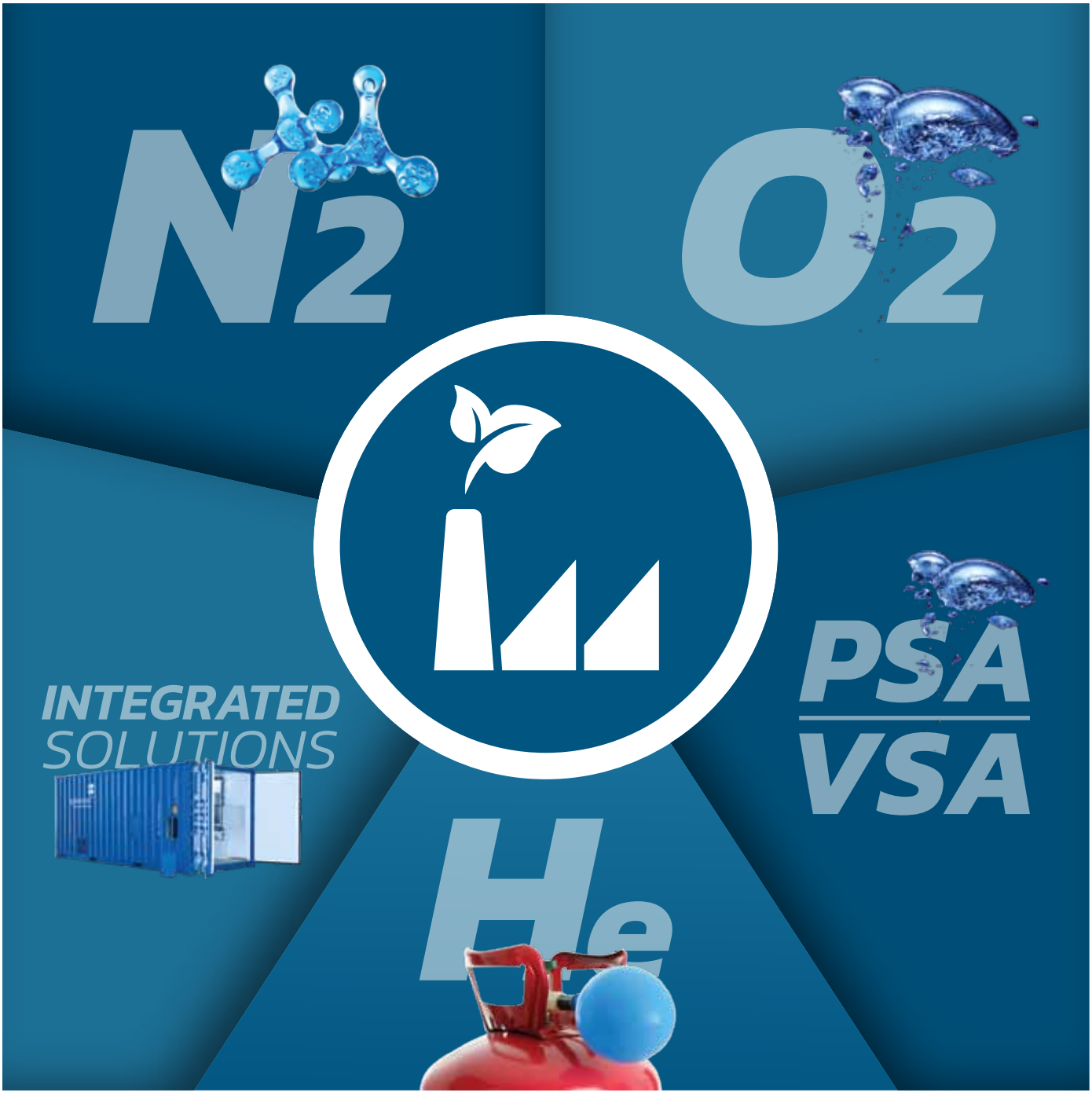
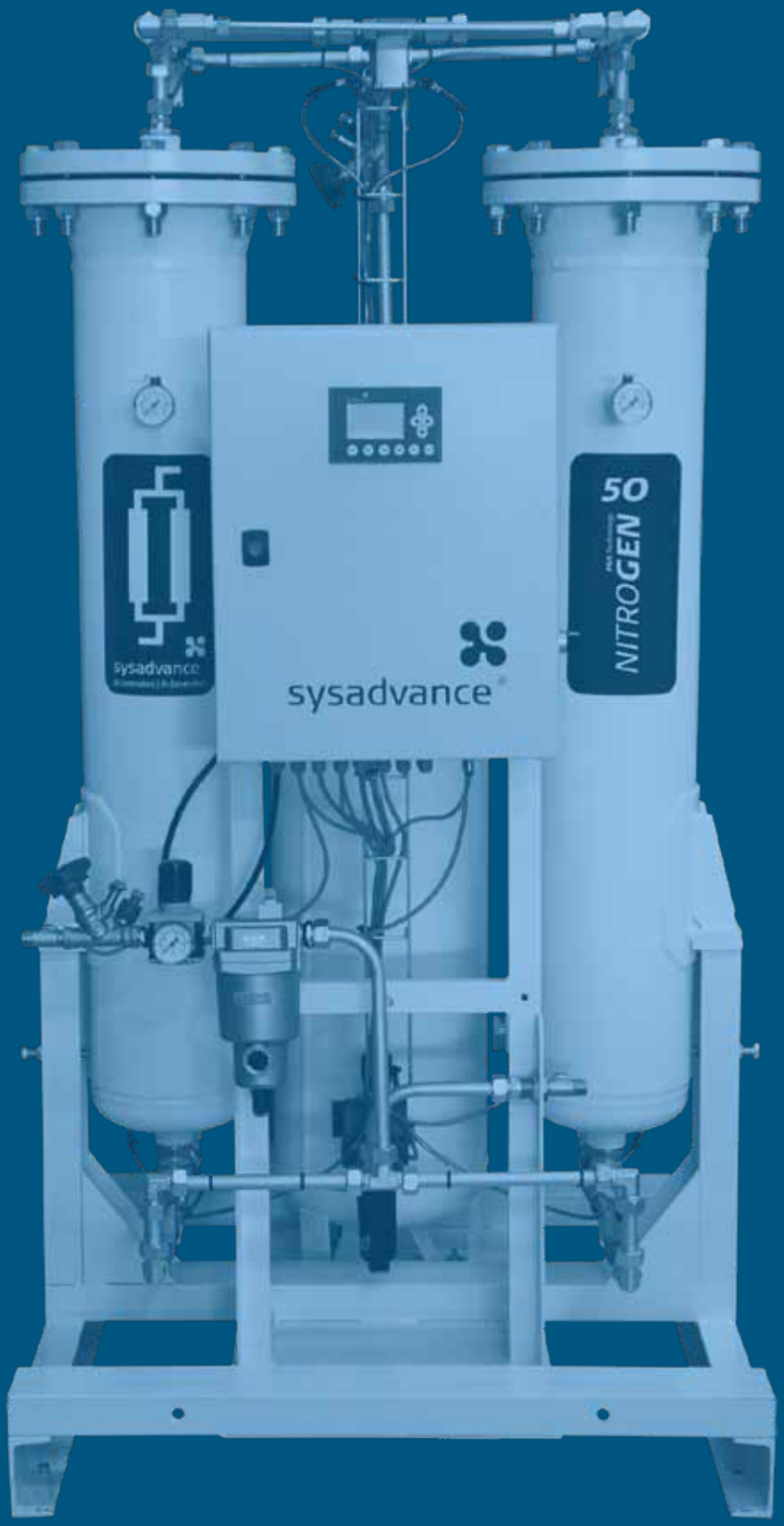
SYSADVANCE

