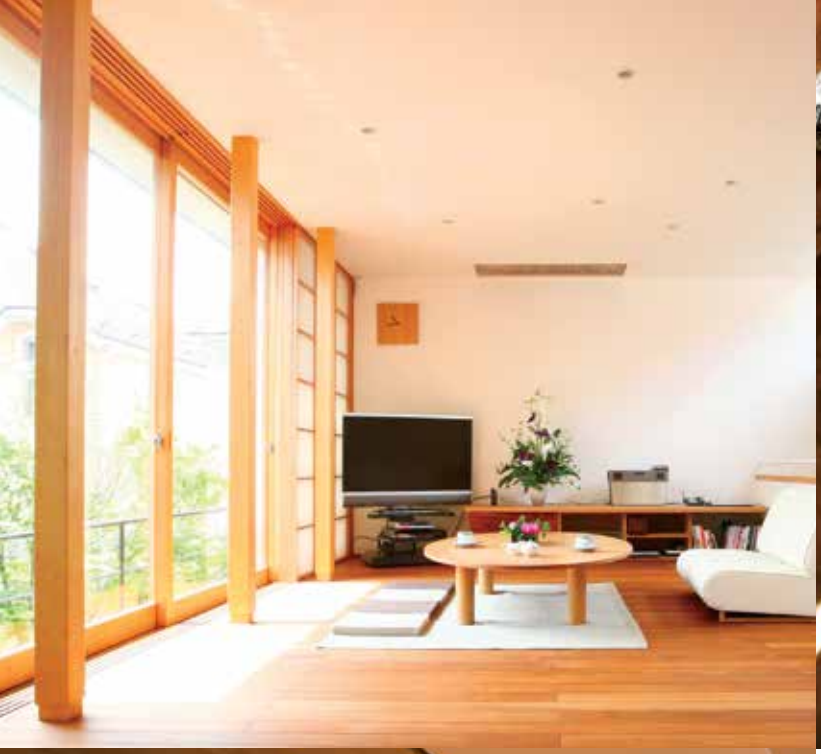
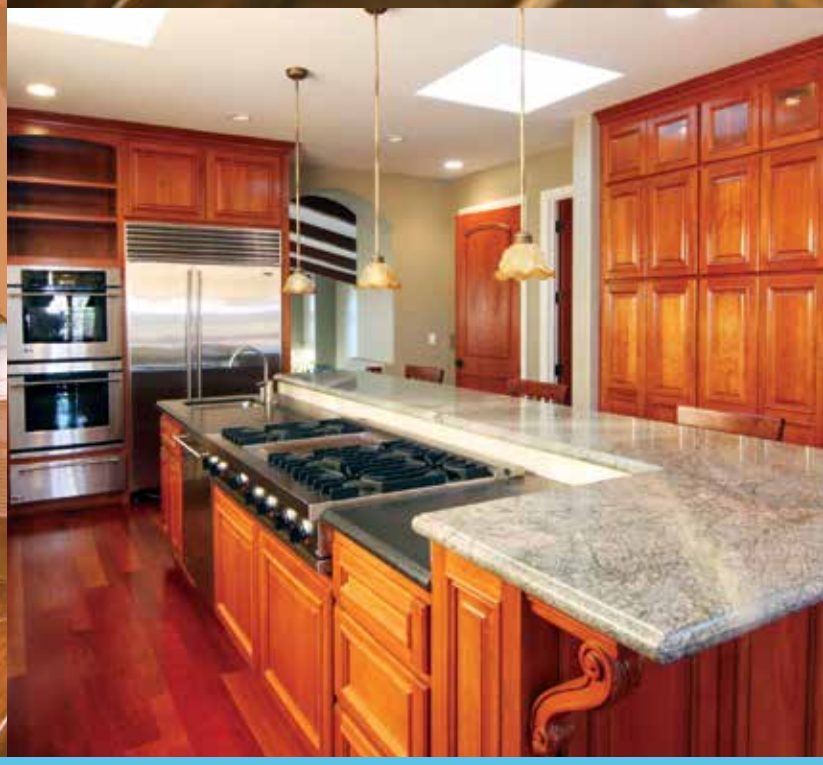




