SAFETY DATA SHEET

According to Annex II EC Regulation 1907/2006

ENERGENICS

Envirox™ DPF Assist

Revision 1
Revision date: 26/03/2012

1. Identification of the Substance/Preparation and Company/Undertaking

1.1 Identification of Substance/Mixture: Cerium dioxide based fuel additive package

Trade Name: Envirox™ DPF Assist

1.2 Use of substance/mixture: Additive for Diesel fuel

1.3 Company/Undertaking identification:

Energenics Europe Ltd
Begbroke Science Park
Kidlington, Oxfordshire
OX5 1PF
UK

Telephone: +44 (0)1865 233 010
Fax: +44 (0)1865 233 024
Email: info@energenics.co.uk

1.4 Emergency Telephone Number: (24 hour) +44 (0) 207 858 1228 (Worldwide)

2. Hazards Identification

2.1 Classification

HARMFUL

DANGEROUS FOR THE ENVIRONMENT

2.2 Hazards

R36 Irritating to eyes
R40 Limited evidence of a carcinogenic effect
R65 May cause lung damage if swallowed
R66 Repeated exposure may cause skin dryness or cracking
R67 Vapours may cause drowsiness and dizziness.
R51/53 Toxic to aquatic organisms may cause long-term adverse effects in the aquatic environment

2.3 Other Hazards

Physical & Chemical Hazards: Vapours are heavier than air and have a potential for accumulation in low lying areas.
The product has the potential for static discharge leading to the possibility of fire.

3. Composition/Information on Ingredients

Chemical Name	CAS-No	EC-No	Concentration	Classification and R-phrases
Hydrocarbon	64742-47-8	265-149-8	65-70% (w/w)	X_n: R65; R66
Proprietary organic mixture (see Section 8)			25-30% (w/w)	X_n: R40 Cat.3 carcinogen R66; R67 N: R51/53
Nanoparticulate Cerium dioxide	1306-38-3	215-150-4	<10% (w/v)	None - not classified as 'dangerous'

4. First Aid Measures

Inhalation: Remove patient to fresh air. Obtain immediate medical attention if there are any signs/symptoms of difficulty in breathing.

Skin contact: After contact with skin wash immediately with cool clean running water for at least 5 minutes. Obtain medical attention if skin is damaged or a rash develops. Wash all contaminated protective clothing before re-use.

Eye contact: Immediately flush eyes with cool clean running water for at least 15 minutes, occasionally lifting the upper and lower eye lids. Obtain medical attention if stinging, watering or tear formation persists.

Ingestion: If swallowed do not induce vomiting, obtain immediate medical attention and show the container / label / Safety Data Sheet.

If vomiting occurs spontaneously, keep head below hips to prevent aspiration.

5. Fire-Fighting Measures

5.1 Suitable Extinguishing media Fight fire with foam, dry powder. .

5.2 Extinguishing media which should not be used None known.

5.3 Special exposure hazards

Flash Point: Typically >77°C / 170°F (Closed Cup) (approximate)

Explosion / Flammable limits: LEL 0.5% (v) UEL 7.0% (v) (in air)

Auto ignition temperature: 230°C / 450°F (Minimum)

Combustible Liquid: May decompose violently when heated above 100^0C in a closed vessel due to sudden pressure increase; container may explode. Fight any fire from a protected location and at a suitable distance away from any containers.
Material will float and may re-ignite on surface water. The vapours are heavier than air, spread along the ground and may be re-ignited by remote sources of ignition.

Material is capable of accumulating static charges which may produce a spark ignition source.

5.4 Special equipment for fire-fighters

Wear suitable fire-retardant suits equipped with self-contained breathing apparatus (SCBA) operated in positive pressure mode to prevent inhalation exposure to combustion products.

6. Accidental Release Measures

Personal precautions

Eliminate any sources of ignition. Ensure adequate ventilation. Use personal protective equipment as described in Section 8.

Environmental precautions:

LAND
Contain any spillage with appropriate absorbent material and prevent entry into natural watercourses, sewers and drains using a bund. Any material entering watercourses, sewers, drains or contaminating soil or vegetation should be notified to the local authorities. For guidance on disposal see Section 13 of this Safety Data Sheet.

