A guide to critical cleaning of oxygen components and services

The COVID pandemic of 2020-2023 increased the demand for critical cleaning of oxygen components to treat patients with symptoms. The need for respirators and installation of new and extended oxygen systems in hospitals, clinics and care homes with the provision of ancillary pressure reduction and delivery systems led to a massive increase in demand for the valves, fittings and pipelines which control the supplies from storage tanks and cylinders, all of which needed critical cleaning.

CLEANING OXYGEN COMPONENTS

Critical cleaning of oxygen components is a crucial process to ensure the safety and reliability of systems that handle oxygen, especially in industries like aerospace, healthcare, and industrial gas production.

Cleaning for oxygen service is best defined as the removal of combustible contaminants from the surface of any equipment or system in oxygen service. Essentially, any component that may encounter an oxygen rich environment. The combustible contaminants include organic and inorganic substances such as hydrocarbon material (e.g., oils and greases, paper, fibre, dust, and soils). If these contaminants are not removed properly, in a worst-case scenario, this can cause combustion or explosion in an oxygen atmosphere or at the least rejection of the product due to unacceptable product purity.

Oxygen is not flammable, but it supports combustion and can react with most materials. The higher the oxygen content and/or pressure in a system the more vigorous the combustion and the lower the ignition temperature required. Materials that do not normally ignite in air will

burn and may explode in an oxygen rich environment. In addition, the oxygen rich environment will give rise to a higher flame temperatures and combustion velocity with potentially devastating consequences. The recognition of oxygen's reactivity has led to stringent requirements regarding the cleanliness of equipment in oxygen service. Strict guidelines exist to ensure that care must be taken in the selection of equipment including all materials and components, which all need to be oxygen compatible. They must also be free from combustible contaminants as described above.

Consideration must be given to any cleaning processes employed in the manufacture and maintenance of all components of oxygen service systems. There are many options depending on the type of contaminants from aqueous to semi aqueous and blasting systems, to removal of welding slag etc. These are all referenced in the section below.

INDUSTRY STANDARDS FOR OXYGEN SERVICE CLEANING

As part of the programme of worldwide harmonisation of industry standards, the 'European Industrial Gases Association', (EIGA) published Cleaning of equipment for Oxygen Service Doc 33/18. The publication was developed from the Compressed Gas Association Document G-4.1 Cleaning Equipment for Oxygen Service by the 'Compressed Gas Association'.

Specific consideration must be given to the following:

· Cleaning standard to be achieved (how clean is clean?).
· Cleaning procedure.
· Solvent cleaner to be used.
· Surface properties of the parts to be cleaned.
· Shape and geometry of the material.
· Types and amounts of contaminants.
· The degree of automation required.

The size and capacity of the equipment is determined by:

· The size of the material or components to be cleaned.
· The required throughput.

Your starting point should be the cleaning standard and procedure. Solvent cleaning and solvent vapour phase cleaning of components consists of the removal of contaminants by immersion in the solvent, possibly with the addition of ultrasonic agitation and the action of continued condensation of solvent vapour on the component surfaces. The procedure requires that the oxygen equipment, system or component is colder than the solvent boiling point. This allows the vapour to condense on the components and perform a final rinse.

The major significant advantage of solvent cleaning is that vaporised solvent is always pure, and the contaminants remain in the boiling liquid section which requires only periodic cleaning out, thus causing a reduction in the frequency of system downtime. The effectiveness of a particular cleaning agent depends upon the method used, the nature and type of the contaminants and the characteristics of the article being cleaned, such as size, shape, and material. Final evaluation of the cleaning agent should include testing of actual products and production processes. All equipment must, together with the cleaning chemistry, comply as a minimum with current legislation for health, safety and environment. The efficiency is controlled by utilising typical samples, written procedures and requested criteria for cleanliness.

THE SOLVENT OF CHOICE FOR THE CRITICAL CLEANING OF OXYGEN SERVICE COMPONENTS

Zero Ozone Depletion Potential (ODP) and very low Global Warming Potential (GWP) solvent cleaner for high performance critical cleaning of oxygen components and services.

