

Onsite Oxygen Generating system GO Series



INSTALLATION, OPERATION, MAINTENANCE PSA Type Oxygen Generating Plant

Dealer: This manual **MUST** be given to the end user.

User: **BEFORE** using this product, read this manual and preserve it for future reference.

For more information regarding our products and services, please visit

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**WARNING**

Do not use this plant or any available optional equipment without completely reading these instructions and any additional instructional material such as user manuals, service manuals or instruction sheets supplied with this product or optional equipment. If you are unable to understand the warnings, cautions or instructions, contact a healthcare professional, dealer or technical professional before attempting to use this equipment.

**DANGER**

DO NOT SMOKE while using this plant. Keep all matches, cigarettes, candles or other sources of ignition out of the room in which the plant is located and away from where oxygen is being delivered.



NO SMOKING signs should be displayed where the plant is installed.

NOTICE

The information contained in this document is subject to change without notice.

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1. GENERAL GUIDELINES

In order to ensure the safe installation, assembly and the operation of this onsite oxygen plant, the following instructions **MUST** be followed strictly.

WARNINGS

This section contains the important information for the safe operation and use of this plant.

Warning	Make sure that your back up/ emergency oxygen supply system connected to the manifold system. Without secondary Oxygen supply system, Don't use this Plant
Warning	Equipment must be placed in a well-ventilated area. Avoid inhalation of gases
Warning	Medical Oxygen Plant, you must follow the procedure for service and maintenance instructions.
Warning	All tubes, hoses and piping used for oxygen plant must be compatible with oxygen
Warning	Exhaust gas must be lead by piping out of the room to outdoor atmospheric air
Warning	Oxygen is a powerful oxidizing agent. It can cause fire or explosion. Observe strict cleanliness procedures when fabricating and connecting the oxygen piping.
Warning	The Panel contains electrical parts that may produce electrical hazard if not handled properly. To prevent electrical shock when servicing the plant, care must be taken. In general electrical installation and servicing is to be performed by trained or authorized personnel only
Warning	Oxygen and Air reservoir must be de-pressurized and purged thorough with air to remove all oxygen before service or inspection. Always vent oxygen to outdoor atmospheric air. Make sure there is no smoking or open flame.
Warning	Smoking should not be permitted in the area where the plant is located
warning	Do not try to modify or enhance the performance of an oxygen plant in any way
Caution	Warranty will not covered <ul style="list-style-type: none"> ➤ If Inlet air temperature below 5 and or above 40 deg C. ➤ Water, oil, rust, scale and/or other foreign objects carry over

	in the inlet air due to damaged filter elements and/or failure in drains. ➤ If the Inlet air quality not comply with ISO 8573 class 4
Important	For safety, installation and operating etc. of compressor, dryer unit or other equipment refer to the concerned manuals of the equipment.

2.PRODUCT DESCRIPTION

GO SERIES Oxygen generators are on-site Oxygen generating plants. They are available in two models, with and without air compressor *. In the first model the plant contains the oxygen generator with the air compressor, air dryer and accessories as a single unit. In the second model the unit contains the above said accessories except the air compressor. Our oxygen generators working on the Pressure swing adsorption technique.

Trident oxygen generators uses imported zeolite based molecular sieves for the air separation that does not require replacement (when maintained and used according to this instruction manual). The process is completely regenerative which makes it reliable and virtually maintenance free. The delivery pressure can be set 3 to 4 bar(g).

- **ACCESSORIES WARNING:** Trident products are specifically designed and manufactured for use in conjunction with Trident accessories. Accessories designed by other manufacturers have to be tested before using it and however Trident is not recommend for use with our products. It is important to note that your compressor, refrigeration dryer and filtration system is an integral part of your total operation. It should be maintained in accordance with the manuals received with the compressor, refrigeration dryer and filtration system to ensure safe and clean air supply. An improperly maintained compressor, refrigeration dryer or filtration system could affect the operation of your oxygen generator. For use up to 24 hours a day, Trident will recommends high quality screw compressors only with external or internal refrigeration dryers and proper sized filtration systems.

2.1 GO Outstanding features and applications

✓ High Reliability

Low gas speeds through the molecular sieve beds, first-class components, stainless steel valve bodies and instrument air tubing, heavy-duty industrial PLC Manufactured to work. Always.

✓ **Lowest Energy Consumption**

Energy cost is your major expense, not depreciation. Fast pay-back assured.

✓ **Easy Integration**

Easy installation and integration with existing equipment: All system tie-in points are on one side.

✓ **Safe**

Heavy-duty adsorption vessels, designed and certified for an unlimited number of cyclic loads.

✓ **Customization**

An extended list of options allow you to define your specific Trident Twin-Tower PSA Oxygen Generator adjusted to your individual need.

Applications



Fish Farming

Fish production can be increased as long as sufficient oxygen, fresh water and food are provided.

Benefits:

Rise in stock density by maintaining a higher level of Dissolved Oxygen.

Preventing ice formation during winters.

Increase in the oxygen content as compared to a typical air-fed aerating system.

Uniform Dissolved Oxygen levels throughout

Sewage Treatment

In the biological treatment of waste-water, the use of oxygen instead of air permits increased capacity in existing treatment plants. Injecting oxygen into sewers reduces hydrogen sulfide formation, which results in reduced corrosion and odor.



**Welding, Brazing and cutting**

Oxygen is used with fuel gases in gas welding, gas cutting, oxygen scarfing, flame cleaning, flame hardening, and flame straightening.

In gas cutting, the oxygen must be of high quality to ensure a high cutting speed and a clean cut.

Pulp and Paper

Oxygen is increasingly important as a bleaching chemical. In the manufacture of high-quality bleached pulp, the lignin in the pulp must be removed in a bleaching process. Chlorine has been used for this purpose but new processes using oxygen reduce water pollution. Oxygen plus caustic soda can replace hypochlorite and chlorine dioxide in the bleaching process, resulting in lower costs.

In a chemical pulp mill, oxygen added to the combustion air increases the production capacity of the soda recovery boiler and the lime-reburning kiln. The use of oxygen in black liquor oxidation reduces the discharge of sulfur pollutants into the atmosphere

**Steel mills**

The largest user of oxygen is the steel industry. Modern steel making relies heavily on the use of oxygen to enrich air and increase combustion temperatures in blast furnaces and open hearth furnaces as well as to replace coke with other combustible materials. During the steel making process, unwanted carbon combines with oxygen to form carbon oxides, which leave as gases. Oxygen is fed into the steel bath through a special lance. Oxygen is used to allow greater use of scrap metal in electric arc furnaces. Large quantities of oxygen are also used to make other metals, such as copper, lead, and zinc.



Furnace Enrichment

Oxygen enrichment of combustion air, or oxygen injection through lances, is used to an increasing extent in cupola furnaces, open-hearth furnaces, smelters for glass and mineral wool, and lime and cement kilns, to enhance their capacity and reduce energy requirements. Smelting times and energy consumption can also be reduced by special oxy-oil or oxy-gas burners in electro-steel furnaces and induction smelters for aluminum. A high thermal efficiency is achieved by these “oxy-fuel” burners, which mix fuel and oxygen at the tip of the burner. As a result, rapid combustion occurs.

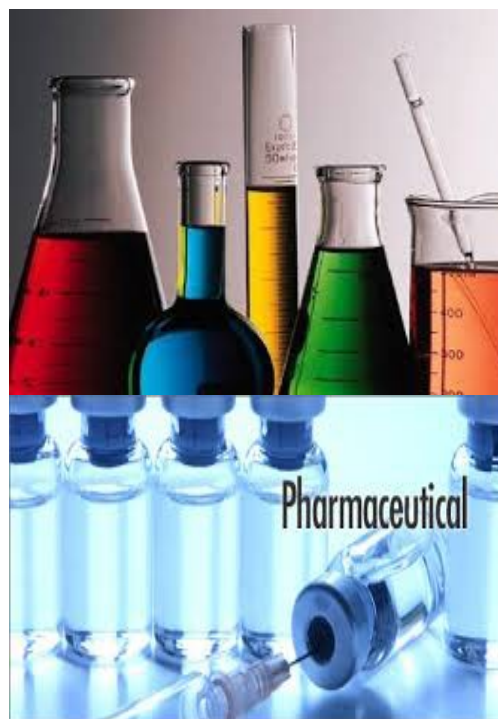
Chemicals, Pharmaceuticals and Petroleum

Oxygen is used as a raw material in many oxidation processes, including the manufacture of ethylene oxide, propylene oxide, synthesis gas using partial oxidation of a wide range of hydrocarbons, ethylene dichloride, hydrogen peroxide, nitric acid, vinyl chloride and phthalic acid.

Very large quantities of oxygen are used in coal gasification to generate a synthesis gas that can be used as a chemical feedstock or precursor for more easily-transported and easily-used fuels.

Oxygen is used to enrich the air feed to catalytic cracking regenerators, which increases capacity of the units. It is used in sulfur recovery units to achieve similar benefits. Oxygen is also used to regenerate catalysts in refineries.

Oxygen is used to achieve more complete combustion and destruction of hazardous and waste materials in incinerators.



Glass and Ceramics Industry

Conversion of combustion systems from air-fuel to oxy-fuel (and construction of new furnaces and tanks around this technology) results in better control of heating patterns, higher furnace efficiencies (lower fuel consumption) and reduction in particulate and NOx emissions.



Medical

In medicine, oxygen is used during surgery, intensive care treatment, inhalation therapy, etc. High standards of purity and handling must be maintained.

Oxygen is typically supplied to hospitals though bulk liquid deliveries, then distributed to usage points. It assists with respiratory problems, saving lives and increasing patient comfort.

Larger scale units using which also use non-cryogenic air separation technology, are being utilized in small and/or remote hospitals where demand is high enough to make cylinder deliveries a logistical problem but where liquid deliveries are unavailable or very costly. These units typically producing 90 to 93% purity oxygen, which is adequate for most medical uses

Miscellaneous Uses

- x Oxygen has many uses in breathing apparatus, such as those for underwater work and refinery and chemical plant self contained breathing apparatus.
- x Liquid oxygen is used in liquid-fueled rockets as the oxidizer for fuels such as hydrogen and liquid methane.
- x Metal Spraying
- x Bead Making, Lamp Working, Glass Blowing
- x Mining & Gold Processing
- x Battery Manufacturing
- x Cement And Lime Kilns
- x Melting
- x Chemical Oxidation Fermentation

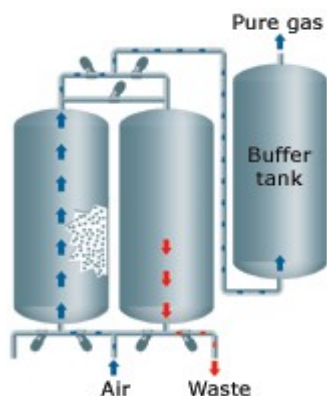
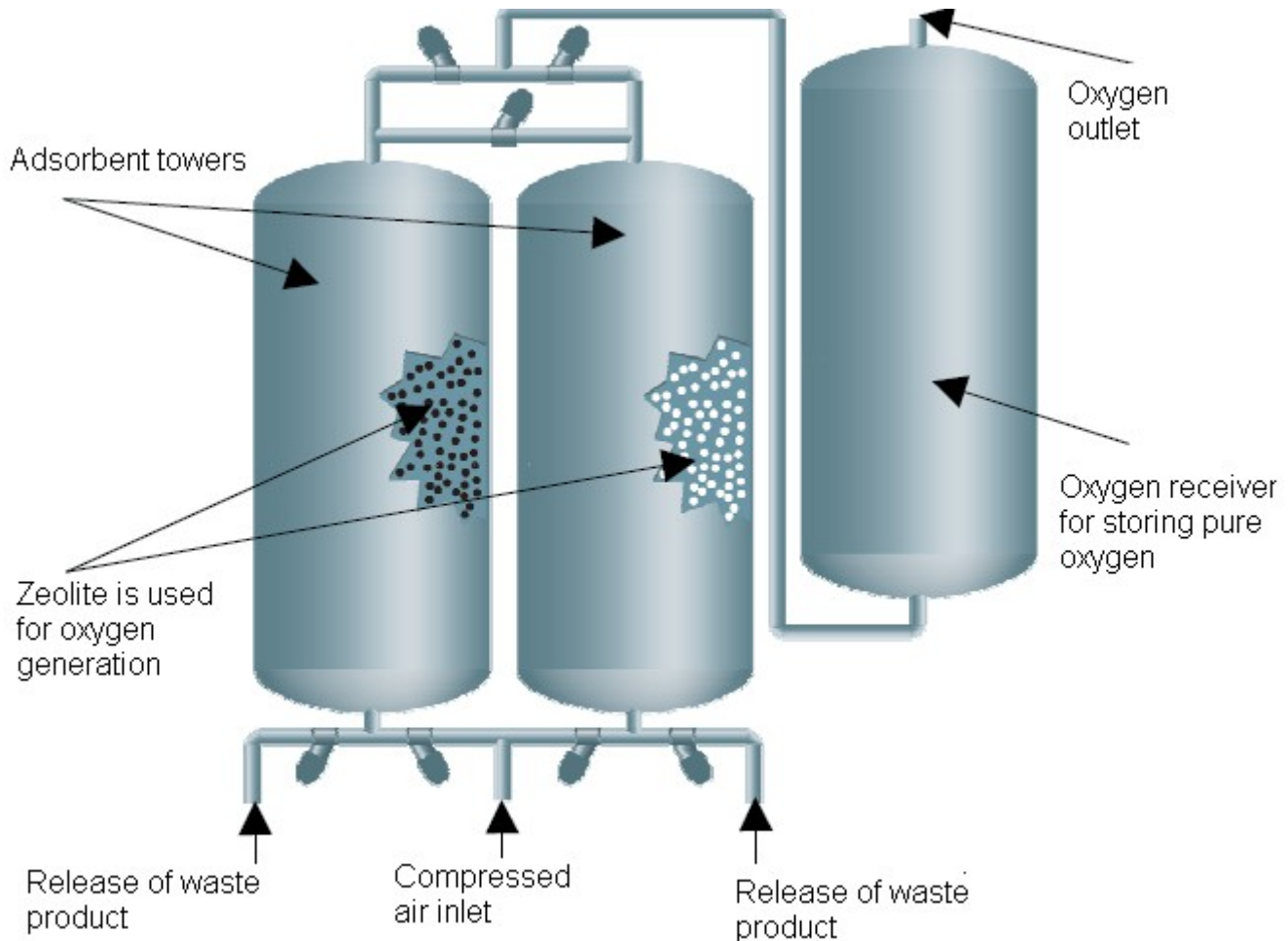
2.2 PSA Technique

