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北京立达恒科技发展有限公司
LDH GAS SYSTEMS COMPANY LIMITED

CRYOGENIC SYSTEM

www.bj-ldh.com

SPECIALTY / Air Separation Equipment
Cryogenic Application Equipment



北京立达恒科技发展有限公司
LDH GAS SYSTEMS COMPANY LIMITED

COMPANY PROFILE

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The products of the company involve metallurgy, petrochemical, electronics, machinery, building materials, food, medicine, new materials and other fields. The products sell well all over the country, and are also exported to Peru, Venezuela, Austria, Nicaragua, Iraq, India, Bangladesh, Pakistan, the Philippines, Angola, Kazakhstan and other countries.



LDH Gas Systems Company Limited is a high-tech enterprise specializing in the R & D, design and manufacture, sales and service of all kinds of air separation equipment and low-temperature application equipment. The company has a number of national patent certificates, computer software certificates, and has passed the EU CE certification and ISO9001 certification.

The company pays attention to scientific and technological innovation, cooperates with foreign counterparts, and exchanges and cooperates with many domestic research institutions, universities and colleges. Fully absorb the advanced design concepts, strict management procedures and exquisite manufacturing technology of domestic and foreign enterprises. On the basis of sincere service support, the company boldly adopts new processes and technologies, enhances the company's product R & D, manufacturing and service capabilities, and strides forward to energy conservation, emission saving, superior quality and diversification.

Through years of research and exploration in the gas industry, we have always insisted on providing high-quality products and professional services to customers in various industries. We adhere to the concept of using Chinese products to serve global users, and use cloud technology to serve customers around the world more quickly and intuitively.

Main low temperature products

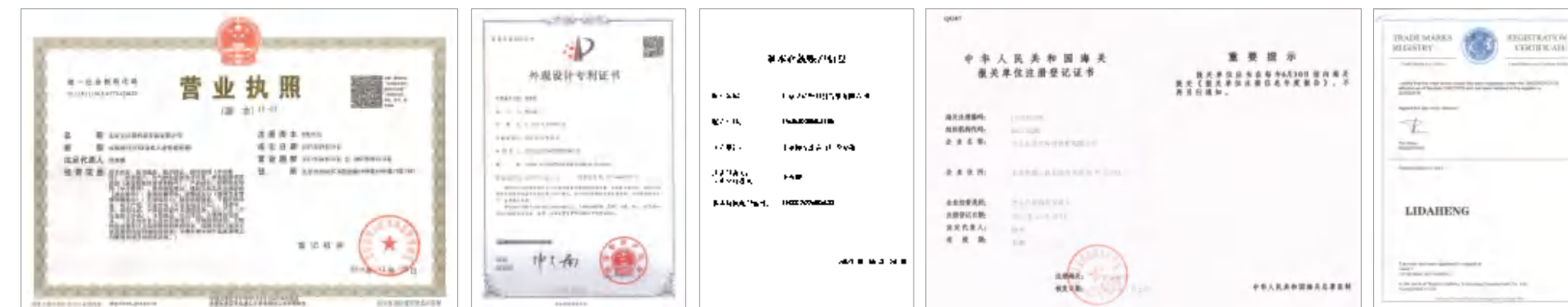
- ◎ **LPLN**-Liquid nitrogen equipment
- ◎ **LPLO**-Liquid oxygen equipment
- ◎ **LPLHE**-Liquid helium equipment
- ◎ **CRYOGENIC STORAGE TANK**

Main Gas products

- ◎ **LPO**-PSA oxygen generator 90-95%
- ◎ **LHO**-High purity oxygen generator 99-99.5%
- ◎ **LPN**-PSA nitrogen generator 98-99.9995%
- ◎ **LMN**-Membrane nitrogen generator 90-99.9%
- ◎ **LG**-Laboratory generator

ENTERPRISE QUALIFICATION

SOFTWARE
COPYRIGHT
REGISTRATION
CERTIFICATE



LDH

Small integrated liquid nitrogen machine

LDH small liquid nitrogen machine is a plug-in liquid nitrogen solution. Using the mixed refrigerant refrigeration mrjt process, based on the regenerative multi-component mixed refrigerant throttling refrigeration cycle, from the ambient temperature to the target refrigeration temperature, select the high, medium and low boiling point pure substance components to form the multi-component mixed refrigerant, so as to realize the relay matching of the effective refrigeration temperature range of each boiling point component. It is a refrigerator that can efficiently achieve the temperature range of -40~-196 °C.



Liquefier interface of small integrated machine



Working Principle

The compressed air passes through the oil-free air compressor, enters the PSA nitrogen generator after cold dry absorption and filtration, and generates sterile nitrogen with a dew point of -60 °C after passing through the sterilization filter. Sterile nitrogen is liquefied into liquid nitrogen after entering the refrigerator.

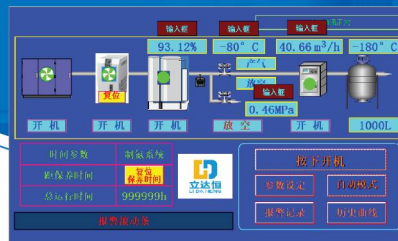
Product Features

- Liquid nitrogen output: 10L-120L per day
- Regular start and stop: you can freely set the daily startup and shutdown time
- Liquid level start and stop: if equipped with liquid nitrogen tank with liquid level gauge, the start and stop can be controlled according to the liquid level, and the liquid level is displayed
- Remote monitoring: MCGS remote monitoring, remote downloading of historical operation records, online program upgrading, convenient for remote maintenance
- Fully enclosed box type compact design
- Liquid nitrogen dewar bottle (optional)

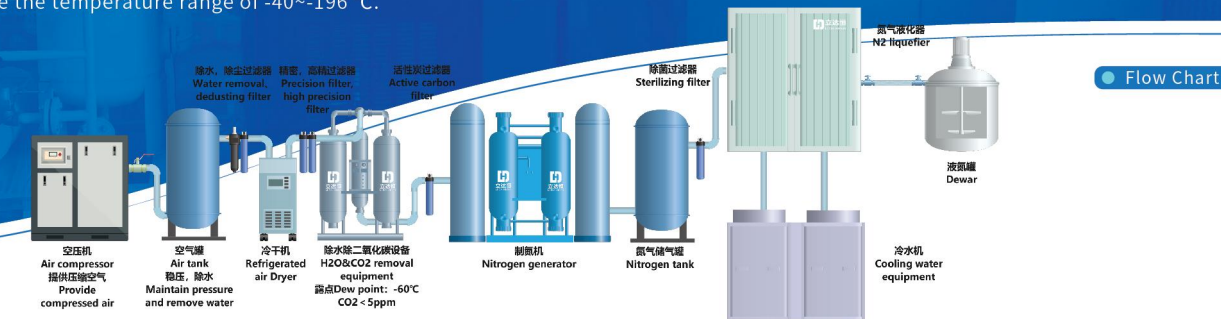
LDH

Medium sized skid liquid nitrogen machine

LDH medium-sized liquid nitrogen machine is a skid based liquid nitrogen solution. Using the mixed refrigerant refrigeration mrjt process, based on the regenerative multi-component mixed refrigerant throttling refrigeration cycle, from the ambient temperature to the target refrigeration temperature, select the high, medium and low boiling point pure substance components to form the multi-component mixed refrigerant, so as to realize the relay matching of the effective refrigeration temperature range of each boiling point component. It is a refrigerator that can efficiently achieve the temperature range of -40~-196 °C.



