

CRAY VALLEY

A BRAND OF  TOTAL

PRODUCT GUIDE





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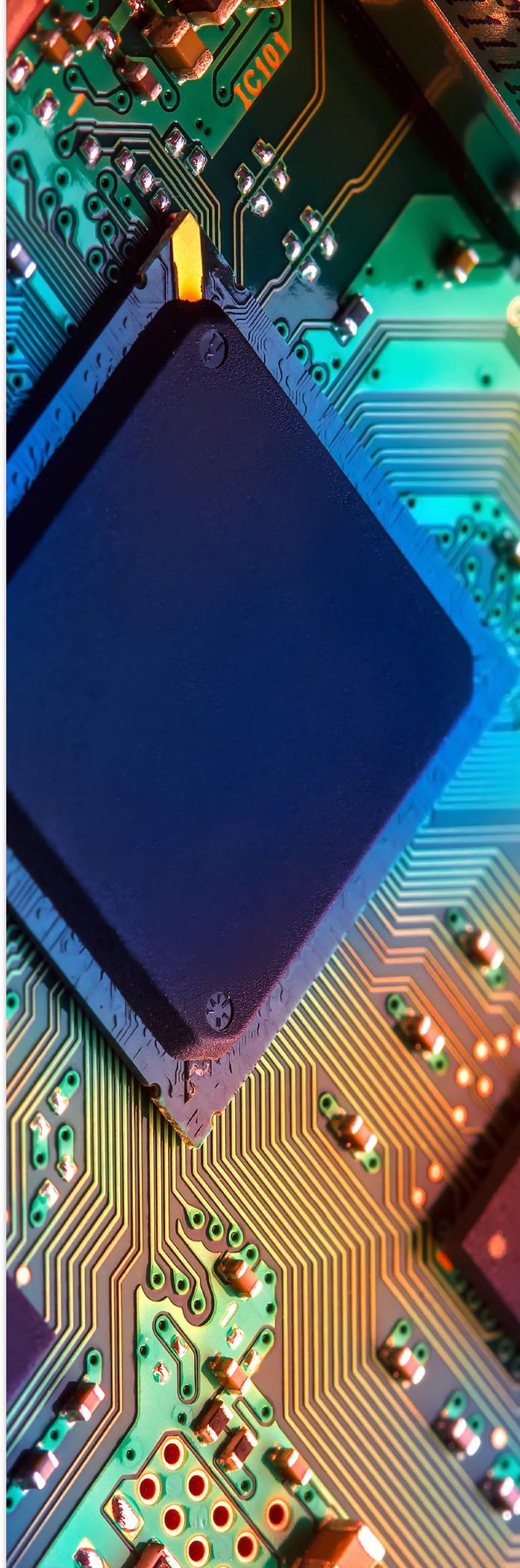
TOTAL Cray Valley manufactures and supplies diene-based liquid homopolymers and copolymers, C5 and C9 hydrocarbon tackifying resins, derivatives, metallic monomer salts of acrylic and methacrylic acid, and specialty monomer products.

TOTAL Cray Valley sells these products under the **Ricon®**, **Ricobond®**, **Krasol®**, **Poly bd®**, **Wingtack®**, **Clartack®**, and **Dymalink®** brand names.

TOTAL Cray Valley focuses on rubber and adhesives, while also supporting other traditional markets and new opportunities in the electronics, coatings, and plastics modification areas.

The many technologies for TOTAL Cray Valley lead to molecular structures in our products that promote rheology control, crosslinking, adhesion, sealing, reactive intermediates, polymer synthesis, and dispersion.

Continuous improvement and technology innovation enables TOTAL Cray Valley to capitalize on new products and manufacturing excellence. These synergies lead to increased value in our markets and business growth for our customers.



TOTAL Cray Valley is part of TOTAL Refining and Chemicals Global Polymers Division.

