



sysadvance[®]

NITROGEN | OXYGEN GENERATORS



CUSTOM ENGINEERING





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THE COMPANY

SYSADVANCE, SA started its activities in 2002, as a spin-off company from a university R&D laboratory with over 40 years experience in gas separation technology.

Today we develop and manufacture on-site gas generation and gas purifiers, as well as integrated solutions for compressed air and technical gases.

SYSADVANCE product portfolio is comprised of Nitrogen Generators, Oxygen Generators, including Medical Oxygen 93 and VSA Oxygen Generators, solutions for purification of biogas, Helium, Hydrogen and SF₆, as well as a wide range of "turn-key" customized engineered solutions.

The success of the projects SYSADVANCE is involved with is the reflection of the quality and dedication of our highly specialized human resources.

Today SYSADVANCE offers solutions for several industries and sectors such as: chemical and pharmaceutical, electronic components, aluminum casting, engineering, laser cutting, automotive, food, wine, aviation, marine, energy, medical, oil and gas, among others.

SYSADVANCE is present today in more than 40 countries, rendering a solid growth as result of a strategy oriented for creating value to our clients, based on superior technology, quality and reliability of our products, as well as continuous innovation.



MESSAGE FROM THE CEO



Since its foundation, SYSADVANCE has been sustaining a solid and continuous growth, based on its original values: Technology, Innovation and Quality.

I believe that our success is due to the attention rendered to our client's needs, adapting our offer to these needs and always exceeding their expectations.

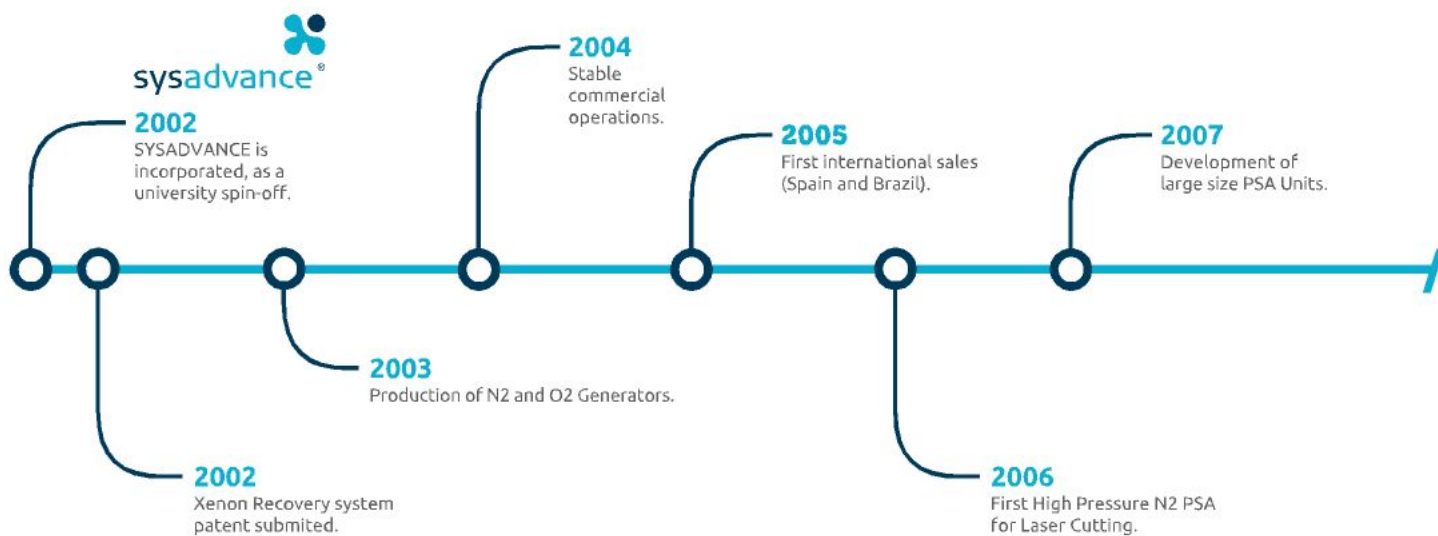
Our success is also due to the quality of our human resources, to their competency, dedication, focus and dynamism, in a unremitting search for improvement of SYSADVANCE products and services.

Our constant efforts and investment on R&D have allowed us to expand rapidly into new business areas, where our applied technological solutions represent indisputable "value-for-money" to our clients.

Our rigorous institutional posture and commitment to reliability and quality is reflected on more than 2800 units and systems installed, in a vast portfolio of select clients, and sustained our average growth rates of 30%.

