

*Nitrogen On
Demand*

NITROGEN GENERATORS



*Largest
Product
Offering*

*Highest
Efficiency*

*Highest
Purity*

*Lowest
Cost*



***From Concept To Completion,
We Sell Solutions!***

NITROSWING® – Nitrogen Generators

OUR TECHNOLOGY

IGS has over 30 years experience in the design and manufacturing of Pressure Swing Adsorption (PSA) plants. We are at the forefront of this technology and have the flexibility to provide the right package to meet all customer requirements. IGS' NITROSWING® 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 adsorptive separation of air 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 passed 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 O₂ 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.

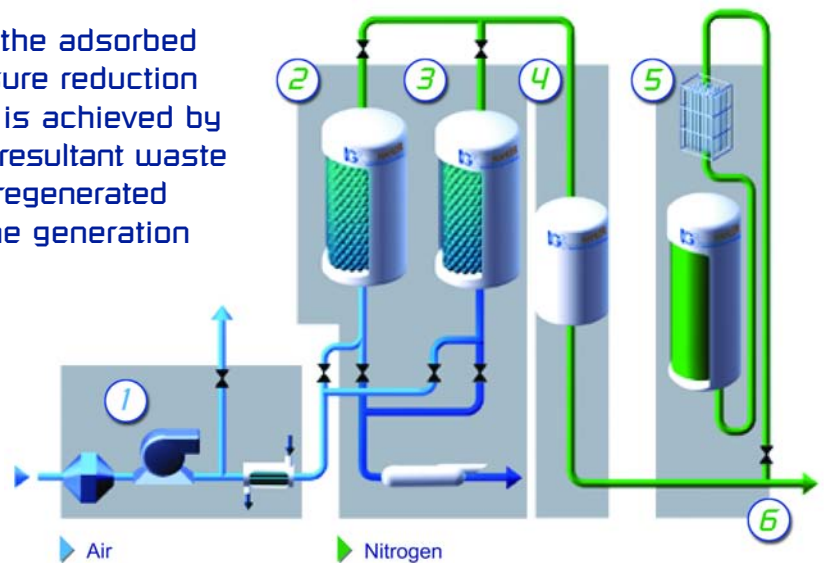
4. NITROGEN RECEIVER

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 99.995% and pressures up to 7.5 bar(g) / 110 psig.

5. OPTIONAL BACKUP SYSTEM

6. NITROGEN PRODUCT

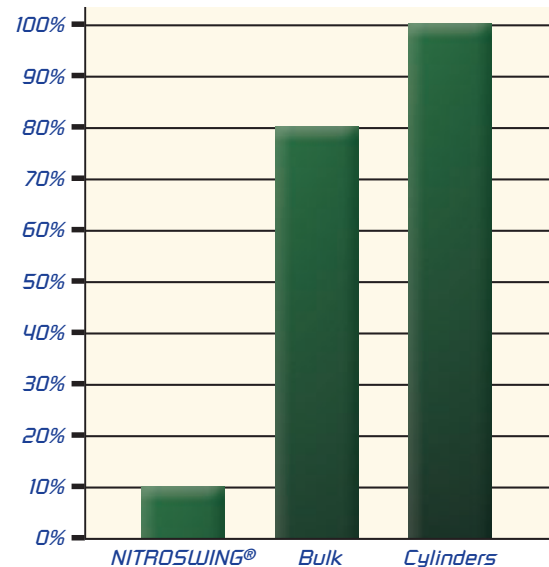
The result is a constant stream of on-site produced high purity nitrogen at cost significantly below that of liquid or bottled gases.



Highlights and System Features

HIGHLIGHTS

- Proven designs with over 30 years experience building one of the world's largest portfolios of nitrogen generators with units starting at 0.6 Nm³/h / 22 scfh
- Over 1,500 industrial systems installed in every part of the globe
- Plants designed for years of trouble free operation. Many plants older than 20 years still have original Carbon Molecular Sieve material
- Cost advantage of a NITROSWING® Nitrogen Generator
 - Cost saving of 70% over Bulk Liquid or 90% over nitrogen cylinders
 - No safety or handling issues with bulky high pressure cylinders or dangerous cryogenic liquids
 - No complicated supply contracts with ever escalating charges



SYSTEM FEATURES

- IGS supplies two types of NITROSWING® nitrogen generator systems:

The economical standard pressure system with output pressure up to 7.5 bar(g) (110 psig) and the High Pressure System for situations where up to 10 bar(g) (145 psig) is required.

