Nye® Lubeletter

The World Leader In Synthetic Lubricants **Volume 27 Number 1**

New Quiet Grease Gets Thumbs Up from Purdue Research Lab

In a double blind study conducted at Purdue University's Tribology Laboratory, Nye Rheolube 716R "registered the lowest vibration level...the lowest start-up noise...(and) the best damping characteristics" when tested under normal and severe operating conditions against leading brands of quiet bearing grease.

Nye commissioned the study in 1997 to further investigate the noise and vibration characteristics of rolling element bearings lubricated with grease.

"Four years ago we had produced a good candidate for entry into the quiet grease arena," said Nye Executive Vice President George B. Mock, III, "but we felt we could do better. Today, after two more years of development, supported by findings from Purdue, we're confident that Rheolube 716R is equal or superior to anything in the marketplace."

It's not just the contamination. Traditionally, quiet grease has been ultrafiltered — with good reason. Miniature precision bearings, for example, can contain balls as small as 350 microns — which means that even the 75-micron particulates often found in an unfiltered grease can make a lot of unwanted noise.

The life of a bearing depends on a micro-thin, elastohydrodynamic (EHD) film of lubricant that separates the rolling element from the raceway. Contaminants which are thicker than the EHD film produce direct surface damage. Smaller contaminants act as "stress risers." In either case, the result is bearing race denting, which creates noise and reduces bearing life. So quiet grease has to be ultra-clean grease.

Through findings from the Purdue study, Nye has confirmed that truly quiet grease, however, requires more than just the removal of microscopic contaminants. Agglomerates of thickener (the clay or soap combined with an oil to make a grease) can also make a grease noisy. That implicates batch processing temperatures, mix times and mixing, milling, and filtration equipment.

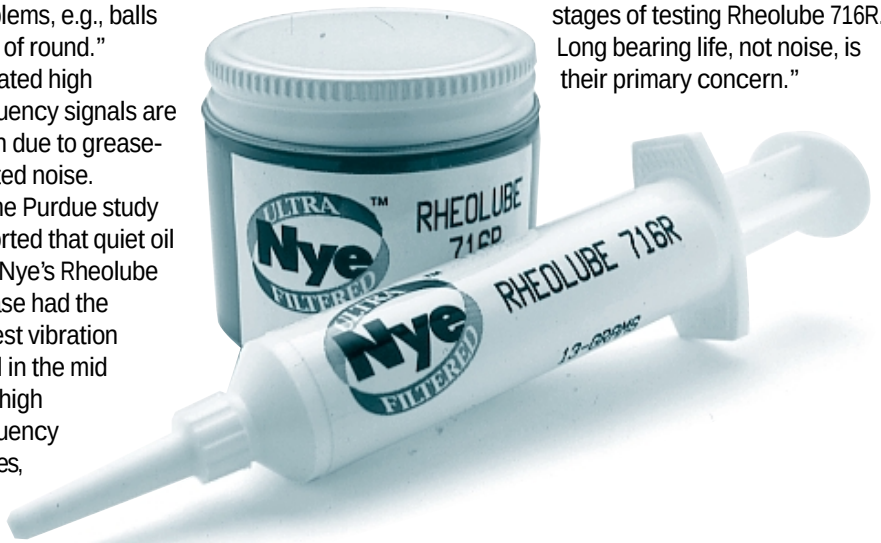
"We've not only learned a lot about how to make a truly quiet grease," George added, " we've learned, perhaps more importantly, what questions we should be asking."

Study protocols. Under the direction of Purdue's Dr. Farshid Sadeghi, a research team investigated the problem of vibration and noise within angular contact bearings. Tests were performed on five bearings of the same size, with two runs on each bearing, at a speed of 1800 RPM and 35 lb. axial load. Vibration and noise related data were gathered in low, mid, and high band ranges. Typically, high readings in the low band are due to bearing geometry problems, e.g., balls "out of round." Elevated high frequency signals are often due to grease-related noise.

