service chimie

5, place de l'Église
77400 Saint Thibault des Vignes
33.01.64.30.89.22
CentreTech@Service-Chimie.fr

NE3*O-Fluid*

OZ36

Thermal and thermodynamic transfer fluid with low environmental impact to meet expanding areas requiring high performance.

ODP	GWP / PRG
(Ozone Depletion Potential)	(global Warmng Potential)
= 0	**= 2** (ITH 100 years)

High temperature chemical stability and use as a working fluid in organic Rankine cycles.

Regulatory pressure has increased globally to address climate change. Hydrofluorocarbons (HFCs) with high global warming potential (GWP), used as working fluids in many applications, are under increasing scrutiny as they are important contributors to global warming.

This paper evaluates NE3O fluid OZ36, as a potential working fluid for organic Rankine cycles (ORC). It has a favorable toxicity profile based on tests performed to date and is non-flammable at both 60°C and 100°C and a very low GWP at one hundred years.

It remained chemically stable in the presence of carbon steel, copper, aluminum, air and humidity up to the maximum tested temperature of 250°C despite its unsaturated chemical nature.

It also remained stable to stereoisomerization in the presence of carbon steel, copper and aluminum at 250°C°C despite the thermodynamic driving force for isomerization to the more energetically favored HFO-133mzz-E isomer.

Its stability was found to be significantly higher than that of other saturated and unsaturated working fluids. It has a normal boiling point of 33.4°C and a relatively high critical temperature of 171.3°C, resulting in relatively low vapour pressures and high energy yields for the cycle.

Its performance in subcritical and transcritical power cycles under conditions representative of potential applications was evaluated by computer modeling. Subcritical Rankine cycles with recuperators operating between an evaporation temperature of 160°C and a condensation temperature of 25°C with OZ36 fluid NE3O could achieve net cycle efficiencies of 25%. It could enable more environmentally sustainable ORC platforms to generate energy from available heat at higher temperatures and with higher energy efficiency than existing working fluids.

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Typical applications

- Evaporative cooling
- High temperature heat pumps
- Coolant
- Organic Rankine Cycles

Resistivity	ohm-cm	10^8
Fault voltage	Kv	10
Global Warming Potential (GWP)	ITH at 100	2
Ozone depletion potential (ODP)	-	0
Occupational Exposure Limit (OEL)	Ppm	500

Physical, environmental and safety properties

Excellent physical and chemical properties for use as heat transfer fluid

- Clear, colourless liquid,
- nonflammable
- thermally stable,
- low toxicity
- Low environmental impact.

The fluid (Base HFO-1336mzz-Z hydrofluoroolefin) has a boiling point at 34°C it is suitable for the substitution of PFC, HCFC, PFPE, HFC, and HFE in heat transfer applications.

Property	Units	NE3OOZ36
Chemical structure	-	CIS-CF 3CH=CHCF$_3$
Molecular weight	g/mol	164
Boiling point	°C	33.4
Freezing point	°C	-107
Density at 25°C (77°F)	g/cm3	1.36
Viscosity at 25°C (77°F)	Cp	0.38
KB value	-	11.3
Dipole moment	D	2.9688
Vapour pressure at 25°C	Mpa	0.07
Flash Point, CC, ASTM D56	°C	None
Flash Point, OC, ASTM D1310	°C	None
Vapour flammability, ASTM E681	%vol	None
Solubility in water	Ppm	560
Critical temperature	°C	171.3
Critical pressure	Mpa	2.9
Critical density	g/cm3	0.471
Heat of vaporization at BP	kJ/kg	166
Liquid thermal conductivity at 25 °C	W/m-f	0.077
Specific heat of liquid at 25 °C	kJ/kg-k	1.2
Surface tension	N/m	0.013
Dielectric constant	-	32

Technical information

Material compatibility

In general, NE3O Fluid OZ36 offers excellent compatibility with materials.

It is not compatible with strong bases. Therefore, contact with very basic process materials is not recommended. Contact with strong Lewis acids, such as aluminum trichloride, alkali and alkaline earth metals, powdered metals and powdered metal salts, is also not recommended.

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Metal

NE3O Fluid OZ36 is compatible with most metals. Exposures to stainless steel, copper, brass and aluminum at 100°C (212°F) for 2 weeks showed good stability, as summarized below.