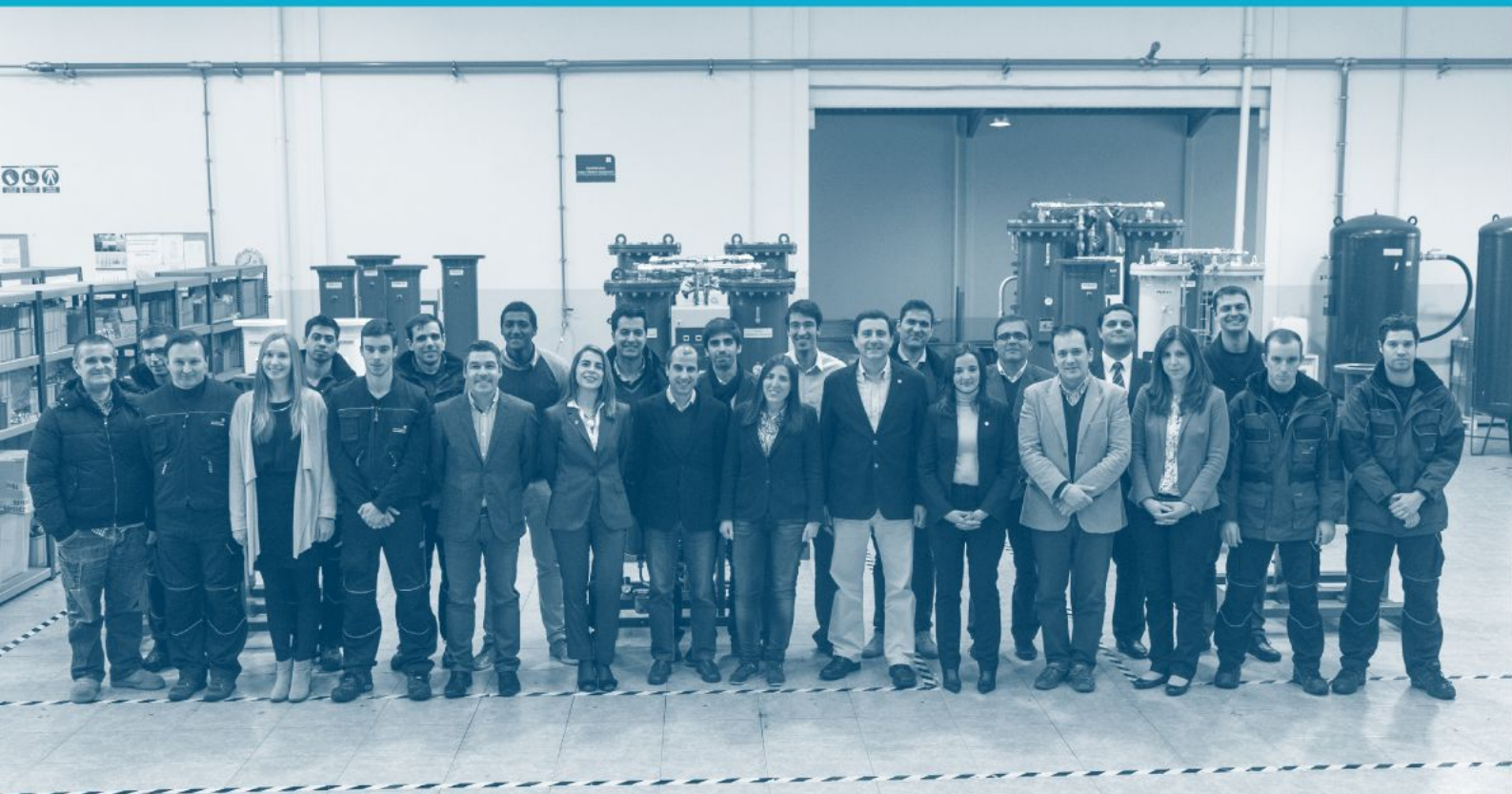
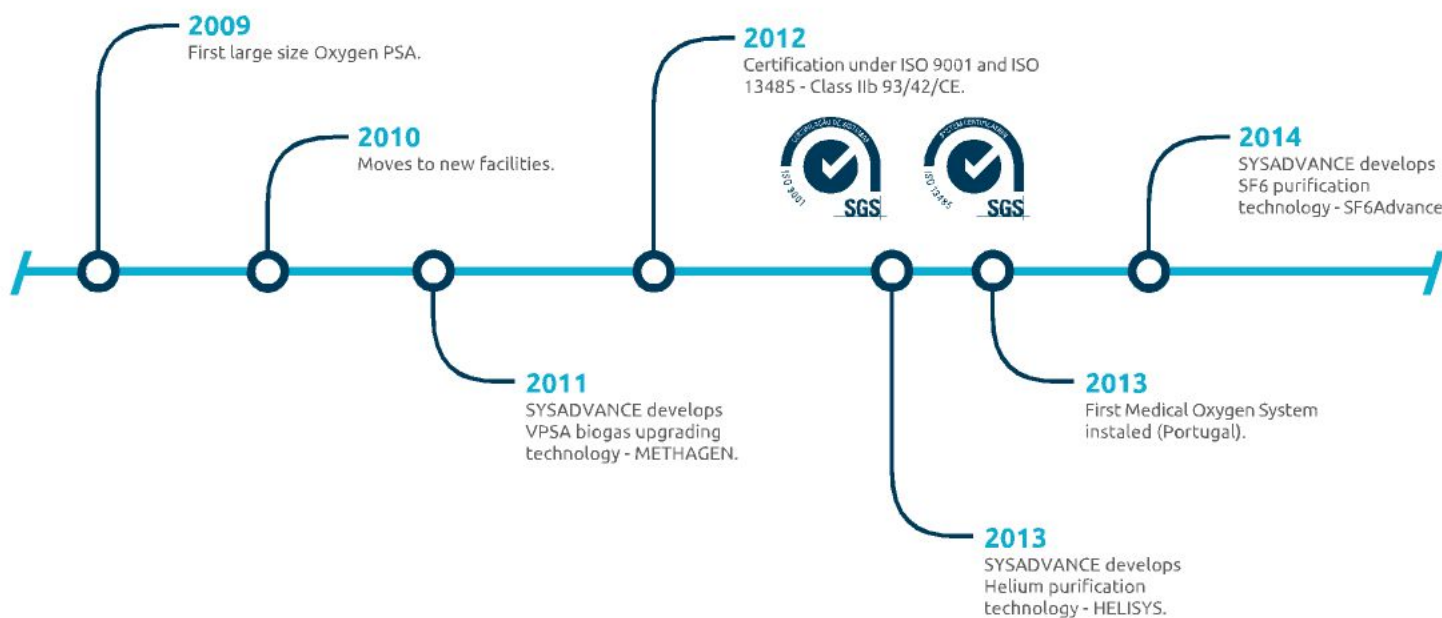
In glimpse of our future, we aim to maintain our technological leadership in the various sectors we operate, as well as to continue to be recognized by our core values - trust, rigor, and business ethics - values always recognized as being the paramount reason for our growth.

