

PRESSURE SWING ABSORPTION PLANTS (PSA)

Oxygen is a colorless gas at atmospheric pressure, odorless, non-flammable and tasteless. It has a liquefaction temperature of -18°C.

Oxygen is administered to patients based on flow control, depending on the type of patient and device, from 0.2 L/min to 60 L/min can be administered. The concentration of this gas for patient administration should not be less than 82%.

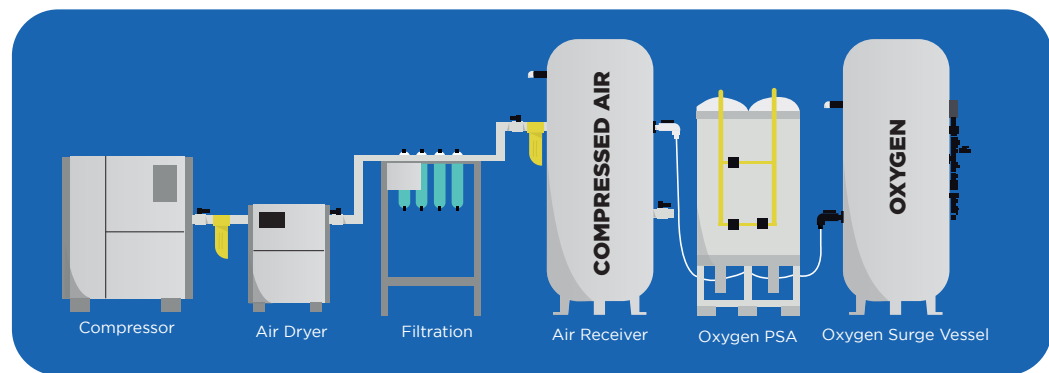
The process of obtaining oxygen through a PSA plant uses equipment that compresses atmospheric air, filters out any impurities it may have, and proceeds to a zeolite molecular sieving process, which adsorbs the nitrogen present in the air, leaving oxygen that is distributed directly, or compressed and stored in tanks at high pressure.

The oxygen produced in this process has a purity between 93% and 95% if the equipment is operating correctly in all its parameters.

ADVANTAGES	DISADVANTAGES
<ul style="list-style-type: none"> • Molecular sieves are fully regenerative, so they have an indefinite service life • Easily scalable • Relatively low operating cost • Permanent availability of oxygen 	<ul style="list-style-type: none"> • Purity level and product flow rate can be variable • Installation depends on location, climatic conditions and ambient air quality • Presence of impurities such as argon • Proper equipment maintenance management is required.

Minimum components of a PSA Plant:

- Air compressor
 - Air aftercooler
 - Air pre-filter
 - Air dryer
 - Compressed air reservoir
 - PSA
 - Oxygen reservoir
 - Oxygen filter
 - Filling compressor*
 - Storage tank/ Cylinder bank*
- *In the case of cylinder filling requirement



Factors affecting oxygen production:

- Air purity and humidity
- Environmental contamination
- Altitude where the plant is installed
- Contamination of the adsorbent substance with water vapor or oil particles
- Air inlet and outlet obstruction
- Lack of maintenance
- Calibration of plant component parameters
- Damage or malfunction of plant components.

References:

Pan American Health Organization. (2022) Recommendations for adopting and acquiring pressure swing adsorption oxygen generating plants. Washington, D.C. Available at: https://iris.paho.org/bitstream/handle/10665.2/55913/OPSPHEIMSCOV19220006_spa.pdf?sequence=5&isAllowed=y

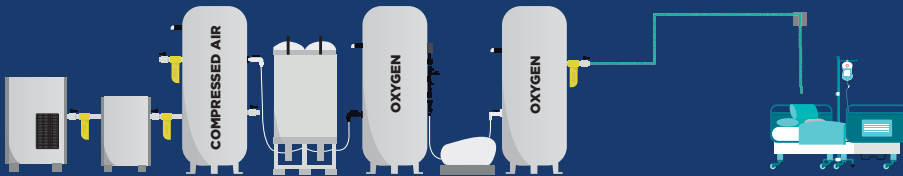
Pan American Health Organization. (2021) COVID-19 Basic manual for oxygen supply installations in EMTs and SAAMs. Available at: <https://www.paho.org/es/documentos/covid-19-manual-basico-instalaciones-suministro-oxigeno-emts-saams>

What is the average PSA Plant oxygen production?

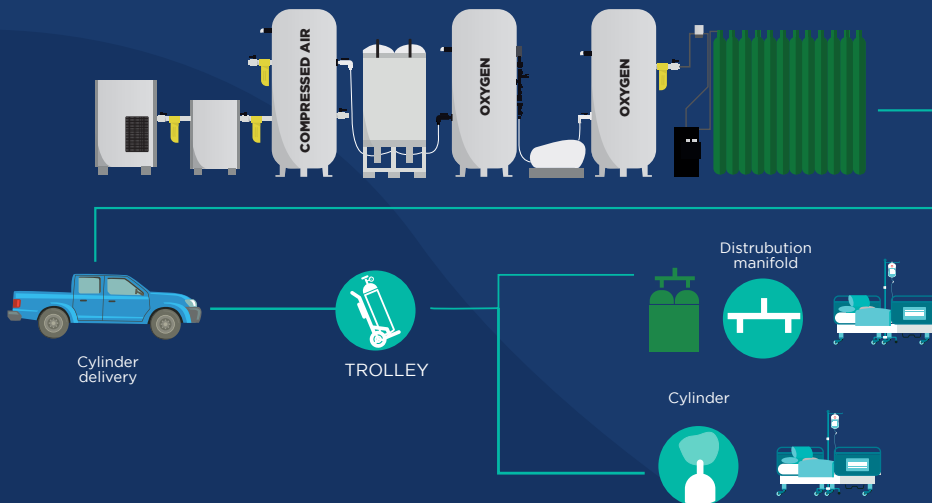
For medical oxygen PSA plants commonly go from 1 to 100 Nm³/h

PSA CONFIGURATIONS

PSA plant into pipe directly



PSA plant filling high-pressure gas cylinders



There are **2 common configurations possible** when using a PSA Plant: It is possible to connect a PSA plant directly to the piping system of the facility or use additional equipment as high-pressure compressors to fill cylinders that can be used on individual patients or connected to a multi-cylinder manifold to the piping system.

Greening of PSA – solar panels

It is possible to consider solar power plants as a power supply for a PSA plant, it's important to consider that regulations for oxygen systems indicate two important things:

The configuration of the power supply of every oxygen system must consider the primary and secondary sources and could have a combination of elements, such as a diesel generator that could be used as a backup source of power considering that oxygen supply has to be continuous 24/7.

Every health facility needs a backup oxygen source in case of main system failure, the most common combination is Cryogenic Tank + Cylinder Manifold and PSA + Cylinder Manifold.



References:

Pan American Health Organization. (2022) Recommendations for adopting and acquiring pressure swing adsorption oxygen generating plants. Washington, D.C. Available at: https://iris.paho.org/bitstream/handle/10665.2/55913/OPSPHEIMSCOV19220006_spa.pdf?sequence=5&isAllowed=y

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Reference: World Health Organization. (2023) . Foundations of medical oxygen systems, 17 February 2023. World Health Organization. <https://apps.who.int/iris/handle/10665/366149>. License: CC BY-NC-SA 3.0 IGO