

# New Lubricants Protect Machines and the Environment

## Originating Technology/NASA Contribution

The Mobile Launcher Platform at NASA's Kennedy Space Center is a two-story steel structure that provides a transportable launch base for the space shuttle. The main body of the platform is 160 feet long, 135 feet wide, and 25 feet high. When completely unloaded, the platform weighs about 8 million pounds. When it is carrying the weight of an unfueled space shuttle, it weighs about 11 million pounds.

To transport a fully assembled space shuttle and the Mobile Launcher Platform from the Vehicle Assembly Building to the launch pad, NASA uses a vehicle it calls a crawler. The crawler is 131 feet long, 114 feet wide, and 20 feet high (about the size of a baseball diamond), and features eight tracks fitted with 7.5- by 1.5-foot shoes that help roll the massive vehicle and its payload along.

Back in 1994, NASA sought a new type of lubricant that would be safe for the environment and would help "grease the wheels" by making the meticulous 1 mile per hour, 3-mile trek of the shuttle-bearing launcher platform to the launch pad an easier process. To satisfy the environmental requirement, the lubricant had to be biodegradable. This was especially important, since Kennedy is a wildlife refuge. To account for the size and the weight of the space shuttle/platform combination, as well as the tortoise-like pace and the distance being traveled, the lubricant had to sustain a long operating life while in use. In addition, it had to provide complete protection from the corrosive sand and the heat that are a part of everyday life at Kennedy.

## Partnership

With the help of Lockheed Martin Space Operations—the contractor for launch operations at Kennedy—and private industry, the Space Agency realized that a new kind of lube could go a long way to protect the environment as well as the integrity of a space shuttle mission.

To develop a special lubricant that could meet the stringent requirements for shuttle transport, NASA and Lockheed Martin Space Operations looked to Sun Coast Chemicals of Daytona Inc. (now known as The X-1R Corporation). Founded in 1989, Sun Coast Chemicals had established a shining reputation amongst the racing circuit for manufacturing effective lubricants that were helping drivers and pit crews overcome engine and transmission problems related to heat and wear damage.

Lockheed Martin Space Operations asked Sun Coast Chemicals to formulate an advanced, environmentally friendly spray lubricant to replace the standard lubricant used during transport, and the company accepted the challenge. It brought a team of researchers, consultants, and production personnel to Kennedy to discuss a solution with NASA and Lockheed Martin personnel.

In a matter of weeks, Sun Coast Chemicals produced the solution. This new biodegradable, high-performance



When they were built, Kennedy Space Center's crawlers were the largest tracked vehicles ever made. The two crawlers, previously used to move the assembled Apollo/Saturn spacecraft from the Vehicle Assembly Building to the launch pad, are now used for transporting the space shuttles.

lubricant, coined the X-1R Crawler Track Lube, first succeeded in trial tests and then succeeded when applied directly to the crawler.

## Product Outcome

In 1996, the company determined there was a market for this new development. During this time, it introduced three products that were derivatives of the base formulation it developed for the NASA application: Train Track Lubricant, which was used to solve wear problems for the Florida Power Corporation's railroad system; Penetrating Spray Lubricant, which has been applied for rust prevention, loosening corroded bolts, and lubricating joints and hinges; and Biodegradable Hydraulic Fluid, which has an oxidation life of 10,000 hours and has been used widely in processing plants, as well as in sugar, pulp and paper, marine, mining, sawmill, and heavy construction industries (Spinoff 1996).

Sun Coast Chemicals hit the ground running, quickly adding a gun lubricant/cleaner and a fishing rod and reel lubricant to its environmentally friendly product portfolio (Spinoff 1997). Now, a decade later, it has brought brand new NASA offshoot products to the market under its brand new company name.

The X-1R Corporation, of Daytona, Florida, has folded the high-performance, environmentally safe benefits into a full line of standard automotive and specially formulated racing products. At the top of this line is the X-1R Engine Treatment Concentrate, a formula that treats engine cylinder walls, bearings, cams, rings, and valve guides. It creates a molecular bond with ferrous metal, which leads to a dramatic reduction in friction and wear. It also protects against the harsh metal-to-metal contact that commonly occurs during cold starts. Other benefits of this product are increased engine life and horsepower, improved fuel economy, and reduced engine noise and operating temperatures.

The company's X-1R Plum Crazy grease is a long-life, multipurpose grease with exceptional water resistance. It

is durable enough for both load-bearing and high-speed automotive applications across a wide temperature range (-30 °F to 500 °F), and is, according to the company, a leading product in suspension and open and closed bearing protection, based on extensive testing against severe

heat cycles, dirt, sand, mud, and water. Other benefits include rust protection and reduced wear, drag, and friction, all leading to reduced downtime and an increase in the life of wheel bearings and other automotive parts. Plum Crazy is considered a calcium sulfonate complex



The X-1R lubricants developed originally for use on the crawlers now provide consumers with superior lubricating qualities in environmentally safe, long-lasting products.

grease, a formulation recognized by the National Grease Lubrication Institute as “an excellent technology for grease applications where heat, water, and high- or shock-loads exist.”

Formulated for diesel-powered vehicles, X-1R Diesel Fuel Concentrate with Cetane Booster contains a variety of proprietary ingredients that The X-1R Corporation said helps: clean injectors; improve Cetane ratings; improve fuel economy; decrease black, white, and start-up smoking; reduce carbon monoxide, nitrogen oxide, and hydrocarbon emissions; eliminate engine knocking; and fight corrosion. (A Cetane rating is a measure of the combustion quality of diesel fuel, with a higher number representing improved quality and performance.)

