

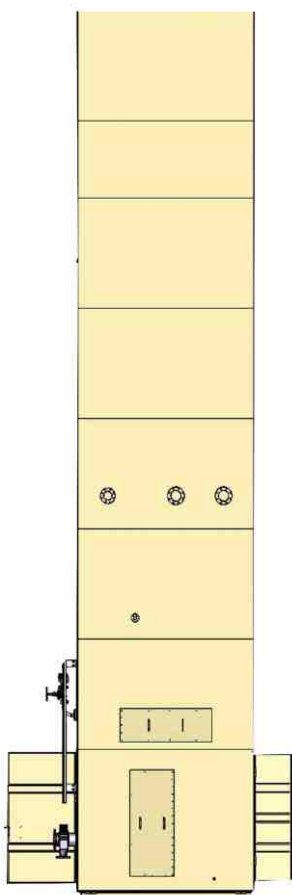
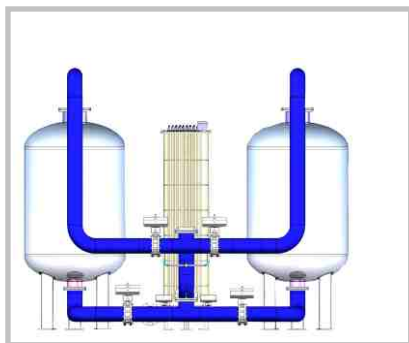
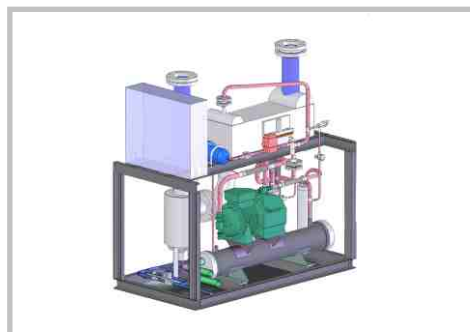


IMPIANTI LIQUEFAZION E PRODUZIONE GAS TECNICI
23 years of Excellence

OXYGEN NITROGEN ARGON AIR SEPARATION PLANTS

LOW OPERATING PRESSURE

40m³/h To 50,000m³/h GOX & GAN



IN TECHNICAL COLLABORATION WITH

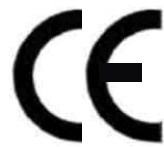
ING L & A BOSCHI OF ITALY

www.oxygenplants.com



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CERTIFICATIONS & STANDARDS



ISO 9001:2000



ING. L. & A. BOSCHI
IMPIANTI LIQUEFAZIONE E PRODUZIONE GAS TECNICI

IN TECHNICAL COLLABORATION WITH

ING L & A BOSCHI OF ITALY



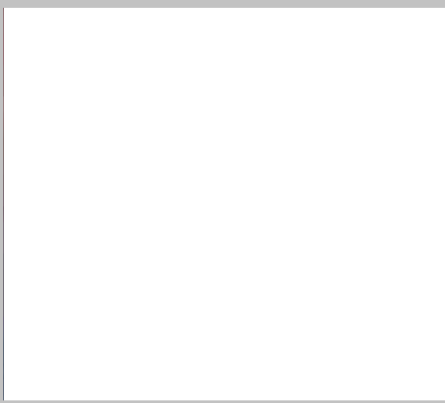
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Company Profile

*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 50m³/hour to 50,000m³/hour including Cryogenic Tonnage gas plants and liquid plants.*



Dr. Boschi (Italy) at New Delhi Press Conference



OEM supplier from Switzerland

With state of the art designs and technology from Europe, established manufacturing facilities spread out in various locations all over India & Asia and sales located in New Corporate Region (NCR) of Delhi, the Italy based company is dedicated to supplying the latest in Cryogenic Technology constantly striving to improve its products through continuous research and development.

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.



Air Compressor

1. Air Compressor:

Rotary air compressor screw type can be used for smaller size plants upto 500m³/hr & 1000m³/hr. Upto 40000m³/hr. Centrifugal compressor can be used for higher size plants.



