

NYE lubeletter

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

THRESHHOLDS

Synthetic Lubricants and High Temperature

To identify the high temperature operating limit for any lubricant, we must ask a series of tough questions which often frustrate the most cooperative of customers. These good people are further annoyed when our final response still ends up with a fuzzy figure and a series of qualifications. We should explain why this is necessary.

Lubricants degrade at high temperature by several routes:

- (1) oxidation - the oil or grease reacts with atmospheric oxygen and is chemically altered into something else, maybe a gas or a polymer, surely something less of a lubricant;
- (2) thermal breakdown - the lube molecule actually splits into smaller fragments (called "cracking") with a catastrophic reduction in viscosity and an increase in volatility.
- (3) evaporation - whether or not affected by thermal or oxidative breakdown, a lube component can volatilize and is no longer available for lubrication.

Thus, the questions we ask will include:

- (1) What is the maximum temperature the lubricant will see and for how long?
- (2) Will the high temperature exposure involve cycling short-term excursion or will it be continuous?
- (3) Is the lubricant in any way sealed from air flow?
- (4) Can the device be re-lubricated or can any lube reservoir be provided?
- (5) Will the lubricant be spread in a thin film - what volume over what area?

For most of our customers, the initial lube is there for the life of the device, the lube quantity is relatively small, and its surface to volume ratio is far higher than for an automobile, a jet engine or for most major larger volume industrial lube applications. A high surface-to-volume ratio exacerbates the effects of both oxidation and evaporation. Thin-film oxidation is far more rapid than oxidation in bulk, and the flow of air across the film can be a significant factor in lube life.

We're going to stick our necks way out and suggest what we believe to be the high temperature degradation thresholds of a variety of lubricant types. We are assuming that anti-oxidants are used for those fluid families which will accept them, but keep in mind that anti-oxidants are like fire extinguishers. They are used up as the high temperature exposure is extended in time.

Fluid Family	Degradation begins °F
Natural petroleum	200
Polyglycols	225
Diesters	250
Synthetic hydrocarbons	250
Polyol esters	275
Methyl silicones	300
Phenyl silicones	400
Halogenated silicones	425
Polyphenyl ethers	475
Fluoroethers	550

The above listing is distressing to anyone with a 300°F. application. None of the fluids listed with higher degradation thresholds are the choicest lubricants, perhaps from film strength limitations, high pour points, or most likely price. Yet we have all seen esters and synthetic hydrocarbons work well in situations where 300°F. is thought to be the operating temperature. Thus, we raise the further question - is it really that hot at the lubricant interface? In specifying the high temperature target, one should examine closely the sources of heat and attempt to assess their effect on the lubricant. Don't include any anticipated heat of friction. If the oil or grease is working to separate or properly smoothe the passage of mating surfaces, that input should be minimal.

We'd be glad to recommend silicones, polyphenyl ethers or fluoroethers where they are needed. In many cases, economical and practical answers can be found with esters and synthetic hydrocarbons, even at elevated temperatures. For your specific need, if you can help us with the answers to the questions posed earlier, we'll recommend and sample on the basis of our best experience.

Synthetic Hydrocarbon Worm Gear Grease

Many of those responding to our introduction of a Synthetic Hydrocarbon Worm Gear Oil were even more interested in greases for open gears or unsealed gear boxes. We have developed a companion grease formulation, our NyoGel 788, which uses the same base oils as Synthetic Gear Oil 189B and promises equivalent performance in difficult wormgear and other gearbox applications.

NyoGel 788 is a mildly thixotropic, adhering grease. Thixotropy means a tendency to soften when agitated or energized; but the softening is temporary, and the material remains fully greaselike away from any shearing interface. This quality lends a non-channeling character to the grease which, with the adhering qualities imparted by high-viscosity synthetic hydrocarbon polymers, imparts an extra degree of film strength for severe service gear applications.