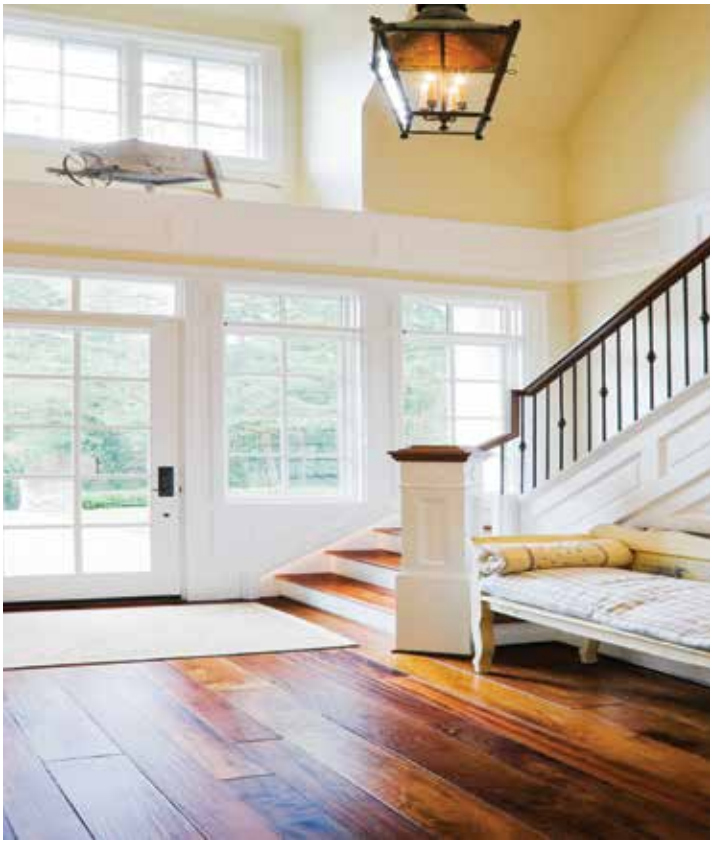
WOOD COATINGS PRODUCT GUIDE

Lubrizol | **Performance Coatings**

www.lubrizol.com/coatings

A WORLD OF EXPERIENCE WORKING FOR YOU

Lubrizol is dedicated to helping our customers by understanding their needs and developing the key ingredients demanded for today's marketplace. We invite you to learn more about our diversified portfolio of resins and additives for wood coatings by visiting www.lubrizol.com/wood. Or better yet, contact your Lubrizol representative to see first-hand how we can work with you to find an effective, efficient solution to meet your production benchmarks.



Resins and Additives

- Extended life and durability
- Enhanced mar and scratch resistance
- Improved chemical and stain resistance
- Gloss control and improved flow
- Improved pigment dispersion and stability
- Solutions for reduced environmental impact

THE LUBRIZOL ADVANTAGE:

- A recognized leader in advanced coating technologies
- Global analytical and research resources and expertise
- Product selection and formulation guidance

DIFFERENTIATED PERFORMANCE

Lubrizol innovates resins, dispersants, and wax additives to help our customers formulate differentiated performance in their coatings products, including unique solutions that make wood more durable and more beautiful.

Formulation

By fully engaging with customers to understand their specific market needs, Lubrizol is well prepared to help formulate solutions for unique and differentiated performance.

Testing Capabilities

Lubrizol maintains extensive product testing capabilities that help ensure formulated coatings solutions for customers will deliver intended protection, durability and aesthetic performance.

Product Innovation

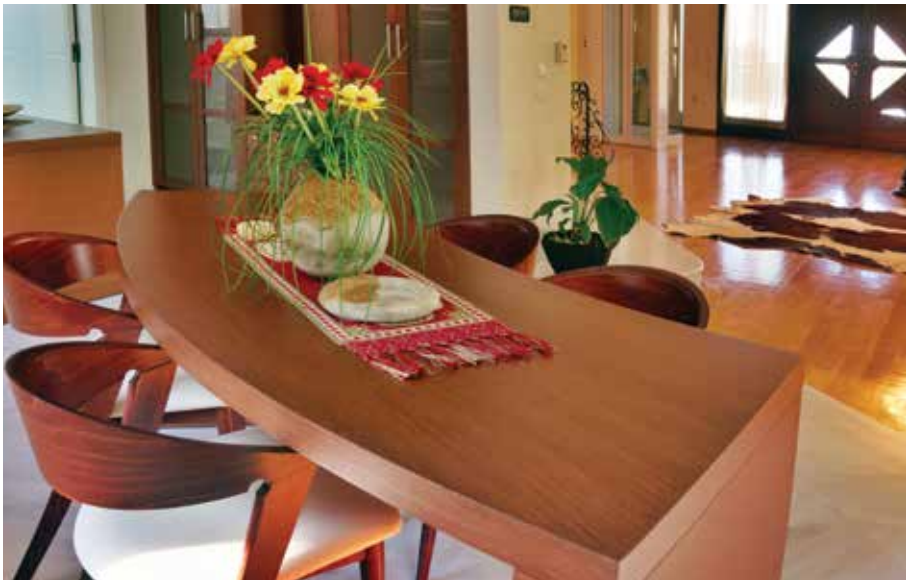
Lubrizol is committed to market-driven product innovation derived from core competencies in resins & binders, hyperdispersants, surface modifiers, specialty additives and formulated solutions.

Global Customer Alignment

A worldwide network of labs and facilities that continues to expand is aligned with the global market needs of our customers, allowing us to bring localized service.

