



**Heat Treating Solutions**

**LSN2.com**

## The Most Reliable, Bullet-Proof Nitrogen Generators in North America...PERIOD.

A big claim? Yes, but backed up and proved by more than 6 million hours of installed machine usage, with 99.9+% uptime, and further backstopped by Liberty Systems 24/7, customer-delighting field support...all made transparently real to you by our many "happy customer" references from tough-to-please general managers, engineers, maintenance techs, and business owners, and available to you in our proposals.

We like to make your inner bean-counter happy, with a laser focus on delivering you maximum cost savings versus purchased nitrogen gas to make your generator investment payback quickly to the bottom line, plus we fulfill on the inherent promise of N2 generation, which is always available, never run out of gas convenience and a much safer work environment versus the cost, hassle, and contract headaches associated with buying nitrogen via traditional suppliers.

Your typical GN2 desktop engineer hasn't lived the life of the maintenance and support mechanic, we have and you benefit from this know how. To top off our machine reliability crusade, our founders insisted that their machines be built under rigid ISO 9001 quality standards, in place and certified since 2008.

### Series P

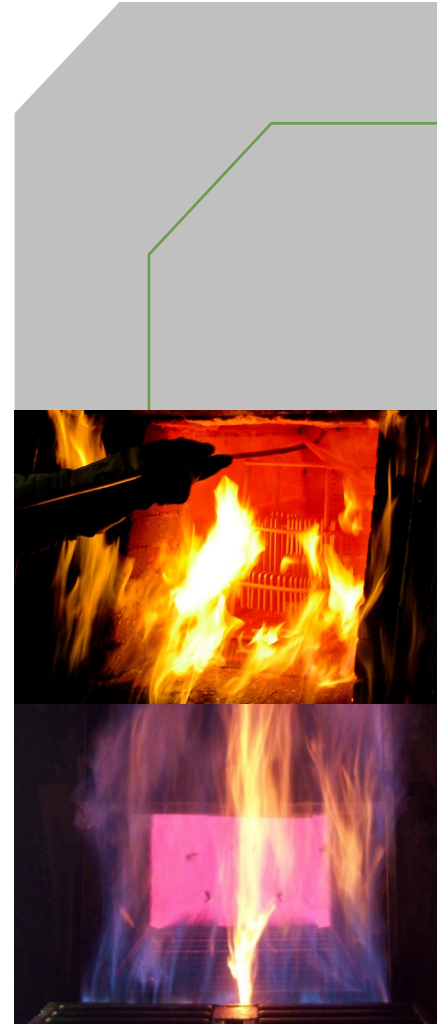
Our Series P nitrogen gas generators are based on pressure swing adsorption (PSA) technology. Series nitrogen gas generators have the ability to produce higher purity nitrogen and greater flow rates than our Series M nitrogen gas generators. Typical delivery pressures of 6 barg (87 psig). Standard purities of 99.5% with the option of up to 99.999%.

A proprietary technology called advanced media tube (AMT) is installed in each of our nitrogen columns. This allows the compressed air entering the columns to achieve a dew point of -40°C (-40°F) thus extending the life of the carbon molecular sieve (CMS). There is no purge loss in the drying process as would be typical with a desiccant dryer thus saving compressed air and energy.

All series P nitrogen gas generators include an integral percent or ppm type oxygen analyzer and incorporate a 3-way ball valve at the outlet to allow a backup nitrogen source to be connected. With proper preventive maintenance, quality supply air and our proprietary media blend that is part of the pre-filtration system, series P nitrogen gas generators are expected to have a life of more than 10 years.

### Experience

Liberty Systems unwavering dedication to results defines our products and offers an impressive portfolio of gas products. Our ISO 9001 management processes, quality control methods, and our dedication to the advancement of separation technology ensure that our clients' most complex projects are delivered on time. As a result, we enjoy enduring relationships with our existing clients, as well as a constant flow of new business.



