

# NYE

# *Lubeletter*

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

ANNOUNCING:

## SUPER-REFINED OILS FOR GYRO SPIN-AXIS BEARINGS

DEVELOPED FOR HIGH PERFORMANCE PRECISION BEARING NEEDS THIS FAMILY OF SUPER-REFINED PETROLEUM OILS AND GREASES ARE NOW STANDARD MATERIALS FOR GYROSCOPE LUBRICATION.

In our highly technical society, the gyroscope, like the chronometer in earlier days, has become a hallmark of dependability. Gyroscope reliability is essential to navigation both under and on the sea, in the air and in space. The lubricant in a gyro's spin-axis ball bearings must bear a heavy burden of reliability and long-term performance, and must have qualities which should extend themselves for use in a great variety of precision bearing applications. We are pleased to announce the addition to the Nye product line of an impressive series of high-performance super-refined petroleum oils and greases developed specifically for gyroscope and related precision bearing needs.

Until the early 1960's when it became unavailable, one particular petroleum oil had traditionally been accepted as a satisfactory gyroscope lubricant. At that time, a major development effort was undertaken by Government and industry to determine the critical elements in precision bearing lubrication and to formulate a superior gyroscope lubricant. The result of this effort was KG-80 oil, developed by Kendall Refining Company, now the Bradford Petroleum Division of Witco Chemical Corporation.

KG-80, now one of a series of lower and higher viscosity homologous oils, has

become a standard for gyroscope lubrication. It and its companion SRG-series oils are all prepared using super-refining techniques and special additive treatment. Properties of viscosity, volatility, lubricity, oxidative stability and metal corrosion are closely controlled to permit extended operation of high-performance bearings. Operating temperature range of these oils extends from 0° C. to +125° C.

Non-melting companion greases have also been developed using KG-80 and the SRG oils as base oils for bearing applications where the grease form is required.

William F. Nye, Inc. has assumed the distribution and marketing responsibilities for KG-80 and the SRG-series oils and greases. We believe that these super-refined oils and greases have potential uses well beyond the range of navigational equipment. Precision bearing applications such as medical or dental equipment, computer disc drives, camera drives and all high-precision electric motors, could utilize the superior qualities of these super-refined petroleum lubricants.

Anyone using precision ball bearings should have data on these lubricants, and we'd be pleased to send our bulletin on KG-80 and the SRG oils (and greases) along with a small oil sample to anyone checking Item 1 on page 3.

## NYETACT 505 - AN AEROSOL LUBE FOR SLIDING ELECTRICAL CONTACTS

The best thing we've found for lubricating sliding electrical contacts, whether noble metal or otherwise, are highly-refined oils fortified with natural high-lubricity triglycerides, such as dolphin head oil. We have several good customers for a 3 ounce aerosol spray can put-up of our dolphin head oils especially formulated for electric contact lubrication and marketed under our label NyeTact 505 at \$2.25/can. Although the use of an aerosol spray for lubricating a delicate mechanism has been likened to oiling one's automobile by immersing the entire car; this particular aerosol product has proved

most helpful in reducing noise in a variety of potentiometer, switch and slip ring installations as a routine maintenance procedure.

A minor, controlled proportion of long-chain free fatty acids in these natural oils either physically or chemically adsorb onto the contact's metal surface, and so orient as to buffer contact of metal asperities when contacts slide across one another. The aerosol spray can permits application of very thin films on contact surfaces. (For a bulletin describing the chemistry and physical characteristics of the dolphin head oils, check Item 3 on page 3).

## A NEW ESTER-BASED IMPREGNATING OIL FOR SINTERED BRONZE BEARINGS

HIGH TEMPERATURE STABILITY OF OIL 661 PROMISES AN ANSWER TO DEVELOPING APPLIANCE NEEDS.

Consider the problems one faces in lubricating a porous metal sleeve bearing in an appliance subjected to temperature extremes.

1. only a very small amount of oil can be accommodated within a porous metal bearing.
2. in most appliances and small motors, there is no opportunity to replenish the oil supply and the life of the initial lubricant governs the life of the device.
3. in porous bearings, a metal matrix with a high surface-to-volume ratio supports an oxidation-vulnerable thin oil film, the degradation of which can be catalyzed by this same metal.

