NanOx™

LEANER, CLEANER, LONGER

NanOx™ is a highly concentrated, micro-emulsion structure, multi-functional fuel additive which uses dynamic liquid nanotechnology.

Application

- NanOx™ is effective in all grades and types of gasoline, diesel fuel, aviation fuel, kerosene, heating oil, propane/butane, bio-fuels, light, medium and heavy fuel oils. Dose ratiow varies with level of performance desired.
- Suggested dose ratio is 10,000:1 by volume (100ppm v/v).

Benefits

- When used at the recommended treatment level, NanOx™ is a combustion enhancer and combustion deposit cleaner.

Physical Properties:

Property	Minimum	Typical	Maximum
Density (Kg/L @ 15˚C)	0.950	1.000	1.050
Flashpoint (˚C)	75˚C	100˚C	Not Specified
Boiling point (˚C)	95˚C	105˚C	Not Specified
Pour Point (˚C)	Not Specified	Minus 35˚C	Minus 20˚C
Viscosity (cSt @ 25˚C)	35	68	140
Viscosity (cSt @ 40˚C)	18	35	70
pH (Oils)	7.0	8.0	9.0
Appearance	Clear and bright, yellow-reddish colour, semi-viscous liquid.		

Equipment Recommendations

- Positive displacement type pumps required (gear pumps for transfer and unloading, and diaphragm pumps for metering and dosing). Do not use centrifugal pumps. For HFO mixing, also use a pipeline mounted static mixer.
- For pump metal parts, use bronze, aluminum, cast iron, carbon steel, or stainless steel.
- For pump elastomers, use Buna-n (nitrile, NBR), Viton (fluorocarbon, FPM) or PTFE (Teflon).
- NanOx™ is combustible/flammable, use appropriate electrical equipment.

Special Instructions

- NanOx™ blends easily with all fuels. Splash mixing is usually sufficient.
- For bulk mixing, use a dosing pump and a pipeline mounted static mixer.
- Do not dose into fuel tanks heavily contaminated with water bottoms.
- Do not pre-mix with any kind of solvents.
- Use steam for heating and tracing only when the material is in motion.
- Use caution when handling. Refer to MSDS as appropriate.

Identification

Product Name: NanOx™
CAS Number: Not applicable to mixtures
Product Use: Fuel additive

Hazards Identification (by GHS Classification)

Health	Environmental	Physical
Acute Toxicity - Category 3 (inhalation) Acute Toxicity - Category 5 (oral/dermal) Eye Irritant - Category 2B Skin Irritant - Category 3 Skin Sensitizer - Susceptible individuals only	Aquatic Toxicity - Acute Category 3	Non-Hazardous

Composition / Information on Ingredients

Component	CAS Number	Weight %
Proprietary ingredients	Proprietary mixture	50 - 60
2-ethylhexyl nitrate	27247-96-7	15 - 25
Ethylene glycol	107-21-1	15 - 25
Glycol ether	34590-94-8	4 - 5

Percentages quoted are typical and do not represent a specification.
The specific chemical names and composition of the components not disclosed is confidential business information and is withheld as permitted by 29CFR 1910.1200 and various state Right-to-Know laws.

First Aid Measures

Eye: Eye irritation. Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Get immediate medical attention.

Skin: May cause skin irritation. Immediately flush the skin with plenty of water while removing contaminated clothing and shoes. Wash contaminated clothing before reuse.

Inhalation: Nasal irritation, headache, dizziness, nausea, vomiting, heart palpitations. Remove exposed person from source of exposure to fresh air. If not breathing, clear airway and start cardiopulmonary resuscitation (CPR). Get immediate medical attention for any breathing difficulty. Avoid mouth-to-mouth resuscitation.

Ingestion: Harmful or fatal if swallowed. Get immediate medical attention. Do not induce vomiting unless directed by medical personnel.

Fire Fighting Measures

Suitable Extinguishing Media: Use dry chemical, foam, or carbon dioxide to extinguish fire. Water may be ineffective but should be used to cool fire-exposed containers, structures and to protect personnel. Caution, water runoff may be slippery.

Fire Fighting Procedures: Do not flush down sewers or other drainage systems. Exposed fire-fighters must wear NIOSH-approved positive pressure self-contained breathing apparatus with full-face mask and full protective clothing.

Unusual Fire and Explosion Hazards: This product will burn, but it is not easily ignited. Dangerous when exposed to heat or flame. Product may form flammable or explosive mixtures with air at room temperature. Vapour or gas may spread to distant ignition sources and flash back. Vapours or gas may accumulate in low areas. Runoff to sewer may cause fire or explosion hazard. Containers may explode in heat of fire. Vapours may concentrate in confined areas. Liquid will float and may reignite on the surface of water.

