NYE® WILLIAM F. NYE, INC.
P.O. Box G-927, New Bedford, Mass
AUTUMN 1989
LUBELETTER

JAPANESE SPECIFICATIONS

Synthetic Greases for Automotive Accessories

The competitive challenge posed by the Japanese auto industry to the American carmaker, both in style and quality, extends to all aspects of the finished automobile, including the lubricants used on automotive accessories. By accessories we mean the window, door, seat, switch and assorted electrical controls throughout the car.

We recently accepted the challenge ourselves when we were asked to submit Nye greases to meet several Japanese automotive specifications for lubrication of such accessories. In responding, we tried to go one better on the Japanese requirements by building our formulations on synthetic rather than petroleum fluids, with resulting increased usefulness at the low and high ends of U.S. operating temperature ranges.

The result of our efforts is a family of four synthetic hydrocarbon-based specialty greases, among which a manufacturer of automotive accessories could cover the range of lubricant needs for mechanical assemblies. (Other Nye greases are available which could afford special benefit on the sliding electrical contacts of switching devices.)

The test protocol for these greases was significantly more extensive than we have encountered with U.S. manufacturer specifications. In addition to a long list of the more standard lubricant bench tests, such as consistency, dropping point, oil separation, evaporation, water wash-out and oxidation stability, the test program included several unusual corrosion and rust protection tests, along with a series of tests where the grease was admixed with water and the resulting properties measured. One special test required exposure of the grease to a carbon arc to simulate weathering effects.

Of the greases submitted in this program, one was one of our more popular stock synthetic hydrocarbon greases, Nye Rheolube 362. Three others were new to our line. The four are listed below:

Nye Rheolube 362: a lithium soap-gelled synthetic hydrocarbon grease using a light base oil and especially intended for applications requiring excellent response at very low temperatures.

Nye Rheolube 364: also a lithium soap-gelled synthetic hydrocarbon grease, using a medium viscosity oil, with additives intended for heavier linkages, especially where rust protection is critical.

Nye Rheolube 790G: a higher viscosity synthetic hydrocarbon oil gelled with a non-melting clay gellant, intended for applications where high temperatures are encountered and extremely stable grease consistency is important.

Nye Rheolube 367-MS: a molybdenum disulfide-fortified synthetic hydrocarbon grease using a high viscosity base oil, formulated for very heavily loaded mechanical linkages.

All of these greases should be considered plastic-and rubber-compatible. The synthetic hydrocarbon base oils have traditionally proven safe with otherwise vulnerable thermoplastics. The major troublesome exceptions would be EPDM rubber and plastics with fire-retardant additives where high stress levels may result in cracking or crazing.

This new quartet could provide a broad range of flexibility for evaluation in mechanical and electro-mechanical devices well beyond those defined as automotive accessories, and we can send product bulletins and evaluation samples on request. If you are having difficulty importing foreign-made greases, we would be happy to evaluate your grease specifications and applications for possible economical, high-performance, domestically-available alternatives.

FINE TUNING THE INDEX/ THE INFRA-RED WINDOW

Variations in Optical Coupling Gels

We have been actively promoting the most recent version of our basic optical fiber coupling gel product, Nye Optical Couplant OC-431A. This is a clear and pliable, but non-melting and non-migrating, oxidatively-stable gel intended to reduce signal attenuation and increase the efficiency of fiber optic connections or splices. It has a refractive index at 25°C (Sodium D line) of 1.46, to match that of the more commonly used glass fibers.

In responding to several hundred sample requests for the OC-431A product, we have fielded quite a few specific requests for variations on the basic material. Variations appear to be needed to connect materials other than the usual glass, for transmission of unusual light frequencies, or for transmission under unusual design or environmental conditions. In most cases, we have been able to respond with an "Experimental Couplant" of one kind or another. A few examples are set forth here in the hope that some of our readers may be prompted to submit their own special needs.

A Window in the Infrared: If it is desired that a coupling gel transmit signals with minimum absorbance in the infrared, say in the 2 to 5 micron range, gels can be prepared from certain unusual synthetic fluids which show minimal infrared absorption peaks in this area. Ask for Experimental Gel GMS890601.

Low Temperature Pliability: If the low temperature viscosity of the regular OC-431A base oil (about 24,000 cs. at -20°F) creates problems in application or use, a lower viscosity base oil can be used. Ask for Optical Couplant OC-432.

Broad Area Coupling: If the intent is to couple, not two small fibers, but a broader expanse of glass, as with lenses or cathode ray tubes, an ultra-soft variation of the OC-431A can prove helpful. Ask for Optical Couplant OC-431A-VS.

