



# Gearing Technology Lubelletter

The World Leader In Synthetic Lubricants

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## Making Custom Synthetic Lubricants Your Competitive Advantage

For most gearboxes — small or large — quality is well defined. They have to be efficient, quiet, and built to last. What many manufacturers who have long relied on off-the-shelf, 80 or 90-weight, petroleum oil to lube their gearboxes are realizing, is that synthetic lubricants can be a major ally in achieving these quality objectives.

In a nutshell, synthetic lubricants last longer, survive extreme temperatures — from -90°C to 250°C! — don't waft away when heated, or get so thick in cold temperatures that they gum up the works. It all adds up to improved reliability, extended operating life, and less warranty claims for the products they lubricate.

A synthetic lubricant, like any other design material, can be engineered to meet specific performance criteria. By selecting the right combination of base oils, thickening agents, and additives, a lubricant engineer can design a grease to control backlash, reduce sling-off, handle heavy loads, enhance low-temperature torque, minimize noise, reduce change in viscosity with temperature, retard rust and corrosion, prevent water and salt-water washout, and even resist corrosive fluids and gases.

By taking advantage of this kind of customization, more and more engineers are asking for lubricants designed with the physical and chemical characteristics that best match their gearing application.

**Out with the old, in with the new.** In the high-performance power tool market, manufacturers want to boost the speed and power. A faster motor, however, takes its toll on gearing, or more precisely, the

lubricant inside the gearbox that's supposed to prevent friction and wear.

Case in point: DeWalt Industrial Tool Co. designed a more compact yet more robust motor for their drills, reciprocating saws, circular saws, and right angle grinders. In tests, gearing took a beating, and they quickly realized that petroleum wouldn't take the heat. Nye solved the problem with Rheolube 380.

Rheolube 380 brought some unique rheology to these

industrial-strength tools. Though metal-on-metal gears traditionally use a medium-to-high viscosity lubricant, Rheolube 380 was a blend of two relatively light base oils, a PAO and an ester. Esters are known for exceptional lubricity. In DeWalt's traditional 300-hour benchmark test, gearboxes lubricated with Rheolube 380 lasted 900 hours. The gears were in great shape, but the motor brushes wore out!

An additional benefit, because Rheolube 380 is a relatively low-viscosity

material, it reduced drag, which optimized motor speed and overall tool performance.

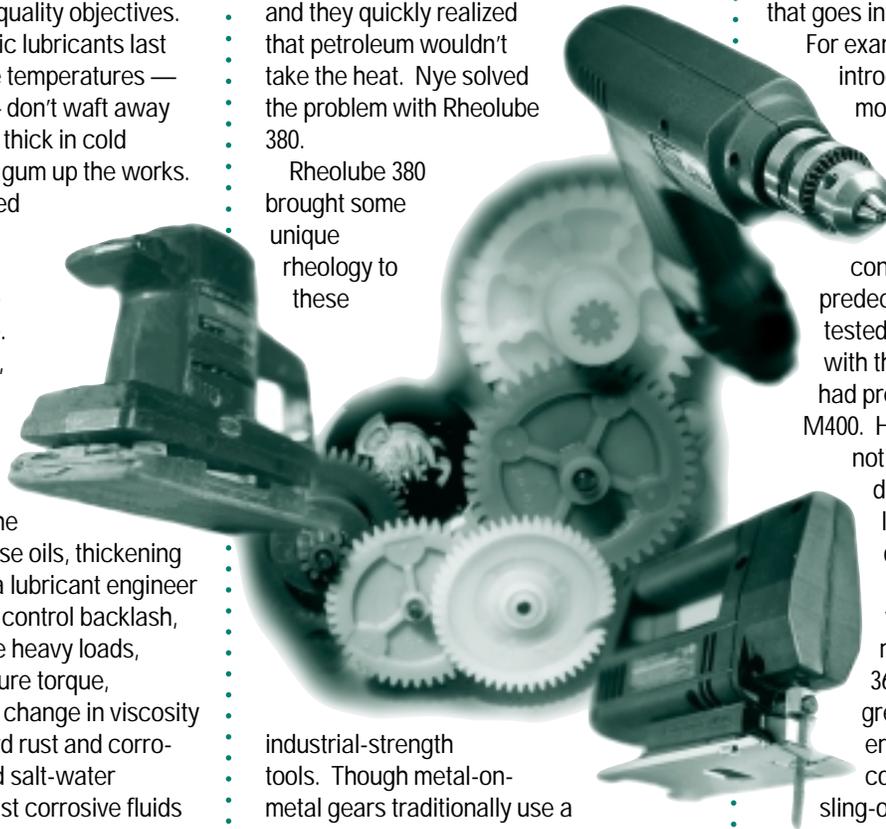
**Put it on my plastic.** Sometimes synthetic greases recommended for one design don't transfer well to another device. Different gearboxes have different specifications, and so should the grease that goes into them.

