



Cleaning Oxygen Lines and Systems with Vertrel® Solvents

Synopsis

Vertrel® MCA has been approved by several manufacturers as the ideal cleaner for the maintenance of oxygen systems.

Cleaning Parameters

Oxygen system cleaning is a critical cleaning application with more demanding parameters than usual. Oxygen systems are critical subsystems in many industrial, analytical, laboratory, military, medical, space and aviation products. Such systems are highly sensitive to contamination. For example, particles left as a residue in an oxygen line may hinder the operation of valves, sensors and controls or otherwise cause excessive friction in moving parts. Friction causes heat and premature component wear; this may be a potential source of system failure.

Oxygen systems need to be cleaned at the point of use, such as within an aircraft system. However, systems used to manufacture and transport oxygen also need to be rigorously cleaned.

Oxygen systems come in all shapes and sizes. Here is an example of a six-inch gate valve used in an oxygen processing facility. This product was cleaned with Vertrel® using an immersion and wiping process. Cleanliness then was verified under a UV light, as specified in the customer's procedures.

Previously, the most widely accepted oxygen system cleaning solvent was CFC-113. The continuing escalation in prices for CFC-113 -- plus the well-known environmental drawbacks -- have made it an undesirable choice. This has forced most companies to search for alternatives.

Several companies also have introduced slow-drying hydrocarbon solvents for this task. However, low-vapor pressure solvents are inadequate to the task for two reasons: they are combustible, and they are slow-drying. It is impossible to guarantee that slow-drying solvents will not be trapped within the complex shapes of an oxygen system. These combustible residues may contribute to an explosive situation once pure oxygen is reintroduced into the system (combustible materials ignite more rapidly in an oxygen rich atmosphere). Even particles which are not normally combustible behave differently in an oxygen atmosphere and may develop a high potential for explosion. For example, some metals will burn in an oxygen atmosphere if an ignition source is available.

Vertrel® MCA has been tested and approved for oxygen system cleaning. It was found to have the optimal combination of handling, cleaning, safety, environmental and economic characteristics. The material is nonflammable, noncorrosive, and environmentally benign. This makes it ideally suited for oxygen service cleaning applications.

MicroCare Corp.
595 John Downey Drive
New Britain, CT 06051 USA
Tel: (860) 827-0626
or in North America, dial (800) 638-0125
TechSupport@MicroCare.com

MicroCare Europe bvba
Erasmuslaan 10
B-1804 Cargovil (Zemst), Belgium
Tel: 00 +32 2 251 95 05
eurosales@microcare.com



Typical System Components

Cleanliness requirements differ depending on (a) the type of surface coming in contact with the oxygen (fixed surfaces such as the insides of pipes, or moving surfaces such as valve gates) and (b) whether the oxygen is in the form of a liquid or a gas. Oxygen systems also demands the use of a solvent that is compatible with the wide variety of materials and elastomers used in such systems.

Components

Instrument valves
Flow valve assemblies
Manifolds
Pumps, compressors, and diaphragms
Heat exchangers
Cylinders and containment vessels
Regulators
Tubing, hoses and pipes
Flow meters

Materials

Safety relief valves
Stainless steel
Low carbon steel
Copper
Threaded pipe
Seals
Krytox

Contamination

Particulate matter
Handling soils
Hydrocarbon oils
Water contaminants
Lubricants

Approved Methods

Today, Vertrel® MCA is listed by the Compressed Gas Association in the official Directory of Cleaning Agents for Oxygen Service. Vertrel® MCA also meets the mechanical impact testing requirements for cleaning liquid oxygen systems, in accordance with NHB 8060.1C, Method 13A. (NASA Handbook 8060 for Mechanical Impact-Liquid and Gaseous Oxygen, Test 13).

Components may be cleaned by a variety of methods. The required degree of cleanliness defines the number of cleaning steps. Whichever method is selected, oxygen service components require a sequence of methods that allow for cleaning, rinsing and drying. The sequence applies to not only new and refurbished parts, but also to field maintenance cleaning. Vertrel® MCA can be used in any of the following cleaning methods to individually or sequentially define a suitable cleaning process:

1. Vapor Degreasing

This method uses the vapors of heated solvent to remove contaminants from intricate, irregular or 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. Extra cleaning power is provided by ultrasonic energy to remove fine particulate. As the parts equilibrate to the temperature of the solvent vapor, condensation ceases. The parts are clean, dry, and safe to handle. This method typically combines all steps necessary for cleaning, rinsing and drying.

MicroCare Corp.
595 John Downey Drive
New Britain, CT 06051 USA
Tel: (860) 827-0626
or in North America, dial (800) 638-0125
TechSupport@MicroCare.com

MicroCare Europe bvba
Erasmuslaan 10
B-1804 Cargovil (Zemst), Belgium
Tel: 00 +32 2 251 95 05
eurosales@microcare.com



2. Wiping

Easy access, flat surfaces may be cleaned with a solvent-moistened, lint-free cloth. Aerosol sprays are a convenient way to handle the solvent and apply it to the wipe. This method is used when surfaces are large and flat, and/or when other methods are impractical.

3. Flushing

Flushing forces solvent through a closed system with a sufficient flow and pressure to remove residual contamination. This method is typically used as a final rinse, after a preliminary cleaning process and before drying. Some systems require a vacuum to be “pulled” on the system to ensure the total evaporation of any residual solvent.

4. 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.

MicroCare Corp.
595 John Downey Drive
New Britain, CT 06051 USA
Tel: (860) 827-0626
or in North America, dial (800) 638-0125
TechSupport@MicroCare.com

MicroCare Europe bvba
Erasmuslaan 10
B-1804 Cargovil (Zemst), Belgium
Tel: 00 +32 2 251 95 05
eurossales@microcare.com