Oxygen PSA process can be described with following steps.

The PSA process starts as clean and dry compressed air enters the first cylinder (left). The unwanted gas is adsorbed by the pellets at high pressure, but the molecules you want pass through the sieves. The resulting high-purity gas is stored in the buffer tank.

1. Compression, drying and filtering of input air:

The ambient air is compressed by an air compressor. Before entering the PSA process the compressed air is dried and filtered.



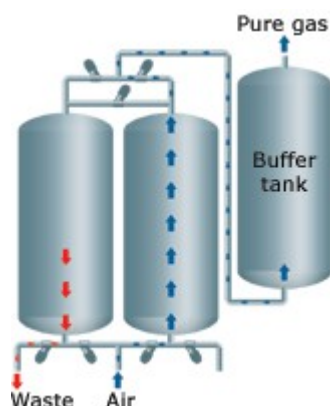
2. Oxygen adsorption on ZMS bed:

Our PSA units have two cylinders filled with Zeolite Molecular Sieve. (ZMS). Compressed and purified air is conducted to one of these cylinders. As the air flows through the cylinder, the Zeolite bed adsorbs nitrogen, while oxygen passes through to the oxygen accumulation tank. The adsorption process is interrupted before the ZMS becomes saturated with nitrogen by diverting the input air to the second cylinder, which at this point starts producing oxygen.

During this step of the cycle, the second cylinder (right) is cleaned.



3. Next, the pressure between the two cylinders is equalized.



4. Nitrogen desorption and Zeolite bed regeneration:

The ZMS of the first cylinder (now saturated with nitrogen) is regenerated by reducing pressure in the cylinder below that of the adsorption step. The adsorbed nitrogen is released and vented into atmosphere. The regenerated adsorbent is then purged with oxygen from the second cylinder. After this step it is again ready for another cycle.

5. Oxygen accumulation in receiver tank:

Adsorption and desorption steps are repeated in the Zeolite tanks at equal time intervals. A constant flow of oxygen is conducted to oxygen receiver tank, which can store the oxygen to pressures up to 4-5 bar. The oxygen purities reached with our systems are $93 \pm 3\%$.

2.3 Statement of conformity

- 97/23/CE : Pressurized Equipment's
- 89/392/CEE : Machine Safety
- 73/23/CEE : Low Voltage

2.4 GO Specifications

Trident make oxygen generating plant are available at various models according to the users requirements of oxygen in lpm. The following table gives the available models of oxygen generator's from Trident.

2.5 Models

Model	Oxygen flow Cu.m/hr
GO 50	3
GO 85	5.1
GO 140	8.4
GO 180	10.8
GO 230	13.8
GO 260	15.6
GO 390	21.6
GO 470	28.2
GO 570	34.2
GO 710	42.6
GO 960	57.6

Specification

Oxygen Purity	: 93±3%
Oxygen Pressure	: 3 – 4 bar g
Air pressure	: 4.5 - 5 bar g
Air Inlet Temperature	: 45 deg C max
Ambient Temperature	: 45 deg C max
Air quality	: ISO 8573 - 2010 class 1-4-1
Working Pressure	: 5 bar g
Voltage	: 85-265 VAC 50 Hz, 1 Ph

Trident make oxygen generator models and complete list of recommended accessories is given in the below table

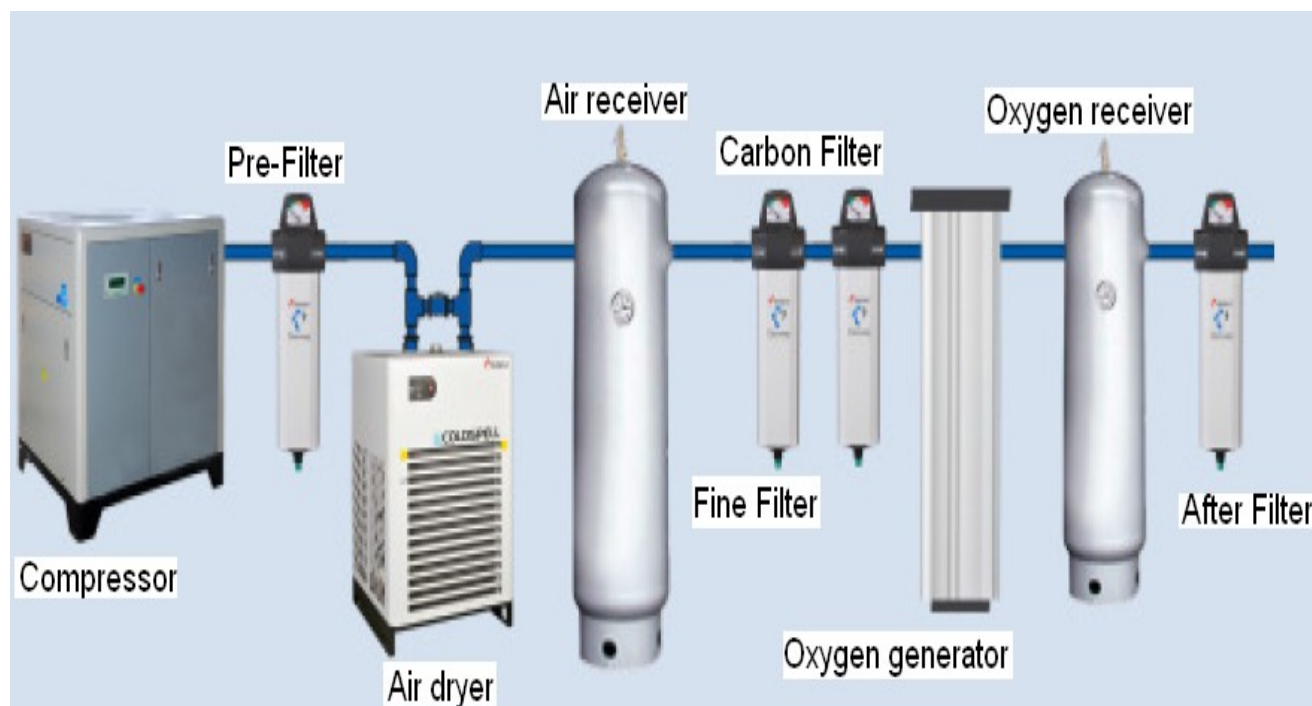
GO Models

Model	Capacity		Liquid oxygen liters / day	No. of cylinders / day	Air requirements (Compressor Power)
	LPM	cu.m/hr			cfm (Kw)
GO 50	50	3.0	90	5 - 11	31(5)
GO 85	85	5.1	153	15 - 18	44(7.5)
GO 140	140	8.4	252	25 - 31	78(11)
GO 180	180	10.8	324	35 - 40	100(15)
GO 230	230	13.8	414	45 - 50	125(18)
GO 260	260	15.6	468	50 - 60	100(15)
GO 390	390	23.4	702	70 - 86	205(30)
GO 470	470	28.2	846	90-105	250(37)
GO 570	570	34.2	1026	110-126	310(45)
GO 710	710	42.6	1278	130-160	390(55)
GO 960	960	57.6	1728	170-220	525(75)

GO Accessories

Model	Air Dryer	Air Filters	Carbon Tower	Oxygen generator	Bacterial Filter
GO 50	CS40	T100	TCT 100	OxyGen 50	TB 100
GO 85	CS60	T100	TCT 100	OxyGen 85	TB 100
GO 140	CS100	T250	TCT 250	OxyGen 140	TB 100
GO 180	CS150	T250	TCT 250	OxyGen 180	TB 100
GO 230	CS200	T600	TCT 600	OxyGen 230	TB 100
GO 260	CS200	T600	TCT 600	OxyGen 260	TB 100
GO 390	CS300	T851	TCT 851	OxyGen 390	TB 100
GO 470	CS400	T851	TCT 851	OxyGen 470	TB 100
GO 570	CS400	T851	TCT 851	OxyGen 570	TB 100
GO 710	CS500	T1210	TCT 1210	OxyGen 710	TB 100
GO 960	CS650	T1210	TCT 1210	OxyGen 960	TB 100