- Purities to 99.995%
- Plant capacity to 300 T/D, 10,000 Nm³/h or 380,000 scfh
- Automatic part load operation to 30% of design capacity
- Fully automated for unattended operation
- Delivery pressure to 7.5 bar(g) / 110 psig
- Flexible design for all locations
 - Indoor
 - Outdoor
 - Skids
 - Offshore platforms
- Skidded and containerized systems
- Custom designed systems to meet your exact requirements

Safety:

- ▲ Low Operating Pressure

Economy:

- ▲ Low Operating Costs
- ▲ Low Air Consumption
- ▲ Low Pressure Drop
- ▲ High User Pressure

Convenience:

- ▲ Fully Automated
- ▲ Unattended Operation

Reliability:

- ▲ Easy to Install
- ▲ Easy to Maintain
- ▲ Safe process operation for long CMS life

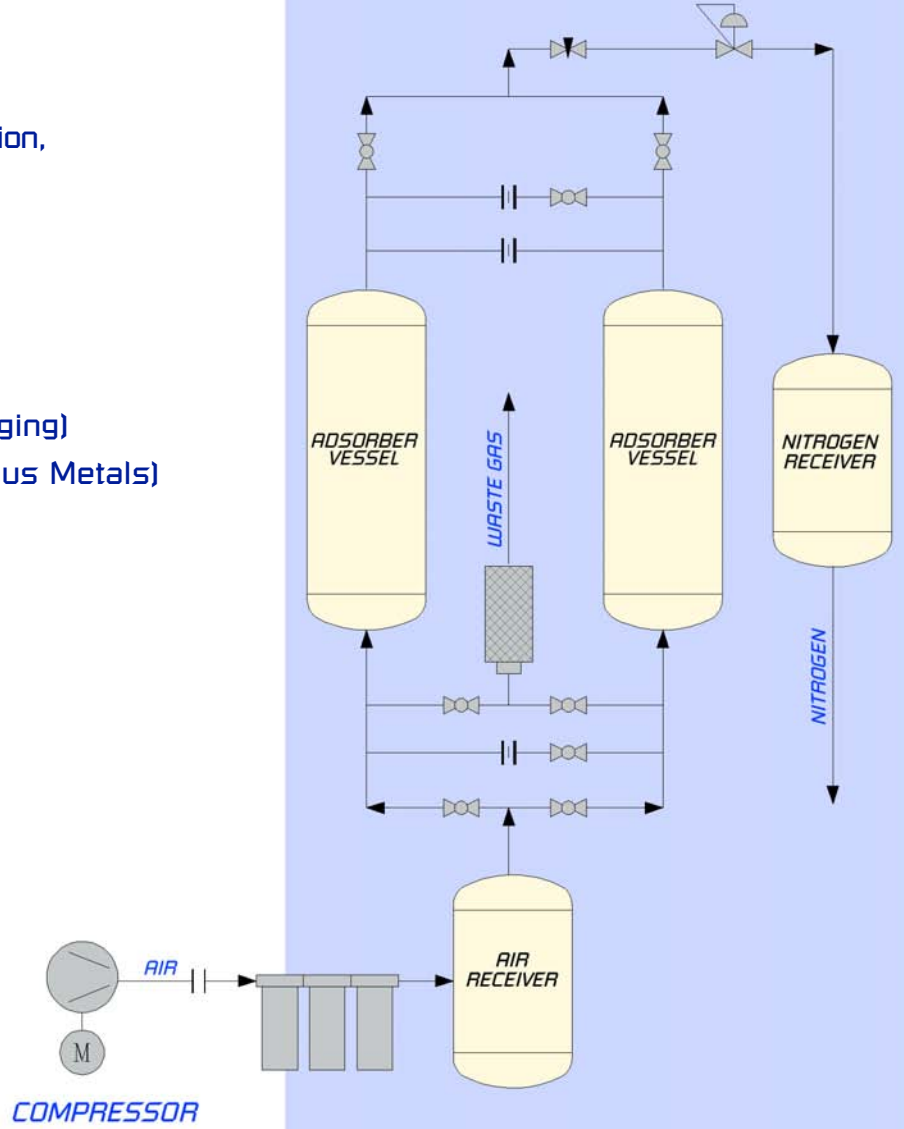
All systems supported by our global service network.



