



# X-1R Performance Lubricants

## An Explanation of Functional Properties



SPACE FOUNDATION





## **X-1R Performance Lubricants – An Explanation of Functional Properties**

*"In fact X-1R proved to provide better protection than any other lubricant on the market..." G. McCorquodale NASA Engineering.*

Almost since the first oils were used in the first internal combustion engines there have been oil additives. These have all fallen short of the elevated performance requirements that were being demanded from the world's leading engineering organizations.

X-1R was specifically designed to overcome this gap in performance and act as a friction reduction modifier within extreme pressure environments that could be added to a varied array of lubricants to reduce energy consumption and extend equipment life, thus reducing operating costs whilst not being cost prohibitive.

Utilizing the latest innovations in lubrication research (tribology) the X-1R Corporation has now formulated what is being seen as the third generation of engine treatments. This new generation actually penetrates and impregnates the metal inside your engine leading to smoother, harder metal surface which in turn reduces friction and hence increases fuel efficiency.

Since the introduction of X-1R the product has been proven in the laboratory, proven in industry and proven in space. In fact it has been proven time and time again to be the most effective lubricant available. That is why we are Certified Space Technology and proudly in the NASA Space Technology Hall of Fame.

The technology used by NASA in the Space Program has been adapted for use in a full range of performance enhancing lubricants, greases and fuel additives that keep machinery running smoother, cooler, quieter and much more efficiently whilst reducing emissions.

### **How X-1R Friction Modifiers Function**

*"...X-1R actually permeates into this outer, loosely bonded layer of molecules to form a metal hybrid..." Dr. Brian Taylor, Chevron Petroleum*

When added to oil there are several functions that X-1R will enhance. Some of the benefits are immediately noticeable; ones that can be heard or seen, others take time or scientific testing to become apparent. However, to put it simply with the use of X-1R



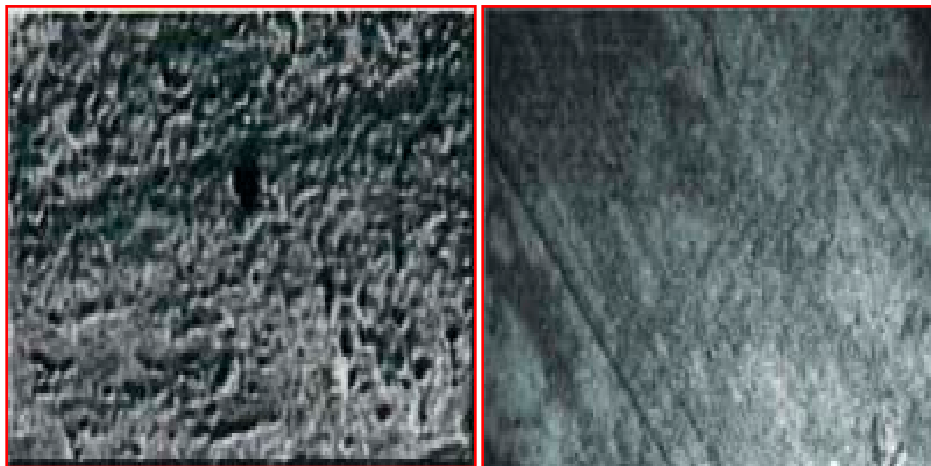
all engines run smoother, cooler, quieter and more efficiently than they were prior to the application of the additive.

In fact when the product was first beta tested in a range of normal conditions it was very evident that the machinery was running very much cooler. Heat in machinery is often a result of friction, and thus the X-1R Corporation set out to fully understand how the product was working.

Initial tests carried out in the early 1990's by Dr Gary Barber of the **University of Oakland**, who is a Consultant for Detroit Diesels noticed that there was a reduction in wear by more than 47% (*report at Technical Manual One, Section 5*). These results were confirmed by tests at the **Falex Corporation** where it was proven that X-1R doubled the protection values of all lubricants that it was tested with whilst there was an even greater reduction in wear.

All metal surfaces have microscopic imperfections, tiny porous terrains that when magnified resemble a mountainous landscape. When heat is applied to the metal the surface imperfections expand and distort increasing the factors that breakdown oil. Further testing particularly at **QC Laboratories** (*report at Technical Manual One, Section 9*) showed that X-1R was actually permeating in to the outer layer of loosely bonded molecules in-effect forming a metal hybrid.