For appliance and small motor applications where temperatures approaching 300° F. are encountered, the choice of an impregnating oil can become a series of compromises with oxidation stability, lubricating capability, and oil cost. Where below zero start-up is also needed, frustration can quickly ensue.

The ester-based impregnating oils have answered many difficult wide-temperature sintered bearing problems. We now have available a newly-synthesized higher viscosity formulated polyol ester fluid, our Nye Synthetic Oil 661, which promises to fill an increasing need for a more capable sintered bearing impregnating oil for -10° F. to +300° F. or higher needs. Its most impressive quality is exceptionally low volatility which is essential for long-life in thin films at high temperatures. The fluid contains no shear- or oxidation-vulnerable polymer-thickeners. Superior sludge-free oxidation stability in our standard 72 hour at 347° F. oxidation test along with very good antiwear test results in the Shell 4-Ball Wear Test support our recommendations for Nye Synthetic Oil 661 as a candidate for high-temperature problems. Viscosity at 0° F. is 3,400 centistokes, and low temperature start-up will depend on torques available at below zero temperatures. We can supply a preliminary bulletin and sample for anyone confronting wide temperature sintered bearing problems. Check Item 2 on page 3.





## BARRIER FILM DEVELOPMENTS

### NYEBAR-TYPE F

For the first time since 1966 we have prepared a new bulletin on the NyeBar oil creep barrier films, the occasion being to introduce the new Type F NyeBar. NyeBar - Type H, a fluorinated resin in 1,1,1-trichloroethane, will be displaced during 1973 by NyeBar - Type F, an improved resin supplied in the faster-evaporating fluorinated solvent, trichlorotrifluoroethane. The extended capabilities of the Type F resin permit use with thin films of most ester-base oils, which would readily loosen and degrade the older Type H resin. Insofar as its fluorinated solvent will not harm most plastics, the availability of Type F will also permit dropping the isopropanol-based Type K from our line of barrier films. If you've never worked with these unusual materials, check Item 4 on page 3 and we will send you the new Bulletin 7220 and a small sample of the new NyeBar - Type F.

### AEROSOL SPRAY CONTAINER

Increasingly frequent requests for a barrier film in an aerosol spray container can now be filled with a newly-available 6 ounce spray can of NyeBar - Type F. To avoid excessively fast evaporation in the spray form, we've had to use a portion of 1,1,1-trichloroethane in the solvent system for the aerosol put-up, so it shouldn't be used indiscriminately with plastics. The very low surface energy of the NyeBar resins imply some unusual mold release possibilities and the aerosol spray may facilitate evaluations. The 6 ounce aerosol can of NyeBar - Type F is priced at \$5 per can, f.o.b. New Bedford.

### A CAUTION ON FLUORESCENT DYES

A major developing use for the superior Type C NyeBar product has been as a coating for printed circuit boards to reduce moisture sensitivity. We have to caution customers using the recent fluorescent-dyed versions of NyeBar-Type C, however, that the presence of the dye compromises water resistance and decreases the resistivity of the barrier film coating. For such applications, the traditional undyed product should be specified. (Any dyed product carries the label code "SSG").

## GREASES GALORE

New departures in grease formulations have been a major element in our ongoing product development program at Nye, and we'd like to introduce

★ **INSTRUMENT GREASE 706 A**  
Nye Synthetic Instrument Oil 220, highlighted in our last Lubeletter, is intended to perform where the traditional diester oils give marginal performance. Our new Instrument Grease 706A provides a comparable high-performance alternative to traditional diester greases. Based on a polyol ester oil gelled with a lithium soap, this standard consistency grease affords lower evaporation and improved thin film stability relative to diester greases for -65° F. to +300° F. ball bearing, gear train or actuator needs. Rust inhibition and anti-wear capability are included in this aircraft instrument grade lubricant.