Standards and System Options

STANDARD APPLICATIONS

- Chemical Manufacturing (Blanketing, Material Transfer)
- Electronics (Storage, Furnace Application, Wave Soldering)
- Laser Cutting
- Food Processing & Packaging
- Tire Filling
- Plastics (Injection Molding)
- Pharmaceuticals (Blanketing, Packaging)
- Heat Treatment (Ferrous & Non-Ferrous Metals)



STANDARD COMPONENTS

- Air Filters
- Adsorber Vessels
- Pneumatic Valves
- Piping and Instrumentation
- Safety Valve
- Exhaust Muffler
- Nitrogen Pressure and Flow Regulator
- Control System with Allen-Bradley PLC
- Skid Mounted
- Hour Meter
- Pressure Switch for automated Idle-Mode

OPTIONS

- Oxygen Analyzer (Zirconium Oxide type)
- Product Flow Meter
- Air Receiver Tank
- Nitrogen Buffer Tank
- Fail-Safe Package (off-spec nitrogen automatically vented to atmosphere*)
- Bottle Filling Station
- Purities to 99.9999% with the DeOxo System
- Feed Air Compressor
- Product Booster Compressor
- Monitor Package (with AB PanelView, indicating Product Pressure, Product Temperature, Oxygen Concentration and Product Flow**)
- Enhanced PLC with Telemetry
- Dew Point Analyzer

* Only in combination with Oxygen Analyzer Option
 ** Includes Oxygen Analyzer and Flow Meter