Pictures from QC Laboratories at x1500 magnification



Before X-1R

After X-1R

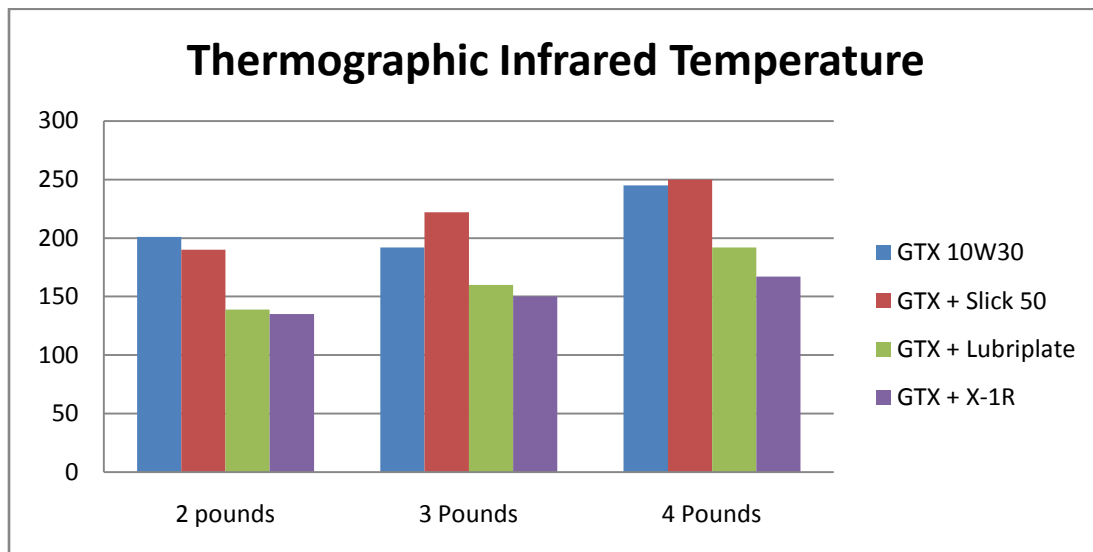
The above picture clearly shows the extent of the smoothing of the test metal, smoother metal leads to less friction and improved fuel efficiency.



The resulting smoother load bearing contact surface allows the forces and loads to be more evenly distributed over a wider surface and this results in a reduction of friction, once you reduce friction you reduce fuel consumption. Cross sectional work at QC Laboratories further demonstrate the permeation into the metal itself and a hardening of the ferrous metals which came into contact with X-1R.

The hardening effect was further noted by the **Swedish National Testing and Research Institute** (*report at Technical Manual One, Section 7*) where the tests conducted confirmed that there was a hardening of the ferrous surface metal, in fact there was a doubling of the hardness from 35Rb to 72Rb. More testing at the **Helsinki University** (*report at Technical Manual One, Section 8*) where a pin on disc test was run proved that this hardening was beneficial to the reduction of friction and thus increasing fuel efficiency. Recently a pin on disc test program was carried out by the **University of Malaya** where the results were replicated.

This information caught the attention of a the Department of Predictive Engineering and Technology Group at the **NASA Kennedy Space Centre**, the home of the Space Shuttle and the world's largest heavy-lift vehicle the Space-Shuttle-Crawler. Here using a state of the art testing equipment X1-R was tested against a range of competing lubricants and additives. X-1R proved that when added to a common lubricant there will be a significant reduction in oil temperature (*report at Technical Manual One, Section 6*).





In fact X-1R proved to provide superior lubrication compared to any other commercially available lubricant and for the past 15 years the X-1R range of friction modifiers and fuel additives have been used by NASA in the Space Shuttle program. In the Year 2000



the work that X-1R had perform within the Space Shuttle program was officially recognized when the company was presented with the prestigious Certified Space Technology Award and thereafter inducted into the **NASA Space Technology Hall of Fame** (visit their home page at [www.spacetechnologyhalloffame.org](http://www.spacetechnologyhalloffame.org)).