Metal	Weight loss	Surface appearance	Appearance solvent	Fluorinated IC
Aluminium	None	No change	Clear Colorless	<0.5 ppm
Copper	None	No change	Clear Colorless	<0.5 ppm
Brass	None	No change	Clear Colorless	<0.5 ppm
Stainless steel	None	No change	Clear Colorless	<0.5 ppm
Carbon steel	None	No change	Clear Colorless	<0.5 ppm

Plastic

NE3O Fluid OZ36 is compatible with most plastics. Exposure to most plastics at room temperature for 2 weeks showed good compatibility.

Symbol	Hardware	% weight change	% change in volume	% change in hardness
NO	Natural rubber	4.4	1.9	0.0
CR	Polychloroprene	0.8	0.1	0.0
NBR	Acrylonitrile Butadiene	15.3	2.6	-13.6
FKM	Fluoroelastomer	7.9	-3.4	-2.9
T	Thiokol	0.3	6.7	-6.1
IIR	Isobutylene Isoprene	0.3	13.1	-13.3
EPDM	Ethylene propylene terpolymer	1.4	5.5	-7.1
MSC	Chlorosulfonated polyethylene	0.2	0.8	-1.3

Elastomers

Exposures to most elastomers at room temperature for 2 weeks show compatibility. Some reversible swelling is expected with partially fluorinated elastomers.

Symbol	Hardware	% weight change	% change in volume	% change in hardness
ABS	Acrylonitrile-ButadieneStyrene	-0.1	-0.6	0.0
HIPS	Impact-resistant polystyrene	0.3	-0.4	-2.9
Domestic animal	Poly (ethylene terephthalate)	0.0	0.7	-1.2
PS	Polystyrene	-0.4	0.9	0.0
Polyvinyl chloride	Polyvinyl chloride	0.0	0.0	0.0
The	Chlorinated polyvinyl chloride	0.0	-0.3	0.0
PTFE	Fluorocarbon	1.1	0.3	-17.2
ETFE	Fluorocarbon	0.7	0.0	12.9
POM	Acetal	0.1	-1.2	-1.3
TO WATCH	Polyetheretherketone	0.0	0.2	0.0
LCP	Polyester	0.0	-0.4	-1.5
PEI	Polyetherimide	-0.1	0.0	0.0
PVDF	Polyvinylidene fluoride	0.0	-0.3	0.0
PP	Polypropylene	0.3	-0.5	0.0
HDPE	High-density polyethylene	0.0	0.3	3.3

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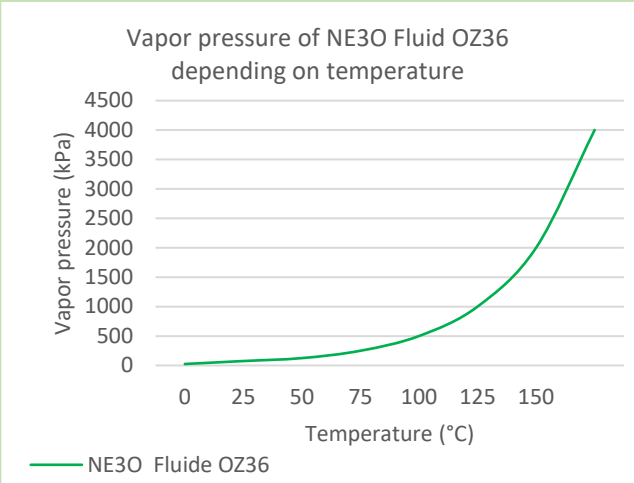
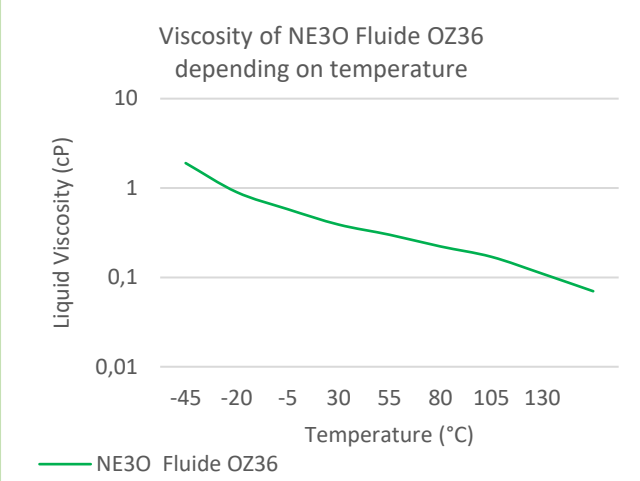
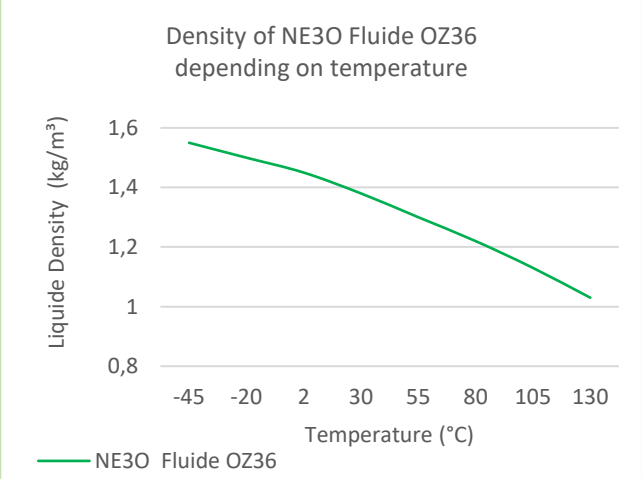
Vapour pressure