SHAPING THE FUTURE OF TECHNOLOGY



sysadvance®

INDUSTRIAL



N_2 | O_2 | O_2 VSA | MEDICAL O_2 GENERATORS | BIOGAS | He | H_2 | SF_6 PURIFICATION

INDEX

sysadvance®

THE COMPANY

SYSADVANCE is a technology company founded in 2002.

Today we develop and manufacture on-site gas generators 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.

SYSADVANCE successful projects are 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, metal works, aquaculture, water treatment, engineering, 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.

sysadvance®

PSA TECHNOLOGY

PRESSURE SWING ADSORPTION

Pressure Swing Adsorption can be used to produce N_2 or O_2 from compressed air, which is fed to the unit that uses adsorption phenomena to remove the contaminants: N_2 when the desired pure gas is O_2, or O_2 when the desired pure gas is N_2. Also, in both cases, H_2O and CO_2 are removed as well as other minor contaminants.

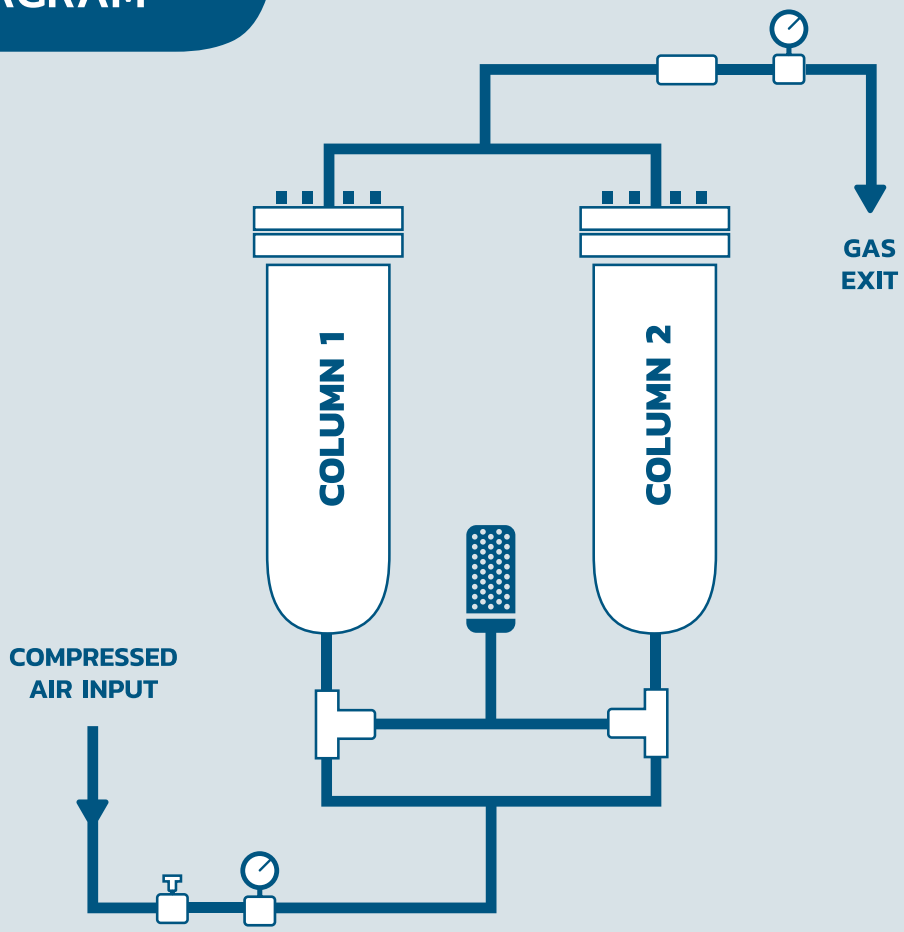
The PSA unit contains two columns packed with a selective adsorbent that has affinity towards the component to be removed: a carbon molecular sieve is used to produce N_2 and zeolites are used to produce O_2.

