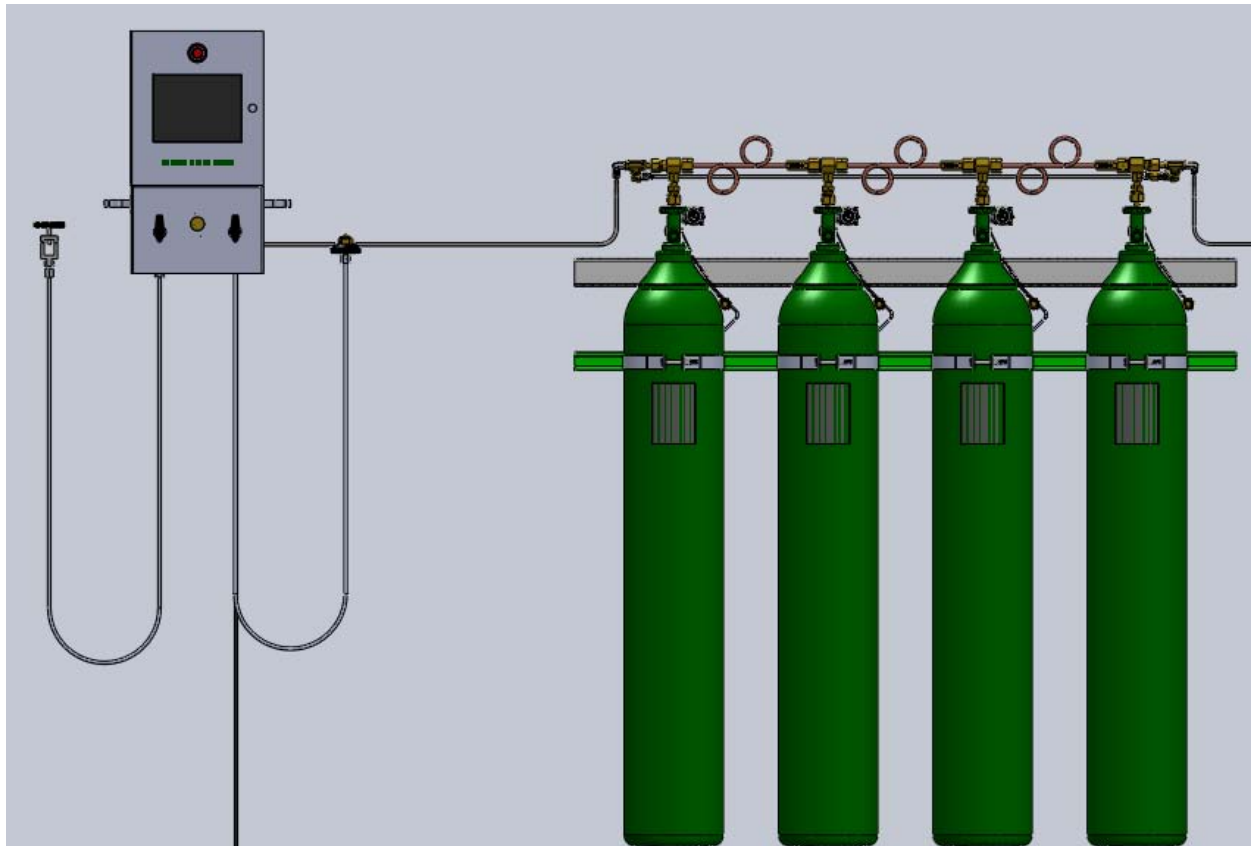




Automatic Cascade System (ACS)

Operation Manual



Oxygen Generating Systems Intl. (OGSI)

Division of Audubon Machinery Corporation

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Using this Manual

This manual is intended as a guide for operators of *OGSI* Oxygen Generators and Oxygen Generating Systems. It includes information on our warranty policy, features, functions, applications, proper set-up and installation, operation and preventive maintenance of our products.

The following symbols are used throughout the manual:

	Information (Do not use product before reading the manual)		Electrical Hazard
	Sound		Fire Hazard
	No Smoking		Warning
	No Open Flames		Power ON/OFF
	Flow Meter		Timer
	No Oil		Not Connected to Outlet



Initial Inspection

The crate should be opened and inspected immediately upon delivery. Unpack the unit at once and perform a visual inspection to determine if it is dented, bent or scratched. Also check to make sure the power cord is attached and that the control panel has not been damaged in any way during shipment.

If for any reason the unit should need to be returned in the future, the original crate is the best way to ship it back to the manufacturer. Claims of damage due to freight handling can only be filed by you, the consignee, as **OGSI** shipping terms are Free On Board (FOB), North Tonawanda, NY USA. This means that once the equipment leaves our dock you are the owner of it. **OGSI** has no legal claim to make against any shipping company for damage.

At **OGSI**, we are committed to using shipping companies with good reputations for taking care in the overall handling of freight and providing service in the event of damage.

Warranty

Oxygen Generating Systems Intl., being a division of Audubon Machinery Corporation (hereinafter **OGSI**), provides a warranty on its products (the “Products”) against defects in material and workmanship, under normal use and operation, to the extent set forth in this Warranty.

THIS WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY OF **OGSI** WITH RESPECT TO THE PRODUCTS AND IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED ALL OF WHICH ARE HEREBY DISCLAIMED TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING DISCLAIMER AND EXCEPT AS OTHERWISE SET FORTH IN THIS WARRANTY, **OGSI** DISCLAIMS ALL WARRANTIES OF MERCHANTABILITY WITH RESPECT TO THE PRODUCTS AND ALL WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE. THE WARRANTY OF **OGSI** AS SET FORTH HEREIN IS FOR THE BENEFIT OF THE ORIGINAL USER OF THE PRODUCTS AND IS NOT TRANSFERABLE WITHOUT THE PRIOR EXPRESS WRITTEN CONSENT OF **OGSI**.

The **OGSI** Warranty provides the following:

- 1) **OGSI** shall repair or replace the Products free of charge to the original user where defects in the material and/or workmanship are evident at the time of delivery. Such replacement of the Products does not include damages incurred in shipping the Products. If shipping damage is evident, the original user should contact the shipper immediately. **OGSI** will pay for shipping the Products to the original user as well as returning damaged/defective Products to **OGSI**. Once the Products are repaired, **OGSI** will ship the Products back to the original user and cover all costs incurred in shipping.
- 2) **OGSI** shall repair or replace the Products (excluding filter elements and sieve material) free of charge to the original user where defects in material and/or workmanship become evident between the time of delivery to the original user and one (1) year from the date of delivery to the original user. **OGSI** will pay for shipping the Products to the original user as well as returning damaged/defective Products to **OGSI**. Once the Products are repaired, **OGSI** will ship the Products back to the original user and cover all costs incurred in shipping. In no event shall **OGSI** have any responsibility or liability for the cost of labor for the removal of component parts or equipment that constitute part of the Products, packaging of the component parts or equipment that constitute part of the Products or the re-installation or replacement of the component parts or equipment that constitute part of the Products.
- 3) The warranty provided by **OGSI** to the original user covers parts and equipment specifically manufactured by **OGSI** and used as components or equipment that constitute part of the Products. The warranty on parts or equipment manufactured by third parties and included as part of the Products (*e.g., air dryers, air compressors, oxygen compressors, instrumentation, etc.*) is limited to the respective original warranties of such third parties.

