

**BOUNDARY LUBRICANT FOR ENGINES PROVIDES ADVANCED LUBRICATION TECHNOLOGY FOR TODAY**

# NNL 690

Power Up **NNL 690** is a unique boundary lubricant which is specifically formulated to solve many of today's tribological problems in high pressure boundary conditions where metal to metal contact is inevitable. **NNL 690** works by forming a wear reducing, protective film which is capable of withstanding extreme pressures as high as 200,000 lbs per sq. inch. **NNL 690** provides critical engine parts, such as the ring zone, cam lobes and turbocharger, with boundary lubrication protection far exceeding that of conventional oils. **NNL 690** is a carefully balanced, complete additive package which contains anti-wear and extreme pressure additives, detergent/dispersants, viscosity index improvers, corrosion inhibitors and acid neutralizers.

## **Primary Benefits of NNL 690:**

- *Strong film affinity maintains lubrication at start-up.*
- *By reducing the generation of large wear particles, the efficiency of the oil filter is improved.*
- *High base number helps neutralize acids that cause corrosion*
- *Reduces friction and metal to metal contact in high load areas of the engine.*
- *Extends equipment life and increases equipment availability*
- *Has a powerful detergent which cleans and suspends sludge and varnish.*

**NNL 690** is specifically designed for use in engines calling for medium to high ash oils (1.0% or more) and is suitable for use in most other lubricated equipment using non-E.P. oils. **NNL 690** provides engines with exceptional anti-wear protection and also

# **POWER UP** **FOR ENGINES**



contains a superb detergent/dispersant package, viscosity index improvers and excellent anti-corrosion additives. **NNL 690** is a balanced additive package that provides complete lubrication when used with good quality mineral based and synthetic oils.

The primary benefit of **NNL 690** is friction reduction at the boundary lubrication regime (metal to metal contact). This includes the ring zone, turbocharger and camshaft lobe areas in engines, and the pump, cylinder rods and valves in hydraulics.

## **Secondary Benefits of NNL 690:**

- *Reduces ultrasonic wear noise which relates directly to component wear.*
- *Helps prevent sludge and varnish formation.*
- *Lowers operating temperatures by reducing friction.*
- *Provides an improved seal around the ring zone area, improving combustion efficiency and reducing smoke opacity and blow-by.*
- *Reduces fuel and/or electrical power consumption.*
- *Improves filtration efficiency by reducing the generation of large wear particles.*
- *Extends equipment life and increases equipment availability.*
- *Reduces friction and lowers temperatures in critical bearing and ring zones.*

"Since adding NNL 690 to my truck engine my fuel economy has improved 1/2 mile to the gallon from 5.9 miles per gallon to 6.4 miles per gallon. In the past, on cold mornings, I had problems with the truck starting up. Now with the addition of NNL 690 it starts right up every morning, even in temperatures as low as 0 °F."

**Kevin Lovell, K&S Trucking - Yuma, Colorado**



Call today for more information **1-800-897-6937**  
or visit us online at **www.powerupusa.net**



# POWER UP FOR ENGINES

Decreasing operating expenses, longer machinery life and remarkable fuel conservation are some of the benefits enjoyed by using **NNL 690**. This means that your vehicles and equipment will last longer, operate more efficiently and save you money. **NNL 690** reduces metal to metal contact like no other product. **NNL 690** cleans, protects and reduces operating temperatures.