2.6 Oxygen plant General Layout

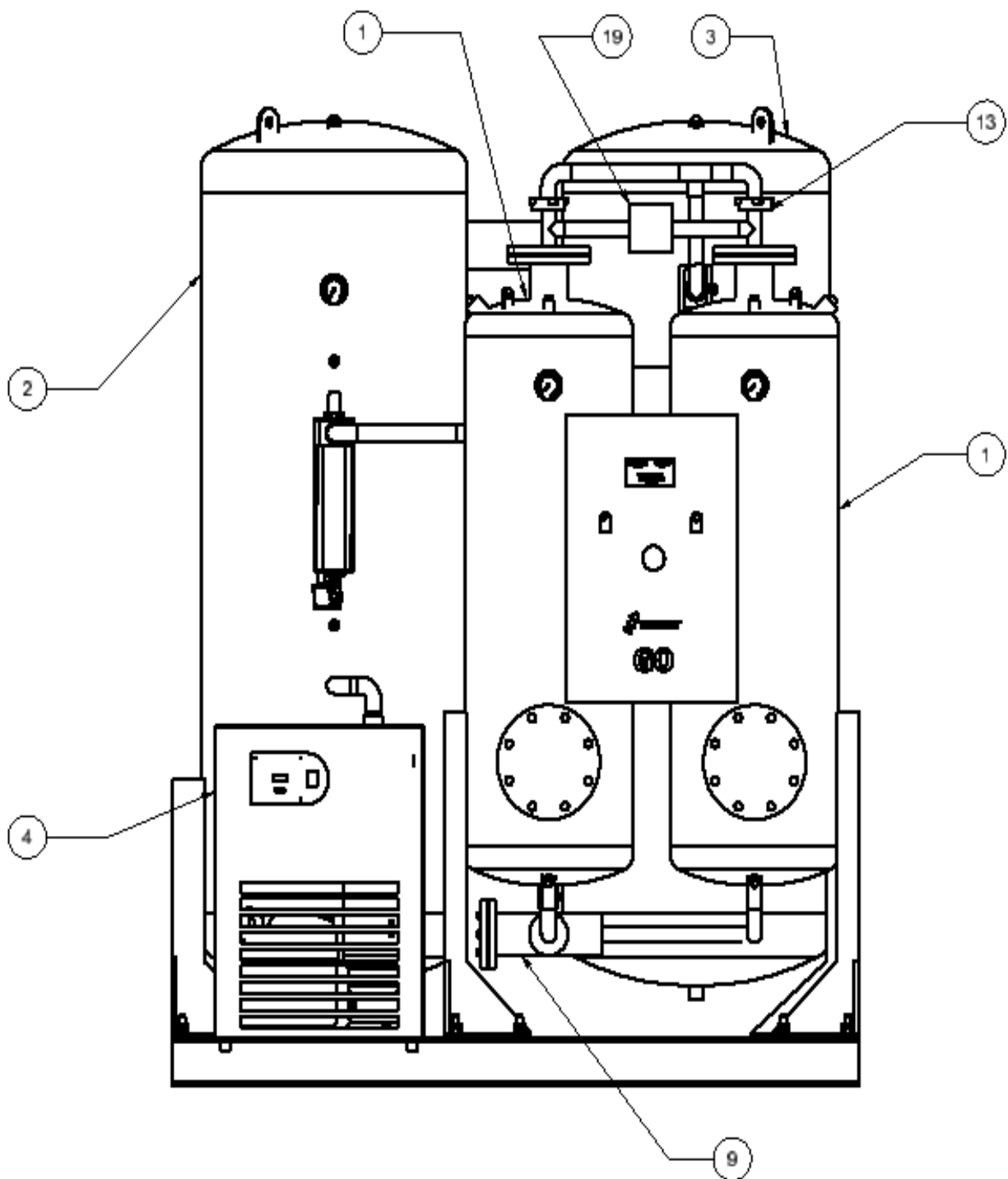


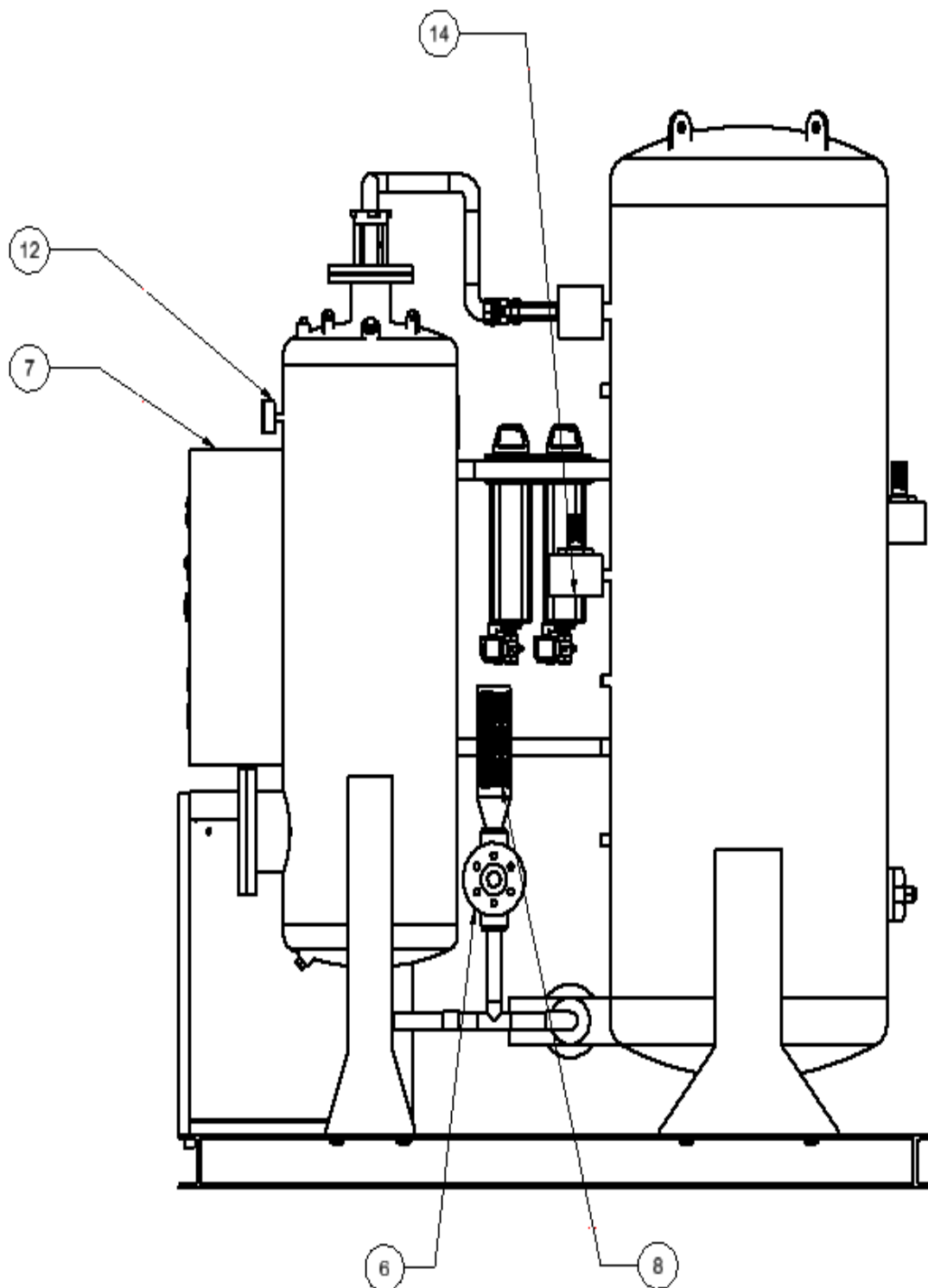
2.7 Adsorbent Material

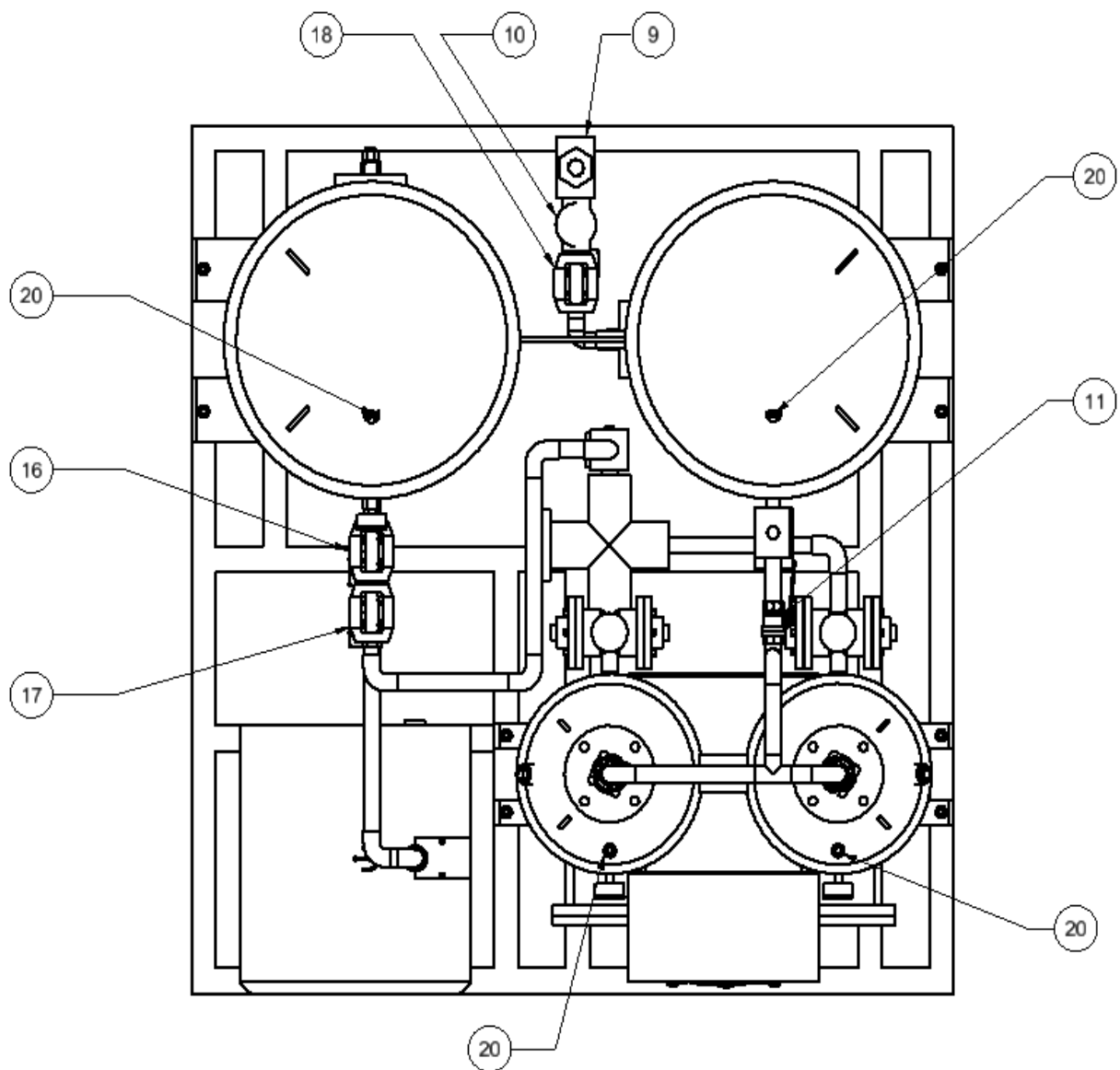
The adsorbent used in the Oxygen series is produced by a unique manufacturing process. The benefits of using this high performance desiccant include:

- Uniform in size
 - ✓ Reduces pressure drop and channeling
- High crush strength
 - ✓ Allows rapid pneumatic loading of towers
- Low abrasion
 - ✓ The low abrasion ensures less dusting during transport, loading, and service life which reduces pressure drop and minimizes downstream valve and filter plugging, common with dustier products.

3. GO DETAILED PARTS AND FUNCTIONS







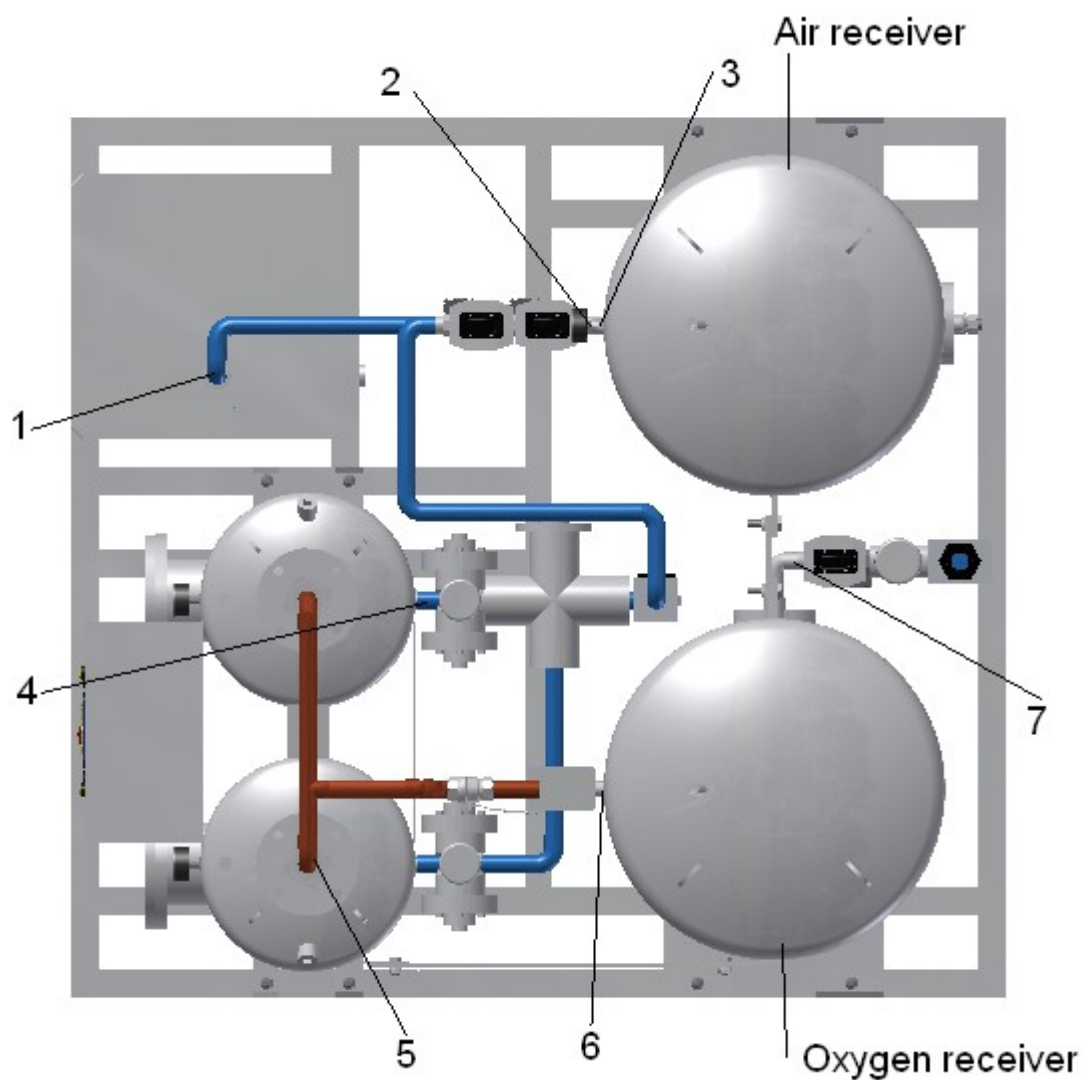
- 1 Desiccant Tower
- 2 Air Receiver
- 3 Oxygen Receiver
- 4 Air Dryer
- 5 Inlet feed air valve (V-1)
- 6 Exhaust valve (V-2)
- 7 Control Panel
- 8 Muffler
- 9 Pressure Regulator
- 10 Bacterial Filter