The application and efficacy of X-1R within everyday scenarios, for example how well would the product perform in a normal family car was of great concern to the X-1R Corporation. Dr Gerald Micklow whilst he was at the **University of Florida** and a consultant to various US Governmental Groups including **NASA**, undertook a series of tests to determine the performance of the products with particular emphasis on fuel economy. In his initial test he found that there was an overall increase in fuel efficiency of more than 7% and an increase in maximum power of more than 2%, (Report at Technical Manual One, section 1) this result was later confirmed by the legendary **Elliot Brothers Racing Team**.



Dr. Micklow considered this work so significant that he published his findings in an **American Society of Mechanical Engineers** journal. More recently Dr. Micklow, now of the **University of North Charlotte** has conducted three further testing programs all of which confirm his earlier findings, in fact his last report found that with the use of X-1R Engine Treatment and X-1R Fuel Treatment you should be able to get about **10% saving in fuel consumption** in normal driving conditions (*reports at Technical Manuals 2, 3 and 4*).

X-1R provides additional benefits by incorporating oxidization reduction agents, thermal and viscosity stabilizers, anti-scuff and anti-wear components, contaminate scavengers, rust and corrosion inhibitors. The inclusion of these compounds provide supplemental



protection in areas that are critical for balancing and extending the usable life of the oil that X-1R is added to.

Because the use of X-1R Friction Modifier has been demonstrated by numerous academic and trade organizations to provide superior protection the product is now supplied to many world recognized and household names. Some of the most recent work on testing has been undertaken by Power Utility Groups who have been severely impacted by the dramatic increase in oil prices in the past few years.

In particular the **National Power Corporation** (NAPOCOR) of the Philippines and **Tenaga Nasional Berhad** (TNB) in Malaysia have conducted extensive tests and are implementing the inclusion of X-1R products into their preventive maintenance programs (reports at Technical Manual Three, sections 1 thru' 7). Significantly it is the reduction in emissions that has been of great interest; X-1R will reduce emissions by a significant amount particularly as the machinery returns to peak operating efficiency as was proven by both NAPOCOR and TNB.

Our work is not finished and the X-1R Corporation continues to invest in research and development of lubricants. However, it is often our customers that surprise us when we hear how they are using X-1R lubricants. For instance we recently discovered that by using X-1R in **Air-Conditioning Treatment** the system would cool down faster, use less power to stay cool and vibrate far less, leading to extended machine life. *(reports in Technical Manual 4, Lam Soong and Sanden)*

## **Conclusion**

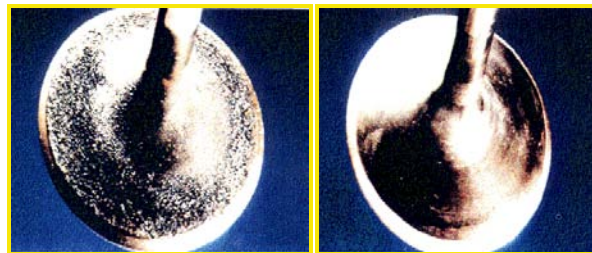
Numerous Academic and Professional bodies around the world have subjected X-1R Friction Modifiers to an array of testing. The product is proven to interact with the ferrous metal within the engine leading to smoother metal to metal contacts and thus a wider more evenly distributed load across the contact surface and hence lowers the internal friction of the machine that has been treated. This reduced friction regime allows the engine to operate closer to its optimum performance and thus consumes less fuel to achieve the same power, or unlocks more usable power. By using X-1R products as a part of a maintenance program you will be able to enjoy smoother and quieter machine operation whilst gaining significant fuel savings. Down time and breakdowns will be minimized and the engine will generate less pollution.



## X-1R Fuel Additives – How they Function

“...we recommend the use of X-1R in all our diesel engines.....” Hyundai Service Department.

Since the oil crisis of 1973, the quality of gasoline has become progressively worse. This has resulted in more carbon deposits in the combustion chamber and on the fuel injectors, with a corresponding drop in octane. This affects the anti-knock quality of the fuel, causing knocking, pinging, poor performance and high emissions.



*Exhaust valve before and after  
Treatment of X-1R Fuel Treatment*

The X-1R Corporation has developed and tested and successfully marketed a range of Fuel System Treatments that are especially formulated to solve gasoline and Diesel related problems. In fact the X-1R Corporation is recognized as world leaders in the formulation and manufacture of **Methylcyclopentadienyl Manganese Tricarbonyl (MMT)** the most advance Octane Booster available today.

