

# OXYGEN & NITROGEN PLANTS

IN TECHNICAL COLLABORATION WITH

ING L&A BOSCHI OF ITALY

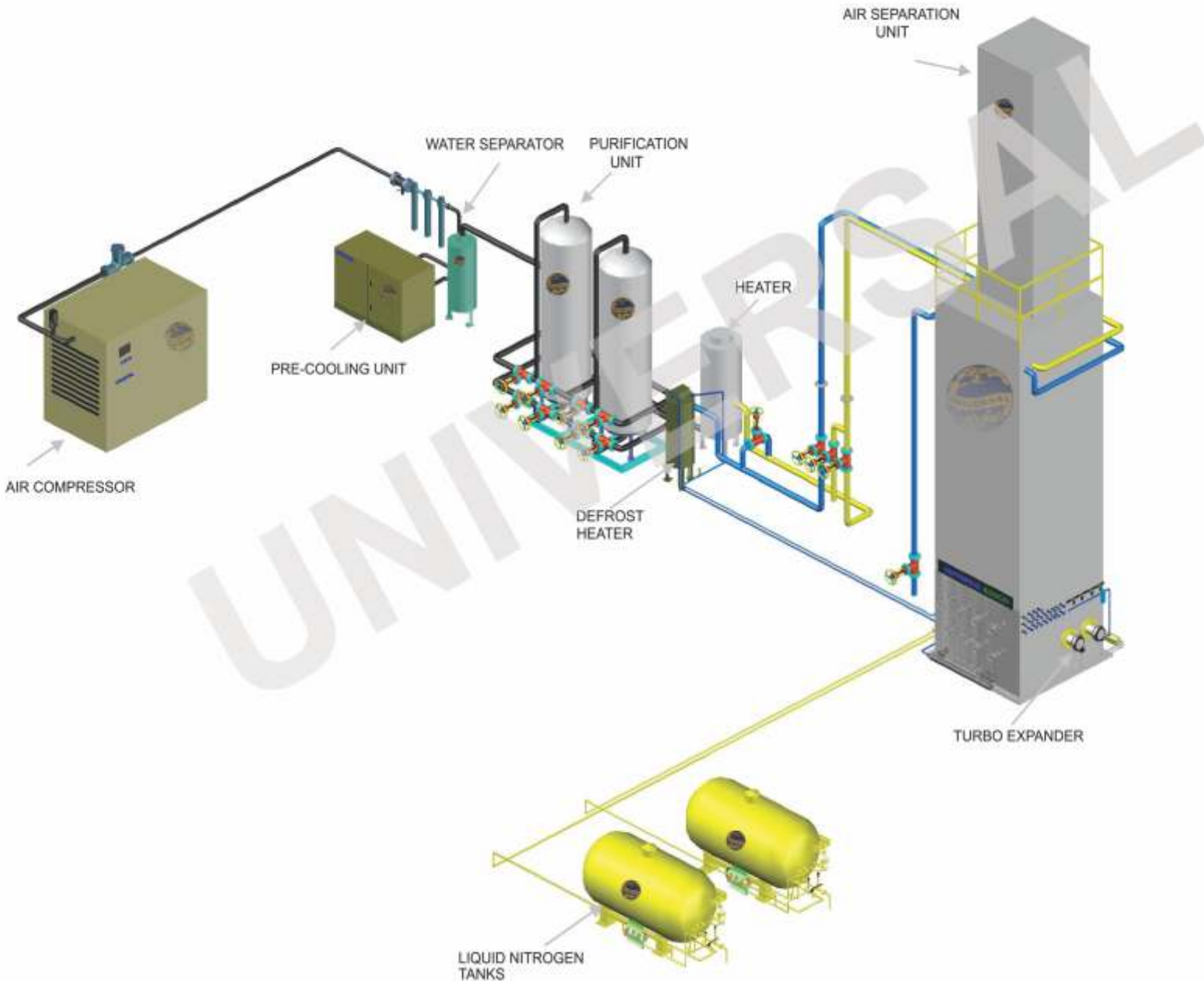


LIQUID NITROGEN PLANT UBTLN SERIES  
(CAPACITY 30 Nm<sup>3</sup> /hr to 500 Nm<sup>3</sup>/hr)