- 11 Ball valve
- 12 Pressure indicator
- 13 Non Return Valve(V-3)
- 14 Oxygen Sensor
- 15 Pre-Filter
- 16 Fine Filter
- 17 Carbon Filter
- 18 After Filter
- 19 Pressure equalization valve (v-4)
- 20 Pressure relief valve

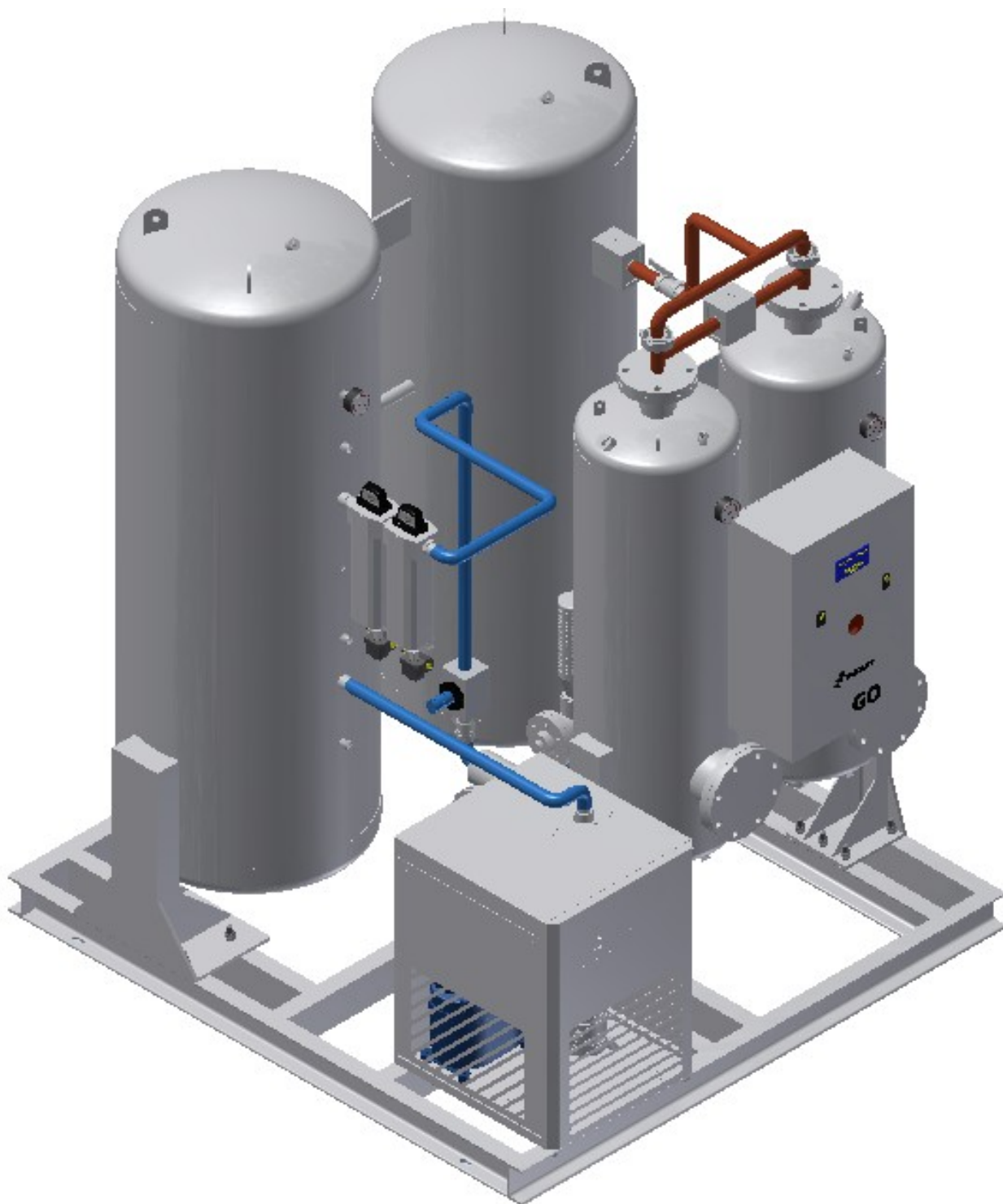
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1. Air outlet from air receiver to towers (Aluminium connection)
2. Air outlet from dryer to Air receiver (Aluminium connection)
3. Oxygen outlet from tower to Oxygen receiver (Copper connection)



- | | |
|--------------------------------------|------------------------------------|
| 1. Air outlet from dryer | 2. Air inlet to receiver |
| 3. Air outlet from receiver | 4. Air inlet to Adsorber tower |
| 5. Oxygen outlet from Adsorber tower | 6. Oxygen inlet to oxygen receiver |
| 7. Oxygen outlet to the user | |



Oxygen plant layout

1. Compressor*

2. Pre Filter - 5 Micron

3. Refrigeration Dryer - CS100

4. Air Tank - 500 litre

5. After Filter - 1 Micron

6. Activated Carbon Filter - 0.01 Micron

7. Pressure Regulator

8. Oxygen generator

9. ES valve

10. Oxygen Tank - 500 litre

11. Oxygen Regulator

12. Fine Filter - 0.01 Micron

13. Bacterial Filter

NOTE:

* It is not included in the scope of supply

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3.2 Parts Description

Oxygen Generator consists of,

- 2 Adsorbent towers filled with Zeolite
- 1 Air dryer
- 1 Air receiver
- 1 Pre filter
- 1 Fine filter
- 1 Carbon filter
- 1 after filter
- 1 Bacterial filter
- 1 Inlet feed air solenoid pilot valves
- 1 electronic control valve
- 2 Mufflers
- Electronic auto drain valves
- 1 Pressure equalization valve
- Pressure regulators
- Pressure gauges
- 2 Non return valves
- Oxygen sensor
- 2 Ball valves
- 2 exhaust solenoid pilot valves
- PLC Control panel
- Pressure relief valve

Adsorbent Towers

Trident oxygen plant has 2 Adsorber towers and which contains the Zeolite Molecular Sieves along with Activated alumina. This mixed desiccant bed adsorbs nitrogen, and concentrates oxygen from the air during drying cycle. Pressure gauges are fitted on this towers to indicate the tower pressure and there is provision for refilling the desiccant.

Air dryer

Moisture in compressed air used in oxygen plant causes problems in the operation of the desiccant beds as well as solenoid valves and can adversely affect the process and product being manufactured. In order to avoid the above said problem and to supply the dry air an air dryer is required in this plant. Trident make Coldspell refrigeration dryer eliminates any water vapour remaining in the compressed air coming at the outlet of the compressor house. The dryers have been designed for nominal standard inlet conditions as per ISO 7183 in order to obtain a dew point under pressure of +3oC to +7oC.

Air receiver

Air receiver is connected in between the Air dryer and Adsorbent towers. This air

receiver acts as a accumulator and the air supplied to this receiver must be dry air.

Pre-Filter

This filter avoids dust, dirt, foreign materials and moisture before entering into the molecular sieves bed and damaging the working. Trident make pre-filter(5micron) is used in this plant.

Fine filter

This filter avoids dust, dirt, foreign materials and moisture before entering into the molecular sieves bed and damaging the working. Trident make fine-filter(1micron) is used in this plant.

Carbon filter

This filter is used to remove oil and hydrocarbon vapour from the compressed air stream before get into the desiccant bed. Trident make carbon filter(0.01micron) is used in this plant.

After filter

This filter avoids the desiccant particles from the adsorbent towers coming with the oxygen after production. Trident make fine-filter(1micron) is used in this plant.

Bacterial filter

Bacterial filters provide effective protection against various types of particles including bacteria, viruses, and moisture droplets in the oxygen out from the plant. This filters help to protect the patient, and the breathing circuit from contamination.

Inlet feed air solenoid pilot valves

This valves allows the inlet feed air between the two adsorbent towers during drying phase. Controls signals for valve operation is taken from the control panel and the pilot air required for this valve is taken from the air receiver.

Electronic control valve

These valves open for a period of when the absorber is pressurized to deliver oxygen to the oxygen receiver for use.

Mufflers

Mufflers are used for reducing the amount of **noise** emitted by the **exhaust** of the waste gases coming out from the adsorbent towers during regeneration phase.

Electronic auto drain valves

Electronic auto drain valve (EDV) automatically removes condensate from the filters.

Pressure equalization valve

After pressurization cycle on one of the absorbers, the purge valve will open for a period and pressure equalization between the adsorber towers will take place.

Pressure regulators

The air pressure regulator controls the inlet air pressure before entering into the adsorber tower in the inlet side and control the delivery oxygen pressure at delivery side.

Pressure gauges

These gauges indicates the air pressure inside the adsorbent towers and receiver.

Non return valves

These valves prevents the back flow of oxygen into the adsorbent towers.

Oxygen sensor

This sensor is used to indicate the product purity in terms of %of oxygen from the oxygen generator.

Ball valves

These valves are used to open and shut off the inlet and product outlet from the receivers based on the requirement.

Exhaust solenoid pilot valves

This valves allows the waste air from the two adsorbent towers during regenerating phase. Controls signals for the valve operation is taken from the control panel and the pilot air required for this valve is taken from the air receiver.

PLC Control panel

The PLC (Programmable Logic Controller) process the inputs and outputs) to and from the system components and communicates with the touch screen.

Pressure relief valve

This valve is in place to ensure that the pressure in the vessels does not exceed safe system working pressure. It will only open in the event of a serious malfunction. It is fitted in all vessels.

3.3 PACKAGING AND HANDLING**Unpacking**

- Check for any obvious damage to the carton or its contents. If damage is evident, notify the carrier, or your local dealer.
- Remove all loose packing from the carton.
- Carefully remove all the components from the carton. The onsite oxygen plant

packaging contains the following parts,. If any parts are missing, please contact your equipment provider.

- ◆ 2 Adsorbent towers filled with Zeolite
- ◆ 1 Air dryer
- ◆ 1 Air receiver
- ◆ 1 Pre filter
- ◆ 1 Fine filter
- ◆ 1 Carbon filter
- ◆ 1 after filter
- ◆ 1 Bacterial filter

Inspection

- Inspect/examine exterior of the oxygen plant and accessories for damage. Inspect all components.

Storage

- Store the repackaged oxygen plant in a dry area.

4. DESCRIPTION OF OPERATION

The oxygen generator works on the PSA principle. The mixed bed desiccant adsorbs moisture and Nitrogen from the compressed air for generating the oxygen. For proper removal of moisture and Nitrogen from the wet air regeneration of the desiccant is required. Regeneration is achieved by means of allowing a part of the the oxygen from the supply outlet.

Cycle of Operations

The oxygen generator works based on the following phases,

- ➔ Drying
- ➔ Pressure Equalization
- ➔ Depressurization
- ➔ Regeneration
- ➔ Re-pressurization

Drying cycle

The compressed wet air flows through the pre filter. The water particles get filtered by the filter. The filtered air flows in to the adsorber tower filled with activated alumina where it loses all the moisture to the alumina. Purified (Moisture and oil free) air further passing through the Molecular Sieves (Zeolite type). The sieves selectively adsorbs nitrogen, allowing oxygen to pass through at the desired purity level.

Pressure Equalization cycle

At the end of drying cycle the second adsorber tower is ready for the next drying cycle so in order to re-pressurize the tower to drying pressure by means of inlet air it take so much time to save that energy the air in the tower 1 is fed in to the second tower and the pressures are equalized.

Depressurization

After drying for the preset cycle time, the desiccant bed will be saturated with moisture and nitrogen. For successful removal of moisture and nitrogen in the next cycle, this moisture and nitrogen is to be removed from the desiccant. This removal of moisture cycle starts with depressurization. In this cycle air inside the tower is vent out by the depressurization valve. The pressure is expanded to atmospheric pressure. The sudden depressurization brings out nitrogen molecules trapped in the sieves pores to the surface of the beads

Regeneration Cycle

In order to remove the moisture and nitrogen during regeneration cycle. Small portion of oxygen from the drying tower is passes over the sieves through the regeneration orifice. This results in complete regeneration of Molecular Sieves and ready for the next cycle.

