

DuPont™ Vertrel® XM

SPECIALTY FLUID

Technical Information

Removes Particulate and Ionic Soils

Introduction

DuPont™ Vertrel® XM is a proprietary azeotrope of DuPont™ Vertrel® XF hydrofluorocarbon (2,3-dihydrodecafluoropentane) with methanol. It is ideally suited for use in vapor degreasing equipment. It offers improved solvency for polar soils, compared to DuPont™ 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.

DuPont™ Vertrel® XM has “zero” ozone-depletion potential, and low global warming potential. It can replace CFC-113, 1,1,1-trichloroethane (1,1,1-TCA), hydrochlorofluorocarbons (HCFCs), and perfluorocarbons (PFCs) in many applications. DuPont™ Vertrel® XM is accepted by the U.S. Environmental Protection Agency under the Significant New Alternatives Policy (SNAP) program, 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 DuPont™ Vertrel® XM. **Tables 3** and **4** summarize test results on short-term exposures of unstressed plastics and elastomers simulating a typical cleaning cycle.

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

Table 1
Physical Properties

Property ¹	DuPont™ Vertrel® XM
Molecular Weight	178
Boiling Point, °C (°F)	48 (118)
Liquid Density, kg/l	1.49
Vapor Pressure, atm	0.392
Surface Tension, N/m	0.0141
Freezing Point, °C (°F)	<–80 (<–112)
Heat of Vaporization (at boiling point), kJ/kg	179.9
Heat Capacity, kJ/kg·°C	1.13
Viscosity, cPs	0.63
Flash Point	
Closed Cup ²	None
Open Cup ³	None
Vapor Flammability	
in Air, vol%	
Lower Limit	9
Upper Limit	11

¹ At 25°C (77°F), except where indicated.

² Setaflash Closed Cup Tester (ASTM D 3278)

³ Tag Open Cup Tester (ASTM D 1310)



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Table 2
Density and Vapor Pressure Change with Temperature

Temperature, °C (°F)	Density, kg/l	Vapor Pressure, atm
0 (32)	1.56	0.117
10 (50)	1.53	0.195
20 (68)	1.51	0.313
25 (77)	1.49	0.392
30 (86)	1.48	0.487
40 (104)	1.45	0.734
50 (122)	1.42	1.078
60 (140)	1.39	1.543

Table 3
Plastic Compatibility
Immersion: 15 Minutes 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	
Polyphenylene Sulfide, PPS	

Incompatible ^a	
Cellulosic	

^a 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 Minutes 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
Viton [®] B	Urethane
Silicone	

Incompatible ^a	
None Tested	

^a 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

DuPont™ Vertrel[®] XM 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 DuPont™ Vertrel[®] XM has low toxicity. DuPont™ Vertrel[®] XM 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 DuPont™ Vertrel[®] XM.

Table 5
Exposure Limits

Component	Limit, ppm	Type
DuPont™ Vertrel [®] XF	AEL ^a 200 400	8- and 12-hr TWA Ceiling [†]
Methanol	AEL 200 TLV ^c 200 STEL ^d 250	8- and 12-hr TWA 8-hr TWA
DuPont™ Vertrel [®] XM	AEL ^{a, b} 200	Calculated ^d

^a AEL (Acceptable Exposure Limit) is an airborne inhalation exposure limit established by DuPont that specifies time-weighted average 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 the blend product as well.

^c TLV (Threshold Limit Value) is an air-borne inhalation exposure limit established by the American Conference of Government and Industrial Hygienists (ACGIH) that specifies time-weighted average concentrations to which nearly all workers may be repeatedly exposed without adverse effects.

^d STEL is short-term exposure limit established by ACGIH.

^e Calculated in accordance with ACGIH formula for TLVs for mixtures.

Safety/Flammability

DuPont™ Vertrel[®] XM exhibits no closed cup or open cup flash point and is not classified as a flammable liquid by NFPA or DOT. However, the product does exhibit vapor flammability limits in air. Users should clear equipment of all vapors and liquids before performing any maintenance operations that could result in an ignition source.

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 assure compliance with NFPA standards and local fire codes.

Recovery

Due to the azeotropic nature of DuPont™ Vertrel® XM, 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 DuPont™ Vertrel® XM to ensure proper classification for waste disposal.

Storage/Handling

DuPont™ Vertrel® XM 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 DuPont™ Vertrel® XM.

Although DuPont™ Vertrel® XM is not classified as a flammable liquid by DOT/NFPA, it does have flammable limits in air. A drum pump is recommended to dispense the product from its container. Refer to the Material Safety Data Sheet for specific handling precautions and instructions.

Environmental Legislation

DuPont™ Vertrel® specialty fluids have “zero” ozone-depletion potential and low global warming potential (**Table 6**). They are used as alternatives to CFC-113, methylchloroform, hydrochlorofluorocarbons (HCFCs), and perfluorocarbons (PFCs) in many critical cleaning, drying, carrier fluid, and other high-value specialty uses where reliability is paramount.

DuPont™ Vertrel® XM is accepted by the U.S. Environmental Protection Agency (EPA) under the Significant New Alternatives Policy (SNAP) program, as a substitute for ozone-depleting substances.

The components of DuPont™ Vertrel® XM are listed in the TSCA inventory. One component, HFC-43-10mee, is subject to the Significant New Use Rule (SNUR) and should be used only in the indicated applications. See MSDS Regulatory Section.

The methanol component of DuPont™ Vertrel® XM is considered a hazardous air pollutant (HAP), and therefore is subject to NESHAP regulation. Spent DuPont™ Vertrel® XM is not a RCRA characteristic or listed waste. However, addition of contaminants could change that status. Methanol is included in the SARA Title III Section 313 list of toxic chemicals, and is subject to SARA Title III (EPCRA) reporting requirements.

Table 6
Environmental Properties

Property	DuPont™ Vertrel® XM
Ozone-Depletion Potential (ODP)	0
Global Warming* Potential (GWP/100 yr ITH)	1222
Volatile Organic Compounds (VOC, g/L)	89

* IPCC Second Assessment Report (1995)

Packaging and Availability

DuPont™ Vertrel® XM 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 7
DuPont™ Vertrel® XM Specifications

DuPont™ Vertrel® XF, wt%	94.0 ± 0.5
Methanol, wt%	6.0 ± 0.3
Nonvolatile Residue, ppm wt	2.0 max.
Moisture, ppm wt	200 max
Appearance	Clear, colorless

If you are interested in purchasing or finding out more about DuPont™ Vertrel® please use the list below to contact the DuPont office closest to you.

North America

DuPont Fluorochemicals
Customer Service Center
Chestnut Run Plaza 702
Wilmington, DE 19880-0702
Ph: 800-969-4758 (U.S. only)
Ph: 1-302-774-1160 (Outside U.S.)

Europe, Middle East, Africa

DuPont de Nemours Intl., S.A.
2, Chemin du Pavillon
CH-1218 Le Grand-Saconnex/GE
Switzerland
Ph: 41 22 717 5296
Fax: 41 22 717 6169

Asia Pacific

DuPont-Mitsui Fluorochemicals Co. Ltd.
Chiyoda Honsha Building
1-5-18 Sarugaku-cho
Chiyoda-Ku Tokyo 101
Japan
Ph: 03 5281 5850 (Japan only)
Ph: 1-302-774-1160 (All others)

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CAUTION: Do not use in medical applications involving permanent implantation in the human body or contact with internal body fluids or tissues. For other medical applications, see "DuPont Medical Caution Statement," H-50102.

