SY GREEN ENERGY

ONSITE NITROGEN GAS GENERATION PLANT

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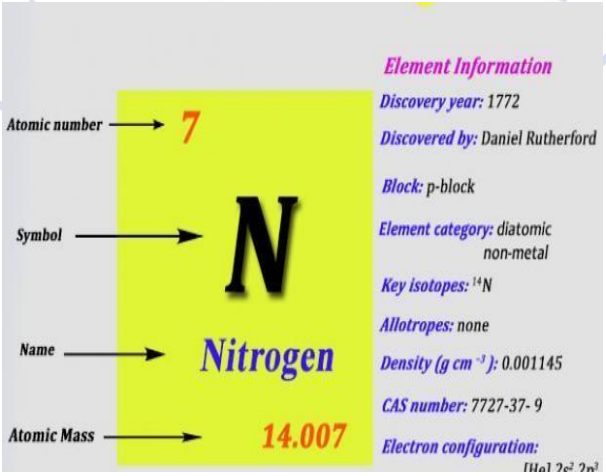
SY GREEN ENERGY is pleased by your presence to have a Pressure Swing Adsorption (PSA) type Nitrogen Generation Unit. This simple machine provides a cost-effective means for the on-site generation of nitrogen. The Nitrogen Generation Unit is based on the latest PSA technology and utilizes Carbon Molecular Sieve (CMS) to separate the nitrogen from the other gases contained in the air. The Nitrogen Generation Unit uses two beds of CMS to separate compressed air into a high-pressure nitrogen product stream and a low-pressure oxygen-enriched waste stream. Pre-Filter and Fine filters are included to remove impurities from the feed air. Each Nitrogen Generator comes pre-tested and fine-tuned to meet the customer-specified nitrogen flow rate and purity. Since the system contains very few moving parts, maintenance and repairs are minimal. Maintenance is simple yet necessary. Air compressor and filter maintenance procedures are especially important and should be followed carefully. If the recommended maintenance procedures are followed, your nitrogen generation Unit will provide you with many years of reliable service.

What's Nitrogen?

Nitrogen is a naturally occurring elements essential for growth and reproduction in plants and animals. It is found in amino acids that make up proteins, in nucleic acids, that comprise the hereditary material and life's blueprint for all cells, and in many other organic and inorganic compounds.



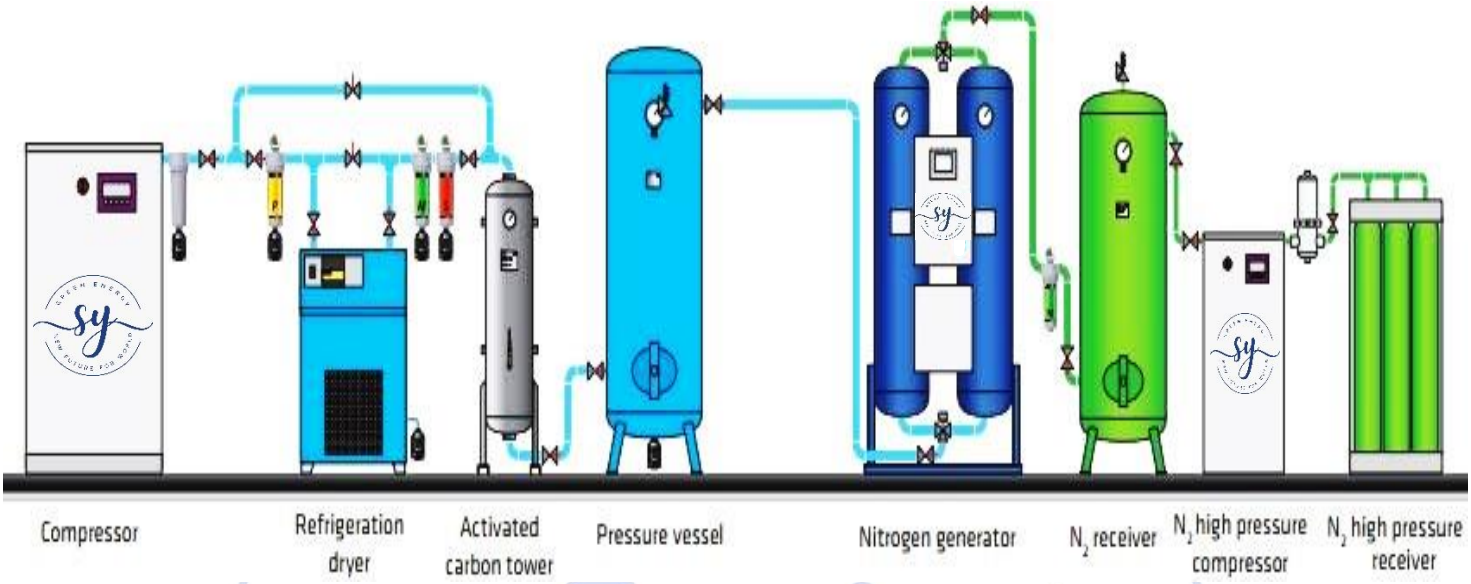
In addition, nitrogen comprises about 78% of the Earth's atmosphere.

