## Waterborne Coatings based on Trilene<sup>®</sup> EPDM Rubber

**Technology and Applications** 

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#### Trilene<sup>®</sup> Outline

- What is EPDM Rubber and Where is it used
- Advantages of Coatings from EPDM Rubber
- Water-dispersed EPDM Coating Technology Development
- Wrap-up



Lion Elastomers is a leading manufacturer of synthetic rubber products. Our products represent the highest performing, highest quality EPDM and SBR rubber materials available anywhere in the world. The company operates world-class EPDM and SBR manufacturing facilities in Geismar, Louisiana and Port Neches, Texas.



#### General Description & Application for EPDM

EPDM (Ethylene Propylene Diene Terpolymer\*)



Compared with other rubbers, many special properties of EPDM are derived from the saturated backbone structure. Primary application areas for EPDM rubber include Automotive, Building & Construction, Wire & Cable, and Consumer Products.



\* In ASTM nomenclature system, M designates a saturated polymer backbone. In contrast, R designates polymers that contain unsaturated backbone, e.g. NR, SBR.

#### **EPDM Properties Desired in Coating Applications**

- Oxidation, UV and Ozone resistant
- Hydrophobic and waterproof
- Low moisture permeability
- Good mechanical strength
- ✓ Flexibility, especially at low temperature
- Excellent electrical properties
- Adhesion to a wide variety of surfaces

Grades	E/P Ratio	Wt. % Diene (Type)	M <sub>w</sub> *	Viscosity**
Trilene <sup>®</sup> 65	50/50	10.0 (DCPD)	47,000	177,000
Trilene 67	46/54	9.5 (ENB)	39,000	128,000
Trilene 77	74/26	10.5 (ENB)	27,000	102,000



\* Molecular weight derived from kinematic viscosity measurements. M<sub>w</sub> is weight average molecular weight.

\*\* Viscosity is Brookfield (cP) at 100°C.

### Water dispersed EPDM Background

- Solvent based coatings based on Trilene<sup>®</sup> EPDM have a relatively high VOC demand.
- Some applications require waterborne formulations for environmental and/or health concerns.
- A dispersion of Trilene EPDM in water has been developed. The dispersion provides an approach to a stand alone coating, or a unique additive to current latex products.
- Typical properties of EPDM dispersions
  - 45-55% by weight solids content
  - Pourable viscosity at room temperature
  - Formulated with common ingredients
  - Water clean-up
  - Metal drier (1K), Peroxide(2K) and/or UV curable
  - Compatible with other water-based resins







Trilene 65



### Roof Coating Technology Comparison

				Coating	Coating	
Туре	Mode	Carrier	VOC	Economics	Life (yrs)	Notes
Bituminous	1K	SB	High	\$	3 - 5	No primer, Recoatable
Elastomeric acrylic	1K	WB	Low	\$\$	5 - 10	Requires primer, Limited recoatability
Silicone	1K MC*	100% to SB	Low	\$\$\$	8 - 12	Requires primer, Difficult recoatability
Moisture cure PUR	1K MC	SB	Low	\$\$\$	8- 12	Requires primer, Difficult recoatability
Polyurethane	2К	SB	Medium	\$\$\$\$	10 - 15	Requires primer, Difficult recoatability
EPDM	2К	SB	High	\$\$\$\$	12 - 20	No primer, Recoatable
WB EPDM	1K or 2K	WB	Low	\$\$\$	12 - 20	No primer, Recoatable
EPDM Re-roof	Membrane	na	Low	4X \$\$\$\$	25 - 40	No primer, Waste disposal, Highest labor costs

\* MC – moisture cure



#### Water dispersed EPDM Prototype

#### Initial Results based on Trilene® 65 Elastomer

Dispersion physical characteristics

- Weight solids 46%
- Viscosity (Brookfield, cP) 14,000
- Appearance Milky white liquid
- pH 8.0
- Density 7.5 lb/gal
- Particle size estimate 1-2 micron
- Stability after 12+ months Good

GOAL: Weatherability like silicone; Toughness like polyurethane; Ease of handling like acrylic



#### **Developmental Starting Point Formulation**

	Weight (grams)		
Trilene <sup>®</sup> 65D	380.69		
Ti-Pure™ R-706	44.77		
Deionized(DI) H <sub>2</sub> O	38.08		
DISPERBYK <sup>®</sup> 2055	0.91		
SR350	11.42		
Mineral spirits	19.03		
Ricon <sup>®</sup> 156	3.81		
10% Cobalt Hydro-Cure <sup>®</sup> IV	0.53		
12% Zirconium Hydro-Cem	<u>0.76</u>		
Total	500.0		

**NOTE:** Peroxide (e.g. Peroxan<sup>®</sup> PIN) can be added to further accelerate cure, making it a 2K system.



#### **Developmental Formulation Properties**

Method	Result*
ASTM D3960	0.32 (38)
ASTM D3960	48
ASTM D1475	1.02
ASTM D2196	11,000
ASTM D1640	8
ASTM D1640	13
ASTM D2794	>90
ASTM D3359	5B
ASTM D3363	3B
	Method   ASTM D3960   ASTM D3960   ASTM D3960   ASTM D3960   ASTM D3960   ASTM D1475   ASTM D1475   ASTM D1640   ASTM D1640   ASTM D2794   ASTM D3359   ASTM D3363

\* No peroxide added





- Solvent-based coatings based on low molecular weight EPDM elastomer have been successfully developed using both peroxide and photoinitiator (UV) crosslinking.
- Properties and advantages of EPDM coatings are well known.
- EPDM Coatings offer potential in various coating applications, including roof, protective, and decorative coatings.

✓ Water dispersed EPDM technology is available.





# Thank you.

