

Enhanced lubricants

by **Lubrication Engineers Inc**

Lubrication Engineers, Inc developed its Pyroshield® lubricants in 1987, with an addition in 2002, to address these problems and allow cement manufacturers to reduce their maintenance and operating costs for ball mills and kilns. Since their introduction, Pyroshield lubricants have established a proven record of providing superior lubrication and wear protection for large open gears in the cement industry.

In March 2010, LE is upgrading its popular Pyroshield lubricants with even better load-carrying capability, wear performance and pumpability. In addition, they no longer contain any heavy metals, making them more environmentally-friendly.

Cement plants using high-performance enhanced open gear lubricants will experience better machine reliability, improved safety, a greener footprint and reduced operating costs. There follows nine specific benefits which can be expected when choosing Pyroshield.

1. Proprietary anti-wear additive

Pyroshield is formulated with LE's proprietary anti-wear additive Almasol®, which provides outstanding wear protection and prevents any possible metal-to-metal contact between the gears. Almasol can resist temperatures of more than 1038°C and loads of more than 400,000psi. These extreme temperature and load levels are at the microscopic asperity level found on all metal gear teeth, and Almasol works like a very thin but powerful glove of anti-wear protection on the metal surfaces.

2. Gear healing solution

Many large open gears experience damage over time – scoring, pitting or spalling can roughen the gear tooth

The maintenance of large open gear systems in cement plants presents a significant challenge because of the heavy loads and harsh environmental conditions. Common lubrication issues include housekeeping due to the large quantity of lubricant that is required to provide a continuous coating to the open gears. In addition, when asphaltic products are in use for many years, the result is a build-up of hardened lubricant in the roots of the gears. This presents many problems with cleaning and mechanical interference which can result in gear misalignment or stress on the pedestal mountings.

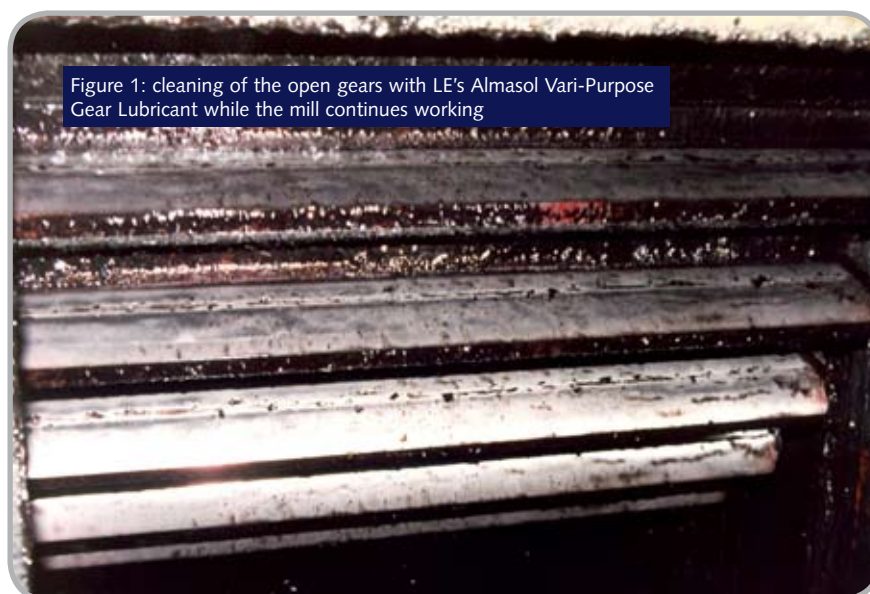


Figure 1: cleaning of the open gears with LE's Almasol Vari-Purpose Gear Lubricant while the mill continues working

contact area. High-performance lubricants provide a healing solution to this expensive maintenance problem.

The healing process begins with a

redistribution of the load over the surface area of the gears, made possible by Pyroshield's high film strength and film thickness. Pyroshield's ability to keep the

