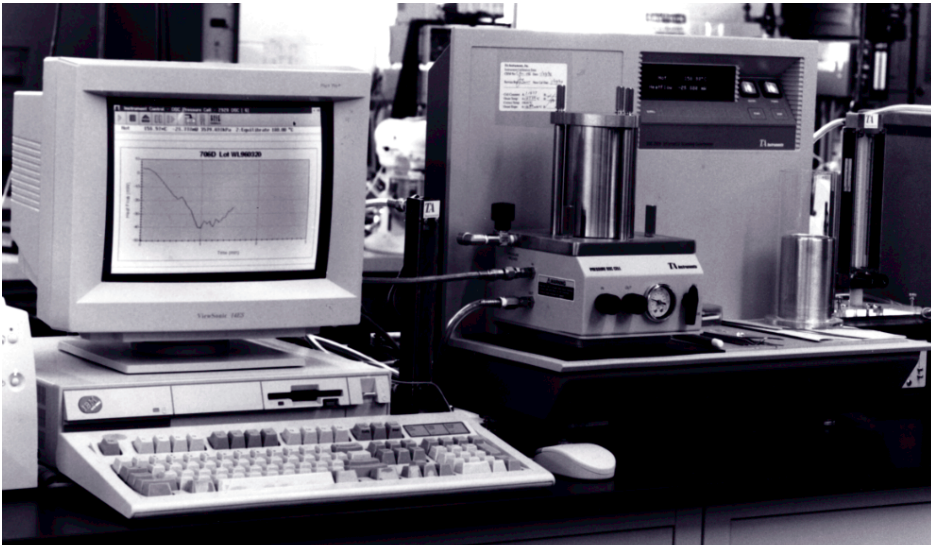


## New Equipment Puts Nye On The Leading Edge of Lube R&D



*A Differential Scanning Calorimeter, which determines the thermooxidative stability of organic materials at elevated temperatures, is part of a major R&D acquisition that supports Nye's commitment to "become one of the foremost lubricant laboratories in the country."*

Three new, state-of-the-art laboratory systems strengthen analytical capabilities at Nye Lubricants, and enhance the company's ability to design custom synthetic oils and greases.

"We made a decision to become one of the foremost lubrication laboratories in the country," said Nye Technical Director Paul Bessette. "To achieve this goal, we made a commitment to invest in sophisticated, analytical hardware that will allow us to better understand how lubricants work, which, in turn, enables us to improve current product lines and tailor new products to very rigorous customer requirements."

The process of selecting additive packages for lubricants will be supported by a Differential Scanning Calorimeter (DSC), which is used to determine the thermooxidative stability of organic materials at elevated temperatures. Using a high-pressure oxygen cell with the DSC,

Nye engineers can test and identify the antioxidants that behave synergistically with various synthetic base fluids. This method of selecting additives helps maximize the oxidative stability of oils and greases, which ultimately extends the life of the devices they lubricate.

A second piece of equipment, a Thermal Gravimetric Analyzer (TGA), measures the change in weight of materials at different temperatures.

"The TGA gives us another tool to look at how materials change as a function of temperature," Paul said. "With it, we'll be investigating the behavior of organic matter under oxidizing and non-oxidizing conditions, which, for example, can provide valuable insights into designing truly clean-burning lubricants for electric switches."

An Inductively Coupled Plasma Emission Spectrograph will be used to improve lubricant formulations for rolling

element bearings. The spectrograph generates an argon plasma into which various elements can be aspirated. In turn, it identifies the elements.

"We'll find this useful in studying the performance of lubricants under hydrodynamic and boundary conditions, and in determining the effectiveness of boundary additives in preventing metal-to-metal contact," Paul said. "The spectrograph allows us to identify wear debris in the parts per billion range. So, for example, if we're testing a lubricant used with stainless steel bearings, and the spectrograph finds traces of nickel, iron or chromium, we'll know the lubricant film ruptured under the test conditions."

Other planned acquisitions include a Gel Permeation Chromatograph and a Control Stress and Control Shear Rheometer.

"The chromatograph will enable us to guarantee a lubricant's vapor pressure from batch to batch, an important quality control measure for aerospace applications, where low volatility is required," Paul added. "The rheometer will allow us to understand better the flow characteristics and gel structure of our products."