Re-pressurization cycle

At the end of drying cycle the second adsorber tower is ready for the next drying cycle so re-pressurization of the tower2 to drying pressure is necessary this is achieved by allowing the inlet feed air to the adsorbent tower.

WORKING

- x Wet dirt atmospheric air is compressed in the compressor.
- x The air coming from the compressor is first fed into the inlet Pre-Filter, here the impurities present itself and water particles are removed.
- x After that in order to remove the water vapor present in the air it is allowed to flow through the refrigerant air dryer, where 2 to 7 deg c pressure dew point is achieved.
- x This dry air is stored in the air receiver under pressure.
- x On the first cycle drying phase dry air is allowed to adsorbent tower by means of inlet valve through the fine filter and carbon filter, Where the foreign materials and carbon particles are removed from the air.
- x The compressed dry air flowing through mixed bed tower 1 is selectively adsorbs the nitrogen and delivers the oxygen enriched air to the oxygen receiver.
- x Where the oxygen is stored under pressure.
- x At this time the tower 2 is in regeneration phase.
- x A small portion of the oxygen enriched air is expanded to near atmospheric pressure by passing through the purge orifice. Expansion of this oxygen gas to near-atmospheric pressure increases the ability of the purge air to strip the previously

adsorbed nitrogen from desiccant bed in tower 2. The absorbed gases exhausts through the opened two-way purge valve.

- x From the oxygen receiver the oxygen is taken to the user end through the after filter and bacterial filter.

The automatic cycling of the adsorption and desorption between the two beds enables the continuous production of oxygen.

Trident make oxygen generator's have a failure alarm system.

In the touch screen display the alarms indicates the following,

- If the purity of the oxygen drops under the rated purity level.
- If the pressure of the oxygen outlet drops under the rated pressure.

Warning

Failure to follow these instructions can lead to serious injury or death.

This dryer should be only be used for drying filtered, compressed air.

Ensure inlet air to this air dryer is filtered.

Only experienced and licensed electricians that are properly trained in compressed air and separation systems should service or repair Trident products. Before start-up or performing any maintenance on any Trident gas separation product like oxygen and nitrogen generator air dryer, filter, drain system, or other equipment, you must first turn off and disconnect all electrical power and service to the equipment at the main disconnect switch. Also, be sure to bypass and depressurize the dryer to 0 PSIG. Do not start or operate the dryer if there is a leak. Make sure the dryer's protection rating is applicable to the installation conditions. Do not operate the generator at pressures and/or temperatures above the maximum allowable marked on the data label. Likewise, verify that incoming voltage matches the voltage marked on the data label. Do not lift the generator by its piping or control box or drop the generator. Doing so may damage the equipment.

5. INSTALLATION

Safety

Oxygen Generator are intended for the separation of compressed air from nitrogen to oxygen. Under no circumstance should they be used to dry other gases.

The adsorbents used are non-toxic. However, they may cause respiratory problems if they are inhaled in dust form. The use of a dust mask is sufficient to protect personnel.

Trident make Oxygen generators are pre - Assembled one. In the case of inbuilt air compressor there is no need for any connections. As in case of without air compressor in the unit proper pipe connection should be given, for the pipe sizes refer the models.

Installation Site and Connections

- Install the generator in a closed clean, dry room protected from freezing.
- Access to the room should be restricted to personnel qualified in maintenance and operation.
- The room must be adequately ventilated.
- The generator must not be directly exposed to sources of heat.
- The temperature of the room must not exceed 43°C/109°F.
- Make sure that the generator is not near any equipment which does not comply with the electromagnetic compatibility directives and which may degrade generator operation.
- There must be a minimum distance of 3 feet between the dryer and any other equipment which uses electricity.
- Ensure that the generator is installed in the vertical position.
- Generator should be secured by bolting it down.
- Install a system of by-pass valves between the Generator inlet and outlet so the dryer can be serviced without having to interrupt the compressed air supply from the circuit (see diagram above). The upstream and downstream valves must be closed during installation.
- Connect a drain line to the Pre-filter auto drain outlet.
- Check for leaks after all connections have been made.
- Always pressurize generator before power up.

Electrical Connections

- Provide separate MCB connections for both the air dryer and Oxygen Generator
- Connect the electrical power cable to an 85 - 265 V, single phase, 50 Hz grounded power supply.

6. HOW TO START THIS GENERATOR?

When you complete the installation as described in the previous section, the oxygen generator is ready for easy start-up and operation.

Initial Start Up

- ✓ Make sure the ON/OFF switch on the control panel is set to OFF.
- ✓ Connect the generator with the power circuit and Make sure the power circuit cannot be turned off accidentally.

Note: If the power is turned off unexpectedly, the unit will stop cycling. If your application is using oxygen when the power is off, the oxygen receiver will depressurize.

- ✓ Fully close the ball valve placed before the adsorber tower.
- ✓ Fully close the ball valve placed after the bacterial filter.
- ✓ Turn ON the compressor & air dryer, and allow the air receiver to pressurize.
- ✓ Now adjust the pressure regulator placed before the inlet ball valve to set 5 bar pressure.
- ✓ Now switch ON the power circuit of the generator. In the control panel touch screen display press the cycle ON button.
- ✓ Now gradually open the inlet ball valve and allow the air to enter into the generator.
- ✓ In the control panel display go to the operator screen on that you can see the Oxygen purity and pressure.
- ✓ It takes some time to pressurize the oxygen receiver to 4.5 bar. After reaching the oxygen pressure more the 4.5 bar in the display open the outlet ball valve and the rated flow of the generator's model.

Note: Don't Overdraw the oxygen more than as specified in the generator's model. Because its lead to

1. Drop in oxygen purity
2. Drop in oxygen pressure

Shutting Down the generator

- If there is an emergency press Emergency switch off button on the control panel.
- For Regular shut down during maintenance and below rated usage of the generator follow the procedure below:

- Open the secondary oxygen supply.
- Close the outlet ball valve.
- In the control panel touch screen display press the cycle OFF button.
- Switch of the compressor and as well as the air dryer.
- Now switch Off the power circuit of the generator.
- Now open the drain valve placed bottom of both the air and oxygen receiver and depressurize them.

Note: Please ensure that the adsorber towers, air and oxygen receiver are depressurized to zero pressure (Atmospheric pressure)

7.MAINTENANCE

This oxygen plant is specifically designed to minimize routine preventive maintenance. Only professionals of the healthcare field or persons fully conversant with this process such as factory trained personnel should perform preventive maintenance or performance adjustments on the oxygen generator.

Note: PSA oxygen generator are robust, reliable machines. To ensure uninterrupted, problem-free operation, regularly perform the inspections below.

A Detailed check list is added in this manual you can also refer it for the maintenance.

Monthly Inspections

During the monthly routine inspection, check that:

- The drying and regeneration cycles function normally,
- The silencers are not clogged.

Semi Annual Inspections

During the semi-annual routine inspection, check that:

- That the drying and regeneration cycles function normally
- The silencers are not clogged
- Replace filter elements

Annual Inspections

During the annual routine inspection, check that:

- The drying and regeneration cycles function normally
- The silencers are not clogged
- Replace filter elements.
- The state all valve seals.




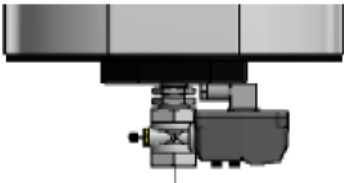
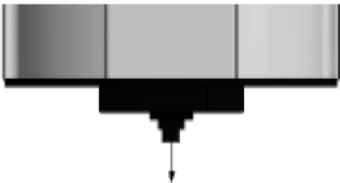
Note: During the entire operation, the compressor and the generator must be shut down. It is recommended for all personnel who are in the presence of the desiccant to wear dust masks.

Changing the Desiccant

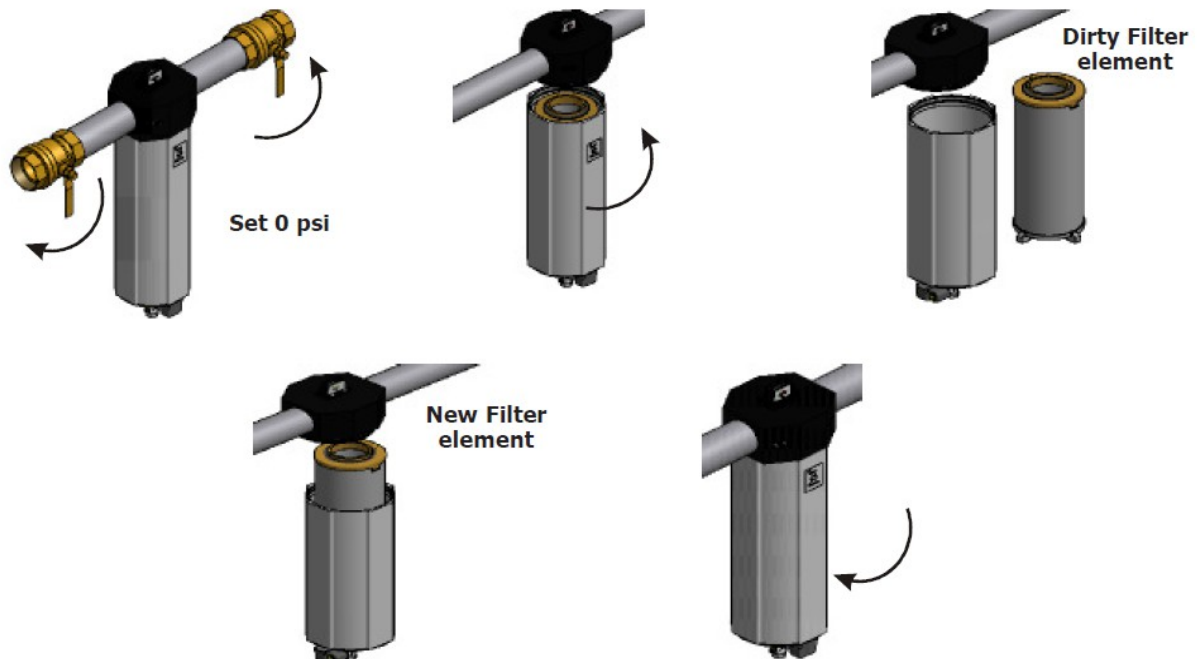
- ◆ Bypass the oxygen supply into the secondary line.
- ◆ Disconnect the power supply to the generator.
- ◆ Make sure the inlet air supply to the generator is closed.
- ◆ Depressurize the pressure in both towers
- ◆ Loosen the dummy present in the tower bottom desiccant port
- ◆ Remove the old desiccant and replace new desiccant one.

Replacing the filter element

1. Before replacing the element we need to check whether the replacement is required.

<p>Clean Stage Indication</p> <p>Green</p> 	<p>Change Stage Indication</p> <p>Yellow</p> 	<p>Dirty Stage Indication</p> <p>Red</p> 
<p>Automatic Float Drain Valve or Electronic Drain Valve Function Check</p> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p>Only Water Out</p> </div> <div style="text-align: center;">  <p>Only Water Out</p> </div> </div> <p>Sensible Leak Check</p> <p>Conduct the sensible leak check around the filters.</p>		

2. During the change Signal we need to prepare for the filter element change. The filter element must be changed at change stage indication.



3. If you are replacing a coalescing filter element, remove and discard the gasket where the top of the filter element connects to the filter housing.

4. If you are replacing a coalescing filter element, make sure a black gasket is attached to the top of the new element.

4. Check for leaks after all connections have been made. Do not start or operate the filter with leak.

5. If the Electronic Adjustable drain valve connection have been installed, must to ensure the input voltage supply.

8.TROUBLESHOOTING

The following problems may exist while using the oxygen plant. This section will give details about the problems and their remedy. Troubleshooting tree will help you to solve the problems

General troubleshooting

Before reviewing the troubleshooting chart, the following steps may be useful to isolate any malfunctions:

- x Turn the generator on. If unit does not turn on, refer to troubleshooting chart.
- x Make sure all filters are clean.
- x Make sure the unit is cycling properly. If the unit is not cycling properly, refer to troubleshooting chart.
- x If generator is not meeting specifications, make sure that the unit is leak free by testing all tubing connections and fittings with leak testing solution. Repair all leaks by tightening connections and fittings.
- x Review troubleshooting chart to isolate and repair any other malfunctions.