Convenience Stability & Energy-saving are our devotion & pursuit

## 3D VIEW LIQUID NITROGEN PLANT-UBTLN SERIES



### Company profile

Universal in Collaboration with **ING.L.A. BOSCHI Italy SINCE 1930** manufactures & suppliers Premium Quality low pressure Air separation plants of all sizes ranging from 30m<sup>3</sup>/hour to 50,000m<sup>3</sup>/hour.

Universal is a certified ISO 9001:2000 organization and the latest achievement includes the successful approval for CE Certification which makes our company the first in Asia to certified for Cryogenic Pressure vessel ,Plant machinery exports to Europe and USA. We have success in the low Pressure plants as it is the technology of today and the future. We have manufactured over 300 plants since last 23 years since 1985 at New Delhi and supplied to over 40 countries world wide.





### PROCESS DESCRIPTION NITROGEN PLANT

Air is compressed at a low pressure of 5-7 Bar. Air can be compressed at such low pressure by trouble free rotary compressor (screw / centrifugal type advanced technology is employed in lieu of old bulky piston compressor.)

Through a filter, the required quantity of process air is taken from the atmosphere by compressor and boosted to necessary pressure. After precooling and separation from water, the compressed process air passed through purifier. Where components of most of the hydrocarbons that would disturb process air, such as moisture, carbon dioxide & most of the hydrocarbons that would disturb processing are reduced to permissible limits. Separation of nitrogen from different components of air is carried out in the fractionation column.

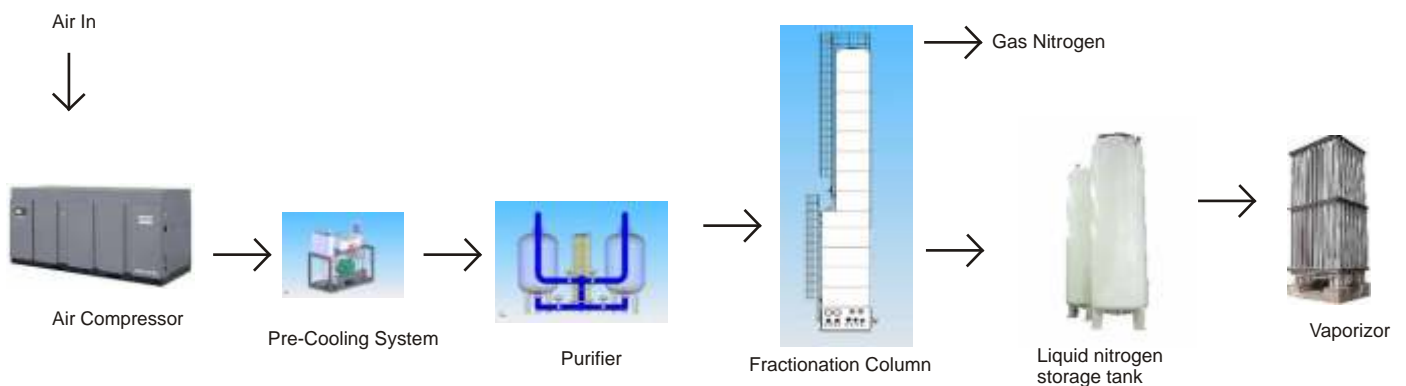
Through warmed up, the gas product nitrogen leaves the coldbox under pressure and delivered to pipeline to customer, s end. From rectification column, the liquid nitrogen is directly injected into storage tank

Through warming up by heat exchanger, oxygen- enriched air, which is rectified by the rectification column, is passed into the turbine for rectification.

Expander waste gas goes into heat exchanger again to recycle the cold capacity

After wards warmed air is delivered to purifier to reactivate the adsorbent.

### PROCESS DRAWING OF NITROGEN PLANT



## ADVANTAGES OF NITROGEN PLANT UBTLN SERIES



Client from australia



Client from U.K.