Rectification Column

2. Air pre cooling system:

Air separation plants adopts chilling system in all air pre- Cooling systems.

3. Air purification system:

This system beds of molecular sieve are used in the air purification system ,it remove the Co₂ & moisture for the process air at low- Pressure.

4. Rectification column:

The unit in cold box are all low pressure technology. This unit employs the latest state of the art plate and fin exchanger, condenser and sub-coolers. The Column is supplied as a packed unit complete with all the control systems including digital flow –meters, temperature, pressure available with high purity upto 2-3 ppm nitrogen as a second product without loss in oxygen production.

5. Turbo-expander:

Turbo - expander is used for giving cooling to the air for the liqefication process and braked by booster, so as to reduce the expanded air volume, stablize the upper columns working condition and reduce power consumption. The turbine expanders have complete trouble free working and long life and reliability.



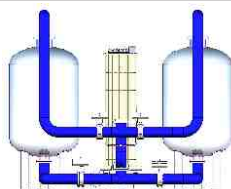
Air Purification System

6. Computer control:

All the plants can be configured for automatic operation through a pc this will use a out switching valves of German or Japanese and motorized cryogenic valves on cold box.



Air Pre-Cooling System



Purifier



Turbo-Expander



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AIR COMPRESSOR

PRE-COOLER+PURIFICATION UNIT

AIR SEPARATION UNIT

TURBO-EXPANDER

CONTROL PANEL



TECHNICAL SPECIFICATION AIR SEPARATION PLANTS OXYGEN--NITROGEN--ARGON GAS

SMALL CAPACITY(40Nm³/hr To 130Nm³/hr)

MODEL (O ₂ /N ₂ */Ar)	UBT-40/50	UBT-60/80	UBT-80/100	UBT-100/150	UBT-120/150	UBT-130/160
Oxygen Capacity Nm ³ /hr	40	60	80	100	120	130
Oxygen Purity % O ₂	99.6	99.6	99.6	99.6	99.6	99.6
Nitrogen Capacity Nm ³ /hr	50	80	100	150	150	160
Nitrogen Purity	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM
Air Pressure (BAR)	7	7	7	7	7	7
No of O ₂ cylinder per day (150 BAR*)	160	240	320	400	480	520
Power Consumption (KW)	36	51	64	80	96	104
Specific Power per M ³ of gox+gan	0.4	0.36	0.35	0.32	0.35	0.35
Specific Power Kwh/m ³ O ₂	0.9	0.85	0.8	0.8	0.9	0.78
Argon**Capacity M ³ /hr	N/A	N/A	N/A	N/A	N/A	N/A



IMPIANTI LIQUEFAZIONE E PRODUZIONE GAS TECNICI
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AIR COMPRESSOR

PRE-COOLER+PURIFICATION UNIT

AIR SEPARATION UNIT

TURBO-EXPANDER

CONTROL PANEL

TECHNICAL SPECIFICATION AIR SEPARATION PLANTS OXYGEN--NITROGEN--ARGON GAS



SMALL CAPACITY(150Nm³/hr To 350Nm³/hr)

MODEL (O ₂ /N ₂ */Ar)	UBT-150/200	UBT-170/200	UBT-200/220	UBT-220/220	UBT-300/300	UBT-350/350
Oxygen Capacity Nm ³ /hr	150	170	200	220	300	350
Oxygen 2 Purity % O ₂	99.6	99.6	99.6	99.6	99.6	99.6
Nitrogen Capacity Nm ³ /hr	200	200	220	220	300	350
Nitrogen Purity	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM
Air Pressure (BAR)	7	7	7	7	7	7
No of O ₂ cylinder per day (150 BAR*)	600	680	800	880	1200	1400
Power Consumption (KW)	117	128	150	165	225	262
Specific Power per M ³ of gox+gan	0.33	0.34	0.35	0.37	0.37	0.37
Specific Power Kwh/m ³ O ₂	0.78	0.75	0.75	0.75	0.75	0.75
Argon**Capacity M ³ /hr	N/A	N/A	N/A	N/A	N/A	N/A