One key start general interface of medium liquid nitrogen machine



Working Principle

The compressed air passes through the screw air compressor and enters the PSA nitrogen generator after cold dry absorption and filtration, and generates sterile nitrogen with a dew point of -60 °C after passing through the sterilization filter. After sterile nitrogen enters the refrigerator (the refrigerator is cooled by a water cooler), it is liquefied into liquid nitrogen.

Product Features

- Liquid nitrogen production: 10L/h-100L/h
- One key start and stop: one key control the start and stop of the whole system
- Regular start and stop: you can freely set the daily startup and shutdown time
- Liquid level start and stop: if equipped with liquid nitrogen tank with liquid level gauge, the start and stop can be controlled according to the liquid level, and the liquid level is displayed
- Remote monitoring: MCGS remote monitoring, remote downloading of historical operation records, online program upgrading, convenient for remote maintenance
- Skid design, simple and convenient installation and connection
- Liquid nitrogen dewar bottle (optional)

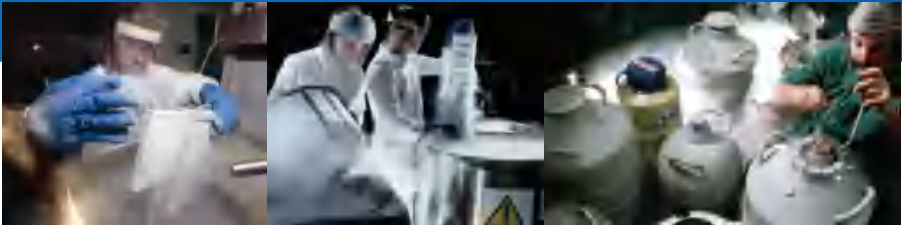
Parameter selection

MODEL	LPLN-240	LPLN-480	LPLN-720	LPLN-960	LPLN-1200	LPLN-1920	LPLN-2400
Style	Split Type						
Capacity	10L/H 240L/day	20L/H 480L/day	30L/H 720L/day	40L/H 960L/day	50L/H 1200L/day	80L/H 1920L/day	100L/H 2400L/day
Purity	≥99%						
Voltage Frequency	380V(AC) 3P 50Hz						
Power (KW)	27	45	55	84	92	155	190
Area covered (㎡)	10	30	30	40	40	60	60
Equipment size (mm)	6000*1100*2200	8000*1700*2300	8000*1700*2300	12000*1800*2350	12000*1800*2350	16000*2000*2350	16000*2000*2350
Required room area (㎡)	>30	>50	>50	>80	>80	>120	>120
Shipping container size	20 Foot Cabinet	40Foot Cabinet 9.6m	40Foot Cabinet 10m	40Foot Cabinet	40Foot Cabinet	40foot high cabinet+ 20Foot Cabinet	40foot high cabinet+ 20Foot Cabinet
Ambient temperature requirements	0-30℃						
One meter noise (dB)	<72dB	<78dB	<78dB	<78dB	<78dB	<78dB	<78dB
Cooling mode	Water-Cooling						
Cooling water volume(m³/h)	>4	>8	>8	>15	>15	>30	>37
Nitrogen quantity (m³/h)	15	30	40	50	60	100	130
Nitrogen dew point (°C)	-60℃						
Nitrogen pressure (Mpa)	0.8	0.8	1.6	0.8	1.6	0.8	0.8
Supporting suggestions (L)	500	1000	1000	2000	2000	5000	5000
Other	If the non-standard voltage frequency, altitude > 1000m, purity ≥ 99.9, it needs to be customized						

LDH

Large cryogenic liquid nitrogen and oxygen machine

LDH large-scale liquid nitrogen machine is a complete set of equipment that liquefies and separates air into oxygen, nitrogen, argon, krypton, xenon, neon, helium and other rare gases by deep freezing.



Working Principle

The principle of the deep freezing method is based on the different boiling points of each component of the gas mixture, which is separated by partial condensation or liquefaction rectification process at low temperature. Among the methods of oxygen and nitrogen production such as deep freezing method, chemical method, electrolysis method, adsorption method and membrane permeation method, deep freezing method is the most economical, adaptable and widely used.

Parameter selection							
MODEL	KDON-50	KDON-100	KDON-200	KDON-400	KDON-500	KDON-1000	KDON-2000
Style	Tower type						
Capacity	50L/H	100L/H	200L/H	400L/H	500L/H	1000L/H	2000L/H
Oxygen Purity	≥99.5%						
Nitrogen Purity	≥99.995%						
Voltage Frequency	380V(AC) 3P 50Hz / 220V(AC) 1P 50Hz						
Ambient Temperature Requirements	0-30°C, The ground is flat and well ventilated						
Infrastructure	Infrastructure required						
Other	If non-standard voltage frequency, altitude > 1000m, purity > 99%, need to be customized						



Product Features

- Liquid nitrogen production: 100L/h-2000L/h
- Two media: nitrogen and oxygen can be produced at the same time, switching production or simultaneous production

LIQUID NITROGEN CIRCULATING PUMP

The liquid nitrogen pump is a stainless steel vortex magnetic pump. The magnetic drive high and low temperature vortex pump is made of stainless steel and has a certain gas-liquid mixing function. The product is designed with no shaft seal and magnetic drive, and the dynamic seal is converted into a static seal to realize the safety and stability of the pump under deep cold and high temperature conditions.

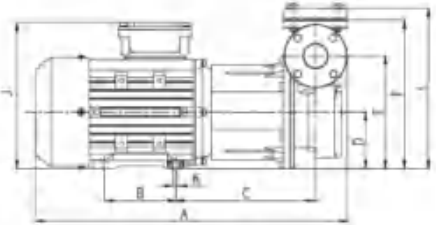
Circulating medium

Water, ethylene glycol, alcohol, heat transfer oil, hydrocarbon solution, silicone oil, glacier refrigerant, gasoline, dye, chemical solution and other liquids without particles and fibers.

