

## Nitrogen Generators

### Pressure Swing Adsorption (PSA)

*Nitrogen On Demand*

*Largest Product Offering*

*Highest Efficiency*

*Highest Purity*

*Proven Dependability*



# Nitrogen Generators — Highlights & System Features

## HIGHLIGHTS

- ✓ Proven designs with over 40 years experience, GENERON® s building one of the world's largest portfolio of nitrogen generators with units from 34 Nm<sup>3</sup>/h / 22 SCFM to 3,200 Nm<sup>3</sup>/h / 2,030 SCFM.
- ✓ Over 20,000 industrial systems installed worldwide.
- ✓ ISO Certified facilities in Texas and California.
- ✓ Cost advantage of a Generon IGS Nitrogen PSA Generator
  - Cost saving of 50% to 300% over Bulk Liquid, Dewars and Nitrogen Cylinders.
  - No safety or handling issues with bulky high pressure cylinders or dangers of cryogenic liquids
  - No complicated supply contracts with ever escalating charges

## SYSTEM TYPES

GENERON supplies two types of PSA Generators:

- Sequential PSA Nitrogen Generators
- Twin Tower Nitrogen Generators

GENERON technical specialist will accurately select and size your system to meet your specific requirements.

## OPTIONS

- Refrigerated Dryer
- Oxygen Analyzer
- Product Flow Meter
- Air Receiver Tank
- Nitrogen Buffer Tank
- Bottle Filling Station
- Product Booster Compressor
- Feed Air Compressor
- Enhanced PLC with Telemetry
- Dew Point Analyzer
- Classified or Unclassified Areas
- Skid –Mounted Receiver Vessels

## KEY FEATURES

- Purities up to 99.9995%
- Automatic part load operation to 30% of design capacity
- Exhaust Muffler
- PLC Piping & Instrumentation
- Safety Valve
- Nitrogen Pressure and Flow Regulator
- Control System
- Skid Mounted
- Hour Meter
- Air Filters
- Adsorber Vessels
- Fully automated unattended operation
- Pneumatic Valves
- Pressure Switch for automated Idle-Mode

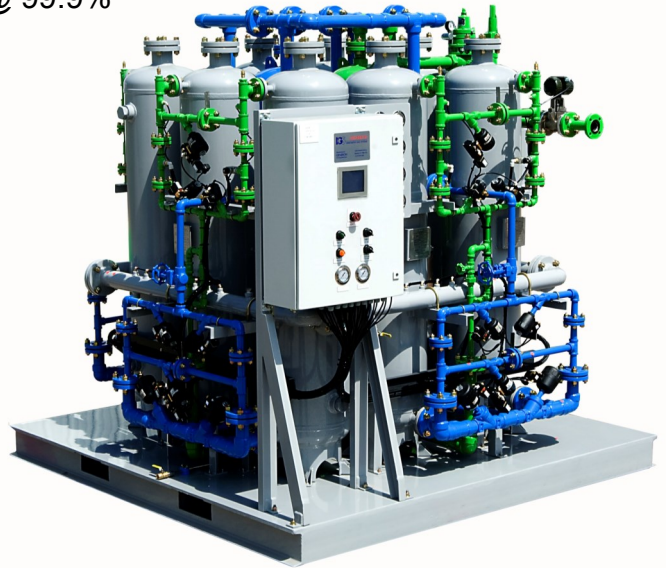
# Nitrogen Generators - Standard Systems

## Nitrogen Sequential PSA Series

The Nitrogen Sequential PSA process consists of multiple individual Twin Tower Adsorber Vessels operating on alternating cycles. By utilizing this sequential operation of the individual PSAs, the requirement of large buffer tanks is eliminated from the process.

**Input Pressures:** up to 1450PSIG (10.3 barg)  
**Output Pressures:** up to 120 PSIG (8.3 barg)  
**Flows:** up to 374,550 SCFH (9,850 Nm<sup>3</sup>/h) @ 99.9%

Applications include FNLG, FPSOs, Platforms & anywhere high purity nitrogen is needed & space is a factor.