Application Understanding

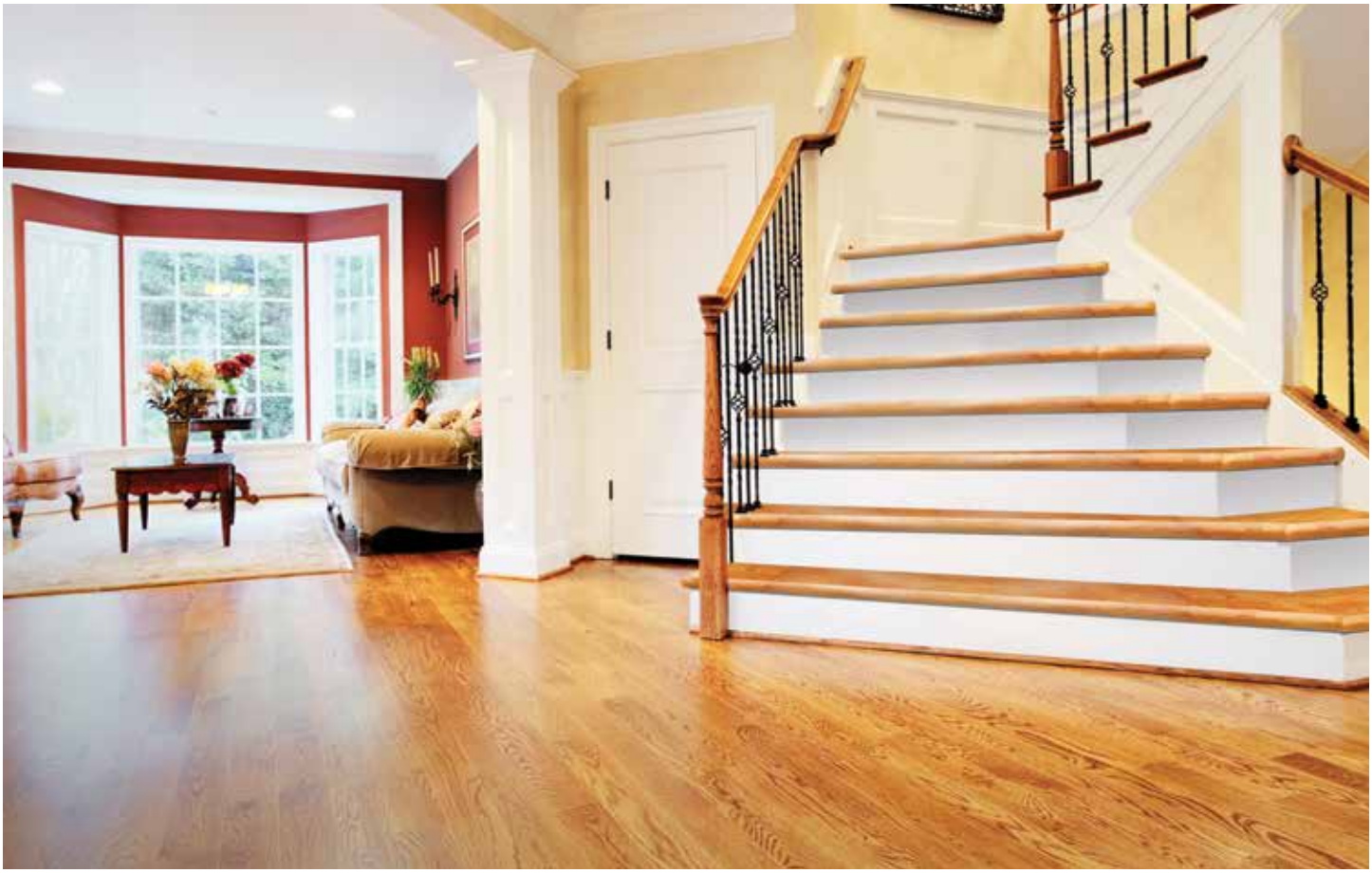
Lubrizol maintains an extensive understanding of the market needs for various surface applications that allows us to help solve highly specialized coatings challenges with our customers.



GUIDE TO LUBRIZOL RESINS

Resins for DIY/Contractor Applications

	PRODUCT NAME	SCRATCH RESISTANCE	ABRASION RESISTANCE	EARLY HARDNESS DEVELOPMENT	CHEMICAL RESISTANCE	BLACK HEEL MARK RESISTANCE	FILM HARDNESS
ACRYLIC-BASED	Carboset® AMO 400						
	Carboset® 2951						
	Carboset® 2968						
	Carboset® 7722						
	Carboset® 7733						
	Carboset® CR-728						
PU-BASED	Aptalon™ W8030						
	Aptalon™ W8034						
	Aptalon™ W8060						
	Aptalon™ W8062						
	Aptalon™ 8080HS						
	Sancure™ 970						
	Sancure™ 20041						
	Sancure™ OM-945						
	Turboset™ 2027						
	Turboset™ Ultra Eco						



Resins for OEM Applications

	PRODUCT NAME	SCRATCH RESISTANCE	ABRASION RESISTANCE	EARLY HARDNESS DEVELOPMENT	CHEMICAL RESISTANCE	BLACK HEEL MARK RESISTANCE	FILM HARDNESS
ACRYLIC-BASED	Carboset® 2968						
	Carboset® AMO 400						
	Carboset® CR-726						
	Carboset® CR-735						
PU-BASED	Sancure™ 970						
	Sancure™ AU-4050						

