SPRING 1974

NYE lubeletter

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

PROBLEM-SOLVING AND SPECIALTY LUBRICANTS

A SURVEY OF CAPABILITIES

Our company has grown by responding to specific needs for special lubricants for difficult applications, usually involving highly-engineered small devices. The resulting collection of successful products defies the usual categorized catalog listing. They are as varied as the problem applications our customers have brought to us. Further it is a constantly expanding collection. Therefore, using this edition of the Nye Lubeletter as a vehicle, we are trying a new approach to a "Summary Catalog", not merely listing products but displaying primarily problem areas where we have demonstrated capabilities for effecting a solution. Specific oils, greases or specialty materials will be mentioned where applicable.

HOW TO USE THIS "LUBELETTER"

If the problems discussed in this Lubeletter are your problems, you can obtain literature on particular Nye products by checking the appropriate box on the bottom of page 3; detach the Response Coupon and mail to William F. Nye, Inc. (or telephone us at 617-996-6721).

For a lubricant sample especially selected for your specific problem or application, complete the Lubricant Recommendation form on page 3; detach and mail to us. A visit by a technical representative can be arranged if desirable.

Remember to check that your name and address appear on the reverse of the Response Coupon and that they are correct.

THE PROBLEM: **TEMPERATURE RANGE**

LOW TEMPERATURES

Synthetic lubricants came of age in World War II.

Among the early successes was the application of diester oils in aircraft instruments exposed to severe cold at high altitudes; -65° F. became a standard target for such needs. Several types of oils can be used at extreme low temperature - esters, silicones, and more recently some super-refined and synthetic hydrocarbons. A variety of gellants are available to produce low temperature greases from these oils. Low temperature usefulness is not merely a function of freezing point or "pour point" of the oil; but must be related to the power available in the device being lubricated. The higher the available torque, the lower the temperature at which any particular oil or grease can function.

The need for low temperature lubricants has extended beyond traditional military uses to include a wide range of industrial, automotive and appliance applications. Requirements to -30° F. in a gear train for an outdoor appliance or to -40° F. in an automotive switch are not uncommon. Nye can provide a wide variety of candidates for low temperature needs, including greases for -100°F. use and solid-film lubricants for even lower temperatures.

WIDE TEMPERATURES

A principal advantage of the several synthetic oil families which form the core of our oil and grease line is not necessarily the very low or very high temperatures at which they are capable, but the very wide temperature "ranges" over which they can operate. This is an important fact of life in today's technology; the tolerances are now being stretched both ways. Not only are automotive under-hood temperatures going up - say, to 300° F. (or higher for many automotive accessory devices); but the low temperature operating limits are being stretched, even to -40°F., to allow ready operation in Alaska or in Dakota or Alberta winters. The same stretching is occuring in certain appliance and switch applications, where miniaturization concentrates energy within small packages, and the lubricant, if there is one, must start-up cold and operate hot.

The diesters, the newer polyol esters, synthetic hydrocarbons and (with qualifications on load-carrying capacity) many silicones can meet these difficult wide-temperature needs, some better than others. The choice of gelling agent in greases is equally significant for wide-temperature usefulness.

HIGH TEMPERATURES

High temperature exposure is a much more critical problem with our formulations than with many lubricant manufacturers, since for the most part we are dealing with small devices which are lubricated for life. The oil or grease cannot usually be replaced with fresh, undegraded lubricant after a high temperature excursion. Rather, the lubricant must be so designed as not to degrade under the temperature and dynamic conditions imposed by the device over the range of its intended operating life. Thus, the repeated questions we put to people with high temperature problems - how high and how long? - constant or cycling?

Extreme high temperature capability (which to us means above 400°F.) often involves a compromise with other lube properties - such as low temperature capability or load-carrying capacity. Both oxidative and thermal degradation must be considered, along with volatility. If lower than atmospheric pressures are involved, alternatives may be further limited. Above 600°F., any oil or grease must be expected to degrade rapidly, and only solid-film materials, as molybdenum disulfide or boron nitride, can be counted on for extended life.

