

# 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<sub>2</sub> (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<sub>2</sub> 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 ( $\mu$ ) 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<sub>2</sub>, WS<sub>2</sub>, 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.

# Low VOC Coatings

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## Water-Based, Heat-Cured, Solid-Film Lubricants

Product Name	Binder Type	Lubricating Solids	Cure Time and Temperature <sup>1</sup>	Continuous Operating Temperature Range	Weight per Gallon <sup>2</sup>	VOC Content (Grams per Liter)	Coverage <sup>3</sup> (Sq. Ft./gallon)	Method of Application <sup>4</sup>	Coefficient of Friction <sup>5</sup>	Corrosion Resistance <sup>6</sup>	Performance <sup>7</sup>		Application/Specs
											Endurance	Load Carrying	
ESNALUBE® 382	Sodium Silicate	MoS <sub>2</sub>	2 hrs @ 175°F + 2 hrs @ 400°F	-360°F to 800°F	11.8 ± 0.3	0	458	S, DS	0.04 to 0.06	NR	VG	E	SAE AS1701, Class VI
EVERLUBE® 811	Sodium Silicate	MoS <sub>2</sub> /Graphite	2 hrs @ 175°F + 2 hrs @ 400°F	-360°F to 750°F	13.6 ± 0.5	0	936	S, DS	0.02 to 0.04	NR	VG	VG	MIL-PRF-81329
EVERLUBE® 812	Sodium Silicate	MoS <sub>2</sub>	2 hrs @ 175°F + 2 hrs @ 400°F	-360°F to 750°F	10.9 ± 0.5	0	320	S, DS	0.04 to 0.06	NR	VG	E	Graphite-free, Good vacuum stability
EVERLUBE® 823	Sodium Silicate	Graphite	2 hrs @ 175°F + 2 hrs @ 400°F	-100°F to 1200°F	9.8 ± 0.5	0	360	S, DS	0.02 to 0.04	NR	G	G	Good high temperature stability
EVERLUBE® 851	Phosphate	MoS <sub>2</sub> /Graphite	30 mins @ 175°F + 1 hr @ 500°F	-100°F to 750°F	9.0 ± 0.5	0	783	S, DS	0.04 to 0.08	NR	G	VG	Fasteners
EVERLUBE® 853	Phosphate	Graphite	30 mins @ 175°F + 1 hr @ 500°F	-100°F to 1200°F	8.3 ± 0.5	0	876	S, DS	0.02 to 0.06	NR	G	G	GE A50TF305, Class A, Silver replacement
EVERLUBE® 858	Phosphate	Graphite Blend	30 mins @ 175°F + 1 hr @ 500°F	-100°F to 1400°F	10.5 ± 0.5	0	783	S, DS	0.02 to 0.06	NR	G	G	Excellent thermal stability, Silver replacement
EVERLUBE® 9001	Epoxy	MoS <sub>2</sub> /Graphite	1 hr @ 375°F	-100°F to 400°F	10.0 ± 0.5	175	764	S, DS	0.02 to 0.04	F	VG	VG	Boeing BMS 3-8, Type II
EVERLUBE® 9002	Epoxy	MoS <sub>2</sub>	1 hr @ 400°F	-100°F to 400°F	10.9 ± 0.5	183	698	S, DS, D, B	0.04 to 0.06	F	E	E	MIL-PRF-46010, AS5272, Type III
EVERLUBE® 9005	Epoxy	MoS <sub>2</sub>	1 hr @ 400°F	-100°F to 400°F	10.9 ± 0.5	183	698	S, DS, D, B	0.04 to 0.06	F	E	E	Lead & Antimony free
EVERLUBE® 9420	Acrylic	PTFE Blend	30 mins @ 77°F + 30 mins @ 200°F	-100°F to 250°F	8.8 ± 0.5	41	802	S	0.02 to 0.06	NR	F	F	O-rings & elastomeric parts
EVERLUBE® 9500	Epoxy	PTFE	1 hr @ 325°F	-100°F to 400°F	9.5 ± 0.5	359	738	S, DS	0.06 to 0.08	VG	G	G	Fasteners
EVERLUBE® 9502	Epoxy	PTFE/MoS <sub>2</sub>	1 hr @ 325°F	-100°F to 400°F	9.1 ± 0.5	280	898	S, DS	0.04 to 0.06	G	G	G	Fasteners
EVERLUBE® 9601	Epoxy	PTFE	1 hr @ 325°F	-100°F to 400°F	9.0 ± 0.5	294	802	S, DS	0.06 to 0.08	G	VG	G	Fasteners, Surgical devices
EVERLUBE® 9800	Epoxy	N/A	1 hr @ 325°F	-100°F to 400°F	8.8 ± 0.5	320	930	S, DS	NA	E	NA	NA	Pump & valve, Oil field
LUBE-LOK® 2396	Sodium Silicate	MoS <sub>2</sub> /Graphite	2 hrs @ 175°F + 2 hrs @ 400°F	-360°F to 750°F	13.6 ± 0.5	0	936	S, DS	0.02 to 0.04	NR	VG	VG	MIL-PRF-81329
LUBE-LOK® S22T	Sodium Silicate	MoS <sub>2</sub> /Graphite	1 hr @ 175°F	-100°F to 750°F	10.5 ± 0.5	0	350	S	0.02 to 0.06	NR	G	VG	Forging & Forming lubricant
LUBE-LOK® S22TG	Sodium Silicate	Graphite	1 hr @ 175°F	-100°F to 1200°F	10.0 ± 0.5	0	210	S	0.02 to 0.04	NR	G	G	Forging & Forming lubricant
No-Swab® WL-33	Phosphate	Graphite	Preheat + 1 hr @ 400°F	-100°F to 1200°F	11.0 ± 0.5	0	1009	S	0.02 to 0.06	NR	G	G	Glass Molds
No-Swab® WL-119	Phosphate	Graphite	Preheat + 1 hr @ 400°F	-100°F to 1200°F	8.3 ± 0.5	0	876	S	0.02 to 0.06	NR	G	G	Glass Molds

<sup>1</sup> Cure times are at part metal temperature.

<sup>2</sup> Weights are listed in pounds and are based on Concentrate product.

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

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

<sup>5</sup> Dynamic coefficient of friction as determined by ASTM D2714 (without oil).

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

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

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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