IMPIANTI LIQUEFAZIONE E PRODUZIONE GAS TECNICI
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AIR COMPRESSOR

PRE-COOLER+PURIFICATION UNIT

AIR SEPARATION UNIT

TURBO-EXPANDER

CONTROL PANEL

TECHNICAL SPECIFICATION AIR SEPARATION PLANTS

OXYGEN--NITROGEN--ARGON GAS

SMALL CAPACITY(400Nm³/hr To 800Nm³/hr)

MODEL (O ₂ /N ₂ */Ar)	UBT-400/400	UBT-500/500	UBT-500/500/8	UBT-600/600	UBT-800/800
Oxygen Capacity Nm ³ /hr	400	500	500	600	800
Oxygen Purity % O ₂	99.6	99.6	99.6	99.6	99.6
Nitrogen Capacity Nm ³ /hr	400	500	500	600	800
Nitrogen Purity	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM
Air Pressure (BAR)	7	7	7	7	7
No of O ₂ cylinder per day (150 BAR*)	1600	2000	2000	2400	3200
Power Consumption (KW)	288	350	350	390	496
Specific Power per M ³ of gox+gan	0.36	0.35	0.35	0.32	0.31
Specific Power Kwh/m ³ O ₂	0.72	0.7	0.7	0.65	0.62
Argon**Capacity M ³ /hr	N/A	N/A	8	N/A	N/A



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AIR COMPRESSOR

PURIFICATION UNIT

AIR SEPARATION UNIT

TURBO-EXPANDER

CONTROL PANEL

TECHNICAL SPECIFICATION AIR SEPARATION PLANTS

OXYGEN--NITROGEN--ARGON GAS

MEDIUM CAPACITY(1000Nm³/hr To 2500Nm³/hr/32 TPD TO 80 TPD)

MODEL (O ₂ /N ₂ */Ar)	UBT-1000/1200/30	UBT-1500/1500	UBT-2000/2000	UBT-2500/2200/70
Oxygen Capacity Nm ³ /hr	1000	1500	2000	2500
Oxygen Capacity Tons Per Day	32 TPD	48 TPD	64 TPD	80 TPD
Oxygen Purity % O ₂	99.6	99.6	99.6	99.6
Nitrogen Capacity Nm ³ /hr	1200	1500	2000	2200
Nitrogen Capacity Tons Per Day	33 TPD	42 TPD	56 TPD	60 TPD
Nitrogen Purity	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM
Air Pressure (BAR)	6	5	5	5
No of O ₂ cylinder per day (150 BAR*)	4000	N/A	N/A	N/A
Power Consumption (KW)	550	825	1000	1250
Specific Power per M ³ of gox+gan	0.25	0.27	0.25	0.27
Specific Power Kwh/m ³ O ₂	0.55	0.55	0.5	0.5
Argon**Capacity M ³ /hr	30	N/A	N/A	70



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AIR COMPRESSOR

PURIFICATION UNIT

AIR SEPARATION UNIT

TURBO-EXPANDER

CONTROL PANEL

TECHNICAL SPECIFICATION AIR SEPARATION PLANTS

OXYGEN--NITROGEN--ARGON GAS

MEDIUM CAPACITY(1500Nm3/hr To 10000Nm3/hr/50 TPD TO 320 TPD)