## Nitrogen Twin Tower PSA

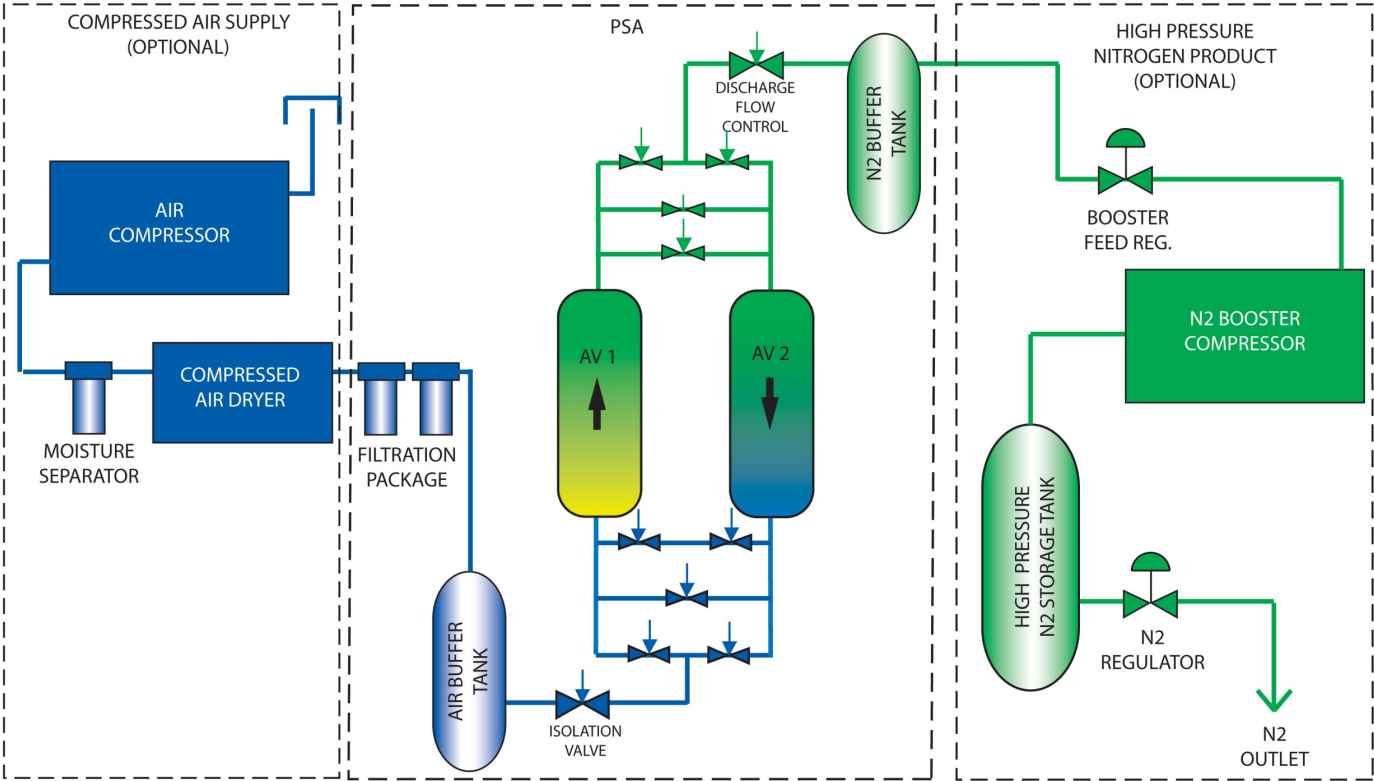
Using the most efficient Carbon Molecular Sieve on the market to date, our Twin Tower PSA System provides

**Input Pressures:** up to 150 PSIG (10.3 barg)  
**Output Pressures:** up to 120 PSIG (8.3 barg)  
**Flows:** up to 44,166 SCFH (1,160 Nm<sup>3</sup>/h) @ 99.9%





# Nitrogen Generators—PSA System Components



# Nitrogen Generators — PSA Technology

GENERON has over 40 years experience in the design and manufacturing of Pressure Swing Adsorption (PSA) systems. We're at the forefront of this technology and have the flexibility to provide the right package to meet all customer requirements. GENERON® Nitrogen Generator Systems use the basic principle of passing air over adsorbent material which bonds with oxygen to leave a rich stream of nitrogen.

The adsorption separation is accomplished in the following process steps:

## 1. FEED AIR COMPRESSION AND CONDITIONING

The ambient (inlet) air is compressed by an air compressor, subsequently dried by an air dryer and filtered before entering the process vessels.

## 2. PRESSURIZATION AND ADSORPTION

The pre-treated air is passes into a vessel filled with Carbon Molecular Sieve (CMS) where the oxygen is adsorbed preferentially in the CMS pores so that nitrogen with an adjustable purity (down to a residual O<sub>2</sub> content of 50 ppm) remains in the gas stream. Before the adsorption capacity of the CMS is fully utilized, the nitrogen separation process is interrupted, and the switching of the adsorber vessels is initiated.

