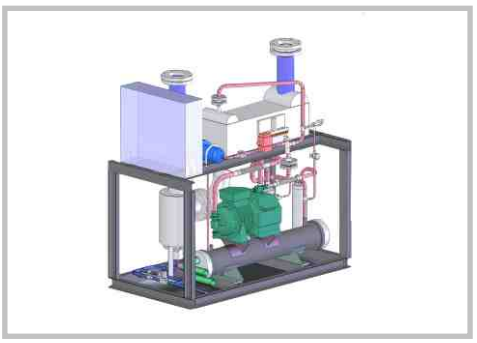
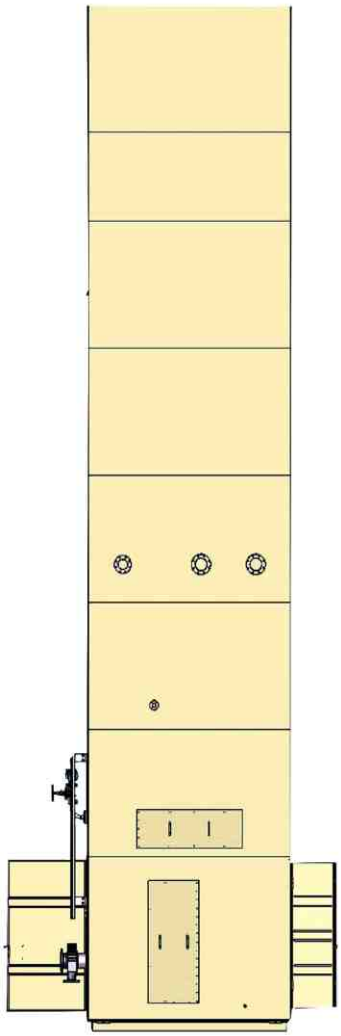
IMPIANTI LIQUEFAZION E PRODUZIONE GAS TECNICI

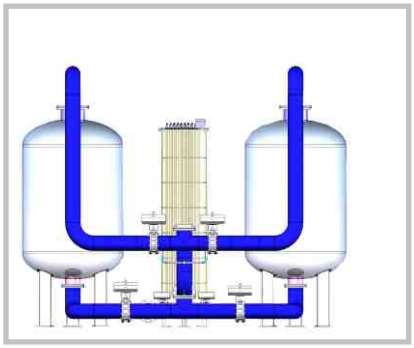
23 years of Excellence

LIQUID OXYGEN NITROGEN PLANTS
AIR SEPARATION PLANTS

Low Operating Pressure(5-7Bar)
20M^3/h To 50,000M^3/h







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Air Compressor

1.Air Compressor:

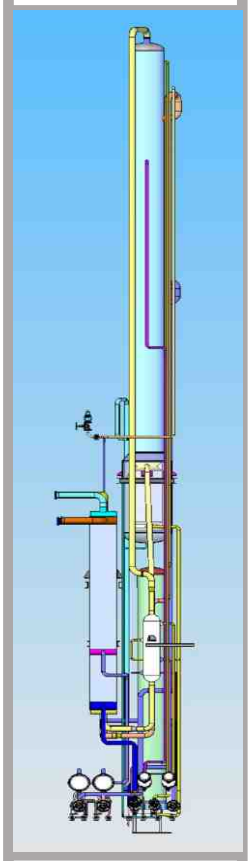
Rotary air compressor screw type can be used for smaller size plants upto 500m3/hr & 1000m3/hr. Upto 40000m3/hr. Centrifugal compressor can be used for higher size plants.

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.



Rectification Column

4.Rectification column:

The unit in cold box are all low pressure technology. This unit employs the latest state of the art plate & fin exchanger, cond -ensor 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.

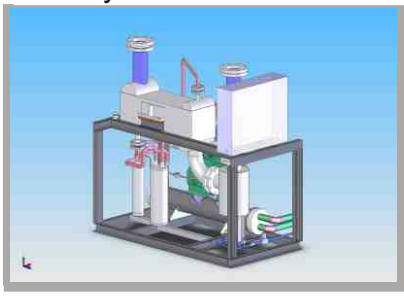
5.Turbo-expander:

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.