Note: A *Return Authorization Number* must be obtained from **OGSI** prior to the return shipment of the Product or any component parts or equipment of the Products. The *Return Authorization*

Number must be visibly written on the outside of the package of the returned Products, component parts or equipment as applicable or **OGSI** will not accept the return.

Note: A *Credit Certificate* will be created for all Warranty Exchange transactions. **OGSI** will provide the *Credit Certificate* with an invoice at the time of shipment to the original user. The *Credit Certificate* must be included in the package to **OGSI** with the returned products within 30 days of the date of the invoice. Failure to return Warranty Exchange Products to **OGSI** within 30 days will make the Warranty Exchange process void and payment for Products will be billed and due on receipt.

Note: The warranties of **OGSI** as set forth herein shall also become null, void and not binding on **OGSI** if a defect or malfunction occurs in the Products or any part of the Products as a result of:

- a) A failure to provide the *Required Operating Conditions* for the Products
(See Page 15)
- b) Repair, attempted repair, adjustment or servicing of the Products, or any component parts or equipment that constitutes part of the Products by anyone other than an authorized representative of **OGSI**. The authorized service representative must obtain prior approval from **OGSI**'s Service Manager before performing any warranty work.
- c) External Causes (e.g. flood, hurricane, tornado, fire, any natural disaster, or any event deemed an act of God).

Molecular Sieve Replacement:

The breakdown of the molecular sieve inside the generator (dusting of the sieve) only occurs if excess water/oil is entrained in the feed air stream. Under no circumstances is the molecular sieve covered under any warranty by **OGSI**. If sieve dusting occurs on your machine, check the air compressor, air dryer and filter elements.

Other Matters:

OGSI is not liable for any special, indirect, punitive, economic, incidental or consequential losses or damages including without limitation, loss of use, malfunction of **OGSI** products, replacement oxygen charges, delays or lost savings related to the Products or otherwise even if **OGSI** shall have been advised of the possibility of such potential losses or damages.

Limits of Liability

OGSI Oxygen Generator products shall not be used for breathable or medical oxygen applications, unless they are assembled with the appropriate support equipment, tested, and operated in compliance with either American, Canadian or ISO norms for hospital oxygen systems.

Safety Guidelines



Handling of Compressed Gas Cylinders

Many of the following procedures for the handling, storage, and utilization of compressed gas in cylinders are taken from material furnished by the Compressed Gas Association, which complies with **OSHA** standards.



Always ensure that compressed gas cylinders are securely strapped or chained in place to prevent tipping or falling. Do not store near elevators, stairs, or passageways.



Do not place cylinders in a position where they might become part of an electric circuit. When electric welding is taking place, precautions should be taken to prevent accidental grounding of cylinders, permitting them to be burned by electric welding arc.

If visual inspection indicates obvious damage, the cylinder should be returned to the supplier without any attempt at using the machine.

If cylinder leaks, other than normal venting, and the leak cannot be corrected by tightening a valve gland or packing nut, the valve should be closed and a tag attached stating that the cylinder is not serviceable. Remove the cylinder outdoors to a well-ventilated or open area, notify the supplier, and follow the supplier's instructions for the return of the cylinder.

Keep the cylinder valve closed at all times except when in active use. When removable caps are provided for valve protection, they should not be removed except for active use. Remember to replace removable caps when not in use.

Cylinders should not be dropped or permitted to strike each other or any other surface. Do not drag or slide cylinders; use a suitable hand truck, fork truck, roll platform or similar device, firmly securing the cylinders for transporting.

Do not store oxygen cylinders with flammable gas cylinders. Stored oxygen and fuel gas cylinders should be at least **20 ft** apart; preferably separated by a fire resistant partition.

*For additional information refer to the CGA publications that can be found at <http://www.cganet.com>
See also ISO publication 10083 that can be found online at <http://www.iso.org>*



Operating

OGSI Cylinder-Filling Plants are self-contained systems for the production of high purity oxygen. Although oxygen itself is not combustible, it can be very dangerous. It greatly accelerates the burning of combustible materials.



Precautions should be taken to avoid a fire in the area of the oxygen generator.



Smoking should not be permitted in the area where the oxygen generator is located.



All oxygen connections and hoses should be kept clean and free of grease, oil and other combustible materials.



Valves controlling oxygen flow should be opened and closed slowly to avoid the possibility of fires or explosions.



Do not attempt to modify or enhance the performance of an oxygen generator in any way.

When bleeding a tank or line, stand clear and do not allow oxygen to embed itself within clothing. A spark could ignite the clothing violently.

Product Information



Features and Applications

The *OGSI* ACS unit is an oxygen bottle trans-filling system.

Features

Easy to use

- Just mount it on the wall and connect to an electrical outlet.
- A digital color touch screen display shows all the information required to monitor the oxygen supply.

Dependable

- The unit is designed for **24/7** operations.

Durable

- The unit is built in a self contained powder coated steel cover and operates quietly.

Expandable

- It can be expanded from 4 bottle (standard) to 8, 12 or 16 bottles.

Applications

The ACS unit can be used in various applications. A few examples are given below.

EMS (Emergency Medical Services)



Fire Department



Hospitals



Scuba Tank Filling/Nitrox



Nursing Homes



Principles of Operation

Example 1 – No Cascade System

If you have 3 bottles at 2200 psi (152 bar) on a standard open manifold with bottle 4 of the same size which is at 0 psi, you can open the valves and let them equalize. This gives you 4 bottles at approximately 1650 psi (114 bar) each i.e. 4 partially filled bottles, much less than a full bottle at 1900-2200 psi (131-152 bar).

Example 2 – With Cascade System

Using the same set-up listed above, with 3 bottles at 2200 psi, fill up bottle 4 using the Cascade method.

- Start by connecting bottle 1 and bottle 4 first.
- Open the valves and let them equalize, since both bottles are the same size they will meet in the middle.
- Bottle 1 will go from 2200 psi down to 1100 psi and bottle 4 will go from 0 psi up to 1100 psi. Then disconnect bottle 1 from bottle 4 and connect bottle 2 to bottle 4.
- Bottle 2 will start with 2200 psi and bottle 4 will be at 1100 psi. When you open the valve and let them equalize, they will meet in the middle.
- Bottle 2 goes from 2200 psi down to 1650 psi and bottle 4 will go from 1100 psi to 1650 psi. Then disconnect bottle 2 from bottle 4 and connect bottle 3 to bottle 4.
- Bottle 3 will be at 2200 psi and bottle 4 will be at 1650 psi. When you open the valve and equalize, they will meet in the middle. Bottle 3 goes from 2200 psi down to 1925 psi and bottle 4 will go from 1650 psi to 1925 psi.