The Forms of Nitrogen

To appreciate the intricacies of nitrogen loading to coastal waters, some understanding of how nitrogen reacts chemically in the environment may be useful. Nitrogen is an element that can combine with itself or with other elements to make different compounds. For instance, nitrogen gas, N_2, is a compound made when two nitrogen atoms form a chemical bond. It makes up about 78% of the atmosphere, while oxygen gas, O_2, makes up a little less than 20.9% of the atmosphere. So, nitrogen gas is very common and plentiful. However, only a specialized group of bacteria, and industrial fertilizer manufacturers, can "fix" this largely inert compound into biologically useful nitrogen compounds. Fertilizer production now exceeds natural nitrogen fixation, making N_2 available to the biosphere.

The Technology

Our Nitrogen Generators operate on Pressure Swing Adsorption, commonly known as P S A Technology. PSA Technology is based on the selective adsorption phenomena of gas molecules under pressure on the surface of the highly porous and efficient adsorbent, in this case of Nitrogen Generation the Adsorbent is a carbon-based Molecular Sieve (C.M.S.) In PSA System when compressed air is passed through an adsorption tower field with C.M.S. the molecules of oxygen, moisture & other unwanted gases are adsorbed on the surface of C.M.S., and Nitrogen which is not adsorbed by C.M.S. comes out of adsorption tower and is collected in a surge vessel. For a continuous generation of nitrogen, two Adsorption towers are provided which are interconnected with Auto-change over valves controlled by PLC in the control panel. After saturation of one tower with oxygen the process automatically changes over to another tower and thus the nitrogen production is continuous. Our systems are the best ones in the industry to ensure the highest efficiency, User-friendly design, Reliable Economical, and Durable. Our onsite nitrogen generators are custom-made and can be adjusted to give the desired nitrogen quality for your process and application.



Safety Features and Audio-Visual Alarms

The Nitrogen Gas Generator is Skid Mounted and Pre- commissioned at our works and is fully Automatic and requires virtually no attention from the Operator. Once started it can be left unattended. All operations take place automatically and Nitrogen Purity remains very consistent. In case of any abnormality, the gas Generator would trip automatically with Audio Visual Alarms for Necessary action. In case of Storage Tank Getting Filled the Gas Generator Goes to Sleep and restarts Once the pressure in the storage tank is Reduced to the set Limit.

