

All About Solid Film Lubricants

1. What are solid film lubricants (SFLs)?

They are thin films of resin that bind lubricating powders such as MoS₂ (molybdenum disulfide), graphite, or PTFE to a surface.

2. How do they work?

They prevent surface-to-surface contact, reducing friction and wear between mating surfaces. Each lubricant powder has different properties. MoS₂ provides higher load carrying and corrosion protection than graphite, while graphite provides higher temperature stability and better electrical conductivity. PTFE provides the highest level of corrosion protection, release, and functionality for lighter load applications.

3. How do solid film lubricants produce low friction?

They have exceptional low resistance to shear and slip easily... like a deck of new cards.

4. Are these films thick?

No. Most are applied to a dry film thickness of 0.0002 to 0.0005 inches.

5. How are solid film lubricants applied?

They are sprayed, dipped, dip/spun, tumble sprayed, or brushed onto a properly pretreated surface. Some require thermal curing and others are ready to use after air drying.

6. Where are SFLs applied?

If only one surface of mating surfaces is to be coated, it is generally best to coat the surface with the greatest area. Camshafts, bearings, guns, weapons, pistons, valves, connectors, fasteners, and slides are examples. Typical situations where solid film lubricants should be used include:

- On heavily loaded equipment susceptible to galling and seizing...particularly aluminum and titanium.
- On inaccessible or concealed components where maintenance of conventional "wet" lubes are not practical or possible.
- On equipment that may not be compatible with fuel, solvents, grease, or oils.
- In place of liquid lubricants that can migrate and contaminate adjacent parts.
- Where dust or other airborne debris may impair machine operation.
- Where operating temperatures exceed the range of fluid lubricants.
- Where fretting corrosion occurs (solid film lubricants can often delay the onset of corrosion beyond the expected life of the part).

7. What are the frictional properties of SFLs?

- As load increases, the coefficient of friction (μ) decreases (to a point), to as low as 0.02 under extreme loads on hard surfaces.
- The kinetic (or dynamic) coefficient of friction is slightly lower than the static coefficient.
- The coefficient of friction is affected by the hardness of the surface to which the lubricant is applied, decreasing for hard surfaces and increasing for soft ones.
- The coefficient of friction is lower for rotating motion than for oscillating motion.
- The purpose of the film is to prevent surface-to-surface contact. The rule is: For the lowest friction and longest wear, use the hardest metals consistent with good design.
- If it is necessary to choose between applying the lubricant to either surface in a hard/soft bearing system, the lubricant should be applied to the softer material.
- The coefficient of friction of a solid film lubricant is independent of temperature within the coating's recommended range.
- The coefficient of friction of crystalline lubricants, like MoS₂, WS₂, and graphite, will always decrease during burnishing.
- In general, coating both surfaces will provide greater service life but may reduce load-carrying capacity due to plastic deformation of the thicker dry film thickness layer.

8. Why you should choose Everlube® Products.

- Our courteous Customer Service Department will help make your ordering experience fast, efficient, and effective.
- Our Technical Service personnel average 35+ years of coating experience to assist with any questions or offer coating recommendations for your specific needs.
- Each of our solid film lubricants is subjected to careful quality testing during every manufacturing step to ensure you receive the highest quality product, along with any requested certifications or test reports. Everlube® Products continues to meet the latest ISO and AS9100 certifications.
- As EPA and other regulatory restrictions tighten, Everlube® Products continues to develop new and improved solid film lubricants to meet VOC restrictions, as well as REACH and RoHS compliance.
- Our guaranteed shelf life for solid film lubricants is one year from the date of shipment when stored in a factory sealed container below 100°F. This ensures you have the maximum use time.
- Our substantial product line offers a wide selection of solid film lubricants, many of which that are qualified to Military, OEM, and standard industrial specifications.

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Solvent-Based, Heat-Cured, High-Load, Solid-Film Lubricants