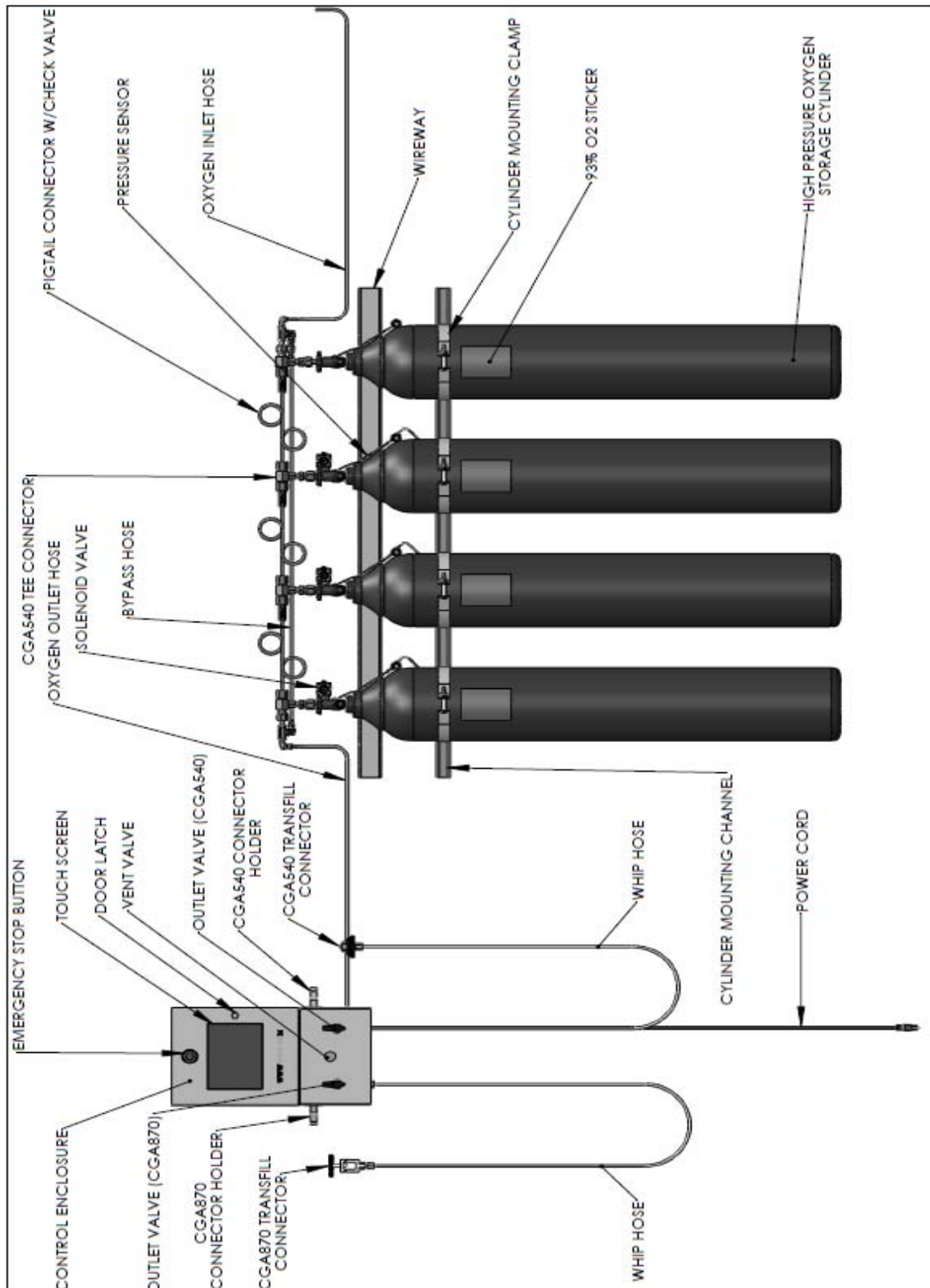
This was a simple example showing the benefits of a Cascade system on bottles of the same size. The Cascade system is very beneficial when there are more bottles or when larger bottles are used to fill smaller ones.

Benefits

There are added benefits of *OGSI*'s Automatic Cascade System (ACS) compared to manual cascade systems. Some of the benefits are listed as follows.

- Manual systems require the technician to turn bottle valves on and off manually, and this causes two problems. Either the technician filling bottles is standing idly waiting for the bottles to fill at a slow and safe rate, or he is opening the bottles too fast causing a dangerous condition of compression heating of the oxygen and cylinder. Either case is not desirable.
- Increased wear to the cylinder shutoff valves also occurs from repeated opening and closing of them. Using the ACS allows the technician to hook up the bottle; push a button and the bottle will automatically fill at a safe rate; and then give the tech audible and visual cues when it is finished.
- The ACS uses PLC controlled solenoid valves and transducers to control and monitor the fill rate, and multiple control orifices to keep filling rate to a safe level. There are two separate fill rates built-in depending on whether you are using a *CGA 540* or *CGA 870* fill adapter which is automatically controlled by which fill adapter you use.

Components



Components Description

93% O₂ Sticker	Net content sticker for bottle that describes precautions, usage and warnings of oxygen in cylinder.
Bypass Hose	This hose allows the full inlet pressure to be seen at the outlet of the system. Every check valve the oxygen has to go through will cause a decrease in pressure. This hose minimizes this drop in pressure.
CGA 540 Tee Connector	These tee connectors are used to connect multiple bottles together and allow fast assembly of components.
Connector Holder	There is a holder for each connector (<i>CGA 540 & CGA 870</i>). This is a convenient storage spot to hang up the connectors when not in use. The hose connector easily snaps in and out of the spring loaded holder.
Control Enclosure	This is NEMA 12 enclosure that houses the electrical controls for the cascade system.
Cylinder Mounting Channel	This steel channel gets bolted to the wall and the cylinders then get clamped to it.
Cylinder Mounting Clamp	This component clamps the cylinders to the mounting channels to safely secure the high pressure storage bottles.
Door Latch	This is quarter-turn latch for opening and closing the control enclosure with a straight blade screwdriver
Emergency Stop Button	This button will disconnect all power to system when pushed. The button needs to be pulled out to repower the system.
High Pressure Oxygen Storage Cylinders	The storage bottles contain oxygen at a pressure of 2200 psi (152 bar) . These are used to trans-fill to a bottle connected to one of the trans-fill connectors.
Outlet Valve	There is a valve for each connector (<i>CGA 540 & CGA 870</i>). The outlet valve needs to be opened to the cylinder that is being trans-filled to.