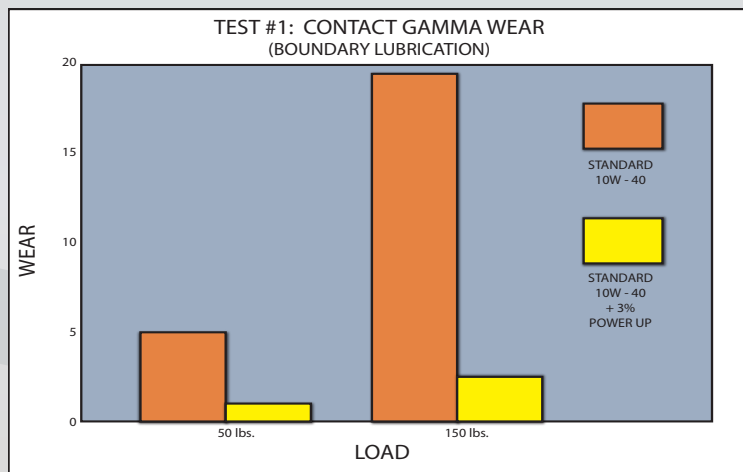
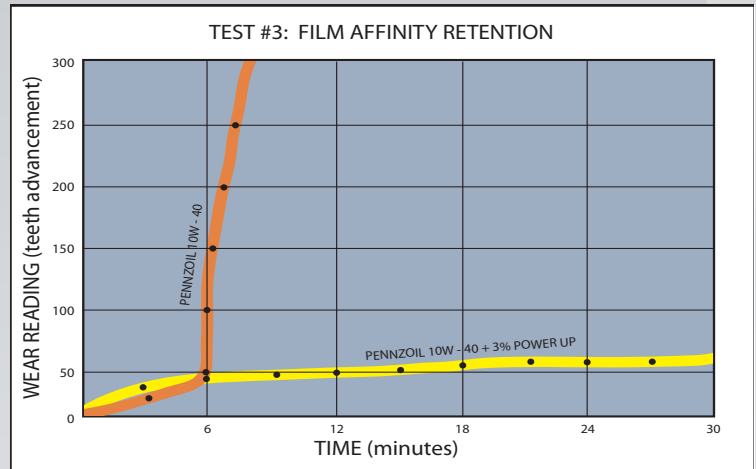
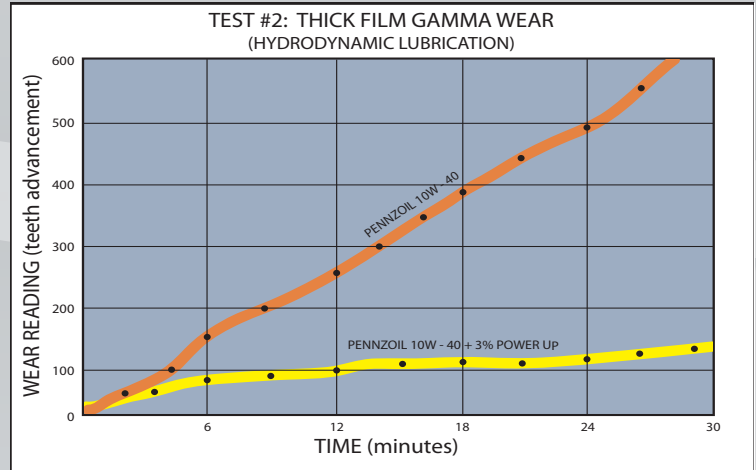
Testing by Fluid Engineering Services Inc., in Stillwater, Oklahoma, with over 80 years of fluid power engineering experience, concluded that "test results reveal that the Power Up NNL-690 has an SLI (Service Life Improvement) of 2.5 over regular oils alone." This means when NNL 690 was tested with conventional oils it increased the component life at least 2 1/2 times longer than oils that were not treated.

## **Our Tests Prove It! Check for Yourself:**

- **High Film Strength**
- **Better Protection at High Temperatures**
- **Protects Against Dry Start Up Wear**
- **Improves Oil Flow in Cold Weather**
- **Keeps Parts Clean and Moving Freely**
- **Reduced Fuel Consumption**
- **Protects Against Water and Antifreeze Contamination and Diesel Dilution**

In two test pairs, after the addition of Power Up NNL 690, under heavily loaded conditions, the amount of wear was reduced between 39% and 87% depending on the load. An average of 18.9% wear reduction was recorded after the addition of Power Up NNL 690 even under hydrodynamic lubrication conditions.

# NNL 690



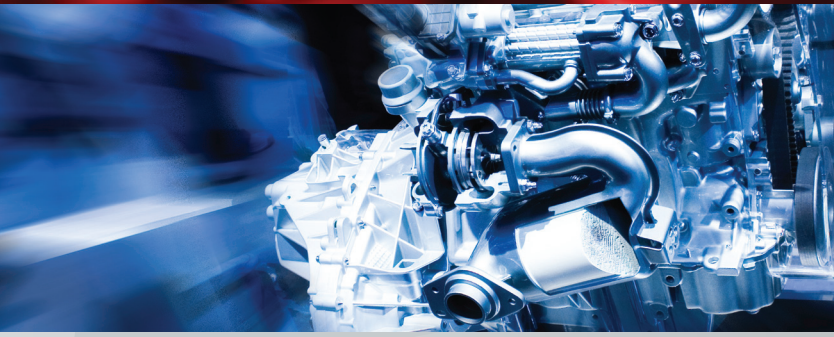
Fluid film retention performance is improved as much as 300% by using Power Up NNL 690 as demonstrated when oil supply is removed.



"The motor is a custom Perkins V8 that is 640 cu.in. making over 3000 horsepower. That kind of power is real hard on the internal motor parts but when I use NNL 690 in my oil, I see a much longer life out of the parts. I also use NNL 690G in the rear end of the tractor because with the front end of the tractor off the ground all the time I have to steer it down the track with the brakes and with NNL 690G it frees up the rear end so I do not have to use the brakes as much as I did before."