JOSÉ VALE MACHADO
Chief Executive Officer



SYSADVANCE EXPORTING TECHNOLOGY





PSA TECHNOLOGY

PRESSURE SWING ADSORPTION

Pressure Swing Adsorption can be used to produce N₂ or O₂ from compressed air, which is fed to the unit that uses adsorption phenomena to remove the contaminants: N₂ when the desired pure gas is O₂, or O₂ when the desired pure gas is N₂. Also, in both cases, H₂O and CO₂ are removed as well as other minor contaminants.

The PSA unit contains two columns packed with a selective adsorbent that has affinity towards the component to be removed: A carbon molecular sieve is used to produce N₂ and zeolites are used to produce O₂.

Each column undergoes a cyclic sequence of high and low pressure steps that guarantees the production of a continuous flow of high purity gas.

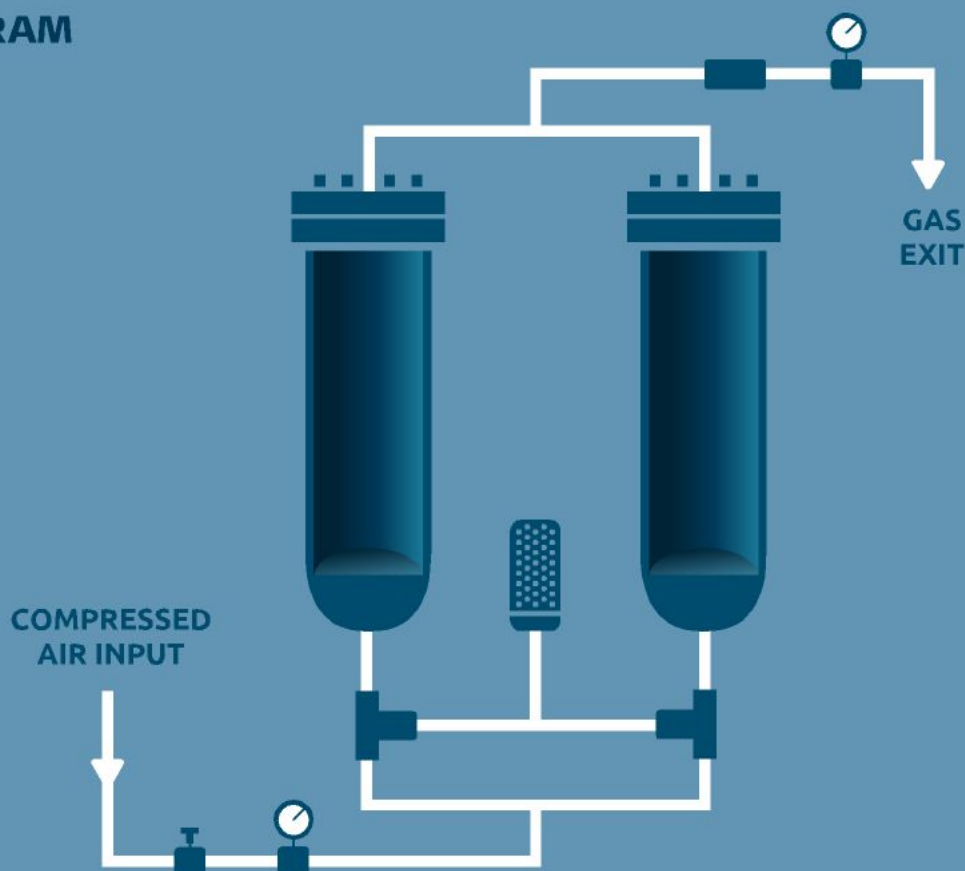
In the high pressure step, the adsorbent retains the contaminants present in the compressed air and the

desired gas (N₂ or O₂) is obtained from the top of the columns.

The regeneration is accomplished in the low pressure step, with the release of contaminants retained by the adsorbent.