## 3. DESORPTION

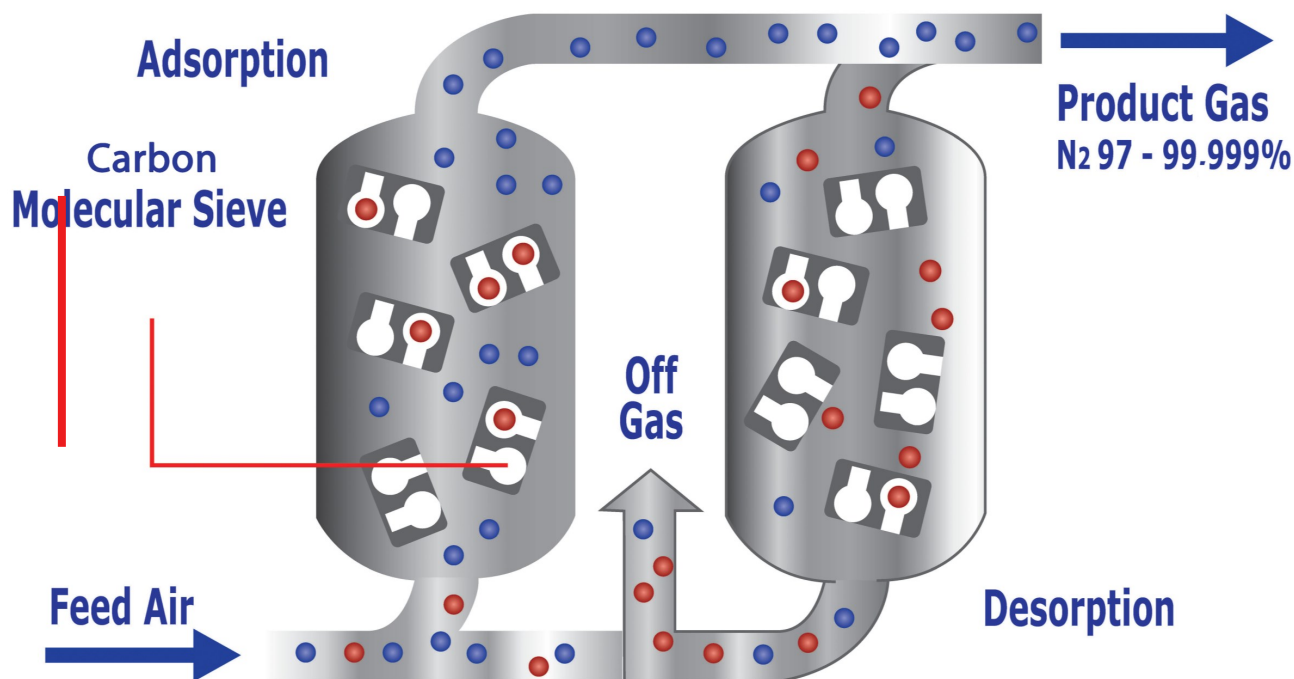
The saturated CMS is regenerated (i.e. the adsorbed gases are released) by means of pressure reduction below that of the adsorption step. This is achieved by a simple pressure release system. The resultant waste stream is vented into atmosphere. The regenerated adsorbent can now be used again for the generation of nitrogen.

## 4. NITROGEN RECEIVER

Adsorption and desorption take place alternately at equal time intervals. This means that the continuous generation of nitrogen can be achieved with two adsorbers, one being switched at adsorption and the other at regeneration. Constant product flow and purity is ensured by a connected product buffer vessel that stores the nitrogen at purities up to 99.9995% and pressures up to 8.3 bar (g) / 120 PSIG.

## 5. NITROGEN PRODUCT

The result is a constant stream of on-site produced high purity nitrogen at cost significantly below that of liquid or bottled gases.



# Nitrogen Generators — Which Technology to use?

GENERON is in an unique position, where we offer both Nitrogen PSA Systems and Nitrogen Membrane Systems.

Our sales and engineering team will be with you to help you decide which technology is right for your application.

GENERON has been designing and manufacturing both PSA and Membrane systems for over 40 years.

**Generon IGS Selection Chart**

System Type	Purity	Pressure	Ease of Operation	Ambient Temperature
<b>Pressure Swing Adsorption (PSA)</b>	PSAs are ideal for generating high purity nitrogen up to 99.999%	Product delivery pressures up to 170 PSIG (11.72 barg)	PSA reliable, having 8 switching valves.	PSA performance declines as temperature rises to a max of 104°F (40°C) (% depending on product purity).
<b>Hollow Fiber Membrane</b>	Membrane Systems are ideal for generating nitrogen between 95% and 99%	Pressures available up to 500 PSIG (34.47 barg)	Membrane systems are relatively simple with no moving parts to maintain	Membrane Systems perform well up to 145°F (63°C) with no performance loss

## So Why GENERON?

### COST SAVINGS

**You can save up to 300% of Nitrogen costs by generating your own nitrogen on-site.**

By generating your own nitrogen on site, you can dramatically reduce your nitrogen consumption costs.