The additive package in NyoGel 788 is similar to that in Synthetic Gear Oil 189B, chosen for compatibility with the chemically-vulnerable non-ferrous alloys found in many wormgear combinations, yet capable for lubrication of loaded steel-on-steel.

Below-zero usefulness is permitted by the fully synthetic base oils in NyoGel 788; depending on available torques, -20°F. operability can be targeted. Special formulations can be supplied for needs as low as -70°F. High temperature performance is buffered by a sturdy anti-oxidant package, and long-term 250°F. performance with cycling to 300°F. is a reasonable expectation.

A data sheet is available along with evaluation samples at no charge. Use the Lubeletter Response Coupon on page 3 to request any sample amount needed to check out this grease in your application.

Telex 940807

ANSWERBACK:
FURTHREAD FRHV

William F. Nye, Inc., can now be contacted directly by Western Union Telex and you may be receiving Telex messages from us. The possibly puzzling answerback arises from the fact that we are sharing this Telex installation with an affiliated firm, New Bedford Thread Company, Inc.

Multi - Purpose Synthetic Hydrocarbon Greases

Although they were originally developed for switchgear, the superior wide temperature capability and excellent film strength of our Rheolube 360 Series of synthetic hydrocarbon greases are turning them into a truly "multi-purpose" series. We are now marketing them as companion greases to our synthetic hydrocarbon bearing and impregnating oils, and they can be considered as candidates for ball bearing, gear box, actuator, slide or O-ring applications. They present few, if any, plastic compatibility problems and, except for EPDM, are useable with the principal synthetic rubbers.

The several members of this grease series are distinguished from each other by the viscosity of the base oil, which in turn affects low temperature operability

Grease	Base Oil Viscosity, cs.		Base Oil Pour Point, °F.
	100°F.	-20°F.	
Rheolube 361	18	1,050	-85
Rheolube 362	33	2,400	-80
Rheolube 363	60	7,000	-75
Rheolube 365	111	20,000	-70
Rheolube 368	260	50,000	-65

By selecting a grease from this table, maximum film strength can be obtained for any particular low temperature start-up limitation. Some of these greases may be the answer to the new - 40°F. requirements for automotive accessory lubrication. A new technical bulletin is available.

MICRO - KITS/PROBING THE DEEP

Field Service Lubrication

The tendency in field service kits of oils and greases seems to be toward smaller and smaller unit containers, and we can see the ultimate, like a box of raisins, as a kit of miniature disposables, each containing a measured one-shot drop, squirt or dab of lubricant specifically sized to accomplish a single re-lubing. The temptation in field maintenance is to apply too much rather than too little lubricant, and careful kit design can produce real savings. We are prepared to assemble and sample special kits for your specific need with disposable one-shot or multiple-use dispenser containers as small as 1 milliliter of oil or grease.

An unusual variety of probes for dispenser containers is available. We were recently able to provide a customer with a 5-gram metal squeeze tube of grease with a one-inch long metal tip for expressing the grease at an otherwise inaccessible buried point within an instrument. Ultra-long dispensing tubes for oils can be supplied permitting deep access; for example, a 5-1/2" tube for dropwise dispensing from a 2 ounce plastic squeeze bottle.

Your own logos and labels can be used on containers or kit boxes. We can use any specified lubricants of other manufacturers, or we can recommend from our own products. Let us know your needs.

LUBE, BRITANNIA

Wire Rope Maintenance

Our valued association with Rocol, Ltd., in Leeds, England, surely one of the most imaginative of international specialty lubricant manufacturers, has led us into some fascinating lube applications. Their new Rocol RD-105, an advanced wire rope lubricant and protective compound, has solved a problem for television broadcasting in several developing countries. The TV transmitter is suspended under a large helium balloon, which floats at an altitude higher than practicable with any metal tower and consequently delivers TV signals to a surprisingly large number of square miles. To prevent this valuable assembly from floating away, the balloon is anchored by a long wire rope, exposed to the elements and subject to considerable twist and stress as the winds at altitude continually buffet the balloon.