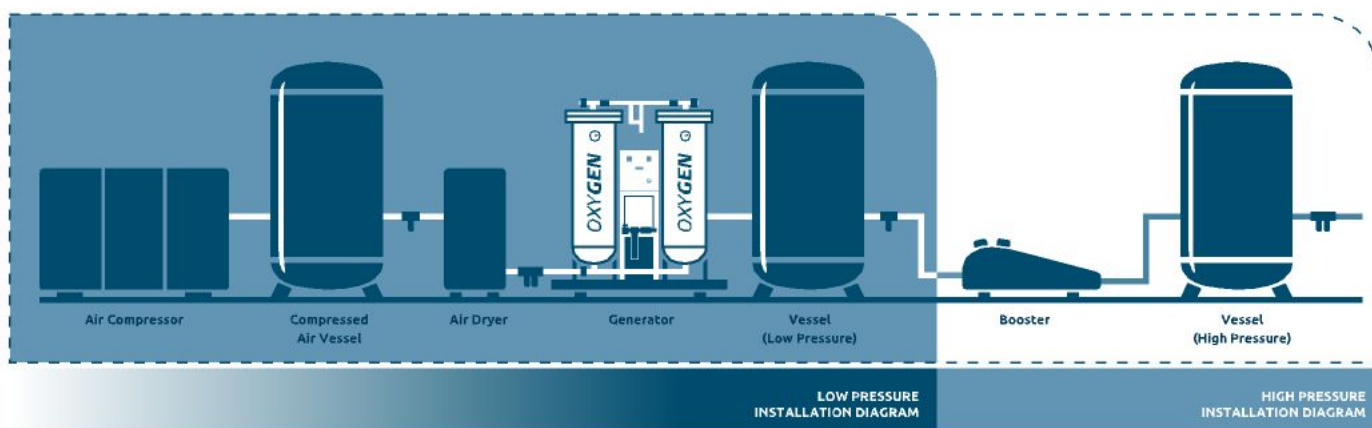
PSA DIAGRAM



PSA SYSTEM ADVANTAGES

PRESSURE SWING ADSORPTION

- ▶ **Economy** - 90% reduction in the cost of Nitrogen | Oxygen
- ▶ **Convenience** - elimination of logistical and administrative operations
- ▶ **Continuous availability** - elimination of orders and deliveries
- ▶ **Modularity / Scalability** - your installation grows with you
- ▶ **Robustness, reliability and durability**
- ▶ **Reduced maintenance**
- ▶ **Security**
- ▶ **Ready-to-use Engineering Solutions**



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VARIOPSA

VARIABLE FLOW PSA TECHNOLOGY

Standard PSA cycles have fixed production and regeneration time cycles designed for optimum efficiency at a constant nominal production.

Some processes have a gas consumption demand that can vary along the production shifts or different production steps, thus requiring variable gas flows at a fixed purity. Standard PSA tend to be less efficient under these consumption scenarios. Lower than the nominal consumption rates will have an effect on the standard PSA which is purity increase, thus decreasing efficiency by higher than needed air consumption.

Sysadvance VARIO option allows for a smart control of the PSA cycle times by continuous monitoring of the outlet purity thus adapting the PSA production capacity to the fluctuating process demand keeping constant the specific air consumption, therefore maximizing efficiency on a variable consumption scenario, while maintaining a constant required purity.

GENERATORS

NITROGEN *series*



N₂

N₂ GENERATORS| NITROGEN SERIES

DESCRIPTION

NITROGEN - A line of robust, reliable and modular Nitrogen generators, based on Pressure Swing Adsorption (PSA) technology using state of the art Carbon Molecular Sieves adsorbents.

SYSADVANCE generators produce high purity Nitrogen from compressed air, allowing continuous availability at a very competitive cost, compared to alternative supply with cylinders or cryogenic tank.

NITROGEN eliminates all disadvantages associated to purchase and operation costs of high-pressure cylinder systems or cryogenic tanks, enabling a permanent source of Nitrogen, with minimum energy consumption and maintenance requirements.

NITROGEN is designed to be easily installed in any indoor facility, requiring only a compressed air line and a power connection.

With purities up to 99.999% of N₂, NITROGEN can be connected to an external buffer allowing a backup or a delay of production/consumption according to the needs of each application.

The modular philosophy of SYSADVANCE NITROGEN generators allows the installation of multiple parallel units.

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FEATURES

- ▀ Nitrogen pressure up to 9 bar;
- ▀ LCD display;
- ▀ Oxygen Zirconium analyzer;
- ▀ GSM / LAN monitoring,
- ▀ Purity up to 99.999%.

ADVANTAGES

- ▀ Reduction of Nitrogen costs up to 95%;
- ▀ Independence from external gas suppliers and from fluctuation of the nitrogen market prices;
- ▀ Suppression of logistic operations like handling of cylinders or liquid nitrogen supplier management;
- ▀ Modular, flexible and low maintenance units.

OPTIONALS

- ▀ Dedicated Air Compressor;
- ▀ Pressure booster for pressure up to 420 bar;
- ▀ Food Pack filter kit.



APPLICATIONS

FOOD (MAP)



The most common technique to control the oxygen level in contact with packed food is the use of Nitrogen as a blanketing gas, which allows for the following advantages:

- Eliminates product oxidation;
- Eliminates unwanted consequences from bacteria and fungi exposure;
- Eliminates unwanted consequences from insect exposure;
- Increases the product shelf life;
- Reduces faulty products return;
- Allows product expedition to distant markets.

WINEMAKING



Nowadays there are several techniques, applied worldwide, to control the level of Oxygen in contact with wine. The most widespread technique consists in the application of Nitrogen for Oxygen removal on some stages of the wine production process, such as:

- Production blanketing of the fermentation barrels;
- Wetness - Pneumatic displacement (pumping);
- Tube cleaning by Nitrogen blow;
- Mixture inside the barrels by Nitrogen bubbling (sparging);
- Blanketing of the storage barrels top;
- Blanketing of the bottle in the filling line by blow.