TEMPERATURE RANGES: SELECTED NYE GREASES

GREASE	BASE OIL
706A	Polyol Ester
719A	Synth-Hydrocarbon
813	Halogenated Silicone
789	Polyol Ester
806	Phenyl Silicone

THE PROBLEM:

HIGH LUBRICITY, OR LOW FRICTIONAL DRAG

William F. Nye, Inc. was founded over a hundred years ago during the whaling days in New Bedford. Ezra Kelley and Bill Nye pioneered the use of porpoise jaw (or dolphin head) oil as a stable, high lubricity oil for watches and clocks. Until the development of synthetic, non-spreading timepiece oils in the 1940's, this oil was a standard and hallmark among horological lubricants.

Lubricity is a difficult characteristic to measure, and the particular qualities imparted by the dolphin oils - stability, low wear, low frictional drag - cannot be fully displayed merely with coefficient of friction measured on the basis of point or area contact. Rather, a special test procedure involving friction versus velocity has proved to be necessary to separate the men from the boys where long-life, stable, low friction lubrication under boundary (low speed) conditions is required.

We are active in development of new wide-temperature formulations for bearing applications where low frictional drag is essential, as in a phonograph turntable. These are developmental oils, involving both synthetic and natural oil components, and are being formulated especially to extend the thin film oxidation stability of the traditional natural oil blends.

THE PROBLEM:

CHEMICAL RESISTANCE

Working with the many functional fluids which comprise synthetic lubricants, Nye has worked into the area of non-hardening sealants, especially for valves, where resistance to chemicals or process fluids can be critical. This is a new area for us, and in a way we are starting at the top and working back. Our first product uses the ultra-stable fluoroether oils, gelled with a fluorocarbon into a wide-temperature grease resistant to aggressive chemicals and permitting longer exposure to such chemicals than is possible with chlorofluorocarbons or fluorosilicones.

The grease is our Nye Fluoroether Grease 849. Besides its stability in the presence of strong acids, bases, oxidizers, halogens and nitrogen oxides, it has another special quality for the electron microscope field. Fluoroether oils do not polymerize or form deposits when fragmented by ionizing radiation; the molecular fragments are volatile. Nye Fluoroether Grease 849 can thus be used in electron microscopes for moving parts such as specimen support stages and aperture controls or for seals, gaskets and flanges without compromising system cleanliness.

We expect to have other novel valve sealants available and invite inquiries about problem applications.

THE PROBLEM:

UNUSUAL PACKAGES— SMALL CONTAINERS

A recent count showed that we stock three dozen different containers of one quart or less (not counting aerosol cans) in glass, plastic or metal. This variety has permitted us to serve unusual customer needs for small containers of oils or greases, either our own formulations or those of others, either with our label or with a special customer label. One manufacturer buys 1.3 ml. of a special instrument oil in a 1/2 dram glass vial to send out with a special instrument. We don't encourage containers this small (they get lost in shirt pockets), but we have an increasing business in a very useful 1-1/4 fluid ounce plastic squeeze bottle containing a high-grade maintenance oil for small motors. We apply a label specially printed for each individual customer with instructions for servicing his device or with his part or stock number.

This packaging service has extended into lubricant kits. We have a widely-used Nye Instrument Lubricant Kit, containing three oils and three greases, all in dispenser containers. For one special customer, we assembled a Camera Repair Kit, containing two oils, four greases and a solid film lubricant.

Let us know if you have any needs or interests along these lines.

LUBRICANT MIGRATION/OIL CREEP CONTROL

NON-SPREADING OILS

Our heritage with timepiece lubricants has led to considerable involvement with problems of oils creeping away from where they are wanted or into places where they shouldn't be. Special synthetic oils which are inherently non-spreading have been developed for watch lubrication. Nye has three varieties,

(1) Nye Astro Oil - for very low temperature needs (to -40° F.)
(2) the PML series of oils - for standard men's and ladies' watches and for clocks and timers with escapements
(3) Fulchem Oil 468 - for severe environments at higher temperatures and where stay-in-place capability becomes more critical than continuous long-term operating life

A recent interesting and successful application of the last-mentioned 468 Oil is as an impregnating oil for a very small electric motor where the proximity of the bearing to the commutator presented a critical oil creep problem. The motor operates infrequently at high speeds and for short periods in this particular application.

BARRIER FILMS

By applying a non-wettable surface around an oiled (or greased) area, oil migration can be controlled. Our NyeBar solutions produce low surface-energy films which are not wetted by most lubricating oils. Creep cannot occur without wetting, and unless large volumes of oil or significant centrifugal or other dynamic forces are present, the NyeBar films can prevent oil creep.