The Purdue study reported that quiet oil and Nye's Rheolube grease had the lowest vibration level in the mid and high frequency ranges, the lowest start-up noise, the lowest noise peaks, and the best damping characteristics.

To Life! For Nye, Rheolube 716R is only the first in a line of quiet bearing greases for AC/DC electric motors, computer cooling fans, disk drives, high speed dental drills, office equipment, and other devices where consumers interpret noise as poor quality. Nye is also eyeing a broader market — the growing number of design engineers who realize that quiet grease also means longer bearing life.

"There is a direct relationship between bearing noise and bearing life," George explained. "While debris denting causes noise, it also can damage the raceway and the ball, eventually leading to microspalling. All this shortens bearing life. That's why more design engineers are sampling quiet grease in applications where noise is not the primary issue. For example, a manufacturer of industrial vacuum cleaners is in the final stages of testing Rheolube 716R. Long bearing life, not noise, is their primary concern."



Nye Rheolube 716R *proved superior to leading brands of quiet grease in an independent acoustic study of lubricated bearings. Listen for yourself. Get a 5g syringe evaluation sample of Rheolube 716R from Nye by calling 508 996-6721.*

Nye Introduces Vacuum Lubricants for "Clean Room" Industries

Instron Series 5500 Load Frame

Nye's ongoing R&D program recently got another technological boost with the installation of an Instron Series 5500 Load Frame Test System, purchased primarily to assist customers who use synthetic elastomers and engineering plastics for devices that require lubrication.

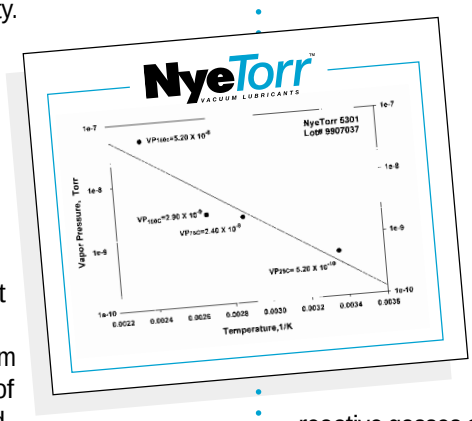
The new load frame enables in-house tensile, compression, shear, peel, flex, cyclic, and other tests on a variety of materials and components. A specific device or material can be tested dry and then with several candidate lubricants to determine a lubricant's compatibility with the material, its durability, and its ability to reduce friction.

"Basically," Nye mechanical engineer Jim McGown said, "this system enhances our ability to help customers understand the effects of our products on their applications."

One of the first studies conducted on the load frame involved stationary separable connectors. In addition to minimizing fretting and environmental corrosion, a lubricant also helps ease insertion forces, facilitating the mating of pins into sockets. Using the load frame to measure and compare the insertion forces required to mate a lubricated connector versus a dry connector, Nye can accurately report a lubricant's ability to reduce insertion forces.

Building upon nearly two decades of experience in formulating specialty lubricants for aerospace applications, Nye recently introduced NyeTorr™ vacuum lubricants, our first commercial line of lubricating oils and gels for high vacuum environments.

For years, Nye has formulated vacuum lubricants for precision bearings in guidance systems, satellite components, and military devices — demanding applications that require very low vapor pressure and little or no out-gassing. Coupling hands-on with theoretical knowledge, Nye Technical Director Paul Bessette and David Stone of Nye Optical Products wrote the chapter "Liquid Lubricants" in Space Vehicle Mechanisms: Elements of Successful Design (P. Conley, ed., John Wiley & Sons, Inc., NY, 1998). The NyeTorr line packages this expertise to help semiconductor, disk drive, and other clean room industries increase productivity.



Each container of NyeTorr™ vacuum lubricants contains lot-specific vapor pressure data for quality control.