APPLICATIONS

MARINE AND OFF-SHORE



Nitrogen has a wide range of applications in Marine and Off-Shore. It can be used in activities such as, multiple blanketing and pressure displacement. Nitrogen applications points are in:

- LPG tankers;
- Chemical tankers;
- Oil tankers.

TYRE INFLATION



Nitrogen tyre inflation allows for the elimination of two tire enemies: Oxygen and water vapor.

The main advantages are:

- Increased Pressure Stability
- Higher Fuel Economy
- Reduced Tyre Oxidation
- Safer Driving
- Longer Tyre Life

APPLICATIONS

PHARMACEUTICALS



The active pharmaceutical ingredients (API) and the pharmaceutical industries use Nitrogen most commonly as an inert gas for the conditioning, transport and storage of pharmaceutical products.

The inertization (blanketing) is a common process in the pharmaceutical industry, where it is used to improve product quality, reducing water vapor, oxygen content and avoiding unwanted reactions. It is also used to increase safety by means of inhibiting combustion or preventing fire and explosions.

METAL WORKS



Metallurgic industry uses Nitrogen as an inert gas for operation and production in the following applications:

- Blanketing;
- Heat Treatment;
- Aluminum Extrusion;
- Aluminum Foundry;
- Foundry (Iron, Copper, Aluminum, Alloys);
- Laser and plasma cutting.

PERFORMANCE

MODEL	95%	99%	99,9%	99,999%
	Flow N ₂ (Nm ³ /h)	Flow N ₂ (Nm ³ /h)	Flow N ₂ (Nm ³ /h)	Flow N ₂ (Nm ³ /h)
NITROGEN 2C	0,916	0,550	0,345	0,083
NITROGEN 5C	1,991	1,195	0,750	0,181
NITROGEN 10C	4,14	2,48	1,56	0,38
NITROGEN 15C	7,03	4,22	2,65	0,64
NITROGEN 30C	13,61	7,17	5,13	1,23
NITROGEN 50/C	18,84	11,32	7,10	1,71
NITROGEN 90/C	40,39	24,25	15,22	3,66
NITROGEN 120/C	60,27	36,19	22,72	5,47
NITROGEN 150/C	80,78	48,50	30,45	7,33
NITROGEN 250	109,81	65,94	41,39	9,96
NITROGEN 325	125,02	75,07	47,13	11,34
NITROGEN 400	164,58	98,82	62,04	14,93
NITROGEN 600	227,50	136,60	85,76	20,64
NITROGEN 800	347,42	208,61	130,96	31,52
NITROGEN 1000LP	430,35	258,40	-	-
NITROGEN 1000HP	-	-	162,22	39,05
NITROGEN 1200LP	492,13	295,50	-	-
NITROGEN 1200HP	-	-	185,51	44,65
NITROGEN 2400LP	806,38	484,19	-	-
NITROGEN 2400HP	-	-	303,97	73,16
NITROGEN 3600LP	1263,96	758,94	-	-
NITROGEN 3600HP	-	-	476,45	114,68



NITROGEN PRODUCTION WITH COMPRESSED AIR INPUT AT 10 barg

PURITY

Purity values are measured in oxygen content. Other purities are available on request. For choosing the appropriate purity for the process please refer to applications purity list or contact SYSADVANCE.

COMPRESSED AIR

Required inlet compressed air quality is 1:4:1 as in ISO DIN 8573-1.

DEW-POINT

Dew-point: an refrigerated air dryer (3° dew-point) is required. The produced nitrogen flow will have a dew-point of -40°C.

Other capacities available on request.
Models and specifications are subject to change without notice.

GENERATORS

OXYGEN

series



O₂ GENERATORS | OXYGEN SERIES

DESCRIPTION

OXYGEN - A line of robust, reliable and modular Oxygen generators based on Pressure Swing Adsorption (PSA) technology using state of the art Zeolite Molecular Sieves adsorbents.

SYSADVANCE generators produce high purity Oxygen from compressed air, allowing continuous availability at a very competitive cost, compared to alternative supply with cylinders or cryogenic tank.

OXYGEN eliminates all disadvantages associated to purchase and operation costs of high-pressure cylinder systems or cryogenic tanks, enabling a permanent source of Oxygen, with minimum energy consumption and maintenance requirements.

OXYGEN is designed to be easily installed in any indoor facility, requiring only a compressed air line and a power connection.

With purities up to 95% of O₂, OXYGEN can be connected to an external buffer allowing a backup or a delay of production/consumption according to the needs of each application.

The modular philosophy of SYSADVANCE OXYGEN generators allows the installation of multiple parallel units.

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FEATURES

- ▀ Nitrogen pressure up to 5 bar;
- ▀ LCD display;
- ▀ Oxygen Zirconium analyzer;
- ▀ GSM / LAN monitoring.

ADVANTAGES

- ▀ Safe delivery and independence from external gas suppliers and from fluctuation of the oxygen market price;
- ▀ Suppression of logistic operations like handling of cylinders or liquid Oxygen and supplier management;
- ▀ Modular, flexible and low maintenance units;
- ▀ Don't waste more money with Oxygen!

