



GEAR

# Lubeletter

The World Leader in Synthetic Lubricants

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## Kid's Stuff

Seitz Corporation, Torrington, Conn., designed a motorized, high-temp, high-speed plastic gearbox using Nylon 6/6 with 30% glass fill for a child's electric car by Step 2 Corporation. Step 2 set high test standards for acceleration, constant high-speed use, and worst-case switching from forward to reverse under heavy load.



Initially, Seitz tested a Nye lubricant it had been using in a motorcycle gearbox. It didn't measure up. The gearboxes lasted only half the required life. They overheated and showed signs of wear on the gear shafts and teeth, which is not uncommon when glass-filled plastic gears mesh together and turn on metal shafts. It's a problem that usually can be overcome by adjusting base oil viscosity and grease stiffness.

After reviewing the Step 2 gearbox requirements and materials with Seitz, Nye engineers recommended Rheolube 368AS

— a medium viscosity, synthetic hydrocarbon/lithium soap grease which incorporates a proprietary additive package that makes lithium-soap-thickened lubricants better suited for high-temperature applications. The recommended grease more than tripled the life of the gearbox under Step 2's rugged testing conditions.

Seitz engineer John Cowles commented, "The project certainly showed that grease is not a one-size-fits-all proposition, and that grease selection needs to be an integral part of the design process."

## Cutting Edge

Synthetic greases can be designed for double duty —



something two leading power tool manufacturers discovered when they came to Nye for greases to increase life and performance of reciprocating saws.

The wobble or reciprocating mechanism and the gearbox both need lubricants. The operating speeds, heat, and sliding motion of the wobble mechanism call for a grease that's soft enough to accommodate tight-tolerance between the parts, yet not so soft that it "slings" or drips off during operation.

In the gearbox, the lubricant should "slump," i.e., it should be soft enough to move freely around the gearbox and continuously work itself back into the gear-tooth mesh.

Nye's Rheolube 363BX-1 offers the best of both worlds. Specially formulated for reciprocating saws, this lithium-soap, synthetic hydrocarbon grease contains a mild tackifying additive to reduce oil separation and to prevent sling-off, drip-off, or wipe-off, especially in small gear applications. It's also fortified for improved lubricity and load-carrying. Safe for use with most plastics, the grease offers wide-temperature stability, from -50°C to 125°C. This lubricant is also being tested in hammer-drills, where design concerns are similar.

## One Hot Grease

Kingston, a Scott Fetzer Company in Smithville, Tenn., found that a high-temp synthetic grease not only ensured long life for its new low-profile motorized range lock, it also helped cut material costs.

Kingston's new, compact range lock gives consumers what they want: more oven space. It's economical for appliance OEMs because it uses thermal plastic cams instead of traditional all-steel construction. And because the cams are lubricated with UniFlor grease, the range lock still works like new after 6,000 cycles (under load at 232°C or higher), which far surpasses both the typical life expectancy of the range as well as UL requirements.

UniFlor is Nye's brand of PFPE/PTFE oils and greases, the only lubricants that won't break down under grueling oven conditions; they're also compatible with most plastics and elastomers.

The lubricant also enabled Kingston to use the same plastic materials throughout the device, "to capture cost breaks that come from buying larger quantities," Kingston engineer Don Smith said.

"A basic design rule says if you want the worse coefficient of friction, put two like materials together. Add a good lubricant, though, and you can do that without excessive wear."

The Class N gearmotor Kingston uses to power its range lock is manufactured by Autotrol Corporation of Crystal Lake, Ill. Coincidentally, Autotrol chose a UniFlor gear grease in its Model 150 Class N motor — to meet Kingston's 6,000-cycle requirement.





Jeff Lay,  
Gearing Industry Director

## IN GEAR

A marketing consultant once suggested that Nye conduct a campaign similar to Intel's — placing stickers that say "Nye Inside" on various consumer products.

For gearing applications alone, there would be a lot of stickers out there. Power tools, washing machines, self-cleaning ovens, food processors, blenders, lawn and garden equipment, bicycles, and automobiles all use synthetic lubricants by Nye.

Nye passed on that idea, but the thinking behind the suggestion was right-on. Just as the quality of the chip determines the performance of a computer, the lubricant plays a critical role in the performance of gears.

Design engineers have only recently begun to use synthetic gear lubricants with regularity because that's what consumers want — in a roundabout way. Consumers want more performance, reliability, and service life. Retail outlets want fewer warranty claims. So, engineers respond with more torque, speed, and load-handling, often in lighter, more compact designs. All this puts more stress on the gears, stress that petroleum lubricants can't handle, which paves the way for synthetics.

Market-driven companies are taking the lead. Last year alone, Autotrol, Black & Decker, Cookeville Electric Motor, DeWalt, Milwaukee Electric Tool, Electrolux, Emerson, Kingston, Mallory, WeedEater, Whirlpool, and others turned to Nye for synthetic gear lubricants.

I hope this Lubeletter offers you some insight into synthetic lubricants as design materials. If it raises questions, call me at (937) 885-2312 or send an E-mail to [gearing@nyelubricants.com](mailto:gearing@nyelubricants.com). As the gearing industry moves toward synthetics, Nye wants to become your technical resource — and show you the advantages of putting a little "Nye Inside."

**Quiet as a...** Finding the right grease formulation is a mix of art and science. Case in point: a squealing worm gear in a household stand mixer. An off-the-shelf grease was "channeling," i.e., getting pushed aside by the gears, and not slumping back into the gear teeth. A metal-on-metal squeal was the result.

In formulating a custom lubricant to solve the problem, a lubricant engineer needs to get the right "apparent viscosity," a measure of how stiff a grease remains under shear, and the right kinematic viscosity, which is the viscosity of the base oil alone. By experimenting with various amounts and types of thickeners and base oils, the engineer can custom-formulate a lubricant for a specific set of operating conditions.

For the household stand mixer, Nye solved the problem with a "pourable damping grease." Damping grease typically is used to quiet noise or prevent unwanted motion, such as coasting or backlash. Think of the smooth, quiet motion of a zoom lens on a 35mm camera, which is the work

of a damping grease on the focusing threads. Damping greases work because they are formulated with highly viscous base oils, which give the grease a high internal shear resistance.

The "pourable damping grease" developed by Nye retained this shear resistance, while allowing the grease to slump back into the gear teeth and not channel.

It enabled the mixer to sail through life-cycle testing and remain as quiet as a ... mouse.



**Last Oil Change** Some washing machine manufacturers are designing new planetary gearboxes using plastic gear materials. Others maintain conventional, cut-metal, spur gear designs. However, if they rely on standard petroleum oils to lubricate those gears, they all have two things in common: leakage concerns and the added cost of seals and gaskets.

Using a synthetic grease solves both problems. While synthetic grease may cost more than petroleum oils, it delivers a hefty ROI by eliminating oil seals, gaskets, silicone sealant, associated manufacturing costs — and the cost of damage control if the transmission leaks oil on a customer's brand new hardwood floor.

## Synthetic Greases for Washing Machine Transmissions

Application	Nye Recommendation	Base Oil/Gel
Plastic Gearing	NyoGel 792D	PAO/Silica
Cut & Powder-Metal Gears	Rheolube 380G1	PAO/Lithium
Cut-Metal and Plastic Gearing	Rheolube 790G	PAO/Clay
Plastic gearing	Rheolube 748S	Polybutene/Clay
Light duty and clutch mechanisms	Rheolube 723GR	PAO/Lithium



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