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 (N_2 or O_2) 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

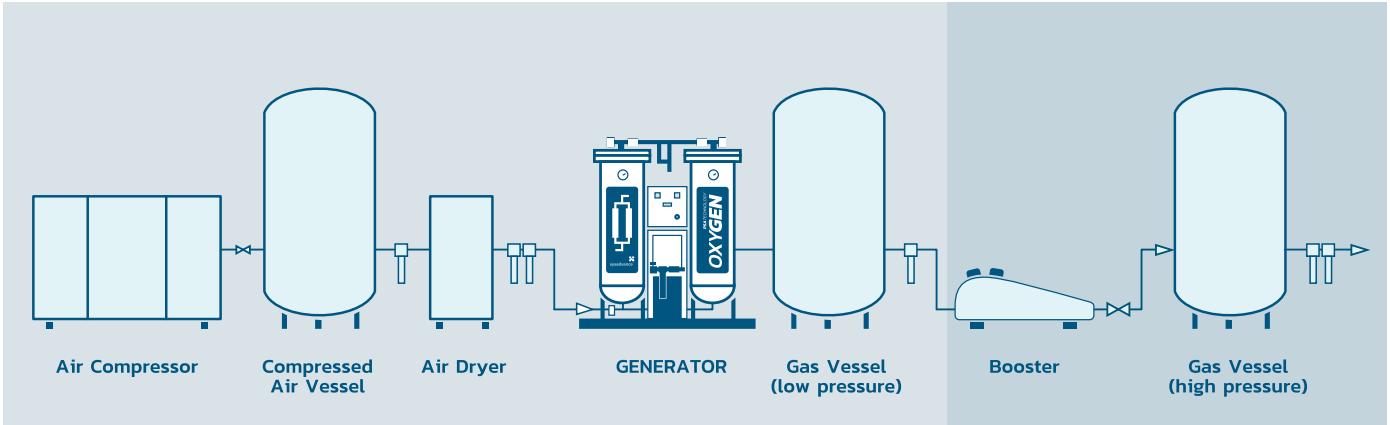


PSA TECHNOLOGY

PSA ADVANTAGES

- **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**

PSA SYSTEM



NITROGENSERIES

N_2

GENERATORS

NITROGEN SERIES

N2 GENERATORS

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 N_2, 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.

FEATURES

- Nitrogen pressure up to 9 bar (without Booster);
- LCD display;
- Oxygen analyzer;
- 4.0 Ready,
- Purity up to 99.999%;
- VARIO PSA (optional).

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.

NITROGENSERIES

VARIO **PSA**

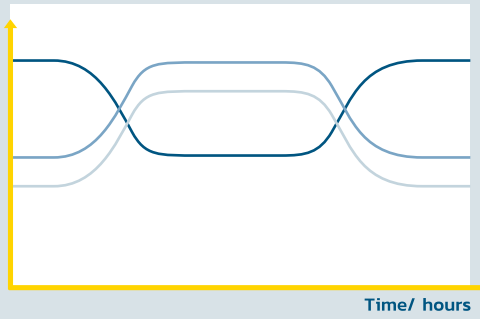
VARIABLE FLOW PSA TECHNOLOGY

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

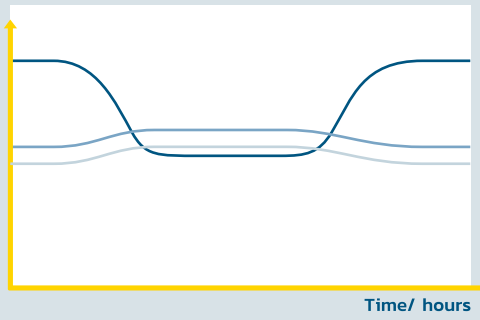
Some processes have a gas consumption demand that can vary along the production shifts or different production steps, thus requiring variable gas flows at a fixed purity. Standard PSA tend to be less efficient under these consumption scenarios. Lower than the nominal consumption rates will have an effect 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.