Product Name	Binder Type	Lubricating Solids	Cure Time and Temperature ¹	Continuous Operating Temperature Range	Weight per Gallon ²	VOC Content (Grams per Liter)	Coverage ³ (Sq. Ft./gallon)	Method of Application ⁴	Coefficient of Friction ⁵	Corrosion Resistance ⁶	Performance ⁷		Application/Specs
											Endurance	Load Carrying	
Ecoalube® 642	Epoxy	MoS ₂	1 hr @ 400°F	-100°F to 400°F	9.6 ± 0.5	695	540	S, DS, D, B	0.04 to 0.08	G	E	E	MIL-L-46010E TYPE II, SAE AS5272 TYPE II
Ecoalube® 643	Epoxy	MoS ₂	1 hr @ 400°F	-100°F to 400°F	9.6 ± 0.5	668	654	S, DS, D, B	0.04 to 0.08	G	E	E	SAE AS5272 TYPE II, Lead-free
Everlube® 620	Phenolic	MoS ₂ /Graphite	1 hr @ 300°-375°F	-100°F to 400°F	9.2 ± 0.5	695	545	S, DS, D, B	0.04 to 0.06	F	G	G	Boeing BMS 3-8, Type I
Everlube® 620C	Phenolic	MoS ₂	1 hr @ 300°F	-100°F to 300°F	9.1 ± 0.5	632	674	S, DS, D, B	0.04 to 0.06	G	VG	VG	MIL-L-46010E TYPE I, SAE AS5272 TYPE I
Everlube® 620CG	Phenolic	MoS ₂	1 hr @ 300°F	-100°F to 300°F	10.5 ± 0.5	567	1043	S, DS, D, B	0.04 to 0.06	F	VG	VG	GE A50TF339
Everlube® 625	Phenolic	MoS ₂ Blend	1 hr @ 300°F	-100°F to 300°F	8.4 ± 0.5	617	783	S, DS, D, B	0.02 to 0.04	G	G	G	Fasteners, Lead-free
Everlube® 626	Phenolic	MoS ₂	1 hr @ 300°F	-100°F to 300°F	8.2 ± 0.5	756	423	S, DS, D, B	0.04 to 0.06	G	G	G	Firearms, Lead-free
Everlube® 629	Phenolic	Graphite	1 hr @ 300°F	-100°F to 300°F	8.3 ± 0.5	703	523	S, DS, D, B	0.02 to 0.04	F	F	G	Release, Conductive
Everlube® 644	Epoxy	MoS ₂	1 hr @ 400°F	-100°F to 400°F	9.6 ± 0.5	668	620	S, DS, D, B	0.04 to 0.06	G	VG	E	Lead & Antimony-free
Everlube® 732	Polyamide-imide	MoS ₂	1 hr @ 400°-450°F	-100°F to 600°F	10.6 ± 0.5	776	820	S	0.04 to 0.06	F	VG	E	SAE AS1701 Class III
Everlube® 968	Polyamide-imide	Graphite Blend	1 hr @ 400°-450°F	-100°F to 600°F	9.6 ± 0.5	852	462	S	0.04 to 0.08	F	F	G	Lubricates in wet environments
Everlube® 969	Polyamide-imide	Graphite Blend	1 hr @ 400°-450°F	-100°F to 600°F	9.6 ± 0.5	855	420	S	0.04 to 0.06	F	F	G	Lubricates in wet environments
Everlube® 970	Polyamide-imide	Graphite Blend	1 hr @ 400°-450°F	-100°F to 600°F	9.5 ± 0.5	846	449	S	0.02 to 0.04	F	F	G	Lubricates in wet environments
Everlube® 974	Polyamide-imide	Graphite	1 hr @ 400°-450°F	-100°F to 600°F	10.0 ± 0.5	648	1190	S	0.04 to 0.10	G	G	G	Pistons, pumps & valves
Everlube® 975	Polyamide-imide	MoS ₂ /Graphite	1 hr @ 400°-450°F	-100°F to 600°F	9.1 ± 0.5	732	828	S	0.02 to 0.04	G	G	G	Pistons, pumps & valves
Everlube® 1150	Phenolic	MoS ₂	1 hr @ 300°F	-100°F to 300°F	10.1 ± 0.5	564	866	S, DS, D, B	0.04 to 0.08	G	VG	VG	Lead & Antimony-free
Everslik® 1301	Phenolic	MoS ₂	1 hr @ 300°F	-100°F to 300°F	8.7 ± 0.5	685	439	S, DS, D, B	0.04 to 0.06	G	VG	VG	Oilfield Applications
Kal-Gard® FA / Everlube KG FA	Phenolic	MoS ₂	1 hr @ 300°F	-100°F to 300°F	9.4 ± 0.5	695	540	S, DS, D, B	0.04 to 0.06	G	VG	VG	MIL-L-46010E TYPE II, SAE AS5272 TYPE II
Lube-Lok® 2006	Silicone	MoS ₂ /Graphite	2 hrs @ 475°F	-300°F to 750°F	9.0 ± 0.5	702	546	S, DS, D, B	0.02 to 0.04	F	G	G	High-temp applications
Lube-Lok® 2006W	Silicone	WS ₂ /Graphite	2 hrs @ 475°F	-300°F to 850°F	9.0 ± 0.5	702	546	S, DS, D, B	0.02 to 0.04	F	G	G	High-temp applications
Lube-Lok® 2109	Epoxy	MoS ₂	1 hr @ 400°F	-100°F to 400°F	9.6 ± 0.5	695	540	S, DS, D, B	0.04 to 0.08	G	E	E	MIL-L-46010E TYPE II, SAE AS5272 TYPE II
Lube-Lok® 5306	Phenolic	MoS ₂	1 hr @ 300°F	-100°F to 300°F	9.1 ± 0.5	640	719	S, DS, D, B	0.04 to 0.08	G	VG	VG	MIL-L-46010E TYPE I, SAE AS5272 TYPE I
Lube-Lok® 5396	Phenolic	MoS ₂ /Graphite	1 hr @ 300°F	-100°F to 300°F	8.5 ± 0.5	694	520	S, DS, D, B	0.02 to 0.04	F	G	G	MIL-L-8937 (ASG)

¹ Cure times are at part metal temperature.

² Weights are listed in pounds and are based on Concentrate product.

³ Theoretical coverage based on 100% transfer efficiency at 0.0005 inches (12.7 microns) dry film thickness.

⁴ S=Spray, DS=Dip/Spin, D=Dip, B=Brush.

⁵ Dynamic coefficient of friction as determined by ASTM D2714 (without oil).

⁶ E= Greater than 800 hours, VG= 400 to 800 hours, G= 100 to 400 hours, F= 24 to 100 hours, NR= Not Recommended.

⁷ E=Excellent, VG=Very Good, G=Good, F=Fair, NR=Not Recommended, NA=Not Applicable. See individual data sheets for more information.

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