TOTAL Cray Valley is a global manufacturer of specialty low-molecular-weight functional additives based on a variety of unique chemistries. Included are functional diene-based polymers, (meth)acrylate-functional metallic monomers, and aromatic and aliphatic hydrocarbon resins based on C5 and C9 feed streams that can serve a wide variety of applications in the adhesives, rubber, and thermoplastics industries. We work closely with our customers, and our ambition is to offer them the solutions that best fulfill the latest needs of the markets in which they operate.

TECHNOLOGY

	Rheology Modifier	Crosslinking	Adhesion	Chemical Intermediate	Polymer Modification
Ricon®	Red	Red	Red	White	Red
Poly bd®	White	White	Red	Red	Red
Krasol®	White	White	Red	Red	Red
Wingtack®	Blue	White	Blue	White	Blue
Clartack®	Blue	White	Blue	White	Blue
Dymalink®	Orange	Orange	Orange	Orange	Orange

MARKET BREAKDOWN

Rubber Additives

Ricon® | Wingtack® | Cleartack® | Dymalink® | Ricobond®

TOTAL Cray Valley has developed a portfolio of products for the tire industry. Ricon liquid polybutadiene resins are established as performance-enhancing additives for tire tread compounds requiring specific recipes for different segments — winter, summer, all-season, racing, and specialty. Ricon resins modify the viscoelastic properties of these compounds to optimize the balance of traction, fuel economy, and durability.

TOTAL Cray Valley is a trusted provider of Dymalink metallic monomers and Ricon functional resins that manage crosslinking, adhesion and dynamic properties for belt, hose, seal, wire and cable, and other industrial rubber applications. Our specialty additives deliver high modulus, hardness, and abrasion resistance to help belts retain their original properties over millions of revolutions. They enhance strong, lightweight hoses with excellent thermal, corrosion, and chemical resistance. They impart rubber adhesion to metals and reinforcing textiles.

Adhesion Promoters

Ricon® | Poly bd® | Krasol® | Wingtack® | Cleartack® | Dymalink® | Ricobond®

TOTAL Cray Valley offers a wide range of products to enhance adhesion in your performance applications.

Our well known Wingtack hydrocarbon resins are extremely consistent, high-quality, low-color resins. Based on C5 chemistry, they act as tackifiers in hot melt and pressure sensitive adhesives. Cleartack pure monomer resins provide styrenic end block reinforcement in SBC adhesive formulations, while imparting low color and tack to hot melt adhesives.

Ricobond resins improve rubber adhesion to a variety of substrates, such as copper and textile, while increasing the crosslink density of the formulation. Dymalink resins will dramatically increase the adhesion of rubber to metal substrates, even brass.

We also offer C4 resins with a variety of functionality, including hydroxyl-terminated, epoxidized, silanated, and maleinized polymers. The resins offers great formulating latitude in reactive adhesives.

Electronics

Ricon® | Poly bd® | Krasol®

Our Poly bd hydroxyl-terminated polybutadiene resins offer unique properties in potting and encapsulation formulations. Cured as urethanes, these resins impart good thermal cycling up to 125 °C, excellent hydrolytic stability, and low moisture permeation. Poly bd formulations show consistent elongation and embedment stress, even at low temperatures.

Ricon resins can be used in copper clad laminate (CCL) applications to improve electrical properties. When used in methacrylated PPE formulations, Ricon copolymers can replace some or all of the TAIC hardener. The Ricon resins will improve toughness while improving the dielectric properties of the formulation. Ricon copolymers have the appropriate balance of backbone chemistry and processable viscosity needed to meet the increasing demands of this industry.

Thermoplastics/Thermoplastic Elastomers

Ricon® | Krasol® | Cleartack® | Dymalink®

TOTAL Cray Valley products provide important advantages for thermoplastic and thermoplastic elastomer (TPE) applications. Dymalink metallic monomers increase melt strength in polypropylene-containing polymers and elastomers. This is important for producing products that are formed from extruded foam, sheet, and film. It also adds value for “upcycling” scrap material. Dymalink aids in the manufacture of extruded foam polystyrene sheet. The material’s improved melt strength allows for significant light-weighting while maintaining packaging performance.