LEDS not Glowing

Check the power supply connection and tension

Tower Status LED not changing

- ✓ Change the controller

LEDS Status Change but Tower not Switching

- ✓ Check coil connection at DIN and terminal connector in the controller
- ✓ Check the solenoid valve

No Purging

- ✓ Check the solenoid valve
- ✓ Check the exhaust valve
- ✓ Clean the silencer (muffler)Continuous Purging at Tower 1A – Shuttle not closing
- ✓ Check pilot air for exhaust valve
- ✓ Check exhaust valve piston stuck

High Purge Loss

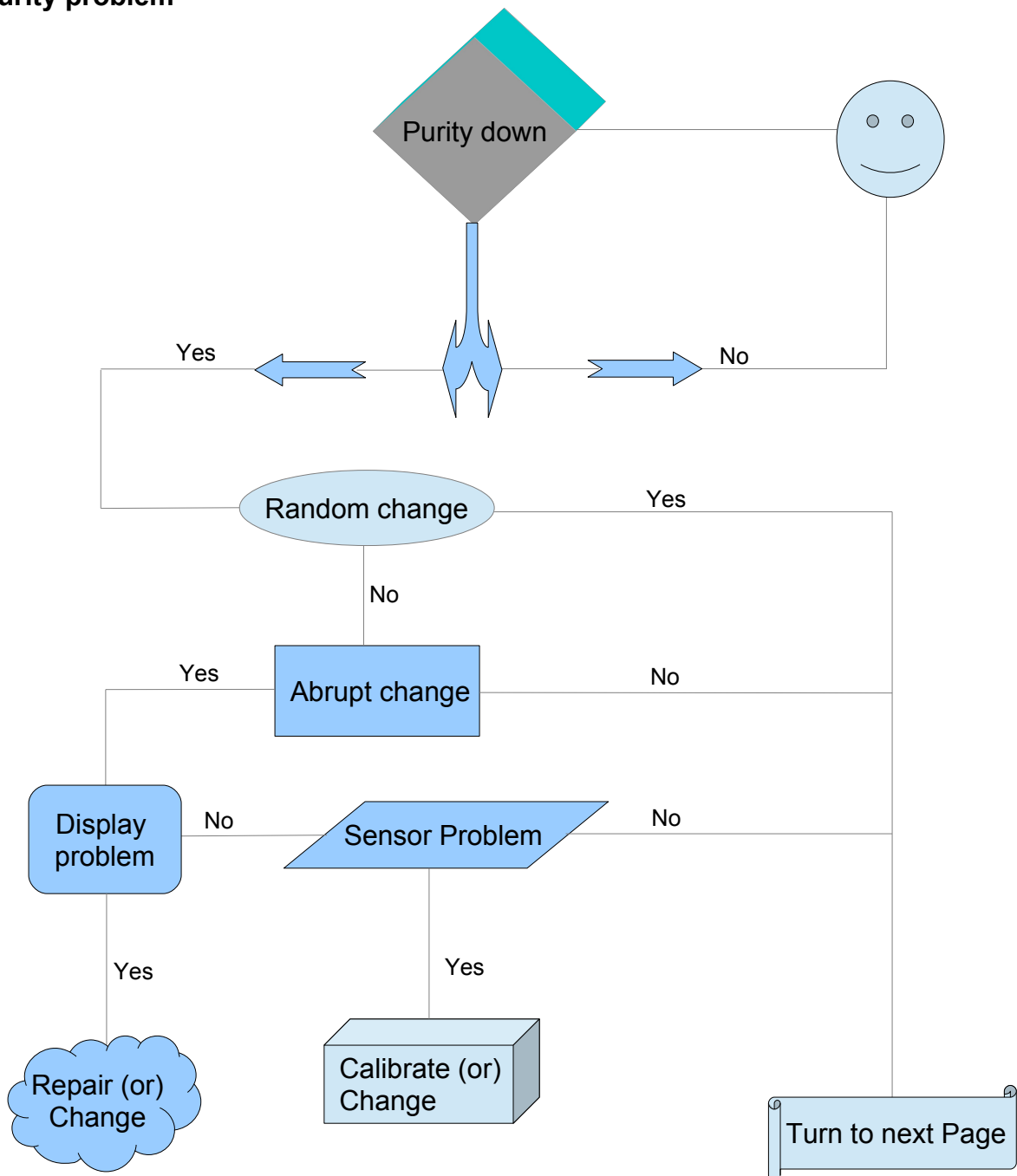
- ✓ Check outlet shuttle closing
- ✓ Check for silencer choke

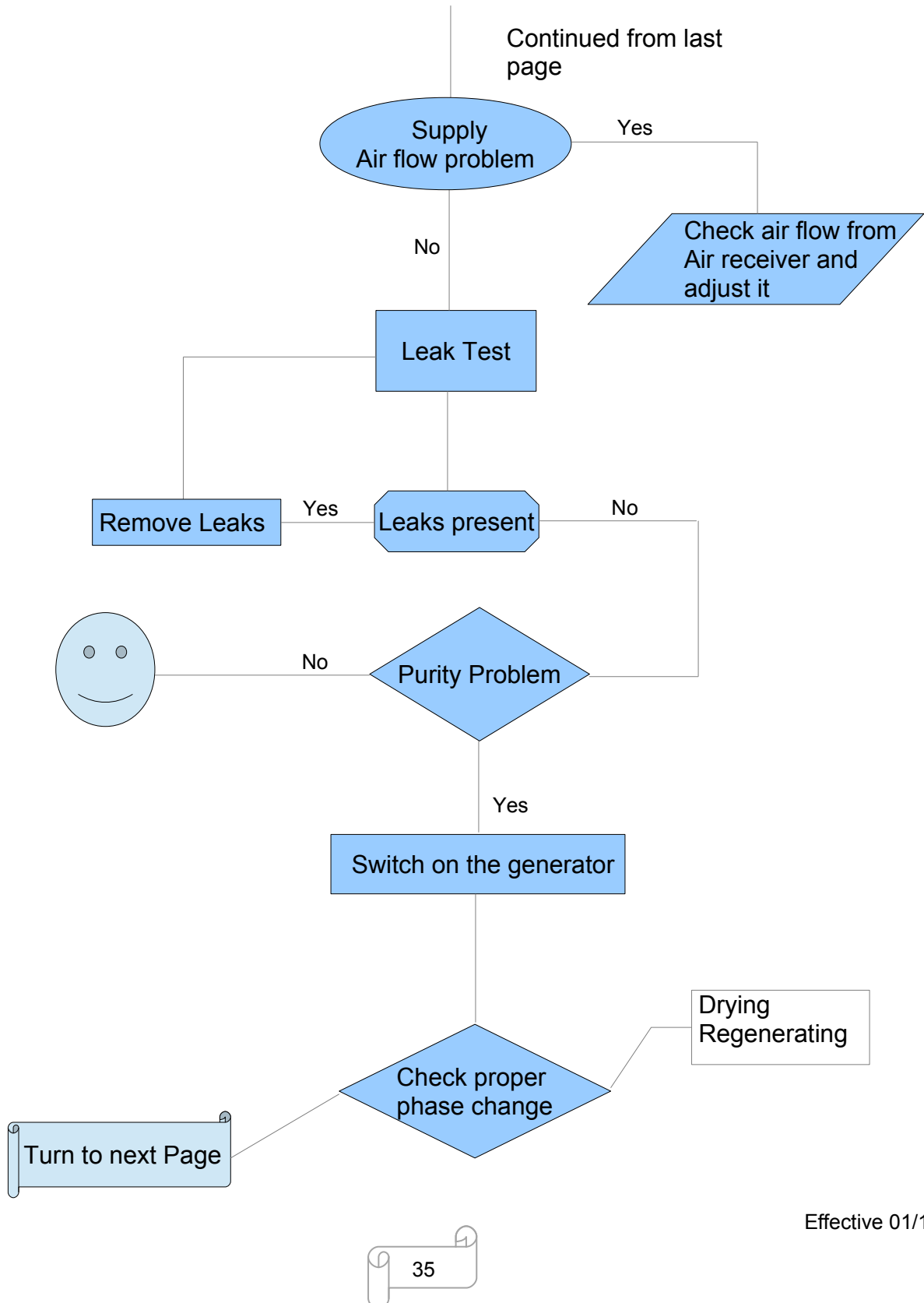
High Pressure Drop across Generator

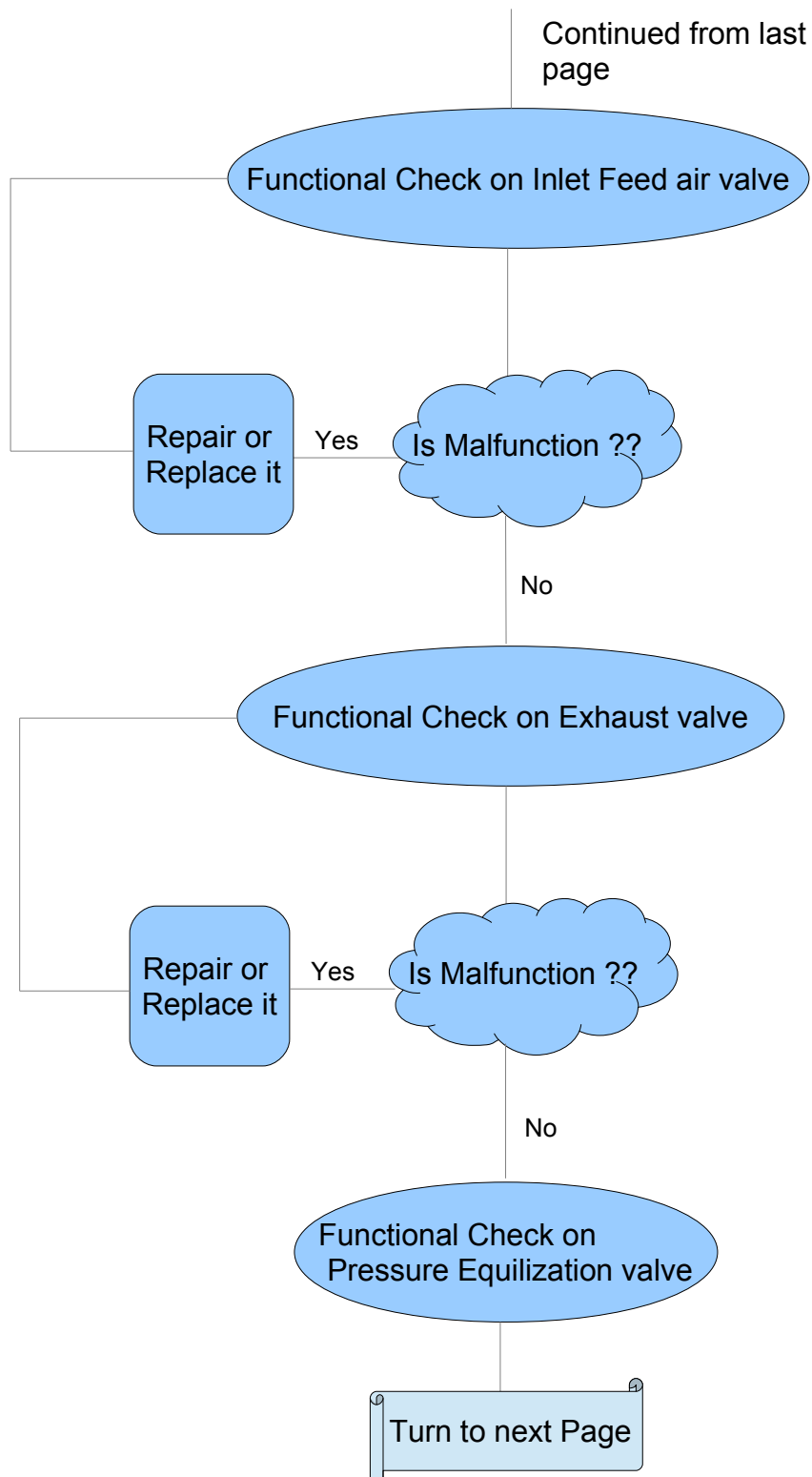
- ✓ Pre-filter may be clogged. Check and replace filter elements.
- ✓ Check whether the generator is being overflowed.

