LE Products manufactured under an ISO 9001:2000 Certified Quality System

MONOLEC®

LE's exclusive wear-reducing additive that creates a single molecular lubricating film on metal surfaces, vastly increases film strength without affecting tolerances.

Historical Background

MONOLEC® is the registered tradename for the exclusive wear-reducing additive used only in lubricants from **LUBRICATION ENGINEERS®, INC.** The name is derived from "mono-molecular," which describes how molecules, similar to ball bearings in their function, form a single (mono) layer on metal surfaces to protect against metal-to-metal contact.

How MONOLEC® Works

Even highly polished metal surfaces are far from smooth. Viewed microscopically, they resemble mountain ranges, with millions of jagged peaks called **asperities** (Figure 1). The distance between these peaks and valleys may be as much as 15 microns (a micron equals one-millionth of a meter).

When metal surfaces slide against one another, especially under high pressure, frictional heat increases rapidly, high points tear, and the metal surfaces weld together. This reaction is called *seizure*. This is exactly what occurs when a lubricating film ruptures.

Figure 1: Asperities on touching metal surfaces

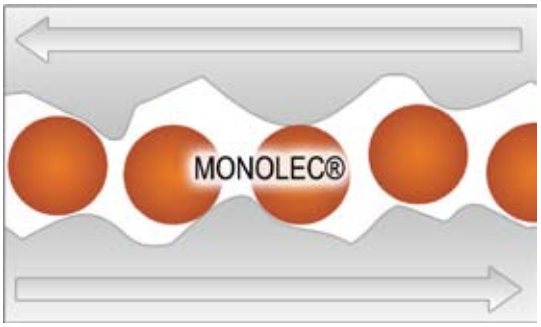

Figure 2: Asperities as smoothed by MONOLEC®.

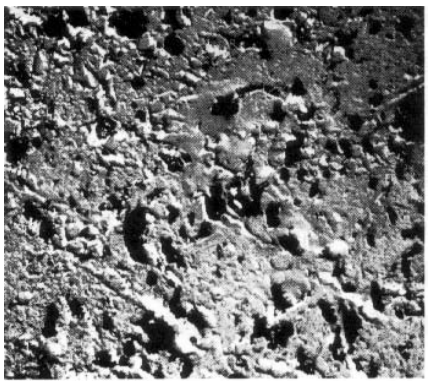

Figure 3: Photomicrograph of piston skirt lubricated with commercial oil.

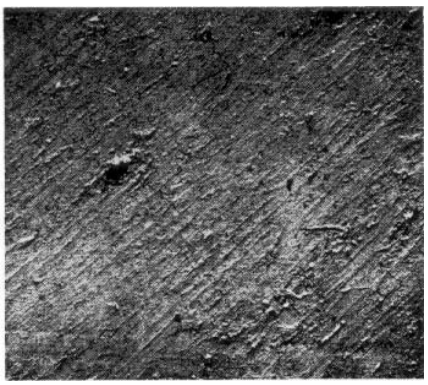

Figure 4: Photomicrograph of same piston skirt lubricated with MONOLEC®.

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When incorporated into a lubricating oil, MONOLEC® protects all metal surfaces with a single layer of molecules, which reduces friction through its "ball bearing" action. Should the oil film rupture under high pressure, MONOLEC reacts with the quickly heating asperities to form a chemical synthetic lubricant *(Figure 2)*, which allows the high points to flow and reduces wear. The metal surface with MONOLEC is much smoother and more easily lubricated.

MONOLEC also greatly increases the film strength of lubricating oils through a process called *particulate attraction*, which is the molecular attraction one particle has for another. Visible proof of MONOLEC's ability to reduce wear is seen in the photomicrographs in *Figures 3 and 4*.

Figure 3 shows the surface of a piston skirt magnified 2,400 times, from a test engine run 480 hours on the test oil without MONOLEC. *Figure 4* shows a portion of an identical piston skirt also run 480 hours, using the same type oil with MONOLEC added.

To measure **only** the wear-reducing ability of the MONOLEC additive, a sophisticated radioactive wear test was conducted. The oil used was not the heavy-duty LE formula, with paraffinic oil and highly effective additives. It was a control or test oil.

The test engine using oil without MONOLEC experienced wear at a rate of 3.5 milligrams per hour, while the engine using oil with MONOLEC had only 2.7 milligrams of wear per hour. *This proved a 24.2% reduction of metal wear with the MONOLEC additive.* MONOLEC prevented welding and tearing, reduced wear and provided for smooth, relatively friction-free operation.

Why MONOLEC adds value to LE lubricants.

- ❑ **MONOLEC** reduces wear by reducing friction, improving oil film strength and giving lubrication protection when high pressures cause metal-to-metal contact.
- ❑ **MONOLEC** disperses quickly and uniformly, always working between moving parts and staying in place at points of potential wear.
- ❑ **MONOLEC** does not build up or fall out. Many antiwear additives can build up on metal surfaces to affect tolerances, or actually drop out of the lubricant to accumulate in low spots. MONOLEC disperses uniformly and completely, will not build up on metal surfaces beyond the molecular layer needed for protection and will not fall out of suspension in either oil or grease.
- ❑ **MONOLEC** acts synergistically to improve performance qualities of other components in oils and greases. MONOLEC enhances other selected antiwear agents in LE lubricants to produce a result greater than if each were used separately.
- ❑ **MONOLEC** has shown its ability to reduce wear, lower operating temperatures, and greatly extend equipment life. Hundreds of case histories from users in LE's files document this extraordinary performance.
- ❑ **MONOLEC** performs in both oils and greases, adding to the many benefits of any LE product bearing the MONOLEC tradename, including Engine Oil, Industrial Oils and other LE lubricants for various applications.
- ❑ **MONOLEC** has no negative side effect. Some chemical anti-wear additives can be harmful under certain conditions. They become corrosive, or contribute to deposit formation or rapid oxidation of the lubricant. MONOLEC has no such side effects, contributing only positive benefits to LE lubricants.

LE products containing MONOLEC

- ➢ Compressor Oils
- ➢ Greases
- ➢ Hydraulic Oils
- ➢ Power Fluids
- ➢ Rock Drill Lubricants
- ➢ Wire Rope Lubricants
- ➢ Engine Oils
- ➢ Industrial Oils
- ➢ Open Gear Lubricants
- ➢ Enclosed Gear Lubricants
- ➢ Refrigeration Oils
- ➢ Turbine Oils

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