OPTIONALS

- ▀ Dedicated Air Compressor;
- ▀ Pressure booster for pressure up to 300 bar;
- ▀ Food Pack filter kit;
- ▀ Remote monitoring;
- ▀ Oxygen analyzer.



APPLICATIONS

OXI-FUEL TECHNOLOGY



Oxy-fuel welding and oxy-fuel cutting are processes that use fuel gases and oxygen to weld and cut metals, respectively. Pure oxygen, instead of air, is used to increase the flame temperature to allow localized melting of the work piece material in a room environment.

OZONE



Used as Air Cleaners, ozone generators are fed with oxygen.

HOSPITALS



Oxygen is one of the most basic drugs that exist. In many acute illnesses such as acute respiratory infections, asthma, fetal asphyxia and shock the availability of an oxygen supply can save a patient's life.



The SYSADVANCE is certified by SGS United Kingdom as a manufacturer of medical devices under 93/42 / EC and ISO 13485 .

The SYSADVANCE is also certified by ISO 9001 .



APPLICATIONS

WASTEWATER TREATMENT



Wastewater Treatment has six stages. In the third stage, called Removal of Biodegradable Organics, is a biochemical process for treating sewage and industrial wastewater that uses oxygen and microorganisms to biologically oxidize pollutants.

FISH FARMING



Farms are able to increase stocking densities. The fish are also healthier and have better taste when raised in an oxygen rich environment.

OXYGEN PRODUCTION WITH COMPRESSED AIR INPUT AT 6,5 barg

MODEL	70%	85%	90%	93%	95%
	Flow O ₂ (Nm ³ /h)	Flow O ₂ (Nm ³ /h)	Flow O ₂ (Nm ³ /h)	Flow O ₂ (Nm ³ /h)	Flow O ₂ (Nm ³ /h)
OXYGEN 2	-	0,167	0,153	0,142	0,125
OXYGEN 5	-	0,345	0,317	0,294	0,258
OXYGEN 10	-	0,835	0,767	0,710	0,624
OXYGEN 15	-	1,18	1,09	1,01	0,884
OXYGEN 35	-	3,68	3,35	3,05	2,68
OXYGEN 50	-	6,04	5,35	4,51	3,77
OXYGEN 70	9,93	8,41	7,35	5,98	4,86
OXYGEN 90	13,80	11,69	10,22	8,31	6,75
OXYGEN 110	17,67	14,96	13,08	10,64	8,65
OXYGEN 150	23,56	19,95	17,44	14,19	11,53
OXYGEN 200	37,26	31,55	27,58	22,44	18,23
OXYGEN 300	46,57	39,44	34,48	28,05	22,79
OXYGEN 400	60,84	51,53	45,04	36,64	29,77
OXYGEN 500	79,13	67,02	58,58	47,66	38,72
OXYGEN 800	120,18	101,79	88,97	72,38	58,81



PURITY

Purity values are measured in oxygen content (Variation $\pm$ 3%). Other purities are available on request. For choosing the appropriate purity for the process please refer to the applications purity list or contact SYSADVANCE.

COMPRESSED AIR

Required inlet compressed air quality is 1:4:1 as in ISO DIN 8573-1.

DEW-POINT

An refrigerated air dryer (3°C dew-point) is required. The produced oxygen flow will have a dew-point of -35°C.

VSA

VACUUM SWING ADSORPTION

The Vacuum Swing Adsorption (VSA) technology for O₂ production is one of the variations of the PSA process specially engineered for low pressure O₂ applications.

The O₂ VSA technology makes use of a proper zeolite adsorbent that takes advantage of the higher adsorption selectivity at lower pressure. The adsorption step is carried out feeding air from a blower at a maximum pressure of 2000 mbar(abs), followed by a regeneration step under vacuum (ranging from 200 to 500 mbar(abs)).

The most relevant advantage of the O₂ VSA compared to O₂ PSA is a 50% reduction in the power consumption for O₂ production.

This technology can produce O₂ with a purity ranging from 75% to 93,5%. The product pressure is 300 mbarg without any supplementary compression stage. Higher pressures can be achieved using an additional blower for O₂ to reach 2 barg, and scroll or piston compressors to reach up to 8 barg.

O₂ VSA is a very good value for money when it comes to heavy duty applications requiring continuous consumption of O₂ at low pressure.

VANTAGES

- ▣ Low power demand:
 - <0,5 kWh/Nm³ @ 90% O₂;
- ▣ O₂ purity up to 93,5%
(dew point < -50°C @ 0 barg);
- ▣ Lower maintenance compared to O₂ PSA;
- ▣ No pre-treatment required for inlet air;
- ▣ Longer adsorbent lifetime compared to O₂ PSA;
- ▣ Compression up to 8 barg available;
- ▣ Production capacity up to 80 m³/h with a single column scheme and from 100 to 500 m³/h with a twin column scheme;
- ▣ Single column scheme:
 - One single pump
 - Less valve inventory
 - Simple process scheme
 - Low maintenance costs
 - Simple operation
- O₂ pressure:
 - 300 mbar (without compressor)
 - 2 barg (with O₂ HP blower)
 - 8 barg (with oil free compressor)
 - 220 barg (with oil free booster);
- ▣ O₂ sensor & output signal for remote monitoring;
- ▣ Skid mounted for mobility.





