PSA NITROGEN LIMITED

71 New DLF Industrial Area,
Faridabad – 121 003
DELHI - NCR
Ph: + 91 9311144667
Email : psahyd@psanitrogen.net ; sales@psanitrogen.net
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Ref: PSA/500-F/10899 **2nd October, 2024**

Fleming Life Sciences Pvt. Ltd.

Kadechur.

Kind Attn: Mr. Asisraja D
Project engineer

Subject : PSA Nitrogen Plant : 20 NM3/hr @ 99.99% N2

Dear Sir,

Thanks for your inquiry of yesterday. We are giving below our Proposal.

We have during last 4 decades supplied thousands of such PSA Nitrogen Plants which have been operating to the entire satisfaction of the end-users in various sectors of chemical, petrochemical, pharmaceutical, metallurgical, cement and food industries. OUR MARKET SHARE FOR SUPPLY OF OUR PSA PLANTS TO PHARMA SECTOR (who have been the largest purchasers for such Nitrogen Plants) HAS CONSISTENTLY BEEN MORE THAN 80% DURING LAST 40 YEARS.

Thanking you and assuring you of our best services at all times,

Yours faithfully,

for ***PSA NITROGEN LIMITED***

Prabhas Misra
Managing Director
+91 9311144667

ANNEXURE – I

ABOUT OUR ORGANIZATION

As you are aware, we are an **Engineering Company** dealing in Design, Manufacturing, Site-installation and Commissioning of :

- **PSA based Nitrogen Gas Generators**
- **PSA/VSA based Oxygen Gas Generators**
- **Ammonia Cracking Units**
- **Compressed Air Drying Units**
- **Steam Boilers**
- **CCE approved Pressure Vessels like LPG, Hydrogen & Ammonia Storage Tanks etc.**

We would also like to bring to your kind notice that :

- We are an ***ISO-9001 certified company***

- Our manufacturing facility is duly approved by:

  - Chief Controller of Explosives – Nagpur.
  - Chief Inspector of Boilers .
  - ASME (American Society of Mechanical Engineers) under **'U' Stamp** for manufacturing of unfired pressure vessels.
  - ASME (American Society of Mechanical Engineers) under **'S' Stamp** for manufacturing of Boilers.

We have been manufacturing PSA based Nitrogen Gas Generators for the last 42 years. During this period, we have supplied **thousands of such PSA Nitrogen Plants** which have been operating in various sectors to the complete satisfaction the respective end-users. OUR **MARKET SHARE** FOR SUPPLY OF PSA N2 PLANTS TO PHARMA COMPANIES (WHO HAVE BEEN THE LARGEST PURCHASERS OF SUCH PSA N2 PLANTS) HAS CONSISTENTLY BEEN **MORE THAN 80%** DURING LAST 40 YEARS.

Works :

Our manufacturing facility is located at the following address :

PSA Nitrogen Limited
71-72, New DLF Industrial Area
Faridabad 121 003
DELHI – NCR

Managing Director:

The Company is headed by Shri **Prabhas Misra**, who is a qualified Chemical Engineer, having graduated from **IIT-Kanpur** and having a working experience of more than **49 years.**

ANNEXURE – II

TECHNICAL SPECIFICATIONS

1. PSA NITROGEN GAS GENERATOR :

a)	**Gas to be produced**	**:**	**Nitrogen Gas**
b)	**Capacity of plant**	**:**	**20 Nm^3/hour (as required by you)**

2. PRODUCT COMPOSITION

A PSA Plant can be designed to generate nitrogen of any purity up to 99.999%. You have asked for 99.99% purity nitrogen. Oxygen is the only impurity in nitrogen. We are accordingly offering to you a PSA Nitrogen Plant which will generate gas of following composition:

Oxygen	**:**	**0.01% (Max) {i.e. 100 PPM maximum}**
Nitrogen + Argon (inerts)	**:**	**Balance**
Oil content	**:**	**Nil**
Dew Point	**:**	**(-) 40 °C(Max)**
Pressure	**:**	**5.5 Kg/cm2g**
Temperature	**:**	**Ambient**

3. We have considered that you will install the Nitrogen Plant in a *Safe Non-Hazardous Area*.

4. As required - we are offering to you separately a 5 M3 geometrical volume N2 Storage Tank - complete with all valves and necessary instrumentation.

ANNEXURE – III

EQUIPMENT DESCRIPTION

Please refer to the enclosed P&I Diagram. Compressed Air as produced by an Air-Cooled Lubricated Air Compressor complete with a Refrigerated Air Dryer will be fed to an Air Receiver wherefrom the compressed air will be passed through a Pre-Filter and a 3-Stage Oil Removal Filters. The clean oil-free compressed air @ 7 Kg/cm2g will then enter a Twin Adsorber Tower PSA Module interconnected with automatic changeover valves. Both Towers are filled up with AA (Activated Alumina) in the bottom portion and with CMS (Carbon Molecular Sieves) in the upper portion. AA has tendency of adsorbing whatever traces of moisture present in compressed air. After passing through this bed, air gets totally dried. THIS IS AN IN-BUILT DESICCANT BASED AIR DRYER.