## Chicago Office, Product Development Bring Two More Engineers to Nye

Brad Richardson and David Stone recently joined the Nye team. Brad is Regional Engineering Manager in Nye's Chicago office, which serves Illinois, Iowa, Minnesota, Missouri, and Wisconsin. David, based at Nye headquarters in

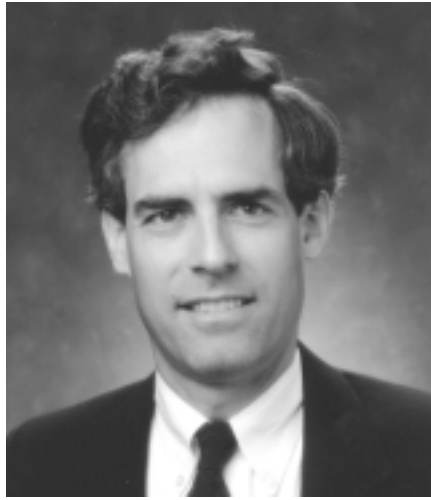


Brad Richardson

Fairhaven, is focusing on new product and market development.

A graduate of Milwaukee School of Engineering, Brad brings nearly 10 years of design engineering experience to Nye. His credits include the design and development of a line of 80 hand-held dental instruments, the design of a device to test bearing load capacity, and the invention and patenting of a water-saving, flow-control device. Brad's previous employers include Rockwell International, Miller Fluid Power, and, most recently, Hu-Friedy Manufacturing Company.

David is a former Project Engineer at Sippican, Inc., in Marion, Massachusetts,



David Stone

where he was responsible for electronic warfare programs for the US Navy. Prior to Sippican, he was the Engineering Manager of the Microwave Tube Division at Varian Associates, Palo Alto, California. David received a Ph.D. in physics from the Massachusetts Institute of Technology in 1979. His many projects at Nye include the development of dry film lubricants and electrically conductive oils and greases.

For our customers served by the Chicago office, Brad can be reached at (847) 398-3114. David's telephone number is (508) 996-6721.

## Better Consistency, Faster Delivery for Grease Cartridges

New de-aeration equipment designed by Nye Mechanical Engineer Jim McGown not only improves the quality of Nye greases packaged in Semco® cartridges, it reduces the time it takes to remove air from even the heaviest of greases.

"Our new equipment, which has been under design for a couple of years, has really surpassed our expectations," Jim said. "It degasses our Semco-cartridge-packaged products more completely and much faster than we had thought possible."

The manufacture of grease normally entrains air in the product. This poses a problem for customers using automatic dispensing equipment, because when cartridges contain air, the proper amount of grease may not be applied. As a result, parts may have to be cleaned and re-lubricated manually, an unexpected, labor-

intensive process that slows production.

"We are now duplicating this first machine so that all our Semco cartridges will be de-aerated with the new equipment. It will result in a quality improvement in both completeness and consistency of cartridge de-aeration," Jim added.

Because the equipment also speeds the de-aeration process, customers can now expect faster turn-around on orders for greases packaged in Semco cartridges.

Nye began packaging greases in Semco cartridges more than 10 years ago, in an effort to meet customers' specialty packaging requirements. Nye's grease packaging options also include plastic squeeze tubes, pipettes, hand-held and auto-dispensing syringes, jars, fiberboard grease-gun cartridges, and aluminum foil blister packs.

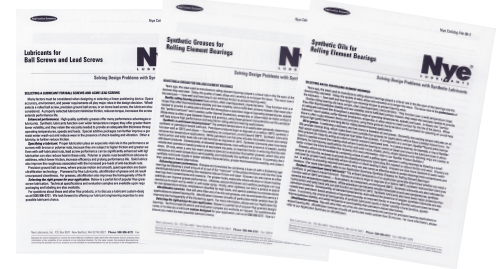
## Ultra-Clean, Ozone-Safe Cleaning Solvent

If you're still looking for a replacement for Freon-TF to clean parts and components, consider Nye Fluorosolvent 504.

Nye Fluorosolvent 504, a nonflammable, non-ozone-depleting fluoroalkane, is an effective solvent for cleaning and dispersing fluorinated oils and greases. Ultrafiltered, it contains no more than one particle greater than 25 microns per 100 milliliters of solvent, when tested to MIL-STD-1246A.

Available in pints, quarts and five gallon plastic pails, Fluorosolvent 504 is delivered with a list of physical properties and a Certificate of Analysis, which validates its cleanliness level. The solvent is not compatible with hydrocarbon-based lubricants.

## Lube Lit Update



Three new application summaries have been added to the Nye literature library: Synthetic Oils for Rolling Element Bearings, Synthetic Greases for Rolling Element Bearings, and Synthetic Lubricants for Ball Screws and Lead Screws.