Created specifically for racing differentials and transmissions, X-1R Synthetic Gear Fluid is super-resistant to high temperatures and contains extraordinary friction-modifying performance features, according to the company. Lower internal friction means less wear and lower operation temperatures. The end result is longer, trouble-free operation. X-1R Synthetic Gear Fluid is compatible with most manual transmissions and rear-end components, including quick change rear-ends.

Another synthetic product, the X-1R Air Tool Lube, is specially formulated for all piston-type and rotary air tools, as well as inline oil systems and any pneumatic air tool that requires an oil lubricant. It contains inhibitors that attack moisture and other contaminants that may prevent air tools from achieving maximum performance.

On the whole, the entire X-1R automotive product line has stood up to rigorous testing by groups such as the American Society of Mechanical Engineers (New York), the Department of Mechanical Engineering at Oakland University (Rochester, Michigan), Morgan-McClure Motorsports (Abingdon, Virginia), the Swedish National Testing and Research Institute (Boras, Sweden), and the National Power Corporation (Quezon City, Philippines).

In Dawsonville, Georgia, Elliott Racing is building some of the fastest racing engines in the country. Formed



Penn Synthetic Reel Oil, Precision Reel Grease, and Rod & Reel Cleaner now protect against corrosion and rust.



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by brothers Dan and Ernie Elliott (Ernie is recognized for building winning engines for NASCAR's Winston Cup), the group recently used X-1R racing formula while testing an engine with a dynamometer—a machine that measures torque and rotational speed to determine engine power.

"It was unbelievable," said Dan Elliott when speaking of the results. "We've worked for 2 weeks to gain 2 horsepower, and here we just poured the X-1R in, and picked up 8 horsepower. But, besides the horsepower, you are picking up fuel mileage, and that plays such a critical role also, because races are won and lost on fuel mileage. What a bonus!"

Fully aware that not everybody is an automotive mechanic or an engine builder, The X-1R Corporation markets "handy packs" for simple jobs around the house. Consisting of multipurpose, multiuse lubricant and grease, these handy packs stop squeaks, reduce friction,

protect against rust and corrosion, free up stuck parts, and repel moisture. They are ideal for doors, garage doors, locks, windows, hinges, washing machines, ceiling fans, electric shavers, exercise equipment, shop tools, and lawn equipment, among many other items.

In 2003, The X-1R Corporation teamed up with Philadelphia-based PENN Tackle Manufacturing Company, a leading manufacturer of fishing tackle since 1932, to jointly develop and market a line of advanced lubrication products for saltwater and freshwater anglers, under the familiar PENN name. PENN Precision Reel Grease, Synthetic Reel Oil, and Rod & Reel Cleaner are now providing optimum lubrication for longer casting and smoother retrieval, plus protection against corrosion and rust.

"The challenge was formulating the products for the marine environment, for both fresh and saltwater applications," said Edwin "E.T." Longo, executive director of special projects development at The X-1R Corporation. "Most marine equipment is subjected to a variety of extreme conditions, such as prolonged exposure to the sun and the corrosive nature of salt and water. The lubricants we developed for NASA had to meet the same stringent demands, so we were able to develop products for PENN that are far superior to anything on the market today."

Following rigorous testing over a 2-year span, PENN committed to using the specially designed X-1R grease as the PENN Precision Reel Grease in early 2006. It is now applied to all reels leaving the company's factory.

The decision came after extensive research to identify the best possible option. "We removed the plate, which houses the gears and bearings, from a number of 965 International Baitcaster reels. A team of engineers cleaned them and coated each one with a different grease out of a selection of five well-known potentials, then we put them through a torture test," said Brent Kane, PENN's national sales manager.

"Torture included repeated dunk-and-dry cycles in saltwater baths, saltwater spray tests, and long days on

the roof in the punishing summer sun," Kane continued. "We wanted to put an accelerated life span on the reels."

According to Kane, the test subject coated with the X-1R formulation that would eventually become the PENN Precision Reel Grease was the only one to withstand the test. He noted that evaporated water left salt crystals emulsifying in the other test subjects that led to "extreme, holes-eaten-through-metal corrosion." As for the X-1R-coated reel plate, Kane noted it operated just like new. "The pinion dropped in and out, and it engaged perfectly. X-1R's PENN Precision Reel Grease displaces water and will not emulsify with saltwater, so there were no corrosion problems after getting it submerged," he concluded.

The Precision Reel Grease, Synthetic Reel Oil, and Rod & Reel Cleaner are part of the co-branded label belonging to PENN and The X-1R Corporation, and are available at a wide array of local bait and tackle shops and at large outdoor equipment retail chains, including Wal-Mart, Cabela's, Sports Authority, Dick's Sporting Goods, Sport Chalet, Big 5 Sporting Goods, Modell's Sporting Goods, Gart Sports, Academy Sports + Outdoors, Gander Mountain, G.I. Joe's Inc., Boater's World, Bass Pro Shops, and West Marine. The items are also available through the Army and Air Force Exchange Service, which provides merchandise and services to active duty, guard, and reserve members, military retirees, and family members.

These three fishing products, as well as all other X-1R advanced lubricants manufactured by The X-1R Corporation, have been officially recognized by the Space Certification Program, which is managed by the Space Foundation in cooperation with NASA. The company was also honored as the 34th inductee into the Space Foundation's Space Technology Hall of Fame in 2000. ❖

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