**Robby Crutchfield, Massey Ferguson SS Pull Tractor, Liberty, NC**

# NNL 690 PAYS LONG TERM DIVIDENDS IN INCREASED SERVICE LIFE AND REDUCED EQUIPMENT REPAIRS



## Extreme Lubrication Protection!

In independent Contact Gamma wear tests, **NNL 690** significantly reduced the amount of wear generated when an engine oil alone was used. Calculated estimates based on wear reduction (up to 86.9%) suggest that the use of **NNL 690** can extend equipment life **over 7 times** by reducing typical friction losses that occur in normal day to day operations.

A series of dynamometer and ultrasonic noise tests were carried out by an independent consultant to determine the effect of **NNL 690** on a diesel highway tractor engine. The application of 3% **NNL 690** increased the horsepower and torque, while reducing fuel consumption, ultrasonic wear noise and emissions. Some of the computer controlled and corrected dynamometer results are given in Figures 1 and 2.



"With oil sampling showing reduced wear counts after using Power Up NNL 690 in the engine, it was not a difficult decision to use Power Up products in rest of the drive train in my dozer. The transmission temperature dropped significantly and there are no more metal filings on the final drive magnetic drain plug. I have put on over 4,000 hours on this machine since I started using Power Up and have had no power train down time. It pays to use Power Up Lubricants."

**Patrick Culhane with Culhane Contracting - Waterville, Minnesota**

FIGURE 1: CORRECTED WHEEL HORSEPOWER VS. RPM

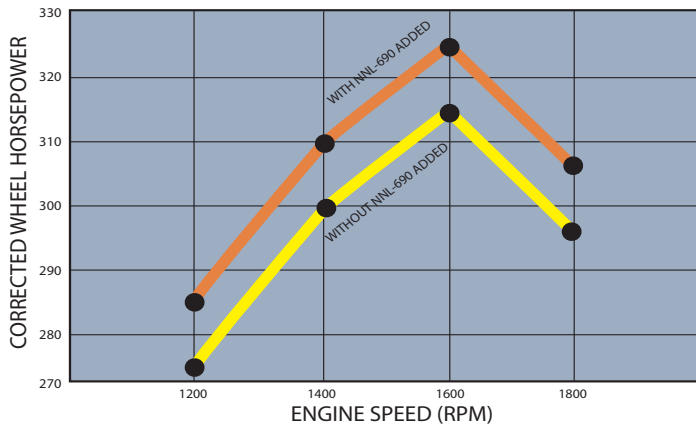
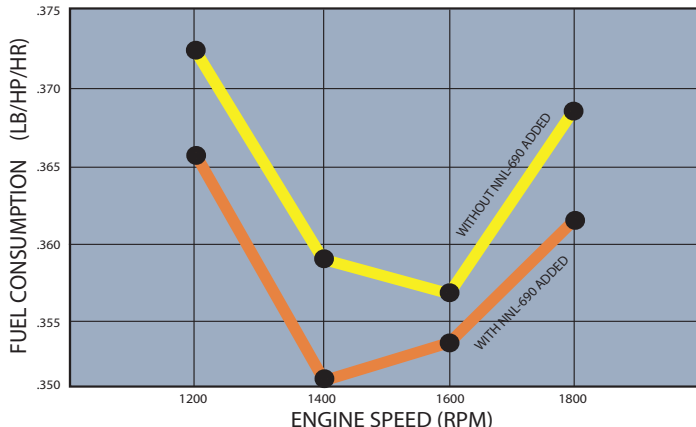


FIGURE 2: FUEL CONSUMPTION VS. RPM



"I have been using Power Up products for over 10 years. I use NNL 690 in my engines, Hydra Maxx in my hydraulics, NNL 690G in my gear boxes, Gen 49D in my diesel fuel, and grease every bearing and every thing that turns with Thixogrease. One of my tractors, a John Deere 4640 recently had a cracked head bolt that allowed water and antifreeze to get into my engine but because of NNL 690, the John Deere mechanics were completely amazed at how good of shape the internals of the engine were in and how clean the engine was internally. I was expecting a total loss of the engine and the John Deere mechanics told me that we just needed to replace the head bolts and the engine would then be suitable for use again. I would not hesitate to recommend the use of Power Up lubricants to anyone that is looking to save money and extend their equipment life."