Oxygen Inlet Hose	This hose gets connected to your supply of oxygen. It is typically hooked up to high pressure oxygen compressor being fed by OGSI oxygen generator.
Oxygen Outlet Hose	This hose connects the cascade system cylinders to the control panel and the trans-fill connectors.
Pigtail Connector with Check Valve	This component connects the tee connectors together to make a cylinder manifold. The check valves allow oxygen to flow in one direction only preventing the higher pressure cylinders from bleeding back to cylinders at a lower pressure.
Power Cord	The standard power cord is designed for use on 115 VAC/60 Hz electrical systems and comes with a three-pronged ground fault protected plug.
Pressure Sensor	This sensor tells the control panel how much pressure is in each bottle and displays it on the touch screen.
Solenoid Valve	This valve controls the flow into and out of each bottle and is triggered by a program in the control panel.
Touch Screen	The touch screen allows you to start and stop trans-filling procedure. It monitors the pressures in each cylinder and indicates when trans-filling is complete.
Trans-fill Connector	There is a connector for <i>CGA 540</i> one for <i>CGA 870</i> cylinders. There are different flow rates for each connector to allow the ACS to fill any cylinder at a safe rate for its size.
Vent Valve	This valve will bleed off pressure from the ACS outlet to allow the connectors to be removed easily from the full cylinder.
Whip Hose	This is a high pressure flexible hose that connects the ACS outlet to the trans-fill connectors.
Wire-way	This holds all the control wiring for the solenoid valves and the pressure sensors.

Safety Precautions



It is very important that you read the precautions below and make yourself aware of the hazards of oxygen in general. While it can be handled and used very safely, it can also be mishandled or applied incorrectly causing dangerous situations.



Oxygen is a fire hazard. It can be very dangerous as it vigorously accelerates the burning of combustible materials. To avoid fire and/or the possibilities of an explosion, oil, grease or any other easily combustible materials must not be used on or near the unit. **DO NOT SMOKE NEAR THE UNIT.** The unit should be kept away from heat and flames. Individuals who have experience handling oxygen systems should become the designated operators of the unit within your facility.



In critical applications, it is important to have a backup supply of oxygen since the generator does not come with any reserve storage tank and requires electrical power to operate. ***Therefore, during power outages oxygen will not be produced.***

Do not use extension cords to bring power to the generator. It is also important to use only a properly grounded outlet.

High pressure oxygen may present a hazard. Always follow proper operating procedures, and ***open valves slowly.*** Rapid pressurization may result in personal injury. Safety glasses and hearing protection are required when venting oxygen under high pressure.

Ensure that the oxygen outlet stream is not directed toward anyone's clothing. Oxygen will embed itself in the material and one spark or hot ash from a cigarette could violently ignite the clothing.



Required Operating Conditions

Location of Machine:

This standard oxygen generating system is intended for use indoors. The enclosure meets **NEMA 12** protection guidelines, which provides a degree of protection against dust, falling dirt and non-corrosive liquids. A **NEMA 4X** enclosure package is optionally available if outdoor location is required. The **NEMA 4X** package will provide a degree of protection against corrosion, windblown dust and rain and splashing or hose-directed water.

Select a location that is clean and dry. This should be a protected area free from possible damage from other equipment like vehicles and forklifts. Any fuel sources should be stored far away from oxygen bottles. Use standard procedures and safety precautions that apply to high pressure oxygen storage cylinders. The control panel with the filling whips can be mounted to the left or right of the storage cylinders. The cylinders need to be secured to the wall with the cylinder mounting channel. Contact **OGSI** if an optional free standing floor mounted channel is required.

Electrical Power:

The power for the control circuitry is a single-phase electrical supply of **115 VAC** and about **1 A** at a frequency of **60 Hz**. This equates to approximately **115 W** of power. This equates to approximately **115 W** of power. Additionally, the unit must be connected to this circuit using only the supplied power cord, and without the use of additional extension cords.



Set-up & Installation

The following instructions are intended as a general guideline for a typical system installation. If you feel that you have an unusual situation or would like additional assistance in determining the appropriateness of a particular set-up, please contact OGSi. (*Refer to Technical Service Assistance on page 29 for contact information.*)

1. Determine the location you are going to want to refill cylinders and mount your control enclosure to the wall. 70" from the floor to the top of the control enclosure is suggested for ease of use.
2. Attach the oxygen outlet hose to the control enclosure and use it as a guide. It will need to reach to the valve on the first cylinder. Mount your cylinder mounting channel to the wall at a height of 44" from the floor to the bottom of the channel.
3. Clamp your cylinders to the channel 13.5" on center with the screw on connector facing the wall.
4. Connect the assemblies with the solenoid valves and pressure sensors onto the cylinders facing upward. The cylinder the farthest away from the control panel is a buffer tank and its connector does not have a valve or sensor.
5. Attach the pigtails between the cylinders to form a manifold. All the check valves in the pigtails have to have the arrows pointing towards the control enclosure. Install manifold end subassemblies to the left and right bottle. Install the bypass hose between the manifold ends making sure the check valve arrow is facing towards the control enclosure. Attach the oxygen outlet hose to the manifold end closest to the control enclosure.
6. Install the wire way to the wall above the cylinder mounting bracket. Put all control wire harness from the control enclosure into the wire way. Plug in all solenoid valves and pressure sensors into the appropriate spots on the control wire harness.
7. Connect the oxygen inlet hose between the other end of the manifold and your oxygen supply source. It is suggested you connect a ball valve between the oxygen supply source and the ACS. This valve is used to isolate the manifold for maintenance. This fitting is a 37°- flared JIC fitting. Connections to these fittings are readily available worldwide through the Parker distribution network or from **OGSi**. If you do not have a valve on hand at this time, skip this step as the valve can be installed at a later date. ***OGSi stocks valves that can be used for this purpose. If you need one, you can reach our Sales Department at (716) 564-5165.***
8. Open all cylinder valves and pressurize the ACS with your high pressure oxygen source. Check all connections for leaks and eliminate as appropriate for source of leak. This could mean tightening fitting or removing fitting and putting oxygen safe sealant on it and re-installing.
9. Connect the electrical cord into an outlet. It can be connected to any typical outlet of magnitude **115 VAC**. It is preferable that the outlet used be one that cannot be accidentally turned off. Once connected, go through the „**Operating Instructions**’ on page 17 before operating the machine.



Operating Instructions

Open Oxygen inlet to cascade system.