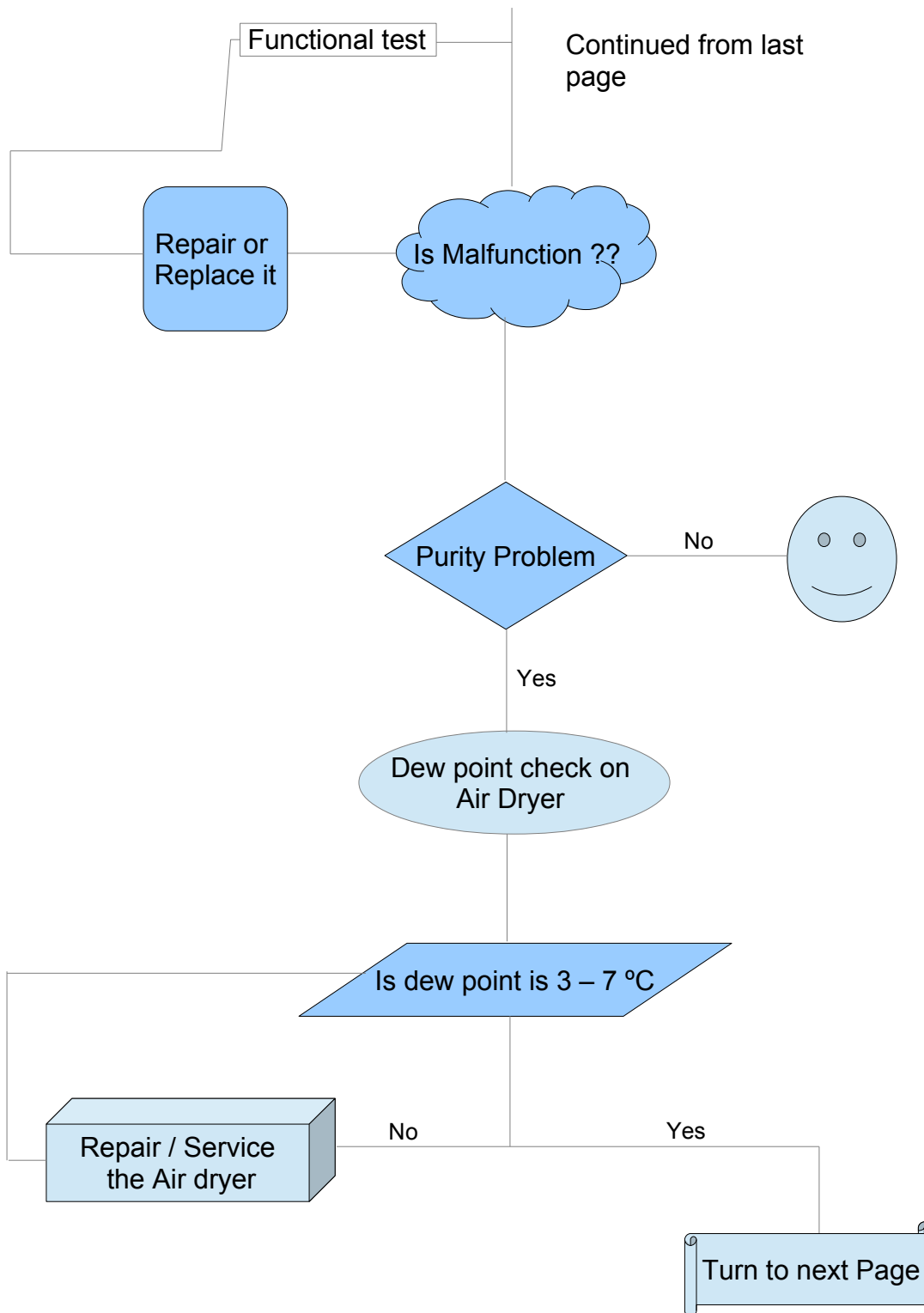
8.1 TROUBLESHOOTING TREE

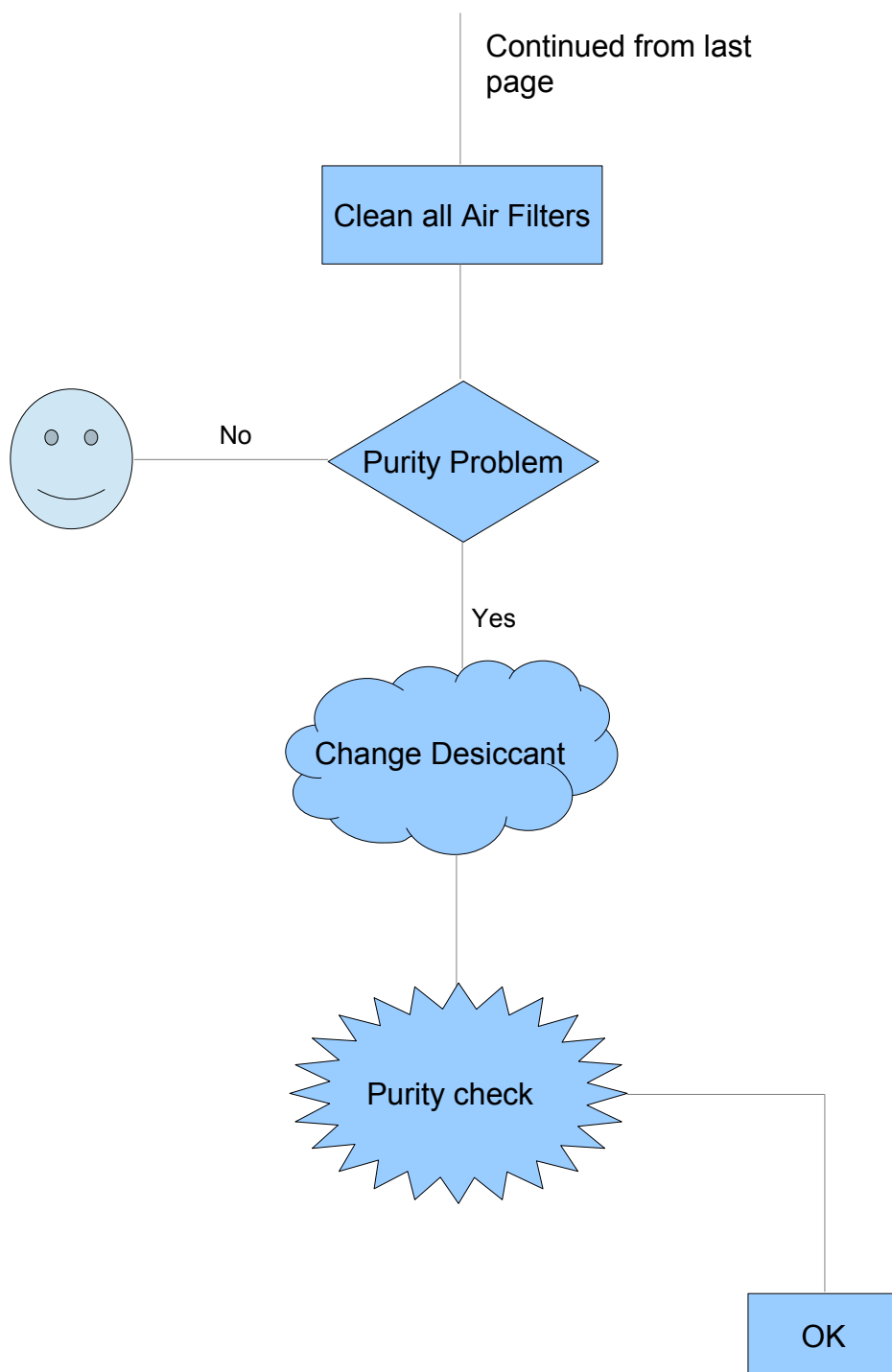
1. Purity problem











2.Low Operating Pressure

Lower than normal operating pressure may indicate any of the following,

- A restriction in the suction air intake filter, which limits the amount of air pass through it to the generator. Clean the air filters free from foreign materials.
- An improperly operating circuit board or solenoid valve. Confirm that the circuit board and solenoid valves function properly.
- A leak in the unit, which allows system pressure to escape. Perform Leak test in the unit.
- A compressor with reduced output. Ensure that the oxygen concentration level at the desired liter flow is within Trident's specifications. If it is below specifications, replace or repair the compressor.

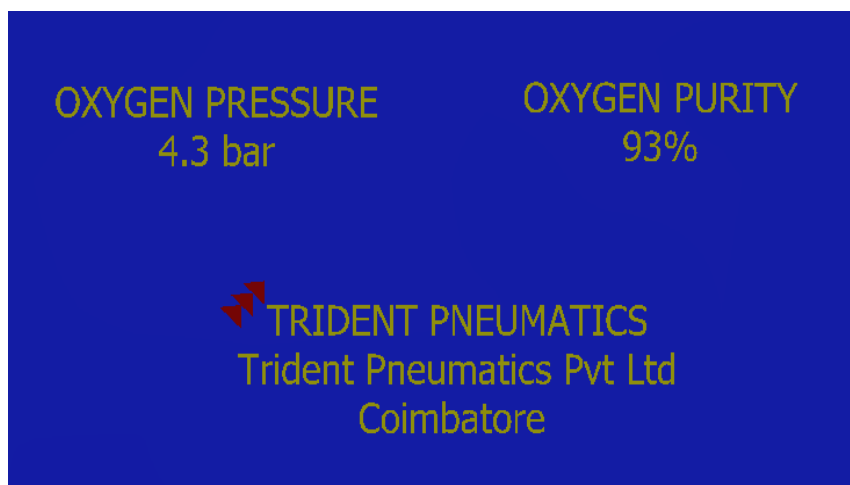
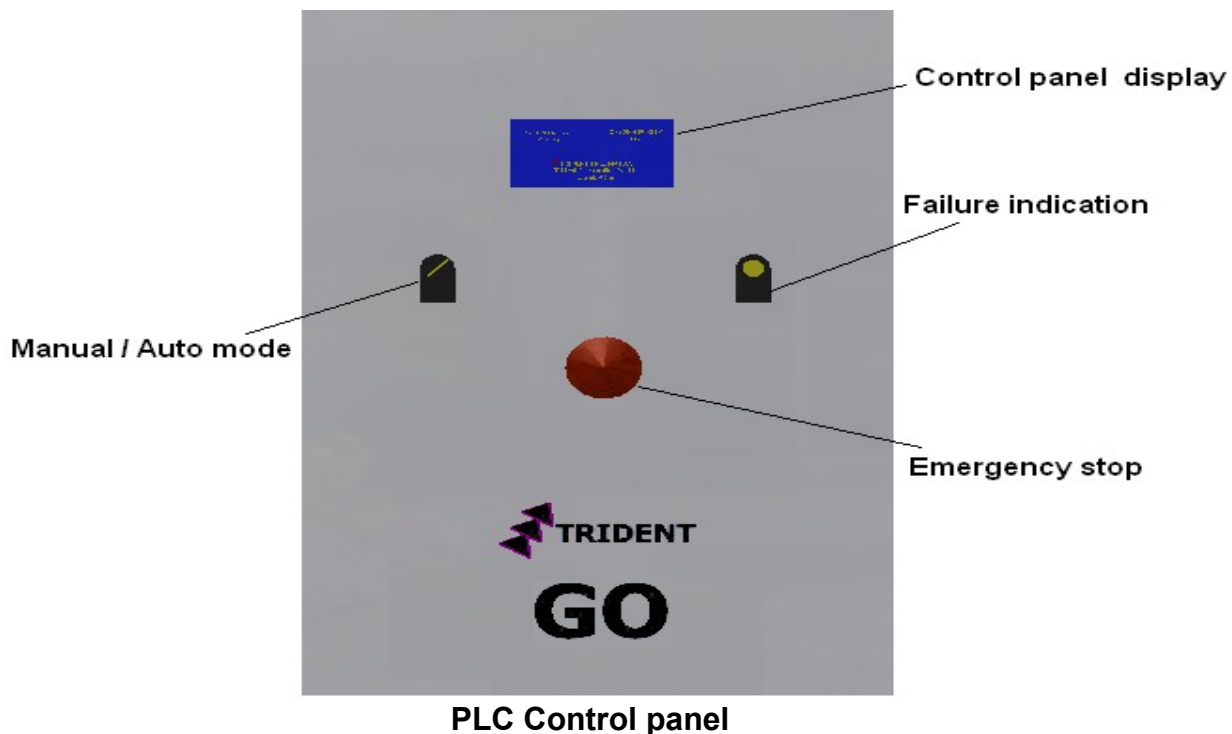
3. High Operating Pressure

Higher than normal operating pressure may indicate any of the following.