Standard Pressure NITROSWING® Nitrogen Generator Specifications

MODEL	SI 7.5 Bar(g) feed pressure				US Standard 110 PSIG feed pressure			SI 7.5 Bar(g) feed pressure				US Standard 110 PSIG feed pressure		
	Oxygen %	Output		Feed Air Nm ³ /m	Output		Feed Air scfm	Oxygen %	Output		Feed Air Nm ³ /m	Output		Feed Air scfm
		N2 Nm ³ /h	P bar(g)		N2 scfh	P psig			N2 Nm ³ /h	P bar(g)		N2 scfh	P psig	
NS-2	5	3.4	5.0	0.12	130	73	4.5	5	124	5.0	4.36	4722	73	166
	3	2.8	5.5	0.11	107	80	4.2	3	103	5.5	4.02	3904	80	153
	2	2.5	5.7	0.10	94	83	3.9	2	90	5.7	3.78	3418	83	144
	1	2.1	6.0	0.10	78	87	3.7	1	75	6.0	3.54	2860	87	134
	0.5	1.7	6.1	0.09	64	88	3.4	0.5	61	6.1	3.26	2328	88	124
	0.1	1.1	6.2	0.07	42	90	2.8	0.1	40	6.2	2.68	1530	90	102
	0.01	0.7	6.2	0.07	26	90	2.6	0.01	25	6.2	2.49	931	90	95
	0.005	0.6	6.2	0.08	22	90	3.1	0.005	21	6.2	2.99	798	90	114
NS-4	5	6.6	5.0	0.23	251	73	8.8	5	176	5.0	6.17	6678	73	234
	3	5.5	5.5	0.21	207	80	8.1	3	145	5.5	5.68	5522	80	216
	2	4.8	5.7	0.20	182	83	7.6	2	127	5.7	5.34	4834	83	203
	1	4.0	6.0	0.19	152	87	7.1	1	106	6.0	5.00	4044	87	190
	0.5	3.3	6.1	0.17	124	88	6.6	0.5	87	6.1	4.60	3292	88	175
	0.1	2.1	6.2	0.14	81	90	5.4	0.1	57	6.2	3.80	2163	90	144
	0.01	1.3	6.2	0.13	49	90	5.0	0.01	35	6.2	3.53	1317	90	134
	0.005	1.1	6.2	0.16	42	90	6.0	0.005	30	6.2	4.23	1129	90	161
NS-8	5	13.1	5.0	0.46	499	73	17.5	5	245	5.0	8.60	9308	73	327
	3	10.9	5.5	0.42	413	80	16.1	3	203	5.5	7.92	7697	80	301
	2	9.5	5.7	0.40	361	83	15.2	2	177	5.7	7.45	6739	83	283
	1	8.0	6.0	0.37	302	87	14.2	1	148	6.0	6.97	5637	87	265
	0.5	6.5	6.1	0.34	246	88	13.1	0.5	121	6.1	6.42	4589	88	244
	0.1	4.3	6.2	0.28	162	90	10.8	0.1	79	6.2	5.29	3015	90	201
	0.01	2.6	6.2	0.26	98	90	10.0	0.01	48	6.2	4.91	1835	90	187
	0.005	2.2	6.2	0.32	84	90	12.0	0.005	41	6.2	5.90	1573	90	224
NS-10	5	17.8	5.0	0.62	675	73	23.7	5	341	5.0	11.96	12950	73	454
	3	14.7	5.5	0.57	558	80	21.8	3	282	5.5	11.02	10709	80	419
	2	12.9	5.7	0.54	488	83	20.5	2	247	5.7	10.36	9375	83	394
	1	10.8	6.0	0.51	409	87	19.2	1	206	6.0	9.70	7843	87	369
	0.5	8.8	6.1	0.47	333	88	17.7	0.5	168	6.1	8.93	6384	88	339
	0.1	5.8	6.2	0.38	219	90	14.6	0.1	110	6.2	7.36	4195	90	280
	0.01	3.5	6.2	0.36	133	90	13.5	0.01	67	6.2	6.84	2554	90	260
	0.005	3.0	6.2	0.43	114	90	16.2	0.005	58	6.2	8.20	2189	90	312
NS-20	5	34.1	5.0	1.20	1295	73	45.4	5	497	5.0	17.44	18886	73	663
	3	28.2	5.5	1.10	1071	80	41.9	3	411	5.5	16.07	15618	80	611
	2	24.7	5.7	1.04	938	83	39.4	2	360	5.7	15.11	13672	83	574
	1	20.6	6.0	0.97	784	87	36.9	1	301	6.0	14.15	11438	87	538
	0.5	16.8	6.1	0.89	638	88	33.9	0.5	245	6.1	13.02	9310	88	495
	0.1	11.0	6.2	0.74	420	90	28.0	0.1	161	6.2	10.74	6118	90	408
	0.01	6.7	6.2	0.68	255	90	26.0	0.01	98	6.2	9.97	3724	90	379
	0.005	5.8	6.2	0.82	219	90	31.2	0.005	84	6.2	11.97	3192	90	455
NS-35	5	56.8	5.0	1.99	2158	73	75.7	5	675	5.0	23.67	25631	73	899
	3	47.0	5.5	1.84	1785	80	69.8	3	558	5.5	21.81	21196	80	829
	2	41.1	5.7	1.73	1563	83	65.6	2	488	5.7	20.50	18555	83	779
	1	34.4	6.0	1.62	1307	87	61.4	1	409	6.0	19.20	15523	87	730
	0.5	28.0	6.1	1.49	1064	88	56.6	0.5	333	6.1	17.67	12635	88	672
	0.1	18.4	6.2	1.23	699	90	46.6	0.1	219	6.2	14.58	8303	90	554
	0.01	13.0	6.2	1.32	492	90	50.1	0.01	133	6.2	13.53	5054	90	514
	0.005	9.6	6.2	1.37	365	90	52.0	0.005	114	6.2	16.24	4332	90	617
NS-50	5	83.1	5.0	2.92	3157	73	110.8	5	831	5.0	29.15	31567	73	1108
	3	68.7	5.5	2.69	2610	80	102.1	3	687	5.5	26.87	26104	80	1021
	2	60.1	5.7	2.53	2285	83	96.0	2	601	5.7	25.25	22852	83	960
	1	50.3	6.0	2.37	1912	87	89.9	1	503	6.0	23.65	19118	87	899
	0.5	41.0	6.1	2.18	1556	88	82.7	0.5	410	6.1	21.77	15561	88	827
	0.1	26.9	6.2	1.80	1023	90	68.2	0.1	269	6.2	17.95	10226	90	682
	0.01	16.4	6.2	1.67	622	90	63.3	0.01	164	6.2	16.67	6224	90	633
	0.005	14.0	6.2	2.00	534	90	76.0	0.005	140	6.2	20.00	5335	90	760

Larger capacity systems are available upon request.
IGS offers full customer engineered systems for large capacity or special specifications.