Dymalink monomers, Ricon and Cleartack resins, participate in the enhancement of processability, mechanical, and adhesion properties for TPE and vulcanizates used in emerging automotive, fluid handling, construction, health care, consumer goods, and wire and cable industries.

Specialty Applications

Ricon® | Poly bd® | Krasol® | Wingtack® | Cleartack® | Dymalink®

From athletic surfaces to rocket motors, our Poly bd resins find utility in applications where high filler loading is required. The resins impart the low-temperature flexibility, moisture resistance, and acid/base resistance critical to these formulations.

Our C4 resins are reactive plasticizers in specialty applications such as printing plates, where formulators can dial in hardness, resistance, and resiliency. Our resins also act as oxygen scavengers in packaging applications, protecting food, juices, and medications from degradation.

Our goal in specialty markets is to work with each customer to develop value-added products that provide solutions to their formulation challenges.

	Rubber Additives	Adhesion Promoters	Electronics	Thermoplastics/ Thermoplastic Elastomers	Specialty Applications
Ricon®					Packaging, Coatings
Poly bd®					Fuel Binders, Urethanes
Krasol®					Urethanes, Coatings
Wingtack®					Waxes, Casting, Coatings
Cleartack®					Coatings
Dymalink®					Coatings, Sporting Goods

POLYBUTADIENES

TOTAL Cray Valley offers a diverse selection of specialty liquid polybutadiene grades including low and high vinyl polybutadiene homopolymers and poly(styrene-butadiene) copolymers.

Ricon grades offer a complete selection of microstructures, which translates to a wide spectrum of glass transition temperatures. In addition to the base product line, functional derivatives are available.

Product	Description	Molecular Weight (M _n , g/mol)	1,2 Vinyl (wt. %)
Low Vinyl Content			
Ricon 130	Homopolymer of Butadiene	2,500	28
Ricon 131	Homopolymer of Butadiene	4,500	28
Ricon 134	Homopolymer of Butadiene	8,000	28
Ricon 138	Homopolymer of Butadiene	2,000	40
High Vinyl Content			
Ricon 150 (Ricon 150D/DA)	Homopolymer of Butadiene (Dry Liquid 70% Active)	3,900	70
Ricon 152 (Ricon 152D/DA)	Homopolymer of Butadiene (Dry Liquid 70% Active)	2,900	80
Ricon 153 (Ricon 153D/DA)	Homopolymer of Butadiene (Dry Liquid 65% Active)	4,700	85
Ricon 154 (Ricon 154D/DA)	Homopolymer of Butadiene (Dry Liquid 65% Active)	5,200	90
Ricon 156	Homopolymer of Butadiene	1,400	70
Ricon 157	Homopolymer of Butadiene	1,800	70
Styrene-Butadiene Copolymers			
Ricon 100	Butadiene-Styrene Random Copolymer (25% Styrene)	4,500	70
Ricon 181	Butadiene-Styrene Random Copolymer (28% Styrene)	3,200	30
Ricon 184	Butadiene-Styrene Random Copolymer (28% Styrene)	8,600	30
Silylated			
Ricon 603	Silylated Polymer of Butadiene	3,000	65

RICON

Low Vinyl Content			
Ricon 130MA8	Maleinized Polybutadiene	3,100	28
Ricon 131MA5	Maleinized Polybutadiene	4,700	28
Ricobond 1731 (Ricobond 1731HS)	Maleinized Polybutadiene (Dry Liquid 69% Active)	5,400	28
High Vinyl Content			
Ricobond 1756 (Ricobond 1756HS)	Maleinized Polybutadiene (Dry Liquid 69% Active)	2,500	70

AQUEOUS
RICON MA,
DISPERSION
RICOBOND

Product	Typical Properties				
	Appearance	Solids	pH	Viscosity (cps @ 25 °C)	Salt Form
Ricobond 7004	Lt. Brown Liquid	30	8.5	500	Ammonium

The Ricon MA and Ricobond series include maleic anhydride grafted grades.