### ADVANTAGES OF NITROGEN PLANT UBTLN SERIES

- \* High purity
- \* Quick start-up after tripping and shut down.
- \* Supply of liquid nitrogen to tank.
- \* Easy operation.
- \* Automatic change over of molecular sieve available as option
- \* Long operation period
- \* Remote control available
- \* Very low power consumption
- \* By product: oxygen on request

#### Basic Principle

We are supplying low pressure plants manufactured by us with the following main components:

1. Low pressure Rotary compressor or Oil free piston air compressors.
2. Low pressure driers.
3. Low pressure refrigerant drier.
4. Turbo expander.
5. Low pressure air separation unit.





Rotary Screw Type



Oil Free Piston Type



Centrifugal Type



The air separation plant is a plant recovering oxygen and nitrogen from air simultaneously. It advance low pressure technology process of Boschi Italy using Rotary screw compressor (or low oil free piston compressor) and turbo expanders. The feed air entering the Molecular Sieve purification system employed to remove the moisture and Co<sub>2</sub> from the process air. The air is liquefied by cryogenic cooling using latest plate and fin high efficiency heat exchangers and turbo expanders. The liquid air separates into oxygen nitrogen and inert gases in the air separation column.

## AIR COMPRESSOR

A good air compressor with good quality is crucial to oxygen and nitrogen plant in its reliability maintenance, compressing capacity, product quality and efficiency. The discharge pressure of air compressor for air separation plant is usually with in 1.0Bar, so there exists a wide selection of Atlas copco rotary screw type and oil flooded, oil free screw type, Centrifugal type and Rotary screw type.

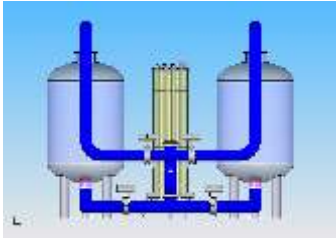
The selection of air compressor is subject to the size of the oxygen plant. Usually for a small-scale nitrogen plant, oil-free screw type is enough. An oil-free piston type compressor is also good option if very robust compressor is required for worse site conditions.

For a larger and medium - scale oxygen/nitrogen plant, there should be equipped a centrifugal air compressor. It functions stably with low operating cost, but the investment is usually very large. Beside, a centrifugal compressor needs a self-cleaning air filter.

## PRE-COOLER SYSTEM

The Pre-cooler equipped in the oxygen/nitrogen plant is provided by professional manufacturer. It is skid mounted with main equipments imported. Function of pre-cooling system is to cool down the compressed air to 5-8°C, and to discharge the condensed water.





## PURIFYING SYSTEM

Purifying system is for secondary removal of moisture carbon dioxide and most of the hydrocarbons that would disturb processing. It works on double-layers of molecule sieve and alumina adsorption.

Through reasonable structure design, the service life and adsorption performance are both strengthened, and thus to ensure a continuous performance of the fractional column.

Regarding the shift, there are generally two types of purifier. automatic shift controlled by PLC, and manual shift. Regarding the structure, there are also two types; skid-mounted type and separate-structure type. The skid-mounted purifier is easy to install and move, but the cost is relatively high. The separate-structure type is always installed at work site with low cost.

Selection of purifying system is subject to the scale and the investment of the oxygen/nitrogen plant by the customer.



Expansion turbine

## EXPANSION TURBINE

A oxygen/nitrogen plant always works on process of back flow expansion turbine when there is a need of expand capacity larger than 3000m<sup>3</sup>/h. Small capacity plants having air flow from 300Nm<sup>3</sup> to 3000m<sup>3</sup>/h, its is often equipped gas-bearing expansion turbine.

The turbine is to increase the flow rate of the compressed gas through a nozzle; meanwhile, the speeded gas drives the wheel & output power through the rotor. During this process, both the pressure and temperature of gas lowered down, thus to provide cold capacity. In modern air separation plant, the cold capacity by turbine takes about more than 90% of entire cold capacity needed.