With all fuels over time, harmful gum and varnish deposits form in the fuel delivery system, restricting the efficient operation of the fuel injectors or the carburetor. These deposits cause the fuel to be released in a stream of droplets in the combustion chamber rather than a finely misted vapor, which the engine needs to burn the fuel efficiently. This liquid cooks in the combustion chamber, forming deposits rather than igniting to produce power. The unburned fuel causes more carbon deposits in the combustion chamber, which reduces the size of the chamber and increases compression. As the compression gets higher, it increases the engine's octane requirement. When this happens, a higher-octane fuel is needed or the engine will begin to experience knocking, pinging, dieseling (run-on), and second-rate performance. X1R Complete Fuel System Treatment contains strong detergent and



deposit control agents which, when used over a period of time, will clean and keep clean the fuel delivery system and combustion chamber. X1R Complete Fuel System Treatment's unequalled cleaning action lowers the engine's octane requirements to original manufacturer's recommendation.

Before and after the application of  
X-1R Fuel treatment



In fact we tested our additives using the **ASTM5598** protocol, this is a process by where an engine and the injectors are purposely "dirtied-up" and then over a short period cleaned using detergents delivered in the fuel. The results proved that X-1R Fuel Additives provide a superior cleaning action compared to other commercially available detergency packages, (*report at Technical Manual Two, Section 2*).

Further and more specific studies have been carried out with the **Cummins L-10 test** procedure. This procedure was specifically designed to simulate severe injector carbonizing problems that may occur particularly within diesel engines. This problem may cause the engine to lose as much as 15% of its maximum power within 40,000 miles (*report at Technical Manual Two, Section 1*)

Throughout the world emissions standards are being raised as pollution continues to be a global issue. **Hyundai Service Department** tested the X-1R Fuel System Treatment and subsequently issued a Global Engineering Bulletin (*report at Technical Manual, Section 4*). Further work by the **Open University of Sri Lanka** (*report at Technical Manual 2, Section 5*) demonstrated that with the increase in power came a very significant reduction in polluting emissions.

X1R Fuel System Treatment contains a super lubricant that coats the entire fuel system (including the fuel tank, lines, injectors, and carburetor) with a light film of oil that prevents wear rust and corrosion. It also lubricates the upper cylinder area including the compression rings, cylinder walls, pistons, valves, valve guides and seats. This process extends engine life and reduces wear in critical engine parts.

X1R Fuel System Treatment contains an emulsifying agent or moisture scavenger, which removes free water from the fuel system. Normal condensation is dispersed in the gasoline in the form of very small droplets, which remain dispersed in the gasoline





and are carried by it into the combustion chamber. By removing the water, it slows down the burn rate, provides more complete combustion and helps steam out the carbon deposits.

**Dr. Brian Taylor of AFD Technologies Group**, tested the Octane/Cetane enhancing abilities of X-1R Fuel Additives. The combustion enhancing compounds help to minimize pre-oxidation of the fuel (i.e. chemical reaction between the fuel and oxygen) in the combustion chamber prior to the spark igniting the fuel mixture. By minimizing the pre oxidation reaction, fuel combustion efficiency is greatly increased because more fuel is now available for burning at the proper time - that being at spark ignition, not before. This results in higher temperatures and pressures in the combustion chamber delivering more push to the piston and consequently more power to the crankshaft. The net result is greater fuel economy, better performance, lower carbon monoxide emissions and reduced unburned hydrocarbons. *(report at Technical Manual Two, Section 3)*

Recently X-1R Petrol System Treatments have been subjected to the **ASTM5500** Test, also known as the **BMW 318i Keep Clean Test**, this test is designed to measure the amount of deposits on the intake valve and within the combustion chamber under test conditions. X-1R passed at the **UNLIMITED APPROVAL** level. In fact within the combustion chamber there was a 58% reduction in carbon deposits after just one treatment *(report at Technical Manual Two, Section 2)*.

## **Conclusion**

X-1R Fuel Additives represent the pinnacle of current technology. As a company we are at the forefront of research and development of fuel additives and thus our customers are always able to benefit from all of the advances made. By using X-1R Fuel Additives your engine will return to an "as new" condition and continue to function efficiently for the life of the engine.