Resins for Stains

PRODUCT NAME	LOW VOC	OPEN TIME	DRY TIME	PENETRATION	COLOR FASTNESS
Carboset® 510					
Carboset® AMO 400					

Wax Additives for Water-Based Wood Coatings

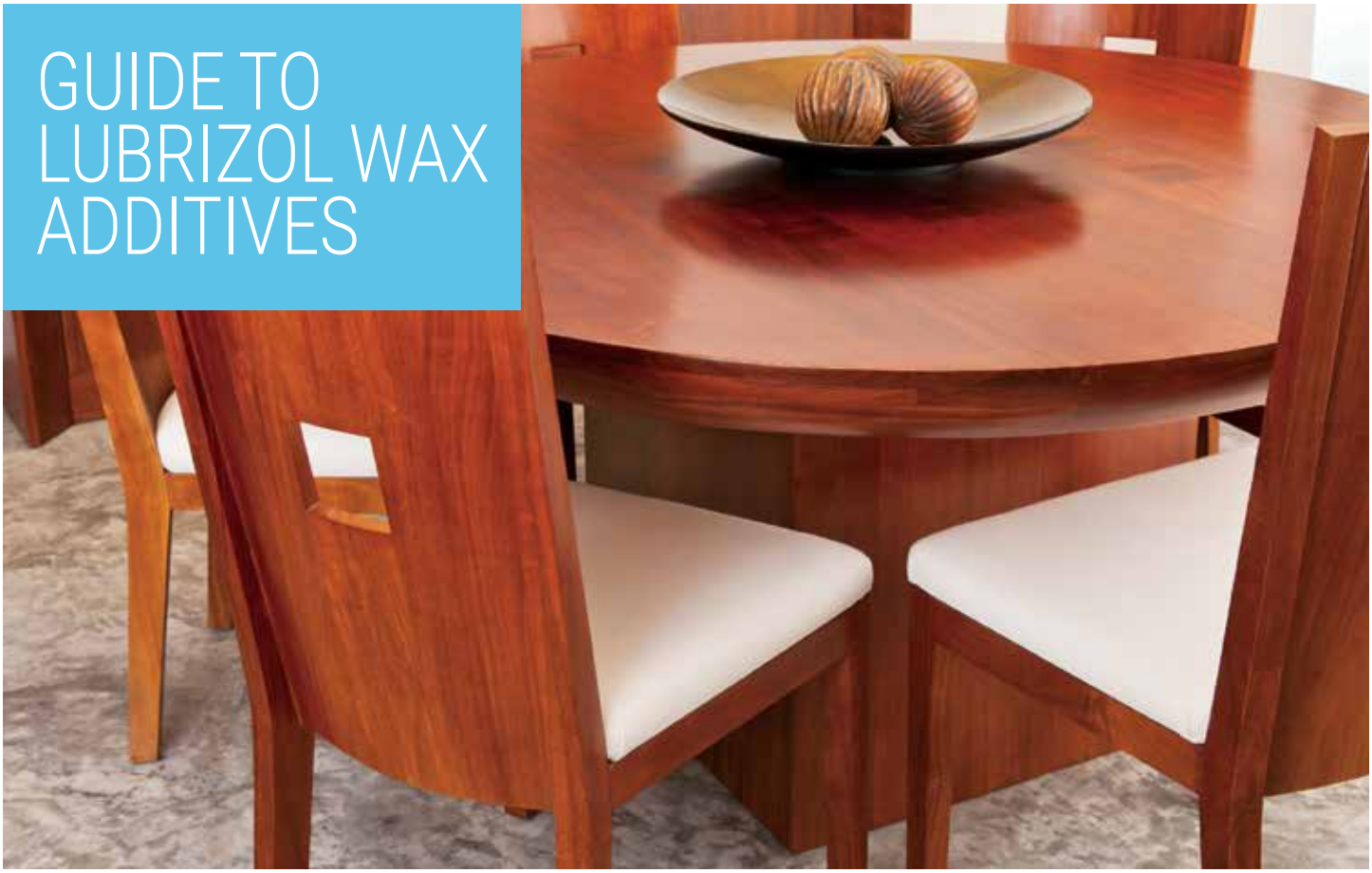
PRODUCT NAME	SCRATCH RESISTANCE	MATTING	SOFT FEEL/ SURFACE SLIP	ANTI-BURNISHING	ANTI-BLOCKING
Aquaslip™ 677					
Aquaslip™ 682					
Lanco™ 1380 F					
Lanco™ 1390 F					
Lanco™ PEW 1555 N					
Lanco™ 1560 LF					
Lanco™ 1588 LF					
Lanco™ TFW 1765 NC					
Lanco™ Glidd 6067					
Lanco™ Glidd 6148					
Lanco™ Glidd 9530 C					
Lanco™ LiquiMatt 6375 AF					

Wax Additives for Solvent-Based Wood Coatings

PRODUCT NAME	SCRATCH RESISTANCE	MATTING	SOFT FEEL/ SURFACE SLIP	ANTI-BURNISHING
Lanco™ 1370 LF				
Lanco™ 1380 F				
Lanco™ 1400 SF				
Lanco™ 1588 LF				
Lanco™ A 1602				
Lanco™ TF 1720 C				
Lanco™ TF 1788 C				
Lanco™ Antimar 450 C				
Lanco™ Glidd 3520				

LOW = HIGH =

GUIDE TO LUBRIZOL WAX ADDITIVES



Wax Additives for UV Curable Wood Coatings

PRODUCT NAME	SCRATCH RESISTANCE	MATTING	SOFT FEEL/ SURFACE SLIP	ABRASION RESISTANCE	IMPACT ON VISCOSITY
Carbocure™ 7000					Diluting Effect
Lanco™ 1380 F					
Lanco™ 1394 F					
Lanco™ 1394 LF					
Lanco™ TF 1720 C					
Lanco™ TF 1788 C					