APPLICATIONS

- ▶ Waste Water treatment plants;
- ▶ Ozonization for water treatment;
- ▶ H₂S reduction in sewage lift stations;
- ▶ H₂S reduction in biological processes (biogas plants)
- ▶ Water oxygenation in aquaculture;
- ▶ Oxy-combustion (foundry, cement, glass production, etc...);
- ▶ Gold leaching for gold mines;
- ▶ Paper pulp bleaching in paper mill plants.

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PERFORMANCE

Purity 90%	P out between 300 and 500 mbar		
MODEL	O ₂ Flow(Nm ³ /h)	Power consumption (kW)	N° of columns
OXYGEN VSA 10	10	5	1
OXYGEN VSA 20	20	9	1
OXYGEN VSA 30	30	14	1
OXYGEN VSA 40	40	19	1
OXYGEN VSA 50	50	24	1
OXYGEN VSA 60	60	28	1
OXYGEN VSA 70	70	33	1
OXYGEN VSA 80	80	38	1
OXYGEN VSA 100	100	92	2
OXYGEN VSA 150	150	61	2
OXYGEN VSA 300	300	184	2
OXYGEN VSA 400	400	245	2

notes : Other capacities available on request
 Available different outlet pressures on request : 6 to 300 bar
 Models and specifications are subject to change without notice.



PSA

HIGH PURITY

A standard Oxygen generator using PSA technology can concentrate the oxygen present in the air at a maximum purity of 95% (V/V). To reach higher purities, up to 99% (V/V), a second stage of purification is needed.

If the first purification stage the adsorbent retains the constituents of the air (N_2 , H_2O and CO_2), except argon and oxygen. A gaseous flow containing 95% O_2 , 4% Argon and 1 % N_2 is obtained.

The second purification stage uses an high performance adsorbent with kinetic selectivity, allowing the separation of argon and the residual N_2 , for the production of O_2 with 99% purity.



VANTAGES

- ▀ 99% purity for high demand applications;
- ▀ Economy - Reduction of the costs with Oxygen (compared to the cryogenic Oxygen);
- ▀ Continuous Availability - No need to order oxygen from external suppliers;
- ▀ Low maintenance required;
- ▀ Simple and robust technology.

APLICATIONS

- ▀ Heat treatment;
- ▀ Oxy-cutting;
- ▀ Laser cutting;
- ▀ Chemical oxidation;
- ▀ Medical Oxygen;
- ▀ Semiconductors;
- ▀ Optical fiber;
- ▀ Military use.

PERFORMANCE

Purity 90%	P out 1 bar	P in 6,5 bar
PSA MODEL	O ₂ Flow(Nm ³ /h)	Air Consumption (Nm ³ /h)
OXYGEN HP 3	0,36	7,8
OXYGEN HP 6	0,60	11
OXYGEN HP 10	1,14	22,7
OXYGEN HP 15	1,68	33,5
OXYGEN HP 25	2,34	47,1
OXYGEN HP 30	3	60,8
OXYGEN HP 40	4,02	84,4
OXYGEN HP 60	5,7	108,1
OXYGEN HP 70	7,2	144,1
OXYGEN HP 90	9	170,9
OXYGEN HP 120	12	227,9
OXYGEN HP 150	15	284,9
OXYGEN HP 200	19,2	372,2
OXYGEN HP 250	24	484
OXYGEN HP 400	37,8	735,1

notes : Other capacities available on request
 Available different outlet pressures on request : 6 to 300 bar
 Models and specifications are subject to change without notice.

TECHNOLOGY OPTIONS

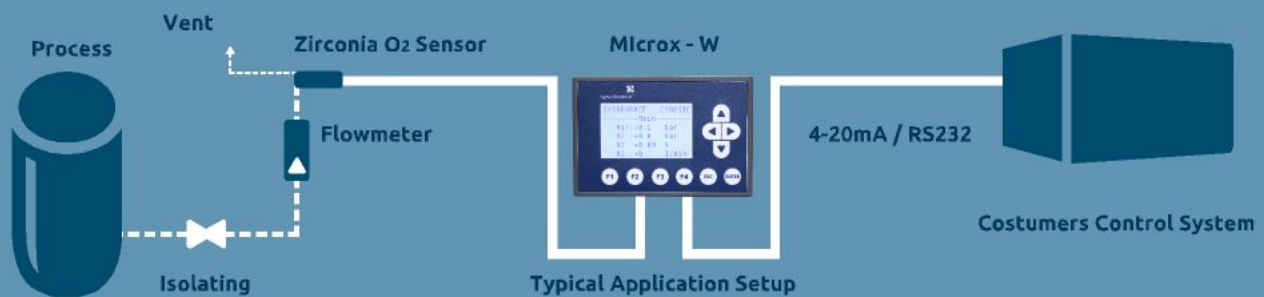
O2 METERS

Sysadvance offers the best oxygen sensors associated to the O₂/N₂ generators to measure the purity of the produced gas. Both electrochemical or zirconia sensors are available, with a range from 100% to 1 ppm. Electrochemical sensors are a reliable and economical solution, whereas zirconia sensors have larger lifetimes and are designed for more demanding applications.

Both types of sensors are indicated for inline measurement in the client's process.