Poly bd hydroxyl-terminated polybutadienes are available, and our unique Krasol product line consists of both unsaturated and fully hydrogenated telechelic polybutadiene diols.

The products are used in an equally broad spectrum of markets and applications. Low-viscosity liquid polybutadienes are used as processing aids, and the wide Tg range allows for modification of tire performance properties. In addition, high vinyl grades are useful as coagents for the peroxide cure of rubber. Functional grades expand the utility of the polybutadiene resins to many other applications, including polyurethanes, hydrophobic sealants and coatings, and thermoplastic/ thermoplastic elastomer (TPE) modification.



Typical Properties

Viscosity (cps)	T _g (°C)	Specific Gravity @ 25 °C	MA (molecules/chain)
750 @ 25 °C	-86	0.89	--
2,750 @ 25 °C	-84	0.89	--
15,000 @ 25 °C	-81	0.89	--
8,000 @ 25 °C	-73	0.89	--
40,000 @ 25 °C	-40	0.89	--
20,000 @ 45 °C	-30	0.89	--
60,000 @ 45 °C	-28	0.89	--
250,000 @ 45 °C	-15	0.89	--
1,600 @ 25 °C	-56	0.89	--
6,000 @ 25 °C	-51	0.89	--
40,000 @ 45 °C	-15	0.90	--
17,500 @ 25 °C	-65	0.90	--
75,000 @ 25 °C	-57	0.90	--
20,000 @ 25 °C	-35	0.90	
6,500 @ 25 °C	-82	0.90	2
15,000 @ 25 °C	-83	0.90	2
50,000 @ 45 °C	-72	0.91	9
140,000 @ 55 °C	-18	0.91	3

(Liquid Polybutadienes list continues on next page)

LIQUID POLYBUTADIENES (*continued*)

Product	Description	Molecular Weight	
		(M _n , g/mol)	
POLY BD*	Polyol		
	Poly bd R-45HTLO	Hydroxyl-Terminated Polybutadiene	2,800
	Poly bd R-45V	Hydroxyl-Terminated Polybutadiene	2,800
	Poly bd R-20LM	Hydroxyl-Terminated Polybutadiene	1,200
	Epoxidized		
	Poly bd 605E	Epoxidized Hydroxyl-Terminated Polybutadiene	1,450
	Poly bd 700S	Epoxidized Hydroxyl Terminated Polybutadiene	3,000

KRASOL*	Diol		
	Krasol LBH 2000	Hydroxyl-Terminated Polybutadiene	2,100
	Krasol LBH-P 2000	Hydroxyl-Terminated Polybutadiene (Primary-OH)	2,100
	Krasol LBH 3000	Hydroxyl-Terminated Polybutadiene	3,000
	Krasol LBH-P 3000	Hydroxyl-Terminated Polybutadiene (Primary-OH)	3,200
	Hydrogenated Diols		
	Krasol HLBH-P 2000	Hydroxyl-Terminated Hydrogenated Polybutadiene	2,100
	Krasol HLBH-P 3000	Hydroxyl-Terminated Hydrogenated Polybutadiene	3,100
	Monol		
	Krasol LBH 5000M	Hydroxyl-Terminated Polybutadiene	5,000
	Krasol HLBH 5000M	Hydroxyl-Terminated Hydrogenated Polybutadiene	5,000
	Biosourced		
	Krasol F3000	Hydroxyl-Terminated Polyfarnesene	3,000
	Krasol F3100	Hydrogenated Hydroxyl-Terminated Polyfarnesene	3,000