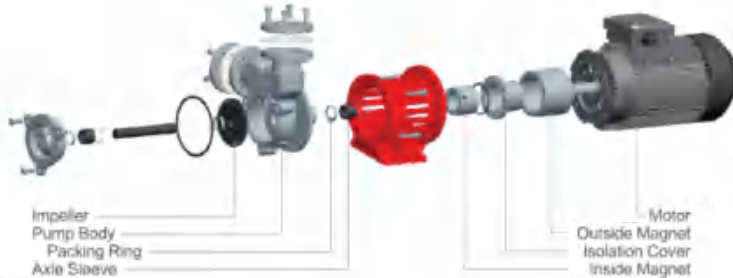


Application Area

High temperature mold temperature control, high and low temperature test instruments, semiconductor precision temperature control, chemical equipment, template temperature control, ultrasonic cleaning equipment, high-end printing and dyeing equipment, TCU temperature control system, etc.



● Outline dimension of liquid nitrogen pump



● Composition of liquid nitrogen pump

SERVICE CONDITIONS:

- liquid nitrogen -197°C ~ +100°C
- High temperature heat transfer oil synthetic oil -120°C ~ +350°C
- Ethylene glycol / silicone oil -120°C ~ +180°C
- Working environment temperature -50°C ~ +70°C
- Highest altitude 5000m
- Maximum working pressure 20bar

Specifications and performance parameters

MODEL	CALIBER		ELECTRIC MACHINERY					PERFORMANCE PARAMETER		
	Entrance	Export	Power kW	HP	Voltage V	frequency Hz	Speed r/min	Maximum/service lift m	Maximum flow L/min	Pump self weight kg
MDH-10	DN25	DN20	0.75	1	3Ø-380	50	2760	55/35	50	16
MDH-15	DN25	DN20	1.1	1.5	3Ø-380	50	2760	80/55	65	18.5
MDH-20	DN40	DN32	1.5	2	3Ø-380	50	2760	90/60	90	26
MDH-30	DN40	DN32	2.2	3	3Ø-380	50	2760	100/70	120	29
MDH-40	DN50	DN40	3	4	3Ø-380	50	2900	120/80	160	37

The above performance parameters correspond to the normal speed transport of water at 20 °C, and the error of performance and parameters is ± 10%. The performance of the pump varies with the specific gravity and density of the fluid medium.

SMALL INTEGRATED LIQUID OXYGEN MACHINE



LDH small liquid oxygen machine is a plug-in liquid oxygen solution. The mixed refrigerant refrigeration mrjt process is adopted. Based on the regenerative multi-component mixed refrigerant throttling refrigeration cycle, from the ambient temperature to the target refrigeration temperature, the multi-component mixed refrigerant composed of high, medium and low boiling point pure components is selected to realize the relay matching of the effective refrigeration temperature range of each boiling point component. It is a refrigerator that can efficiently achieve the temperature range of -40 ~ -185 °C.

Working Principle

The compressed air passes through the air compressor, enters the PSA oxygen generator after cold dry suction and filtration, and generates sterile oxygen with dew point of - 60 °C after passing through the sterilization filter. After sterile oxygen enters the heat exchanger, liquid nitrogen is used to cool the oxygen and liquefy it into liquid oxygen. The liquid nitrogen for cooling is recycled in a closed manner to achieve the effect of energy saving.

Product Features

- Liquid oxygen production: 40L-1200LEvery day
- Timed start and stop: Timed start and stop
- Liquid level start / stop: if the liquid oxygen tank with liquid level gauge is equipped, the start / stop can be controlled according to the liquid level and the liquid level can be displayed.
- Remote monitoring: MCGS remote monitoring, remote download of historical operation records, online program upgrade, convenient for remote maintenance
- Fully enclosed box type compact design
- Liquid oxygen Dewar (optional)

Parameter selection					
MODEL	LPLO-40	LPLO-80	LPLO-240	LPLO-480	LPLO-1200
Style	Integrated Machine				
Capacity	40L/day	80L/day	10L/H 240L/day	20L/H 72L/day	50L/H 120L/day
Purity	≥93%~99%				
Voltage Frequency	380V(AC) 3P 50Hz / 220V(AC) 1P 50Hz				
Ambient Temperature Requirements	0-30℃ , The ground is flat and well ventilated				
One meter noise (dB)	<58dB	<58dB	<65dB	<65dB	<72dB
Cooling mode	Water-cooling				
Nitrogen dew point (°C)	-60℃				
Other	If the non-standard voltage frequency is higher than 1000m, it needs to be customized				

HELIUM RECOVERY LIQUEFACTION SYSTEM

The helium recovery, purification and liquefaction system has a series of standard products. The helium recovery and purification capacity is 5~200Nm³ / h and the helium liquefaction rate is 10 ~ 200L / day, which can meet the different needs of users.

The helium purifier uses the GM refrigerator as the cold source. It does not need to consume liquid nitrogen in the working process. The equipment is simple and compact. The purity of the helium produced is high. The helium can be purified by power on.

Helium liquefiers include kdhr15 external shock absorber series, i-liquefier 20~40 movable series (cold head sinking into the dewar) and kdhr 60~200 series. Users can choose corresponding series of helium liquefiers according to their own characteristics.

The integrated structure of helium purifier and liquefier has compact structure and small floor area. It is a good choice for customers with limited space.

>99.999%

The closed cycle direct re liquefaction system is applicable to the liquid used Closed system of helium, high purity of helium at the outlet.

The liquefier is of external hanging structure and is directly connected with the user equipment through the infusion pipe and the gas return pipe,

As shown in the figure. While realizing zero evaporation of liquid helium of the user equipment, the pressure of the user equipment is maintained within 0.15psi.



PRODUCT FEATURES

1 External vibration reduction design KDHR15~30/KDHR10 Series

The KDHR15~30/KDHR10 series external vibration damping helium liquefiers directly return the helium evaporated by the user's system to the liquefier, and are re liquefied at the cold head, and drip into the user's system through the infusion pipe. At the same time, the vibration damping structure is adopted, which can be used in occasions with certain requirements for vibration, such as PPMs and STM.

2 Mobile design I-LIQUEFIER20~40 Series

I-LIQUEFIER20~40Series of movable helium liquefier is the Dewar of the refrigerator immersed in liquid heliumAt the same time, the helium compressor and the liquefier are integrated on a skid, and the whole system isSmall in size, it can be moved in the startup state. When liquid helium is transferred, it is directly transferred from the liquefier dewarIn the equipment where the user uses liquid helium, the transfer process of the intermediate Dewar is omitted to avoid the liquid in the transfer processHelium loss.