Audio Visual alarms in our Standard System

- Air Compressor Trip
- Low Feed Air Pressure & High Air Inlet Pressure
- Low Surge Tank Pressure
- High & Very High Oxygen Content - 2 Set
- High Moisture Content (Optional)
- High Storage Tank Pressure

The System Start with Only Three Switches

Control On - To Energize the Control Panel

System On - To Start the System or Gas Generator

Nitrogen On - To Start Feeding Nitrogen to your System

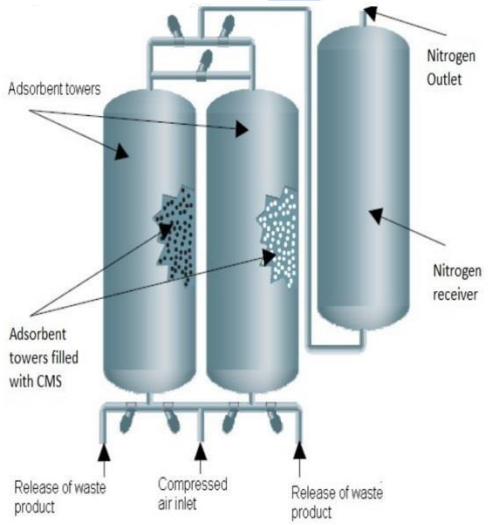
Onsite Nitrogen Gas Generation Plant

PSA Technique Nitrogen PSA process can be described with the 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 to pass through the sieves. The resulting high-purity gas is stored in the buffer tank.

1. Compression, drying, and filtering of input air:

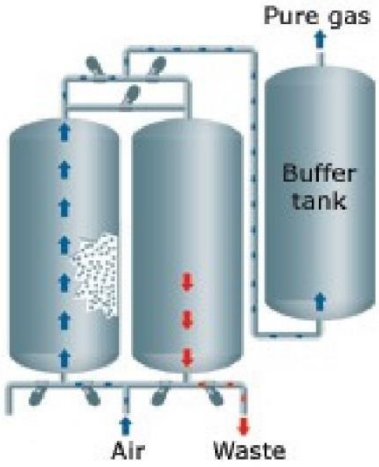
The ambient air is compressed by an air compressor. Before entering the PSA process the compressed air is dried and filtered.



2. Oxygen adsorption on CMS bed:

Our PSA units have two cylinders filled with Carbon Molecular Sieve. (CMS).

Compressed and purified air flows through the cylinder, and the CMS bed adsorbs oxygen, while nitrogen passes through to the nitrogen accumulation tank. The adsorption process is interrupted before the CMS becomes saturated with nitrogen by diverting the input air to the second cylinder, which at this point starts producing nitrogen.
During this step of the cycle, the second cylinder (right) is cleaned.

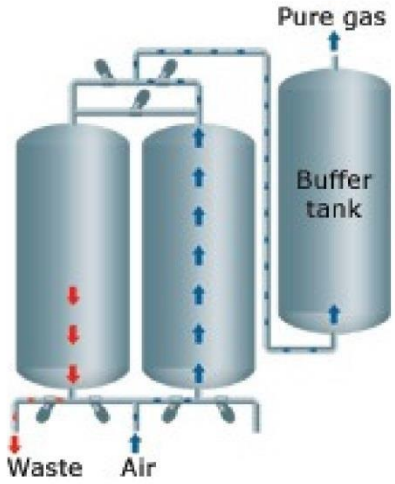


3. Next, the pressure between the two cylinders is equalized.

4. Oxygen desorption and CMS bed regeneration:

The CMS of the first cylinder (now saturated with oxygen) is regenerated by reducing pressure in the cylinder below that of the adsorption step. The adsorbed oxygen is released and vented into the atmosphere.

After this step, it is again ready for another cycle.



5. Nitrogen accumulation in the Surge tank:

Adsorption and desorption steps are repeated in the CMS tanks at equal time intervals.

A constant flow of nitrogen is stored in a nitrogen surge tank.