"Using a lubricant formulated specifically for high vacuum applications is one of the most overlooked routes to cutting downtime," Dave Stone explained. "Think of it this way: bearings in a satellite orbiting the earth can't very well be re-lubricated, so the lubricant has to be designed to last. The NyeTorr line applies the same 'made to last' criteria to vacuum lubricants for industry-based applications."

NyeTorr vacuum lubricants are formulated with specially fractionated raw materials that have a narrow range of molecular weight. The elimination of light molecular weight fractions significantly reduces trace out-gassing, which not only depletes the lubricant supply, but also creates a source of contamination which can be adsorbed on semiconductor wafers or on nearby instruments, such as sensors and optics. Low out-gassing is quantified by measuring the vapor pressure of the material in a vacuum environment. For stringent quality control, Nye measures the vapor pressure of each lot, and attaches the report to each container of lubricant.

NyeTorr lubricants are also ultrafiltered for removal of microscopic particle contamination which can degrade the performance of precision mechanisms or behave as an additional source of volatile material.

Further, all offerings in the NyeTorr line are chemically stable, non-toxic, synthetic materials suitable for applications that demand high reliability and long service life. The line includes a variety of base oil chemistries, including lubricants formulated with Pennzane SHF-X2000, a proprietary, low vapor pressure, multiply-alkylated cyclopentane manufactured by Pennzoil® and available exclusively through Nye.

Temperature serviceability ranges from -40°C to 250° C, and design engineers choose lubricants for compatibility with plastics and elastomers; resistance to reactive gasses and chemicals; very low starting torque; and a wide range of mechanical loads, from light to heavy.

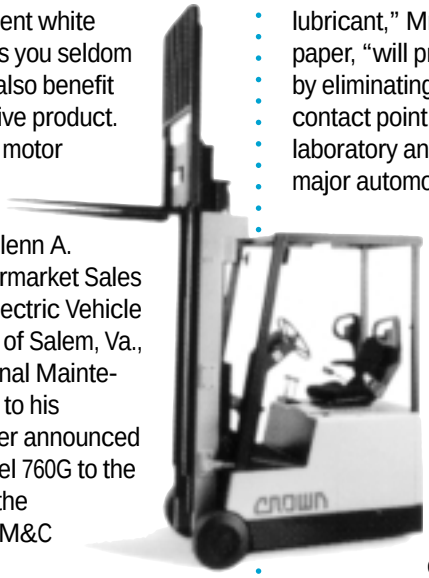
In addition to standard NyeTorr lubricating oils and gels, Nye will also work with design and manufacturing engineers to custom formulate vacuum lubricants for specific applications — literally starting at the molecular level. Since Nye works closely with all major synthetic fluid suppliers, we can select the most appropriate base oil for your application.

For more information about NyeTorr vacuum lubricants, contact the Nye regional office nearest you.

Nye Adds Electric Vehicles to Its Customer Fleet

With well over 100 lubricants custom formulated for automotive applications, Nye is a major supplier to automakers and their component manufacturers. Now, thanks to a recent white paper by GE, vehicles you seldom see on the road will also benefit from a Nye automotive product.

The story: electric motor vehicles (EMVs) meet NyoGel 760G.



In January 1999, Glenn A. Nalls, Manager, Aftermarket Sales and Service, at GE Electric Vehicle Motors and Controls of Salem, Va., issued a "Plug Terminal Maintenance White Paper" to his customers. The paper announced the addition of NyoGel 760G to the terminal sockets on the connectors of GE EVM&C electric motors.

GE supplies motors to Original Equipment Manufacturers of EMVs, which can include lift trucks (commonly called fork lifts), other industrial trucks such as scissor lifts, side loaders, pallet trucks, and tow tractors. Non-industrial EMVs include golf carts and some agricultural vehicles.

"The addition of (NyoGel) 760G lubricant," Mr. Nalls wrote in his white paper, "will prevent the oxidation process by eliminating the access of oxygen to the contact point. Extensive testing in our laboratory and at user sites, and use by major automotive manufacturers, has shown this is a very effective means to prevent the intermittent operation that can occur when fretting exists at these types of connections."