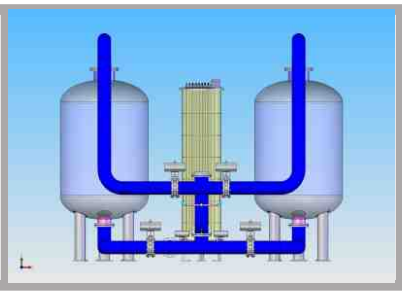
Air Purification System

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

Liquid Tank

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AIR COMPRESSOR

PRE-COOLER+PURIFICATION UNIT

AIR SEPARATION UNIT

TURBO-EXPANDER

CONTROL PANEL

TECHNICAL SPECIFICATION AIR- SEPARATION LIQUID OXYGEN / NITROGEN PLANTS

SMALL CAPACITY PLANTS (20 Nm^3/hr TO 100 Nm^3/hr)

MODEL (O2/N2*/Ar)	UBTL-20/20	UBTL-30/30	UBTL-40/50	UBTL-60/80	UBTL-80/100	UBTL-100/150
LOX Capacity Nm3/hr	20	30	40	60	80	100
LOX Capacity L/hr	24	36	48	72	96	120
GO2 Purity % O2	99.6%	99.6%	99.6%	99.6%	99.6%	99.6%
GN2 Capacity Nm3/hr	20	30	50	80	100	150
LIN Capacity Nm3/ h	20	30	40	60	80	100
GN2 Purity X 10^{-6}O2	99.9%-99.9% 3PPM	99.6%-99.6% 3PPM	99.9%-99.9% 3PPM	99.6%-99.6% 3PPM	99.9%-99.9% 3PPM	99.6%-99.6% 3PPM
Operating Air Pressure Bar(Mpa)	10(1)	10(1)	10(1)	7(0.7)	7(0.7)	7(0.7)
Power Consumption (M3) Liquid O2	75	75	80	110	145	155
Argon Capacity Nm^3/h	N/A	N/A	N/A	N/A	N/A	**3
Argon purity % Air	N/A	N/A	N/A	N/A	N/A	99.90 %

IMPIANTI LIQUEFAZION E PRODUZIONE GAS TECNICI

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AIR COMPRESSOR

PRE-COOLER+PURIFICATION UNIT

AIR SEPARATION UNIT

TURBO-EXPANDER

CONTROL PANEL

TWIN TURBO EXPANDER

LEAK PROOF WELDING

TECHNICAL SPECIFICATION AIR- SEPARATION LIQUID OXYGEN / NITROGEN PLANTS

SMALL CAPACITY PLANTS (120 Nm^3/hr TO 250 Nm^3/hr)

MODEL (O2/N2*/Ar)	UBTL-120/150	UBTL-150/200	UBTL-170/200	UBTL-200/220	UBTL-220/220	UBTL-250/250
LOX Capacity Nm3/hr	120	150	170	200	200	250
LOX Capacity L/hr	144	180	204	240	264	300
GO2 Purity % O2	99.6%	99.6%	99.6%	99.6%	99.6%	99.6%
GN2 Capacity Nm3/hr	150	200	200	220	220	150
LIN Capacity Nm3/ h	120	150	170	200	220	250
GN2 Purity X 10^{-6} O2	99.9%-99.9% 3PPM	99.6%-99.6% 3PPM	99.9%-99.9% 3PPM	99.6%-99.6% 3PPM	99.9%-99.9% 3PPM	99.6%-99.6% 3PPM
Operating Air Pressure Bar(Mpa)	7(0.7)	7(0.7)	7(0.7)	7(0.7)	7(0.7)	7(0.7)
Power Consumption (M3) Liquid O2	185	215	235	298	320	350
Argon Capacity Nm^3/h	N/A	N/A	**3	**6	N/A	**3
Argon purity % Air	N/A	N/A	99.90%	99.90%	N/A	99.90 %

IMPIANTI LIQUEFAZION E PRODUZIONE GAS TECNICI

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AIR COMPRESSOR

PRE-COOLER+PURIFICATION UNIT

AIR SEPARATION UNIT

TURBO-EXPANDER

CONTROL PANEL

PLATE & FIN TYPE EXCHANGER

TECHNICAL SPECIFICATION AIR- SEPARATION LIQUID OXYGEN / NITROGEN PLANTS

SMALL CAPACITY PLANTS (300 Nm^3/hr TO 800 Nm^3/hr)