Optional features of both sensors:

- ▣ LCD screen and multifunction keyboard
- ▣ Analog Output 4-20 mA for signal transmission
- ▣ Communication module RS232
- ▣ 3 configurable alarms
- ▣ DIN rail, panel or wall mounted



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CONTROL SYS PREMIUM

Main features of Control SYS Premium:

Programmable PLC
 3,5" to 10" colour touchscreen
 Air and N₂/O₂ pressure sensors
 N₂/O₂ Flowmeter
 O₂ Analyzer (Zirconia sensor)

Features:

- Remote Start/Stop;
- Total control and visualization of the PSA system;
- Intelligent control of multiple PSA generators and compressors in operation according to flow and purity demand;
- Parameters and alarms recording capability in data cards and USB;
- Alarms and data via GPRS (optional);
- Local alarms (coil free contact);
- Remote access via Web Server;



- Communication protocols:
 Profibus; Modbus; Ethernet.

Available information:

- Generator(s) condition(s);
- Air pressure;
- Produced N₂/O₂ pressure;
- Produced N₂/O₂ purity;
- Produced N₂/O₂ flow;
- Compressed air consumption (optional);
- Power consumption (optional);
- Work hours;
- Maintenance alarm;
- Other sensors available on request.

TECHNOLOGY OPTIONS

GAS MIXERS

There are many applications that despite the need of a pure gas also need a controlled mixture of two or more gases.

Sysadvance can offer electronic and/or mechanic systems that create gaseous mixtures according to client needs.

Available in a wide range of flows and applicable to all the technical gases, this kind of equipment is normally applied in the following industries:

- Cutting and Welding;
- MAP - Modified Atmosphere Packaging;
- Beverage Filling;
- Helium Leak Detection;
- Diving;
- Laser technology.

Gas Mixers can be associated to sensors for an even more accurate control of the produced mixture.



DEOXO

Some industrial N₂ applications require a low O₂ residual content below 50 ppm. When coupled to a N₂PSA, the DEOXO technology becomes the more efficient way to produce ultrapure N₂.

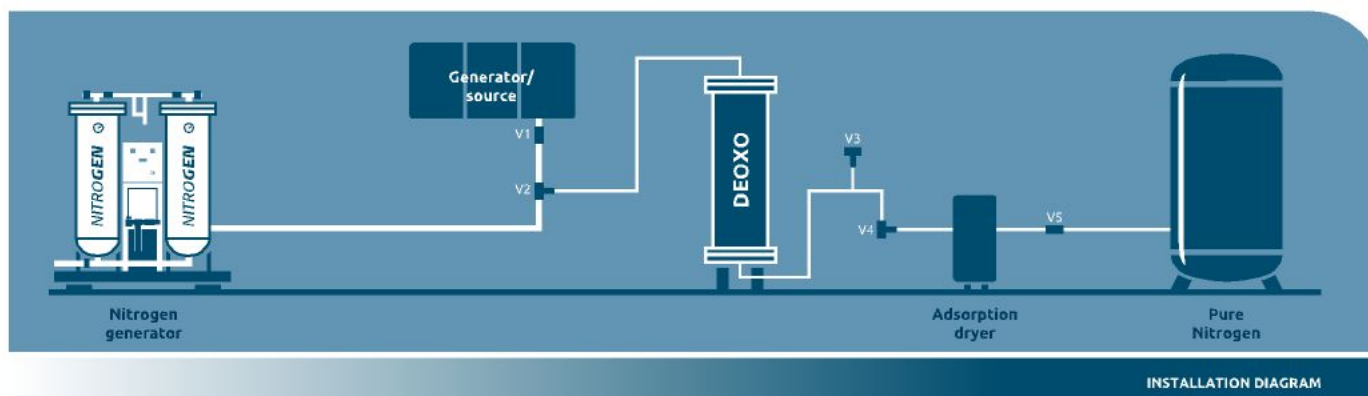
In the DEOXO system, Nitrogen is first produced by a PSA with a purity ranging from 99,0 to 99,9%, being then mixed with a small flow of hydrogen prior to be fed in a DEOXO reactor. In this reactor, the O₂ present in the gas is consumed by reacting

with the H₂ producing water, according to the following reaction:



After the reaction step, the water is removed by passing through an adsorption drier producing ultrapure and dry N₂ (>99,999%).

This solution is recommended for applications requiring ultrapure N₂ non-sensitive to the presence of residual H₂.



INSTALLATION DIAGRAM

SPECIAL PRODUCTS

SYSADVANCE generators or complete systems can be installed in fully insulated and thermal controlled containers or mounted in metal skids.

Contact us for more information.



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SYSADVANCE develops and manufactures equipments for gas separation and supplies integrated solutions for gases and compressed air, such as N2 Generators, O2 Generators, Medical Oxygen 93 Generators, Biogas Upgrading systems, O2 VSA Generators, Helium, Hydrogen and SF6 Purification and custom engineering solutions.

Since its foundation in 2002, the company has experienced significant and continuous growth, as a result of its customer satisfaction oriented strategy as well as its superior technology and reliability of the products and technologies delivered.

With highly qualified technical personnel and a strong R&D culture, **SYSADVANCE** strives to deliver state-of-the-art technology to its clients in more than 40 countries, in different industries and sectors of activity.

A dark blue world map with white dashed lines and orange dots representing global distribution routes and locations. The lines radiate from a central point in Europe towards various continents.

AUTHORIZED DISTRIBUTOR

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