Special Refractive Indices: Some fiber optics designers need to couple plastic (acrylic) rather than glass, and a different refractive index (1.49) will apply. Ask for Experimental Couplant B890626. Other targets we've tackled are 1.525 (Experimental Couplant B890703) and 1.4585 (Experimental Couplant B890629).

High Energy Transmission: It could be that the wavelength and intensity of the energy being transmitted are such that, over a long period of time, oxidative degradation can be induced in the gel's base fluid, in which case experimentation with more oxidatively-stable base fluids would be in order. This hasn't been presented to us yet but is a prospect, especially in some laser applications.

THE PROBLEMS OF AGEING

The "Shelf Life" of Lubricants

What is meant by the "shelf life" of an oil or grease? We would define it as the period following its manufacture during which a lubricant stored in its original container could be deemed suitable for use without a re-test of its physical characteristics prior to use.

Lubricants are inherently stable materials. Neither synthetic nor high-quality petroleum oils would be expected to oxidize, polymerize or volatilize over any reasonable (decade-long) period at the usual temperatures of storage. We have regularly checked the quality of certain synthetic hydrocarbon-based precision bearing oils over periods exceeding five years and have detected no significant change in viscosity or neutralization number, which would be the signal properties for degradation.

Hydrocarbons and silicones would likely be least affected by simple ageing. Ester oils, where the ester linkage may be subject to a minute degree of hydrolysis in the presence of moisture, could experience greater changes in neutralization number over long periods if moisture is present.

Greases can "age" in more complicated ways. The most likely mode by which time could affect grease quality would be by contraction of the gel structure. If this occurred, significant oil bleed would be evident and the remaining grease would stiffen. In other greases, the gel structure changes in such a manner that the grease becomes softer over a period of time.

The oil separation or "puddling" which can sometimes be found on the top of the grease in bulk pails or drums is usually insignificant when the separated oil quantity is compared with the mass of grease present. Such oil can normally be safely stirred back into the bulk of the grease in the container. Experience has shown us that much of this time-related oil separation can be reduced if the surface of the grease is kept smooth during storage; i.e., don't leave "craters" in the grease.

Oil separation over time is also a function of grease consistency. An NLGI Grade 000 grease could be expected to exhibit pronounced oil separation from the day of its manufacture.

As with oils, there are straightforward bench tests by which grease qualities can be measured and any "age-degradation" determined. These are worked penetration, dropping point, oil separation, and, again, neutralization number.

It should be emphasized that manufacturers' recommendations on shelf life relate only to storage life in the original container. Once the oil or grease has been applied to a bearing or other device, factors which the manufacturer can neither predict nor control will govern lubricant life. A new and different data base on either storage or operating life would have to be constructed. Again, high quality lubricants are inherently stable materials; and long life is a reasonable expectation in the absence of temperature extremes or other hostile conditions.

Our company's normal recommendations on shelf life of oils or greases are two to three years after date of manufacture. These are conservative estimates, and we are prepared to make more liberal recommendations as conditions require.

Customer concerns about shelf life lead to some difficult bureaucratic impasses at times. To avoid being caught with a lubricant stock which has exceeded its shelf life estimate, a lubricant purchaser will stipulate that no oil or grease will be accepted which does not have at least, say, 80% of shelf life remaining. Other purchasers will require "grease no more than three months old". Since many specialty greases, particularly for precision bearings, are manufactured in ten to twenty pound batches, perhaps only once per year, these limitations on shelf life can mean that grease of an "acceptable age" is simply unavailable.

As a practical matter, there is no technical reason to suspect the usefulness of high quality oils or greases after only one year, and only after two or more years should any "age-related re-testing" be justified. We hope the considerations presented here will help relieve some of the concerns which have led to difficult and unnecessary shelf life restrictions.

MAINTAINING IMPORTED EQUIPMENT

U.S. Availability of Products from Dow Corning-Europe

Research and development over the past decade at Dow Corning, Munich, Germany, into new forms and combinations of solid lubricants has resulted in introduction in Europe of a range of new and unusual specialty lubricant products. These lubricants have been sold to European machinery manufacturers and are recommended for original lubrication and for maintenance of certain machinery products; however, some of these lubricants are not immediately available here in the United States. American purchasers of this machinery, in order to follow maintenance and warranty instructions, would need the European lubricant, and William F. Nye, Inc., is attempting to set up a U.S. distribution point for such products.