Clean-up methods:

Wear appropriate PPE during clean up operation as described in Section 8. Pick up spillage using appropriate pump, if available, or following addition of inert absorbent (soil, sand etc;) a shovel. Remove all contaminated material and place in a suitably labelled container fitted with a lid and then dispose of safely. Do not flush residual material away with water.

Environmental precautions:

WATER
Confine spill if possible using booms.

Clean-up methods:

Remove spill from the water surface by skimming or with suitable absorbents and place in a labelled container fitted with a lid for disposal. Contact local authorities and environmental agencies immediately.

7. Handling and storage

7.1 Handling

Open containers slowly in order to control any possible pressure release. Handle material in well ventilated areas. Avoid inhalation of vapours and fumes during handling. Use in a bunded area to prevent environmental release wherever possible.
Material may accumulate static charge which may cause an electrical spark. Use proper earthing procedures when transferring material.
Avoid handling material at temperatures above its flash point as flammable / explosive vapour-air mixtures can form.

7.2 Storage

Keep container tightly closed in a dry and well-ventilated area away from direct sunlight, sources of heat or ignition when not in use.
To prevent potential environmental releases store in a bunded area.
Avoid storing alongside strong oxidising agent.

7.3 Specific Use(s)

Envirox™ DPF Assist is pre-mixed with diesel fuel. It can be added directly to the fuel tank during fuel filling,

8. Exposure Control/Personal Protection

8.1 Exposure Limit values

Component	CAS-No	Type/Form of Exposure	Control Value	Basis for recommendation
Hydrocarbon[1]	64742-47-8	TWA (8-h)	1200mg/m^3	Supplier SDS
Trimethylbenzene	95-63-6	TWA (8-h)	123mg/m^3	WEL
Naphthalene	91-20-3	TWA (8-h) STEL	10ppm 15ppm	ACGIH/OSHA
Solvent naphtha	64742-94-5	TWA (8-h) STEL (15-m)	100mg/m^3 150mg/m^3	EH40/2005 WEL

[1] Based on total hydrocarbon

8.2 Exposure controls

8.2.1 Occupational exposure controls

Engineering measures Always ensure adequate ventilation when handling this product. Use Local Exhaust Ventilation (LEV) or a fume cupboard wherever possible to ensure worker exposure to airborne contaminants is below any recommended or statutory limits.

Personal protective equipment

Respiratory: An appropriate combination of mask and filter suitable for organic gases and vapours (boiling point >65°C (150°F) according to EN141:2002 should be worn.

Hand protection: Use protective gloves according to EN 374:2003 to prevent skin contact with liquid. Vitron is a suitable material of construction.

Eye protection: Use goggles or safety glasses with side shields to prevent accidental splashes to eyes.

Skin protection: Wear suitable impervious protective clothing including apron and boots or a full protective suit if handling large quantities. Wash hands, forearms and face after handling and at the end of the work shift.

Hygiene measures Good occupational hygiene practice is required during and after handling the product.

8.2.2 Environmental exposure controls

Material should be stored and used in bunded areas to contain any potential environmental release. Releases from workplace operations may need to be scrubbed or filtered to reduce emissions to the environment.

9. Physical and Chemical Properties

9.1 General Information

Form: liquid
Colour: clear (yellow/orange)

Odour:	hydrocarbon/ammoniac

9.2 Important health, safety and environmental information – numerical data below are for the hydrocarbon component

pH:	not applicable
Boiling point:	190 -290°C
Flash point:	>77°C
Auto-ignition temperature:	251°C
Explosive limits (in air):	0.5 – 7% (v)
Water solubility:	<0.10% (wt) (immiscible)
Log P_{ow} (Octanol-water partition coefficient)	Not determined
Relative density:	0.798 @ 15.6°C
Viscosity	1.68 cSt @ 40°C 2.16 cSt @ 25°C
Vapour density (Air =1)	6.2 @ 101 kPa
Vapour pressure (20°C)	0.023 kPa (0.17 mm Hg)
Evaporation rate (n-butyl acetate =1)	0.1

9.3 Other information

Pour point:	-39°C

10. Stability and Reactivity

10.1 Conditions to avoid — Avoid heat, sparks, open flames and other ignition sources. Do not store in direct sunlight.

Material is stable under normal conditions.