Two types are available,

(1) NyeBar - Type C - a relatively costly fluorocarbon polymer, available as a 2% solution in the solvent xylene hexafluoride. Its extremely low surface energy can prevent creep of silicone oils up to 400° F.
(2) NyeBar - Type F - a lower-cost, but also somewhat less effective barrier film is available as a 2% solution in trichlorotrifluoroethane.

A 6-ounce aerosol container has recently been introduced for NyeBar - Type F and has proved useful for quick application to large rotating shafts in electric power plants where oil creep from turbine bearings has created problems.

ULTRA-LOW-SHEAR GREASES

Greases were originally developed as a means for keeping oils in place. The gel structure of a grease increases "apparent viscosity" relative to the oil from which it was made. In many small, low-power devices, greases cannot be used.

Nye has worked with several approaches toward achieving a gel structure with minimum attendant increase in "apparent viscosity" or internal shear resistance of the grease. The most successful approach has been through use of polytetrafluoroethylene as a gelling agent and our Fluorocarbon Greases have achieved wide uses in devices as varied as electric demand meters, potentiometers, surveying instruments, cameras, switches and small motor bearings.

Newly-available polymers have permitted sharp reduction in price for many of our fluorocarbon-gelled greases. Large volumes of such materials are now being used in push-button switch assemblies both in telephone and wide-temperature automotive applications.

THE PROBLEM:

ELECTRIC CONTACT LUBRICATION

SLIDING CONTACTS

Many people leave electrical contacts unlubricated; and certainly, if loads and other factors permit dry operation, this is preferred. On the other hand, ordinarily insulative oils and greases, when present in thin film on contact surfaces, can reduce wear, noise and friction. Lubricants are less effective in point contacts than in sliding contacts since shearing of the lubricant to permit current flow either through asperities on the contact metal or, by means of the "tunnel effect" through a thin lubricant film, is essential to effective operation of lubricated contacts.

Nye lubricants for sliding contacts originally were developed for potentiometers; two ester greases - Rheolube 745R and Thixo Grease 786 - have given best results. Good results have also been obtained on several unusual printed circuit applications with these greases. Both greases have -65° F. to +200° F. capabilities, as does a companion ester-based oil, Nye Synthetic Instrument Oil 202. Hydrocarbon-based analogs are available where ester-vulnerable plastics are present. For general purpose sliding contact lubrication (especially for maintenance purposes), where temperature extremes are not involved, we offer our NyeTact 505, a high lubricity oil in a 3-ounce aerosol spray can.

STATIONARY SEPARABLE CONTACTS

Plugging and unplugging connectors or printed circuit assemblies can cause wear on the contacting elements, and tarnish of contacts can create even more serious problems. Lubrication and tarnish prevention for such stationary, separable contacts requires a semi-solid lubricant which will not creep away during the "stationary" part of contact operation. A traditional lubricant for such use has been petroleum jelly, which unfortunately melts slightly above 100° F., and tends to creep away.

NyeTact 510 was developed especially for this type of contact. This is a highly-stable hydrocarbon-based lubricant with a special binder. It is available in dilute solution in a fast-evaporating non-flammable solvent. When the solvent evaporates, the resulting thin lubricant film is non-migrating and highly resistant to atmospheric oxidation, while protecting the contact from corrosion or contamination by atmospheric pollutants.

NyeTact 510 is now available in a 6-ounce aerosol spray can to simplify application to multiple "fingers" on printed circuit boards which are frequently inserted or removed from computer equipment.

ARCING CONDITIONS

Where electrical conditions cause arcing between contacts, it is extremely difficult to obtain long-life contact lubrication. The temperatures in any electric arc are sufficiently high to thermally degrade any lubricating fluids (and most gelling agents in greases). About the best that can be done, if a lubricant is required in a severe arcing situation, is to minimize the amount and retention of degradation product from the lubricant. Several synthetic oil families thermally degrade, not to carbon or polymer gums, but to short-chain molecules with high volatility which evaporate cleanly from the contact area. We have several developmental products of this type.

A special contact lubricant specifically developed to suppress arcing and to keep a low contact resistance when switching high loads or in the presence of inductive loading is Rocol Switch Grease 50, which we import from Rocol, Ltd., Leeds, England. We represent Rocol, Ltd., in the United States, and they report good success with Rocol Switch Grease 50 in small automotive switches which must operate over a wide temperature range from -40° F. to +300° F.

