Oxygen System Safety

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Oxygen Hazards

- Is slightly heavier than air, vapor specific gravity 1.10
- Pure oxygen can be very reactive
- Systems must be properly designed, cleaned, maintained and operated (Use no oil, Oxygen Cleaned)
- Explosions or fires can be initiated by the sudden pressure increase when a cylinder valve is opened if the system is not cleaned or maintained properly.
- Mixed with a flammable gas (hydrogen, propane) will become explosive. In welding operation this can happen if there are no backflow preventers

Common Contaminants in Oxygen Systems, Luxfer

- **Any of these contaminants—many of which are very difficult to detect—can be the initial fuel for an *ignition event*, the technical term for starting a fire.**
  - Machining oils (including residual oil film)
  - Hydrocarbon-based grease and lubricants (including compressor oil)
  - Some soaps, detergents, solvents and cleaning solutions, especially those that contain organic compounds
  - Skin lotions and emollients and cosmetics
  - Sun-tanning oils and lotions
  - Human skin oil and bodily fluids
  - Insects and insect body parts
  - Paint, wax, and marking crayons
  - Carbon dust from filtration systems
  - Metal fines, filings, scale and burrs
  - Chrome chips (usually from valves and other chrome-plated parts)
  - Rust particles and dust
  - Metallic oxides in general
  - Airborne soot and dust
  - Pipe thread sealants
  - Residue from soapy water and leak-detection fluids used to check for leaks
  - Lint from cloths used in cleaning
  - Any other material containing organic compounds and hydrocarbons

Oxygen Compatible Materials

- **Good Compatibility**

  Nickel 201
  Monel
  Inconel (600 series)
  Copper
  Yellow & Red Brass

  Note: Elastomers not in flow path
  Viton A
  TFE Teflon (nonfilled)
  Vespel SP21
  Fluorel

- **Suitable**

  Aluminum Silicon Bronze
  Stainless (300 series)
  Inconel (800 series)
  Brass

- **Unsuitable**

  Silicone Rubber
  Neoprene
  Carbon Steel
  Ethylene Propylene Rubber
  Buna N
  Aluminum

Oxygen Sustained Combustion

Alloy	Diameter inch	Threshold Pressure, psig
Stainless Steel 304	0.25	725
Aluminum 6061	0.25	25
9% Nickel Steel	0.25	15
Carbon Steel 1018	0.25	15
Stainless Steel 316	0.125	510
Stainless Steel 304	0.125	525
17-4 Stainless	0.125	150-400

Zabrenski, John S., "Positive Displacement LOX Pump Fire", Fall 1998 ASTM G-4 Seminar, Sept 23, 1998, Cocoa Beach, FL

Oxygen Regulators

- Proper design
- Cleaned
- Maintained
- Stored in a clean bag

Oxygen Regulators

- To dissipate heat rapidly heavy wall Brass is used. Brass will not burn even at 10,000 psig while Aluminum is as low as 25 psig
- Some designs have deadend directly opposite of inlet to dissipate heat prior to entry into diaphragm
- Nylon has highest ignition of most elastomers
- Dust and dirt embedded in seat can ignite. Fine filter is used to screen out.
- Ignition tested under CGA (Compressed Gas Association) Guidelines

Improper Storage!

Thank You

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