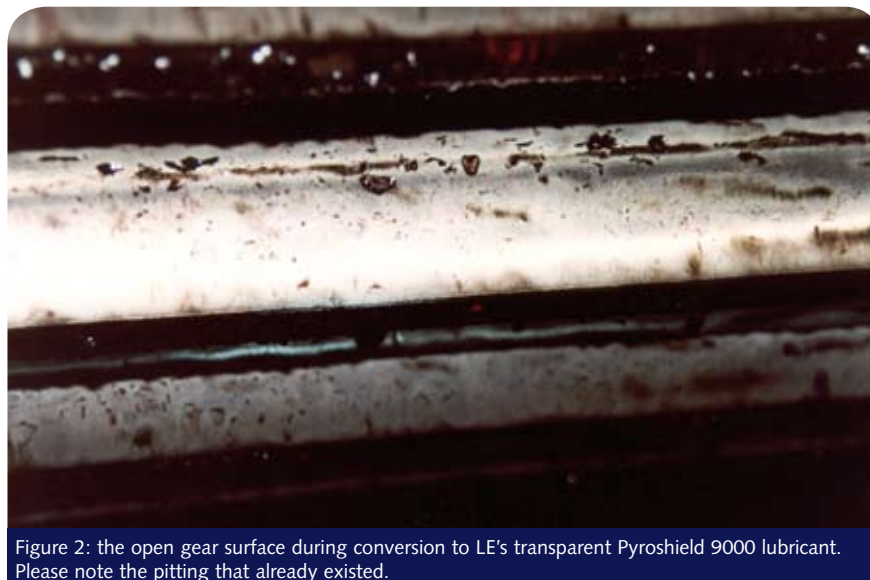


Figure 2: the open gear surface during conversion to LE's transparent Pyroshield 9000 lubricant. Please note the pitting that already existed.

gears separated and not allow asperities and high points to come into contact allows the non-destructive deformation of the gear surface, which ultimately results in healed gear appearance. Often small pits will close up completely and disappear due to this deformation of the gear surface.

See Figures 1-4 of the gear teeth at a cement plant in Halkis, Greece, for just one example of gear healing that substantially increased open gear life and reduced maintenance costs.

3. Better gear protection

Asphaltic-based compounds typically have Timken OK Load ratings of 20-25lb, and so they must be used in excessive quantities to provide adequate protection. The Timken ratings for enhanced lubricants exceed 60lb. Some synthetic lubricants such as Pyroshield achieve results as high as 90lb.

Pyroshield 9011 achieved a 14th stage pass in the critically important FZG Gear Test, which evaluates actual gear protection. This high level of protection reduces gear wear and maintenance requirements, while extending the life of the expensive gear system. Increasing the life of gears adds profit to the bottom line through improved reliability and availability of these large capital assets.

4. Easy visual inspection

Applied to open gears, Pyroshield appears clear enough to see through, which makes it easy for maintenance personnel to inspect the surface of the gears by using a strobe light while the mills continue to work. No cleaning or downtime is required for inspection, thus reducing maintenance and operating costs.

5. Faster, safer cleanup

Cleanup and other housekeeping associated with the use of asphaltic-based products can be time-consuming and expensive. Although total costs are difficult to estimate, operators have reported labour requirements in excess of four man-days to clean some units. In addition, the large amount of lubricant that is generally used creates build-up around the shrouds, which creates a messy, sticky, potentially unsafe work environment.

Typically, a much smaller amount of Pyroshield is required to provide far



Figure 3: the open gears after two years of Pyroshield usage



Figure 4: five years later... the gear healing phenomenon. Please note the elimination of the pitting that previously existed

superior, less messy gear protection. Ultimately, the ball mill housekeeping is improved. For example, the cement plant in Halkis, Greece, reduced its annual open gear lubricant consumption at its six ball mills by an impressive 87 per cent – from 7200kg to only 960kg per year – by converting all six of them to Pyroshield.

6. Less energy consumption

The annual electricity cost of ball mills is a major overhead cost for all cement plants. Due to the superior lubricating qualities of Pyroshield, many cement plants have experienced up to a three per cent reduction in electrical costs. The source of heat in an open gear set is friction. Lower friction means less energy required to overcome that friction. LE has documented substantial temperature drops, some exceeding 15°C during the conversion process and continuing during normal operation. Enhanced lubrication leads to reduced friction, which

leads to reduced energy consumption, which means lower costs and a greener footprint.

7. No more hazardous waste

Pyroshield can be treated as an ordinary lubricant and can often be added to the fuel or coal burned in the normal operation of many plants. However, many asphaltic compounds contain lead or other heavy metal compounds as extreme pressure additives, contributing to their designation as hazardous waste products. The asphaltic compounds could also contain polycyclic aromatic hydrocarbons that require disposal as hazardous waste. Hazardous waste disposal is expensive, and it necessitates tedious cradle-to-grave record keeping.

A cement plant in Bulgaria dramatically reduced its disposal costs by converting its two KHD kilns and two of its Polysius ball mills to Pyroshield. The waste reduction at its two kilns alone was 600kg per kiln

– a tonne less hazardous waste to dispose of annually. The reduction for its two ball mills using Pyroshield was even greater – nearly 1800kg per mill. With a total of 19 fewer drums of hazardous waste to dispose of each year, at an approximate disposal cost of €350 per drum, the plant experienced total savings of €6650.

In addition to the cost savings, environmental concerns make the choice of using a non-hazardous lubricant a wiser choice as well as a greener one.