Rocol RD-105 has proved its worth in this demanding application, providing effective strand-to-strand lubrication under high loads and preventing rust and fretting corrosion. The product is a molybdenum disulfide-fortified high viscosity fluid which is readily brushed onto wire rope. We're holding a good stock ready for offshore oil drilling needs when New England's day comes, and we offer a sample gallon at no charge to anyone with a deserving application.

OIL CREEP PREVENTION

The Mono-molecular Layer



Theoretically, with barrier films, a monomolecular layer will do the job. A surface is either wettable or non-wettable, and the thickness of a non-wettable surface modifier should not be significant in its effectiveness.

The NyeBar barrier films started out fifteen years ago as a 2 percent (by weight) solution of a fluorinated polymer in a fast-evaporating solvent. To our knowledge, no one has as yet determined what specific concentration would produce a monomolecular layer. Doubtless, such a perfect film is not a practical expectation; anyone who has ever seen an electron microscope's display of the reality of any flat surface would despair of achieving a perfect film among the labyrinthine peaks and chasms.

Thus, it has been interesting to watch the increasing acceptance of more and more dilute solutions of our NyeBar - Type CT. Eventually, we'll find a threshold of ineffectiveness, but 0.1 percent solutions are finding use for control of oil creep and for protection of electric contacts and similar components where oil contamination would create problems.

There are economies in dilution, and we have prepared a new price list for NyeBar-Type CT in trichlorotrifluoroethane in a range of concentrations from the traditional 2.0% down to 0.1%. Trichlorotrifluoroethane is the standard solvent for NyeBar-Type CT. This solvent evaporates very quickly, indeed, too quickly for some uses; and we can modify solvent volatility using higher molecular weight solvents on request. The military specification material, NyeBar-Type W, is such a modified solution with a 0.18% concentration.

Samples of any of the NyeBar solutions and dilutions are available.

Safe Handling of Lubricants

Lubricants are not normally hazardous materials, but increased concern for worker safety justifies some general comments on using oils and greases. Three types of exposure should be mentioned.

1. **INGESTION** - obviously, no industrial lubricant is intended to be ingested, and precautions should be taken that food is not contaminated by oils or greases and that workers' hands are not oily or greasy when they are handling food. Although not all lubricant components are poisonous if eaten, most would cause digestive upset; and some, like tricresyl phosphate, are poisonous; others, like phenothiazine, are drugs with unusual physical effects if taken internally.

2. **INHALATION** - unless the lubricant is intentionally applied from a dispersion in a volatile solvent, the volatility of most lubricants, certainly all sold by our company, is not sufficiently high that inhalation of lubricant components during application is of concern. This would not be the case, however, if the lubricant was heated to, say, 250°F. or higher for an extended time or was pyrolyzed by burning. The vapors and/or smoke from any oil or grease exposed to high temperature should be avoided. For this reason, anyone handling lubricants should wash his hands carefully before smoking. This is especially true for any lubricant containing any fluorinated polymers. They are quite non-toxic below 500°F., but, if thermally degraded, can produce extremely irritating fumes, which would be inhaled if they got onto a burning cigarette.

3. **SKIN CONTACT** - it would not be expected that any lubricant base stock or additive would be corrosive or irritating to the skin, with the exception of individual allergic reaction. A minor proportion of the population can show skin sensitivity to a wide variety of chemical materials, doubtless those included among the great variety of lubricants or additives. Further, the oils in greases can leach or displace natural skin oils over extended or repeated exposure, and excessive skin dryness or other skin reactions can appear for very sensitive individuals. Workers handling lubricants should always be advised to wash their hands before eating or going to the bathroom. Normal prudence would dictate that workers not be called upon to have their fingers or hands continuously exposed to any oil or grease without glove protection. Production line application techniques should be adapted to use of brushes, probes or other dispensing hardware to avoid prolonged skin exposure.