Cylinders start at the outlet end (closest to the control box and fill whips) and increment up until you reach the inlet end. The highest numbered cylinder in your system will not have a transducer or solenoid valve; this is a buffer cylinder that prevents the system from over cycling or having your oxygen compressor from shutting off prematurely. The ACS is available as a 4-cylinder, 8-cylinder 12-cylinder or 16-cylinder set-up. The programming for the control will recognize how many cylinders are in the system and adjust accordingly. Your system can be expanded up to 16 cylinders by adding the appropriate expansion package.

Allow all cascade bottles to completely fill.

The cascade system has check valves in the copper pigtails between each bottle. This prevents the higher pressure cylinders from bleeding backward into the cylinders with less pressure. The solenoid valves act like a one-way check valve. When they are not energized, they will allow oxygen to flow into the cylinders but not out. When they are energized (as can be seen by the LED light on the coil head) oxygen will flow either way. When the bottles get close to full (usually over 2000 psi i.e.138 bar) the solenoids on the cylinders will cycle **ON** and **OFF** to top them off if the PLC senses the oxygen compressor is running. While this occurs, the outlet solenoid valve remains closed so that no oxygen will be fed to the fill whips. This top off cycle will discontinue if the **START** button is pushed to trans-fill to a cylinder and will automatically restart when the filling is complete.

Filling Cylinder with *CGA 540* Connector

Connect *CGA 540* fill connector to cylinder to be filled.



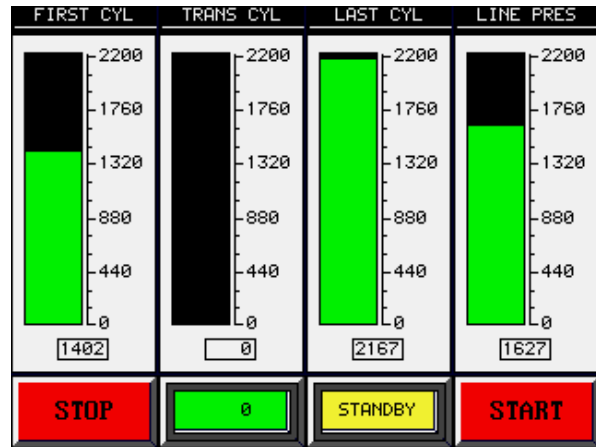
Open valve on cylinder to be filled.



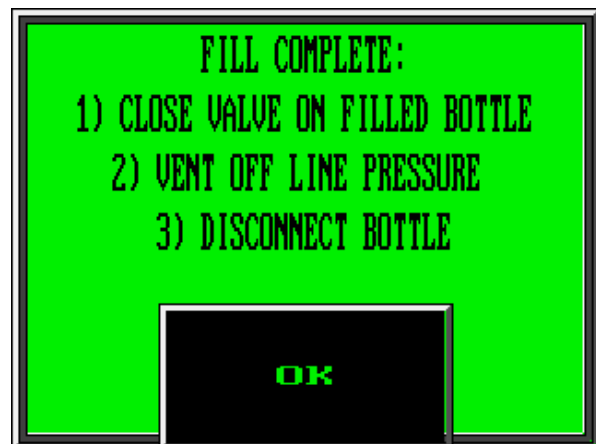
Turn *CGA 540* outlet valve to open.



Push **START** *button* on touch screen.



Touch screen will show fill is complete and beep when done.



Close cylinder valve when filled.



Open line vent to bleed off pressure.
Close valve when noise from venting
pressure stops.



CGA 540 outlet valve should be closed
if no other *CGA 540* cylinders are to
be filled.



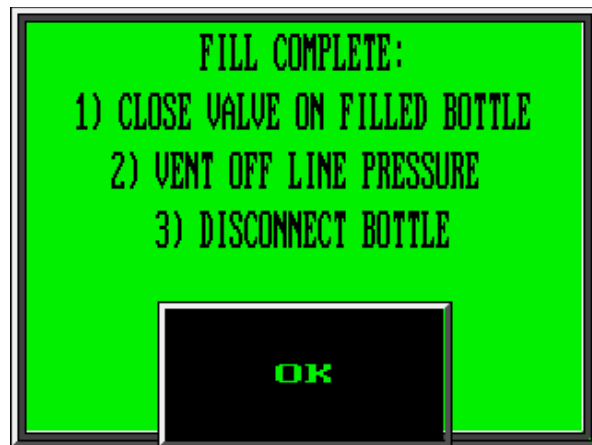
Disconnect *CGA 540* fill adapter
from cylinder



Return *CGA 540* fill adapter to holder if no other cylinder are to be filled, or hook up to next cylinder.



Push **OK** on touch screen to return to **CONTROL** screen.



Filling Cylinder with *CGA 870* Connector

Connect *CGA 870* fill connector to cylinder to be filled.



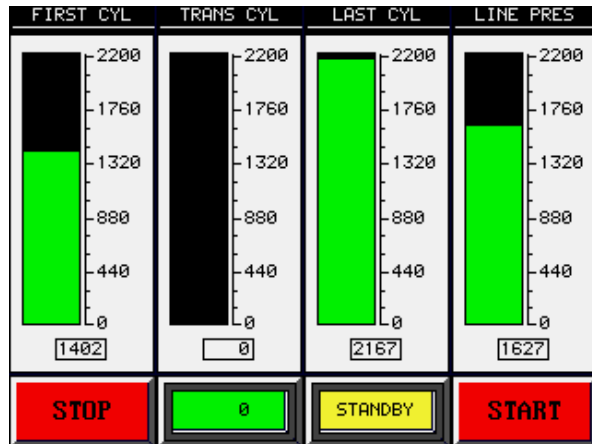
Open valve on cylinder to be filled.



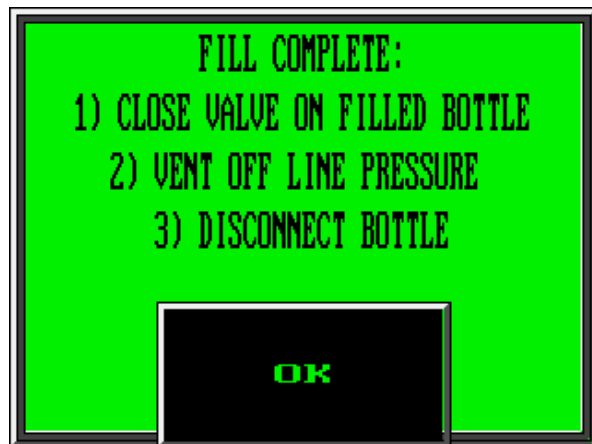
Turn *CGA 870* outlet valve to open.



Push **START** button on touch screen.



Touch screen will show fill is complete and beep when done.



Close cylinder valve.



Open line vent to bleed off pressure.
Close valve when noise from venting
pressure stops.



CGA 870 outlet valve should be closed if no
other *CGA 870* cylinders need to be filled.