MODEL (O2/N2*/Ar)	UBTL-300/300	UBTL-350/350	UBTL-400/400	UBTL-500/500	UBTL-600/600	UBTL-800/800
LOX Capacity Nm3/hr	300	350	400	500	600	800
LOX Capacity L/hr	360	420	480	600	720	960
GO2 Purity % O2	99.6%	99.6%	99.6%	99.6%	99.6%	99.6%
GN2 Capacity Nm3/hr	300	350	400	500	600	800
LIN Capacity Nm3/ h	300	350	400	500	600	800
GN2 Purity X 10^{-6} O2	99.9%-99.9% 3PPM	99.6%-99.6% 3PPM	99.9%-99.9% 3PPM	99.6%-99.6% 3PPM	99.9%-99.9% 3PPM	99.6%-99.6% 3PPM
Operating Air Pressure Bar(Mpa)	7(0.7)	7(0.7)	7(0.7)	7(0.7)	7(0.7)	7(0.7)
Power Consumption (M3) Liquid O2	398	475	550	680	780	990
Argon Capacity Nm^3/h	N/A	N/A	N/A	N/A	N/A	N/A
Argon purity % Air	N/A	N/A	N/A	N/A	N/A	N/A

IMPIANTI LIQUEFAZION 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 LIQUID OXYGEN / NITROGEN PLANTS

SMALL CAPACITY PLANTS (350 Nm^3/hr TO 1000 Nm^3/hr)

MODEL (O2/N2*/Ar)	UBTL-LOX/350 LIN/350 GAN	UBTL-1000(LOX/LIN)1000	UBTL-1000(LOX)/1000(LIN)	LOX/450GOX/100 LIN/ 1000 GAN/LAR 70
LOX Capacity Nm3/hr	350	1000	1000	450
LOX Capacity L/hr	420	1200	1200	540
GO2 Purity % O2	99.6%	99.6%	99.6%	99.6%
GN2 Capacity Nm3/hr	N/A	N/A	N/A	1000
LIN Capacity Nm3/ h	350	1000	1000	100
GN2 Purity X 10^6O2	99.9%-99.9% 3PPM	99.6%-99.6% 3PPM	99.9%-99.9% 3PPM	99.6%-99.6% 3PPM
Operating Air Pressure Bar(Mpa)	N/A	9(0.9)	10(1)	
Power Consumption (M3) Liquid O2	630	1350	2200	3000
Argon Capacity Nm^3/h	N/A	N/A	N/A	80
Argon purity % Air	N/A	N/A	N/A	N/A

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AIR COMPRESSOR

PURIFICATION UNIT

AIR SEPARATION UNIT

CONTROL PANEL

SCREW COMPRESSOR

PLATE & FIN TYPE EXCHANGER

TECHNICAL SPECIFICATION AIR- SEPARATION LIQUID OXYGEN / NITROGEN PLANTS

MEDIUM CAPACITY PLANTS (1000 Nm^3/hr TO 10000 Nm^3/hr- 48 TPD TO 320 TPD)

MODEL (O2/N2*/Ar)	UBTL-1000/1000	UBTL-1500/1500	UBTL-2000/2000	UBTL-1500/1500/45	UBTL-3600/3600/100	UBTL-6000/13000/200	UBTL-10000/18000/380
LOX Capacity Nm3/hr	1000	1500	2000	1500	3600	6000	10000
LOX Capacity L/hr	1200	1800	2400	1800	4320	7200	12000
Oxygen Capacity Tons Per Day	32	48	64	48	115	192	320
GO2 Purity % O2	99.6%	99.6%	99.6%	99.6%	99.6%	99.6%	99.6%
GN2 Capacity Nm3/hr	800	1500	2000	1500	3600	13000	18000
LIN Capacity Nm3/hr	1320	1980	2640	1980	4752	7920	13200
Nitrogen Capacity Tons Per Day	22	42	56	42	100	365	505
GN2 Purity X 10^{-6} O2	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	99.9%-99.99% 3PPM
Operating Air Pressure Bar(Mpa)	6(0.6)	5(0.5)	5(0.5)	5(0.5)	5(0.5)	5(0.5)	5(0.5)
Power Consumption (M^3) Liquid O_2	1320	0.5	0.55	0.5	0.45	0.48	0.48
Argon Capacity Nm^3/h	N/A	N/A	N/A	45	100	200	380
Argon Purity % Air	N/A	N/A	N/A	99.90%	99.90%	99.90%	99.90%

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AIR COMPRESSOR **PURIFICATION UNIT** **AIR SEPARATION UNIT** **CONTROL PANEL**