**Maurice Trites Jr., Maurice Trites Jr. Farms - Gillette, Arkansas**

# NNL 690 PROVIDES YOU WITH A TOTAL PREVENTATIVE MAINTENANCE PROGRAM

Typical Properties of NNL 690		
Property	Method	Result
Appearance		Clear, light amber liquid
Color	ASTM D1500	L 2.5
Viscosity @ 40°C (104°F) @ 100°C (212°F)	ASTM D445	69 cSt 9 cSt
Viscosity Index	ASTM D2270	105
Specific Gravity	ASTM D941	1.00 (H2O =1)
Density @ 68°F (20°C)	ASTM D941	1.00 g/mL
Pour Point	ASTM D97	-6°F (-21°C)
Flash Point	ASTM D92	383°F (195°C)
Acid Number	ASTM D664	0.4 mg KOH/g
Zinc and Lead Content		nil
Colloidal Suspension (Solid particles, PTFE, graphite, MoS2)		none

Special Notations on NNL 690	
Viscosity:	A 5% application of NNL 690 in typical SAE 30 to SAE 50 weight oil results in little or no change in viscosity or viscosity index of the oil.
Pour Point:	NNL 690 is formulated to have a negligible effect on the pour point of typical engine oils.
Alkaline Reserve:	Power Up NNL 690 is blended with an acid scavenger to neutralize blow-by gases and acidic oil degradation products. The addition of 3% NNL 690 will increase the base number of engine oils by about 0.5 mg KOH/g.
Application:	NNL 690 is intended for use in engine crankcases at 3% of the oil volume, each time the oil is changed. It can also be used in automatic transmissions at an application rate of 1%, power shift transmissions at 3% and in circulating systems at 3% to 5%, depending upon operating conditions. NNL 690 is compatible with all mineral oils and polyalphaolefin and diester based synthetic oils. NNL 690 is not recommended for use with water based fluids, phosphate esters or polyglycol fluids.

Test Data on NNL 690		
Property	Method	Result
Copper Strip Corrosion (266°F (130°C) x 2 Hours)	ASTM D130	1b
Rust Preventing Characteristics (100% NNL 690) - Distilled Water - Synthetic sea water	ASTM D665	Pass Pass
Elastomer Compatibility (3% in 10W-30 oil) • Nitrile • Neoprene • Fluorocarbon	ASTM D4289 (Modified)	Pass Pass Pass
Contact Gamma Wear @ 150 lb. load 10W-30 oil with NNL 690		592 teeth 77 teeth

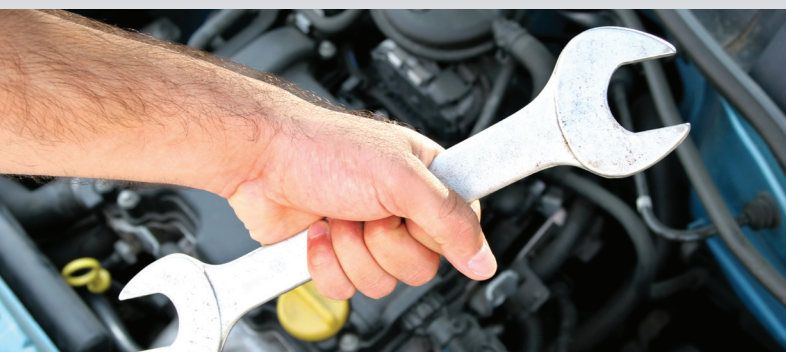
## Product Application:

**NNL 690** is intended for use in internal combustion engine crankcases at 3% of the oil volume, each time the oil is changed. It is also suitable for use in automatic transmissions at an application rate of 1%, in power shift transmissions at 3%, and in circulating systems at 3% or 5%, depending on the severity of service. **NNL 690** is compatible with mineral based and synthetic oils based on polyalphaolefins and diesters. At recommended application rates, engine oil viscosity ratings and typical engine seal materials remain unchanged.

Power Up NNL-690 Application Quick Reference Chart	
Component	Amount NNL-690 to Add
Gasoline Engines	3 - 5% (1 oz / qt - 1.7 oz qt)
High Mileage Gas Engines	3 - 5% (1 oz / qt - 1.7 oz qt)
Diesel Engines	3 - 5% (1 oz / qt - 1.7 oz qt)
Hydraulic & Gear Applications Requiring Engine Oil	3 - 5% (1 oz / qt - 1.7 oz qt)

**NNL 690** is available in the following convenient sizes:

- 1 Liter (35 oz.) Bottle
- 1 Gallon (128 oz.) Jug
- 20 Liter (5.5 Gallon / 700 oz.) Pail
- 205 Liter (56.05 Gallon / 7,175 oz.) Drum



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