



# MAGNAPLATE

COATINGS ENGINEERED **FOR YOUR SUCCESS**

## BENEFITS

- Recognized by The Guinness Book of Records for the Lowest COF of Any Solid (0.03)
- Can operate in vacuums of  $10^{-7}$  Torr
- Prevents abrasive wear and galling
- Will not outgas in space environments
- Excellent adherence to base metals, regardless of changes in temperature or environment
- Withstands sliding and rolling loading at high/low temperature extremes
- Excellent stability under severe vibration conditions
- Permanently dry self-lubricating for extended wear
- Compatible with most hydrocarbons and synthetic lubricants
- Control of coating thickness is  $\pm .0003$  at  $.001$ "

# Hi-T-Lube<sup>®</sup>

*Dramatically Prevents Friction, Galling and Wear – Even at Temperature Extremes*

Although HI-T-LUBE “synergistic” coatings were used to solve performance problems troubling critical metal parts on NASA’s space vehicles, engineers worldwide soon recognized them as the solution to “down to earth” problems encountered by all types of manufacturing, processing, and packaging equipment.

Magnaplate-applied HI-T-LUBE, listed in The Guinness Book of Records as the world’s “slipperiest” solid (with a COF of 0.03), is created in a proprietary, multi-step process. It maintains excellent lubricity over a variety of temperature extremes and withstands extremely high compression loads. HI-T-LUBE also remains unchanged in high vacuum applications. Unlike conventional lubricants, it will not outgas or accumulate in unloaded areas. Its dimensions can be controlled so that crucial fits and clearances are maintained. Since the newly created surface of the part is superior in performance, both to the substrate metal or to any of the individual engineering polymers or other components used in the process, HI-T-LUBE is identified as “synergistic.”

The selection of which polymers are used is based on many factors, including: end-use application of the part, its base metal, the kind of hostile environments to which it might be exposed, and the coating buildup permitted.



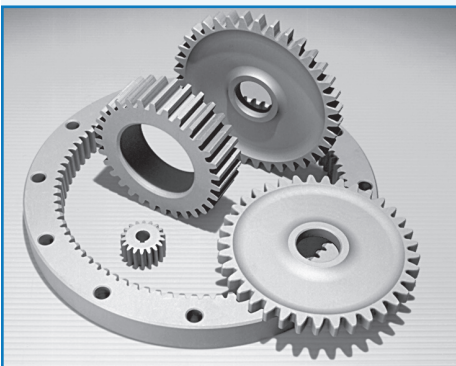
*Pictured here is a small selection of the huge number of different types of sliding or mating parts which exhibit dramatic improvements in their performance properties after being treated with a Magnaplate-applied HI-T-LUBE coating.*





## TYPICAL APPLICATIONS

- Acme thread
- Aircraft parts of all types
- Ball joints
- Bearing surfaces
- Chains
- Engines
- Furnaces
- Gears
- Housings
- Impellers
- Nuts, bolts and screws
- Ovens
- Pistons
- Rings
- Rollers and roller bearings
- Shafts
- Splines
- Tenter frames
- Threads
- Torque measuring devices
- ...Plus any other sliding or mating metal parts



*HI-T-LUBE is recommended for use on all types of gears and gear assemblies to prevent abrasive wear under heavy loads at both high and low temperature extremes.*

## ENGINEERING TEST DATA

**High Loads and Temperatures.** In application testing for jet engine use, HI-T-LUBE proved its superiority under the most exacting conditions. Overall, HI-T-LUBE demonstrated its ability to perform effectively under high loads and extreme temperatures.

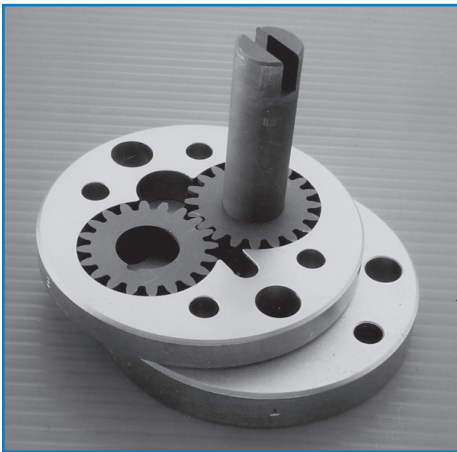
**Permanence.** In an aircraft manufacturer's experience with Haynes bushings it was stated that General Magnaplate's HI-T-LUBE treatment significantly extended their life cycles. However, this proprietary high temperature dry lubricant was tried on the bushing and also the mating part of the lever and link into which the bushings were installed, and the life cycles jumped even higher. This more than met the required life span of the parts. In another series of tests, HI-T-LUBE coated gears outperformed untreated gears under cryogenic conditions.

