

An Invitation

The Nye Lubeletter, since 1973, has regularly discussed the many issues and problems associated with specialty lubrication and synthetic lubricants. With this special mini-edition, highlighting our wide-ranging discussion of "Lubricants as Design Components", we invite you to join the mailing list. The enclosed card is postage-paid and will permit you to link on painlessly. Please fill it out and drop it in the mail. We hope to add your name to the Lubeletter list.

THE COMPLEXITY OF LUBRICANT CHOICE

Lubricants as Design Components

In a complicated mechanism involving moving parts, the choice of lubricant can often be the last decision made, almost an afterthought. Yet successful performance of the device can be critically dependent on the lubricant's performance; the lubricant could be its "life blood".

Increasingly, design engineers are properly taking the view that the lubricant is just as important a design component as the metals, plastics, seals, bearings or electrical linkages in any highly-engineered mechanism.

A special series of questions should be asked when making any lubricant choice. The type of questions in such a list may surprise many who might otherwise take lube selection for granted. The list would include such obvious criteria as operating temperature range along with friction reduction and load carrying capability. However, it should extend to often-overlooked areas, such as lubricant migration, compatibility with other design materials, the protective quality of the lubricant and, for precision bearing applications, lubricant cleanliness.

Special applications require asking special questions. For example, when electric contacts are being lubricated (and many people will be surprised to learn that they usually are), the question of potential arcing and arc degradation products must be considered.

Even within predictable question areas, such as operating temperature range, there are complex linkages in the analysis. At the coldest anticipated operating temperature, the lubricant must remain unfrozen; however, since it will be getting more and more viscous as its temperature decreases, its maximum viscosity (or permissible consistency) must be considered in relation to the moving forces available within the device. At the higher ranges of operating temperature, not only must the lubricant's resistance to oxidation be evaluated, but also its tendency to volatilize. One of the most oxidation resistant synthetic lubricants known, the exotic 5-ring polyphenyl ether with its 250°C capabilities, has been known to simply waft away when spread in very thin film on a metal surface and exposed to air flow at 100°C for an extended period.

Friction reduction and load carrying capability are often difficult to predict and certainly to quantify. Much will depend on the mating materials. Metal against metal will be different from plastic against plastic. Load-carrying additives, which usually work in a chemically sacrificial manner with heavily-loaded metal surfaces, would be useless when plastics are being lubricated and will perform differently with different metals. An effective sulphur-based load-carrying lubricant for steel would corrode copper unacceptably.

Consistency of the lubricant is an area where a great latitude of choice can be accommodated. Light oils would be appropriate for lightly-powered, delicate devices. Extremely viscous greases would be the lubricant of choice for the focusing threads in an optical instrument.

Lubricant migration must be considered both from the standpoint of avoiding lubricant loss and starvation during operating life as well as avoiding the spread of oil to points where it is decidedly **not** wanted, as on an operating knob or on a critical electrical relay contact. The oldest method for controlling migration is to use a grease (a gelled oil) instead of an oil; however, there are other more recently-developed techniques.

Compatibility of lubricants is a necessary question with plastics and rubbers. Plastics such as polycarbonate or polysulfone are among those that will be attacked or crazed by synthetic fluids like esters or ethers. Many rubbers will swell or shrink when exposed to certain families of functional fluids. You wouldn't want to use silicone oil with silicone rubber, unless you were specifically looking for elastomer swell.

The protective capability of lubricants ranges from the prevention of rusting in ball bearings to the protection of stationary separable electrical connectors from corrosion caused by atmospheric pollutants. There are special kinds of corrosion, such as the fretting corrosion caused by low amplitude vibration, where the proper grease can provide significant relief.

Lubricant cleanliness can be critically important in a small precision ball bearing with tiny balls riding in a race. In such a bearing, a 100 micron hard dirt particle would be like an anvil on a railway track. Any particulate contaminant that is larger than the elastohydrodynamic film thickness of a bearing oil can result in premature bearing failure. Significant increases in bearing life can be obtained by ultra-filtration of bearing lubricants.

The application itself will demand its own questions. We have mentioned electric contacts as an area for special questions. Often a lubricant is used as more than just a lubricant, such as tacky greases which function as damping media or motion control compounds. A grease can be more important as a seal than as a lubricant. Fluids can serve as hydraulic media, as dielectrics, for flotation or heat transfer purposes or even as ultrasonic coupling fluids. One new grease-like product is specific for use as an optical coupling gel for optical fiber connections.

Since 1973 the Nye Lubeletter has discussed all of the above-mentioned problems and issues as well as many other aspects of specialty lubrication. We plan to continue to do so and would welcome your name on our mailing list.

The Lubricant Sample Request Form on the reverse of this sheet asks many of the basic questions involved in choosing a lubricant. We invite your submission of any special applications or lubricant problems with which you may be contending. We will do our best to respond with an interesting material. A separate section lists a range of available literature.

We look forward to hearing from you.

Lubricant Sample Request

Mail in your company envelope to:

WILLIAM F. NYE, INC.

P.O. Box 8927, New Bedford, MA 02742

Telephone (508) 996-6721

Special Requests or Comments:

Send at no charge or obligation a lubricant sample especially selected to meet the following needs:

Type of Mechanism _____

Components to be Lubed _____

Materials of Construction _____

Ball or Sleeve Bearing (if either)? _____ Sintered Metal? _____

Preference for Oil _____ Grease _____ Dry-Film _____

Is Oil Creep a Problem? _____

Will Lube Touch Plastics? _____ Type: _____

Elastomers? _____ Type: _____

Lowest Operating Temperature _____ °C/°F. If an electric contact,

Highest Operating Temperature _____ °C/°F. is arcing expected? _____

Desired Life at High Temperature _____

Present Lube _____

If unsatisfactory, in what way? _____

Fill in your name, company and address below.

Mail sample or literature request to: **William F. Nye Inc., P.O. Box 8927, New Bedford, MA 02742**

LITERATURE SECTION

Check below for special catalogs and other literature:

- Designer Lubricants, a Summary Catalog
- Lubricants for Electric Contacts and Connectors, a special catalog.
- The Lubeletter Digest, a compendium of over twenty articles from Nye Lubeletters for the years 1972 to 1987.
- Fluid-Central Catalog, a descriptive summary of the grades and physical properties of the principal synthetic functional fluids.
- Flexibility in Packaging, a pictorial guide to small oil and grease dispenser containers presently available.
- Precision Dispensing Equipment, a list of references to manufacturers of precision dispensing apparatus.
- Nye Lubricant Kit H, a two-page brochure on a special kit of oils and greases in dispenser containers for instrument servicemen.
- Precision Bearing Greases: Ultrafiltered Packaging, a small volume price list for super-cleaned commercial bearing greases.

Send Lubricant Sample (from above) or literature (as checked to the left) to:

Name: _____

Title/Position: _____

Company: _____

UPS or Mailing Address: _____

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