All About Solid Film Lubricants

1. What are solid film lubricants (SFLs)?
They are thin films of resin that bind lubricating powders such as MoS_2 (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. MoS_2 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 is 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 MoS_2, WS_2, 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 and many are qualified to Military, OEM, and standard industrial specifications.

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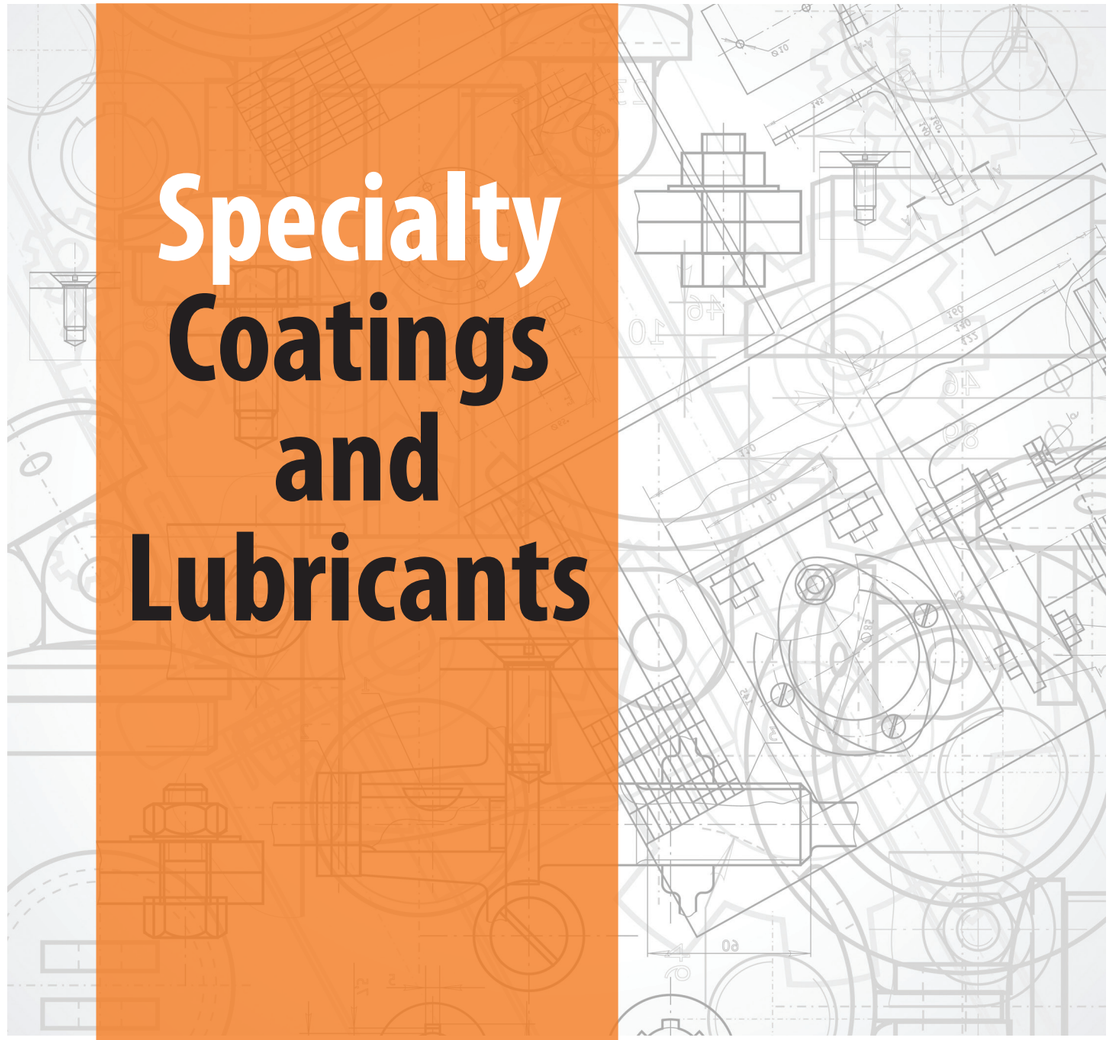
Specialty Coatings and Lubricants