MODEL (O ₂ /N ₂ */Ar)	UBT-1500/1500/45	UBT-3600/3600/100	UBT-6000/6000/200	UBT-10000/18000/380
Oxygen Capacity Nm ³ /hr	1500	3600	6000	10000
Oxygen Capacity Tons Per Day	50 TPD	115 TPD	190 TPD	320 TPD
Oxygen Purity % O ₂	99.6	99.6	99.6	99.6
Nirogen Capacity Nm ³ /hr	1500	3600	6000	18000
Nitrogen Capacity Tons Per Day	42 TPD	100 TPD	170 TPD	500 TPD
Nitrogen Purity	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM
Air Pressure (BAR)	5	5	5	5
No of O ₂ cylinder per day (150 BAR*)	N/A	N/A	N/A	N/A
Power Consumption (KW)	825	1800	2700	4800
Specific Power per M ³ of gox+gan	0.27	0.25	0.26	0.17
Specific Power Kwh/m ³ O ₂	0.5	0.5	0.45	0.48
Argon**Capacity M ³ /hr	45	100	100	380



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AIR COMPRESSOR

PURIFICATION UNIT

AIR SEPARATION UNIT

CONTROL PANEL

TECHNICAL SPECIFICATION AIR SEPARATION PLANTS

OXYGEN--NITROGEN--ARGON GAS

HIGH CAPACITY(10000Nm3/hr To20000Nm3/hr/480 TPD TO 640 TPD)

MODEL (O ₂ /N ₂ */Ar)	UBT-10000/18000/ 380	UBT-15000/13000/ 450	UBT-40000/20000/ 1500	UBT-15000/10000	UBT-18000/15000	UBT-20000/20000
Oxygen Capacity Nm3/hr	10000	15000	40000	15000	18000	20000
Oxygen Capacity Tonne Per Day	320 TPD	480 TPD	1285 TPD	480 TPD	575 TPD	640 TPD
Oxygen Purity % O ₂	99.6	99.6	99.6	99.6	99.6	99.6
Nitrogen Capacity Nm3/hr	18000	13000	20000	10000	15000	20000
Nitrogen Capacity Tonne Per Day	500 TPD	365 TPD	560 TPD	280 TPD	420 TPD	560 TPD
Nitrogen Purity	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM
Air Pressure (BAR)	5	5	5	5	5	5
No of O ₂ cylinder per day (150 BAR*)	N/A	N/A	N/A	N/A	N/A	N/A
Power Consumption (KW)	4800	7050	1600	6000	7200	8000
Specific Power per M3 of gox+gan	0.17	0.25	0.26	0.25	0.26	0.25
Specific Power Kwh/m3 O ₂	0.48	0.47	0.4	0.4	0.4	0.4
Argon**Capacity M3/hr	380	450	1500	OPT.	OPT.	OPT.



AIR COMPRESSOR

PURIFICATION UNIT

AIR SEPARATION UNIT

CONTROL PANEL

**TECHNICAL SPECIFICATION AIR SEPARATION PLANTS
OXYGEN--NITROGEN--ARGON GAS**

HIGH CAPACITY(25000Nm³/hr To 50000Nm³/hr/800 TPD TO 1600 TPD)

MODEL (O ₂ /N ₂ */Ar)	UBT-25000/20000	UBT-30000/25000	UBT-40000/30000	UBT-50000
Oxygen Capacity Nm ³ /hr	25000	30000	40000	50000
Oxygen Capacity Tons Per Day	800 TPD	960 TPD	1285 TPD	1600 TPD
Oxygen Purity % O ₂	99.6	99.6	99.6	99.6
Nitrogen Capacity Nm ³ /hr	20000	25000	30000	50000
Nitrogen Capacity Tons Per Day	560 TPD	700 TPD	840 TPD	1400 TPD
Nitrogen Purity	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM
Air Pressure (BAR)	5	5	5	5
No of O ₂ cylinder per day (150 BAR*)	N/A	N/A	N/A	N/A
Power Consumption (KW)	10000	11400	14400	17500
Specific Power per M ³ of gox+gan	0.26	0.27	0.24	0.22
Specific Power Kwh/m ³ O ₂	0.4	0.36	0.36	0.35
Argon**Capacity M ³ /hr	OPT.	OPT.	OPT.	OPT.



