Vertrel™ XE

Specialty Fluid

Removes Particulate and Ionic Soils

Technical Information

Introduction

Vertrel™ XE is a proprietary azeotrope of Vertrel™ XF hydrofluorocarbon (2,3-dihydrodecafluoropentane) with ethanol. It is ideally suited for use in vapor degreasing equipment. It offers improved solvency for polar soils, compared to Vertrel™ XF, while maintaining excellent compatibility with most plastic, ceramic, and metal components. Typical applications include precision and specialty cleaning and rinsing for removal of particulate, fingerprints, and light soils from metal, plastic, and glass parts.

Vertrel™ XE has zero ozone depletion potential (ODP) and low global warming potential (GWP). It can replace CFC-113, 1,1,1-trichloroethane (1,1,1-TCA), hydrochloro-fluorocarbons (HCFCs), and perfluorocarbons (PFCs) in many applications. Vertrel™ XE is accepted by the U.S. Environmental Protection Agency (EPA) under the Significant New Alternatives Program (SNAP), as a substitute for ozone-depleting substances.

Its unique properties (**Tables 1** and **2**) include a high density, low viscosity, and low surface tension for effective particle and soil removal.

Cleaning Process

Vapor degreasing should be used for optimum cleaning effectiveness and economy. Modern vapor containment technology is recommended for both batch and in-line equipment. These systems have higher freeboard and a secondary set of low temperature (–29 °C [–20 °F]) condenser coils to greatly reduce vapor losses.

Plastic and Elastomer Compatibility

Most plastics and elastomers can be safely cleaned in Vertrel™ XE. **Tables 3** and **4** summarize test results on short-term exposures of unstressed plastics and elastomers, simulating a typical cleaning cycle.

Long-term exposure data simulating exposure of vapor degreaser construction materials is available from Chemours upon request.

Table 1. Physical Properties

Property[a]	Vertrel™ XE
Molecular Weight	214
Boiling Point, °C (°F)	52 (126)
Liquid Density, kg/L	1.52
Vapor Pressure, atm	0.329
Surface Tension, N/m	0.0141
Freezing Point, °C (°F)	<–80 (<–112)
Heat of Vaporization (at boiling point), kJ/kg)	144.8
Heat Capacity, kJ/kg·°C	1.13
Viscosity, cP	0.73
Flash Point Closed Cup[b] Open Cup[c]	 None None
Vapor Flammability in Air, vol% Lower Limit Upper Limit	 None None

[a]At 25 °C (77 °F), except where indicated.
[b]Setaflash Closed Cup Tester (ASTM D3278)
[c]Tag Open Cup Tester (ASTM D1310)

Chemours™

Table 2. Density and Vapor Pressure Change with Temperature

Temperature, °C (°F)	Density, kg/L	Vapor Pressure, atm
0 (32)	1.58	0.076
10 (50)	1.56	0.146
20 (68)	1.53	0.255
25 (77)	1.52	0.329
30 (86)	1.50	0.416
40 (104)	1.48	0.638
50 (122)	1.45	0.932
60 (140)	1.42	1.306

Table 3. Plastic Compatibility Immersion: 15 Min at Room Temperature

Compatible	
Polyethylene	ABS
Polypropylene	Acetal
Polystyrene	Acrylic
Polyester, PET, PBT	Epoxy
Polyphenylene Oxide (PPO)	Ionomer
Polyimide, PI, PEI, PAI	Liquid Crystal Polymer
Polyetherketone (PEK)	Phenolic
Polyaryletherketone (PEEK)	PVC, CPVC
Polysulfone	PTFE, ETFE
Polyarylsulfone	Cellulosic
Polyphenylene Sulfide (PPS)	
Incompatible*	
None Tested	

*Material composition varies depending upon compounding agents, plasticizers, processing, etc. Specific materials should be tested for compatibility with solvent.

Table 4. Elastomer Compatibility Immersion: 15 Min at Room Temperature

Compatible	
Buna N, NBR, Nitrile	Buna S, SBR, GRS
Butyl Rubber, IIR	Chlorosulfonated PE
EPM, EPDM, Nordel	Polysulfide
Natural Rubber, Isoprene	Neoprene
Urethane	Viton™ B
	Silicone
Incompatible*	
None Tested	

*Material composition varies depending upon compounding agents, plasticizers, processing, etc. Specific materials should be tested for compatibility with solvent.

Elastomer swelling and shrinking will, in most cases, revert to within a few percent of original size after air drying. Swell, shrinkage, and extractables are strongly affected by the compounding agents, plasticizers, and curing used in the manufacture of plastics and elastomers. Therefore, prior in-use testing is particularly important.