10.2 Materials to avoid — Strong oxidising agents.

10.3 Hazardous decomposition products — Carbon dioxide, carbon monoxide,

11. Toxicological Information

No specific toxicological testing has been conducted on the product. The hazard assessment is based on experience and knowledge of toxicological profiles of all ingredients and limited in vitro test data.

Toxicokinetics — Organic ingredients may be absorbed through the skin. May cause significant adverse systemic effects – chemical pneumonitis – if swallowed. Dermal absorption may be a significant route of exposure.

11.1 Acute effects:

(a) Inhalation — Low toxicity. Rat 4-h LC_{50} expected to be >20mg/l

(b) Skin — Low dermal toxicity. Rat LD_{50} expected to be >2000mg/Kg. May cause transient skin irritation with some redness.

(c) Eye — May cause significant eye irritation with tear formation and redness if accidentally splashed into the eye.

(d) Oral	Low toxicity. Rat LD_{50} expected to be > 2000mg/Kg. Due to the presence of the hydrocarbon and solvent naphtha there is a possibility of aspiration into the lungs if this product is swallowed or, following vomiting. Lung inflammation (chemical pneumonitis) may follow aspiration and this may be fatal unless immediate medical intervention is available.
(e) Sensitisation	Not expected to be a skin sensitising agent.

11.2 Repeated dose toxicity

(i) Inhalation	In a 13-week study rat inhalation study, cerium dioxide caused bronchial lymph node changes at 1 mg/m^3 – this was the LOAEL. Reduced alertness may occur if prolonged or repeated exposure to the product occurs in the absence of adequate ventilation.
(ii) Skin	May cause drying with skin redness and cracking possibly leading to dermatitis.
(iii) Eye	May cause significant irritation with stinging, redness and excessive tear formation.

11.3 CMR effects

With the exception of naphthalene, a Category 3 suspected carcinogen (present at <2%) no other ingredients are classified as carcinogenic (IARC), mutagens or toxic to reproduction.

Carcinogenicity	Rat inhalation studies, using excessively high levels of cerium dioxide, have caused lung cancer due to an 'over load' effect; these studies are not relevant for humans.
Mutagenicity	Cerium dioxide (both nano- and non-nanoparticulate) were negative when tested in a bacterial gene cell mutation assay (Ames test) over a range of concentrations up to 5000 µg/plate in the presence and absence of metabolic activation (S9).
Toxicity to reproduction	No data available. Not expected to cause adverse effects on fertility or developmental toxicity.

12. Ecological Information

No specific toxicological testing has been conducted on the product. The hazard assessment is based on experience and knowledge of toxicological profiles of all ingredients and limited in vitro test data.

12.1 Ecotoxicity

(a) Acute effects	Expected to cause significant harm to the aquatic environment due to the presence of ingredients which have been shown to be very toxic and/or toxic to aquatic organisms (typical concentration >20%). May cause adverse effects if accidently discharged direct to a Sewage Treatment Plant (STP) due to organic ingredients.
(b) Chronic effects	No data available.
12.2 Mobility	During use as a catalyst in diesel fuel, the product will be combusted in the diesel engine and cerium dioxide is likely to be strongly

adsorbed on to any soot emissions from the engine exhausts in to air. These emissions will end up in the terrestrial environment on settling.

12.3 Persistence and degradation

Cerium dioxide is a metal oxide present in small amounts in the product; following use soot emissions will possibly contain strongly bound cerium particles within the soot. CeO_2 readily undergoes photo-chemical reaction in air.
The organic ingredients are expected to be biodegradable (hydrocarbon readily biodegradable and aromatic solvent naphtha inherently biodegradable). The hydrocarbon will also undergo oxidation reactions in air.
Abiotic processes of transformation are unlikely to be significant.
During use the organic ingredients will be combusted within the diesel engine.

