

NYE

lubeletter

FROM: WILLIAM F. NYE, INC., P.O. Box G-927, New Bedford, Mass.



THE MOLECULE AS A FORTRESS

The Shielded Polysilicates A New Type of Synthetic Lubricant

New families of synthetic lubricants appear infrequently. Perhaps once in a decade if we look back to mid-century. Existing government regulations on introduction of new chemicals may in the future reduce even this rate of singular excitements. Here in 1979, however, we are able to announce an impressive new addition to the universe of synthetically-derived functional fluids - the shielded polysilicates.

Silicate esters have been around a long time - as wide temperature hydraulic fluids and electronic coolants, especially suited for extreme low temperatures. For general purpose lubrication they have displayed a critical flaw-hydrolytic instability. They would break down slowly in the presence of high humidity.

A new molecular configuration, comparable to "putting the wagons in a circle," imparts unusual hydrolytic stability to the silicate esters, producing what we are calling shielded polysilicates. Stable silicon-oxygen linkages at the center of the molecule are surrounded by a hydrophobic shield of hydrocarbon. The resulting oil is an oxidation-stable fluid with wide temperature capability from -100°F to +300°F, with good lubricating capability, low volatility and excellent viscosity index.

Viscosity index (v.i.) is a dimensionless parameter reflecting the rate of viscosity's change with temperature. It is a key feature among the polysilicates' special qualities. The higher the viscosity index, the less viscosity changes with temperature. The best of the hydrocarbons, even with "v.i. improver" additives, rarely exceed a viscosity index of 200. Our shielded polysilicates, Nye Synthetic Oils 340 and 345, have viscosity indices close to 300.

Note the viscosity comparison in the table below comparing a shielded polysilicate with (1) a 50 cs (at 77°F.) dimethylpolysiloxane, representative of the highest known viscosity indices and (2) a high quality synthetic hydrocarbon oil.

Viscosity, cs.	Nye 340 (Polysilicate)	50cs Silicone	Nye 180 (Hydrocarbon)
at 210°F.	10.5	16	5.7
at 100°F.	39	38	32.6
at -40°F.	1070	250	8370

This table raises the question "Why not use a silicone?" The answer lies in basic lubricating capability. The shielded polysilicates are good lubricants without additives, comparable to the diesters in anti-wear testing. Further, they are sturdy at high temperatures, but they do require antioxidants for thin film use above 100°C. Fortunately, they readily accept most additives including antioxidants.

In fact, the solubilizing capability of shielded polysilicates leads to one of their more promising applications, as vehicles for additive infusion into silicone oils.

Silicones are notoriously unreceptive to the most useful antioxidants, rust inhibitors and, most especially, anti-wear and extreme pressure agents. Using a shielded polysilicate, however, to solubilize an anti-wear agent into a silicone formulation permits Shell 4-Ball wear scars (steel-on-steel) to be cut in half.

The combination of unusual qualities in the shielded polysilicates promises a wide variety of successful use in difficult lubricant applications where heretofore only compromises have been practical.

We are presently offering two viscosities of formulated shielded polysilicates for evaluation. Nye Synthetic Oil 340 is a stabilized 39 centistokes (at 100°F.) oil; Nye Synthetic Oil 345 is lighter at 25 centistokes at 100°F. Several companion greases for each oil are available involving both fluorocarbon and silica as gelling agents. Other gelling agents can be used and will be as specific needs arise.

Whether your need is for wide-temperature fluidity, high viscosity index with good lubricity or an improved additive response from a silicone formulation, we can recommend one of these newest of synthetic lubricants for your consideration and evaluation. Use the Lubeletter Response Coupon on Page 3 to let us know your special requirement.

PROTECT THE SUBSTRATE

Lubrication and Protection of Gold-plated Electrical Connectors

An unusual inhibitor-lubricant has been developed which can reduce insertion and desertion wear in gold-plated electrical connectors and can also protect the plating substrate from corrosion.

Gold forms no tarnish film, even in grossly-polluted air. The use of gold plating on electrical connectors is a critical element in the reliability and dependability of electronic equipment. The steadily rising cost of gold has impelled efforts toward minimum plating thicknesses, which, however, render the connector more vulnerable to plating wear and porosity, either of which can lead to exposure of the base metal substrate. Such exposure would be catastrophic to connector reliability.