Series P							
	Flow SCFH					Air Comp (kW)	Dims (L x W x H)
	99.99%	99.95%	99.90%	99.50%	99.00%		
<b>P3-F2200</b>	994	1305	1553	2331	2796	22	12' x 8' x 8'
<b>P3-F3000</b>	1243	1625	1950	2600	3500	30	12' x 8' x 8'
<b>P3-F4000</b>	1492	1950	2300	3200	4200	40	12' x 8' x 8'
<b>P11-V1100</b>	1988	2600	3100	4200	5500	45	12' x 8' x 8'
<b>P11-V1500</b>	2486	3250	3900	5200	7000	57	16' x 8' x 8'
<b>P11-V2200</b>	2984	3900	4650	6400	8400	75	16' x 8' x 8'

\*Larger Systems Available Upon Request

## Selection

Determining the proper size of a nitrogen generator is not as simple as it seems. The local compressed air guy certainly knows a lot (we hope) about compressed air systems. They may even be able to get a nitrogen generator manufacturer on a conference call to explain how the system works but it is unlikely they know anything about heat treating, whether it is annealing, nitrating or aging. We have been living nitrogen generation for 15 years. Are you looking for a piece of equipment or a solution?

We ask the right questions to ensure you are getting what you want. We design, build and produce the most reliable nitrogen generators...Period.

## Autoclaves

As the production of carbon fiber and composite components grows significantly due to the increasing demand for lighter weight materials, especially in aerospace applications, the use of autoclaves to process the parts continues to grow. Consequently the use of nitrogen generators to provide an inert atmosphere and pressure during the curing process becomes critical to the operation. Because of the unique cycles of the various composite curing processes in the autoclaves, the operating parameters, such as autoclave volumes, instantaneous flow rates, pressures, purity, fill times, overall duration, and number of autoclaves are all critical to understand.

A thorough understanding of the overall operational requirements allows a nitrogen generator to be properly sized to provide reliability in meeting production schedules and quality of these expensive parts, while also ensuring safety in the use of nitrogen. Many manufacturers use nitrogen generators to provide an inert atmosphere for pressurizing their large autoclaves.

## Annealing

Nitrogen, typically the main atmosphere component, provides the inert base that prevents undesirable reactions from occurring. Often, a reducing agent such as hydrogen or a hydrocarbon is added to adjust atmosphere reducing potential. Using a nitrogen generator to provide the inert base for electrical steel annealing, providing up to 100% off the atmosphere or blending with hydrogen up to 15% or if annealing a nonferrous material maybe as little as 75% nitrogen and 25% dissociated ammonia.

## Brazing

Nitrogen is used as the carrier gas with small percentages of hydrogen as the reducing agent. Small additions of hydrocarbon may be added to control and reduce the dew point to compensate for decarburization if required. Stringent control over the dew point to hydrogen ratio allows for the brazing of high-carbon steels, stainless steels, and nonferrous metals.

## Quenching

Liberty Systems has developed high pressure gas quenching solutions to meet the exacting demands of low pressure vacuum carburizing technologies. Gas quench capabilities up to 580 psig using nitrogen can be provided. Specific equipment is recommended based on the type and volume of gas required. High-pressure gas storage can be custom designed and optimized to satisfy the specific requirements of the process and quench frequency.

## Nitriding, Carburizing and Hardening

Nitrogen, methanol, and/or a small amount of enriching gas are blended at the furnace to provide a furnace atmosphere essentially identical in composition to that of endothermic. By varying the amount of enriching gas, the furnace carbon potential can be adjusted to meet your specific atmosphere requirements. Using a nitrogen generator to supply the nitrogen for carburizing, neutral hardening, carbonitriding, nitriding and nitrocarburizing.



## Extended Warranty

Liberty Systems offers the best extended warranty in the industry. How can we do this, simple, build a package that is strong and dependable. It is in our best interest that the system we provide you is worry free and keeps producing. The last thing we want is our name, one of the most recognized in the industry, to get tarnished because the system your down.

Liberty Systems offers an optional “up to” three year warranty. For you to capitalize on this, all we ask is you perform the preventive maintenance as scheduled, document that the maintenance was performed and submit an oil sample to an independent lab for analysis. Why the oil sample, because, reading an analysis of your oil we can determine if condensation, metal fragments or possibly a high acid content is present. If there is a high acid content, which can damage the air compressor, we can find the source and eliminate it before something catastrophic happens.

For us, it is about being proactive, we have a team in our after sales support group that are in communication with your maintenance team so you can enjoy worry free operation of your equipment.

*Below is a portion of the three year warranty agreement. The entire document is available upon request.*

### The Three Year Warranty program is contingent on the following provisions:

The optional “Three Year Warranty” program applies to Liberty Systems Series D5, D7, D9, M5, M7, M9, P5, P7, P9 and P11.

