



LE PRODUCTS
 MANUFACTURED
 UNDER AN ISO
 9001:2000
 CERTIFIED QUALITY
 SYSTEM

ALMASOL®

The Protective Edge

LE's exclusive EP, wear and friction reducing additive . . . protects metal surfaces at temperatures and loads beyond the range of conventional lubricants and additives.

ALMASOL® is a proven advancement in the science of lubrication. It is a solid film lubricant additive available exclusively from Lubrication Engineers®, Inc. This soft, tan powder is processed under exacting conditions by LE's wholly-owned subsidiary, The Almasol Corporation. ALMASOL® particles are so small that it would take approximately 8,000 of them to cover the period at the end of this sentence.

ALMASOL® is added to LE lubricants to amplify the protection every user needs to receive from a quality, high performance lubricant. Incorporated into LE's oils and greases, these microscopic particles are evenly and permanently dispersed. ALMASOL® is also processed into a dry or solid film lubricant. This dry film technology has been used on every manned U.S. space flight.

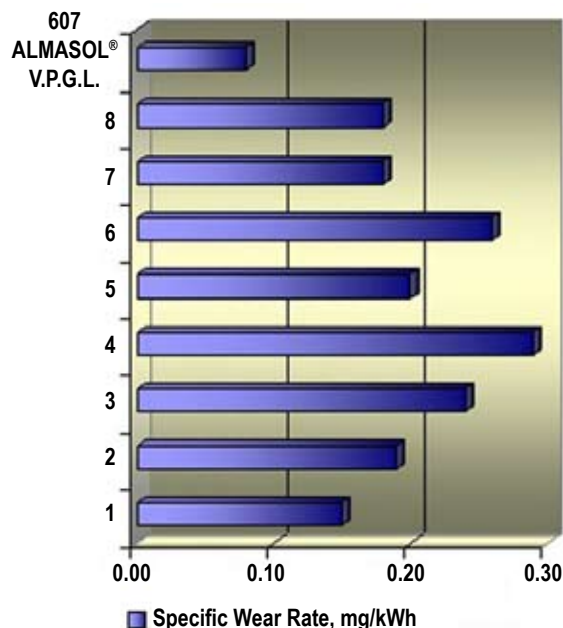
How ALMASOL® Works - ALMASOL® has natural affinity for metal as a result of surface attraction. Since these particles are mutually repelled, they form a single protective layer over the working surfaces, yet maintain an even dispersion throughout the lubricant fluid. Thus, ALMASOL® will not build on itself or affect machine tolerances. When equipment is operating, the molecular layers of ALMASOL® will slide on each other to inhibit metal-to-metal contact. And if a single particle were to be "worn away," another particle would immediately take its place.

Only ALMASOL® Provides All These Benefits

– Normally lubrication is accomplished by providing a lubricant film between two surfaces which are moving relative to one another. Under light to moderate loads and sufficient speeds, lubricants of the proper viscosity provide the desired oil film strength. With further load increases and/or speed decreases, the oil film alone is insufficient to prevent galling, scoring, wear, friction and high temperature as metal-to-metal contact occurs. Only ALMASOL® provides EP and wear-reducing protection and reduces friction. No other single additive provides all these benefits.

- **Provides Wear-Reducing Protection** – ALMASOL® protects the moving surfaces under conditions of lower speeds and/or higher loads where the lubricant film can be intermittently penetrated, causing metal-to-metal contact. Graph 1 clearly demonstrates ALMASOL's® ability to reduce wear. In the FZG test, commercial gear oils had 138% to 263% more wear than LE's 607 ALMASOL® Vari-Purpose Lubricant.

GRAPH 1: FZG Test Wear Rates at 10th Stage



FZG – German Test Method DIN 51354 (Modified) Test Conditions: Circumferential Gear Speed – 20.0m/sec. Initial Oil Bath Temperature – 90°C (194°F). Normal tooth load.

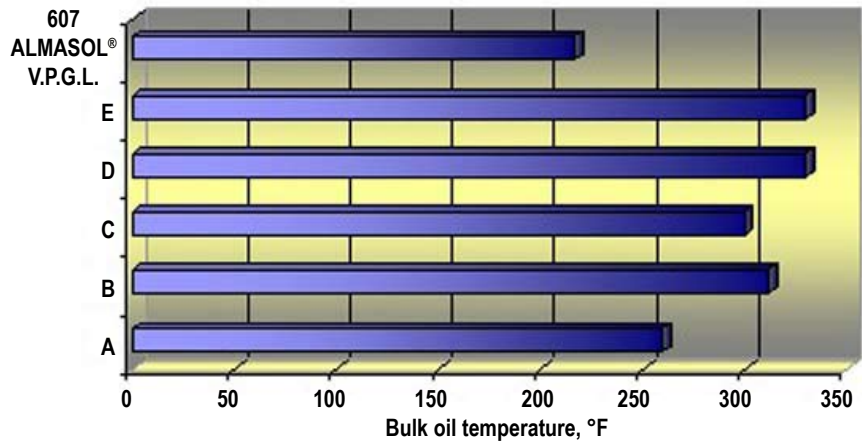
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- **Provides EP Lubrication** – With further load increase and/or speed decreases, the region of boundary or extreme-pressure (EP) lubrication is reached, and metal-to-metal contact occurs. Under these conditions a solid film lubricant like ALMASOL® is required for full protection of the metal surfaces.
- **Reduces Friction & Energy** – ALMASOL® provides a smooth, low drag surface to reduce friction and reduce consumption of electrical energy.

GRAPH 2: LE Modified Four-Ball EP Test



Test Conditions. Speed – 1760 rpm,
Load – 100kg. Duration – 60 Minutes,
Initial Oil Temperature – Ambient

Graph 2 dramatically illustrates that ALMASOL®, incorporated into a gear oil provides EP lubrication and reduces friction. Using a test closely approximating the actual severe EP conditions normally experienced in gear unit applications, the 607 ALMASOL® Vari-Purpose Gear Lubricant oil temperature was 50°F to 120°F cooler than ordinary commercial grade gear oil temperatures.

ALMASOL® Outperforms Other Solid Lubricants

	ALMASOL	Molybdenum Disulfide	Graphite	Fluorocarbon (PTFE)
Maximum Service Temperature ¹	1900°F (1038°C)	650°F (343°C)	800°F (426°C)	500°F (260°C)
Load Carrying Capacity, psi ²	400,000	400,000	80,000	5,000
Acid Resistance	Inert	Some	Some	Inert
Drawbacks	None	Oxidizes in air above 650°F (343°C) to form molybdenum trioxide, which is abrasive. Tendency to build on itself and affect close tolerances. Cannot tolerate hydrochloric and nitric acid – one or more chemicals often encountered in lubricant environments, especially where heat, water and air are present.	Galvanic corrosion problems. Tendency to build on itself.	No load-carrying capacity. Tendency to build on itself.

1 & 2 All metal surfaces have high and low spots. High points, called asperities, on opposing working surfaces meet under heavily loaded conditions. Instantaneous contact temperatures of these asperities often exceed 1,000°F. Also, pressures can occur above the 175,000 psi yield strength of steel.

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