★ **STEM GREASE 828**  
Even the most advanced of modern watches, with a minimum of moving parts, still have a few linkages and threads needing an especially good grease: We have put together an unusual new watch stem grease, Nye Stem Grease 828, based on highly-stable synthetic and super-refined hydrocarbons gelled with fluorocarbon polymers. Its useful temperature range of -20° C. to +125° C. surpasses that of previously available materials, and it further possesses the thin-film oxidation stability, mild damping qualities and adherence capability required in a successful watch or clock grease. Threads on delicate optical devices would be another potential application.

*We can offer a bulletin and an evaluation sample for any of the above new greases. Just check the appropriate box next to Item 4 on page 3. Or if you have a maverick need for a special grease, ask for one of our Lubricant Recommendation Questionnaire Cards by checking Item 10.*

★ **RHEOLUBE 723 F6**  
Especially intended for wide temperature situations involving ester-vulnerable plastics or elastomers, the Rheolube 723 series uses a 32 centistoke synthetic hydrocarbon as a base oil. The inherent good lubricating capability of paraffinic hydrocarbons carries through to the lithium soap-based 723F6 grease, which is further fortified by a fluorocarbon additive for more heavily-loaded non-ferrous metals. An EP grade is available for steel-on-steel under load. Low temperature bearing torques indicate usefulness to -30° F. or below and high temperature cycling to 300° F. is permitted.

★ **RHEOLUBE 789**  
Where improved grease life is needed around and above the 300° F. level, and below zero start-ups are also important, we can suggest Nye Rheolube 789, a grease version of our very successful Nye Synthetic Oil 622, a medium viscosity polyol ester oil with a good history of use in porous bronze bearings. The 789 Grease uses an inorganic, non-melting gelling agent and contains an adherence modifier to improve its usefulness in small gear trains. Oxidation test data is especially impressive for this grease, and we recommend its evaluation for any situation where you are at the grim edge of volatility or stability at higher temperatures.

## SERENDIPITY SECTION

### PIEZOELECTRIC DAMPING

The usual tests applied to greases don't suggest piezoelectric possibilities, but some of our lighter consistency damping greases are proving to be quite useful as damping media for the piezoelectric members in such devices as phonograph pickups. We don't know why they work, but they tend to damp out spurious elements in the mechanical vibrations which transduce the mechanical signals from the phonograph needle into the electric energy fed into the amplifier and speaker. Elastomers are sometimes used as piezoelectric damping media but they usually damp only at one or a few fixed locations along the length of the vibrating piezoelectric beam, which is clamped at one end. A grease, on the other hand, can fill the entire beam channel and serve as a dampener along the entire beam length.

Any piezoelectricians who would like to try such proven materials as our NyoGels 759 or 779 in their particular applications may check Item 6 on page 3 for free samples.

### DILATANT GEL

While working in the laboratory one recent afternoon, one of our more adventurous operatives attempted to gel a polyether synthetic oil with an inorganic gelling agent and produced one of the most interesting but so far least useful of our recent formulations. What he obtained can perhaps be called a gel, but a very peculiar one which stiffens only on agitation. The professional rheologists call this phenomenon "dilatancy" and NyoGel 797 has it with a vengeance. It's liquid when quiet, but on stirring rapidly becomes rigid; then when agitation ceases, the return to liquid form is intriguing to watch. Anyone need a good fluid clutch? Check Item 6 on page 3; we'll gladly share a sample of this lab curiosity with you.



## "NON-SPREADING" OILS - THE PHENOMENON OF OIL CREEP

The search for non-migrating fluids with the film strength and lubricity to withstand the loads imposed in watch jewels and pivots has led lubricant manufacturers into hitherto unexplored realms of surface chemistry. Only in recent years has the complete explanation emerged for the migration or creep of oils on metal or jewel surfaces. Much of this highly original work was completed by the U.S. Naval Research Laboratory in Washington, D.C., under the guidance of Dr. W. A. Zisman.

The Naval scientists determined that a fluid will spread upon or "wet" any surface whose surface energy is higher than the surface tension of the fluid. Thus, water with a surface tension of 72.8 dynes/cm., which might thoroughly wet a freshly washed automobile, will bead-up and roll off the car once it has been waxed, since the usual waxes have surface energies below 40 dynes/cm., Mercury, with the very high surface tension of a liquid metal skitters in small beads without "wetting". Silicone oils, with low surface tensions (roughly 20 dynes/cm.) readily wet and migrate on solid surfaces.