Gas bearing expansion turbine

### Fractionation column

Fractionation column is the key part of the entire plant, where separation of oxygen/nitrogen is carried out through heat transfer by very highly efficient plate and fin tube exchangers current being used by all the leading manufactures in the world like Linde, Air Liquide air products USA.

Based on different processes, there are mainly two types of fractionation column single stage column and double stage column.

The fractionation column designed and manufactured by us has a superior systematic performance, flexibility and stability. The purity and recovery both have been equivalent with the most advanced international technologies.

We equip plate-fin type heat exchanger and full aluminum structure to main part of internal components of the cold box, which is close sealed and filled in gas to preserve pressure. Thus the cold loss caused by heat in leak is reduced to large extent. Cold box below 6000Nm<sup>3</sup>/h can be assembled within our workshop, which could reduce work load at customer's work site and supplied as a packaged unit.

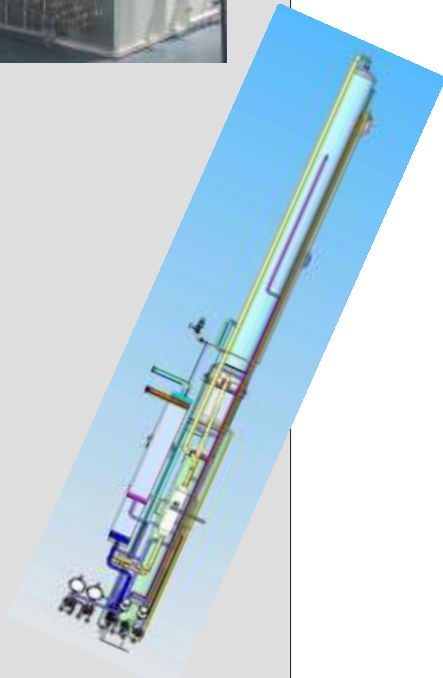


Plate & Fin type exchanger

## INSTRUMENT-CONTROL SYSTEM



Instrument-control system, the window of the whole plant, could reflect all the information of the plant during its operation. A common instrument-control system is equipped with side by side cabinet and digital display together to reveal those parameters as pressure, temperature and flow rate. It is easy to operate, and the cost is relatively little.



Centralized control system is equipped with PLC or DCS from Siemens for the function of display, operation, adjusting, memorizing, recording, alarming, interlock, start-up and shut down. In the computer, there are displays of main menu, process flow, parameter list, alarm and history trend. Network control of multi-computer is also achievable.

As fast development of internet, based on DCS & PLC, the network could connect the control system at customer's end together with the manufacturer's office for observation and supervision. Thus, if there is any problem in operating the plant, we would be able to offer a help hand in time, providing solution or technical support. Selection of control system depends finally on the requirement of the customer.

## ANALYSIS CABINET

Analysis cabinet is to quicken the response speed, improve precision, protect the analytical instruments, convenient check out and offer standard gas.

The components of analytical gas can be collocated according to customer's requirement as follows:

Micro oxygen, micro moisture CO<sub>2</sub>, and other components of high-purity nitrogen (such as H<sub>2</sub>, CO, CH<sub>4</sub>----







### LIQUID NITROGEN STORAGE TANK

The cryogenic storage tank works on vacuum and power heat-insulation with operating pressure of 8Bar and 16Bar. Leading models as 5m<sup>3</sup>, 10m<sup>3</sup>, 20m<sup>3</sup>, 30m<sup>3</sup>, 50m<sup>3</sup>, 100m<sup>3</sup>.

If there is large quantity of liquid to be stored, it is recommended to equip power insulation cryogenic storage tank. Its operating pressure varies from atmospheric pressure to 8Bar or even higher. Its capacity varies from 200m<sup>3</sup> to 1000m<sup>3</sup>. Selection of storage tank is subject to the requirement of the customers.

### VAPORIZER

Based on the difference of working condition, there are two types of vaporizer: atmospheric vaporizer and water-shower vaporizer.

