

# MEETING THE NEEDS OF MODERN INDUSTRIAL GEAR OILS

**Lubrizol observe lubricants based on sulphur-phosphorus chemistry provide greater protection and performance.**

Industrial gear oils operate under more diverse conditions and applications than automotive gear oils. The gears can be as large as 10 meters in diameter and incorporate spur, bevel, helical and spiral bevel designs in an endless variety of configurations. Industrial gear oils typically must function in the presence of large quantities of water, which can cause rust, corrosion and a loss of protection. These oils also are used in highly contaminated environments. To make matters worse, modern gearboxes have been downsized and operate at higher speeds and loads, resulting in higher operating temperatures.

To meet the demands of today's industrial gear drives, a lubricant must meet a variety of performance requirements. The minimum performance requirement for industrial gear oil is heavy-duty extreme pressure (EP) performance combined with rust, corrosion and oxidation resistance in the presence of water, scale and heat. A higher, premium level of performance adds thermal stability and cleanliness to the baseline requirements. Top-tier performance includes durability requirements such as high temperature EP

protection, extended demulsibility and foam inhibition in the presence of contaminants. Compatibility with various mineral and synthetic base fluids is also a concern.

Two important trends in the development of industrial gear oils are:

- Increased emphasis by end users on reducing costs. They are demanding longer lubricant life, which reduces maintenance and disposal costs.
- Design changes to improve efficiency. Today's smaller gearboxes operate at higher speeds and loads, resulting in higher operating temperatures.

They also have smaller oil capacities, so less lubricant is available to cool the equipment and suspend contaminants.

The United States Steel (USS) 224 Specification for Non-lead, EP Industrial Gear Oils is one of the most widely recognised specifications in the U.S. industry. It was written and released in the early 1980s to address the use of sulphur-phosphorous formulations. The American Gear Manufacturers Association (AGMA) upgraded its AGMA 250.04 enclosed gear oil specification shortly after USS 224 was released.

Recently, Lubrizol developed new additive technology to improve the performance of modern industrial gear oils.

### GEAR TEST RESULTS

Tests	Commercial Oil	New Oil	Requirements
4-Ball Wear Scar Diameter (mm)	0.29	0.29	0.35 max
4-Ball EP Weld Load (kg)	250	250	250 min
4-Ball EP LWI (kg)	55.1	60.5	40 min
Timken OK Load (lb)	80	75	60 min
Copper Strip Corrosion (ASTM D130)	1A	1A	1B min
Turbine Oil Rust			
A - Distilled Water	Pass	Pass	Pass
B - Synthetic Water	Pass	Pass	Pass
S-200 Viscosity Increase (%)	3.7	4.88	6.0 max
ASTM D 1401 Demulsibility @ 82°C Oil-Water-Emulsion (ml)	40/40/0 (20)	40/40/0 (10)	
ASIM D 2711 Demulsibility @ 82°C			
Water in Oil (%)	1	0.2	2
Total Free Water (ml)	84.6	84.1	80
Emulsion (ml)	0	0.1	1
ASIM D 2711 Demulsibility @ 54°C			
Water in Oil (%)	2.3	1.6	
Total Free Water (ml)	79.5	81.4	
Emulsion (ml)	0.1	0.1	

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