TONNAGE PLANTS

TECHNICAL SPECIFICATION AIR- SEPARATION LIQUID OXYGEN / NITROGEN PLANTS

LARGE CAPACITY PLANTS (10,000 Nm^3/hr TO 25,000 Nm^3/hr- 320 TPD TO 800 TPD)

MODEL (O2/N2*/Ar)	UBTL-10000/18000/380	UBTL-15000/13000/450	UBTL-15000/10000	UBTL-18000/15000	UBTL-20000/20000	UBTL-25000/20000
LOX Capacity Nm3/hr	10000	15000	15000	18000	20000	25000
LOX Capacity L/hr	12000	18000	18000	21600	30000	36000
Oxygen Capacity Tons Per Day	320	480	480	420	640	800
GO2 Purity % O2	99.6%	99.6%	99.6%	99.6%	99.6%	99.6%
GN2 Capacity Nm3/hr	18000	13000	10000	15000	20000	20000
LIN Capacity Nm3/hr	13200	15000	19800	23760	33000	39600
Nitrogen Capacity Tons Per Day	505	365	280	420	560	560
GN2 Purity X 10^{-6} O_2	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
Operating Air Pressure Bar(Mpa)	5(0.5)	5(0.5)	5(0.5)	5(0.5)	5(0.5)	5(0.5)
Power Consumption (M^3) Liquid O_2	0.48	0.45	0.45	0.42	0.4	0.4
Argon Capacity Nm^3/h	380	450	Opt.	Opt.	Opt.	Opt.
Argon Purity % Air	99.90%	99.90%	Opt.	Opt.	Opt.	Opt.

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AIR COMPRESSOR

PURIFICATION UNIT

AIR SEPARATION UNIT

CONTROL PANEL

TECHNICAL SPECIFICATION AIR- SEPARATION
LIQUID OXYGEN / NITROGEN PLANTS

TONNAGE PLANTS

LARGE CAPACITY PLANTS (25,000 Nm^3/hr TO 50,000 Nm^3/hr- 800 TPD TO 1600 TPD)

MODEL (O2/N2*/Ar)	UBTL-25000/20000	UBTL-30000/25000	UBTL-40000/30000	UBTL-50000/50000
LOX Capacity Nm3/hr	25000	30000	40000	50000
LOX Capacity L/hr	36000	36000	48000	60000
Oxygen Capacity Tons Per Day	800	960	1280	1600
GO2 Purity % O2	99.6%	99.6%	99.6%	99.6%
GN2 Capacity Nm3/hr	20000	25000	30000	50000
LIN Capacity Nm3/hr	39600	39600	52800	66000
Nitrogen Capacity Tons Per Day	560	700	840	1400
GN2 Purity X 10^{-6} O_2	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM	99.9%-99.99% 3PPM
Operating Air Pressure Bar(Mpa)	5(0.5)	5(0.5)	5(0.5)	5(0.5)
Power Consumption (M^3) Liquid O_2	0.4	0.4	0.38	0.35
Argon Capacity Nm^3/h	Opt.	Opt.	Opt.	Opt.
Argon Purity % Air	Opt.	Opt.	Opt.	Opt.

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AIR COMPRESSOR **PURIFICATION UNIT** **AIR SEPARATION UNIT** **CONTROL PANEL**

TONNAGE PLANTS

Notes

It will give both LOX & LIN simultaneously as per the capacity mentioned.
It will give either LOX or LIN.
1.The above data is only indicative to enable the buyer to select the model and detailed offer shall be given with the order.
2.The oxygen booster/ LO Pump depending on model is used for filling oxygen gas in cylinders at 150 bar pressure.
3.Argon can be produced in all plants above 500m3/hr.
4.Pure nitrogen gas upto 3ppm is available as a second product without loss of oxygen production.
5.All capacities are as per design suction conditions.
6.Liquid Nitrogen LIN output can be taken as optional along with liquid oxygen as per requirement.
7.Liquid Oxygen is collected in a liquid tank and cab ne gasified to get gox by additional liquid oxygen pump, vaporiser.
8.Voltage 380-415 & 50/60 Hz as Specified. Also Voltage & Frequency coun HT motors above 400 KW of 10/11KV
9.Nm3/hr means the volume flow at 0.1013 mpa (a) and 0 deg centigrade.
10.The liquid has been converted into gas volume flow at 0.1013 mpa (a) and 0 deg centigrade.