Fretting corrosion is the result of low amplitude vibration caused by nearby motion. This microscopic movement continually exposes the metal of the connector pins to oxidation. Sufficient build-up of oxides results in intermittent contact and operation. A lubricant film minimizes metal-to-metal contact during vibration, protecting the connector metal from wear.

Nye first introduced NyoGel 760G to the automotive industry in 1992. A high viscosity, synthetic hydrocarbon grease, it offers good high temperature stability, plastic and elastomer compatibility, an antioxidant additive system, and a UV dye. Because NyoGel 760G is a transparent grease, it's difficult to see. The UV dye enables manufacturers to run the terminals under an ultraviolet light to ensure lubrication. Today, NyoGel 760G meets specifications at Chrysler, Ford, and General Motors — and GE.

In addition to using NyoGel 760G in the manufacture of their motor controls, GE EVM&C also recommends the grease for field maintenance when "servicing existing vehicles exhibiting symptoms of intermittent mis-operation or shutdown by the GE control ... (and) after proper cleaning of the connectors ..."

Currently, NyoGel 760G can be purchased from GE (GE Plug Lube Kit 328A1777G1, which contains the Nye grease and a contact cleaner). Individual syringes of NyoGel 760G can also be purchased from Nye's authorized small volume distributor, TAI Lubricants, at (302) 326-0200. TAI fills all Nye product orders under $500 and accepts Visa and Master Card.

For OEMs, Nye can supply both evaluation samples and production line quantities of NyoGel 760G. In addition, our specialty packaging division can fill large orders for individual syringes of NyoGel 760G for OEMs who want to make NyoGel 760G available to their EMV customers for field maintenance. Nye can also package syringes in kits with application instructions and a contact cleaner — under Nye's brand name or the OEM's private label.

Distributor Inquiries Welcome

Nye Lubricants is currently seeking qualified distributors for NyeTorr™ vacuum lubricants which are designed specifically for high vacuum environments in industrial settings.

Ideally, distributors of NyeTorr lubricants will be experienced, worldwide suppliers of vacuum systems, fluids, components, and related supplies. Nye provides full engineering support for Nye products sold through distributors and, on request, can custom-design vacuum lubricants for end-user applications identified by distributors. Our philosophy is to add both Nye products and Nye capabilities to a distributor's menu of products and services.

Please inquire by calling David S. Stone, Manager, New Product Development, at (508) 996-6721.

Typical Applications for NyeTorr™

Semiconductor Manufacturing	Ball bearings, turbomolecular pump bearings, metal-on-metal lead screws, plastic-on-metal lead screws, ball screws, actuator shafts, sliding seals, rotatable joints, load lock conveyor slides and tracks, valve stems and threads
Clean Rooms	HVAC actuators and motor bearings, journal bearings, lead screws, trolley bearings and tracks
Spacecraft	Gyro bearings, spin stabilizers, actuators, antenna positioners, damping fluids, anti-backlash gels

Nye Global

Fred Mock, Director, International Development

Nye's international business plans have shifted into high gear.

In January, Nye appointed its first Director of International Development, Fred Mock, and National Sales Manager Brian Holley made technical presentations to automotive engineers in Australia and South Korea. In February, new distributors were named in Spain, Portugal, and the Benelux countries. In March, six of Nye's 14 international agents and distributors convened at Nye's headquarters in Fairhaven, Mass., for a week of intensive training in synthetic lubricants and their applications. And that gathering was soon followed by business trips to Italy, Spain, and the UK by Nye CEO Jerry Madden.

"We're ready to emphasize our commitment to the international marketplace," Fred said. "We now have representatives on five continents, serving more than 25 countries. Importantly, our international partners are familiar with the industries we serve and the products we sell. We want to deliver not only Nye's product excellence to countries around the globe, but to offer the value-added knowledge we've gained from working closely with so many industries and applications."

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