NyeTact 512 is a multi-component inhibitor/lubricant system, applied to connectors by dipping or brushing from a dilute solution in a fast - evaporating solvent. The resulting lubricant film on the connector provides a dramatic reduction in wear of the soft gold. Of equal importance is its ability to anchor to the noble metal surface and through any surface porosity to the metal substrate. It thereby presents a hydrophobic barrier to the combination of sulfur dioxide and moisture in the air, which would otherwise cause galvanic corrosion of the substrate and failure of the connector. Both results are accomplished without affecting the electrical conductivity of the connector linkage.

The NyeTact 512 film is a semi-solid at temperatures to 75°C. and will not creep away from the contact. Its inhibitor function is reduced at temperatures above 75°C., but testing has shown that it maintains its lubricant properties to temperatures of 150°C. It will not chemically decompose below 200°C. When proper care is used in selection of the solvent vehicle, plastics in the connector body are not affected by it.

Use of this special lubricant can result in significant savings in gold plating costs, since thinner platings can be tolerated. Improved reliability of a wide range of electronic devices can be achieved. An evaluation sample along with a technical bulletin is available on request.

Rust Inhibitor For Indoor Storage

Instructions for Preventing Rust:

1. Run a tub of water.
2. . . . You may have turned us off completely before reaching Instruction No. 2, so we had best begin again by outlining the qualities looked for in a good rust inhibitor for protecting ferrous metal parts in storage.
 - a. it should be easy to apply;
 - b. it should be non-messy, permitting ready handling of the treated parts;
 - c. it should not interfere with subsequent lubrication of the parts;
 - d. it should effectively prevent rust.

A very thin protective film of rust inhibitor can be 'plated' onto a rust-vulnerable part by dipping the part into a solvent solution of the inhibitor and allowing the solvent to evaporate. Since the cheapest and safest of all solvents is water, a water-soluble rust inhibitor would allow easy application. By adjusting the concentration of the active inhibitor in the water solution, a useful compromise can be obtained between film thickness and inhibitor effectiveness.

NyeFilm 541 is a highly effective multi-component rust inhibitor, which is also water-soluble. Water solutions ranging in concentration from 10% to 30% of NyeFilm 541 have proven most successful. The film deposited from a 30% solution has prevented rusting for 160 days in a 100°F. humidity cabinet test.

Use of a hot water dip (150°F. to 170°F.) produces the most effective coating; however, satisfactory results can be achieved with ambient dipping temperatures. Should the film have to be removed, as for painting or plating, normal degreasing procedures can be used.

A technical data sheet and a complimentary sample of NyeFilm 541 will be sent on request.

Polyphenyl Ether Greases

The stable linked - ring structure of the polyphenyl ethers has come to mean the ultimate in resistance to stress, either oxidative, thermal or radiation - induced, among synthetic lubricants. Polyphenyl ethers consist of benzene rings linked in a careful pattern through oxygen atoms. Presently, commercial availability is limited to a single polymer - a 5-ring linkage. This oil, available as our Nye Synthetic Oil 438, has a viscosity of 360 centistokes at 100°F. and a pour point of +40°F.

As companion lubricants, we now have available two greases based on this 5-ring polyphenyl ether oil. One, our Nye FluoroGel 810, uses polytetrafluoroethylene as the gelling agent. A newer material, Nye NyoGel 718B, uses an alternative non-melting gelling agent, more resistant to radiation than the fluorocarbon polymer. This latter grease is now being used in specialty valve applications exposed to nuclear radiation.

The aromatic ring structures of the polyphenyl ethers have put them first on the list for stability under high radiation. Either the 810 or the 718B grease would also provide excellent stability against oxidation or thermal breakdown at temperatures to 500°F. These are expensive greases; yet, for certain "grim - edge" applications, there may be few alternatives. Let us know about your specific intended use. We would be pleased to send evaluation samples at no charge.