8. Simple conversion process

Converting ball mills and kilns to Pyroshield lubricants is simple using LE's proven, effective and safe procedure that provides no interruption in production or operation. Effective cleaning and lubricant protection of the gear system takes place throughout the process. Local LE lubricant consultants, supported by LE's Technical Services Department, provide engineering support.

9. Lower lubrication costs

Although high-performance enhanced lubricants cost more initially than the alternatives, the resulting reduction in lubricant consumption leads to an overall reduction in lubrication costs. Cement plants regularly experience lubricant reductions of more than 80 per cent when they convert their ball mills to Pyroshield.

Cement plants worldwide have benefited from using Pyroshield high-performance lubricants. The lubricant consumption reductions alone can more than justify the cost. The Bulgaria cement plant's estimated savings per year were €86,904. These are immediate, tangible savings – not taking into consideration the other important cost-reducing factors such as reduced energy consumption,

Figure 5: before Pyroshield applicaton

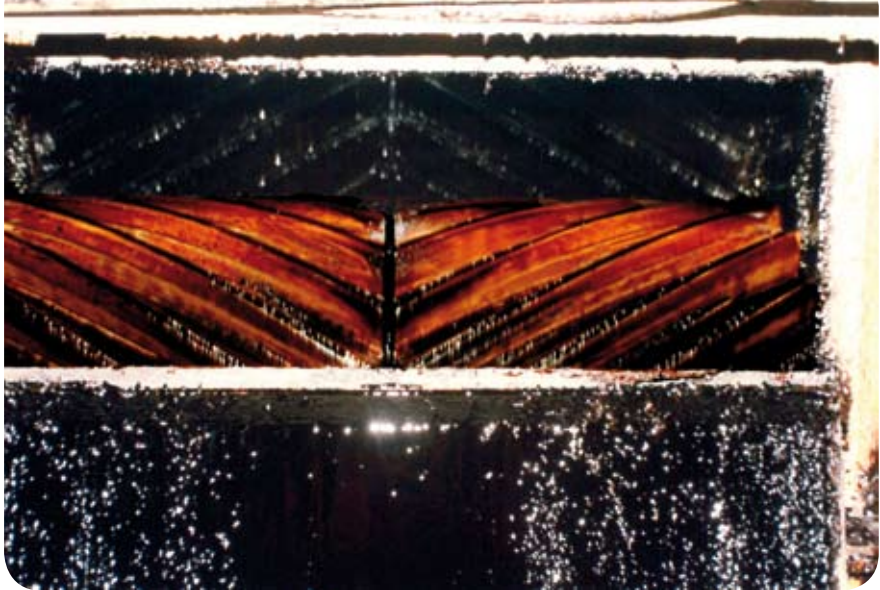
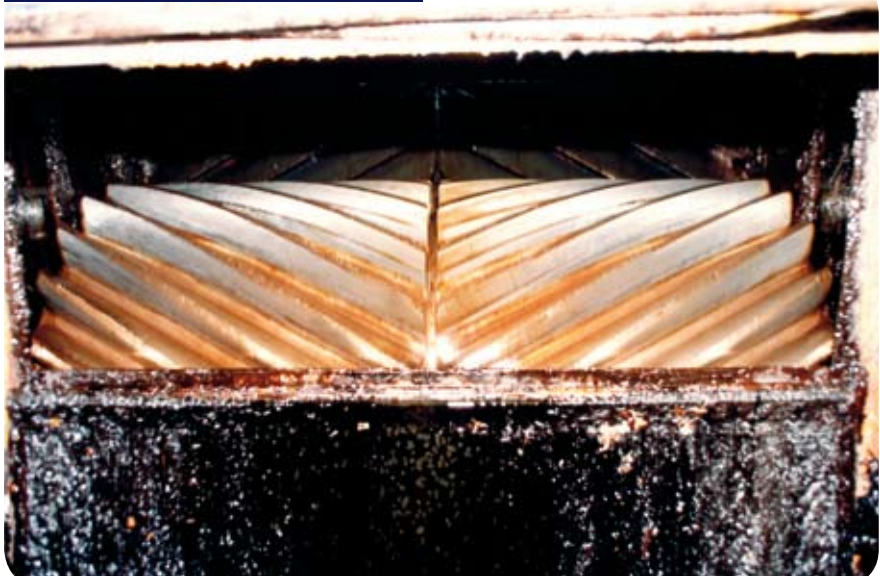


Figure 5: after Pyroshield has been applied



longer equipment life, cleaner working environment and ease of inspection.

Enhanced lubricants such as Pyroshield can improve bottom line profits and return

on net assets by improving the reliability of cement plant open gears and by reducing their required maintenance. Like Pyroshield, the choice should be clear. _ █