We hope these general comments are useful and that you will contact us here regarding any specific questions which may arise in your work with lubricants.

A Package for Purchasing

We've put together a package which may prove especially useful to Purchasing Departments with frequent or infrequent needs for special lubes, fluids, silicones, greases, damping oils and the like. This special file folder contains:

-- a price list on Dow-Corning's silicone and fluorosilicone oils in smaller containers from 8 ounces to 1 gallon.

-- a descriptive brochure describing all of Dow Corning's silicone and fluoro-silicone oils.

-- a price list on Tenneco Chemical's Anderol diester-based synthetic oils and greases in containers from one pint or one pound to 5 gallons.

-- a descriptive brochure on the Anderol diester-based lubricants.

-- bulletins and price list on Nye's synthetic hydrocarbon bearing oils and companion greases.

-- a Lubricant Recommendation Questionnaire Card.

We'd be delighted to send this new collection to you or your Purchasing Department on request.

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? _____

SPECIAL REQUESTS OR COMMENTS:

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? _____

Lubricants for Switches and Electric Contacts

A couple of years ago we put together a collection of data sheets on oils, greases and specialty films for sliding and stationary electric contacts. This is the fastest-growing area of our business, and this collection has been up-dated and expanded into a new catalog in four sections under the title Lubricants for Switches and Electric Contacts. The sections are:

Greases for Sliding Switch Contacts
Potentiometer Greases
Oils for Electric Contacts
Connector Lubricants

We've attempted to send one of these new documents to all those who requested the earlier "Switch Lubricant Catalog"; but, if we've overlooked anyone, or, if you have special needs in this area, please drop us a note, and we'll respond quickly. The products in this new catalog are directed to applications ranging from miniature toggle switches to major utility switchgear. We stand ready to make recommendations on any specific or unusual problems.

Fluorinated Greases For High Temperature and Chemical Resistance

Grease needs in the process industries can involve exposure to 400°F. and even higher temperatures in many situations. Such applications can also involve exposure to aggressive and reactive chemicals. The combined challenge to both the oil and the gelling agent in a grease can be overwhelming, even for traditionally dependable synthetic lubricants.

The most oxidatively and thermally stable family of oils, and also the most inert chemically, is that of the fluorinated polyether, consisting of completely fluorinated propylene units connected through oxygen atoms into polymers of various chain lengths. A range of oil viscosities is available, the least volatile of which for ultra-high temperatures is a 500 centistoke at 100°F. oil with a pour point below -10°F. Oxygen won't dent the molecule; the oil has no flash point; and thermal degradation in air is not apparent until temperatures rise above 570°F.

Our Fluoroether Grease 849 consists of this oil gelled with an equally stable and inert fluorocarbon polymer. The resulting grease is an excellent lubricant, even for highly-loaded applications. It does not degrade or melt at temperatures in excess of 550°F. and is resistant to such threatening chemicals as fluorine, bromine, strong acids, bases and oxidizers.

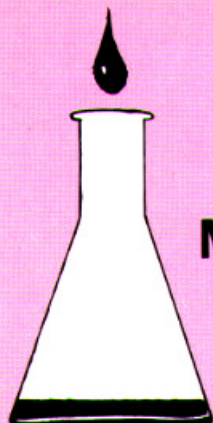
One problem with use of this grease, however, is its tendency to react violently, even to detonation, with aluminum or magnesium under conditions where fresh, active metal surfaces are being generated. Use with these metals and their alloys should be avoided.

When operating temperatures exceed 600°F., there are no good answers among oils or greases, even among the fluoroethers. Resort must be made to solid film lubricants or lubricating powders. However, for less strenuous duty in the 400°F. to 550°F. range, we recommend your consideration of Fluoroether Grease 849. A data sheet is available, and samples can be supplied at no charge.

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**New Developments in
 Specialty Lubricants**