3 Integrated design of multiple cold heads KDHR60~200 Series

The KDHR60 ~ 200 series helium liquefier has 3~10 cold heads and a liquefaction rate of 60L / day~200L / day, which can meet the different needs of users.

4 Refrigerator purification KDHP5-10 Series

KDHP5-10 uses 10K GM refrigerator as cold source and purifierIt can work when powered on, without consuming liquid nitrogen, and the equipment is simple and compact,The purity of helium produced is high.

5 Fully automatic control

The company's helium recovery, purification and liquefaction system adopts PLC full-automatic control, without personnel watching, and The system status can be monitored remotely.

6 Deep customization

The base of the liquefaction system can be purified in standard helium recovery On this basis, we will make in-depth adjustments according to the different needs of customers system.

CRYOGENIC STORAGE TANK BIOLOGICAL CONTAINER



The aluminum alloy liquid nitrogen container is mainly composed of a shell, an inner tank, a neck pipe, a multi-layer insulator and a bucket.

- The shell and inner liner of the vessel are made of aluminum alloy plate, which has the characteristics of light weight, high strength under low temperature and corrosion resistance.
- The neck pipe is made of glass fiber reinforced plastic, with high mechanical strength and low thermal conductivity.
- Aluminum foil with excellent reflection performance is used as the reflection screen for multi-layer insulation, and materials with extremely low thermal conductivity and low gas release rate are used as insulation materials to reduce thermal radiation.
- The interlayer between the outer liner and the inner liner of the container is in a high vacuum state to prevent the thermal convection of the gas. The adsorbent with large adsorption capacity at low temperature is used to ensure the long-term stable and reliable performance of the container and the product life is not less than five years.



MODEL	CONFIGURATION	DESCRIPTION
YDS-3	6 standard round buckets, including lock cover and protective cover	
YDS-6	6 standard round buckets, including lock cover and protective cover	
YDS-10	6 standard round buckets, including lock cover and protective cover	
YDS-10-80	6 standard round buckets, including lock cover and protective cover	
YDS-10-125	Standard configuration: 1 4-layer square lifting cylinder, including 5×5 freezing box, including lock cover, storage capacity 100	
YDS-15	6 standard round buckets, including lock cover and protective cover	
YDS-20	6 standard round buckets, including lock cover and protective cover	
YDS-30	6 standard round buckets, including lock cover and protective cover	
YDS-30-80	6 standard round buckets, including lock cover and protective cover	
YDS-30-125	6 standard round buckets, including lock cover and protective cover	
YDS-30-125	Six 4-layer square lifting cylinders are provided as standard, including 5×5 freezing box, including lock cover, storage capacity 600	
YDS-35	6 standard round buckets, including lock cover and protective cover	
YDS-35-80	6 standard round buckets, including lock cover and protective cover	
YDS-35-125	6 standard round buckets, including lock cover and protective cover	
YDS-35-125	Six 5-layer square lifting cylinders are provided as standard, including 5 × 5 freezing box, including lock cover, storage capacity 750	



MODEL	CONFIGURATION	DESCRIPTION
YDS-47-127	Including lock cover, protective cover, standard 6 5-layer square lifting cylinders, including 5 × 5 freezing box, including lock cover, storage capacity 750	
YDS-50	6 standard round buckets, including lock cover and protective cover	
YDS-50-80	6 standard round buckets, including lock cover and protective cover	
YDS-50-125	6 standard round buckets, including lock cover and protective cover	
YDS-50-125	Six 5-layer square lifting cylinders are provided as standard, including 5 × 5 freezing box, including lock cover, storage capacity 750	
YDS-65-216	Standard lock cover, no bucket, no protective cover	
YDS-65-216	Six 4-layer square lifting cylinders are provided as standard, including 9 × 9 freezing box, including lock cover, storage capacity 1944	
YDS-95-216	Standard lock cover, no bucket, no protective cover	
YDS-95-216	Standard configuration: 6 5-layer square lifting drums, including 9 × 9 freezing box, including lock cover, storage capacity 2430	
YDS-120-216	Standard lock cover, no bucket, no protective cover	
YDS-120-216	Six 6-layer square lifting cylinders are provided as standard, including 9 × 9 freezing box, including lock cover, storage capacity 2916	
YDS-120-216	Six 8-layer square lifting cylinders are provided as standard, including 9 × 9 freezing box, including lock cover, storage capacity 3888	
YDS-170-216	Standard lock cover, no bucket, no protective cover	
YDS-170-216	Six 10 layer square lifting cylinders are provided as standard, including 9 × 9 freezing box, including lock cover, storage capacity 4860	
Digital display temperature level gauge	Real time display of temperature and liquid level, customized cycle of 20 days	
Data concentrator	Collect the data of liquid level gauge, realize wechat and telephone real-time alarm, and use the cloud platform to view and export the historical data for free. One concentrator can collect the data of 100 liquid level gauges.	



The YDZ series self pressurized liquid nitrogen container developed by our company is a kind of high vacuum multi-layer insulation movable cryogenic container.

- The vessel is mainly composed of stainless steel inner tank, stainless steel outer cylinder, built-in pressurization system, valve, pressure gauge, pipeline and safety system.
- The vessel is designed as a high vacuum multi-layer winding insulation structure. The inner tank is used to store low-temperature liquid. Its outer wall is wrapped with multi-layer insulation materials, which has super heat insulation performance. At the same time, the interlayer (the space between the two layers of vessels) is pumped into high vacuum to form a good insulation system.
- This product adopts advanced production process and technology, which is safe and reliable, easy to use, high loading rate, and can be refilled repeatedly. This product uses a small amount of liquid nitrogen in the tank to vaporize and generate pressure, so that the container can automatically discharge liquid, thus replenishing liquid nitrogen for other containers.
- It can be equipped with liquid nitrogen tank monitoring terminal and monitoring software to realize remote transmission of liquid nitrogen level, pressure and other data, and realize remote alarm of low liquid level and overpressure.
- At present, it is widely used in laboratory, mold industry, animal husbandry, medicine, semiconductor, food, low-temperature chemical industry, aerospace, military and other fields.