Combustion Products: Irritating or toxic substances may be emitted upon thermal decomposition. Thermal decomposition products may include oxides of carbon, nitrogen and sulphur.

Accidental Release Measures

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas.
Vapour protective clothing should be worn for spills and leaks. Shut off ignition sources; no flares, smoking or flames in hazard area.

Small spills: Take up with sand or other non-combustible absorbent material and place into containers for later disposal.

Large spills: Dike far ahead of liquid spill for later disposal. Do not flush to sewer or waterways. Prevent release to the environment if possible. Refer to Section 15 for additional spill/release reporting information.

Handling and Storage

Handling: Do not get in eyes, on skin or on clothing. Do not breathe vapours or mists. Keep container closed. Use only with adequate ventilation. Use good personal hygiene practices. Wash hands before eating, drinking, smoking. Remove contaminated clothing and clean before re-use. Destroy contaminated belts and shoes and other items that cannot be decontaminated. Keep away from heat and flame. Keep operating temperatures below ignition temperatures at all times. Use non-sparking tools.

Storage: Store in tightly closed containers in a cool, dry, well-ventilated area away from heat, sources of ignition and incompatibles. Ground lines and equipment used during transfer to reduce the possibility of static spark-initiated fire or explosion. Store at ambient or lower temperature. Store out of direct sunlight. Keep containers tightly closed and upright when not in use. Protect against physical damage. Empty containers may contain toxic, flammable and explosive residue or vapours. Do not cut, grind, drill, or weld on or near containers unless precautions are taken against these hazards.

Exposure Controls / Personal Protection

Exposure Limits:	Component	TWA
	Ethylene glycol	100 ppm
	Glycol ether	100 ppm
	2-ethylhexyl nitrate	1 ppm (skin)

Engineering Controls: Local exhaust ventilation may be necessary to control air contaminants to their exposure limits. The use of local ventilation is recommended to control emissions near the source. Provide mechanical ventilation for confined spaces. Use appropriate ventilation equipment.

Personal Protective Equipment (PPE):
Eye Protection: Wear chemical safety goggles and face shield.
Have eye-wash stations available where eye contact can occur.

Skin Protection: Avoid skin contact. Wear gloves impervious to conditions of use. Additional protection may be necessary to prevent skin contact including use of apron, face shield, boots or full body protection.
A safety shower should be located in the work area. Recommended protective materials include: Butyl rubber and Teflon.

Respiratory Protection: If exposure limits are exceeded, NIOSH approved respiratory protection should be worn. A NIOSH approved respirator for organic vapours is generally acceptable for concentrations up to 10 times the PEL. For higher concentrations, unknown concentrations and for oxygen deficient atmospheres, use a NIOSH approved air-supplied respirator. Engineering controls are the preferred means for controlling chemical exposures. Respiratory protection may be needed for non-routine or emergency situations.
Respiratory protection must be provided in accordance with OSHA 29 CFR 1910.134.

Physical and Chemical Properties

Odour/Appearance: Clear, light amber, semi-viscous liquid with strong, fragrant odour
Molecular Formula: Not applicable to mixtures
Flashpoint by closed cup (PMCC ASTM D93): Product boils before flashpoint is reached
Fire Point by open cup (COC ASTM D92): 106˚C (223˚F). See note at the end of Section 9
Autoignition Temperature: 205˚C (401˚F)
Upper / Lower Flammability Limits: not known
Vapour Pressure: 0.4 mm Hg @ 20˚C
Vapour Density 5.1 (air = 1.0)
Initial Boiling Point: 106oC (223˚F) @ 760 mm Hg
Pour Point: -36˚C (-33˚F)
pH (oils): 7.9
Density: 1.0146 Kg/L @ 15˚C (60F)
Viscosity: 70 cSt @ 25˚C (320 SSU @ 77˚F)
35 cSt @ 40˚C (180 SSU @ 104˚F)

Note regarding flashpoint: Product mixture contains both volatile flammable and volatile non-flammable components. According to Annex X2.3 of ASTM D93, *"When a liquid contains flammable and non-flammable components, there are cases where this liquid can evolve flammable vapours under certain conditions and yet will not exhibit a close-cup flash point. This phenomenon is noted when a non-flammable component is sufficiently volatile and present in sufficient quantity to inert the vapour space of the closed cup, thus preventing a flash. In addition, there are certain instances where an appreciable quantity of the non-flammable component will be present in the vapour, and the material will exhibit no flash point".* Product falls into this category and a flashpoint cannot be recorded using ASTM D93 (closed cup). Therefore ASTM D92 (open cup) was used to try and determine the flashpoint. However, the volatile non-flammable component's boiling point happened to coincide with both the Flashpoint and Fire-Point, therefore it is this temperature which is given.