Among the lubricant products involved are:

- Three different lubricating pastes incorporating various types of solid lubricants;
- Seven specialty greases, both petroleum and silicone-based, with a variety of solid lubricant additives;
- Five chain and gear lubricants of varying consistencies containing molybdenum disulfide or other fortifiers.

Since many of these lubricants are used on production equipment, your Plant Engineer would probably appreciate receiving notice of this service. Should you be in the position of needing either data on or a supply of one of these Dow Corning-Europe lubricants, we'll do all we can to help.

BRIAN C. HOLLEY

Our Man in Detroit

William F. Nye, Inc. has a Detroit area office manned by Brian Holley, an energetic and highly-valued new member of our technical staff. Brian is covering our activities in the three state area of Michigan-Ohio-Indiana and is especially attentive to new lubricant promotion among the instrumentation and accessory suppliers for the automotive industry. He is an electrical engineer and has a good working knowledge of synthetic lubricant applications for electromechanical devices and electrical switches and connectors. Brian is recently married, to Monica Parrish, and they live in Oak Park, where the Nye office is also maintained. From Oak Park, he undertakes daily (or longer) sorties to provide application engineering support to our present and prospective customers in his area. You can call him at (313) 542-2720.

Prospects for Products Containing Chlorinated Solvents

The developing ozone depletion controversy, which has implicated the most commonly-used chlorinated solvents, trichlorotrifluoroethane and 1, 1, 1-trichlorethane, is already affecting both the cost and availability of such solvents. Prices for dispersions of oils or greases in halogenated solvents will likely be increasing steadily for the foreseeable future. Beginning probably at the local or state level, there will doubtless also be use restrictions and regulations on such solvents imposed by government authorities and, in some situations or localities (as typified by the new regulations in Irvine, California), it may prove impossible to utilize products containing chlorinated or chlorofluorocarbon solvents, regardless of price.

Unfortunately, the use of alternative solvents involves compromises of various sorts. Our first recommendation would be the use of mineral spirits, which is actually a highly refined, low-odor kerosene with a flash point of about 105°F. This flash point removes the solvent from the classification "Flammable" (at least in the United States); however, it remains a combustible liquid, and precautions against explosion and fire must be respected.

An additional disadvantage of mineral spirits, at least relative to the aforementioned halogenated solvents, is lower volatility; a mineral spirits with a flash point of 105°F would be significantly slower in evaporating. Also, although mineral spirits is not considered highly toxic or hazardous from a health standpoint, the ACGIH TLV (threshhold limit value) for its vapor is only 120 ppm compared to 350 ppm for 1, 1, 1-trichlorethane and 1000 ppm for trichlorotrifluoroethane. Mineral spirits is definitely a lower-cost solvent, however.

For certain highly specialized materials, in particular for fluorinated polymers such as our NyeBar barrier film products and for dissolving fluorinated ether oils, the shift will have to be toward fully fluorinated solvents. It is the chlorine content of solvents which appears to render them harmful in the stratosphere. By the end of 1989, we expect to have available alternative, fully fluorinated solvent formulations for the various NyeBar solutions; unfortunately there will be cost penalties for the fully fluorinated option.

In addition to the pressures arising from the ozone depletion issue, we also expect overtones from the anticipated "greenhouse effect" which will affect the use of all solvents, the vapors from which are not re-condensed. If your company has been using a grease or oil plating solvent dispersion, you should be alert to the imminent need to consider the possibility of solvent recovery or, more practically, the use of a different method of lubricant application, not involving solvents.

The semiconductor industry has prompted the development of a great variety of precision application equipment for very small, controlled volumes of liquid or plastic compounds. This equipment should be readily adaptable to lubricant dispensing and application. Its use will require for many companies a drastic shift of attitudes and a capital investment, but it holds the potential for significant savings by reducing lubricant waste and by greater control in deposit consistency and placement accuracy.

We stand ready to refer you to firms manufacturing precision dispensing equipment for grease or oils, should you want to consider alternative application methods not involving solvents.

Response Coupon

Cut along the above line and mail in your company envelope to:

WILLIAM F. NYE, INC.
P.O. Box G-927, New Bedford, MA 02742
Telephone (508) 996-6721

Special Requests or Comments:

Fill in your name company and mailing address on the reverse of this form.

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.

Highest Operating Temperature ______ °C/°F.