MODEL	Geometric volume	Effective volume	Overall dimensions		Empty weight	Full weight	Working Pressure	Daily evaporation loss rate	Infusion volume
			External Diameter mm	high mm					
YDZ-15	16.5L	15L	355	750	21kg	28.5kg	≤0.1Mpa	7%	≥2L/Min
YDZ-30	31.5L	30L	405	1050	32kg	56kg	≤0.1Mpa	2.7%	≥2L/Min
YDZ-50	55L	50L	455	1140	40kg	81kg	≤0.1Mpa	2.2%	≥4L/Min
YDZ-100	110L	100L	606	1180	69kg	150kg	≤0.1Mpa	1.3%	≥6L/Min
YDZ-175	181L	175L	706	1260	98kg	238kg	≤0.1Mpa	1.1%	≥8L/Min
YDZ-200	210L	200L	706	1350	105kg	265kg	≤0.1Mpa	1.1%	≥8L/Min
YDZ-240	252L	240L	706	1480	115kg	307kg	≤0.1Mpa	1.1%	≥8L/Min
YDZ-300	313L	300L	706	1650	128kg	368kg	≤0.1Mpa	1.1%	≥10L/Min
YDZ-500	520L	500L	1108	1720	285kg	685kg	≤0.1Mpa	1.1%	≥12L/Min

Above 500L, horizontal liquid nitrogen tank (customized as required)

LOW TEMPERATURE STORAGE LIQUID NITROGEN COLD STORAGE / REFRIGERATOR

Application of liquid nitrogen in animal husbandry

1 It is widely used in the improvement of frozen mating of livestock

2 Preparation of viable embryos in embryo transfer of domestic animals and various animals

Embryo cryometer is the key equipment for cryopreservation of biological samples. When the normal temperature sample needs to be transferred to the liquid nitrogen low temperature environment, it can mediate the cooling process of the biological sample. It is widely used in the fields of stem cell transplantation, cord blood cryopreservation, cryopreservation of cornea, heart valves, skin and other organs and tissues. The small liquid nitrogen machine effectively provides liquid nitrogen production for this equipment and is convenient to use.

3 Liquid nitrogen ultra low temperature collection microbial skills

The principle of the liquid nitrogen permanent collection method of collecting the bacteria at -196 °C is to collect the microorganisms usefully by utilizing that the metabolism of microorganisms tends to stop below -130 °C.

4 Genetic survival of agricultural organisms

5 Survival liquid nitrogen vaccine

6 Preservation of human and animal genes

Application case - human gene preservation

Customer Demand

2900L liquid nitrogen is used every week for cell preservation and experimental freezing. The 1000L self pressurized liquid nitrogen tank is used to store liquid nitrogen and is equipped with vacuum hose + hard pipe for liquid nitrogen transmission. It can realize liquid level start and stop and computer remote start and stop. Equipped with low-voltage drawer cabinet to monitor power consumption

Customer environment

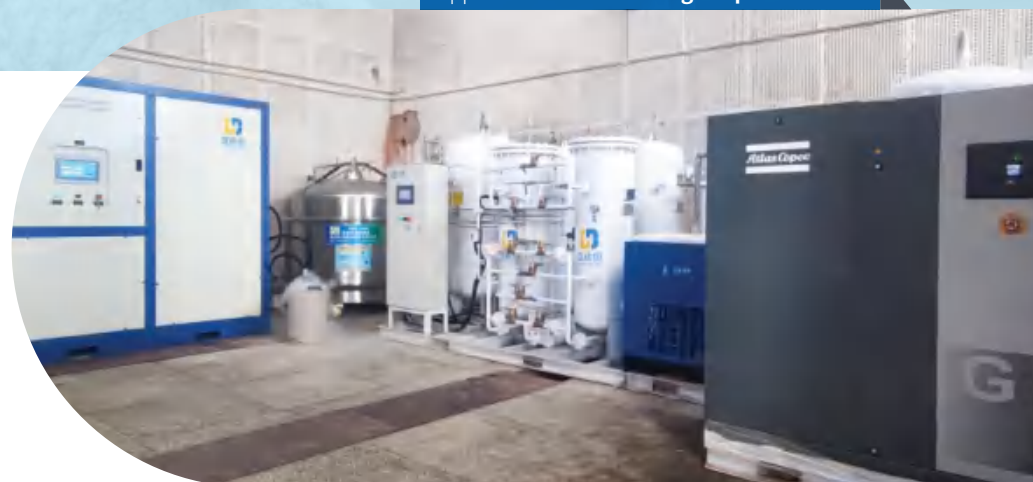
The location of the institution is 2100 meters above sea level, with its own water chiller. The equipment in the old machine room is removed and the new equipment is installed

Equipment requirements

Equipped with Atlas air compressor, cold dryer + suction dryer + ATS filter, electronic flowmeter, dew point meter, nitrogen generator, liquefier, 1000L self pressurized liquid nitrogen tank

Design finished product

Divided into 5 parts, air compressor skid: air compressor + wet tank; Drying system skid: cold dryer + suction dryer + filter; Nitrogen generator skid: Nitrogen Generator + nitrogen storage tank + control cabinet; Liquefier; liquid nitrogen tank



LIQUID NITROGEN DRIP

Liquid nitrogen drip is
widely used in
**beverage, edible oil
and pharmaceutical
production.**

Liquid nitrogen drip can be divided into completely sterile drip and conventional drip

Aseptic drip is liquid nitrogen cooled by heat exchanger to realize aseptic drip.

Conventional drip is to liquefy the produced sterile nitrogen directly into liquid nitrogen, and then drip it into drinks or edible oil.

At present, many beverage manufacturers have accepted nitrogen or the mixture of nitrogen and CO₂ to replace the traditional CO₂ and inflate the beverage. The high carbonated beverage filled with nitrogen causes less problems than the beverage filled with only carbon dioxide; Nitrogen is used for filling non foaming beverages such as wine and fruit juice. The benefit of filling liquid nitrogen in non inflatable beverage cans is that the small amount of liquid nitrogen injected can remove the oxygen in the top space of each can, making the gas in the upper space of the storage tank inert, thus extending the storage life of perishable products.

Application Case - Liquid Nitrogen Drip

Customer Demand

A beverage factory dripped 16000 bottles per hour, producing 160000 bottles per day for 10 hours. 350-400L liquid nitrogen per day

Equipment requirements

Configure liquid nitrogen machine + drip machine

Design finished product

Equipped with 20L / h liquid nitrogen machine, one 1000L digital liquid level meter liquid nitrogen tank and two 175L self pressurized liquid nitrogen tanks



NUCLEAR MAGNETIC RESONANCE SPECTROMETER

Application of liquid nitrogen in nuclear magnetic resonance spectrometer

Based on the spin quantum number, the strong magnetic field of non-zero nuclei in external low temperature superconductor

Nuclear magnetic resonance (NMR) spectroscopy is an analytical method based on the resonance phenomenon caused by the absorption of radio-frequency energy corresponding to the energy difference between its splitting energy levels by an atomic nucleus with non-zero spin quantum number in an external low-temperature superconducting strong magnetic field. Nuclear magnetic resonance spectroscopy provides qualitative structural information such as the type, number, existence form, connection mode of atoms, relative orientation of space, etc. of atoms in molecules through the spectrum of different nuclei, chemical shift value, multiplicity of spectral peaks, coupling constant value, relative intensity of spectral peaks and relevant peaks in various two-dimensional and multi-dimensional spectra.