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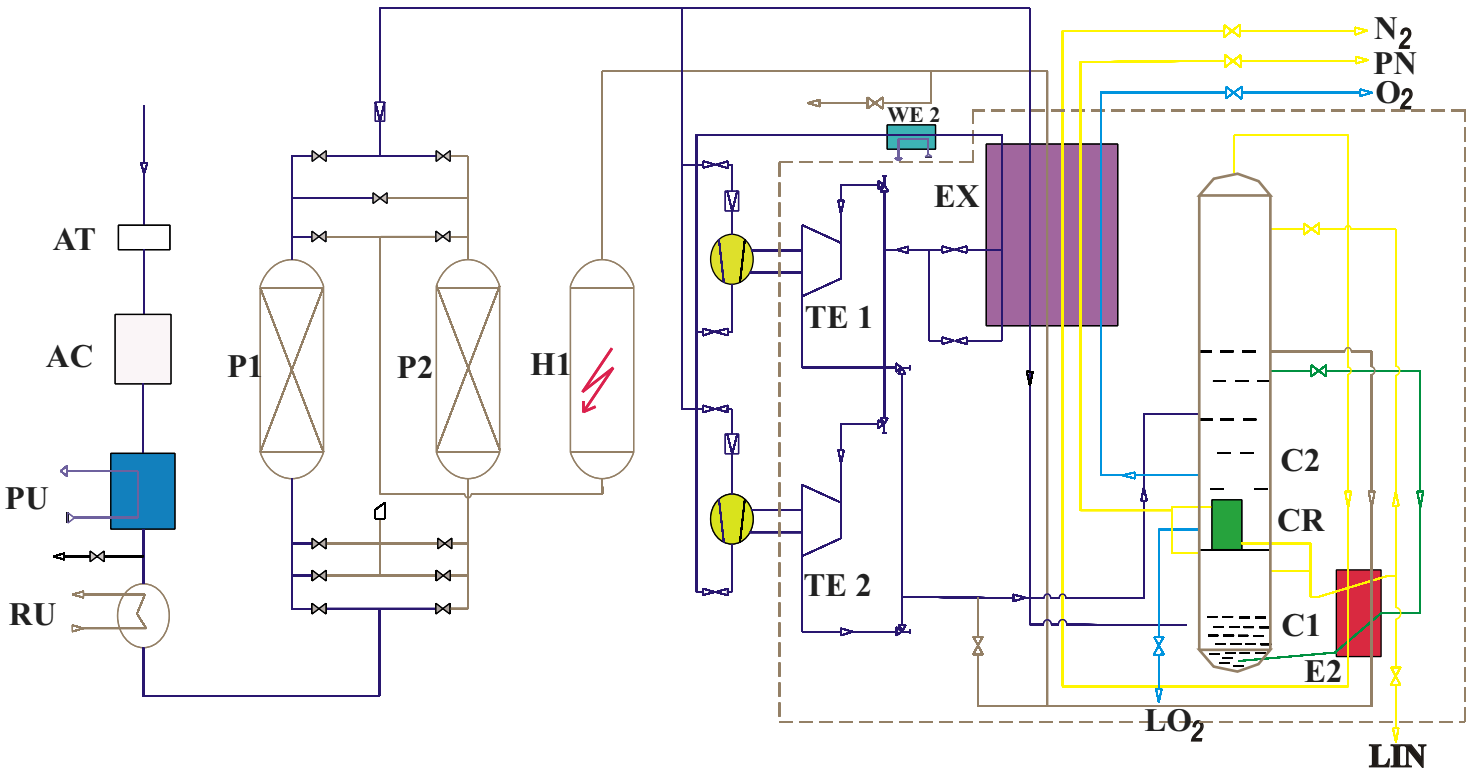
AIR SEPARATION PLANT FLOW CHART WITH MOLECULAR SIEVE PURIFIER AND BOOSTER AIR EXPANSION



AI	AIR FILTER	H	HEATER	CR	CONDENSOR REBOILER
AC	AIR COMPRESSOR	EX	MAIN HEAT EXCHANGER	C2	LOW PRESSURE COLUMN
PC	PRE-COOLING UNIT	TE1/2	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