ProSolv®5408e has been developed to provide superior critical cleaning performance, suitable for many different industries. High Solvency (KB Value 98) for removal of organic residue and oils, compatible with organic and synthetic oils and most plastics and metals.

ProSolv®5408e is a high-performance solvent cleaner used for sustainable and future proof degreasing. It has a GWP of less than 1, with a 100-year Integrated Time Horizon (ITH). Soft on the environment and safe for users, it offers improved cleaning at lower costs.

ProSolv®5408e ticks all the boxes and is the perfect profile for a modern degreasing solvent. Exceptionally low surface tension to penetrate micron sized holes and close contact surfaces. Sustainable and secure for the future. Non-carcinogenic, low boiling point, economical with energy with low solvent losses, faster production, reduced costs, easy handling. Exceptionally low surface tension to penetrate micron sized holes and close contact surfaces.

ProSolv®5408e has a unique range of characteristics making it the solvent of choice for cleaning oxygen components and service line cleaning, aircraft avionics and aerospace parts and servicing, precision optics, medical and high vacuum components and electronics.

ProSolv®5408e can be used in most solvent cleaning systems, one tank vapour degreasing or multi tank immersion / vapour tank systems using ultrasonics or flush cleaning for complex mechanical and electronic components with blind holes and channels and close mounted electronics or for removing grinding and buffing soils on surfaces.

EFFICIENT AND ECONOMICAL

- Fast precision cleaning with short cycle times.
- Can be used in any vapour degreasing equipment, lower energy consumption and lower maintenance.
- Can be used as a line flushing solvent.
- Ideal replacement for Trichloroethylene, n-Propyl Bromide, Perchloroethylene, high ODP/GWP fluorocarbons and HCFC based solvents.
- Excellent choice to replace flammable solvents such as MEK, Acetone, Isopropyl Alcohol (IPA) or Hydrocarbons.
- Stable with no additives, no testing required.
- Improved productivity, parts exit the machine cool, dry and spot-free with no drying required.
- Fast drying.
- Minimal non-volatile residue (>10ppm).
- High density solution, excellent for ultrasonic cleaning.
- Mid-range boiling point (46°C), processed components easily handled.

- Very low surface tension for penetration into the micron level crevices and holes, efficient cleaning in tight to reach places and complex geometries.
- Easy process monitoring, minimal effort and minimal waste generation, easy reclamation for reuse.
- High Solvency (KB Value 98) for a variety of contaminants.
- Compatible with a broad range of substrates.

SAFE FOR USERS AND THE ENVIRONMENT

- Safe for the environment, Zero Ozone Depletion Potential (ODP).
- Very low Global Warming Potential (GWP).
- GWP of less than 1, AR4 100yr Integrated Time Horizon (ITH).
- Non-hazardous for transportation.
- Non-flammable (No Flash Point).
- Not classified as a carcinogen.
- RoHS compliant.

Listed above are some of the benefits from using ***ProSolv®5408e***, a sustainable degreasing solvent for critical cleaning and an economical and efficient replacement solution for cleaning systems using older legacy solvents, which are now either banned or being phased out. EnviroTech Europe have many years of experience and our experts are available to guide you through your solvent cleaner changeover procedures or to advise on equipment. We have extensive partnerships with equipment manufacturers through our distributors worldwide and information and advice on solvents and solvent systems and which need to be considered.

FURTHER INFORMATION

Please visit our website **https://www.envirotech-europe.com/prosolv5408e** for information about other uses and applications for ***ProSolv®5408e***.

Visit **www.envirotech-europe.com/applications-and-case-studies** for information about uses and applications for all EnviroTech Europe products. For more advice, please telephone us on +44 (0) 20 8281 6370 or use our website contact form.

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ENVIRO Tech
Europe, Limited

EnviroTech Europe Ltd
Aissela, 46 High Street, Esher, Surrey, KT10 9QY,
United Kingdom
Tel +44 (0) 20 8281 6370
www.envirotech-europe.com | contact@envirotech-europe.com

bsi. ISO 9001:2015 Quality Management
FS 502194