LOW = HIGH =

GUIDE TO LUBRIZOL DISPERSANTS

Dispersants for Water-Based Wood Coatings

PRODUCT NAME	INORGANIC PIGMENTS					ORGANIC PIGMENTS					RESIN-FREE MILLING					MILLING RESIN CONTAINING					PIGMENT LOADING MILLBASE VISCOSITY				
Solsperse™ 27000	■					■	■	■	■		■	■	■	■		■	■	■	■	■	■	■	■	■	
Solsperse™ 40000	■	■	■	■	■	■					■	■	■			■	■	■	■	■	■	■	■	■	■
Solsperse™ 45000	■	■	■	■		■					■	■	■	■	■	■	■	■			■	■	■	■	■
Solsperse™ 46000	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■			■	■	■	■	■
Solsperse™ W100	■	■	■	■		■	■	■	■		■	■	■	■	■	■	■	■	■		■	■	■	■	
Solsperse™ W150	■	■	■	■		■	■	■	■		■	■	■	■	■	■	■	■	■		■	■	■	■	
Solsperse™ W320	■	■	■	■	■	■	■				■	■	■	■	■	■	■	■	■		■	■	■	■	
Solsperse™ W430	■	■	■	■		■	■	■			■	■	■	■	■	■	■	■	■		■	■	■		
Solsperse™ WV400	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■	■			■	■	■	■	

Dispersants for Solvent-Based Wood Coatings

PRODUCT NAME	INORGANIC PIGMENTS					ORGANIC PIGMENTS					MULTI-COMPATIBILITY					PIGMENT LOADING MILLBASE VISCOSITY				
Solsperse™ 32500	■	■	■			■	■	■	■	■	■	■	■			■	■	■	■	■
Solsperse™ 36600	■	■	■	■	■						■					■	■	■	■	■
Solsperse™ 38500	■	■	■			■	■	■	■		■	■	■	■	■	■	■	■	■	
Solsperse™ 45000	■	■	■	■	■						■					■	■	■	■	■
Solsperse™ 85000	■	■	■	■	■						■	■	■	■		■	■	■	■	
Solsperse™ M385	■	■				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Solsperse™ M386	■	■				■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Solsperse™ M388	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	

= LOW

= HIGH

Dispersants for EB/UV Cured Wood Coatings

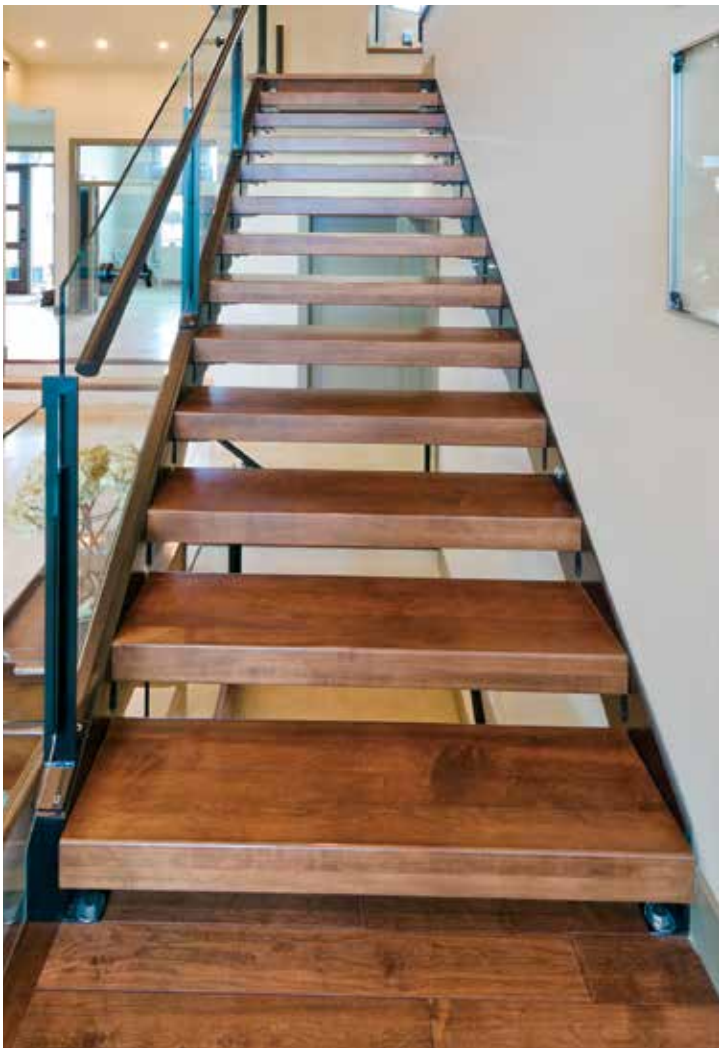
PRODUCT NAME	INORGANIC PIGMENTS					ORGANIC PIGMENTS					SILICA MATTING AGENT					SOLVENT-FREE
Solsperse™ 36000																•
Solsperse™ 39000																•
Solsperse™ 41000																•
Solsperse™ 71000																•
Solsperse™ 75000																•
Solsperse™ 79000																•
Solsperse™ 85000																•
Solsperse™ 86000																•
Solsperse™ 87000																•

With certain organic pigments, it may be advantageous to include the use of a Solsperse synergist in combination with the polymeric Solsperse hyperdispersant. The synergist helps to improve the interaction between the hyperdispersant and the surface of certain organic pigments (e.g. phthalocyanine blues, greens) and carbon black pigments. The synergist hyperdispersants include:

Solsperse™ 5000S Synergist – for use on organic blues/greens and carbon black pigments in solvent-based systems
Solsperse™ 12000S Synergist – for use on organic blues/greens and carbon black pigments in water- and alcohol-based systems
Solsperse™ 22000 Synergist – for use on certain organic reds and yellow pigments in solvent based systems

Recommended Hyperdispersant : Synergist ratios

4 : 1 for carbon black pigment
4 : 1 for organic blue/green pigment
9 : 1 for organic red/yellow pigment



Resins

Our resins for water-borne systems deliver the core properties to help our customers be differentiated in the marketplace-enabling wood coatings to be more durable, simple to use, and environmentally conscious.