IMPIANTI LIQUEFAZION E PRODUZIONE GAS TECNICI

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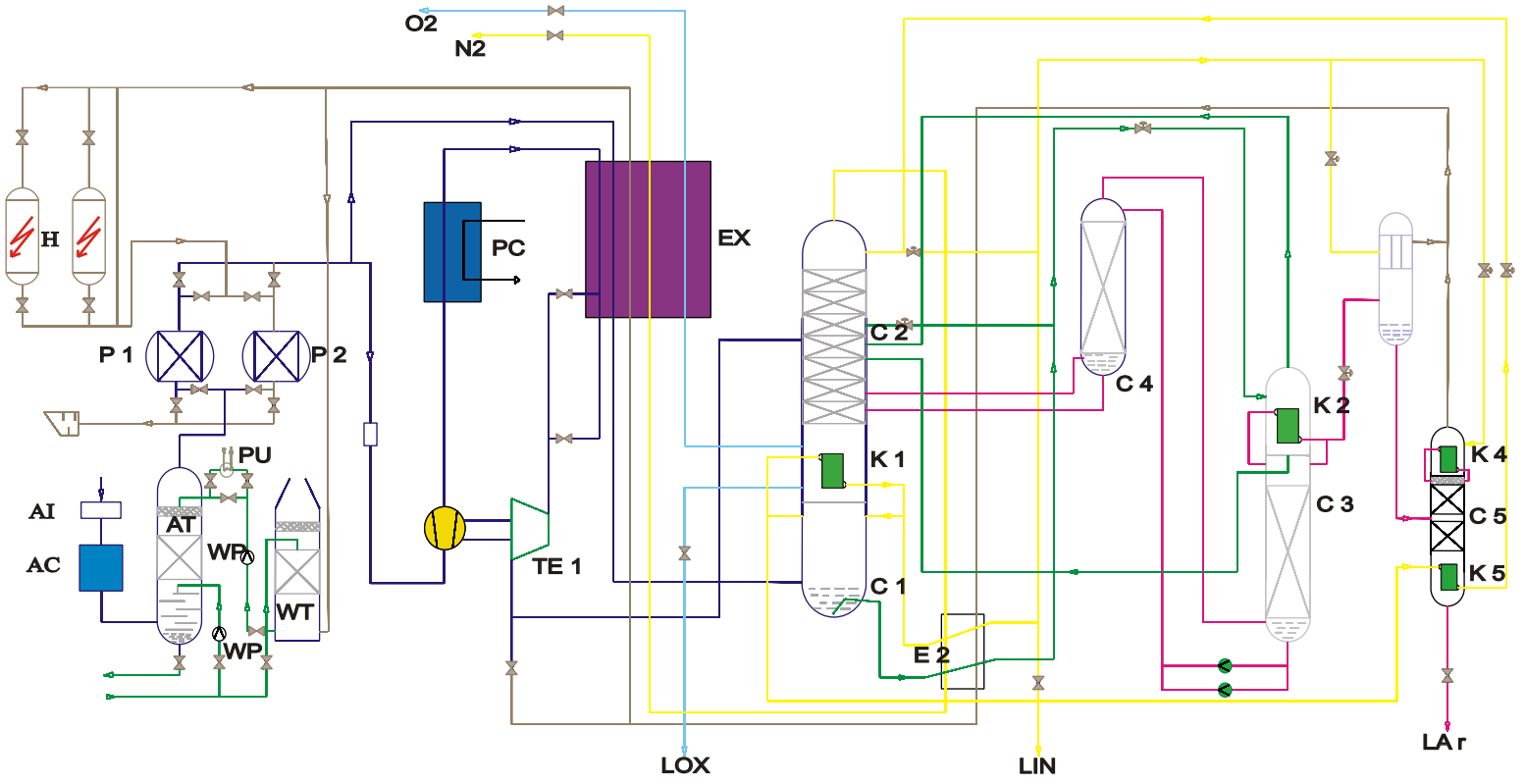
AIR SEPARATION PLANT FLOW CHART WITH MOLECULAR SIEVE PURIFIER AND BOOSTER AIR EXPANSION & FULL RECTIFYING ARGON RECOVERY



