

Oxygen System Safety

SCOPE

The purpose of this document is to give our Cleaning for Oxygen Service customers more information on the reason for the services we perform and to enlighten others who have interest in our services. Through this document we will give information on how Oxygen System fires may occur and why Cleaning for Oxygen Service lowers these risks.

FIRE HAZARD

Scrupulous cleaning is the most fundamental fire-safety measure applied to Oxygen Systems. Oxygen is a fire hazard in itself, because it promotes combustion. We all know that if you remove normal atmospheric air (roughly 21% Oxygen) by covering or “smothering a fire” it will extinguish. If you increase the Oxygen concentration, you greatly increase the fire hazard. Many items that will not burn in “normal atmospheric air” will easily burn in an oxygen enriched atmosphere. Materials that are combustible in “normal atmospheric air” will ignite easier and burn hotter, as well as faster, if higher concentrations of Oxygen are present. That is why Oxygen systems require special cleaning and care to remove the ignition sources. Ignition sources that are of no consequence in “regular atmospheric air”, in an Oxygen enriched environment, may ignite with explosive consequences.

IGNITION CHAIN

The ignition chain begins when a very small amount of energy is released inside an Oxygen System and ignites a low ignition material or a particle that is small in mass with a larger surface area. Once the small item is ignited, heat that is generated from that source will ignite larger materials with higher ignition temperatures, which in turn generates more heat until the fire itself is self-sustaining. There are three common methods of ignition from poorly cleaned oxygen equipment. These are friction, mechanical impact and particle impact.

FRICTION

Merriam-Webster Dictionary defines friction as , A. The rubbing of one object against another & B. The force that resists relative motion between two objects in contact. So basically, when two solid materials rub together they create heat which may ignite other materials.

MECHANICAL IMPACT

When one object strikes against another forcefully, heat which may cause ignition is produced at the point of impact. In an Oxygen System, many risks are involved and this is a great one. Many instances may occur that would cause a mechanical impact ignition. For example purposes consider the following; a mechanical component may break off, or a large piece of debris may strike a surface that is pressurized with oxygen, producing heat upon impact. If the surface has not been cleaned properly and meticulously, contaminates such as oils, lubricants or any other hydrocarbon material may ignite and the results could be the Ignition sequence could be started. The Compressed Gas Association defines harmful contamination as both organic and inorganic materials such as oils, greases, paper, fiber, rags, wood, coal dust, solvents, weld slag, rust, sand and dirt. Any of these items could cause the ignition chain to begin.

PARTICLE IMPACT

Small particles such as bits of weld slag, scale, filings, chips and even some lint material can be carried along with a flowing stream of oxygen. Most often Oxygen systems supply at high velocities. When the particulates strike a surface inside the system, impact energy is released as heat. Because of the small mass of these types of contaminates, the particles become hot enough to ignite larger materials.

HOW CLEANING FOR OXYGEN SERVICE LOWERS THE RISKS

Most items that are to be cleaned may appear in a clean and ready to use state. This is deceiving to a person without knowledge of the nature of oxygen contaminates. Just because a particular object is "brand new" does not mean that it is clean and ready for use in an oxygen system. During the production process the item may be exposed to any of the above mentioned contaminates. When ignition sources are removed from the item to be cleaned it greatly reduces the risks involved in handling oxygen. Several different methods may be used to clean for oxygen service dependant upon the material of which the item is constructed and the contaminates involved. Below are the main methods used at CELCO for cleaning and a brief description.

AQUEOUS CLEANING

The advantage for using this method is the non-flammability of the solvent (Water and Surfactant). During this process, usually agitation of the Surfactant water mixture is an aid in removing contaminates. Ultrasonics play a large role in the aqueous cleaning procedures used at Central Electropolishing Co., Inc. (CELCO). Ultrasonics have the ability to penetrate areas normally unreachable by other aqueous methods.

SOLVENT CLEANING

When Aqueous cleaning is not an option due to the design of the item being cleaned, solvent cleaning is used. Solvent cleaning may be accomplished by various methods including immersion, spraying, and wiping. CELCO is extremely environmentally conscience about the solvents that are used during this process.

ACID CLEANING

The Acid cleaning procedure removes oxides and other contaminants by immersion in a suitable acid solution, usually at room temperature.

Acid cleaning can be used post aqueous cleaning to remove any oxidation caused by the cleaning process.

CHOOSING A SPECIFICATION

CELCO has its own in house specification. We can perform Oxygen Cleaning to most any Industry Standard and Company Specific Standards upon review of the specification. CELCO assesses the components upon arrival for contaminants and problem areas. We use visual white light inspection (and Ultra Violet Light inspection if necessary), to determine the degree of contamination and the optimum method for removal. When the Oxygen Cleaning Process is complete, the cleaned items are packaged as required by specification to protect the integrity of the cleaning. A certification is sent back to the customer with the cleaned items stating that the parts are Cleaned for Oxygen Service, Tested and Packaged per the customer's choice of specifications.

Central Electropolishing Co., Inc. has a great respect for the risks involved with handling oxygen . We strive to provide our customers cleaning for oxygen service that surpasses all others.