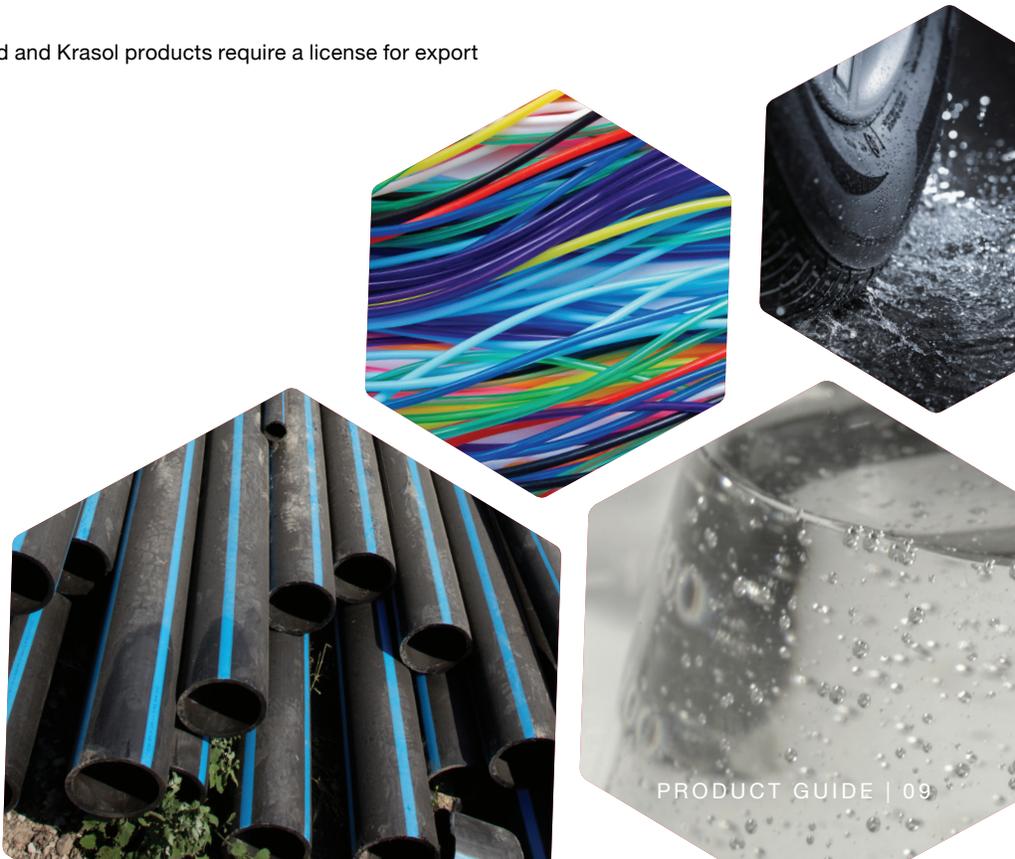
Product	Typical Properties				
	Appearance	Viscosity (cps @ 25 °C)	Molecular Weight (M _n , g/mol)	T _g (°C)	Specific Gravity @ 20 °C
Ricon 300	Viscous Liquid	750	2,500	-85	0.89
Ricon 330	Solid	N/A	600	35	1.06
Ricon 340	Viscous Liquid	30,000	400	-31	0.90

Typical Properties

1,2 Vinyl (wt. %)	Viscosity (cps)	T _g (°C)	Specific Gravity @ 25 °C	MA (molecules/chain)	-OH (molecules/chain)	Epoxy (eq. wt.)
20	5,000 @ 30 °C	-75	0.90	--	2.5	--
20	5,000 @ 30 °C	-75	0.90	--	2.5	--
20	1,400 @ 30 °C	-70	0.91	--	2.5	--
20	12,000 @ 30 °C	-47	1.01	--	2.5	450
20	10,000 @ 30 °C	-65	1.01	--	2.5	400
65	13,000 @ 25 °C	-35	0.89	--	1.9	--
65	13,000 @ 25 °C	-35	0.89	--	1.9	--
65	20,000 @ 25 °C	-35	0.89	--	1.9	--
65	20,000 @ 25 °C	-35	0.89	--	1.9	--
--	1,750 @ 60 °C	-46	0.88	--	1.9	--
--	3,000 @ 60 °C	-46	0.88	--	1.9	--
65	25,000 @ 25 °C	-45	0.89	--	0.98	--
--	65,000 @ 25 °C	-57	0.88	--	0.92	--
40 3,4 vinyl	1,700 @ 25 °C	-65	0.90	--	2.0	--
0	15,000 @ 25 °C	-56	0.90	--	2.0	--