High Pressure NITROSWING® Nitrogen Generator Specifications

		<i>SI</i> 10 Bar(g) feed pressure				<i>US Standard</i> 145 PSIG feed pressure			<i>SI</i> 10 Bar(g) feed pressure				<i>US Standard</i> 145 PSIG feed pressure		
MODEL	Oxygen %	Output		Feed Air	Output		Feed Air	Output		Feed Air	Output		Feed Air		
		N2 Nm³/h	P bar(g)	Nm³/m	N2 scfh	P psig	scfm	N2 scfh	P psig	scfm	N2 scfh	P psig	scfm		
NS-2H	5	4.4	7.0	0.15	166	102	5.8	5	160	7.0	5.60	6067	102	213	
	3	3.6	7.5	0.14	138	109	5.4	3	132	7.5	5.16	5017	109	196	
	2	3.2	7.7	0.13	120	112	5.1	2	116	7.7	4.85	4392	112	184	
	1	2.7	8.0	0.12	101	116	4.7	1	97	8.0	4.55	3674	116	173	
	0.5	2.2	8.1	0.11	82	117	4.4	0.5	79	8.1	4.18	2991	117	159	
	0.1	1.4	8.2	0.09	54	119	3.6	0.1	52	8.2	3.45	1965	119	131	
	0.01	0.9	8.2	0.09	33	119	3.3	0.01	31	8.2	3.20	1196	119	122	
	0.005	0.7	8.2	0.11	28	119	4.0	0.005	27	8.2	3.84	1025	119	146	
NS-4H	5	8.5	7.0	0.30	322	102	11.3	5	226	7.0	7.92	8581	102	301	
	3	7.0	7.5	0.27	267	109	10.4	3	187	7.5	7.30	7096	109	278	
	2	6.1	7.7	0.26	233	112	9.8	2	163	7.7	6.86	6212	112	261	
	1	5.1	8.0	0.24	195	116	9.2	1	137	8.0	6.43	5197	116	244	
	0.5	4.2	8.1	0.22	159	117	8.4	0.5	111	8.1	5.92	4230	117	225	
	0.1	2.7	8.2	0.18	104	119	7.0	0.1	73	8.2	4.88	2780	119	185	
	0.01	1.7	8.2	0.17	64	119	6.5	0.01	45	8.2	4.53	1692	119	172	
	0.005	1.4	8.2	0.20	54	119	7.8	0.005	38	8.2	5.44	1450	119	207	
NS-8H	5	16.9	7.0	0.59	641	102	22.5	5	315	7.0	11.05	11961	102	420	
	3	14.0	7.5	0.55	530	109	20.7	3	260	7.5	10.18	9891	109	387	
	2	12.2	7.7	0.51	464	112	19.5	2	228	7.7	9.57	8659	112	364	
	1	10.2	8.0	0.48	388	116	18.3	1	191	8.0	8.96	7244	116	341	
	0.5	8.3	8.1	0.44	316	117	16.8	0.5	155	8.1	8.25	5896	117	313	
	0.1	5.5	8.2	0.36	208	119	13.9	0.1	102	8.2	6.80	3875	119	258	
	0.01	3.3	8.2	0.34	126	119	12.9	0.01	62	8.2	6.31	2358	119	240	
	0.005	2.9	8.2	0.41	108	119	15.4	0.005	53	8.2	7.58	2022	119	288	
NS-10H	5	22.8	7.0	0.80	867	102	30.4	5	438	7.0	15.37	16641	102	584	
	3	18.9	7.5	0.74	717	109	28.0	3	362	7.5	14.16	13762	109	538	
	2	16.5	7.7	0.69	627	112	26.3	2	317	7.7	13.31	12047	112	506	
	1	13.8	8.0	0.65	525	116	24.7	1	265	8.0	12.47	10079	116	474	
	0.5	11.2	8.1	0.60	427	117	22.7	0.5	216	8.1	11.47	8203	117	436	
	0.1	7.4	8.2	0.49	281	119	18.7	0.1	142	8.2	9.46	5391	119	360	
	0.01	4.5	8.2	0.46	171	119	17.4	0.01	86	8.2	8.79	3281	119	334	
	0.005	3.9	8.2	0.55	146	119	20.9	0.005	74	8.2	10.54	2813	119	401	
NS-20H	5	43.8	7.0	1.54	1664	102	58.4	5	639	7.0	22.41	24269	102	852	
	3	36.2	7.5	1.42	1376	109	53.8	3	528	7.5	20.65	20069	109	785	
	2	31.7	7.7	1.33	1205	112	50.6	2	462	7.7	19.41	17569	112	738	
	1	26.5	8.0	1.25	1008	116	47.4	1	387	8.0	18.18	14698	116	691	
	0.5	21.6	8.1	1.15	820	117	43.6	0.5	315	8.1	16.73	11963	117	636	
	0.1	14.2	8.2	0.95	539	119	36.0	0.1	207	8.2	13.80	7862	119	524	
	0.01	8.6	8.2	0.88	328	119	33.4	0.01	126	8.2	12.81	4785	119	487	
	0.005	7.4	8.2	1.05	281	119	40.1	0.005	108	8.2	15.38	4102	119	584	
NS-35H	5	73.0	7.0	2.56	2774	102	97.3	5	867	7.0	30.41	32936	102	1156	
	3	60.4	7.5	2.36	2294	109	89.7	3	717	7.5	28.03	27236	109	1065	
	2	52.8	7.7	2.22	2008	112	84.3	2	627	7.7	26.35	23844	112	1001	
	1	44.2	8.0	2.08	1680	116	79.0	1	525	8.0	24.68	19947	116	938	
	0.5	36.0	8.1	1.91	1367	117	72.7	0.5	427	8.1	22.71	16236	117	863	
	0.1	23.6	8.2	1.58	898	119	59.9	0.1	281	8.2	18.73	10669	119	712	
	0.01	16.7	8.2	1.69	633	119	64.4	0.01	171	8.2	17.39	6494	119	661	
	0.005	12.3	8.2	1.76	469	119	66.8	0.005	146	8.2	20.87	5567	119	793	
NS-50H	5	106.7	7.0	3.75	4056	102	142.3	5	1067	7.0	37.46	40563	102	1423	
	3	88.3	7.5	3.45	3354	109	131.2	3	883	7.5	34.52	33544	109	1312	
	2	77.3	7.7	3.24	2937	112	123.3	2	773	7.7	32.45	29365	112	1233	
	1	64.6	8.0	3.04	2457	116	115.5	1	646	8.0	30.39	24566	116	1155	
	0.5	52.6	8.1	2.80	2000	117	106.3	0.5	526	8.1	27.97	19996	117	1063	
	0.1	34.6	8.2	2.31	1314	119	87.7	0.1	346	8.2	23.07	13140	119	877	
	0.01	21.0	8.2	2.14	800	119	81.4	0.01	210	8.2	21.41	7998	119	814	
	0.005	18.0	8.2	2.57	686	119	97.7	0.005	180	8.2	25.70	6856	119	977	