The application summaries for rolling element bearings offer a much broader array of lubricants than previous bearing summaries, including very wide temperature and chemically resistant bearing oils, as well as wide-temperature, low-torque, chemically-resistant, water- and salt-water resistant, and "quiet" bearing greases. The ball and lead screw summary suggests greases for light, medium, and heavy duty applications, and introduces specialty greases for lead screws and precision ground and high speed ball screws.

To receive the summaries, check the appropriate boxes on the enclosed Literature Request Card and mail or fax it to Nye, or call Nye at (508) 996-6721.



# Product Round-Up: Lubricants for Telecommunication Applications

Lubricants from Nye are used in countless telecommunication applications, from gold-plated IC socket pins, to heat sinks for electronic components. This product round-up offers an overview of Nye's telecom lubricant collection, and suggests "lubricant solutions" to problems faced by component designers.

## Lubricating electrical connectors.

The lubrication of stationary, separable connector pins and blades offers immediate and long term benefits. A thin film of lubricant can reduce mating force by as much as 80%, a critical factor in connector assembly, especially for electronic connectors with dozens or even hundreds of pins. For gold-plated connectors, lubricants also reduce noble metal wear during mating and separation, an important consideration since thin plating is the rule of thumb.

Long term connector lubricants guard against oxidation and harsh environments for tin-lead and gold-plated connectors. Because a lubricant seals the microscopic pores in thin gold plating, it protects the base-metal substrate from atmospheric corrosion.

A thin lubricant film also protects tin-lead connectors from fretting corrosion, that is, metal-to-metal contact caused by low amplitude vibrations produced by nearby motion, as from fans, motors, or the opening and closing of cabinet doors.

**Keeping out the elements.** Telecommunication systems incorporate many subsystems and components whose performance depends on the dielectric properties of their materials. Outdoors and in industrial or marine environments,

a properly selected lubricant can help guard against in-service degradation of those dielectric properties.

For gasket and O-ring seals at connector joints in coaxial cables or in weather enclosures, silicone lubricants like NyoGel 783D become back-up weather seals. They help prevent the influx of moisture which can cause load mismatch, insertion loss, or even sudden catastrophic failure of a transmission line in higher wattage systems.

Within the waveguide in a microwave connector, Nye Fluoroether Grease 842 and NyoGel 762G are exceptional water displacement lubricants. In critical applications, these products can be ultrafiltered and vacuum-treated to maximize their dielectric strength. Fluorinated greases also ensure long-term oxidative stability across broad temperature ranges. They also ease connector mating and separation.

Similarly, in a fiber optic transmission line, moisture or an air gap at the junction of two optical fibers can cause significant signal reflection. Nye's fiber optic coupling gels serve as a coupling medium and an environmental seal between mating fiber optic waveguides. These crystal clear gels, which have the requisite optical purity and good thermal and oxidative stability, are available over a range of refractive indices, from  $n=1.3075$  to  $n=1.6365$ . Custom formulations are available. Use of these gels, which require no catalyst or curing, can offer dramatic cost savings over the conventional fusion splicing method.



*Nye manufactures a broad array of lubricants designed to ensure optimum performance and long life for telecommunication components. Proven in the field, the NyeTact series of connector lubricants is also recommended by leading telecommunication laboratories.*

**Dissipating heat.** The telecommunication designer often faces a tradeoff between excessive heat dissipation in electronic components and compact, cost-effective packaging. The design challenge is to lay out a low thermal impedance heat path from the component to a heat sink, and forego more complex and costly heat pipes or powerful air cooling fans.

The heat path is comprised not only of layers of plastics and metals in the equipment package, but also of the interfaces between the layers in the heat sink itself. In fact, the temperature across such interfaces is often greater than the temperature across the heat sink layers. When heat dissipation constraints are tight, the designer looks for ways to reduce — and ideally eliminate — the thermal impedance of the heat sink interfaces.

Nye Thermal Coupling Compounds 925, 926 and 929 perform this function by filling the interface gaps and providing an additional heat path. These compounds are compatible with plastics, paints and varnishes, and withstand high operating temperatures. Non-metallic additives are available where electrical conductivity is required.

For more information and samples of Nye's telecommunication lubricants, or to request a custom-designed lubricant, call Nye or return the enclosed Sample Request Form.

