

# Lubnotes:

Design Engineer's Guide to Selecting a Lubricant

## Greases for Rolling Element Bearings



Quality rolling element bearing greases function over a wide temperature range; offer thermooxidative stability and low volatility; and have base oils that retain the viscosity needed to provide an adequate lubricant film throughout a specified range of operating temperatures, speeds and loads. Using these general characteristics as the yardstick for selecting a lubricant will help ensure high performance and long life for rolling element bearing applications.

**Enhancing grease performance.** Greases are formulated by combining a base oil with a thickening agent. They lubricate rolling bearings by bleeding a small amount of oil out of the “reservoir” of the grease thickener and into the raceway. The oil provides the elastohydrodynamic lubricating film needed to reduce friction and wear. Greases can also serve as effective seals to protect bearings from contaminants and moisture. For greater loads, especially where vibration or shock loading is likely, special anti-wear additives can improve grease performance. Likewise, special thickeners and additive packages can augment a greases natural resistance to wash-out by water or salt-water spray. Thickeners can also be processed to reduce the noise-generating characteristics of a grease. Finally, other additives can tailor a grease to specific application needs: PTFE for low temperature torque, molybdenum disulfide for high loads, special additives to promote electrical conductivity, and specific chemistry for low vapor pressure applications.

**Ultrafiltration services.** Nye will ultrafilter any of its oils and greases, and recommends this service for precision bearing applications to extend bearing life. Standards of cleanliness are clearly defined by the US Government for both oil and grease. MIL-STD-1246 includes five cleanliness levels for oil: 50, 25, 10, 5, and 1, where each number refers to the largest particle (in microns) allowed in an oil. There are three cleanliness levels for grease. Ultrafiltered grease can contain particles larger than 75 microns. Filtered or “clean grease” cannot have any particles larger than 75 microns, and there must be less than 1,000 particles per cubic centimeter between 24 and 74 microns in size (MIL-G-81322, Aircraft Grease). Ultrafiltered or “ultraclean grease” must not have any particles larger than 35 microns, nor may it have more than 1,000 particles per cubic centimeter between 10 and 34 microns in size (MIL-G-81937, Ultraclean Instrument Grease). Nye offers ultrafiltration services in a Class 100 environment for our own oils and greases – and for those of other manufacturers, which continues to be a sizable portion of our operations.

**Selecting the right lubricant for your application.** On the back is a partial list of Nye lubricants for rolling element bearings. Additional oils and greases are available to meet a wide range of application requirements. For technical specifications, evaluation samples, questions about any Nye products, or to discuss a lubricant *custom-designed* for your application – call us at +1.508.996.6721 or visit our website at [www.nyelubricants.com](http://www.nyelubricants.com).

Contact Nye at +1.508.996.6721  
or [contact@nyelubricants.com](mailto:contact@nyelubricants.com)

Innovative Solutions since 1844 

| Grease<br>(Temp. Range °C)                                    | Oil                     | Thickener         | NLGI<br>Grade | Dropping<br>Point (°C) | Evaporation | Water<br>Washout | 4-Ball<br>Wear Scar | Rust<br>Test | Application Notes  |
|---|-------------------------|-------------------|---------------|------------------------|-------------|------------------|---------------------|--------------|--|
| <a href="#"><u>Rheolube™ 374B</u></a><br>(-40 to 150)         | PAO                     | Lithium<br>Soap   | 2             | 260                    | 0.8%        | 4.1%<br>(40°C)   | 0.45mm              | pass         | High load, lower-speed bearings  |
| <a href="#"><u>Rheolube™ 374C</u></a><br>(-40 to 150)         | PAO                     | Lithium<br>Soap   | 4             | 280                    | 0.9%        | 2.8%<br>(40°C)   | 0.66mm              | pass         | Light load, high-speed bearings  |
| <a href="#"><u>Rheolube™ 374A</u></a><br>(-54 to 175)         | PAO                     | Lithium<br>Soap   | 2             | 273                    | 0.3%        | 3.2%<br>(40°C)   | 0.44mm              | pass         | High-speed bearings,<br>MIL-PRF-32014A   |
| <a href="#"><u>Rheoplex™ 6000HT</u></a><br>(-40 to 150)       | Alkylated<br>Naphtalene | Sodium<br>Soap    | 2             | >260                   | 0.3%        | 8%<br>(40°C)     | 0.34mm              | pass         | High speed bearings  |
| <a href="#"><u>Rheolube™ 716R</u></a><br>(-54 to 150)         | Ester                   | Lithium<br>Soap   | 2             | 185                    | 0.2%        | 4.5%<br>(40°C)   | 0.50mm              | pass         | Low-torque, precision bearings.  |
| <a href="#"><u>Rheotemp™ 500</u></a><br>(-54 to 175)          | Ester                   | Sodium<br>Complex | 1.5           | 202                    | 0.06%       | 7.3%             | 0.45mm              | -            | High speed bearings.   |
| <a href="#"><u>Fluorocarbon Gel 813-1</u></a><br>(-45 to 125) | Silicone                | PTFE              | 1             | >260                   | 0.1%        | 0.6%             | -                   | -            | Wide-temperature instrument bearings.  |
| <a href="#"><u>Rheolube™ 2000</u></a><br>(-45 to 125)         | MAC                     | Sodium<br>Soap    | 2             | >260                   | 0.1%        | -                | 0.38mm              | -            | Aerospace and other low vapor pressure applications.<br>Vapor pressure at 25°C = 10 <sup>-9</sup> torr           |
| <a href="#"><u>Uniflor™ 8771</u></a><br>(-50 to 250)          | PFPE                    | PTFE              | 2             | Non-melting            | 0%          | 0.4%             | 0.56mm<br>(20kg)    | -            | Wide-temperature bearings in extreme environments.<br>Vapor pressure at 25°C = 10 <sup>-9</sup> torr             |
| <a href="#"><u>Uniflor™ 8931</u></a><br>(-70 to 250)          | PFPE                    | PTFE              | 2             | Non-melting            | 0.13%       | -                | 0.91mm              | -            | Wide temperature, low torque bearings in extreme environments.<br>Vapor pressure at 25°C = 10 <sup>-9</sup> torr |

### Nye Product Test Protocols

|                         |  |
|-------------------------|--|
| <b>Dropping Point</b>   | ASTM D-2265                                |
| <b>Evaporation</b>      | NYE CTM-1 (24 hrs. at 100°C)               |
| <b>Water Washout</b>    | ASTM D-1264 (60 min. at 80°C)              |
| <b>4-Ball Wear Scar</b> | ASTM D-2266 (1 hr., 75°C, 40 kg, 1200 RPM) |
| <b>Rust Test</b>        | ASTM D-1743                                |

Nye Lubricants, Inc. 12 Howland Road Fairhaven, MA 02719 USA Ph: +1.508.996.6721 Fx: +1.508.997.5285 [www.nyelubricants.com](http://www.nyelubricants.com)

Because we cannot anticipate or control the many different conditions under which this information and our products may be used, we cannot guarantee the applicability of this information or the suitability of our products in any individual situation. For the same reason, the products discussed are sold without warranty, expressed or implied. Statements concerning the possible use of our products are not intended as recommendations to use our product in the infringement of any patent.