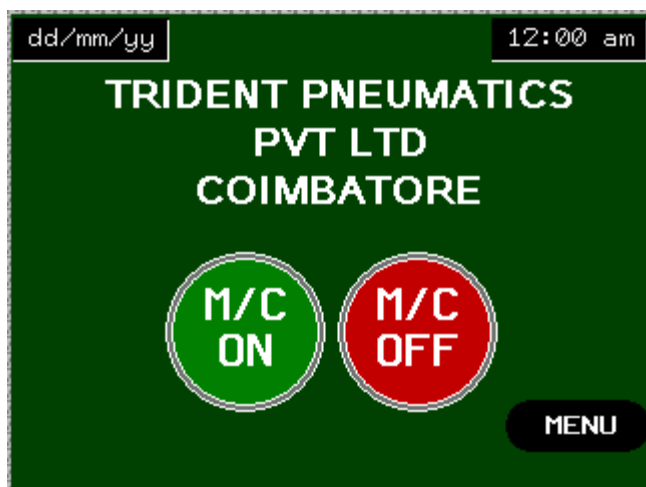
- A restrictive muffler, which does not allow the waste (purge) gas to exit the system freely. Operate the unit with the muffler disconnected to see if the operating pressure returns to normal.
- An improperly operating circuit board or solenoid valve. Confirm that the circuit board and solenoid valves function properly.
- A restrictive diffuser, which does not allow the inlet feed air as well as exhaust air from the generator. Check the diffuser and correct it.
- Contaminated sieve beds. Change the sieve beds.

9. PLC CONTROL PANEL USAGE

The following steps will explain about, how to use the control panel touchscreen display.



HOME SCREEN



BUTTONS:

- | | | |
|---------|---|----------------------------|
| M/C ON | - | USED TO START THE PROCESS. |
| M/C OFF | - | USED TO STOP THE PROCESS. |
| MENU | - | NAVIGATION TO MENU PAGE. |

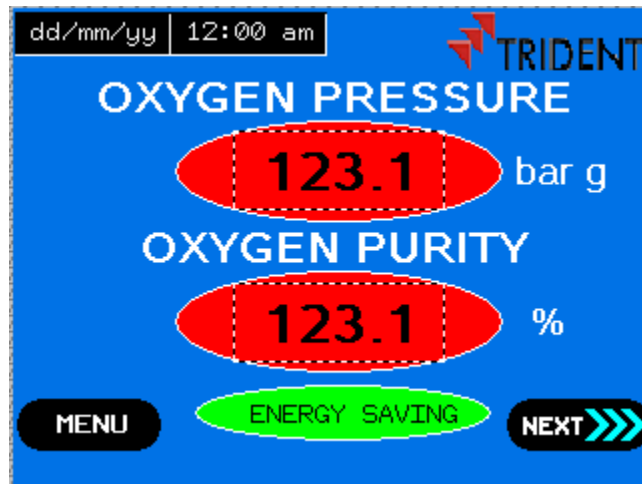
MENU PAGE



BUTTONS:

- | | | |
|-----------------|---|--|
| SETTINGS | - | NAVIGATION TO SETTINGS PAGE PASSWORD SCREEN. |
| OPERATOR SCREEN | - | NAVIGATION TO OPERATOR SCREEN PAGE. |
| ALARM | - | NAVIGATION TO ALARM PAGE. |

OPERATOR SCREEN



BUTTONS:

- MENU - NAVIGATION TO MENU PAGE.
- NEXT - NAVIGATION TO RUN HOURS VIEW PAGE.

Oxygen pressure in bar g and Oxygen purity in % will be displayed. Energy saving will blink when the machine is in energy saving mode.

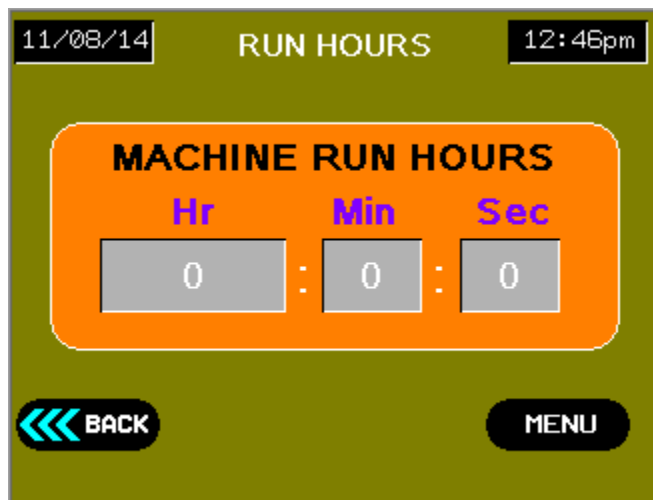
ALARM



BUTTONS:

- MENU - NAVIGATION TO MENU PAGE.
- This page provides the list of alarms occurred in the machine.

RUN HOURS



BUTTONS:

- MENU - NAVIGATION TO MENU PAGE.
- BACK - NAVIGATION TO OPERATOR SCREEN PAGE.
Displays the machine's total running hours.

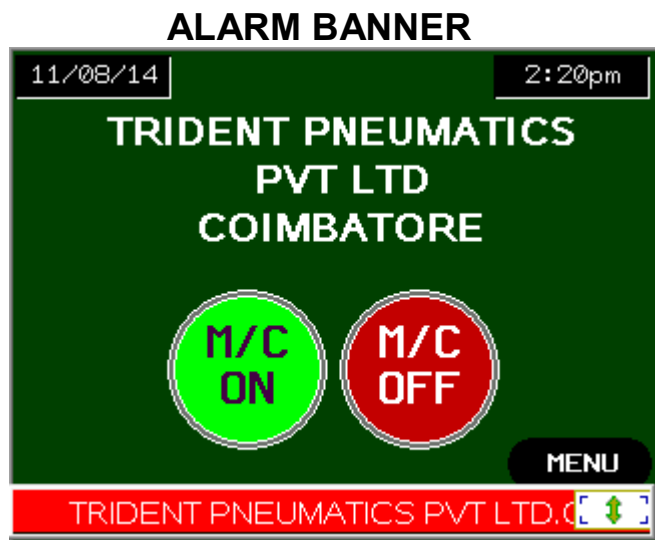
EMERGENCY ALARM



BUTTONS:

- ESC – NAVIGATION TO HOME PAGE.

This page will be displayed when emergency button in the panel is pressed. When emergency stop button is pressed then the process will be stopped. To start the process check the condition of machine and release the emergency button and move to home page and press the M/C ON button.



When any alarm present on the machine that will be displayed on the alarm banner. Alarm banner is at bottom line on every page.

NOTES

- x Emergency stop button is used to stop the process during risky conditions.
- x Control on selector is used to power up the controller.
- x Alarm indication will be on when oxygen purity & oxygen pressure are less than the setpoint.
- x Alarms configured on the machine are emergency stop, filter element replacement, bacterial filter autoclave, oxygen purity low, oxygen pressure low.

CHECK LIST

Activities	Frequency						
	Hourly	Daily	Weekly	Monthly	Half Yearly	Yearly	Whenever required
Check Compressor Pressure	✓						
Check Compressor oil level		✓					
Service compressor according to supplier instructions						✓	
Check Oxygen Pressure	✓						
Check rated oxygen flow	✓						
Check Oxygen Purity	✓						
Check Dew point at dryer outlet	✓						
Service Air dryer according to supplier instructions						✓	
Check Air Dryer condensate drain	✓						
Check Tower pressure	✓					✓	
Check drain on all Filter		✓					
Replace all filter element					✓		
Check pressure in Air tank	✓						
Check pressure in Oxygen tank	✓						
Check Pressure safety valve					✓		
Calibrate all Pressure gauge					✓		
Calibrate Oxygen sensor						✓	
Check solenoid valves for corrosion			✓				
Check pipes / hoses				✓			✓
Replace desiccant							✓

GO SPARES LIST

GO DETAILED SPARES CHANGING FREQUENCY													
Spares	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10	Whenever required	Requirement	
Air Dryer	Gas Topup	✓										Keep 2Kg as spare	
	Compressor										✓		
	Expansion valve										✓	Keep 1 as spare	
	Controller										✓	Keep 1 as spare	
	HP/LP switch										✓	Keep 1 as spare	
Filters	Pre-Filter (P)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	Fine Filter (X)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	Carbon Filter (A)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	After Filter (Y)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	Bacterial Filter				✓					✓	✓		
Oxygen Generator	Inlet valve seal kit		✓			✓			✓		✓	Keep 1 as spare	
	Exhaust valve seal kit		✓			✓			✓		✓	Keep 1 as spare	
	Shuttle valve seal kit		✓			✓			✓		✓	Keep 1 as spare	
	Solenoid valve (3/2 way)										✓	Keep 1 as spare	
	Desiccant												
	Pressure gauge										✓	Keep 1 as spare	
	Oxygen sensor		✓			✓			✓				
	Pressure Transmitter				✓					✓	✓		
	Pressure Regulator										✓		

GO DETAILED SPARES LIST PRICE													
GO Model / spares	GO 50	GO 85	GO 140	GO 180	GO 230	GO 260	GO 390	GO 470	GO 570	GO 710	GO 960		
Item code/ Price	Item code	Price	Item code	Price	Item code	Price	Item code	Price	Item code	Price	Item code	Price	Item code
Gas Tooup	* * *	* * *	* * *	* * *	* * *	* * *	* * *	* * *	* * *	* * *	* * *	* * *	* * *
Compressor	CH457 12986	CH458 12402	CH087 21175	CH072 23562	CH204 19250	CH204 19250	CH205 34650	CH205 34650	CH205 34650	CH205 34650	CH226 39160		
Expansion valve	CH238 7535	CH238 7535	CH238 7535	CH238 7535	CH238 7535	CH238 7535	CH374 5170	CH374 5170	CH374 5170	CH374 5170	CH374 5170		
Controller	CE575 3383	CE575 3383	CE575 3383	CE575 3383	CE575 3383	CE575 3383	CE575 3383	CE575 3383	CE575 3383	CE575 3383	CE575 3383		
HP/LP switch	CH163 1375	CH163 1375	CH163 1375	CH163 1375	CH265 1375	CH265 1375	CH265 1375	CH265 1375	CH265 1375	CH265 1375	CH265 1375		
Pre-Filter	AS703 1860	AS703 1860	AS695 3360	AS695 3360	AS699 4520	AS699 4520	AS715 5520	AS715 5520	AS715 5520	AS715 5520	AS719 6840		
Fine Filter	AS702 1860	AS702 1860	AS694 3360	AS694 3360	AS698 4520	AS698 4520	AS716 5520	AS716 5520	AS716 5520	AS716 5520	AS720 6840		
Carbon Filter													
After Filter	AS701 1860	AS701 1860	AS693 3360	AS693 3360	AS697 4520	AS697 4520	AS717 5520	AS717 5520	AS717 5520	AS717 5520	AS721 6840		
Bacterial Filter													
Inlet valve seal kit	2000	2000	3000	3000	3500	3500	4500	4500	5000	5500	6000		
Exhaust valve seal kit	2500	2500	4000	4000	4500	4500	5000	5000	5500	6000	6500		
Shuttle valve seal kit													
Solenoid valve (3/2 way)													
Desiccant													
Pressure gauge													
Oxygen sensor Pressure Transmitter													
Oxygen Regulator													
Pressure equalization valve													
Energy saving valve													

* Price varies

WARRANTY

Products of Trident Pneumatics Pvt Ltd are guaranteed to be free from defects in material and workmanship when installed and operated in accordance with the instructions outlined in the instruction manual.

Trident Pneumatics pvt. Ltd.'s obligation under this warranty shall be limited to repair or replacement (at the discretion of Trident) of defective goods returned to Trident Plant within one (1) year from the date of commissioning or 18 months from the date of invoicing which ever is occurring earlier.

Product :

Model :

Serial No. :

Quality Assurance Dept

Trident Pneumatics Pvt Ltd

5/232, K.N.G Pudur Road, Somayampalayam,
Coimbatore 641 108. Ph: 0422 2400492, 2401373
Fax: 0422 2401376 e-mail: sales@tridentpneumatics.com
Website: www.tridentpneumatics.com

INSTALLATION & COMMISSIONING REPORT

PSA Type Oxygen Generator

Customer :	Model :
	Sl. No. :
Contact person :	Phone :
Designation :	Fax :

(Please add any comments or remarks here found while unpacking)

1. INSTALLATION

a) Installation at :	Before / After Air Dryer	LED Glowing	Yes / No
b) Inlet air Temperature :	Normal / High	Tower 1 and 2 Drying	Yes / No
c) Side clearance provided :	Yes / No	Depressurizing	Yes / No
d) Power Grounded :	Yes / No	Regeneration	Yes / No
e) Oxygen Flow Outlet :	Normal / Faulty	Oxygen Purity: Oxygen Pressure:	
f) Change over sequence :	Normal / Faulty		

2. COMMISSIONING

Installation	Date of Completion
Commissioning	Date of Completion

Comments:

Customer	Installation Engineer
----------	-----------------------

Signature & Name of Installing Engineer	Dealers Signature & Seal	Customer's Signature & Seal
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