



NANO MATERIALS & PROCESSES INC.

NANODIAMOND LUBRICANT ADDITIVE

Engine Oil Additives FM-Protect™ and FM-Conditioner™ Properties & Benefits

Nano Materials and Processes, Inc. (NMPI) creates high-performance Engine Oil additives that are available in two versions: FM - Protect™ and FM-Conditioner™. FM-Conditioner™ contains trace metals and is normally used to improve older, worn engines. It is anticipated that FM-Protect™ would be used in racing and other high-performance applications. The following applies to both versions.

NMPI's engine oil additives consist of Nanodiamond Crystals (**ND**) created by the Detonation Synthesis process and then refined and suspended in Valvoline SAE 10w30 motor oil. The crystals are typically 2-6 nanometers (nm) in size when created. For illustrative purposes, approximately 1.5 million crystals can fit on the head of a pin. Because of their atomic structure the crystals agglomerate to approximately 50 nm.

The crystals are completely different from the diamonds we see in everyday life:

- Rounded with no edge
- Virtually without mass
- Electrically charged
- Catalytic, with functional groups on their surface
- Adsorptive (attracts and holds oil on the surface)
- **Harmless** to metal surfaces

When Engine Oil Additive FM™ is added to engine oil at the ratio of 1 part additive to 100 parts motor oil, this is what occurs:

- ND mixes with the existing motor oil through normal engine operation
- ND crystals permanently adsorb (carry) engine oil on their surface
- The action of lubricated, "contacting" metal surfaces such as crankshafts and bearings, piston rings and cylinders, camshaft lobes and cam followers, etc. force the permanently lubricated nanodiamond crystals into sub-microscopic irregularities in the metallic surfaces
- The crystals quickly coat and penetrate the contacting components and make their surfaces diamond hard and permanently lubricated
- Surfaces retain the lubricant even under loss of lubrication conditions, minimizing or even preventing the damage that might have occurred without the presence of nanodiamonds
- ND becomes a part of the fuel stream through EGR valve recirculation

- ND interacts with the fuel-air mixture during compression and combustion process to increase combustion efficiency and reduce undesirable contaminants such as soot, CO_x, and NO_x
- While oil is an insulator, ND is the best known conductor of heat, reducing operating temperature
- Life of the engine oil additive package is increased by the reduction in soot and operating temperature

Independent Testing

Pin and V testing was performed by Petro-Lubricant Testing Laboratories, Inc., Lafayette, NJ with the following results:

Pin & V Test	
Test	Improvement
PSI Load, 95,709 PSI (failure)	17.3%
Wear Scar, 0.190	15.6
Coefficient of Friction, 0.1101	12.9%

Additional benefits information was obtained in tests performed on Refuse collection vehicles. While not subject to the same stresses as a NASCAR[®] vehicle, the service places special strains on engine oil in the high stress environment of low speed, stop and go driving and can be instructive even for auto racing. A four truck study was performed and provided these results:

Waste Collection Trucks				
Truck No.	1	2	3	4
Additive metals	maintained	maintained	maintained	maintained
MSM	stabilized	stabilized	stabilized	stabilized
Wear Metals	-22%	-18%	-29%	-28%
Contaminant metals	-10%	-12%	-19%	-16%
Fuel Dilution	-12%	-10%	-19%	-16%
Soot	-25%	- 31%	-16%	- 53%
Viscosity	maintained	maintained	maintained	maintained
Oxidation	- 25%	- 21%	-15%	-15%
Nitration	- 20%	- 16%	-12%	- 11%

Specific benefits identified include:

- Reduced electro-spark erosion as measured by the reduced wear metals in the oil.
- Residual oil in the cylinder, combined with the additive, became a component of the combustion process, significantly improving combustion efficiency as seen in the reduced soot in oil measurement.
- The life of the additive package is extended as indicated by the reduced nitration and soot levels.

Use in NASCAR®

Engine Oil Additive FM™ has been utilized by two racing teams. A letter from the crew chief includes the following highlights (direct quotes):

- The engine ran cooler allowing us to use more tape on the radiator, resulting in a reduction in drag, plus creating an aerodynamic advantage.
- The response and performance on coast down was much better.
- The engine reached maximum RPMs quicker through the power band.
- Engine components showed much less wear after its first NMPI Engine Oil Additive FM - Protect™ treatment during qualifying and the race itself. Moreover, the engine shop and gear shop were both able to re-use internal components after five (5) races which normally are scrapped as unusable due to excessive wear after just four (4). In fact, engine and gear engineers (kept in the dark about the products I was testing) both inquired about what products are you using here? My response to them was “black magic.”
- The engine was able to use a lesser weight oil than recommended by the engine program. Normally, in a race engine, 40 weight oil is recommended and used by most teams; however, I was able to use a lighter weight oil (20 weight) resulting in increased horsepower.
- As we continued using NMPI Additive throughout the season, it became apparent that our car’s performance was improving with each race as the engine and drive train became conditioned by the continued use of NMPI Additives
- We track the performance of each of our cars throughout each Sprint Cup season using dynamometers. I saw increases of (i) 6-8 horsepower on engine dynamometer tests and (ii) 13 horsepower on chassis dynamometer tests.

After a complete NASCAR® Sprint Cup season and with the results I’ve just discussed, I am convinced that NMPI’s products will provide my cars with a decided advantage in the upcoming Sprint Cup season and I plan on continuing to use NMPI’s products in the engine, transmission, and rear end for this season and beyond. In addition I’ve asked NMPI to explore new product areas for me to improve the performance of different components on our car.”

For more information about our products go to www.nanompi.com.