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Product Name	Binder Type	Lubricating Solids	Cure Time and Temperature[1]	Continuous Operating Temperature Range	Weight per Gallon[2]	Coverage[3] (Sq. Ft./Gallon)	Method of Application[4]	Coefficient of Friction[5]	Corrosion Resistance[6]	Performance[7]		Application/Specs
										Endurance	Load Carrying	
E-4 Powder	Powder	MoS_2	None	-360˚F to 750˚F	N/A	N/A	BU	0.04 to 0.08	N/A	F	VG	Thin lubrication for precison applications. Meets AMS-M-7866.
E-5 Powder	Powder	MoS_2	None	-360˚F to 750˚F	N/A	N/A	BU	0.04 to 0.08	N/A	F	VG	Thin lubrication for precison applications.
E-659 Powder	Powder	Graphite	None	-100˚F to 1200˚F	N/A	N/A	BU	0.06 to 0.12	N/A	F	G	Thin lubrication for precison applications. Good to 1200˚F.
Everlube® 6173	Acrylic	PTFE Blend	30 mins @ 300˚F	-100˚F to 400˚F	9.2 ± 0.5	1594	B, S	0.02 to 0.06	F	F	F	Primarily a gasket coating, but good for freeze plugs and as a thread sealant.
Everlube® 9420	Acrylic	PTFE Blend	30 mins @ 77˚F + 30 mins @ 200˚F	-100˚F to 250˚F	8.8 ± 0.5	802	S	0.02 to 0.06	NR	F	F	O-rings and elastomeric parts.
Formkote® T-50	Silicone	Graphite	30 mins @ 200˚F	-65˚F to 1500˚F*	8.0 ± 0.5	345	B, S	0.06 to 0.12	NR	F	G	A forming lubricant primarily for the superplastic forming of titanium.
Formkote® T-50-66	Silicone	Graphite	Air Cure or 30 mins @ 300˚F	-65˚F to 1500˚F*	7.3 ± 0.5	400	B, S	0.06 to 0.12	NR	F	G	Same as Formkote T-50 but formulated to be California Rule 66 compliant.
Henco-Phos® 1526	Phosphate	N/A	Air Cure	-100˚F to 250˚F	6.9 ± 0.5	1000	S, D	NA	G	N/A	N/A	An organic sealed iron phosphate wash primer typically applied at 0.1 mils.
Henco-Prime® 602	Epoxy-Polyamide	N/A	Air Cure	-100˚F to 200˚F	11.1 ± 0.5	1500	B, S	N/A	VG	N/A	N/A	Durable, two-component, chrome-free corrosion inhibiting primer.
Insul-Cote™ 445	Two-Component Polyurethane	N/A	Full Cure: 7-10 days	-65˚F to 500˚F	10.0 ± 0.5	721	S	N/A	G	N/A	N/A	Superior dielectric coating with good chemical and corrosion resistance.
Kal-Gard® Gunkote	Phenolic	MoS_2	1 hr @ 300˚F	-100˚F to 300˚F	8.1 ± 0.5	640	S, DS, D, B	0.1 to 0.2	G	F	F	Protective finish for small arms.
Lubri-Bond® 320 HS	Epoxy	PTFE	24 hours @ >65˚F	-100˚F to 250˚F	7.2 ± 0.5	472	S, DS, D, B	0.06 to 0.08	G	G	G	Good universal PTFE-based DFL.
Perma-Slik® 1460W	Dispersion	Cetyl Alcohol	24 hours @ >65˚F	0˚F to 140˚F	8.2 ± 0.5	272	S, DS, D	0.04 to 0.08	N/A	N/A	N/A	Press-fit fasteners. Meets SAE AS87132 and (formerly) MIL-L-87132B.
Perma-Slik® C	Alkyd	MoS_2/Graphite	24 hours @ >65˚F	-325˚F to 300˚F	7.1 ± 0.5	122	S, DS, D, B	0.02 to 0.04	F	G	G	Primarily used as a break-in lubricant.
Perma-Slik® RGAC	Organo-Metallic	Graphite	1-6 hrs. @ >65˚F	-100˚F to 1200˚F	7.0 ± 0.5	322	S, DS, B	0.06 to 0.12	NR	G	G	Elastomeric parts. High-temp applications.
Perma-Slik® RRM	Organo-Metallic	MoS_2	1-6 hrs. @ >65˚F	-325˚F to 750˚F	9.1 ± 0.5	497	S, DS, B	0.04 to 0.06	NR	VG	VG	Railroad switches, cold forming.
Perma-Slik® RWAC	Organo-Metallic	WS_2	1-6 hrs. @ >65˚F	-325˚F to 850˚F	10.3 ± 0.5	465	S, DS, B	0.04 to 0.06	NR	VG	VG	Good to 850˚F, cold forming, fasteners.
Perma-Slik® S	Alkyd	MoS_2	24 hours @ >65˚F	-325˚F to 750˚F	8.1 ± 0.5	132	S, DS, B	0.04 to 0.06	F	G	G	Primarily used as a break-in lubricant.
Perma-Slik® T	Dispersion	PTFE	1-6 hrs. @ >65˚F	-100˚F to 500˚F	7.3 ± 0.5	186	S, DS, D	0.06 to 0.08	N/A	G	F	Precision instruments, patio doors, furniture slides, sealer for anodize.

[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, BU=Burnish.

[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.

* Stable to 1200˚F in air and 1500˚F in an oxygen-free environment.

Our products meet the latest regulatory requirements for Volatile Organic Compounds (VOC) coatings. These coatings are waterborne and they meet or exceed the performance levels of their solvent-borne counterparts.

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