12.4 Bioaccumulation potential Accidentally released product may accumulate in biota due to the organic ingredients.

12.5 Results of PBT assessment The product is not considered to have the characteristics for either a PBT (Persistent Bioaccumulative and Toxic) or vPvB (very Persistent, very Bioaccumulative) substance.

12.6 Other adverse effects None known (not expected to be either an ozone depleter, POP (Persistent Organic Pollutant) or endocrine disrupter).

13. Disposal Considerations

Disposal must be in accordance with local and national laws and regulations applicable at the time of disposal.

Recommendations Any surplus product may be incinerated at a licensed facility where high temperature incineration may prevent formation of any hazardous combustion products. Do not wash to drain or landfill.

Packaging should be thoroughly drained and either cleaned before re-use or disposed of by a specialist contractor. Residues from the container may form flammable or explosive mixtures if heated above flash point. Do not puncture, cut or weld uncleaned drums.

14. Transport Information

Labels

Land (RID/ADR: Road/Rail)

Proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (contains petroleum distillates)
UN-No.	UN 3082
Class	9
Packing group	III
Tunnel restriction code	E
Hazard Identification No:	90

Sea (IMO-IMDG)

Proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID N.O.S. (contains petroleum distillates)
UN-No.	UN 3082
Class	9
Packing group	III
Marine pollutant	Solvent naphtha (petroleum), heavy aromatic

Air (IATA/ICAO)

Proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID N.O.S. (contains petroleum distillates)
UN-No.	UN 3082
Class	9
Packing group	III

Transport classification may vary by container volume and may be influenced by regional regulations

15. Regulatory Information

Safety, health and environmental regulations/ legislation specific for the substance or preparation	Directive 67/548/EEC & Directive 1999/45/EC.
Chemical Safety Assessment (CSA)	A CSA has not been carried out on this product

16. Other Information

Full text of relevant R- and S- phrases:

R36	Irritating to eyes
R40	Limited evidence of a carcinogenic effect
R65	May cause lung damage if swallowed
R66	Repeated exposure may cause skin dryness or cracking
R67	Vapours may cause drowsiness and dizziness.
R51/53	Toxic to aquatic organisms may cause long-term adverse effects on the aquatic environment

S23	Do not breathe fumes / vapour / spray
S24	Avoid contact with skin
S26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice
S33	Take precautionary measures against static discharges
S36/37	Wear suitable protective clothing and gloves
S60	This material and its container must be disposed of as hazardous waste
S61	Avoid release to the environment. Refer to special instructions/Material Safety Data Sheet
S62	If swallowed do not induce vomiting: seek medical advice immediately and show this container or label

Training Advice
Instructions regarding use and handling of Envirox™ must be followed.

Recommended restrictions on Use
Envirox™ DPF Assist is a diesel fuel additive and should not be used for any other applications.

Further Information
Contact: www.energenics.co.uk
Major component (aliphatic hydrocarbon distillate) is listed on AICS, DSL, TSCA and EINECS.

Sources of Key Data used to compile the SDS:
Health Effects Institute (HEI) Report No. 9 2001.
Park et al. 2008. Inhalation Toxicology 20: 547-566.
Park et al. 2007. Particle & Fibre Toxicology 4: 12-
Fall et al. 2007. Nanotoxicology 1(3): 227-234.
Viau A. 1994 Unpublished report (see EPA website EPA/635/R-08/002) entitled:"13-week inhalation toxicity and neurotoxicity study by nose-only exposure of a dry powder aerosol of ceric oxide in the albino rat". Bio-Research Labs.
Suppliers SDS.
IUCLID datasheet for CAS number 64742-47-8

SDS History:

Revision 1 issued	28 March 2012
Reason for revision:	first issue.

Disclaimer:
The technical information provided in this SDS should only be used for the purposes of assessing hazards, with respect to health, safety or the environment. It should not be used as a technical specification or for engineering calculations. Energenics Europe Ltd reserves the right to amend its product specifications at any time without notice. The information contained herein is accurate to the best knowledge and belief of Energenics Europe Ltd. and is intended to describe the product for the purposes of health, safety and environmental requirements only. It is not intended and should not be construed as a warranty. Consult Energenics Europe Ltd for further information.