NYEFILM 571

Molybdenum Disulfide Colloidal Spray

Formulating a severe service lubricant often involves a patient elimination of weak links in a chain. This has been especially true with dry film solid lubricants. Most dry film materials require binders in order to adhere to the surface to be lubricated. These lubricants usually have excellent wide temperature capabilities - one of the reasons for their wide use - and, unless the binder involved has the same wide temperature usefulness, the qualities of the dry film are compromised. Binders can also affect the lubricity or friction-reducing ability of the solid lubricants.

Our NyeFilm 571 is a molybdenum disulfide dry film aerosol formulation with binder content reduced to an absolute minimum, which yet provides an effective, immediately adhering film of this most widely used dry film solid lubricant. Molybdenum disulfide readily burnishes onto a metal surface, and the effect of the NyeFilm 571 spray is that of a burnished film.

NyeFilm 571 is recommended for all applications where wet lubricants are not desired or cannot be tolerated, where close fitting parts have to be assembled, or where extreme wide temperatures, from -200°F. to +750°F., are expected. Send us a description of your application, and we will send a sample spray can.

JUST A FEW

Grease Packaging — Tubes, Cartridges or Syringes

Have you known the frustration of wanting too few of something? Welcome to the club! This club surely includes all of us who ever wanted lubricants in small packages - like 200 ¼-ounce tubes of grease.

We're trying to fill a "service" gap here.

We know people who've had the frustration of being confronted with "minimum orders" of 25,000 or even 100,000 units for small grease dispensing containers. We are stocking at present two sizes of metal grease tubes — ¼-ounce (5 to 9 grams weight, depending on grease density) and 1-ounce (20 to 35 grams). We can custom fill any grease you may specify, our own or someone else's, into these tubes. With luck, we'll expand this service shortly to include 4-ounce tubes. Already, we can provide 3-ounce cartridges and a variety of sizes of plastic syringes.

Our ¼-ounce tubes are made of tin (fast becoming a precious metal) while the 1-ounce tubes are aluminum. The smaller ones cost us more than the larger, which has led to perplexity among several purchasing agents looking for quotations in both sizes.

With this warning that we, too, have a few frustrations to offer, we are actively soliciting business in custom filling of greases in small tubes, cartridges, or syringes. Please let us know your needs.

Multipurpose Lube Kit

For years we've sold our Instrument Lubricant Kit B, a small kit collection of three oils and three greases intended to provide instrument servicemen with a comprehensive range of wide-temperature lubricants for instrument repair and field lubrication. This kit was designed before the development of the plastic-compatible synthetic hydrocarbons, and we have now redesigned this kit concept to incorporate these multipurpose lubricants.

We are pleased to introduce Instrument Lubricant Kit H, containing the following items:

- Synthetic Instrument Oil 132G** - for light oil needs
- Synthetic Oil 188B** - for medium oil needs and motor bearings
- Electric Contact Oil 140** - for switch and electrical contact lubrication
- Rheolube 728J** - a semifluid grease for low-power, stay-in-place needs
- Rheolube 362** - a general purpose light instrument grease
- Rheolube 723 - MS** - fortified with molybdenum disulfide for heavy loads.

The kit contents are packaged in applicator containers. For the oils we provide a 2-ounce plastic squeeze bottle with a dispensing valve and a 5 inch long small bore applicator tube. The greases are packaged in a 1-ounce aluminum squeeze tube with an applicator tip. Write for our brochure on Nye Instrument Lubricant Kit H. The price is \$18.00 per kit.

Electrically-Conductive Lubricants

Dr. Walter Mitty announced with great concern as he operated, "Coreopsis has set in!" We must report about our first electrically conductive greases, "Syneresis has set in." Lest anyone fear a disease as serious as Dr. Mitty encountered, we should quickly define syneresis as "the contraction of a gel, releasing liquid therefrom."

The syneresis in our NyoGel 756 was not serious as oil separations go, only a few percent; however, in a ball bearing, where a conductive grease was needed to bleed static electricity out of the rotating element, the small amount of oil bleeding from the gel accumulated in the narrow ball raceway contact area, and effective conductivity was lost.

We believe we have achieved a fix on this problem in our NyoGel 756G which incorporates a second gelling agent to reduce oil separation to an innocuous minimum. Volume resistivity for NyoGel 756G is measured at 80 ohm-cm.

The approach we have taken in preparing electrically conductive greases produces far more useful lubricants than can be accomplished merely by filling a grease with silver or some other metal powder.