*Poly bd and Krasol products require a license for export

Aromaticity
No
Yes
No



METALLIC MONOMERS

TOTAL Cray Valley provides a selection of metallic

monomers. Non-scorch-retarded and scorch-retarded rubber coagent monomers are available for peroxide-cure applications, while our speciality monomers are used in a wide variety of cure systems, including accelerated sulfur vulcanization and metal oxide cure.

Our products find utility in a variety of applications including tires, power transmission belts, rubber sealing systems, coatings, thermoplastics, and adhesives.

SPECIALITY MONOMERS

Product	Description
Non-Scorch-Retarded	
Dymalink 636	Calcium Diacrylate
Dymalink 705	Zinc Diacrylate
Dymalink 706	Zinc Diacrylate
Dymalink 708	Zinc Dimethacrylate
Dymalink 709	Zinc Monomethacrylate
Scorch-Retarded	
Dymalink 633	Zinc Diacrylate
Dymalink 634	Zinc Dimethacrylate

Product	Typical Properties				
	Appearance	Percent Actives	Targeted Systems	Specific Gravity @ 20 °C	Application
Dymalink 9200	White Powder	100	Polypropylene	1.68	Ionomeric Crosslinker
Dymalink 9201	Pellets Concentrate	70	Polypropylene	1.29	Ionomeric Crosslinker



Typical Properties

Appearance	Specific Gravity @ 25 °C	Percent Actives
White Powder	1.44	100
White Powder	1.68	100
White Powder	1.68	100
White Powder	1.49	100
White Powder	1.88	100
Off-White Powder	1.59	100
Off-White Powder	1.48	100

	Product	Description	Softening Point (RB, °C)
WINGTACK	Wingtack 10	C5 Hydrocarbon Resin	10
	Wingtack 86	C5 Hydrocarbon Resin	87
	Wingtack 95	C5 Hydrocarbon Resin	98
	Wingtack 98	C5 Hydrocarbon Resin	98
	Wingtack 102	C5 Hydrocarbon Resin	102
	Wingtack RWT-7850	C5 Hydrocarbon Resin	102
	Wingtack Plus	C5 Hydrocarbon Resin	96
	Wingtack EXTRA	C5 Hydrocarbon Resin	97
	Wingtack ET	C5 Hydrocarbon Resin	95
	Wingtack STS	C5 Hydrocarbon Resin	94
CLEARTACK	Clear tack W-85	Pure Monomer Resin	85
	Clear tack W-90	Pure Monomer Resin	90
	Clear tack W-100	Pure Monomer Resin	100
	Clear tack W-110	Pure Monomer Resin	110
	Clear tack W-120	Pure Monomer Resin	120
	Clear tack W-130	Pure Monomer Resin	130
	Clear tack W-140	Pure Monomer Resin	140

TOTAL Cray Valley's hydrocarbon resin products complete a diverse portfolio.

The Wingtack and Cleartack lines cover a wide spectrum of aliphatic and aromatic grades. The Wingtack grades are high-quality, low-color C5 and C5/C9 resins. The Cleartack W series are colorless pure-monomer resins.