NO VARIO



WITH VARIO



NITROGENSERIES

N2 GENERATORS

APPLICATIONS

PREPARED AND CATERED FOODS

WINERIES

PHARMACEUTICALS

LABORATORIES

CHEMICAL INDUSTRY

OIL & GAS

MARINE & OFF-SHORE

FIRE SUPRESSION

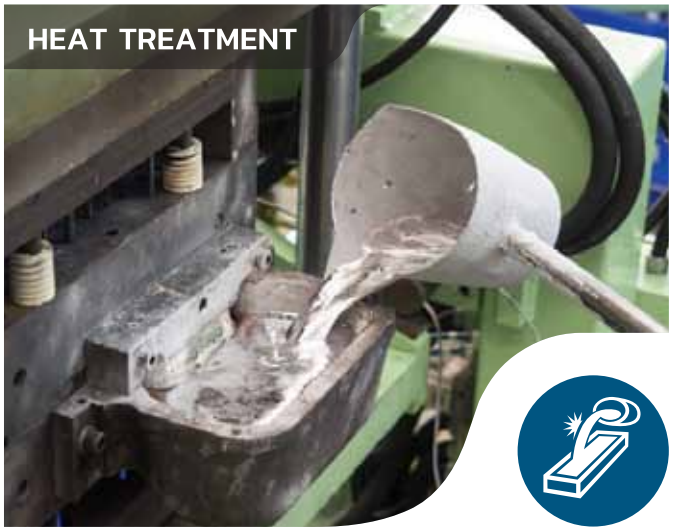
NITROGENSERIES

N2 GENERATORS

APPLICATIONS

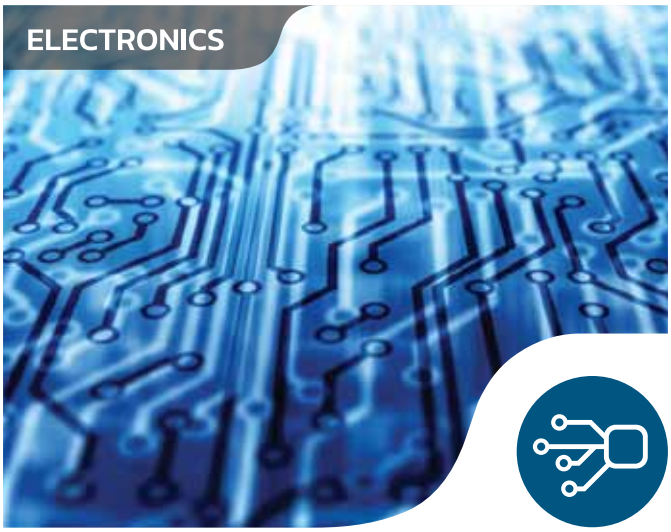
LASER AND PLASMA CUTTING

HEAT TREATMENT



FOUNDRY (IRON / COPPER / ALUMINIUM / ALLOYS) / ALUMINIUM EXTRUSION

ELECTRONICS



TYRE INFLATION

NITROGENSERIES

N2 GENERATORS

PERFORMANCE

MODEL	95% Flow N2 (Nm³/h)	99% Flow N2 (Nm³/h)	99,9% Flow N2 (Nm³/h)	99,999% Flow N2 (Nm³/h)
NITROGEN 5C	2,0	1,2	0,8	0,2
NITROGEN 10C	4,1	2,5	1,6	0,4
NITROGEN 15C	7,0	4,2	2,7	0,6
NITROGEN 30/C	13,6	8,2	5,1	1,2
NITROGEN 50/C	18,8	11,3	7,1	1,7
NITROGEN 90/C	40,4	24,3	15,2	3,7
NITROGEN 120/C	60,3	36,2	22,7	5,5
NITROGEN 150/C	80,8	48,5	30,5	7,3
NITROGEN 250	109,8	65,9	41,4	10,0
NITROGEN 325	125,0	75,1	47,1	11,3
NITROGEN 400	164,6	98,8	62,0	14,9
NITROGEN 600	227,5	136,6	85,8	20,6
NITROGEN 800	347,4	208,6	131,0	31,5
NITROGEN 1000LP	430,4	258,4	-	-
NITROGEN 1000HP	-	-	162,2	39,1
NITROGEN 1200LP	492,1	295,5	-	-
NITROGEN 1200HP	-	-	185,5	44,7
NITROGEN 1800LP	649,3	389,8	-	-
NITROGEN 1800HP	-	-	244,7	58,9
NITROGEN 2400LP	806,4	484,2	-	-
NITROGEN 2400HP	-	-	304,0	73,2
NITROGEN 3000LP	1035,2	621,6	-	-
NITROGEN 3000HP	-	-	390,2	93,9
NITROGEN 3600LP	1264,0	758,9	-	-
NITROGEN 3600HP	-	-	476,5	114,7
NITROGEN 4000LP	1447,6	869,2	-	-
NITROGEN 4000HP	-	-	545,7	131,3

NITROGEN PRODUCTION WITH COMPRESSED AIR INPUT AT 10 barg

Performance stated at standard conditions: 15°C /1013,25 mbar

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 aprox. -40°C.