The timepiece manufacturer is confronted with lubrication of metal and jewel surfaces, both of which, when clean, have very high surface energies. It would appear improbable, therefore, that non-spreading oils could be found unless the lubricant surfaces were coated or otherwise transformed. The technique of "epilame", whereby a coating of a long-chain fatty acid was applied to jewels, actually did transform the surface and permitted otherwise normally spreading oils to "see" a low-surface energy jewel on which they do not spread. However, the Naval Research Laboratory discovered two peculiarities in the theory of oil

spreading, both of which have been utilized in watch lubrication.

One involves jewel surfaces, where many of the older watch oils based on natural oils, such as porpoise jaw or neatsfoot oil, did exhibit reasonably satisfactory stay-in-place properties. The researchers found that water molecules are inherently part of the jewel surface, and the molecules of the fatty esters in these natural oils were "hydrolysed" or broken in two by this water. One fragment adsorbed on the jewel surface and provided an equivalent to an "epilame" treatment.

The other peculiarity was that of fluids which, even when highly purified, do not spread on the cleanest of metal surfaces. Here it was found that these fluids do deposit an initial film of themselves on the surface; however, the surface energy of this initial film is such that the remaining fluid will not spread on its own film. These fluids are thus called "autophobic" i.e., they are "afraid of themselves".

It is from this latter group of fluids that the most successful synthetic non-spreading watch and clock oils have been derived. These fluids are consistently high surface tension fluids relative to the silicones, petroleum and esters normally used as lubricating oils. They consistently involve benzene-derived ring structures (aromatic groups) in their molecular structure. Such ring structures produce high freezing points, and a consequence has been extreme difficulty in producing non-spreading oils which will operate at temperatures of -40° F. or lower. Further, the ring structures are not especially helpful in providing "lubricity" or basic lubricating capability in these oils.

For these complex and interlocking reasons the successful non-spreading watch and clock oils can be numbered on the

fingers of one hand. One of the more successful has been the series of PML lubricants developed by a major American watch manufacturer. Over a ten-year period, a comprehensive search was undertaken to isolate autophobic fluids which, while resistant to spreading on either metal or jewel surfaces, would, at the same time:

1. possess sufficient lubricating power to provide an effective film in tiny watch bearings where loads are calculated to exceed several tons per square inch.
2. be stable over extended periods against degradation from oxidation or from the thermal and shear forces generated in the lubricating process
3. not produce corrosion of the lubricated parts, many of which are high-copper-content alloys
4. not volatilize or evaporate over extended periods.

After long search, one highly-purified synthetic fluid containing a small amount of additive to enhance its natural lubricity was selected as the best among a very few fluids which survived the extensive screening process; and, after several years of laboratory testing and field trials in watches, this oil was marketed as PML 79 Oil for Men's Watches. Over the past twenty years, it has achieved a considerable success and acceptance among watchmakers in the United States where it is presently manufactured by William F. Nye, Inc.

Two related oil formulations have also been successfully introduced—PML92 Oil for Ladies Watches and PML163 Clock and Timer Oil.

Should you have an application which could benefit from the special capabilities we've described, check Item 7 below, and we'll send a bulletin on the PML lubricants.