Metals and Other Compatibility

Vertrel™ XE was found compatible with zinc, stainless steel, aluminum, copper, and brass after exposure for two weeks at 100 °C (212 °F) in sealed tubes.

Large amounts of water may extract alcohol and affect cleaning performance. Therefore, to reduce alcohol loss, use desiccant dryers rather than water separators in the condensate return line.

Contact with highly basic process materials, pH 10 or above, is not recommended.

Exposure Limits

Data from acute toxicity studies has demonstrated that Vertrel™ XE has low toxicity. Vertrel™ XE is a slight skin and eye irritant and has low acute inhalation toxicity. **Table 5** shows the applicable exposure limits for the component materials of Vertrel™ XE.

Table 5. Exposure Limits

Component	Limit	ppm	Type
Vertrel™ XF	AEL[a]	200	8- and 12-hr TWA Ceiling[b]
Ethanol	AEL TLV[c]	1,000 1,000	8- and 12-hr TWA 8-hr TWA
Vertrel™ XE	AEL[b]	235	Calculated[d]

[a]Acceptable Exposure Limit (AEL) is an airborne inhalation exposure limit established by Chemours that specifies time-weighted average (TWA) concentrations to which nearly all workers may be repeatedly exposed without adverse effects.

[b]A ceiling limit is the concentration that should not be exceeded during any part of the working day. The ceiling limit for individual components applies to a blend product as well.

[c]Threshold Limit Value (TLV) is an airborne inhalation exposure limit established by the American Conference of Government and Industrial Hygienists (ACGIH) that specifies TWA concentrations to which nearly all workers may be repeatedly exposed without adverse effects.

[d]Calculated in accordance with ACGIH formula for TLVs for mixtures.

Safety/Flammability

Vertrel™ XE exhibits no closed cup or open cup flash point, and is not classified as a flammable liquid by The National Fire Protection Association (NFPA) or Department of Transportation (DOT). In addition, the product has no vapor flammability limits in air.

Flash point data and limits of flammability in air provide the user with additional information that should be used as elements of a fire risk assessment and to determine guidelines for the safe handling of volatile chemicals. Users should ensure compliance with NFPA standards and local fire codes.

Recovery

Due to the azeotropic nature of Vertrel™ XE, the product is easily recoverable by off-line or in-line distillation equipment, such as a vapor degreaser or still. The presence of soil, however, may alter the characteristics of the material during the recovery operation. Recovery should be closely monitored to ensure operating levels are maintained. Users should test the spent Vertrel™ XE to ensure proper classification for waste disposal.

Storage/Handling

Vertrel™ XE is thermally stable and does not oxidize or degrade during storage. Store in a clean, dry area. Protect from freezing temperatures. If solvent is stored below –10 °C (14 °F), mix prior to use. Do not allow stored product to exceed 52 °C (125 °F) to prevent leakage or potential rupture of container from pressure and expansion.

Consideration should be given to retrofit of existing, or purchase of new, vapor degreasing equipment to provide vapor containment technology that enables safe and economical use of Vertrel™ XE.

Drum pumps are recommended to dispense Vertrel™ XE from its container. Refer to the Safety Data Sheet (SDS) for specific handling precautions and instructions.

Environmental Properties

Vertrel™ specialty fluids have zero ODP and low GWP (**Table 6**). They are used as alternatives to CFC-113, methylchloroform, HCFCs, and PFCs in many critical cleaning, drying, carrier fluid, and other high-value specialty uses where reliability is paramount.

Vertrel™ XE is accepted by the U.S. EPA under the SNAP program, as a substitute for ozone-depleting substances.

Table 6. Environmental Properties

Property	Vertrel™ XF
Ozone Depletion Potential (ODP)	0
Global Warming Potential (GWP/100 yr ITH)*	1248
Volatile Organic Compounds (VOC, g/L)	61

* IPCC Second Assessment Report (1995)

Packaging and Availability

Vertrel™ XE is commercially available in 55-gal (208-L) drums with a net weight of 600 lb (272 kg) and in 5-gal (19-L) pails with a net weight of 55 lb (25 kg). One gallon and smaller samples in glass containers are available on request. Customers are encouraged to secure samples now for compatibility and performance testing.

Specifications

Composition and specifications are shown in **Table 7**. All components are listed in the TSCA Inventory.

Table 8. Vertrel™ XE Specifications

Vertrel™ XF, wt%	96.0 ± 0.5
Ethanol (SDA), wt%	4.0 ± 0.3
Nonvolatile Residue, ppm wt	2.0 max.
Moisture, ppm wt	200 max.
Appearance	Clear, colorless

For more information on Vertrel™, please visit vertrel.com or call (800) 235-7882.

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