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

OXYGENSERIES

O2

GENERATORS

OXYGENSERIES

O2 GENERATORS

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 O_2, 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.

FEATURES

- Oxygen pressure up to 5 bar (without Booster);
- LCD display;
- Oxygen analyzer;
- 4.0 Ready.

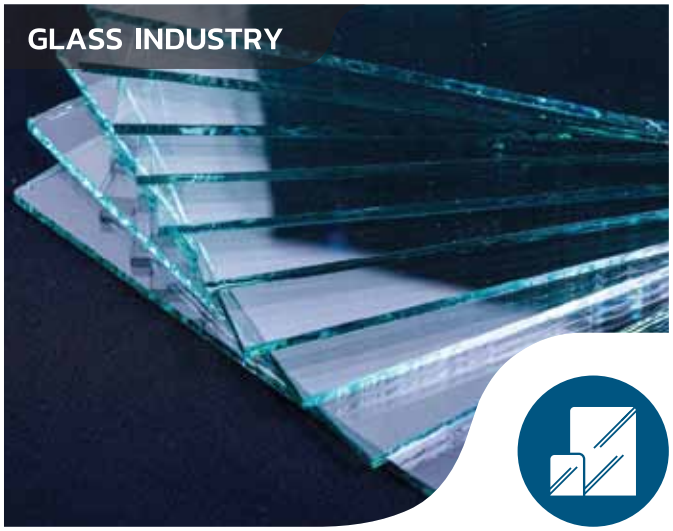
ADVANTAGES

- 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!

OXYGENSERIES

O2 GENERATORS

APPLICATIONS



OXYGENSERIES

O2 GENERATORS

APPLICATIONS

PERFORMANCE

MODEL	85% Flow O2 (Nm³/h)	90% Flow O2 (Nm³/h)	93% Flow O2 (Nm³/h)	95% Flow O2 (Nm³/h)
OXYGEN 5	0,37	0,34	0,32	0,28
OXYGEN 10	0,91	0,84	0,78	0,68
OXYGEN 15	1,26	1,16	1,07	0,94
OXYGEN 35	4,4	4,0	3,1	2,5
OXYGEN 50	6,5	6,0	4,6	3,8
OXYGEN 70	9,2	8,5	6,5	5,3
OXYGEN 90	11,2	10,4	8,0	6,5
OXYGEN 110	13,4	12,4	9,5	7,8
OXYGEN 150	17,5	16,2	12,4	10,1
OXYGEN 200	25,6	23,7	18,2	14,8
OXYGEN 300	36,9	34,1	26,2	21,3
OXYGEN 400	51,4	47,6	36,5	29,7
OXYGEN 500	61,2	56,7	43,5	35,3
OXYGEN 800	78,3	72,6	55,7	45,2
OXYGEN 1000	116,2	101,6	82,7	67,2

OXYGEN PRODUCTION WITH COMPRESSED AIR INPUT AT 6,5 barg

Performance stated at standard conditions: 15°C /1013,25 mbar.

PURITY
Purity values are measured in Oxygen content (Variation ± 1%).
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 aprox. -35°C.

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

PSA *HIGH PURITY*

PSA

GENERATORS

PSA HIGH PURITY

DESCRIPTION

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 99,5% O_2 (V/V), a second stage of purification is needed.

In 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 up to 99,5% purity.

ADVANTAGES

- Up to 99,5% 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.

APPLICATIONS

PERFORMANCE

MODEL O_2 / Pressure up to 8 barg Purity up to 99,5%

	Flow O_2 @ 99% (Nm^3/h)	Air Consumption (Nm^3/h)	Power Consumption @ 8 barg outlet
OXYGEN **HP 70**	2,4	48	0,8
OXYGEN **HP 90**	3,4	68	0,8
OXYGEN **HP 120**	4,2	84	0,8
OXYGEN **HP 150**	5,7	114	1,5
OXYGEN **HP 200**	9,1	182	1,5
OXYGEN **HP 250**	11,4	228	2,2
OXYGEN **HP 400**	19,3	386	3,7
OXYGEN **HP 800**	29,4	588	5,5

OXYGEN PRODUCTION WITH COMPRESSED AIR INPUT AT 6,5 barg
Performance stated at standard conditions: 15°C /1013,25 mbar

PURITY
Purity values are measured in Oxygen content (Variation ± 1,5%).

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 aprox. -35°C.

System includes oil-free Oxygen compressor;
Other purities and flow capacities available on request;
Different O_2 outlet pressures available on request: 10 to 300 barg;
Models and specifications are subject to change without notice.