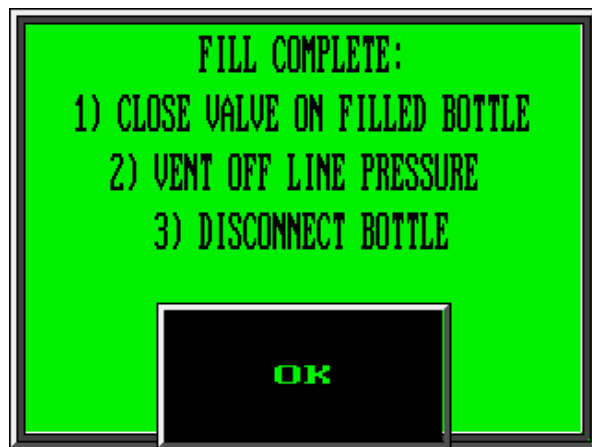
Disconnect *CGA 870* fill adapter
from cylinder



Return *CGA 870* fill adapter to holder if no other cylinders are to be filled, or hook up to next cylinder.



Push **OK** on touch screen to return to **CONTROL** screen.



Touch Screen Description

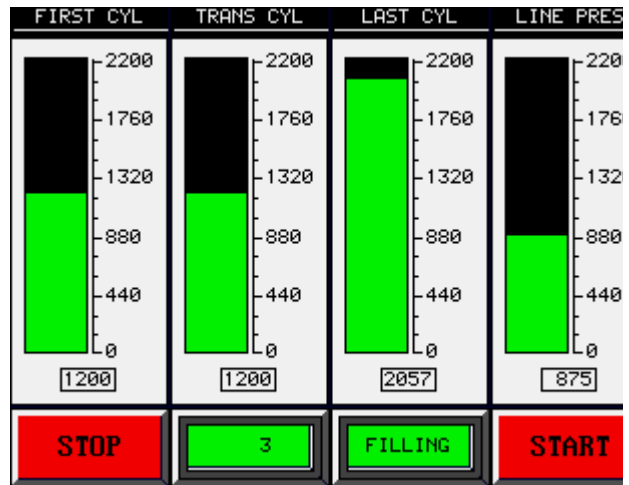
When the **START** button is pushed, the screen will be similar to the sequence below.

Line pressure shows what is going into your cylinder you are filling.

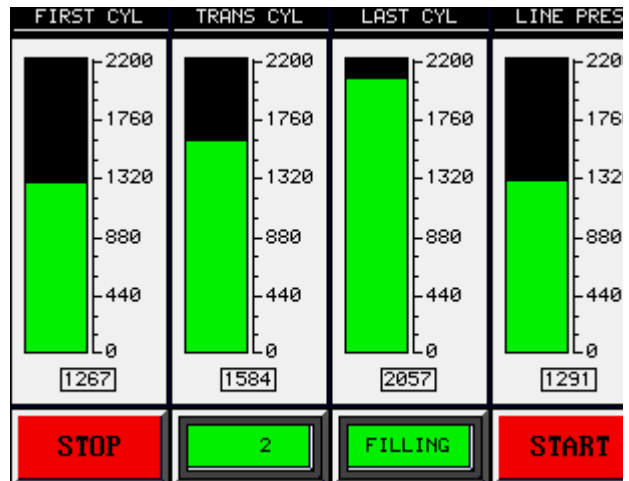
TRANS CYL shows what cylinder is being used to fill your empty cylinder; the cylinder number is shown under the **TRANS CYL** gauge (its reading cylinder 3 in this photo).

FIRST CYL shows what is in the cylinder at the beginning of your cascade system after the buffer cylinder (it is the cylinder with the highest number and usually the lowest pressure)

This shows the system switched to the next stage, which is cylinder 2.

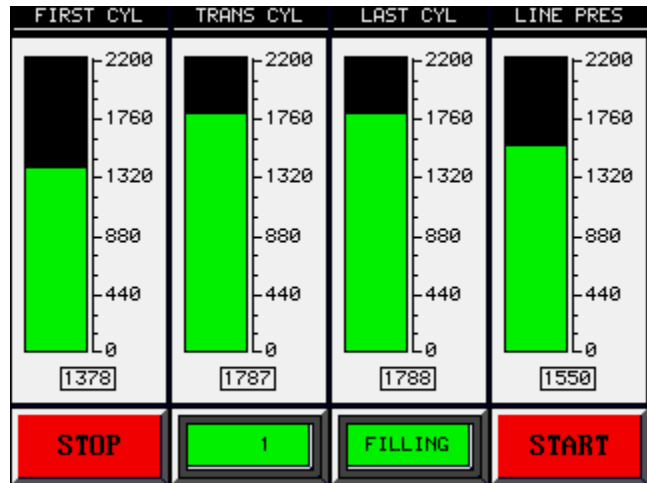


System is on the last cylinder in the fill sequence, which is cylinder 1.



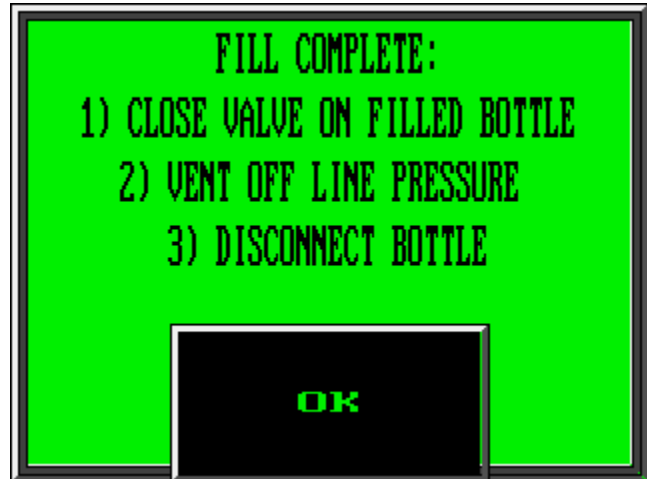
Because it is on the last stage of fill using cylinder 1, the **LAST CYL** gauge and the **TRANS CYL** gauge will read the same.

STOP button can be pushed at any time to abort the filling sequence.

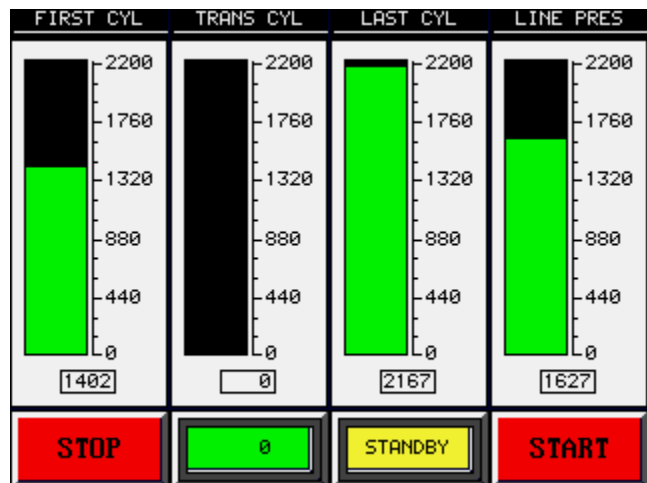


When filling sequence is complete, you will be prompted to finish closing valves, vent and disconnect system.