If an electric contact, is arcing expected? ______

Desired Life at High Temperature ______

Present Lube ______

If unsatisfactory, in what way? ______

Unit Costs for Small Amounts of Expensive Grease

The price of a lubricant, expressed on a per pound basis, is only one element in determining its cost effectiveness in any particular device. Specialty lubricants, especially for the markets we serve, can be used in vanishingly small amounts on a "per device" basis. Volumes are often difficult to calculate or even to visualize. When one asks the question as to how much grease is needed on a single mechanical pivot or a single potentiometer track, the reply may be "Oh, just a dollop." The table below is our attempt to define the "dollop" and to interpret the implications of various sizes of "dollops".

In the far left column is a round dot. Consider this dot as a hemisphere of grease, the base of which has the diameter noted. The "grease weight" column records the number of pounds of grease required to lubricate 100,000 devices if each device uses a grease amount represented by the hemisphere. The code LD stands for low density, meaning a "standard" density grease with a specific gravity close to 1.0, such as most traditional hydrocarbon, silicone or ester-based greases. The code HD defines a high density grease with a specific gravity closer to 2.0, such as fluorinated ether-based greases. (Some fluorocarbon-gelled greases are intermediate in density; some hydrocarbon greases have specific gravities lower than 1.0.) Using the volume shown in milliliters, it is simple mathematics to obtain grease cost per device for any grease density and any associated grease price. Note that the last two columns express lubricant cost per device in **cents**, not dollars.

Diam. mm.	Volume* ml.	lbs./100,000 units LD	HD	Grease cost per device LD.$10/lb	HD.$100/lb
1	0.0003	0.06	0.12	0.0006 ¢	0.012 ¢
2	0.0021	0.46	0.93	0.005 ¢	0.09 ¢
3	0.007	1.6	3.1	0.016 ¢	0.31 ¢
5	0.033	7.2	14.4	0.07 ¢	1.4 ¢
10	0.26	57.8	115.5	0.58 ¢	11.6 ¢

* Equivalent to weight of the hemisphere in grams for an LD grease. An HD grease would weigh twice as many grams.

Cut along this line and mail sample or literature request to: **William F. Nye Inc., P.O. Box G-927, New Bedford, MA 02742**

LITERATURE I

Electrical Connector Lubrication

In the April 6, 1989, issue of **Machine Design,** Robert Mroczkowski of AMP, Inc., Harrisburg, PA, discusses some basic questions about electrical connector design. His article "Electrical Contacts Get Off the Gold Standard" is an excellent primer about friction, wear and lubrication in electric contacts with special reference to tin metal connectors. The treatment of the fretting corrosion potential with tin contacts is especially thorough. The article further discusses the multi-functional usefulness of electrical connector lubricants- for environmental sealing as well as for friction, wear and fretting corrosion reduction. We thought enough of it to purchase a quantity of reprints and we are enclosing a copy with our special catalog on **Designer Lubricants for Electric Contacts and Connectors.** We would be glad to send you a copy of the article reprint and/or the catalog on request.

LITERATURE II

"Fluid-Central" Re-Born

Back in 1967, as we were attempting to assemble a comprehensive collection of synthetic oils for our "lubricant drug-store" concept, we issued a four-page descriptive summary of the grades and physical properties of all the various then-available types of synthetic functional fluids, actually listing prices for small quantities. Looking back, the most intriguing data in that little catalog might be the 1967 prices. However, the document became quite popular as a guide and summary of the then still-expanding universe of synthetic fluids. In the decades since, there have been some contractions as well as some very important additions. We are re-issuing "Fluid-Central", up-dating it to include new types of synthetic oils currently commercially available. Additions since 1967 would be the entire range of synthetic hydrocarbons (poly-alpha-olefins) and also the methyl-alkyl silicones. Fluoroalkyl esters are no longer listed, but the types of fluoroalkylpolyethers have elaborated. A copy of this new guide is available on request.

LITERATURE III

The Lubeletter Digest

Everyone on the Nye Lubeletter mailing list should by now have received a copy of the **Nye Lubeletter Digest,** a compendium of over twenty of the more durable articles from the Nye Lubeletters for the years 1972 to 1987. We feel that this is a valuable reference work for anyone involved in specialty lubrication. If you missed getting a copy, or if any of your colleagues might benefit from having this document in their files, please let us know. The **Nye Lubeletter Digest** is available at no charge.

Send lubricant sample (from reverse)
or literature (as checked below) to:

Name: ______________________

Title/Position: ______________________

Company: ______________________

Mailing Address: ______________________

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Send:
- ☐ Article on Electrical Connector Lubrication
- ☐ Catalog on Electrical Contact Lubricants
- ☐ Fluid-Central Catalog
- ☐ Nye Lubeletter Digest
- ☐ Nye Designer Lubricants (Summary Catalog)