**Atmospheric vaporizer:** It makes use of the heat capacity of natural convection air to vaporize liquid by aluminum alloy fin tube, which is used in high ambient occasions and need not any additional power and annex equipment. Its technique is simple; no operation expense. If the condition is available, had better to use air temperature vaporizer.

**Water bath vaporizer:** It is made of stainless steel or purple copper tube, which is dipped in water to heat water by steam or electric heat tube. The heated water vaporizes by exchanging heat with liquid inside tube. It is fit for the north of low ambient temperature. Its technique is quite complex to atmospheric vaporizer and need operation expense.



## Introduction

### Introducing BOSCHI Italy UBTLN Series (Liquid Nitrogen Series)

#### The world standard in packed cryogenic air separation plants.

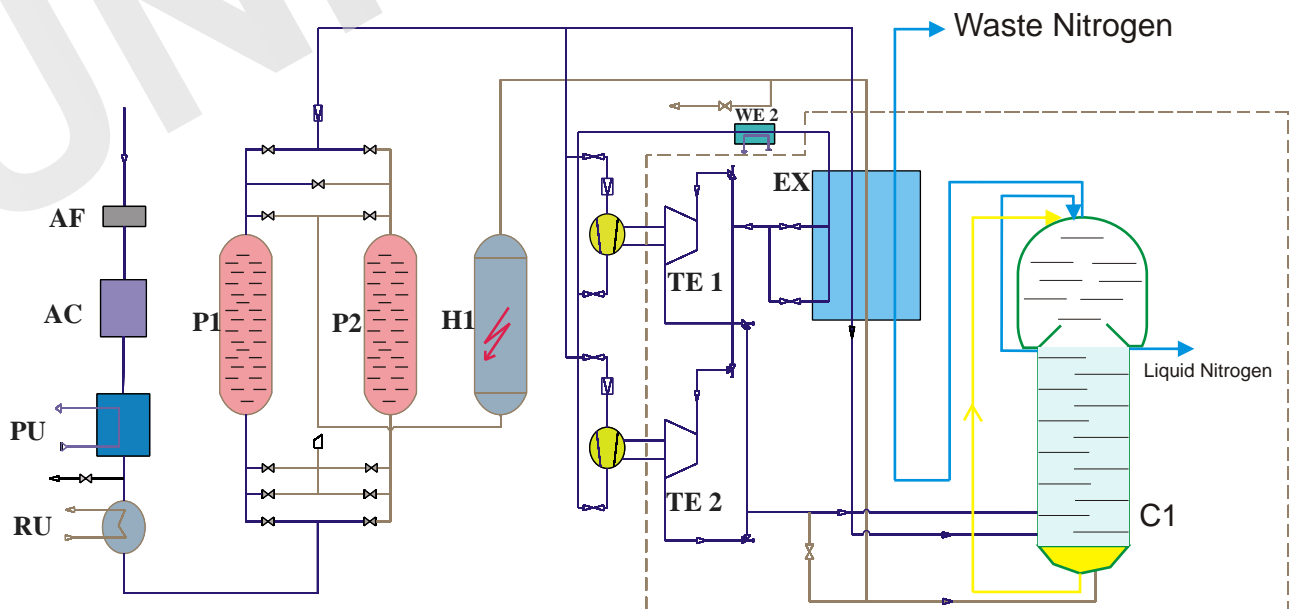
UBTLN series plants are designed and built to meet the most severe operating conditions. Regular inspection and performance testing under actual operating conditions is a pre requisite at our factory to assure highest quality.

Some of the advantages of UBTLN series are:-

- Minimization of transportation & handling expenses.
- Rapid on-site installation & commissioning within 2 days.

Over 300 air separation plants are working produced by universal in collaboration with ING.L.&A.BOSCHI all over the world.