This particular 756G formulation is intended for ball bearings. There are other needs for electrically conductive greases and other formulations designed specifically for them. One example is an ultra-high viscosity silicone oil gelled to a conductive grease for a special phonograph cartridge application. The gellation technique for NyoGel 756G can be used with a wide range of functional fluids, and we can prepare gels for special needs as may be necessary.

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, MASSACHUSETTS 02742, Tel. (617) 996-6721

(Make Sure Your Correct Address Appears On The Reverse Of This Coupon)

SEND LITERATURE ON THE FOLLOWING:

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.

Desired Life at High Temperature _____

Present Lube _____

If unsatisfactory, in what way? _____

SPECIAL REQUESTS OR COMMENTS:

SMALL ORDER SERVICE

Silicone Greases and Compounds

A full range of wide-temperature silicone and fluorosilicone greases and compounds has been added to our small-order, small-container service for Dow Corning Corporation's broad line of specialty lubricants.

We have provided this service for the Dow Corning DC200, DC510, DC550, DC710 and FS1265 fluids for several years, and we are now stocking the equally widely-used DC33, DC41, and DC44 greases, the DC4, DC5 and DC7 compounds along with several other specialties, including a molybdenum disulfide paste and a heat sink compound. The fluorosilicone-based greases FS3451 and FS3452 are included in the new program. All of these products are available in 1-ounce metal tubes, 1-pound jars and 7-pound pails. Nye labels are used, and our \$10.00 minimum billing is the only ordering limitation.

A complete price list is available, along with which we will send Dow Corning's brochure "Selection Guide to Electrical/Electronic Materials" and their "Selection Guide to Silicone Fluids".

Special dispenser applicators, such as plastic syringes, cartridges or very small (1/4-ounce) tubes are available, and we can provide quotations for any specific needs.

WANTED: ONE THEORY

Switch Lubricants For Arcing Conditions

In our work with lubrication of electric switches, we are repeatedly asked for lubricants which can withstand a bolt of lightning. Not in so many words, perhaps, but this is the implication of any request for an arc-resistant lubricant. When contacts carrying any significant amount of electrical current are separated, the tendency of the current to continue to flow across an opening gap between the contacts causes a spark, or arc, which, depending on the amperage, can persist for a sufficiently long period to cause damage to the separating contacts and to anything in between, including any lubricant.

There is little point in looking for a lubricant, however exotic or expensive, which can withstand degradation in the arc. The temperatures in an electric arc can reach thousands of degrees, far beyond the thermal degradation temperatures of any known functional fluid, even polyphenyl ethers or fluorinated ethers. In the path of the arc, however minute it may be, lubricant molecules are blasted apart into smaller fragments. Silicones become sand, and fluoroethers toxic gases.

There is considerable speculation that some materials have the capacity actually to suppress arc formation; however, we have as yet been unable to confirm any such phenomenon. Should a theory of arc suppression be volunteered by anyone involved in this area of electric contact phenomena, we would welcome the opportunity to synthesize a candidate arc-suppressing lubricant, utilizing any special qualities which can be contributed from among the ever-broadening range of synthetic functional fluids.

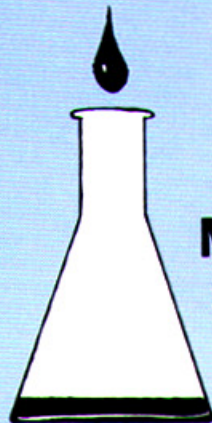
In the meantime, however, there is a contribution to be made by synthetic fluids which, when degraded by the arc, degrade to harmless volatiles rather than to carbon, sludge, gum or polymeric residue. When used as greases, the gelling agent should also degrade harmlessly.

Our new NyoGel 782 is an electric contact grease prepared for switches operating over a -10°F. to +200°F. temperature range where arcing is unavoidable. The base oil is a polyether, and precautions have to be taken with a few plastics and elastomers; however, NyoGel 782 is a proven wide-temperature switch lubricant which "burns clean" under arcing conditions and deserves your consideration for special switch lubrication problems. Evaluation samples are available at no charge, and a data sheet has been prepared.

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**New Developments in
Specialty Lubricants**