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Nano Protect Services
Herr A. Winkels,

Friedenstrasse 8a
47551 Bedburg-Hau

Your ref.	Your letter	Our ref.	Extension	Date
		Hssl	430	02.07.2007

Declaration of Conformity

Evaluation of products NPS Engine Improvement – EngineRenovator and NPS Engine Improvement – GearRenovator as per specifications for operating fluids sheets 228.3 / 228.5.

Dear Mr A. Winkels,

Please find attached our assessment of your products NPS Engine Improvement – EngineRenovator and NPS Engine Improvement – GearRenovator as per the specifications for operating fluids sheets 228.3 / 228.5.

According to the regulations issued by the automotive manufacturers the fundamental requirements are defined in relation to additives or the supplementary additivation of lubricants. Sheets 228.5 and 228.3 include the following:

> 'Do not use lube oil additives. They may result in increased wear and damage to engines. If lube oil additives are used, this will affect the scope of any warranty claims.'

Assessment of NPS Engine Improvement

NPS Engine Improvement cannot be categorised as a classic additive (see Table 1). This is due to the structural concept of its mode of action. The basic formulation is introduced to a carrier medium (engine oil, grease). The NPS Engine Improvement components Al_2O_3 and SiO_2 instantly adhere to the friction surfaces while the graphite provides an additional lubricating effect. Once bonded to the friction surfaces, the components of NPS Engine Improvement are no longer freely present in the lubricating medium: it is thus no longer appropriate to speak of an additivated lubricating oil. The result is a symbiosis combining the basic wear-reducing action of lube oil with active improved friction surface protection (see Tables 1 and 2).

Nowadays engine oil consists on average of the following components:
- 75% base oil/grease
- 7% viscosity index improvers
- 5% detergents
- 5% dispersants
- 3% wear protectors
- 5% other additional manufacturer-specific substances (thickeners, depending on required consistency)

Table 1: Composition of engine oil

Additive	Function	Characteristic compound	Mode of action	% of lube oil
Wear protection	To reduce wear	Fatty oils, oxidised waxes, soaps, fatty acid amides, PTFE	Formation of an oriented polar surface film	2-5%
Wear protection Extreme Pressure (EP additives) - see Table 3	To prevent adhesive wear (welding)	Sulphur-nitrogen compounds Sulphur-phosphorus compounds Molybdenum-nitrogen-sulphur compounds Sulphurised fatty oils Graphite, molybdenum sulphide	Formation of a surface film with low slide resistance	
Corrosion protection	To prevent corrosive attack of bearing metals	Sulphonates, amines, sodium salts, polyfunctional carboxylic acids	Prevents the formation of acid salts or forms a protective film on the surface	<1%
Anti-oxidants	To inhibit oxidation	Aromatic amines, aromatic phenols	Decompose peroxides and trap radicals	<1%
Tackiness improvers	To improve surface adhesion	Polyisobutylenes, olefin polymers, latex	Result in cohesiveness	<1%

Table 2: Additive components by application

Wear protection additives (EP additives)	
Type 1:	Phosphoric acid esters, sulphurised olefins
Type 2:	Sulphurised fatty esters, polysulphides, zinc dithiophosphates
Type 3:	Zinc dithiocarbamates, phosphorothionates

Table 3: Type categorisation of EP additives

The available information about lubricants should now be used to determine whether the components of NPS Engine Improvement alter the formulation of the lubricating medium specified by the manufacturer, i.e. whether they form chemical bonds with the active agents and thus influence their mode of action in any manner.

If we consider the chemical and physical properties of the above lube oil additives from this aspect, we come to the conclusion that the components of NPS Engine Improvement (Al_2O_3, SiO_2 and graphite) are unable to undergo chemical conversion under the basic conditions of a mechanical process. *It can thus be ruled out that formulations of lubricating media are influenced by NPS Engine Improvement.*
In addition, the substances used here are base components contained in every engine oil.

Another factor involves the evaluation of any negative effects (increased wear) on engines treated with NPS Engine Improvement.

It is once again possible to provide a clear-cut answer by using the characteristics established for wear protection. *An engine treated with NPS Engine Improvement is afforded active wear protection, which is also effective under extreme mechanical stress. Damage to engines by NPS Engine Improvement can be ruled out here.*

NPS Engine Improvement was tested using the four-ball tester specified by
DIN 51350/Part 4. The welding and metal loads of standard 10W40 engine oil are between 3,200 N and 3,400 N. Following the addition of NPS Engine Improvement
(<0.1% NPS Engine Improvement to 99.9% 10W40), the result was a welding and metal load which exceeded 12,000 N. It was not possible to determine any welding and metal load in detail following the application as welding of the balls did not take place even at the maximum force load of the 4-ball tester: 12,000 N (1.2 t spot fixing load).

Further testing using a tribometer (pin-on-disc) showed that the friction resistance measured on the friction surfaces with a test load of 300–1,000 N was approx 20% below that of pure 85W90 lube oil.

Summary

NPS Engine Improvement is a product that results in a lower coefficient of friction in the friction zones than can be achieved with standard lubricating media. The wear protection layer that develops here also remains fully effective in critical situations (high pressure, high temperatures). The performance level exceeds that of customary EP additives (see Four-ball Wear Test).

The lubricating medium initially functions as a carrier medium. NPS Engine Improvement is working concentration is well below 0.1% (see NPS Engine Improvement safety data sheet). Once the wear protection layer has developed, NPS Engine Improvement product particles can no longer be found in the lube oil. Chemical conversion of its components with the constituents of the lubricating medium is not possible. Formulations of the lubricating media are not influenced by NPS Engine Improvement.

Good adhesion of Al_2O_3 to metal surfaces ensures that the wear-reducing components SiO_2 and graphite are also preserved following replenishment or exchange of the lubricating medium. The maximum thickness of the NPS Engine Improvement layer is 700 nm. Damage to engines by NPS Engine Improvement can be ruled out here.

The products NPS Engine Improvement – EngineRenovator and NPS Engine Improvement – GearRenovator comply with the requirements of the specifications for operating fluids sheets 228.3 / 228.5.

Yours faithfully,

T. Heßler
TÜV Thüringen Anlagentechnik GmbH & Co. KG