Nye's Most Popular Stationary Separable Connector Lubricants			
Nye Product	Suggested Coating	Contact Material	Typical Applications
NyeTact 570	Thin	Noble Metal	Databus connectors, backplanes, rf coaxial connectors, IC socket pins, low current/low signal level analog connectors, power connectors
NyeTact 515 or NyeTact 502	Thin	Non-Noble Metal	Databus connectors, backplanes, rf coaxial connectors, IC socket pins, power connectors
NyoGel 760G	Thick	All	High current connectors, power connectors, severe atmosphere, moisture, or marine exposure

## New High Speed, High Temp Bearing Grease

Nye recently introduced Rheoplex 6000HT, a high-temperature synthetic hydrocarbon grease designed to reduce torque and extend the life of high speed rolling element bearings.

Rheoplex 6000HT, an NLGI Grade 2 grease, can be a cost-effective alternative to fluorinated lubricants for high temperature applications. Its operating temperature range extends to 170°C, and complex grease chemistry pushes its dropping point beyond 250°C, 50 degrees higher than conventional synthetic hydrocarbon greases.

The new synthetic lubricant is also fortified with film-forming, antiwear additives that provide superior protection for the ball and the race under boundary conditions. After a Four-Ball Wear Test (1200 RPM, 40 kg, 75°C, 1 hr.), the wear scar measured only 0.34 mm. Traditionally, wear scars under these test conditions range from 0.5 mm to 0.8 mm. Corrosion inhibitors further protect bearing components.

The new grease also exhibits a quality called rheological channeling, enabling



*Nye's new Rheoplex 6000HT can be a cost-effective alternative to PFPE lubricants for high speed bearing applications.*

the bearing to run cooler and last longer. The grease in the ball path readily becomes semi-fluid under modest mechanical shear, reducing viscous drag and torque. The undisturbed grease outside the ball path remains firm and acts to seal the race.

Rheoplex 6000HT is packaged in 30cc syringes, one-pound jars, seven- and 35-pound pails, and is available for immediate delivery.

## Gunther Horn Featured at Seminar Seminar Hand-Outs Available

Gunther Horn, Director of Research and Development at Advanced Metallurgy, Inc., in Export, Pennsylvania, presented a full-day seminar on arcing contacts in February, the latest offering in Nye's quarterly seminar series.

The 1994 recipient of the Ragnar Holm Achievement Award, which honors persons who have made significant contributions to the field of electric contacts, Mr. Horn is currently Vice Chairman of the IEEE TC-1 Committee and serves as the Associate Editor for the IEEE Transactions on CPMT for Holm Conference and electrical contact related papers.

The invitation-only seminar was attended by Nye employees and representatives from 15 Nye customers in the automotive, telecommunication, and computer industries.






For a copy of hand-outs distributed at Mr. Horn's presentation or for more information about upcoming Nye seminars, contact Kevin Akin at (508) 996-6721.

## Calculating the Unit Cost for Small Amounts of Grease

Knowing the price of a pound of specialty grease can be misleading if you are trying to determine the incremental cost of lubricating a particular device — because a little specialty grease can go a long, long way. The table below helps estimate the per-device cost of specialty greases.

Table Notes: The dots, whose diameters are noted in millimeters, represent various "dollops" of grease. The volume of each dollop is given in milliliters in the second column. The next two columns indicate the amount of grease in pounds needed to lubricate 100,000 devices, if each device uses the amount of grease shown in the

first column. "LD" stands for low or "standard" density grease, that is, a grease with a density close to 1 g/ml, such as most synthetic hydrocarbon, silicone or ester-based greases. "HD" stands for high density grease, that is, a grease with a density closer to 2 g/ml, such as fluorinated ether-based greases. (Some fluorocarbon-gelled greases are intermediate in density; some hydrocarbon greases have densities lower than 1 g/ml.) Note that the volume is equivalent to the weight of the dollop in grams for an LD grease; an HD grease would weigh twice as many grams. The last two columns list the grease cost per device in cents, not dollars.

Amount of Grease Per Device (Dia. in mm.)	Volume (ml.)	lbs./100,000 Units		Grease Cost Per Device (in Cents)	
		LD	HD	LD@\$10/lb	HD@\$100/lb
 1	0.0003	0.06	0.12	0.0006¢	0.012¢
 2	0.0021	0.46	0.93	0.005¢	0.09¢
 3	0.007	1.6	3.1	0.016¢	0.31¢
 5	0.033	7.2	14.4	0.07¢	1.4¢
 10	0.26	57.8	115.5	0.58¢	11.6¢

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If this is your first issue of our newsletter and you'd like to stay on our mailing list, please check the LubeLetter box on the enclosed Literature Request Card and return it to Nye.



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