Save on:

- Delivery Costs
- Bulk Liquid Evaporation Loss
- Monthly Cylinder / Tank Rental Fees
- Handling and Purchasing Costs
- Site Liability Insurance

### RELIABILITY / EXPERIENCE

The key to making the investment in nitrogen Generation equipment is purchasing from a dependable company. GENERON has thousands of systems that have been installed worldwide.

GENERON has over 40 years of experience of designing and manufacturing Pressure Swing Adsorption (PSA) systems. Our systems have are designed for on shore and offshore applications.

# Other Generon® Products

## Primary Compression Packages

All custom designed to your specifications



## Twin Tower Desiccant Air Dryers

Custom designed to your specifications in the Oil & Gas and Petrochemical Industries.



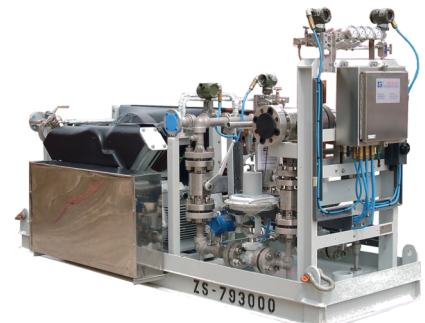
## Nitrogen Membrane Generators

Available in flows up to 4,000 SCFM



## Post Compression Packages

Custom designed systems available up to 5,000 PSIG



## Process Gas Separation Systems

Membrane and PSA systems available, H<sub>2</sub>, CH<sub>4</sub>, CO<sub>2</sub>, He, SF<sub>6</sub>



## Booster Compressors

Custom systems available to meet your specifications with Zone II rating, Class I, Div II





General Mills  
POET Engineering  
Airgas  
La Fabril  
Valley National Gases  
Acamp  
Omega Nutrition  
Dometic USA  
Elab  
Metal Tech  
Seadrill Offshore  
Agilent Technologies  
Scott Gross Welding  
Celta  
Advanced Composites  
ITASA  
Mohawk  
BJ Services

General Electric  
Spectrum Controls  
Delphi  
Ecka Granules  
Proton Energy  
Northwest Equipment  
Mahle  
DJA  
Ansen Corporation  
Conelec of Florida  
Cenovus Energy  
PCC Airfoil  
Innomag  
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Ecka Granules  
One Source Toxicology  
Precision Air Drilling

3M  
Ormex  
City of Springfield  
Micross  
Sugar Foods  
Criteria Labs  
Matheson Trigas  
Lacamas Labs  
ADM  
King Nut  
Welsco  
Utah State University  
Auburn University  
US Air Force  
US Army  
US Navy  
Fuji Film  
Weatherford

## Contact Information

### SALES, RESEARCH & MANUFACTURING

#### Generon® IGS

16250 Tomball Parkway  
Houston, Texas 77086  
+1.713.937.5200 (phone)  
+1.713.937.5250 (fax)  
igssales@generon.com  
www.igs-global.com



#### Generon® IGS - CA

992 Arcy Lane  
Building 992  
Pittsburg, California 94565  
+1.925.431.1030 (phone)  
+1.925.439.3811 (fax)  
igssales@generon.com



#### IGS SMC Asia Gas Systems Co. Ltd

Shunfeng Rd., Shuangliu Aviation  
Zone Chengdu, Sichuan, P.R.China  
610225  
+86 28 8588 2034 (phone)  
+86 28 8588 2037 (fax)  
+86 1390 8180 491 (cell)  
hubo@smc-igs.com  
www.smc-igs.com



### SALES

#### Generon® IGS Europe

c/o WWBC Business Center.Koenigsallee 14  
D-40212 Duesseldorf / Germany  
+49 211 13 866 293 (phone)  
+49 211 13 866 294 (fax)  
+49 172 25 04 759 (cell)  
rgester@generon.com  
www.igs-global.de

#### Generon® IGS Middle East

Mister Denish Nambiar  
+971.56.7146074 (cell)  
dnambiar@generon.com

#### Generon® IGS Korea

Represented By:  
PMG Corporation Ltd  
James Jung, President  
#811 Doosan The Zenith Square  
Haeundae-Gu Busan Korea  
+82 70 4320 7441 (phone)  
+82 51 702 5911 (fax)  
pmg@pmgkorea.net  
www.igskorea.co.kr