Nuclear magnetic resonance quantitative analysis is based on structural analysis, and quantitative determination is carried out by using the relationship between the number of protons of a specific group of a molecule and the peak area of the corresponding spectral peak. NMR spectroscopy is mainly used to determine the structure of small organic compounds and biological macromolecules in solution.

Superconducting magnets are widely used **in the fields of chemistry, biology, physics, materials, pharmacy and medicine**. Superconducting magnets are immersed in liquid helium, and the liquid helium is covered with liquid nitrogen. The purpose of liquid helium is to maintain the superconductivity of the magnet to provide the required magnetic field environment. The purpose of liquid nitrogen is to add a "thermal barrier" between liquid helium and the external environment to reduce the volatilization of liquid helium.

Application Case - Nuclear Magnetic Resonance Spectrometer



Customer Demand

Use 80-150L of liquid nitrogen every week for NMR spectrometer

Equipment requirements

Equipped with liquid nitrogen machine + liquid nitrogen tank, with timing start and stop and liquid level start and stop

Design finished product

A 3L / h liquid nitrogen machine and a 100L digital liquid level meter liquid nitrogen tank

HYPOTHERMIA THERAPY

Liquid Nitrogen Freezing Chamber

Cryogenic cryotherapy with liquid nitrogen is actually an enhanced version of ice compress

Liquid nitrogen is a colorless, odorless, non flammable and non explosive transparent liquid, its working principle mainly includes the following points:

- ◇ Freeze blood vessels to achieve hemostasis;
- ◇ Destroy nerve endings and receptors, and play the role of anesthesia and analgesia;
- ◇ Freezing can kill microorganisms and prevent infection;
- ◇ The destruction of tissue by freezing can eventually lead to hypoxia and necrosis of the tissue at the lesion site, which in turn can promote the regeneration of local tissues of the body and accelerate the healing;
- ◇ Freezing has a high degree of selectivity and limitation, and it has a greater destructive force on the diseased tissues, while it has a smaller damage on the normal tissues.
- ◇ At present, most of the liquid nitrogen freezers used by athletes are actually used to treat the body through atomization. That is to say, these liquid nitrogen is used to let the gas contact the muscles of the human body by spraying, rather than directly contacting the human body with the original chemical products such as liquid nitrogen.

Clinical Medicine

Liquid nitrogen cryotherapy is a new technology in the field of modern therapeutics

The virus can be killed by extremely fast freezing. People with severe cold urticaria cannot be treated with this method. Liquid nitrogen cryotherapy is a comprehensive effect of cryobiology. When normal cells are extremely frozen, irreversible damage will occur. It is to quickly kill the cells in the disease area under extreme freezing, so that the disease area can recover normally. It is generally used to treat corns, warts, neurodermatitis and skin diseases.

Liquid nitrogen is the most widely used cryogen in cryosurgery. It is one of the best refrigerants invented so far. It can be injected into a low-temperature medical device, just like a scalpel, and can be used for any operation.

Application case - liquid nitrogen treatment chamber

Customer Demand

A sports institution needs a liquid nitrogen treatment chamber to be used for the recovery treatment of athletes

Equipment requirements

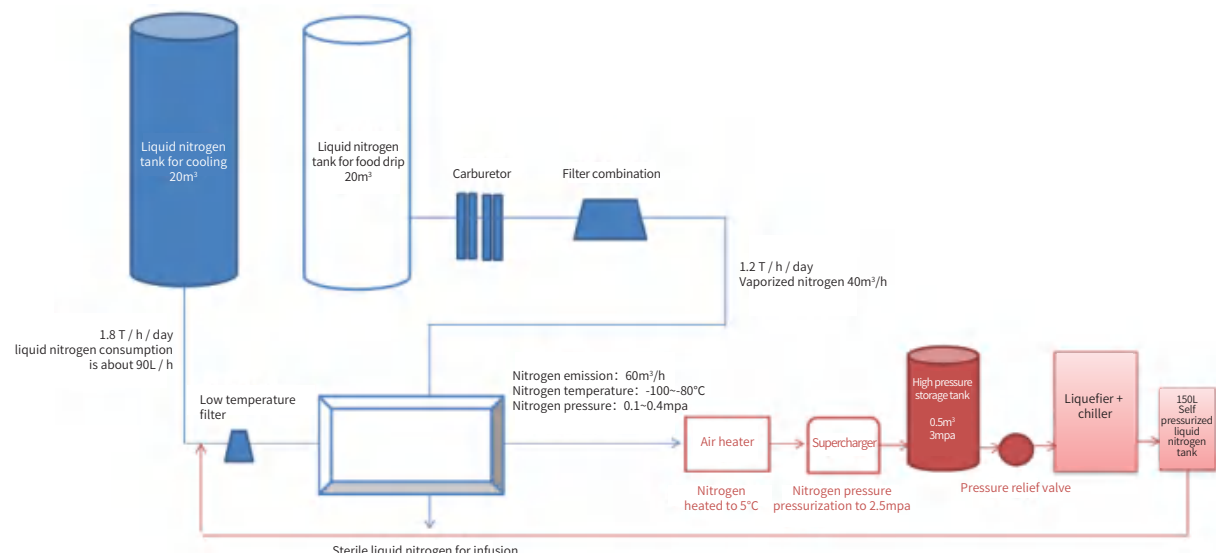
Liquid nitrogen treatment chamber

Design finished product

Liquid nitrogen treatment chamber, no additional supporting liquid nitrogen tank is required



LIQUID NITROGEN RECOVERY



Liquid nitrogen is used as a low-temperature cold source to create a low-temperature environment. In general, after the use of liquid nitrogen, because the liquid nitrogen recovery process is complex and the recovery cost is high.

Therefore, most of the liquid nitrogen is vented. For the air separation unit with a large amount of liquid nitrogen, long-term venting treatment of liquid nitrogen is not only a serious waste of energy, but also will increase the operating cost of the unit. The existing solution is to establish a liquid nitrogen circulation system and use a closed structure to ensure the circulation of liquid nitrogen in the whole system. However, since it is difficult to achieve complete sealing, some vaporized nitrogen will be lost. Therefore, it is necessary to supplement some nitrogen regularly to solve nitrogen loss.

