

DuPont™ Vertrel®

Specialty Fluid

Oxygen Service Cleaning

DuPont™ Vertrel® MCA is a proprietary azeotrope of Vertrel® XF hydrofluorocarbon and trans-1,2-dichloroethylene. It has zero ozone-depletion potential and is ideally suited for oxygen service cleaning applications.



Graphic, courtesy of descote, Inc.

Oxygen service cleaning is more critical than other cleaning applications. Particles left as a residue may hinder operation of valves, sensors, and controls or otherwise cause excessive friction in moving parts. Friction causes heat and may be a potential ignition source. Another concern is explosion potential. Combustible materials ignite more rapidly in an oxygen rich atmosphere. Particles and residual hydrocarbons have a high potential for explosion in an oxygen atmosphere. Some metals may burn in the presence of an ignition source in an oxygen atmosphere. Cleanliness requirements may differ depending on fixed or moving surfaces coming in contact with oxygen and whether the oxygen is in the form of a liquid or a gas. Oxygen service cleaning is more critical and demands the use of a solvent that is oxygen compatible.

Vertrel® MCA is listed by the Compressed Gas Association, Inc. in the Directory of Cleaning Agents for Oxygen Service. Vertrel® MCA also meets LOX (liquid oxygen) mechanical impact testing requirements in accordance with NHB 8060.1C, Method 13A.*

Items cleaned include:

- Pipe
- Hoses
- Flow valve assemblies
- Manifolds
- Pumps, compressors, and diaphragms
- Heat exchangers
- Cylinders and containment vessels

* NASA Handbook 8060 for Mechanical Impact—Liquid and Gaseous Oxygen (Test 13)

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- Instrument valves
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Cleaning Methods

Components may be cleaned with alternate methods. A cleaning process for component parts used in oxygen service requires a sequence of methods for cleaning, rinsing, and drying. The sequence applies to not only new and refurbished parts, but also to field maintenance cleaning. The critical nature of oxygen service cleaning and the required degree of cleanliness determine the process sequences necessary to accomplish a desired level of cleanliness. Vertrel® MCA can be used in any of the following cleaning methods. These methods individually or sequentially define a cleaning process.

Wiping

Easy access, flat surfaces may be cleaned with a solvent-moistened, lint-free cloth. The wiping method is used when surfaces are large and other methods are impractical to use.

Flushing

Flushing forces solvent through or upon the surface to be cleaned with a sufficient flow rate to remove residual contamination. This method is typically used as a final rinse, after a preliminary cleaning process and before drying.

Immersion

In this method, components are submerged in solvent for a specified time to dissolve and lift surface contaminants. Solvent agitation and ultrasonic energy are often used to dislodge particles and break up difficult-to-remove soils.

Spraying in glove box environments is also used. This method is often used for a first pass, preliminary cleaning process.

Vapor Degreasing

This method uses the vapors of heated solvent to remove contaminants from intricate, irregular, and hard-to-access locations. Spraying with vapor condensation is also used to further remove contaminants from surfaces. In a typical two-sump degreaser, components are rinsed in pure solvent condensate with ultrasonic energy to remove fine particulate. As the parts equilibrate to the temperature of the solvent vapor, condensation ceases



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and the parts are clean, dry, and safe to handle. This method typically combines all steps necessary for cleaning, rinsing, and drying.

Typical Material Surfaces

- Stainless steel
- Low carbon steel
- Copper
- Threaded pipe
- Seals
- Gaskets

Soils and Contaminants

- Particulate matter
- Handling soils
- Hydrocarbon oils
- Water contaminants
- Lubricants
- Krytox®

Major Advantages of Vertrel® MCA

- Solvent residue is liquid oxygen compatible
- Low residue
- Excellent solvent penetration
- Fast and thorough drying
- Solvent can be recycled
- Chemically stable
- Environmentally preferred
- Low in toxicity

Disadvantages of Other Cleaning Systems

- Aqueous wash
 - Low grease-cutting capability
 - Long soak times for cleaning
 - Low penetration for complex parts
 - Long drying time
 - Large potential for rust
 - High energy consumption
- Isopropyl alcohol
 - Flammable
 - Requires extensive venting
 - High disposal costs
 - Photochemically reactive
- Trichlorethylene
 - Hazardous composition
 - Extensive venting required
 - Banned in some states due to high photochemical reactivity
 - High disposal costs



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