- Liberty Systems’ normal warranty policies and procedures concerning warrantable failures, credits for labor, travel and mileage and freight charges apply to the warranty period and are as follows:
  - Stage one: **Parts and labor.** Months one (1) through (24) twenty-four from date of startup or (30) thirty months from date of shipment.
  - Stage two: **Parts only.** Months (25) twenty-five through (36) thirty-six from date of startup or (42) forty-two months from date of shipment.
    - Stage two labor, lodging, travel expenses and meals will be billed as a direct pass through to the customer during the extended warranty period.

To qualify for the “Three Year Warranty”, a customer must purchase preventive maintenance items and perform preventive maintenance requirements. The customer must keep detailed records as to what and when preventive maintenance was performed.

To qualify for the “Three Year Warranty”, a customer must purchase the first 4000 hours of preventive maintenance items from Liberty Systems at the time of system purchase.

- Should the customer exceed 4000 hours of operation within any twelve (12) month period, additional preventive maintenance items shall be required.

To extend the warranty into subsequent years, the customer shall continue to purchase preventive maintenance items as required through the term of the “Three Year Warranty” agreement.

To further qualify for the Liberty Systems “Three Year Warranty” program, the customer must submit an oil sample for analysis every 2000 hours during the term of the warranty period.

## Cost Analysis

Every solution we provide comes with a cost analysis. We try to gather as much information as possible to show a true representation of the money saved when investing into a nitrogen generator from Liberty Systems. For us to be accurate we will typically request what you currently pay for liquid N2, cost of your power, hours of operation and what type of process or processes you use. We include in the analysis the anticipated preventative maintenance costs and power.

Below is a Liberty Systems customer consuming about, on average 2000 cubic feet per hour (scfh). Power cost is \$0.10 per kWh, operating 3000-4000 hours per year and the client was contractually held hostage by the gas company paying an absurd amount of \$0.79 per ccf for the micro-bulk supply of liquid nitrogen. \$50K or more savings annually, less than 24 months payback, now that is ROI!

Analysis			
Monthly Liquid Nitrogen Expense (LN2)		Generated Nitrogen (GN2) Cost Analysis	
Current Cost per 100 cubic feet (ccf)	\$0.79	GN2 Nitrogen Cost per Hour	\$3.44
Rental Fees Per Bulk Tank	\$800.00	Monthly Cost	\$1,002.50
Deliveries Per Month	\$4.00	Annual Cost	\$12,030.00
Delivery, Hazmat Fees	\$50.00	<b>Cost per Hundred Cubic feet</b>	<b>\$0.17</b>
<b>Monthly Rental / Delivery and Han-</b>	<b>\$1,000.00</b>		
Liquid Nitrogen Cost Analysis		Generated Nitrogen 7 Year Savings	
Liquid Nitrogen Cost per hour	\$19.23	<b>GN2 Cost per Hour</b>	<b>\$3.44</b>
Monthly Cost	\$5,608.33	<b>LN2 Cost per Hour</b>	<b>\$19.23</b>
Annual Cost	\$67,300.00		
<b>Cost per Hundred Cubic Feet</b>	<b>\$0.79</b>	<b>Annual Savings</b>	<b>\$55,270.00</b>

## Gas Contracts

Do you feel trapped locked into a 7 year product supply agreement with an evergreen clause and unlimited price increases?

With the explosion of fiber lasers in the past few years, we have been watching as gas consumption of those lasers increase. What does that mean? That means that you will most likely be paying more every month for nitrogen. Who is pleased about this? You guessed it, the industrial gas suppliers. They are in the business to make profits. Where do they get that profit from?

I certainly would not want to be locked into agreement like that, but what can you do? All the industrial gas suppliers have the same evergreen clause. It is like all the CEO's of the gas companies were at the country club one day after a round of golf, drinking bourbon and smoking \$100 cigars and the conversation went like this.

CEO #1: "hey, we should make the product supply agreements 7 years".

CEO #2: "yeah, and we should make it almost impossible to get out of it, how about an evergreen clause that renews the contract"?

CEO #3: "That is perfect, we also need to make sure we can give the customer unlimited price increases".

What if you could produce your own nitrogen gas, as much as you need 24 hours per day, 7 days per week? What if you had an in house Nitrogen generator? No more need for that 7 year industrial gas product supply agreement.

For more information about opportunities regarding your application, please contact us or visit our website.

[LSN2.com](http://LSN2.com)



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