Nye® Synthetic Lubricants

Get smart about grease

and add performance, life, and value to your product.

SmartGrease™

Synthetic lubricants designed for your product

SmartGrease™

Good grease.
Bad grease.
Right grease.
Wrong grease.
It's all relative.

In the real world, mountains of data about grease quality, testimonials about grease performance, and claims that this grease is just what you need — all of it means nothing if the grease doesn't work in your product. Your product. That's what counts. And that's what SmartGrease is all about.

SmartGrease is high-quality synthetic grease custom-designed for your product. We select each ingredient based on your materials, performance criteria, and life cycle. Then, we test it, reformulate, and test again — until we have the grease that "knows" how you want your product to perform.

We've been making lubricants this way since 1865 when we introduced a natural ester oil formulated to keep whale-ship chronometers operating in sub-zero temperatures. Today, our synthetic oils and greases lubricate critical components in cars, light trucks, office equipment, spacecraft, home appliances, power tools, computers, and thousands of other high quality, long-life products — whose quality and long life depend on a SmartGrease from Nye.

It starts with your product.

Switches

Contacts

Potentiometers

Gears

Bearings

Electric Motors

LEDs

Connectors

Look inside to learn more about SmartGrease: our materials, processes, and technical support. Then, let's work together to select the oils, gellants, and additives that are right for you. Two companies, one goal: a SmartGrease that boosts performance, extends life, and adds real value to your product.

Get your own SmartGrease.

Call: 1.508.996.6721

E-mail: techhelp@SmartGrease.com

Log on: www.SmartGrease.com

Oils lubricate and determine temperature limits.

It's the oil that lubricates – even in a grease. So choosing the right synthetic oil or creating a special blend of synthetic oils is the first step in designing a SmartGrease for your product. Because some oils weaken or destroy metals, plastics, or elastomers, we recommend only those oils that have a successful track record with the materials in your product. We match the oil to your operating temperature range, so it won't get too thick at low temperatures, too thin at high temperatures, or worse, oxidize and leave gummy deposits that compromise the performance and life of your product. And we design to hold cost down. PAOs, the least expensive synthetic oils, work well for many applications. However, if your product is exposed to extreme temperatures, harsh chemicals, high vacuum, radiation, and other special operating conditions, we may recommend more robust oils. Importantly, no matter what type of synthetic oil is best for your product, you'll find it at Nye.

PFPE

Polyalphaolefin

Base Oil

Synthetic Esters

MACs

Right Oil? Wrong Oil? It depends on the product.

Other oils failed. But with a PFPE grease on thermal plastic cams in a motorized oven lock, the lock worked like new after 6,000 cycles at 232°C — surpassing UL requirements as well as life expectancy for the range.

Low-temp squealing from an automotive HVAC motor was a perceived quality problem. The noise went away when residual process oil was removed from the sintered motor bearings, and the bearings were filled with a low-temperature PFPE oil.

Gears in the paper feed mechanism of an office printer were too noisy to meet quality specs. Increasing the viscosity of the PAO base oil eliminated unwanted noise and extended gear life.

Synthetic Oils Commonly Used at Nye

Synthetic Oils	Temp Range (°C)	Key Characteristics/Typical Applications
Alkylated Naphthalene (AN)	-30 to 180	Compared to PAO and diesters, offers improved hydrolytic, thermal, and oxidative stability. Good blendstock for polyalphaolefins requiring high stability under extreme conditions.
Pennzane® *from Shell*	-45 to 125	Highly specialized fluid that combines the low vapor pressure of a PFPE with the lubricity and film strength of a PAO. Typically used in aerospace and critical vacuum applications.
Perfluoropolyethers (PFPE)	-90 to 250	Extremely stable, nonflammable, chemically inert, low-vapor-pressure fluids. Used in extreme environments and to avoid plastic and elastomer compatibility problems.
Polyalphaolefins (PAO)	-60 to 125	Stable, lubricious fluids compatible with most plastics and elastomers. A drop-in replacement for petroleum, it's used in countless applications in many industries.
Polyglycols	-40 to ~125	Good load-carrying ability, compatible with most elastomers, non-carbonizing. Often used in arcing switches.
Polyphenylethers	+10 to 250	Radiation, chemical, and acid-resistant fluids. Traditionally used for noble-metal connectors and high-temperature mechanical components.
Silicones	-70 to 200	Stable fluids with good wetting characteristics. Commonly used with plastic gears, control cables, and seals.
Synthetic Esters	-65 to 150	Excellent wear resistance, stable, affinity for metals, handles heavy loads. Great for loaded bearings.