## Process Flow Diagram



AF	AIR FILTER	H1	HEATER
AC	AIR COMPRESSOR	EX	MAIN HEAT EXCHANGER
PC	PRE-COOLING UNIT	TE1/2	TURBO EXPANDER
PU	PURIFICATION UNIT	C1	COLUMN
P1/2	TOWER1/TOWER 2		

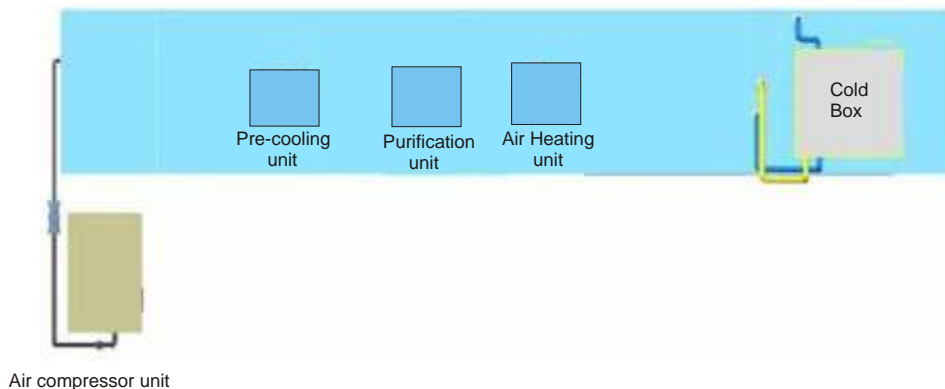
## Technical Specifications

Production	UBTLN 50	UBTLN 100	UBTLN 150	UBTLN 200	UBTLN 300	UBTLN 400	UBTLN 500
Liquid Nitrogen (Nm <sup>3</sup> /hr)	50	100	150	200	300	400	500
Liquid Nitrogen (L/hr)	73	145	218	290	435	578	724
<b>Purity</b>							
Liquid Nitrogen (%)	99.99	99.99	99.99	99.99	99.99	99.99	99.99

\*Indicative : End specifications are as per actual offer.

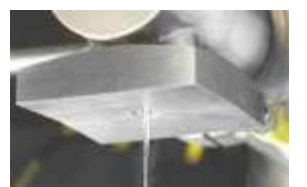
**Note:-**

- 1.) No water required for cooling the air compressor, air cooled type rotary air compressor is used.
- 2.) Skid mounted uses can option.
- 3.) ISO frame available.
- 4.) Containerized option available.



**Plan view**

# Application of liquid nitrogen



### Semiconductor

Liquid nitrogen is used widely in semiconductor in multifarious application. Vacuum jacketed, sealed or dynamic and flexible piping provides the semiconductor industry with safe, reliable transfer of LN<sub>2</sub> for on demand supply from the large LN<sub>2</sub> bulk storage tanks for portable LN<sub>2</sub> dewars.

### Pharmaceutical and Biotech

Vacuum-insulated, flexible cryogenics piping from the liquid nitrogen storage tank, plants provide the pharmaceutical industry with most safe, efficient and clean transfer of liquid N<sub>2</sub> for lyophilization, cryo-storage, SEM, NMR, MRI Dewar fill stations, vial freezing and oxygen reduction.

### Packaged Foods

Liquid nitrogen injection systems for pressurization or inerting a variety of packaged foods. Liquid nitrogen dosing systems provide the most accurate, pure liquid nitrogen dosing, allowing for consistent pressure from package to package, at all line speeds. Therefore liquid N<sub>2</sub> systems are used to inert all package types to reduce oxygen absorption by the product which extends the product shelf life and maintains product taste, colour and freshness.

Liquid nitrogen plants 20 L/hr to 500L/hr can be installed in house to reduced cost of LN<sub>2</sub> by more than 90%.

### Liquid nitrogen dosing

#### Liquid nitrogen dosing-PET bottle and thin wall can pressurization or inerting

##### Pressurizing

Liquid nitrogen dosing is used to pressurize PET bottle and thin wall cans with controlled the liquid nitrogen provides package strength to eliminated paneling and pelletizing problems and provide a manufacturer cost saving with the use of lighter weight PET plastic.