Push the **OK** button after you have done this.



When the system is not filling a cylinder it will look like the example on the previous page. Notice that **TRANS-FILL** gauge and cylinder number are both zero (0) because there are not any cylinders trans-filling at this point.



Troubleshooting Guide

Problem	Sign	Cause	Solution
No Power	Control switch not illuminated	<ul style="list-style-type: none">• Power cord not connected to electrical outlet• Loose wires	<ul style="list-style-type: none">• Ensure that power is available from 115 VAC supply.• Check the fuse to ensure that it is fully installed and blown.• Visually inspect the electrical wiring. Reconnect any loose wires.

Preventive Maintenance

Cabinet & Power Cord:

The cabinet and power cord should be occasionally washed down with a sponge or clean rag and some soapy water. Avoid the use of ammonia or other strong chemical based cleaning solvents. This prevents dust and dirt from building up on the machine.

Technical Service Assistance

It is our intention to provide complete customer satisfaction. This manual is one way in which we hope to provide you with technical assistance.

If you do not find what you need in this manual or you have other questions about this equipment, please feel free to contact us directly. We look forward to serving your oxygen needs and invite your inquiries. We will respond to you as promptly as possible.

You can reach **OGSI** through the following means:

- **By Telephone (Within the United States and Canada):**
(800) 414-6474 - Our toll free number (Within USA and Canada only)
(716) 564-5165 - Our direct number
- **By Telephone (Outside the United States):**
Your local International Access Code (usually **0** or **00**), followed by
The Country Code for the U.S. which is **(1)**, followed by our Area Code and Number
(716) 564-5165
- **By Automated Voicemail:**
(716) 564-5165
- **By Fax (Within or outside the United States):**
(716) 564-5173
- **By E-Mail or Website:**
ogsimail@ogsi.com
<http://www.ogsi.com>
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- **By UPS, FedEx or Common Carrier: (Address to return shipments)**
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*Technical service personnel are available from 8:00 AM to 5:00 PM EST (GMT - 5).
We also have a list of Distributors and Authorized Service Agents available upon request.*

Customer Satisfaction Survey

Help us serve you better. Please take our Customer Satisfaction Survey at www.ogsi.com

Appendix

Spare Parts List

	<u>PART NUMBER</u>	<u>QUANTITY</u>
1/4" NPT HP Female 90 Elbow	1210002.CHC	1
1/4" Street 45 Elbow Brass 3000 psi	1210003.C45H	15
1/4" NPT HP Street 90 Elbow	1210003.CHC	5
1/4" JIC x NPT 90 Elbow	1210005.C0C	3
1/4" NPT x 3" Long HP Nipple	1220001.CH3	4
1/4" NPT High Pressure Hex Close Nipple	1220002.CH2	4
1/4" Female Tee 3000 psi	1240002.C01H	3
1/4" Run Tee Steel	1240203.C01	15
1/4" Female Cross 3000 psi	1250002.C04H	1
1/4" JIC X 1/4" FPT Adapter	1300005.C2C	2
1/4" JIC Coupler Brass	1310002.C04	3
ACS Enclosure	1410002.009	1
Tool Holder for CGA Whips for ACS	1460004.003	2
ACS Outlet Bracket	1460011.001	1
1/4" Direct Acting 2200 psi Solenoid Valve	1510009.CD2	16
1/4" Female High Pressure Ball Valve	1520002.C01	2
Check Valve	1530001.C04	1
1/4" NPT X FPT HP Needle Valve	1550003.C01	1
1/4" NPT O21 Screened Orifice	1610002.C21	2
1/4" Sintered Bronze Muffler	1700002.C02	1
6" Touch Screen Panel	1810001.S6C	1
DL06 PLC	1810002.003	1
4 Channel Input Card (4.20 mA)	1810103.002	4
EZ Touch Screen RS232 Cable	1810106.003	1
Terminal Block	1820004.001	36
Ground Term Block	1820005.001	6
Din Rail	1820007.001	26
3-Place Term/Block Jumper	1820008.003	11
Weidmuller Terminal Block Stop End Bracket	1820009.001	4
Terminal Block End Plate	1820009.002	4
PIN 24-18GA Crimp On	1820014.021	30
2-Pin Plug	1820014.302	15
2 1/4" Wire Duct with Cover and Adhesive	1820016.PP1	21
1/2" Strain Relief	1820018.E01	9
1/2" Knockout Plug for Electrical Enclosures	1820019.001	6
Emergency Stop Button	1840052.001	1

24 VDC Power Supply Din Rail Mount	1860200.001	1
18 GA 604-Dark Blue Wire 300 V	1880001.001	3
18 GA 604-Brown Wire 300 V	1880001.002	3
ACS 4 Wire Harness	1880022.001	1
ACS 8 Wire Harness	1880022.002	1
ACS 12 Wire Harness	1880022.003	1
ACS 16 Wire Harness	1880022.004	1
3-Prong Power Cord 16'	1890001.001	1
0-3000 psi Pressure Transducer 1/4" NPT	1910003.000	16
7/8" Surface Mount Clamp	2230003.H01	1
8" Rigid Clamp	2230005.008	16
CGA 540 Brass Pigtail with Check Valve	2240000.004	15
1/4" FPT Non-swivel Steel Braided Hose	224011C.072	2
1/4" JIC X 48" Long PTFE Steel Braid Hose	224066C.048	6
WWW.OGSI.COM LABEL with Cast Vinyl Adhesive	2420001.004	1
93% O ₂ Cylinder Labels FDA APPROVED	2420003.004	16
10-32 x 1/2" Machine Screw Pan HD Phillips	2910AC0.050	18
10-32 Hex Locknut	2910AC0.0LN	18
Strut Channel 10 ft	2970000.002	2
CGA 870 x 1/4" Pin Index Yoke	3010002.003	1
Tool-Less CGA 540 Nipple	3020002.663	1
CGA 540 x 1/2" NPT Nipple 3 1/2" Long	3020002.C35	1
1/4" NPT x 2 1/6" Oxygen Regulator Nipple Western	3020002.C63	31
Regulator Nut CGA 540	3030002.062	34
Tool-less CGA 540 Nut	3030002.662	1
CGA 540 Tee Coupler M x M x M	3040001.005	16
CGA 540 Male Cap and Chain	3040001.CMP	16
ACS Manifold End Subassembly	4500003.001	2
ACS Buffer Tank Manifold Connector	4500003.002	1
ACS Outlet Subassembly	4500003.003	1
ACS Cylinder Valve Subassembly	4500003.004	15
ACS Control Box Subassembly	4500003.005	1
ACS Tank Mount Kit 8 Cylinders	4500003.007	2
ACS Electrical Panels	4500003.010	1
ACS Electrical Expansion 4 CYL TO 8 CYL	4500003.011	1
ACS Electrical Expansion 8 CYL TO 12 CYL	4500003.012	1
ACS Electrical Expansion 12 CYL TO 16 CYL	4500003.013	1
ACS Operation Manual	9000000.001	1

Oxygen Cleaning Procedure

Scope

This procedure sets forth the cleaning requirements for parts that are used in the construction of **OGSI** oxygen systems and are in the gaseous oxygen product stream including but not limited to valves, tubing, fittings, manifolds and pipes.