Standard Scope of supply

- Air Intake after cooler, Moisture separator, Prefilter, Auto Drain valve& Wet Air Receiver
- Twin Tower Desiccant based Air Dryer or Refrigerated Air Dryer (Optional)
- Dry Air Receiver with Pressure Gauge, Pressure Switch, and Candle type After Filter
- Twin Tower P.S.A. Module with Automatic Pneumatically Operated Changeover valves, Pressure Gauges & Interconnecting Piping, Surge Vessel with Instruments& Drain valve
- C.M.S. (CARBON MOLECULAR SIEVES) One Charge filled in P.S.A. Adsorption Towers
- Flow meters with Flow control valve, Nitrogen Three Way Vent Valve NRV, and Back Pressure Controller
- Centralized control panel with PLC / Sequence Programmer and Fault Indications Lamps

- Online Oxygen Analyzer with settable high oxygen and very high oxygen alarms

Upstream Equipment for Feed Air

In case the Feed Compressed Air required for Nitrogen Generator is not available from your centralized air supply you will be required to attach the following upstream equipment.

Choose Between a Screw or Reciprocating Compressor

Packaged Screw Compressor Air Cooled Lubricated Electrically Operated Silent, complete with integral Instruments & Starter Panel along with oil filters (needs no foundation and is vibration free) OR Oil free Water-Cooled Reciprocating Compressor with its Standard Accessories, Electric Motor, Drive Arrangement, Foundation Bolts for Grouting it to Foundation, with Instrument Panel and Separate Motor Starter Panel

Downstream Equipment for Nitrogen Purification

Nitrogen required with oxygen content in PPM level following downstream types of equipment can be added.

1. Palladium-based De-Oxo System for Oxygen up to Less than 2 ppm and Dewpoint up to Minus 70 Deg C

2. Copper-based De-Oxo System for Oxygen up to Less than 1 ppm and Dewpoint up to Minus 70 Deg

Allied Equipments / Accessories

Ammonia Crackers & Manifolds

Gas Analyzers

Storage Vessels

Gas Purification & Mixing Stations

Gas Boosters for 30 Bar, 70 Bar 150 Bar 300 Bar

Models for Onsite Skid Mounted SY GREEN ENERGY

Pressure Swing Adsorption Nitrogen Gas Generator

MODEL	NITROGEN GAS PURITY				
	98.00%	99.00%	99.50%	99.90%	99.99%
SY- 005	8	6	5	3	1.7
SY- 010	16	12	10	6	3.3
SY- 015	24	18	15	9	5.0
SY- 020	32	24	20	12	6.7
SY- 025	41	30	25	15	8.3
SY- 030	49	36	30	18	10
SY- 040	65	48	40	24	13
SY- 050	81	60	50	30	17
SY- 060	97	72	60	36	20
SY- 075	122	90	75	45	25
SY- 100	162	120	100	60	33
SY- 125	203	150	125	75	42
SY- 150	243	180	150	90	50
SY- 175	284	210	175	105	58
SY- 200	324	240	200	120	67
SY- 250	405	300	250	150	83
SY- 300	486	360	300	180	100
SY- 400	649	480	400	240	133
SY- 500	811	600	500	300	167
SY- 1000	1620	1200	1000	600	335
Nit/Air Ratio	45 %	38 %	34 %	25 %	18 %

Note: The Figures above are the capacity (in Nm3 /hrs) of Nitrogen Generated at Various Purity.

Model	98%	99%	99.5%	99.9%	99.99%	99.999%	Weights(kgs)
SY-200-10	65	48	40	24	13	8	1100
SY-200-20	130	96	80	48	26	16	1700
SY-200-30	195	144	120	72	39	24	2300
SY-200-40	260	182	160	96	52	32	2900

Dimensions (mm) [Front (width) X Length X Height]

APM – 200-10: 1250 X 1200 X 2200,

APM – 200-20: 1250 X 1800 X 2200

APM – 200-30: 1250 X 2400 X 2200

APM – 200-40: 1250 X 3000 X 2200

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