Gellants keep the oil where it belongs.

Grease is a lubricating system with two key components: oil and gellant. Technically, a grease is a colloid, a type of "permanent suspension," where microscopic particles of a gellant are uniformly dispersed in oil. Too large to dissolve and too small to settle out, the particles of gellant create a unique web-like matrix that keeps the oil where you want it. But gellants can do much more. The right gellant can enhance the thermal stability and lubricity of the oil. It can work as an environmental seal to keep water, salt water, dirt, and other contaminants away from moving parts. It can reduce noise, improve the feel of hand-operated devices, and enhance quality of your product. When designing a SmartGrease, we match the gellant to the oil and your product's operating conditions. You get more than a good grease. You get the right grease for your product.

Right gellant? Wrong gellant? It depends on the product.

In accelerated life testing, copper contacts in an ignition switch corroded prematurely because the organic soap gellant absorbed and retained too much water. Switching to bentonite clay kept water away from the contacts and solved the problem.

Changing the gellant from lithium soap to a super-slippery PTFE solved a stick/slip problem in a telescoping steering column. The PTFE added just enough lubricity to make up for a lack of oil at the interface at start-up.

Bentonite Clay

+Gellant

Lithium Complex

Hydrophobic Silica

PTFE

Gellants Commonly Used at Nye

Gellant	Water Resistance	Salt Water Resistance	Thermal Stability	Low Noise Contribution	Thickening Efficiency	Lubricity	Shear Stability
Organic Soaps							
Lithium	◓	●	◓	●	◓	◓	◓
Lithium Complex	●	●	●	●	●	◓	●
Sodium	◒	●	◒	◓	◒	◓	◒
Sodium Complex	◒	●	◓	◓	◓	◓	◓
Calcium	◓	●	●	◓	◒	◓	◒
Calcium Complex	◓	◓	●	◓	◓	◓	◒
Aluminum Complex	●	◒	●	◓	◓	◓	◓
Organic Non-Soap							
Polyurea	●	●	●	◓	◓	◓	◒
Inorganic							
Bentonite Clay	●	●	●	◒	◓	◒	◓
Standard Silica	◓	◓	●	◓	●	●	◒
Hydrophobic Silica	●	●	●	◓	●	●	◒
PTFE	●	●	◓	◓	◒	●	●

● Excellent ◓ Good ◒ Fair ● Poor

Additives boost a grease's performance.

Additives change the way a grease performs. Some additives alter performance through a chemical reaction. They can extend the life of the oil, reduce gumming and browning, retard rust and corrosion, add extra wear protection, inhibit seizing and bonding, or improve a grease's ability to adhere to moving parts. Chemically inert additives modify a grease's physical characteristics, such as its water resistance, viscosity, shear stability, and temperature limits. Colored and UV dyes can be added to a grease as assembly aids or to facilitate quality inspections. Sometimes, additives can reduce the cost of a grease. For example, antioxidants can make less expensive oils work in higher-temperature environments, eliminating the need for higher cost oils. Importantly, the right blend of additives can work synergistically to make the whole greater than the sum of its parts.

Antioxidants
Lubricity
+Additives
Fortifiers
Antiwear

Right additive? Wrong additive? It depends on the product.

Adding a tackifier and a lubricity additive to the grease formula eliminated excessive wear and high torque in a washing machine timer. The tackifier helped the grease cling to the gears to reduce wear. The lubricity additive reduced torque.

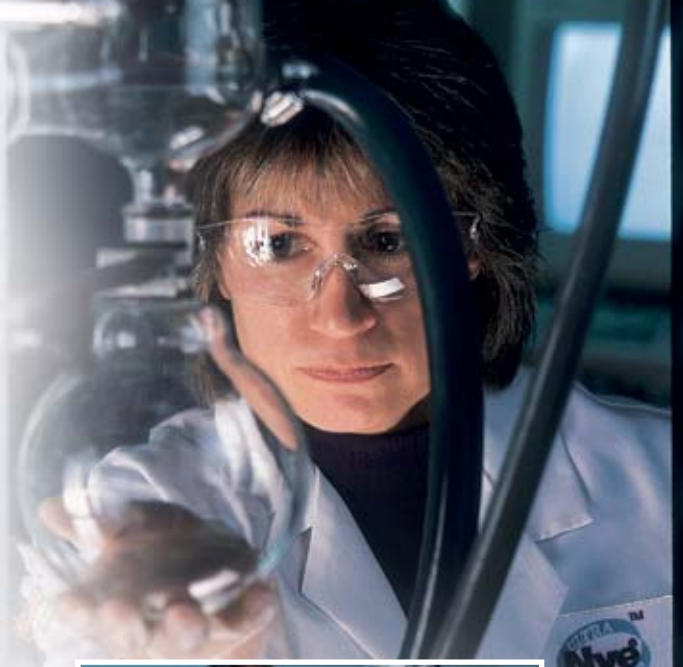
When a manufacturer changed the design of its jet engine actuator, the part didn't survive wear tests. The grease no longer worked. Different antiwear additives plus a higher viscosity oil not only got the new design through rigorous testing, it actually lowered the cost of the grease.