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AIR COMPRESSOR

PURIFICATION UNIT

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CONTROL PANEL

OPT.Optional (as required by buyer Argon attachment can be provided extra)

* CYLINDER CAPACITY FOR CALCULATION PROSES IS 6 TO7CU METER OR 40-47 LITERS WATER CAPACITY

** Argon gas purity 99.9 & above upto 99.999% or ppm quality

NOTES:

1. All the above data is only indicative to enable the buyers to select the model and detailed offer shall be given with the order.
2. The oxygen booster/ LO pump depending on model is added for filling oxygen gas in cylinders at 150 /200 bar.
3. Argon can be produced in all plants above 500m³/hr.
4. Pure nitrogen gas upto 3ppm is avail able as a second product with out loss of oxygen, production.

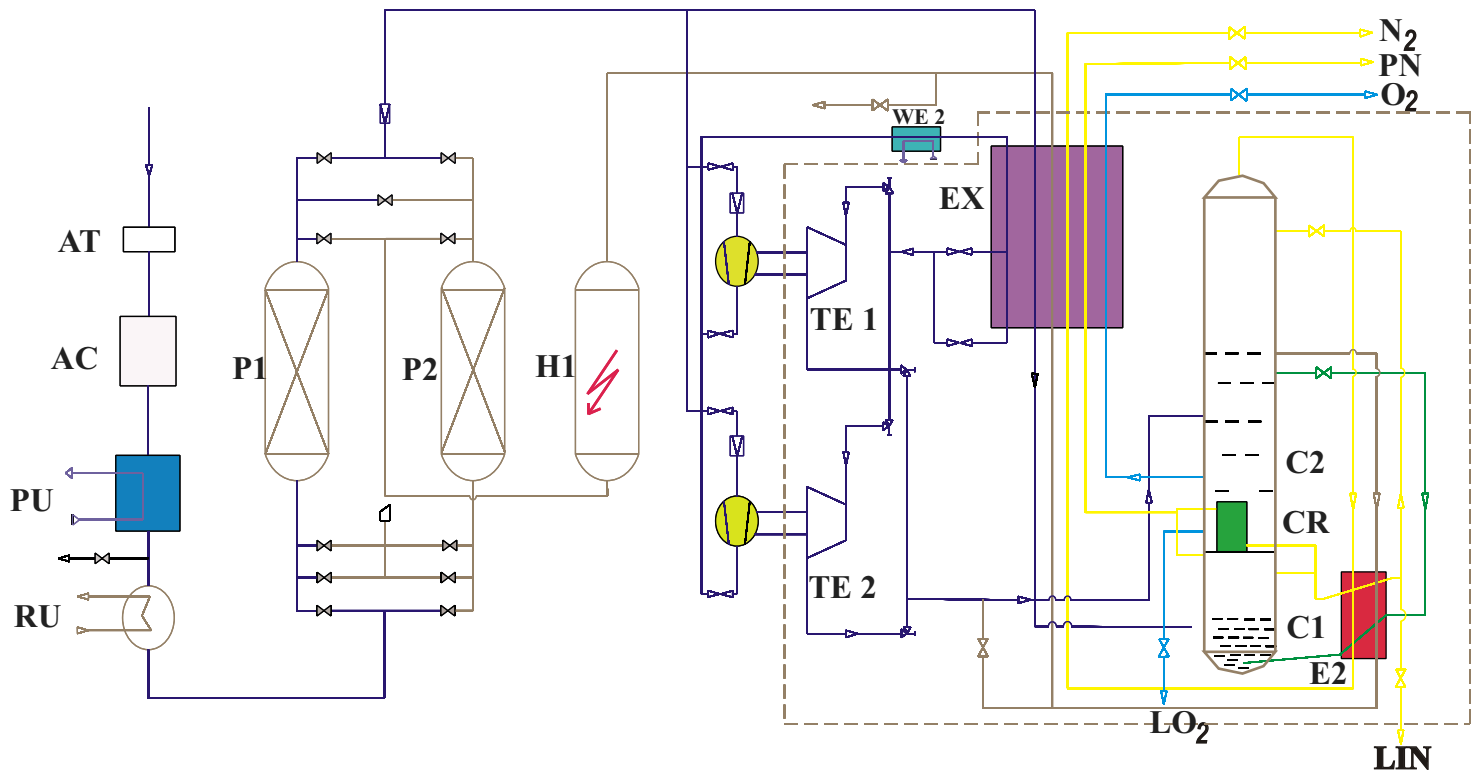
All capacities are as per design suction conditions.