Stability and Reactivity

Stability/Incompatibility: Stable under ordinary conditions of use and storage. Exothermally unstable above 130˚C (270˚F). Hazardous polymerization is not expected. Avoid strong oxidisers.
Hazardous Reactions/Decomposition Products: Thermal decomposition products may include oxides of carbon, nitrogen and sulphur.

Toxicological Information

Signs and symptoms of overexposure: Eye and nasal irritation, headache, dizziness, nausea, vomiting, heart palpitations, difficulty breathing, tremors, weakness, itching of the skin.

Acute Effects:
Eye Contact: Irritating to eyes
Skin Contact: May cause allergic skin reaction in susceptible individuals
Inhalation: May cause irritation
Ingestion: Harmful if swallowed

Chronic Effects:
Medical Conditions Aggravated by Exposure: Pre-existing diseases of the respiratory tract, nervous system, cardiovascular system or gastrointestinal tract.

Acute Toxicity Values:
Oral LD50 (Rat) = 4,700 mg/kg (ethylene glycol)
Dermal LD50 (Rabbit) = 4,800 mg/kg (2-ethylhexyl nitrate)
Inhalation LC50 (Rat) = 639 ppm vapour/1 hr (2-ethylhexyl nitrate)

Ecological Information

ErC50 (Algae) = over 12.6 mg/L/72 hr (2-ethylhexyl nitrate)
ErC50 (Daphnia) = over 12.6 mg/L/48 hr (2-ethylhexyl nitrate)
Bioaccumulation is not expected to be significant. This product is probably biodegradable. Do not release to the environment without proper government permits.

Disposal Considerations

Disposal can occur only in properly permitted facilities. Refer to state and local requirements for any additional requirements, as these may be different from Federal laws and regulations. Chemical additions, processing or otherwise altering this material may make waste management information presented in this SDS incomplete, inaccurate or otherwise inappropriate.

Transport Information

U.S. Domestic Shipping, DOT Regulations:

- Hazard Class: This Product is not DOT regulated
- Hazard Label: None required
- Proper Shipping Name: None required

Proper Shipping Name/Hazard Class may vary by packaging, properties and mode of transportation. The description given may not apply to all possible shipping situations; consult 49CFR for any additional requirements.

Maritime Shipping, IMDG / IMO Regulations:
This product is not classified as dangerous under IMDG regulations.

Air Shipping, IATA / ICAO Regulations:
This product is not classified as dangerous under IATA regulations.

Regulatory Information

U.S. Federal Regulations:

- Comprehensive Environmental Response and Liability Act of 1980

(CERCLA): 2-ethylhexyl nitrate is a CERCLA "ICR" substance. Unless cleaned up immediately, release of over 100 pounds of 2- ethylhexy nitrate (500 pounds of Nanox™) may trigger reporting requirements.

- Toxic Substances Control Act (TSCA): All product ingredients are included on the TSCA inventory.
- Clean Water Act (CWA): None known.
- Superfund Amendments and Reauthorization Act (SARA) Hazard Categories: None known.
- Clean Air Act (CAA): None known.

European Regulations:

European Inventory of Existing Chemicals (EINECS): All of the components of this product are included on EINECS. All substances contained in this preparation have been pre-registered under Article 28(4) of the REACH regulations of the ECHA European Chemicals Agency. EU Classification: This product is not classified as "dangerous" according to Directive 2001/58/EC and its amendments.

EU Risk (R) Phrases:

- R22 Harmful if swallowed
- R36 Irritating to eyes
- R37 Irritating to respiratory system
- R38 Irritating to skin
- R42 May cause sensitization by inhalation
- R43 May cause sensitization by skin contact
- R44 Risk of explosion if heated under confinement
- R52 Harmful to aquatic organisms

Other Information

National Fire Protection Association (NFPA) Ratings:
Health: 1 (slight)
Flammability: 1 (slight)
Reactivity: 1 (slight)

This information is intended solely for the use of individuals trained in the NFPA system.

Disclosure/Comments:

- The responsibility to provide a safe work place remains with the user. User should consider the health and safety information contained herein as a guide and should take all necessary precautions required for a safe working environment. It is the responsibility of the user to comply with all applicable federal, state and local laws and regulations.
- The information contained herein is accurate to the best of our knowledge and belief. Since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for any consequential damages whatsoever incurred by the use of this product. We assume no responsibility for injury to user or third parties or for any damage to any property and user assumes all such risks.
- The information in this Safety Data Sheet (SDS) relates only to the specific product designated herein and does not relate to use in combination with any other material or in any process.