FOR DIY/CONTRACTOR APPLIED COATINGS

PRODUCT NAME	PRODUCT TYPE	USES: FLOORS	USES: DECKS	USES: FURNITURE, FIXTURES AND SMALL PROJECTS	USES: INTERIORS TRIMS & PRIMERS	BENEFITS: PRIMARY BENEFIT
Aptalon™ W8030	Self Crosslinking Polyamide Polyurethane	•	•	•	•	Naturally Matte Finish
Aptalon™ W8034	Self-Crosslinking Polyamide Polyurethane Dispersion	•	•	•	•	Low VOC, low gloss without matting agents & excellent abrasion resistance
Aptalon™ W8060	Self-Crosslinking Polyamide Polyurethane Dispersion	•		•		Hardness, chemical resistance, scratch resistance; Excellent for sports floors
Aptalon™ 8080HS	Self Crosslinking High Solids Polyamide Polyurethane	•		•		Thicker film build per coat, reducing the number of coats required
Carboset® AMO 400	Acrylic Oil Modified Copolymer	•	•	•		High renewable resin providing high melt temperature for high speed sanding; Low VOC[1] capable
Carboset® 2951	Self-Crosslinking Acrylic Emulsion	•	•	•	•	Rapid Hardness Development
Carboset® 2968	Self-Crosslinking Acrylic Emulsion	•		•		Early hardness and sandability
Carboset® 510	**Acrylic Dispersion**	•	•			**Low VOC[1]**
Carboset® 7722	Acrylic Emulsion				•	Scrub resistance in all sheens
Carboset® 7733	Acrylic Emulsion				•	Scrub resistance in high gloss
Carboset® CR-726	Self-Crosslinking Acrylic Emulsion	•	•	•	•	Hardness
Carboset® CR-735	Self-Crosslinking Acrylic Emulsion	•	•			Chemical resistance
Carboset® CR-728	Self-Crosslinking Acrylic Emulsion	•		•		Chemical and stain resistance
Sancure™ 970	Polyurethane Composite	•		•		Hardness, chemical resistance
Sancure™ 20041	Polyurethane Dispersion	•		•		Mar, scuff and wear resistance
Sancure™ AU-4050	Polyurethane Acrylic Blend	•				Rapid hardness development
Sancure™ OM-945	Oil Modified Urethane Dispersion	•	•	•		Higher solids content
Turboset™ 2027	Self-Crosslinking Polyurethane Composite			•		Chemical and stain resistance
Turboset™ Ultra Eco	Self-Crosslinking Polyurethane Composite	•		•		Formulates ultra low VOC[1] finishes and maintains exceptional overall performance; Can be formulated to <50 g/L VOC U.S. (<25 g/L EU)

[1]Low VOC systems are defined as systems with <50 g/l via US EPA Method 24 <25 g/l EU method)

				TYPICAL PHYSICAL PROPERTIES					
SECONDARY BENEFIT	APEO-FREE	NMP-FREE	LOW VOC	MFFT (°C)	% WEIGHT SOLIDS	% VOLUME SOLIDS	pH	SPECIFIC GRAVITY	VISCOSITY cP
Outstanding Hardness and Durability	•	•			35.0	34.2	7.0	1.04	<500
	•	•	•	5	35	33	8	1.03	<500
Black heel mark resistance, abrasion resistance	•	•		57	36	33	7.5-8.5	1.05	<500
Hardness, chemical & scratch resistance	•	•			50	50	7.0-8.0	1.05	<500
Improved toughness; black heel mark and abrasion resistance over acrylic polymer	•	•	ultra low	12	40	37.5	7.5-8.5	1.05	<500
Chemical resistance	•	•	low	<5		44	8.0-9.2	1.01	30-200
Chemical resistance	•	•		57	42	39	7.5-9.5	1.04	<600
Excellent open time for wiping stains in small projects	•	•	•	**3**	**40**	**36**	**7.0**	**1.07**	**<1000**
Adhesion and stain blocking	•	•	low	<5	50	48	8.4-9.2	1.06	<800
Exterior durability	•	•	low	21	50	47	8.4-9.2	1.06	<500
Low VOC[2] capable	•	•		35	42	41	7.9-8.6	1.04	50-60
High gloss alkyd-like appearance	•	•		34	41.5	40.7	8-9	1.03	<150
Mar resistance	•	•		45	42	40	8.4-9.2	1.05	20-80
Adhesion to multiple substrates; crosslinkable	•	•		50	42	41	8.5	1.06	300-700
Wide formulating latitude; Crosslinkable	•	•			34	33	7.5-9.0	1.05	<200
Mar, scuff and wear resistance				50	36	35	8.0	1.05	75
Exterior durability; version of OM933	•			10	45	43	7.5-9.0	1.06	<1000
Abrasion resistance	•	•	low	22	40	35	8.2-9.2	1.06	<500
Black heel mark resistance, abrasion resistance, chemical resistance and adhesion	•	•	ultra low	<5	36	36	7.5-9.0	1.04	<400

[2]Low VOC systems are defined as systems with <140 g/l via US EPA Method 24 <75 g/l EU Method)

Wax Additives

Our selection of Lanco™, Carbocure™ and Aquaslip™ wax additives deliver a balanced mix of performance benefits to help coatings protect wood surfaces. We can tailor wood coating formulations to offer your customers the surface feel, durability and gloss or matte finish desired of high quality products.