##### Inerting

Liquid nitrogen dosing is also used to inert bottles and thin wall can to reduce oxygen levels. The LN<sub>2</sub> extended product shelf life, maintains product taste, color and freshness and eliminates paneling.

For a reliable and cheap supply of liquid nitrogen of high quality its is more variable install liquid nitrogen generator.

### Non carbonated Beverages-

Liquid nitrogen injection systems for controlled dosing to pressurize delicate PET packages. Liquid nitrogen injection systems provide the most accurate, pure liquid nitrogen dosing, allowing for consistent pressure from package to package, at all line speeds. Combined with seal dynamically pumped cryogenic piping liquid nitrogen consumption is reduced by 80% within food and beverage industry and a manufacturer cost saving can be realized with the use of weight packages. While the percent decline is not significant, the trend has opened eyes

## Application of liquid nitrogen



Amongst major CSD companies and brands.

Beverage companies, like COCO-COLA & PEPSI, have seen the declining trend in regards to consumption and have ramped up non-CSD efforts to meet the growing demand.

For reliable supply of high quality beverage grade liquid nitrogen install Bosch Brand Liquid nitrogen generator/plants of purity upto 99.999%.

Our liquid nitrogen has been tested by COCO-COLA company to satisfied their standards.

Here's how it works: a precisely-timed charge of liquid nitrogen is dosed into the bottle after filling. The cold injection liquid nitrogen (320 degrees Fahrenheit) rapidly (in milliseconds) turns into nitrogen gas and by using the physical properties of boiling off liquid the head-space is exchanged with oxygen free nitrogen gas. The number of air exchanges is directly related to the dissolved oxygen readings obtained in the wine, which turn, allows the wine to maintain the desired bouquet, color & flavor.

"We are extremely pleased to have a unit that meets Hogue's requirements" say Edward Hanlon, Vice President Sales, Vacuum Barrier. "Our intent in the development of this unit was to allow those who could not in the past, enjoy the benefits of liquid nitrogen." Thanks in part to this solution approximately 70% Hogue Cellars wine will have a screw cap by 2010.

For reliable and cheap supply of liquid nitrogen of high quality its is more viable install liquid nitrogen generator.

### Lighting

Closed loop cryogenic piping systems and custom spray manifolds for high velocity liquid nitrogen spray.

Closed loop cryogenic piping systems and custom spray manifolds for reliable, clean and uninterrupted liquid nitrogen supply. Our vacuum jacketed, flexible cryogenic piping includes sealed and dynamics for versatile routing from bulk storage tanks or portable dewars.

### Automotive

Vacuum jacketed cryogenic piping and specially chambers for liquid nitrogen cryoshrink. Vacuum jacketed cryogenics systems to cryoshrink valve seats, pins, guides, baths, cylinder liners and bearings. Our complete line of bendable cryogenic piping sealed and dynamic operates frost-free and provides versatile routing from large storage tank or portable dewars. Freeze Chambers for valve seats feature apparatus for rapidly chilling work pieces as they are delivered to an assemble line using liquid nitrogen cryogenic fluid.

Our wide range of liquid nitrogen generator are highly reliable and provided major cost reduction.

### Oil well & Down hole drilling

Liquid Nitrogen is used both as cooling media and to provide inert atmosphere for oil high temperature dewars for optimum thermal protection.

Liquid nitrogen is pumped upto 400 bars in the oil well during drilling operation. our wide range of our liquid nitrogen generator/plants.



### Safety

It is highly safety use liquid nitrogen as it is an inert gas. The liquid nitrogen generators /plants can be operated very safety.

The liquid nitrogen plants are manufactured with the by best international standards including ISO9000:2000 system and standards prescribed by ING.L.& A. BOSCHI ITALY. for supply to Europe CE Marks has been obtained as the by best safety marks.

### Cost

The cost of liquid nitrogen depends on the distance from related facilities and the price of energy; the actual cost tends to range between US\$0.10 and US\$0.50 per litre.



## OXYGEN & NITROGEN PLANTS

IN TECHNICAL COLLABORATION WITH

ING L&A BOSCHI OF ITALY

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