1 lbs or 87.7 gal
Total	4.36	100.0	834.7 lbs or 100 gal

- (1) Based on U. S. Patent 3,307,966.
- (2) Weight of Bonding Agent P-1 Wetcake should be adjusted according to exact solids content.
- (3) Sodium dioctyl sulfosuccinate is a wetting agent supplied by Cytec Industries, West Patterson, NJ.
- (4) Epoxy resin curative supplied by Nagase America Corporation, New York, NY.
- (5) Supplied by Penta Manufacturing Company, Livingston, NJ

PROCEDURE FOR PREPARING POLYESTER PRE-DIP SOLUTION
MAKES APPROXIMATELY 100 GALLONS

- (1) Weigh Bonding Agent P-1 masterbatch into 150 gallon mixing vessel equipped with slow speed agitation.
- (2) Add gum tragacanth (2%).
- (3) Add 10.0 wet pounds of NER 010 slowly with fast agitation and mix 5 minutes.
- (4) Add 733.1 pounds of soft water slowly and complete mixing for 10 minutes.

This pre-dip formulation will have a total solids of 4.36%. The water portion can be adjusted up or down as desired.

Because of variations between polyester suppliers, oven drying times and temperature, stretch conditions should be requested of the polyester source.

The polyester pre-dip formulation may be used immediately, but should be agitated during the tire cord treatment to prevent settling. Recommended maximum shelf life is 5 to 7 days.

RFL FORMULATION FOR FINAL POLYESTER DIP

SOLUTION A	DRY	WET
Penacolite Resin R-2170 Solution ⁽¹⁾	16.0	21.6
28% Ammonium Hydroxide		6.0
Water		72.4
Total	16.0	100.0
Storage life is 72 hours maximum		

SOLUTION B	DRY	WET
37% Formaldehyde	4.2	11.3
Water		38.7
Total	4.2	50.0

RFL FORMULATION	DRY	WET
Gen-Tac ⁽²⁾ (41% solids)	100.0	244.0
Solution A	16.0	100.0
Solution B	4.2	50.0
Water	as necessary	as necessary
Storage life is 48 hours maximum		

- (1) Penacolite Resin R-2170 Solution is a partially condensed resin solution of resorcinol and formaldehyde at 75% solids, supplied by Indspec Chemical, Pittsburgh, PA.
- (2) Gen-Tac is a vinyl pyridine-butadiene-styrene polymer in latex form (41% solids) from Gen Corp, Akron, OH.

Maximum solids normally recommended for this compound is 26 to 27%. Therefore, water must be added for dilution. A solids working range is 16 to 26% depending on needs and conditions. Use the following order of addition: 1 = Gen-Tac, 2 = Water, 3 = Solution A, 4 = Solution B.

**PROCEDURE FOR PREPARING RFL FORMULATION
MAKES APPROXIMATELY 100 GALLONS**

		DRY	WET
1	Use a mixing vessel of about 150 gallons capacity equipped with slow speed agitation. Weigh into it 381 wet pounds of Gen-Tac.	156	381
2	Add 219 pounds of water under slow agitation.		219
3	Add 156 wet pounds of Solution A (resin) slowly and mix 5 minutes.	25	156
4	Add 78 wet pounds of Solution B (formaldehyde) slowly and complete mixing for 10 minutes.	7	78
	Total	188	834

- (1) Use a mixing vessel of about 150 gallons capacity equipped with slow speed agitation. Weigh into it 381 wet pounds of Gen-Tac.
- (2) Add 219 pounds of water under slow agitation.
- (3) Add 156 wet pounds of Solution A (resin) slowly and mix 5 minutes.
- (4) Add 78 wet pounds of Solution B (formaldehyde) slowly and complete mixing for 10 minutes.

This mix will have a solids content of 22.5%. The water portion can be adjusted up or down as desired.

The dip compound may be used immediately, but adhesion improves if the dip compound is aged (matured) for at least 12 hours (16 to 18 hours maximum). Maximum recommended dip age is 72 hours.

DIPPING AND DRYING CONDITIONS FOR POLYESTER CORD

PRE-DIP	
Pre-Dip (Bonding Agent P-1) pick up	0.5 – 1.0% (based on fabric weight)
Unblocking temperature	220 – 240°C
Exposure time	40 – 60 seconds

RFL DIP	
RFL pick up	3.0 – 4.0% (based on fabric weight)
Heat treatment time	220 – 225°C
Exposure Time	40 – 90 seconds

Actual temperature, exposure times and stretch conditions should be determined based on equipment design and operating exposure.

ADHESION TEST DATA

“H” Adhesion Test (ASTM 2138) at 121°C (250°F)	
Passenger Carcass Compound – 1000/3 Polyester Tire Cord	
Time and Temperature of Vulcanization	
15 minutes at 160°C (320°F)	5.4 kN/m (31 pli)

Two Ply Strip Adhesion* at 121°C (250°F)	
Time and Temperature of Vulcanization	
15 minutes at 160°C (320°F)	8.9 kN/m (51 pli)
Stock Coverage	95 – 100%

- * 2.54 cm (1 inch) wide pieces of square woven polyester fabric are solution coated using the two step process. These pieces are then separated and backed with a passenger carcass compound and cured. The adhesion value is the force required to separate these pieces after vulcanization.