PRODUCT NAME	PRODUCT TYPE	SYSTEMS			PRIMARY BENEFIT
		WATER-BASED	SOLVENT-BASED	UV	
Aquaslip™ 677	Modified Paraffin Wax Emulsion	•			Improved slip, anti-blocking
Aquaslip™ 682	Oxidized Polyethylene Wax Emulsion	•			Scratch and abrasion resistance
Carbocure™ 7000	Liquid Matting Agent			•	Uniform matting, smooth feel
Lanco™ 1370 LF	Modified Polyethylene Wax	•	•		Scratch and abrasion resistance
Lanco™ 1380 F	Modified Polypropylene Wax	•	•	•	Matting efficiency, scratch and abrasion resistance
Lanco™ 1390 F	Modified Polypropylene Wax	•	•		Scratch and abrasion resistance
Lanco™ 1394 F / LF	Polypropylene Wax		•	•	Scratch and mar resistance
Lanco™ 1400 SF	Modified Synthetic Wax	•	•	•	Smooth surface finish, slip
Lanco™ 1560 LF	Polar Modified Polyolefin Wax	•			Anti-blocking
Lanco™ 1580 LF	Polyethylene Wax	•	•	•	Surface hardness
Lanco™ 1588 LF	Polyolefin Wax	•	•	•	Surface protection
Lanco™ A 1602	Fatty Acid Amide Wax		•		Surface touch
Lanco™ Antimar 450 C	Modified Silicone Wax Dispersion		•		Slip, mar resistance
Lanco™ Glidd 4370	Proprietary Wax Dispersion		•		Water beading
Lanco™ Glidd 6067	Polyethylene Wax Dispersion	•			High gloss retention
Lanco™ Glidd 6148	Polyolefin Wax Dispersion	•			Scratch resistance
Lanco™ Glidd 9530 C	PTFE-Modified Polyethylene Dispersion	•			Scratch resistance
Lanco™ Glidd KX	Polyethylene Wax Dispersion		•		Matting efficiency
Lanco™ Liquimatt 6375 AF	Modified Silica Wax Dispersion	•			Amine-free, efficient gloss control
Lanco™ PEW 1555 N	Polar Modified Polyethylene Wax	•			Uniform matting
Lanco™ TF 1720 C	PTFE-Modified PE Wax	•	•	•	Scratch and abrasion resistance
Lanco™ TF 1788 C	PTFE-Modified Polyethylene Wax	•	•	•	Scratch and abrasion resistance

SECONDARY BENEFIT	TYPICAL PHYSICAL PROPERTIES					
	AS DETERMINED BY LASER DIFFRACTION					
	PARTICLE SIZE DV50 (µm)	PARTICLE SIZE DV90 (µm)	DENSITY (g/cm³) @ 20 °C (68 °F)	MELTING POINT (°C)	SOLVENT	SOLIDS (%)
Water resistance			0.95	64	Water	54-56
Anti-blocking			1	118	Water	40
Anti-burnishing, low viscosity	≤6	≤12	0.92		Fatty Acid Ester	95+
Good burnishing resistance	≤9	≤18	0.93	150		100
Burnishing resistance	≤9	≤22	0.95	150		100
Matting efficiency, anti-slip	≤11	≤22	1.03	165		100
Smooth feel, matting efficiency	≤9	≤18	0.90	140		100
Scratch and metal mark resistance	≤6	≤14	0.97	140		100
Scratch resistance	≤9	≤22	0.96	95		100
Uniform matting	≤9	≤18	0.97	125		100
Soft feel, uniform matting	≤9	≤18	0.96	105		100
Sandability	≤9	≤22	0.99	142		100
Improved leveling			0.93		Butyl Acetate	50
Water resistance and repellency			0.85		Aliphatic Hydrocarbon	60
Scratch resistance	≤6	≤15	0.98	105	Water	43
Matting efficiency	≤9	≤22	0.96	105	Water	53
Metal marking resistance	≤5.5	≤14	1.00	102	Water	30
Scratch resistance, soft feel	≤3.5	≤7.5	0.88	106	Xylene	20
Mar resistance	≤7.5	≤15.5	1.10		Water	50
Scratch and abrasion resistance	≤9	≤22	0.99	105		100
Slip resistance	≤8	≤18	1.02	125		100
Slip, metal marking resistance	≤6	≤14	1.04	102		100

Dispersants

Our industry-leading Solsperse™ hyperdispersants help enhance the natural beauty of wood by improving pigment dispersion and stability. We offer a range of hyperdispersants specifically designed to be compatible with water-based, solvent-based and UV coatings.