VSA TECHNOLOGY

VACUUM SWING ADSORPTION

VSA

GENERATORS

VSA TECHNOLOGY

VACUUM SWING ADSORPTION

DESCRIPTION

The Vacuum Swing Adsorption (VSA) technology for O_2 production is one of the variations of the PSA process specially engineered for low pressure O_2 applications. The O_2 VSA technology makes use of a specific 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 O_2 VSA compared to O_2 PSA is a 50% reduction in the power consumption for O_2 production.

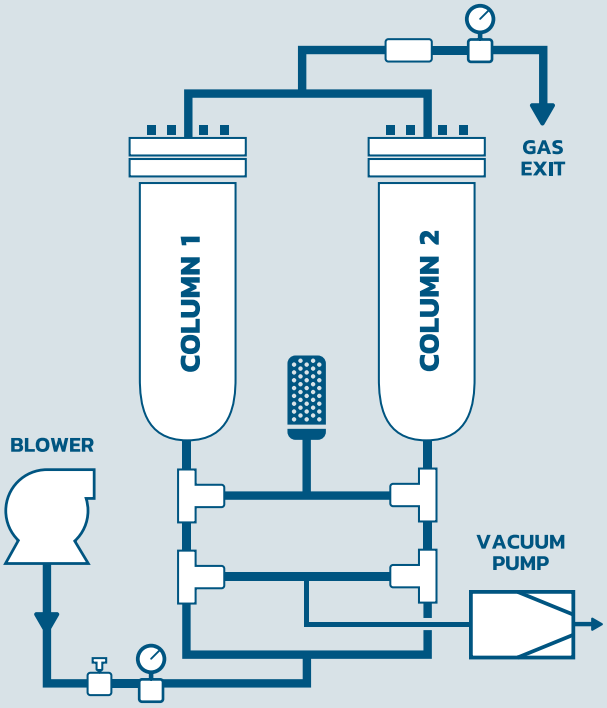
This technology can produce O_2 with a purity ranging from 75% to 93,5%. The product pressure is 300 mbarg without any supplementary compression stage. Higher pressures can be achieved using an additional blower for O_2 to reach 2 barg, and scroll or piston compressors to reach up to 8 barg.

O_2 VSA is a very good value for money when it comes to heavy duty applications requiring continuous consumption of O_2 at low pressure.

ADVANTAGES

- Low power demand:
  <0,5 kWh/Nm³ @ 90% O_2;
- O_2 purity up to 93%
  (dew point < -50°C @ 0 barg);
- Lower maintenance compared to O_2 PSA;
- No pre-treatment required for inlet air;
- Longer adsorbent lifetime compared to O_2 PSA;
- Compression up to 8 barg available;
- O_2 sensor & output signal for remote monitoring;
- Skid or container mounted for mobility.

VSA DIAGRAM



VSA TECHNOLOGY

VACUUM SWING ADSORPTION

APPLICATIONS

- WASTE WATER TREATMENT PLANTS;
- OZONIZATION FOR WATER TREATMENT;
- H_2S REDUCTION IN SEWAGE LIFT STATIONS;
- H_2S 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.

PERFORMANCE

VSA MODEL

	Flow @ 90% (m^3/h)	Flow @ 93% (m^3/h)	Power Consumption @ 90% @ 500 mbarg[1] (kWh/m^3)	Power Consumption @ 90% @ 8 barg[2] (kWh/m^3)
OXYGEN **VSA 20**	22	18	0,40	0,53
OXYGEN **VSA 30**	42	30	0,40	0,53
OXYGEN **VSA 60**	72	60	0,40	0,53
OXYGEN **VSA 90**	108	90	0,40	0,53
OXYGEN **VSA 120**	144	120	0,40	0,53

Performance stated at standard conditions: 15°C /1013,25 mbar /40% RH;
Operation at different conditions will affect performance;
Power Requirements: 400 VAC +/- 5%, 50/60 Hz +/- 3%, 3-Phase;
[1] Power Consumption includes: Blower, Vacuum Pump and Control;
[2] All items on [1] + Oxygen Compression;
Purity may vary within +/- 2%;
Power Consumption and O2 Flow may vary within +/- 5%;
Other capacities available on request;
Different outlet pressures available on request: 2 to 300 barg;
Models and specifications are subject to change without notice.

INTEGRATED SOLUTIONS

INTEGRATED SOLUTIONS

INTEGRATED SOLUTIONS

DESCRIPTION

SYSADVANCE developed container and skid mounted solutions that allow the customer to have a plug & play unit, allowing for easy installation and start-up.

OIL & GAS, container or skid mounted

The specifications for Nitrogen systems in Oil & Gas are very restrictive and normally the installation site is remote with difficult access. A complete system with a wide range of equipment and options is available.

The preparation of the site to receive the unit is also minimal and the units comply with the most known certifications, as well as the possibility to install in classified areas. The quality and efficiency of our Nitrogen generators is guaranteed, even in the most extreme conditions:

- Temperatures from -30°C to +55°C;
- Humidity up to 90% RH at 40°C.

Special Specification for Integrated Solutions:

- ASME – U-stamp – UL CSA standard compliant packages;
- ATEX systems.