Application case - liquid nitrogen recovery

Customer Demand

An organization needs liquid nitrogen recycling. During the operation of the device, a part of low-temperature liquid nitrogen needs to be used as a cold source to cool the device, and another part of low-temperature liquid nitrogen needs to be vaporized and converted into sterile liquid nitrogen in the heat exchanger to drip into the beverage. The liquid nitrogen consumption is 3 tons per day, including 1.8 tons per day for cooling, equivalent to 1440m³ for nitrogen³/ day; 1.2 tons of liquid nitrogen per day, equivalent to 960m³/ The liquid nitrogen cooling medium is vaporized and reheated to -100 ~ -80 °C and discharged into the atmosphere after leaving the unit.

During the continuous operation of the whole unit, about 3 tons of liquid nitrogen are required to be consumed every day. The unit is equipped with 2 sets of 20m³ The low-temperature vacuum storage tank regularly needs to purchase liquid nitrogen for replenishment. The cold energy of liquid nitrogen is discharged into the atmosphere after being used, which is not conducive to environmental protection and energy conservation. If the discharged nitrogen is recycled, or liquefied and reused, it not only reduces waste but also saves a lot of money.

Equipment Requirements

Liquid nitrogen recovery

Design Finished Product

1. Start up for the first time to recover the nitrogen of liquid nitrogen for cooling
2. The nitrogen is heated to 5. D egree, After that, it enters the liquefier for liquefaction
3. Liquid nitrogen is generated after liquefaction and sent to the self pressurized liquid nitrogen tank.
4. When sufficient liquid nitrogen is stored in the self pressurized liquid nitrogen tank, Close the liquid nitrogen tank for cooling.
5. The liquid nitrogen in the pressurized liquid nitrogen tank flows through the heat exchanger to recycle the liquid nitrogen.
6. Since 1% of the pressurization opportunity leaks, the liquid nitrogen used for cooling will decrease with time.
7. The self pressurizing liquid nitrogen tank is equipped with a liquid level gauge function and a warning line. When the liquid level reaches the minimum of When a certain value is reached, liquid nitrogen for cooling is used to supplement nitrogen for liquefaction and recovery.

OTHER INDUSTRY APPLICATIONS

FOOD INDUSTRY

1 Application of liquid nitrogen in food quick freezing

Liquid nitrogen quick freezing has the following obvious advantages:

- ① Fast freezing rate (the freezing rate is about 30-40 times faster than the usual freezing method): the quick freezing of liquid nitrogen can make food quickly pass through the maximum ice crystal growth zone of 0 °C - 5 °C. Food researchers have made useful experiments in this respect.
- ② Link food quality: because of the short time of liquid nitrogen quick freezing, the food frozen by liquid nitrogen can link the color, aroma, taste and nutritional cost before processing to the maximum extent. Duan Zhenhua et al. Punished betel nut with liquid nitrogen for quick freezing treatment. The results showed that the betel nut treated with liquid nitrogen had higher chlorophyll content and good charm.
- ③ Low dry consumption of materials: as usual, the loss rate of dry consumption of freezing is 3-6%, while the liquid nitrogen quick freezing can be eliminated to 0.25-0.5%.
- ④The equipment deployment and power consumption are low, and it is easy to realize mechanized and active assembly lines to improve productivity. At present, there are three important methods of liquid nitrogen quick freezing: spray freezing, immersion freezing and cold atmosphere freezing, among which spray freezing is the most widely used.

2 Application of liquid nitrogen in storage and preservation of fruits and vegetables

The use of liquid nitrogen in the storage and preservation of fruits and vegetables has the advantage of air conditioning, which can regulate the contradiction between supply and demand of agricultural and sideline products in the peak season and the off season, and eliminate the loss of storage. The effect of air regulation is to improve the concentration of nitrogen, control the gas ratio of nitrogen, oxygen and CO2, and keep them in a stable state, reduce the respiratory intensity of fruits and vegetables, delay the ripening process, so as to keep fruits and vegetables in the strange state and original nutritional cost during picking, and extend the fresh-keeping period of fruits and vegetables.

3 Application of liquid nitrogen in meat processing

4 Application of liquid nitrogen in food low temperature comminution

Low temperature comminution is the process of breaking the material cooled to the embrittlement point temperature into powder under the action of external force. Low temperature crushing of food is a new food processing skill developed in recent years. This skill is suitable for processing food with high aroma content, high fat content, high sugar content and colloidal substances. The low-temperature crushing treatment with liquid nitrogen can smash all the bones, skins, meat and shells of the materials at one time, so that the finished particles are small and connected with their useful nutrition.

5 Application of liquid nitrogen in food refrigerated transportation

Refrigerated transportation is a very important part of the food industry. Developing liquid nitrogen refrigeration skills and developing liquid nitrogen refrigerated trains, refrigerated vehicles and refrigerated containers are the common growth trends in the world today.

6 Other applications of liquid nitrogen in food industry

Due to the refrigeration effect of liquid nitrogen, egg juice, liquid condiment and soy sauce can be roughly processed into granular frozen food that can move freely and can be poured out. These foods can be used at any time and are easy to prepare. When grinding spices and water absorbing food additives, such as sugar substitutes and lecithin, liquid nitrogen is injected into the grinder to cover the costly status and increase the grinding output.



OTHER INDUSTRY APPLICATIONS

ELECTRONIC INDUSTRY

1 Superconductive skills

Superconductors have been widely used in various fields due to their unique characteristics. The use of liquid nitrogen instead of liquid helium as superconducting refrigerant to obtain superconductors has opened up the application of superconducting technology in a wide range. It is considered to be one of the greatest scientific inventions in the 20th century.

2 Manufacturing and testing of electronic components

Liquid nitrogen is a faster and more useful method for shielding and testing electronic components and circuit boards.

3 Low temperature ball milling skills

The low-temperature planetary ball mill continuously inputs liquid nitrogen gas into the planetary ball mill equipped with thermal insulation cover. These cold gases absorb the heat generated by the high-speed rotating ball mill tank in real time, so that the ball mill tank equipped with materials and grinding balls is always in a certain low-temperature environment. It is a necessary device for mixing, fine grinding, new product development and small batch production of high-tech materials in low temperature environment. The product is small in size, full in efficacy, high in compliance and low in noise. It is widely used in medicine, chemical industry, environmental protection, light industry, building materials, metallurgy, ceramics, minerals and other parts.