PRODUCT NAME	PRIMARY BENEFIT	SECONDARY BENEFIT
SUITABLE FOR WATER-BASED		
Humectant™ GRB3	Offers improved humectancy over propylene glycol and can therefore be used at lower dosage levels	VOC-free
Solsperse™ 27000	Resin-containing dispersion and resin-free grind	Low foaming
Solsperse™ 40000	Viscosity stability of dispersion	Economic dispersant for TiO^2 and fillers
Solsperse™ 44000	High pigment loadings	Early water resistance
Solsperse™ 46000	Works well with most pigments in water, particularly with difficult-to-disperse organics	Early water resistance
Solsperse™ W100	Wide compatibility on range of pigments	Lower dosage requirement vs competitive dispersants
Solsperse™ W150	100% active, biocide-free	Wide compatibility on range of pigments
Solsperse™ W320	Effective wetting and stability on transparent iron oxide pigments	Fast milling, capability of reduced cycle time
Solsperse™ W430	Effective on a wide range of pigments	Good stain resistance
Solsperse™ WV400	Excellent dispersion of challenging high-performance organic pigments	Effective milling and storage stability over time
SUITABLE FOR SOLVENT-BASED		
Solsperse™ 32500	Higher gloss and pigment strength	Improved flow and lower mill base viscosity
Solsperse™ 36600	Improved rheology and stability	Particularly effective for inorganics
Solsperse™ 38500	For multimedia colorants in esters and ketones, wide compatibility with other solvents	Tinter stability
Solsperse™ 45000	Lower viscosity in combination with inorganic pigments and fillers. Better dispersion quality in the millbase. Reproducible tint strength	Wider colorant compatibility
Solsperse™ M388	Achieves maximum transparency	Broad resin compatibility with wide range of solvents
Solsperse™ 84500	Fast and effective dispersion of inorganic pigments in coatings	Good opacity and film hardness
Solsperse™ M385	Good affinity for organic pigments	Broad resin system compatibility
SUITABLE FOR UV		
Solsperse™ 75000	Higher gloss and pigment strength	Improved flow and lower mill base viscosity
Solsperse™ 36000	Non-yellowing of white coatings	Higher gloss and opacity
Solsperse™ 39000	Dispersion and stability in UV coatings	Easier handling
Solsperse™ 41000	Prevents gellation during dispersion	Increased silica matting agent loadings
Solsperse™ 71000	Lower gloss levels and higher silica loadings	Improved pigment and matting agent concentration
Solsperse™ 79000*	Improved fire retardant properties through dispersion flame retardant pigments in radiation-cured coatings	Improved film clarity and rheology
Solsperse™ 85000	High pigment loading at low viscosity	High tint strength and opacity
Solsperse™ 86000	Suitable for use across wide range of pigment	Good viscosity reduction and particle size stability
Solsperse™ 87000	Excellent viscosity stability for dispersions of red pigments (esp. PR 57:1)	Improved wetting and dispersion
Solsperse™ M386	Good affinity for organic pigments	Broad resin system compatibility

PIGMENT TYPE	TYPICAL PHYSICAL PROPERTIES			
	PHYSICAL FORM	SOLVENT	% ACTIVE INGREDIENT	SUGGESTED STARTING DOSAGE (mg/m²)
All pigments and fillers	Liquid			5% during dispersion, 2% when added to the final coating
Organic, inorganic, carbon black	Liquid		100	2.0
Inorganic, silica	Liquid	Water	84	2.0
Organic, inorganic, carbon black	Liquid	Water	50	2.5
All pigments and fillers	Liquid	Water	50	2.5
All pigments and fillers	Liquid	Water	40	1.7
Organic, inorganic, carbon black	Liquid	–	100	2.0
Transparent iron oxides & inorganic pigments	Liquid	Water	40	20-25% AOWP %
Organic, inorganic, carbon black	Liquid	Water	50	2.0
Organic, carbon black, inorganic	Liquid	Water	40	2.5
Organic, carbon black, untreated silica	Waxy solid		100	2.0
Inorganic	Liquid	Solvesso 100	50	2.0
Organic	Liquid	MPA	40	2.5
Inorganic including fillers	Liquid		100	2.0
Organic	Liquid	Methoxy Propyl Acetate	50	2.0
	Liquid	Methoxy Propyl Acetate	50	1-4% AOWP %
Organic	Liquid	Methoxy Propyl Acetate	50	2.5
Organic, carbon black, untreated silica	Waxy solid		100	2.0
Inorganic, including silica	Waxy solid	n-Butyl Acetate	100	2.0
Organic, carbon black	Liquid		100	2.0
Inorganic, silica	Liquid		100	2.5
Organic, silica	Liquid		100	2.5
Flame retardant pigments, Inorganics	Liquid		100	4.0
TiO^2, oxide pigments	Liquid	–	100	2.0
Organic, inorganic, carbon black	Liquid	–	100	2.0
Organics, esp. Pigment Red 57:1	Liquid	–	100	2.0
Organic	Liquid	Solvesso 100	50	2.5

Lubrizol Locations

NORTH AMERICA
Lubrizol Advanced Materials, Inc.
9911 Brecksville Road
Brecksville, OH 44141 USA
+1.888.234.2436

EUROPE
Lubrizol Deutschland GmbH
Max-Planck-Str. 6
27721 Ritterhude Germany
+49.421.69333

ASIA-PACIFIC
Lubrizol Specialty Chemicals
(Shanghai) Co., Ltd
10/F, Park Center International
No. 1088 Fang Dian Road
Shanghai 201204, PR China
+8621.3866.0366

SOUTH AMERICA
Lubrizol do Brasil Aditivos Ltda
Avenida Nove de Julho, 3653
Jardim Paulista
Sao Paulo – SP
01407-000
+55.11.4097.0250

Lubrizol Performance Coatings is a market-driven innovator of specialty chemicals for advanced coatings, inks, and composites. Our portfolio of resin and additive technologies solve challenges across a wide range of markets and applications. Formulators choose Lubrizol to achieve unique performance, productivity, and sustainability benefits. More than just a supplier, we are a collaborator with extensive experience in surface protection, dispersion, adhesion, and barrier properties – working closely with customers to explore and develop truly differentiated solutions.

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