MEDICAL OXYGEN, container or skid mounted

Medical Oxygen is needed all over the world and the difficulty to access it in remote places is real. On-site Oxygen plants guarantee the security of supply on remote locations or islands.

INTEGRATED SOLUTIONS

LABORATORY UNITS

Attending the difficulties experimented by laboratories with traditional Nitrogen generation units, **SYSADVANCE** developed reliable and functional systems together with laboratory equipment manufacturers and customers. Our systems combine the technology applied generally in the industry to the laboratory scale, giving a high efficiency and low maintenance solution to our customers.

HIGH PRESSURE / CYLINDER FILLING

The possibility to increase the pressure up to 40 bar with an high pressure booster, is the perfect solution to answer customers needs regarding high pressure consumption of Nitrogen or Oxygen. In addition, Nitrogen and Oxygen cylinder filling stations up to 300 bar, can solve the problem of peak consumptions, as well as easy access to gas in remote locations.

CUSTOMIZED UNITS

The development of custom engineered solutions adapted to specific processes and site conditions are recognized from our partners as cost-effective alternatives to surpass challenges of on-demand Nitrogen and oxygen generation.

GASMIX SOLUTIONS

Our solutions for mixing gases allow a high level of accuracy together with the possibility to change the mixture for better results. **SYSADVANCE** has a large experience in designing and installing systems in food industry (CO_2/N_2 mixture), metal heat treatment (N_2/H_2 mixture), leak test machines (N_2/He mixture), among others.

OPTIONALS

CONTROL SYS PREMIUM

FEATURES

- PLC able to integrate a wide range of sensors alarms and data communication options;
- 3,5" to 10" colour touchscreen;
- Air and N_2/O_2 pressure sensors;
- N_2/O_2 flowmeter;
- O_2 analyzer (Zirconia sensor);
- 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;
- Comunication protocols: Profibus; Modbus; Ethernet,
- 4.0 Ready.

AVAILABLE INFORMATION:

- Generator(s) condition(s);
- Air pressure;
- Produced N_2/O_2 pressure;
- Produced N_2/O_2 purity;
- Produced N_2/O_2 flow;
- Compressed air consumption (optional);
- Power consumption (optional);
- Work hours;
- Maintenance alarm;
- Other sensors available on request.

4.0 READY

OPTIONALS

N2 | O2 GENERATORS

MODEL	Serie ● Optional o	N_2/O_2
CONTROL PANEL		
Control basic (Siemens logo + HMI)		●
ControlSYS Premium (Siemens S7-1200 + Touch HMI)		o
SENSORS AND DATA HANDLING		
Air and Nitrogen / Oxygen Pressure Sensors		●
External Alarms Digital Inputs		●
General Alarms / Fault (Dry Contacts)		●
Remote Start-Stop		●
Data Logging		●
Oxygen Sensor		o
Dew Point Sensor		o
Flowmeter (Instant and Accumulation Values)		o
Sensors Analog Outputs		o
COMMUNICATIONS		
Webserver		●
S7 – Protocol		●
SMART Server		o
PROFINET / ETHERNET TCP -IP		o
MODBUS TCP / IP and MODBUS RTU		o
Other Protocols through Gateway		o
Remote Maintenance / Acess through SECOMEA		o
E-MAIL and SMS Events / Alarm		o
EQUIPMENT		
Turn Key Solution (Skid and Container Mounted)		o
Air Compressor and Treatment		o
Gas Booster from 10 bar to 300 bar		o
Filling Station and Bottle Rack		o
Food / Medical Grade Filter Pack		o
ON – OFF SPEC Control		o
Multi-Purity Switch		o
VARIO (Efficient Cycle Control)		o

HELISYS®

HELIUM RECOVERY & PURIFICATION

He

GENERATORS

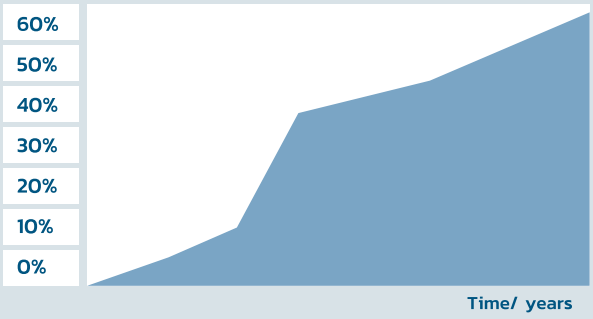
HELISYS®

HELIUM PURIFICATION

DESCRIPTION

Helium has been a low price resource for many years leading to its ineficient use.
Helium is now a scarce resource and its prices are increasing significantly.

He PRICE EVOLUTION / %



Therefore, solutions for Helium recovery and purification are needed. Helium recovery alone is not the answer to this problem, as Helium purity decreases at each process cycle and needs to be released when minimum purity level is reached.
SYSADVANCE developed an Helium purification system – **Helisys** – using PSA technology.
These units allow the achievement of high purities, high recovery rates, and huge savings in costs associated with Helium usage.

ADVANTAGES

- Huge savings on Helium cost;
- Short payback period;
- High Helium recovery rates;
- High and constant purity;
- Also suitable for He / N2 mixtures;
- Easy and quick integration with existing recovery systems.