For example, Mallery Controls recently introduced its Delta Timer, a timer motor with plastic gearing for clothes dryers. Through improved materials and a more sophisticated design, the Delta Timer cycles considerably longer than its predecessor, the M400. Mallery tested a prototype of the Delta Timer with the synthetic grease that Nye had previously formulated for the M400. However, the older grease did not measure up to the new design. Tighter tolerances and larger gears required a different formulation.

Working in collaboration with Mallery engineers, Nye recommended Rheolube 362HB, a PAO, lithium-gelled grease with adherence modifiers. It offered excellent plastic compatibility and resistance to sling-off and drying out — the qualities needed to match the extended life Mallery designed into the Delta.

**Bigger boxes too.** A transaxle manufacturer recently switched to a custom-formulated synthetic grease by Nye — which actually reduced manufacturing costs and enhanced the marketability of the transaxle.

Grease tends to stay where it's put; oils don't. This simple lubrication fact allowed



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a more economical design for the transaxle gearbox. When filled with oil, expensive gaskets and sealants were needed to prevent leakage. However, since the company sells transaxles to



OEMs of three-wheel electric scooters — the indoor/outdoor vehicles that offer mobility to handicapped persons — a no-leak transaxle is critical. Oil

spills are never good for the environment, but “hazardous waste” all over Mrs. Smith’s carpet is something to be avoided at all costs.

Nye formulated NyoGel 760W for the transaxle. A synthetic hydrocarbon grease with a high viscosity base oil, it not only outperformed the oil, it reduced manufacturing costs. The cost of sealing the grease inside the gearbox is considerably less than the sealing oil, though there is no increased risk of leakage with the grease.

NyoGel 760W will likely find a home in transaxles for small tractors, electric golf carts, recreational vehicles, and other applications where oil leakage, recycling, and disposal pose more serious environmental problems.

**Greasing the future.** While some gearbox manufacturers and OEMs are specifying synthetic greases, the majority are still married to petroleum. The reason: Synthetic lubricants cost more. But the numbers work both ways. Experience has shown that synthetic lubricants can cut manufacturing costs, reduce environmental risks, and make products perform more reliably and last longer — all strong selling points in today’s marketplace. Eventually, more and more manufacturers will agree that a few pennies more per part is a small price to pay for that kind of competitive advantage.

## Popular Gearing Lubricants by Nye

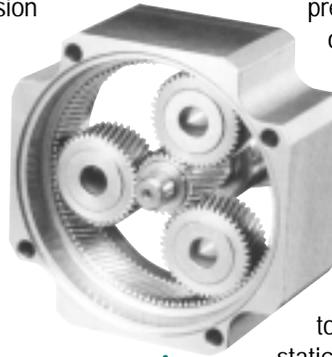
Product Name	Typical Application
Rheolube 380	High-speed spur, helical-cut, and powdered-metal gears
Rheolube 377AL	Planetary gears; widely used in starter motors
Nye Synthetic Oil 605	High-temp, heavily loaded helical gears. Ideal for automotive superchargers.
Rheolube 362HB	Plastic gearing applications, such as appliance timers, automotive seat and window lift motors.
NyoGel 790G	Worm gear drives; excellent for low-to-medium speed, high-reduction gear boxes.

## Helical Planetary Gears – Definitely Cooler

With more than 250,000 precision gearheads installed world-wide, Bayside Motion Group ([www.BMGnet.com](http://www.BMGnet.com)) is reputed for attention to detail.

To meet the increasing demands of high performance servo motors, Bayside designed a unique family of all-helical planetary gearheads that feature HeliCrown® gear tooth geometry and Plasma Nitriding, a computer-controlled, gear-hardening process. Compared to standard planetaries, these engineering breakthroughs offer gearheads with 30 percent more torque, backlash as low as 3 arcminutes, under-70 db quiet operation, and over 92% efficiency.

Having pushed the laws of physics to the limit with gearing design, Bayside then focused on the lubricant. It asked Nye to design a grease that would protect tooth surfaces from wear and loss of profile accuracy — a real challenge. This gearbox can see input speeds up to 10,000 RPM. Plus, in a



precision gear set even a film of lubricant potentially can be thick enough to cause a positioning error.

After just three rounds of sampling, Nye delivered NyoGel 792D, a very light, thixotropic grease that actually flows under shear and returns

to a gel consistency when static. Its “flow-ability” assures

continuous lubrication of gears and bearings for the life of the gearhead. Proof? After a grueling 300-hour/3,000 RPM test at Bayside, the gear teeth retained their profile.

An interesting foreshadower of the results, the internal temperature of the gearbox during the test stayed about 5 degrees cooler than with its former grease. Since wear produces particulates, which cause friction, which produces heat, the lower gear box temperature was an accurate indication of the grease’s successful performance — which Bayside and Nye considered, well ... quite cool.



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