Objective

The objective of this procedure is to provide personnel with clear directions and an understanding of how parts are to be cleaned and why that is important. This document is based on guidelines provided in publication **CGA G-4.1-2009** which is produced by the Compressed Gas Association (CGA) and is intended to ensure that our internal procedure is compliant with that publication.

Safety

Harmful contamination such as grease, dirt, oil, dust, solvents, weld slag, sand, rust and previously applied thread sealants on parts that come into contact with oxygen can cause a combustion reaction resulting in system degradation or failure or worse, a hazard to nearby personnel. Care needs to be taken in the cleaning and handling of components used in oxygen service to prevent any contamination related failure.

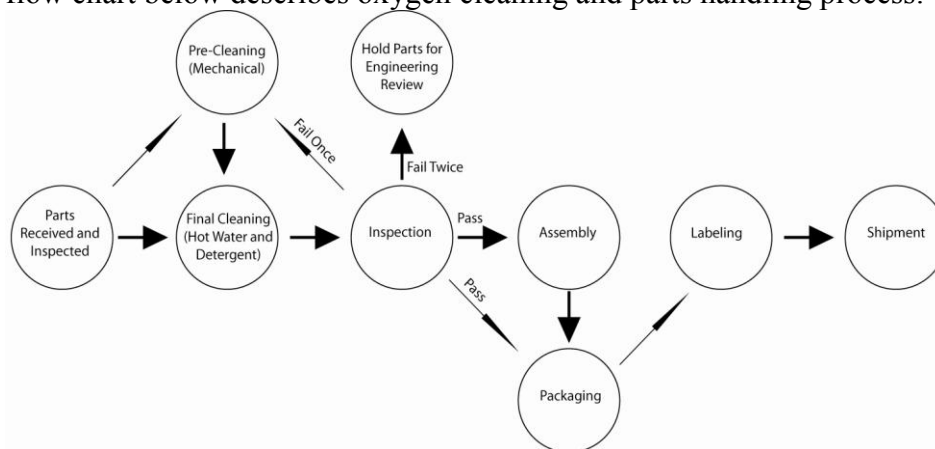
While the **CGA G-4.1-2009** standard makes allowance for cleaning parts using caustic agents, acids or solvents, the **OGSI** procedure will use only mechanical (soaking, wire brushing or grinding) means for pre-cleaning and hot water cleaning with aqueous detergents for final cleaning. This is done to reduce any chemical exposure risk to personnel and to eliminate the additional steps needed to remove these cleaning agents from the parts themselves.

Training

Personnel involved in the cleaning and preparation of parts used in oxygen service should be trained in these cleaning procedures and be familiar with this document.

Process Flow Chart

The flow chart below describes oxygen cleaning and parts handling process.



Parts Received and Initial Inspection

Upon determining which parts need to be cleaned, the technician needs to perform an initial visual inspection (under white light). Check for the presence of visible residue on the parts

including but not limited to oil, grease, dirt, dust, rust, weld slag or pre-existing thread sealant among others. For parts that have an internal cavity that is not directly observable by the naked eye, a lint free cloth that is first soaked in water can be inserted into the part and withdrawn for evidence of contamination. No part failing inspection shall be used in any assembly.

Pre-Cleaning

Pre-cleaning methods include soaking parts in a water based solution with an aqueous detergent, using a wire brush or thread pick, holding it under a wire brush grinding wheel or simply wiping it down with a clean rag. Upon completion of pre-cleaning, the part should be clear of any visible contamination and ready for final cleaning.

Final Cleaning

Final cleaning involves placing the parts in the parts washing machine, adding an appropriate amount of detergent and running them through the cleaning cycle. Consideration shall be given to the size, shape and number of parts to be cleaned at one time to ensure that the system is not overloaded or its function impaired. The cleaning temperature inside the washer shall be **120°F (49°C)** to **140°F (60°C)** and the detergent to be used shall be Cascade™. This detergent has a flash point above **105°F (41°C)** but it does not sustain combustion and there are no exposure controls for it. Parts can be removed from the washer once the drying cycle is complete.

Inspection

Upon completion of the final cleaning cycle, all parts should be removed from the parts washing machine and inspected for any residual contamination. The item shall be observed to confirm the absence of any contaminants including any oil, grease, detergent, moisture, lint, or other foreign materials. If any material remains on the part after the final cleaning cycle, the part shall be returned for a second round of pre-cleaning and final cleaning.

Packaging

Once a part or assembly has been cleaned for oxygen service, it should be protected to prevent recontamination if it will be put into storage. Small to medium sized parts should be packaged in plastic bags. Larger assemblies should be bubble-wrapped or wrapped in foam material and then moved on to final packaging in boxes and/or crates.

Labeling

Once a part or an assembly has been cleaned and packaged for oxygen service, it should be labeled per the customer's instructions, but at a minimum;

- contain the statement "**Cleaned for Oxygen Service**"
- contain the date of cleaning or packaging

References

The following publications were referenced in the creation of this document.

- CGA G-4.1-2009, *Cleaning Equipment for Oxygen Service*, Compressed Gas Association, Inc., 4221 Walney Road, 5th Floor, Chantilly, VA 20151. www.cganet.com
- *Oxygen Cleaning Procedure* Rev. L (8/05), RIX Industries, Inc., 4900 Industrial Way, Benicia, CA 94510. www.rixindustries.com

Units of Measurement

lb	U.S. Pound
hp	Horsepower
psi	Pound-force per Square Inch
kW	Kilowatt
kWh	Kilowatt hour
ft³	Cubic Feet
VAC	Volts Alternating Current
Hz	Hertz
SCFH	Standard Cubic Foot per Hour
SCFM	Standard Cubic Foot per Minute
LPM	Liter Per Minute
1 bar	1.45 x 10 ¹ psi
dBA	Decibel (A scale)
A	Ampere
W	Watt
°C	Degree Celsius/Centigrade
°F	Degree Fahrenheit