Nitrogen gas Pure output can be taken as optional along with liquid oxygen as per requirement.

Plants for Oxygen/ Nitrogen/Argon output of any desires/specific requirement of the buyer of 20,000 m³/hr upto 40,000m³/hr.

VOLTAGE 380-415 AND 50/60 HZ AS SPECIFIED.ALSO VOLTAGE AND FREQUENCY COUNTRY SPECIFIC AS ORDERED.HT MOTORS ABOVE 400 KW OF 10/11 KV.

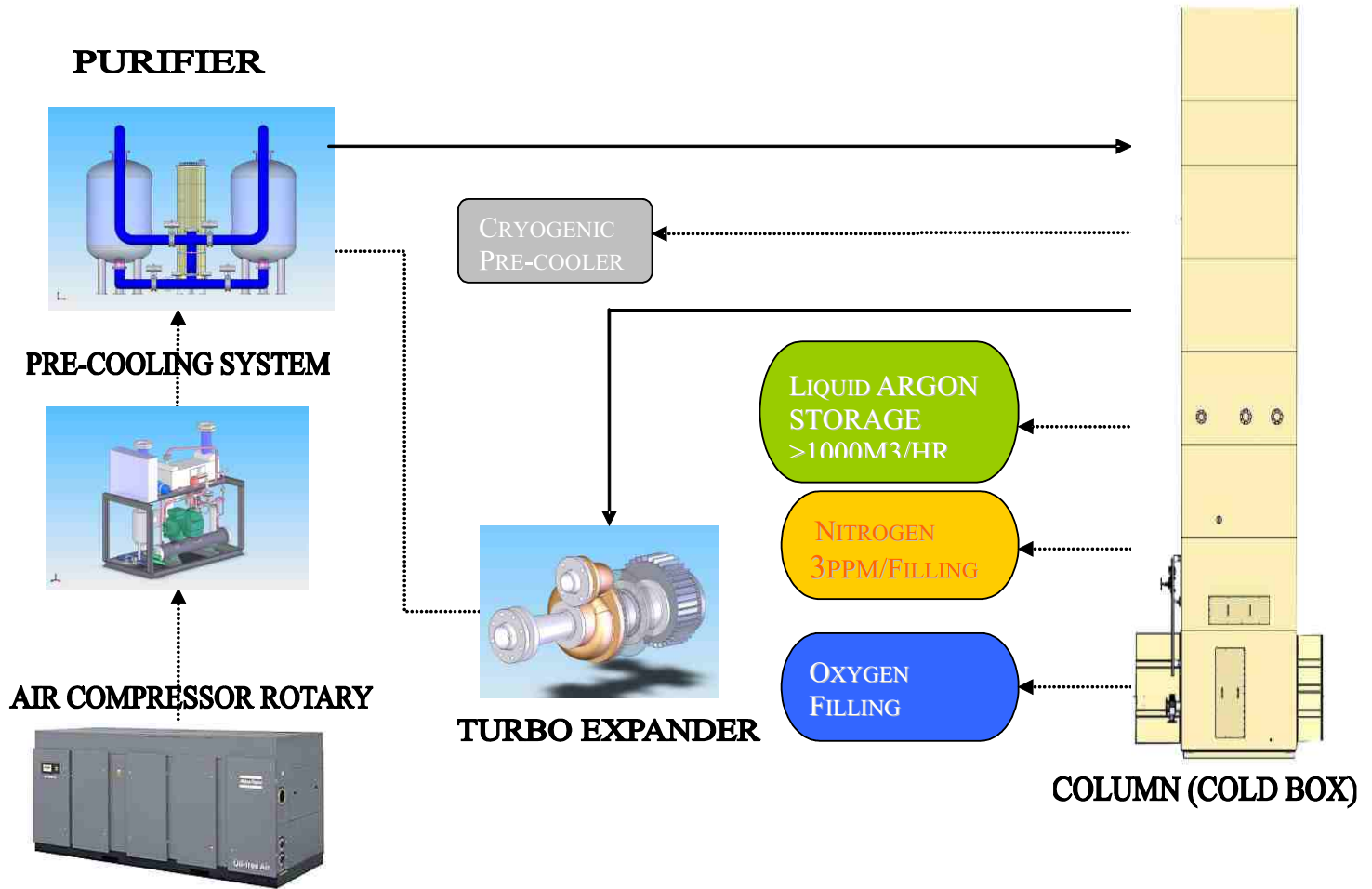
AIR SEPARATION PLANT FLOW CHART WITH MOLECULAR SIEVE PURIFIER AND BOOSTER AIR EXPANSION