Large range of models and purities available.

TECHNICAL SPECIFICATIONS

- Flowrates: from 2 – 1000 m^3/h;
- Helium purity: up to 99,9%;
- Minimum Helium recovery: 95%;
- Helium storage: up to 300 barg;
- Power consumption:
  < 0.40 kWh/m^3 of purified Helium
  @ 6.5 barg;
- Options: TCD Helium analyser
  Storage bag available.

HELISYS®

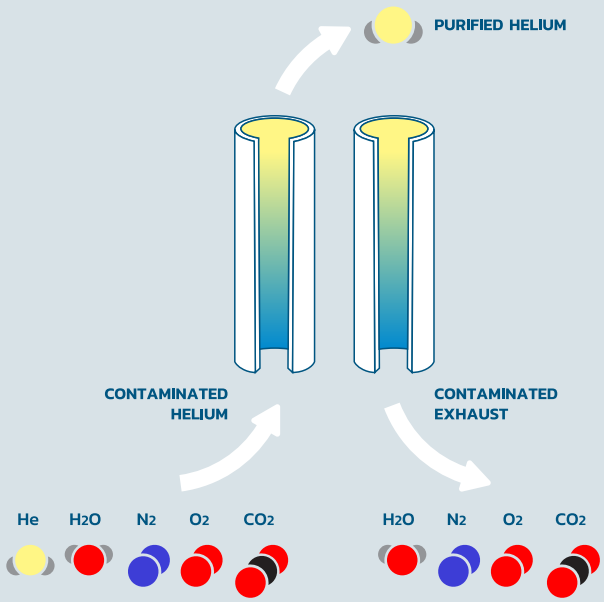
HELIUM PURIFICATION

PSA TECHNOLOGY

Contaminated Helium is fed to the **Helisys** unit that uses Pressure Swing Adsorption technology to remove N_2, O_2, Ar, H_2O and CO_2.

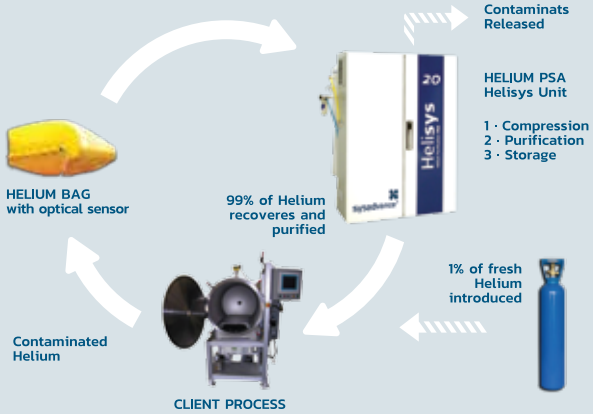
The **Helisys** unit contains two columns packed with a selective adsorbent. Each column undergoes a cyclic sequence of high and low pressure steps, to produce a continuous flow of high purity Helium. The adsorbent regeneration step is assisted by a vacuum system to enhance the process efficiency. The residual Helium desorbed during the regeneration step is recycled into the Helium baloon, resulting in minimum Helium recovery rates of 95%.

The **Helisys** unit is fully automated and controlled by a PLC.

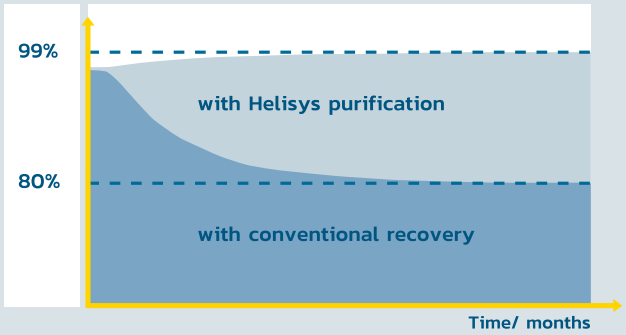


HELISYS VS. CONVENTIONAL RECOVERY

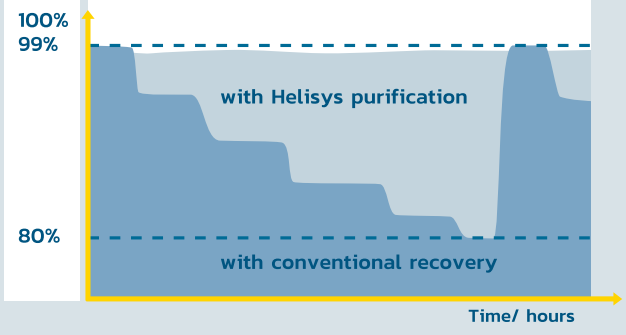
	HELISYS®	CONVENTIONAL RECOVERY
REMOVED CONTAMINANTS	N_2, O_2, CO_2, H_2O, Oil	H_2O
RECOVERY	99% Constant	Decreases down to 80%
DEW POINT	–40° C Constant	Up to +3° C
PURIFICATION	YES	NO
PURITY	Constant (up to 99,5%)	Variable



He RECOVERY / %



He PURITY / %



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