4 Green cutting skills

6 Other applications of liquid nitrogen

Jiuquan satellite sent the central special gas station to produce liquid nitrogen, which is the propellant of rocket fuel. A large amount of liquid nitrogen pushes the rocket fuel to the combustion chamber with high pressure. Development of high temperature superconducting power cables; It is used to freeze the liquid pipeline in emergency maintenance; Used for low temperature stabilization and low temperature quenching of materials; The skills of liquid nitrogen cooling equipment (the application of signs of thermal expansion and contraction in industry) are also widely used; Liquid nitrogen artificial precipitation enhancement skills; The technology of liquid nitrogen drainage and real-time liquid drop and induced injection is being studied continuously. Receiving nitrogen for underground fire extinguishing, the fire was quickly destroyed and the gas explosion damage was eliminated.

Choose liquid nitrogen: because it cools faster than other methods and does not react chemically with other substances, it greatly throttles the space and provides a dry atmosphere. It is environmentally friendly (liquid nitrogen is directly volatilized into gas and returned to the atmosphere without leaving any pollution). It is simple and convenient to use.



PERFORMANCE TABLE					
O N .	Customer Name	Nitrogen production	Purity	Explain	Remarks
1	Institute Of High Energy, Chinese Academy Of Sciences	3L/h	99.90%	Liquid Argon Insulation And Protection	
2	China Aerospace	5L/h	99.999%	Low Temperature Test	
3	Institute Of Biology, Chinese Academy Of Sciences And Medicine	20L/h	99.90%	Low Temperature Storage	
4	Institute Of Chemistry, Chinese Academy Of Sciences	30L/h	99.999%	Nuclear Magnetic Resonance	
5	Dunhuang Mogao Grottoes Research Institute	20L/day	99.000%	Low Temperature Protection	
6	Tibet Institute Of Agriculture And Animal Husbandry	1L/h	98%	2900m Animal Husbandry	
7	Qinghai University	10L/h	99.90%	3200m Nuclear Magnetic Resonance	
8	Coca Cola	50L/h	99.99%	Beverage Drip	
9	Institute Of Health Sciences, Fudan University	15L/h	99.00%	Low Temperature Storage	
10	Beijing Agricultural College	10L/h	99.00%	Nuclear Magnetic Resonance	
11	Brooke, Germany	30L/h	99.999%	Nuclear Magnetic Resonance	
12	Physics Laboratory Of Lanzhou University	10L/h	99.99%	Nuclear Magnetic Resonance	
13	Qingdao Inarf	3L/h	99.00%		
14	Hangzhou Normal University	5L/h	99.90%	Low Temperature Storage	Agent
15	Taiyuan Institute Of Technology	3L/h	99.90%	Low Temperature Storage	Agent
16	Southern University Of Science And Technology	3L/h	99.90%	Low Temperature Storage	Agent
17	Chinese Academy Of Sciences Observatory (Lijiang)	5L/h	99.99%	Low Temperature Storage	Agent
18	Xiamen University	5L/h	99.50%	Low Temperature Storage	Agent
19	Tonghua Dongbao	10L/h	99.90%	Low Temperature Fracture Of Rubber	Agent
20	Hayjaya	3L/h	99%	Low Temperature Fracture	Agent
21	Shenyang Aircraft Design And Research Institute Yangzhou Collaborative	40L/day	99.9%	Cryogenic Materials	Direct Selling
22	Innovation Research Institute Co., Ltd	20L/day	99.99%		
23	Hangzhou Kaihe Air Separation Equipment Co., Ltd	20L/day	99.50%	Cultural Relics Protection	
24	Lanzhou Huaxi Science Equipment Co., Ltd	10L/h	99.90%		
25	International Atomic Energy	3L/h	99%		
26	Agent	20L/h	99.90%	Beverage Drip	
27	Agent	35L/h	99.00%		
28	Agent	15L/h	99.00%		
29	Agent	20L/h	99.00%		
30	Agent	20L/day	99.90%	Beverage Drip	

PERFORMANCE TABLE					
ON.	Customer Name	Nitrogen production	Purity	Explain	Remarks
31	Agent	35L/h	99.90%	Beverage Drip	
32	Agent	10L/h	99.995%		
33	Agent	1L/h	98.00%		
34	Agent	8L/h	99.00%		
35	Agent	10L/h	99.92%		
36	Agent	50L/h	99.99%		
37	Peru	3L/h	99.90%	3900m Animal Husbandry	
38	Peru	10L/h	99.90%	1500m Animal Husbandry	
39	Peru	50L/h	99%	Liquid Nitrogen Sales	
40	Peru	15L/h	99%	3500m Animal Husbandry	
41	Chile	40L/h	99.9%	Liquid Nitrogen Sales	
42	Ecuador	50L/h	99.9%	Liquid Nitrogen Sales	
43	Kazakhstan	50L/h	99.99%	Liquid Nitrogen Sales	
44	Bengal	40L/h	99.9%	Liquid Nitrogen Sales	
45	Poland	30L/h	99.999%	Liquid Nitrogen Sales	
46	Australia	50L/h	99.9%	Liquid Nitrogen Sales	
47	Peru	5L/h	99.90%	Hypothermia Therapy	Agent
48	Belgium	20L/h	99.90%	Sell	Agent
49	Panama	3L/h	98%	Cell Freezing	Agent
50	Ethiopia	15L/h	99%	Gene	Agent
51	Cambodia	20L/h	99.99%	Cryopreservation	Agent
52	Peru	50L/h	99%	Liquid Nitrogen Sales	Agent
53	Peru	15L/h	99%	3500m Animal Husbandry	Agent
54	Bengal	30L/h	99.99%	Offshore Platform	Agent
55	Cuba	50L/h	99.99%	Sale	Agent
56	Denmark	25L/h	99.99%		Agent
57	Norway	40L/h	99.00%	Hypothermia Therapy	Agent
58	Ukraine	20L/h	99.99%		Agent
59	Canada	20L/h	99.99%	Hypothermia Therapy	Agent
60	Cambodia	50L/h	100.00%	Liquid Nitrogen Sales	Agent

Conversion table between volume, mass and standard state of common gas

Gas Medium	Weight kg	Liquid L	Standard state m³
Oxygen O ₂	1000	877	700
	1140	1000	798
	1429	1254	1000
Nitrogen N ₂	1000	1235	799
	810	1000	648
	1251	1544	1000
Argon Ar	1000	709	561
	1410	1000	799
	1784	1265	1000
Carbon Dioxide CO ₂	1000	639	506
	1564	1000	791
	1977	1264	1000
Hydrogen H ₂	1000	14085	11136
	71	1000	791
	89.8	1264	1000
Methane CH ₄	1000	2381	1395
	420	1000	586
	717	1706	1000