AI	AIR FILTER	H	HEATER	CR	CONDENSOR REBOILER
AC	AIR COMPRESSOR	EX	MAIN HEAT EXCHANGER	C2	LOW PRESSURE COLUMN
PC	PRE-COOLING UNIT	TE 1/2	TURBO EXPANDER		
PU	PURIFICATION UNIT	E2	SUB COOLER		
P1/2	TOWER1/TOWER 2	C1	COLUMN		

Technical Data

Production	Oxygen	Nitrogen	Argon
Purity	99.6%	99.9%-99.99% or 3ppm	99.5% or 5ppm
Air Pressure	0.7Mpa/7Bar		
Normal operating pressure of plant	0.6 To 0.7Mpa	0.6 To 0.7Mpa	0.6 To 0.7Mpa
Power Consumption for oxygen	0.5 To 0.8 KWh/m	Nil	Negligible



PROCESS FLOW DIAGRAM

Basic Principle

The air separation plant is a plant recovering oxygen and nitrogen from air simultaneously. It advances 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 CO₂ 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.



PROCESS DESCRIPTION

1. AIR COMPRESSOR-LOW PRESSURE

Air is compressed at a low pressure of 5-7 bar (0.5-0.7mpa). 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).

2. PRE COOLING SYSTEM

The second stage of the process uses a low pressure refrigerant for pre-cooling the processed air to temperature around 12 deg C before it enters the purifier.

3. PURIFICATION OF AIR BY PURIFIER

The air enters a purifier consisting of twin Molecular Sieve driers, working alternatively. The Molecular Sieves remove the Carbon dioxide & moisture from the process air before the air enters Air Separation Unit.

4. CRYOGENIC COOLING OF AIR BY TURBO (EXPANDER)

The air has to be cooled to sub zero temperatures for liquification & the cryogenic refrigeration & the cooling is provided by highly efficient turbo expander, which cools the air to temperature almost below -165 to -170 deg C .

5. SEPARATION IF LIQUID AIR INTO OXYGEN AND NITROGEN BY AIR SEPARATION COLUMN

Oil free, moisture free and Carbon Dioxide free air enters into low pressure plate fin type Heat exchanger where the air is cooled below sub zero temperatures by air expansion process in the turbo expander. Due to the excellent thermal efficiency we can achieve a temperature difference delta t as low as 2 deg c at the warm end of these exchangers.

Air gets liquefied when it enters the air separation column & gets separated into oxygen & nitrogen by the process of rectification.

Oxygen is available at the outlet of the ASU at a purity of 99.6%.

Nitrogen is also available t the outlet as a second product at purity of 99.99% upto 3ppm simultaneously without loss of oxygen product.

6. COMPRESSION OF OXYGEN FILLING IN THE CYLINDER

The final product in the form compressed Oxygen/Nitrogen goes to the high pressure oxygen cylinders at 150 bar or upto higher as required..

Or for pipeline supply or captive consumption

Or for liquid plants to fill in cryogenic liquid tanks.