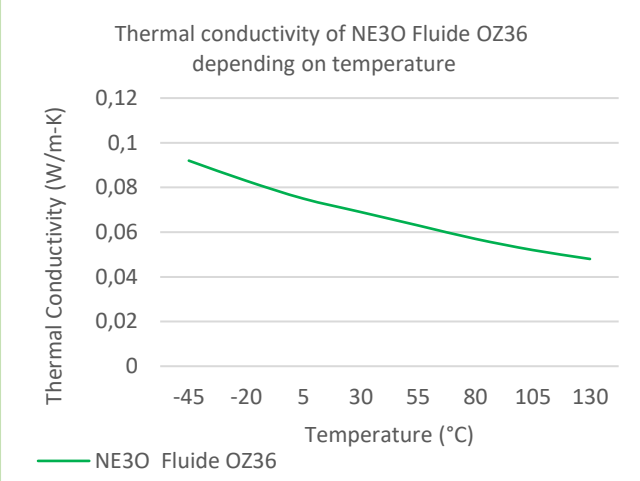
Viscosity



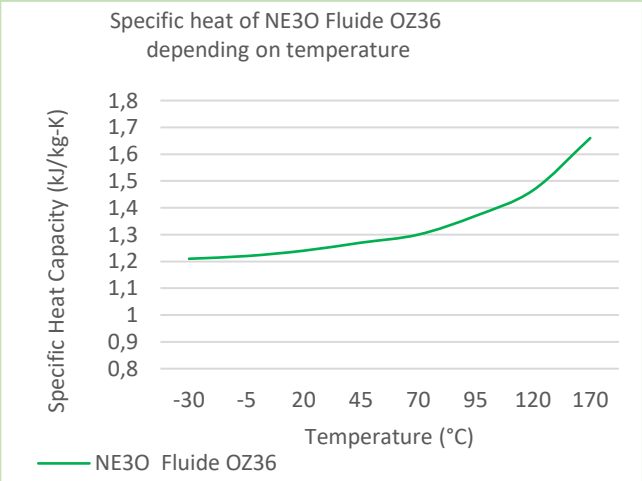
Density



Thermal conductivity



Specific heat



Storage and handling

NE3O Fluid OZ36 is thermally stable and does not oxidize or degrade during storage. It has no closed or open cup flash points and is not classified as a flammable liquid by the NFPA or DOT. Store in a clean and dry place, protect from freezing temperatures; and do not allow stored product to exceed 52°C (126°F) to prevent leakage or potential rupture due to pressure and expansion. Refer to the Safety Data Sheet (SDS) for additional safety information.

S.A.S. au capital de 180 000 €uros, R.C.S. Meaux 331 915 645, N° TVA FR43 331 915 645