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

(Check Your Address On Reverse Of This Coupon For Correctness.)

SEND LITERATURE ON THE FOLLOWING:
(please fill in temperatures)

- ☐ Low-Temp. Lubes (Min. ____°C/°F.)
- ☐ High-Temp. Lubes (Max. ____°C/°F.)
- ☐ Wide-Temp. Lubes (Range____to____°C/°F.)
- ☐ High Lubricity Oils
- ☐ Chemically-resistant Greases
- ☐ Non-Spreading Oils (Range ____to ____°C/°F.)
- ☐ Oil Creep Barrier Films
- ☐ Fluorocarbon(Ultra Soft) Greases
- ☐ Damping Greases (Range____ to ____°C/°F.)
- ☐ Sliding Electrical Contact Lubes
- ☐ Stationary Electrical Contact Lube

SPECIAL REQUESTS OR COMMENTS:

Send at no charge or obligation a lubricant sample especially selected to meet the following need.

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? _____

THE PROBLEM:

MATERIALS COMPATIBILITY

The proliferation of different types of plastics as components of mechanical devices, the increasing variety of synthetic elastomers used as seals or other basic elements in such devices, and the interactions of a number of potentially available petroleum or synthetic fluids used as lubricants - all these factors combine to make materials compatibility fully as critical as temperature in choosing a lubricant.

PLASTICS

Some plastics are especially vulnerable to the ester-based fluids, and an ester oil creeping from a bearing onto a molded surface of such a plastic can craze or crack the plastic, especially at stressed points and at higher temperatures. The principal ester-vulnerable plastics are polycarbonates, polysulfones, polyphenylene oxides, a-b-s resins, polyvinyl chloride and polystyrene. The acetals, nylons, phenolics and certain polyesters are relatively safe with most lubricating materials.

Nye has used the newly-available synthetic hydrocarbons to develop plastic-compatible parallels to many ester-based wide temperature oils and greases. These synthetic hydrocarbon lubricants have found good use in wide-temperature situations involving ester-vulnerable plastics.

ELASTOMERS

Lubricant compatibility with elastomers presents an even more complex problem than with plastics. Among the variety of synthetic rubbers are some, like ethylene-propylene rubbers, which have only limited usefulness with petroleum oils; others, like neoprene or Buna rubbers, which are vulnerable to esters; and a few, like some silicone rubbers, where it's tough to find any liquid lubricant which can be given a fully clean bill of health. Special formulations have been prepared for most problem situations.

THE PROBLEM:

MOTION CONTROL

Here's an area where special lubricants can act to slow things down (in a very special way, of course). Hand-operated devices requiring precise adjustment, whether the focusing threads on a microscope or the shaft on a television tuner, can be lubricated with "damping greases" which smooth motion and prevent "coasting" beyond the setting required. The device need not be hand-operated; electric meters measuring power demand also use damping greases at the pivot of the demand indicating lever.

The great majority of damping greases are very tacky materials. The core of our damping grease line is the Rocol Kilopoise series of damping greases, manufactured by Rocol, Ltd., Leeds, England. These are synthetic oils gelled by various procedures to form more or less viscous gels. These products have excellent oxidation stability for extended life and impart an exceptionally smooth "feel" when applied to the shafts of hand-operated potentiometers, volume controls and similar control devices.

Special-purpose damping greases include:

- Nye NyoGel 823F - a silicone-based grease for needs to −65° F.
- Nye NyoGel 793Z - an ester-based grease for requirements to -40° F.
- Nye NyoGel 771 - a relatively soft hydrocarbon grease for finer threads, especially fortified for use with mating aluminum surfaces

Where low breakaway forces are needed at low temperatures (to −40° F.) but where a very high degree of damping (high tack) is required throughout the operating range (to +300° F.), we can propose a new silicone based damping grease, Nye NyoGel 838F, which is gelled with fluorocarbon polymers. It is not recommended for use too close to optics (silicones can permanently contaminate glass surfaces), but it has found good use on the leveling screws of surveying transits.

from: WILLIAM F. NYE, INC.
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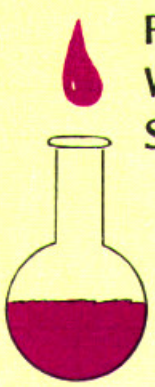
A New NYE *Lubeletter*



PROBLEM-SOLVING WITH SPECIALTY LUBRICANTS