### 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 FOLLOWING INFORMATION OR SAMPLES:

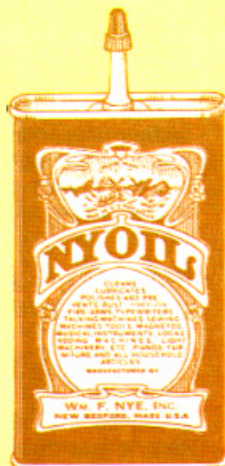
	INFO	SAMPLE		INFO	SAMPLE
ITEM NO. 1 - GYRO BEARING OILS	<input type="checkbox"/>	<input type="checkbox"/>	ITEM NO. 6 - PIEZOELECTRIC GREASES	<input type="checkbox"/>	<input type="checkbox"/>
ITEM NO. 2 - POROUS BEARING OIL 661	<input type="checkbox"/>	<input type="checkbox"/>	- DILATANT GEL 797	<input type="checkbox"/>	<input type="checkbox"/>
ITEM NO. 3 - DOLPHIN OILS FOR CONTACTS	<input type="checkbox"/>	<input type="checkbox"/>	ITEM NO. 7 - NON-SPREADING OIL	<input type="checkbox"/>	<input type="checkbox"/>
ITEM NO. 4 - NYEBAR - TYPE F	<input type="checkbox"/>	<input type="checkbox"/>	ITEM NO. 8 - FLUID-CENTRAL CATALOG	<input type="checkbox"/>	<input type="checkbox"/>
ITEM NO. 5 - GREASE 706A	<input type="checkbox"/>	<input type="checkbox"/>	ITEM NO. 9 - ROCOL D.F.S.M. MoS <sub>2</sub> SPRAY	<input type="checkbox"/>	<input type="checkbox"/>
723 F 6	<input type="checkbox"/>	<input type="checkbox"/>	ITEM NO. 10 - LUBE RECOMMENDATION	<input type="checkbox"/>	<input type="checkbox"/>
828	<input type="checkbox"/>	<input type="checkbox"/>	QUESTIONNAIRE CARD	<input type="checkbox"/>	<input type="checkbox"/>
789	<input type="checkbox"/>	<input type="checkbox"/>			

SPECIAL REQUESTS: \_\_\_\_\_



# gulp...

Many years ago, we had a senior salesman who peddled our Nyoil, a fine household oil, to the hardware and sporting goods people in New England. The oil was advertised as "odorless, colorless, and tasteless" and was ably demonstrated by our loyal representative, who volunteered to drink a can when the selling got tough. This he did regularly, living to the ripe age of ninety-six, but he set a tough precedent for his successor, now our company's President, who was mystified for some time as he toured the hardware circuit in the mid-1950's attempting to re-invigorate the Nyoil market. His pitch was met by a good reception, which quickly lapsed into silence and an anticipatory grin from the purchasing agent. He withstood several months of this before a merciful purchasing type clued him in as to what everyone was waiting for. His response was prudent, diplomatic and in strict accord with FDA regulations; but a generation of New Englanders may have lost something purgative.



## ROCOL D.F.S.M. - MoS<sub>2</sub> SPRAY

### A SOLID - FILM LUBRICANT FOR EXTREME ENVIRONMENTS:

Rocol, Ltd., of Leeds, England, is one of the foremost specialty lubricant manufacturers in Europe, and we are pleased to represent them in the U.S. market. One of their more impressive products is an inorganically-bonded molybdenum disulfide solid film lubricant applied as an aerosol spray which has proved a very useful fallback alternative for the most difficult of environments involving ultra-wide temperatures, high vacuum, or zero volatility constraints. This material is Rocol D.F.S.M. The inorganic bonding agent is cured by atmospheric moisture, giving a firmly held water - resistant and abrasion - resistant lubricating film of MoS<sub>2</sub> with capability from -200° C. to +500° C. Resistance to leaching by organic solvents or oils is also impressive. The 12-ounce aerosol can sells for \$2.75 or \$30 per case of twelve. User reports highlighting the oxidation resistance, noncombustibility and vacuum exposure of Rocol D.F.S.M. are included on a 2 page flyer which we'd be pleased to send to anyone checking Item 9 on page 3.

## A CATALOG OF FUNCTIONAL FLUIDS

Some years ago we printed a "Fluid-Central" catalog listing a comprehensive variety of specialized functional fluids representing the major chemical families now commercially available. Over fifty ethers, esters, chloro- and fluorocarbons, silicones, hydrocarbons and natural oils were listed. The service is still active; and the catalog itself has proved to be a helpful summary of viscosities, flash points, pour points and densities of the various synthetic lubricants. Except for the absence of some late blooming items such as the methyl alkyl silicones, and the inclusion of a couple of polyphenyl ethers no longer manufactured, the Fluid-Central catalog remains up-to-date, and we'd be pleased to send a copy to anyone interested. Check Item 8 on page 3.

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



CAPSULE REPORTS ON  
NEW DEVELOPMENTS IN  
SPECIALTY LUBRICANTS