**Torture Test.** One of the nation's leading actuator manufacturers applied HI-T-LUBE on component parts of a high temperature ball screw actuator used as a positioning device for the variable afterburner exhaust nozzle on the J-85 jet engine. Typical components of the actuator, which demanded an uncompromising lubricant to operate in a temperature range of  $-65^{\circ}\text{F}$  ( $-54^{\circ}\text{C}$ ) to  $+840^{\circ}\text{F}$  ( $+449^{\circ}\text{C}$ ), were trunion and gimbal mechanisms, sliding thrust rods, and highly loaded thrust bearings. Although re-lubrication at 150-hour intervals was permissible on actual engine tests, more torturous testing proved that HI-T-LUBE coated parts survived without re-lubrication for up to 485 hours of test life.

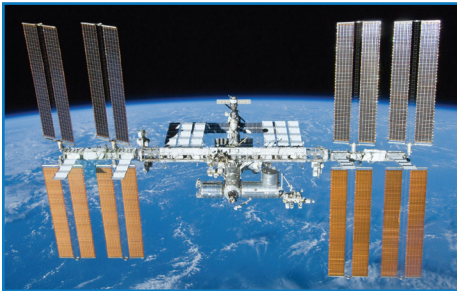
**Adherence.** The HI-T-LUBE "synergistic" coating becomes an integral part of the load-bearing metal surface. It reduces wear and increases the operating life of most metals.

**High Vacuum.** Unlike conventional coatings or lubricants, which generate outgassing when subjected to high vacuums, HI-T-LUBE-coated instrument parts have successfully withstood outgassing problems at  $10^{-7}$  Torr.

**Parent Metal Substrates.** HI-T-LUBE can be applied to most metals normally used where components are subject to high compressive force: steel, stainless steel, copper, copper alloys, etc. It may also be successfully employed on aluminum where that metal's surface will withstand the compression forces involved in the application.



A gear assembly is treated with two of Magnaplate's non-stick "synergistic" surface enhancements, HI-T-LUBE and NEDOX®, to prevent wear, sticking, and galling.



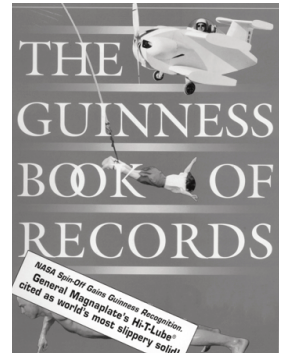
HI-T-LUBE can be applied to a variety of parts on NASA, private and commercial spacecraft, such as solar arrays, to prevent corrosion, abrasive wear, and galling in the harsh environment and extreme temperatures of outer space.



## EXCERPT FROM THE GUINNESS BOOK OF WORLD RECORDS, WHICH RECOGNIZES HI-T-LUBE AS THE WORLD'S "SLIPPERIEST" SOLID!

"I put five materials together and composited them into a lubricant. It worked the first time," declared Dr. Charles P. Covino, Magnaplate's founder and the inventor of HI-T-LUBE®.

HI-T-LUBE surface enhancement coating registers the lowest coefficient of static and dynamic friction of any solid material in the world. HI-T-LUBE is recognized as the world's "slipperiest" solid by The Guinness Book Of World Records.



Dr. Covino invented HI-T-LUBE in the early 1960's, and soon after, he was contacted by the US Air Force to investigate a series of accidents involving F105s. Covino discovered that the speed brake pedals were constantly jamming. "The pedals were cooking hot from exposure to the jet flame, then freezing when the exhaust was opened and the air stream hit them. They would go immediately from super-hot to sub-zero." The inventor realized that the solution was a coating that could withstand these rapid temperature shifts; his recently invented HI-T-LUBE.

HI-T-LUBE also played a pivotal role in the space program of the mid-1960s. NASA was faced with severe problems. Its missions required on-board equipment to function in the vacuum of space, an environment where the use of conventional lubricants was impossible. "They tried everything, including metals like graphite and silver, but everything migrated once it was in a high vacuum. The metals would actually grow whiskers, which would then either jam moving parts or act as conductors and short out electronic systems," said Covino.

"HI-T-LUBE was the only thing that held together in a vacuum and in both high heat and very cold zones" said Covino. It was used for the first trip to the moon, probes to Venus and Mars, and continues to be utilized on countless parts on a variety of space missions.