Static build-up on a motor shaft found its way to ground through the bearing, pitting and shortening the life of the rolling elements. A unique additive package worked synergistically to create an electron pathway through the grease to reduce pitting and extend bearing life.

Grease Additives Commonly Used at Nye

Additive	Key Characteristics	Additive	Key Characteristics
Anticorrosion	Slows deterioration of non-noble metals	Friction Modifier	Protects loaded metal surfaces
Antioxidant	Prolongs life of base oil	High-Temp Enhancer	Boosts high-temperature limit of oil
Antirust	Slows corrosion of iron alloys	Lubricity Enhancer	Reduces coefficient of friction
Antiwear	Helps protect loaded metal surfaces	Pour Point Depressant	Improves low-temperature limit of oil
Color/UV Dye	Visual markers for inspection or assembly	Tackifier	Increases ability to adhere to moving parts
Conductive Agent	Adds thermal or electrical conductivity	Viscosity Modifiers	Alters oil viscosity/improves viscosity index
Extreme Pressure (EP)	Solids burnish into surface under pressure		

Testing ensures quality and consistency from batch to batch.



Nye offers a full range of engineering support and technical services, including three types of testing programs that help us deliver the right grease for your product. Pre-qualification testing reduces the testing you have to do in your lab. Working closely with your engineers, we develop meaningful test protocols, conduct tests in our lab, and deliver only the most viable grease candidates for your product. If our grease or another manufacturer's grease doesn't make the grade, we offer failure analysis services. We use a scanning electron microscope and other state-of-the-art analytical tools to examine the surface of lubricated parts and samples of used grease to determine why a grease failed and what needs to be done to make the grease meet your performance expectations. Finally, all Nye greases undergo a series of more than a dozen standardized tests. By carefully measuring the characteristics of each grease, we ensure quality and consistency from batch to batch — a SmartGrease that always knows how you want your product to perform.

+Testing Viscosity Index ASTM Water Washout Evaporation

Standardized Laboratory Tests for Nye Greases

Test	Test Method	Test Description
Oil Properties		
Kinematic Viscosity	ASTM D-445	Consistency of a fluid in centistokes (cSt). Water = 1.0 cSt. Molasses = 10,000 cSt.
Viscosity Index	ASTM D-2270	A dimensionless number that indicates the change of viscosity with temperature.
Flash Point (°C)	ASTM D-92	When a flame will cause a "flash" of fire from a fluid.
Pour Point (°C)	ASTM D-97	When a fluid becomes too viscous to flow.
Grease Properties		
Unworked/Worked Penetration	ASTM D-217	The distance a metal cone penetrates a grease before/after a grease is "worked."
NLGI Grade	—	Classification of grease consistency from 000 (semi-fluid) to 6 (hard).
Dropping point	ASTM D-2265	When grease begins to melt (not the high-temp operating limit).
Oil Separation	FTM 791B, 321.2	Tendency to bleed over time and at high temperature.
Evaporation	ASTM D-972	Indicator of volatility.
Water Washout	ASTM D-1264	Percentage of grease "washed out" of a bearing under a jet of water for 60 min.
Copper Corrosion	ASTM D-4048	Indicates chemical reactivity with metals.
4 Ball Wear	ASTM D-2266	Wear scar on a steel ball rotated under load for 1 hour in a nest of 3 similar balls.
Low Temperature Torque	ASTM D-1478	Force required to move a bearing at –40°C.
Oxidative Stability	ASTM D-942	Tendency to resist oxidative breakdown.
Bearing Rust Test	ASTM D-1743	Differentiates relative rust-preventive capability.

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ISO 14001