Hydrocarbon resins from TOTAL Cray Valley have utility in many markets. In adhesives,

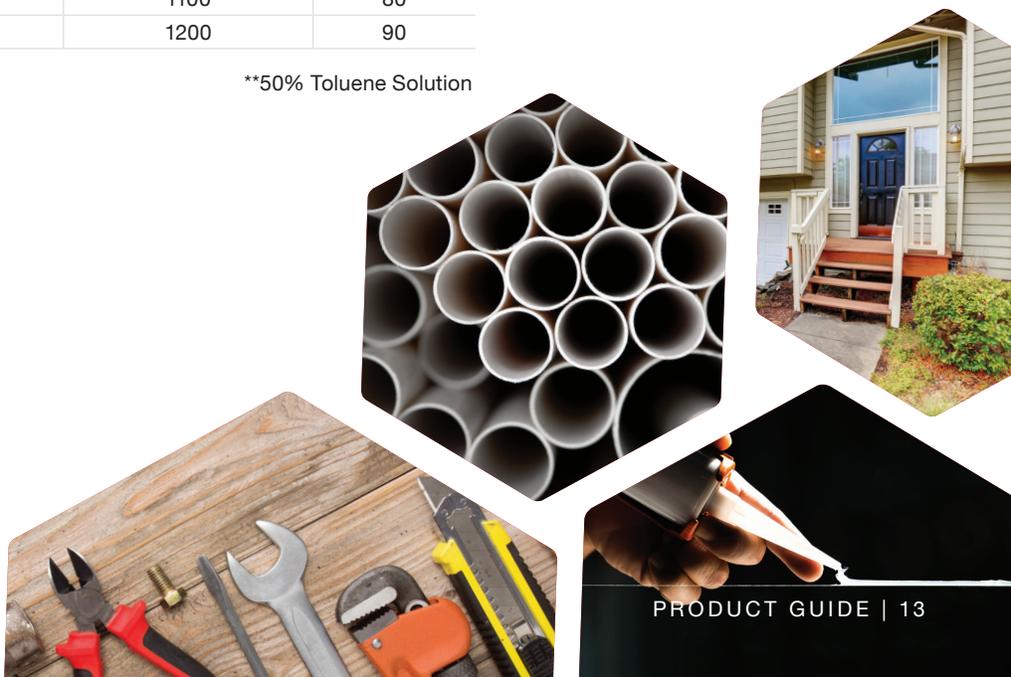
hydrocarbon resins are used in hot melts, pressure sensitive tapes and labels, construction mastics, and many specialty applications. Hydrocarbon resins are also excellent tackifiers and compatibilization aids in the rubber market. In addition, hydrocarbon resins have found utility in coatings, investment wax casting compounds, thermoplastic/thermoplastic elastomers (TPE) modification, hydrophobic sealants, and coatings.

Typical Properties

Appearance	Gardner Color**	Specific Gravity @ 20 °C	Molecular Weight (M _n , g/mol)	T _g (°C)
Light Yellow Liquid	1.5	0.90	370	-31
Light Yellow Solid	1.2	0.98	650	42
Light Yellow Solid	1.7	0.95	1100	52
Light Yellow Solid	2.9	0.95	1000	52
Light Yellow Solid	2.9	0.95	1000	48
Light Yellow Solid	2.4	0.95	1000	56
Light Yellow Solid	1.6	0.95	1000	50
Light Yellow Solid	1.7	0.96	1100	52
Light Yellow Solid	2.0	0.96	1000	47
Light Yellow Solid	2.9	0.97	1000	44

Appearance	Hazen Color**	Specific Gravity @ 20 °C	Molecular Weight (M _n , g/mol)	T _g (°C)
Colorless Solid	<40	1.06	600	35
Colorless Solid	<40	1.06	650	40
Colorless Solid	<40	1.06	750	50
Colorless Solid	<40	1.06	850	60
Colorless Solid	<40	1.06	950	70
Colorless Solid	<40	1.06	1100	80
Colorless Solid	<40	1.06	1200	90

**50% Toluene Solution



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