Larger capacity systems are available upon request.

IGS offers full customer engineered systems for large capacity or special specifications.

IGS References and Standards

Customer Reference List

- ▲ Abbott
- ▲ Air Products
- ▲ BASF
- ▲ BJ Services
- ▲ Degussa
- ▲ EMS Chemie
- ▲ Ferrero Rocher
- ▲ Ferrostaal
- ▲ Hoek Loos
- ▲ Holox
- ▲ Hutchinson Technology
- ▲ KTl
- ▲ Lorenz-Bahlsen Snack World
- ▲ Lurgi
- ▲ Messer
- ▲ Mitsubishi Heavy Industries
- ▲ Odra Gas
- ▲ Sandvik
- ▲ Slovako Farma
- ▲ Uhde
- ▲ Zimmer AG
- ▲ And Hundreds More

Industry Standards

- ▲ ASME
- ▲ CE/PED
- ▲ ATEX/CENELEC
- ▲ DNV
- ▲ Lloyds Register
- ▲ CSA
- ▲ Bureau Veritas
- ▲ ABS
- ▲ Baseefa
- ▲ IEC/NEC
- ▲ NFPA RINA
- ▲ Class I Div 2
- ▲ Zone 2
- ▲ GOST
- ▲ Class NK
- ▲ Germanischer Lloyd
- ▲ NEMA/IP
- ▲ Customer Specifications

Systems Sold:

IGS has sold over 1,500 Nitrogen Generating Systems

- | | | | |
|-------------------------------------|-----|--|----|
| ▲ Chemical Processing Industry: | 500 | ▲ Laboratories: | 60 |
| ▲ Food Processing and Wine Storage: | 400 | ▲ Pharmaceutical: | 40 |
| ▲ Heat Treatment: | 100 | ▲ Laser Cutting: | 25 |
| ▲ Metal Processing: | 50 | ▲ And many more specialized applications | |

INNOVATIVE GAS SYSTEMS

- ❑ Innovative Gas Systems is a global technology company with operational centers in North America, South America, Europe and Asia.
- ❑ Our products are world class with over 75 patents supporting our innovative technology in Nitrogen/Dehydration membranes, Nitrogen PSA and Oxygen PSA/VPSA.
- ❑ Please visit our website for a review of the complete list of products from IGS or contact one of our local sales associates directly.



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