AI	AIR FILTER	E 2	SUBCOOLER	K4	PURE ARGON CONDENSER
AC	AIR COMPRESSOR	C 1	COLUMN	K5	PURE ARGON REBOILER
PC	PRE-COOLING UNIT	K 1	CONDESOR REBOILER		
PU	PURIFICATION UNIT	C2	LOW PRESSURE COLUMN		
P 1/2	MOLECULAR SIEVE ADSORBER	C3/4	ARGON COLUMN		
H	ELECTRIC HEATER	C5	PURE ARGON COLUMN		
TE	TURBO EXPANDER	AP	LIQUID ARGONG PUMP		
EX	MAIN HEAT EXCHANGER	K2	CRUDE ARGON CONDENSER		
		K3	CRUDE ARGON LIQUEFIER		

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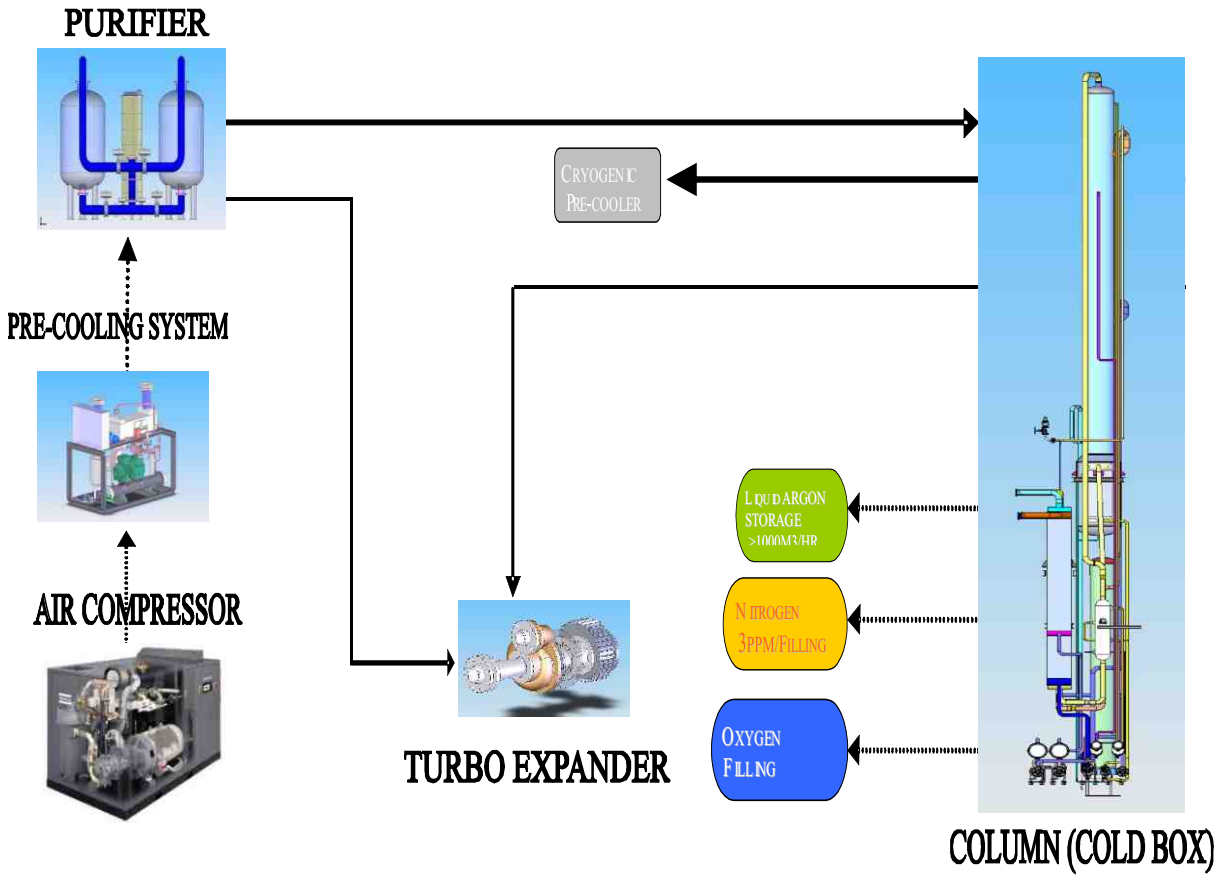

PROCESS FLOW DIAGRAM

Basic Principle

The air separation plant is a plant recovering oxygen and nitrogen from air simultaeously. 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 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 temp. 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.

Liquid Oxygen is available at the outlet of the ASU at a purity of 99.6%.
Liquid Nitrogen is also available at the outlet as a alternate product at purity of 99.99%(upto 3ppm as required).Nitrogen gas will be available as a by product.