Dried compressed air will now come in contact with bed of CMS which are special grade of adsorbent having the property of preferential adsorption of oxygen molecules. At a time, one of the two towers remains under nitrogen production cycle whereas the other tower undergoes regeneration which is achieved through depressurization of the tower to atmospheric pressure. The two towers of PSA modules are inter-connected with automatic changeover valves which will be having actuators actuated through pneumatic signal given by 5-port 4-way solenoid valves which in turn get the electrical signal from the PLC provided in the control panel. The changeover time cycle will be 1+ 1 minute which means that each tower will be in nitrogen production cycle for a period of one minute. The outgoing nitrogen gas will be sent to a surge vessel where the minimum nitrogen pressure will be maintained with the help of Back pressure Regulator.

From the surge vessel , it will be sent to a 5 M3 Nitrogen Receiver Storage Tank (being offered by us – separately) and from there : to the nitrogen consumption points.

A. BASE FRAME / STRUCTURE

It shall be complete by utilizing suitable steel sections and designed to accommodate all vital equipment of the plant duly assembled.

B. AIR COMPRESSOR & ACCESSORIES

For generating 20 NM3/hour of 99.99% purity nitrogen – we need 120 NM3/hour of Feed Compressed Air. We are accordingly offering to you an Air-Cooled Screw type Lubricated Air Compressor having a capacity of 90 CFM(FAD) suitable for a discharge pressure of 7 Kg/cm2g and complete with all accessories including 15 KW motor and a Refrigerated Air Dryer.

C. AIR RECEIVER

We are offering to you a 0.5 M3 geometrical volume Air Receiver. The Air Receiver will be provided with Pressure Gauge, Pressure Switch, Safety Valve and a manual drain valve.

D. AIR FILTRATION SYSTEM :

A Pre-filter will be provided to ensure that outgoing compressed air will be free from any foreign particles. 3-Stage Oil Removal Filter provided thereafter will ensure that oil content in compressed air will be 0.003 PPM maximum.

E. PSA NITROGEN MODULE:

PSA Unit is the heart of PSA Nitrogen Gas Plant. We will be providing you a Twin Tower PSA Module. Both Adsorber Towers will be filled up with Activated Alumina in the bottom portion (for moisture removal) and with CMS (Carbon Molecular sieves) in the upper portion (for oxygen removal). Compressed air first comes in contact with Activated Alumina bed for removal of moisture before it enters the bed of CMS (Carbon Molecular Sieves) for oxygen removal. The Nitrogen PSA process concentrates Nitrogen from air by utilizing the faster rate of adsorption of oxygen over nitrogen on Carbon Molecular Sieves (CMS).

F. NITROGEN SURGE VESSEL

Nitrogen production from the PSA Towers is in cyclic manner. The flow rate of Nitrogen and its purity continuously changes throughout the cycle of PSA. To stabilize nitrogen purity and nitrogen pressure, a surge vessel is provided for proper gas mixing and providing gas of correct purity for consumption and from there the nitrogen gas flows to end user point. The surge vessel holds nitrogen at 5.5 to 6 Kg/cm2g pressure and average Nitrogen purity as 99.99%. The MOC of the Nitrogen surge vessel will be Carbon Steel as per SA 516 Gr70.

G. NITROGEN FLOW METER

We are offering a Flow meter on product nitrogen line - to observe the gas flow. It will give indication of nitrogen flow in NM3/hour.

H. BACK PRESSURE CONTROL VALVE

For maintaining correct nitrogen purity from PSA System, it is very essential that PSA should operate under a constant back pressure. We have, therefore, provided an Automatic Pressure Holding Valve at the outlet of the Surge Vessel. This would automatically maintain around 5.5 Kg/cm2g back pressure in the nitrogen Surge vessel. This back pressure in the surge vessel, pressure in the PSA system would be automatically maintained at 5.5.kg/cm2g and the performance of nitrogen plant remains unaffected with change in flow rate of nitrogen consumption.

I. AUTOMATIC 3-WAY VENT VALVE

An automatic 3 way venting valve for nitrogen gas at the outlet of surge vessel is provided. In case of higher oxygen contents in Nitrogen Gas, PSA unit would continue to run but nitrogen would start venting to atmosphere. The fault would be indicated on the control panel by Audio Visual Alarm, so that corrective action can be taken.

J. CONTROL PANEL:

A PLC is provided in the Control Panel . There is no manual operation for plant operation and require no continuous operator attention. The operation of plant shall be from this panel by push button start and it shall house all necessary display of vital parameters of running condition of plant. On-Line type continuous Indicating Oxygen Analyzer with alarm facility will be installed in this Control Panel.

ANNEXURE – IV

SPECIFICATIONS OF COMPONENTS

A. Air Receiver

- Volume : 0.5 M3
- Orientation : Vertical
- Dia : 800mm
- Height : 1,700mm
- Shell thickness : 8 mm
- Dish thickness : 8 mm
- Type of dish : Semi ellipsoidal
- MOC of Shell : SA-516 Gr.70
- MOC of Dish : SA – 516 Gr.70
- Design Code : ASME Sec. VIII, Div. 1
- Working Pressure : 7 Kg/cm2g
- Design pressure : 7.7 Kg/cm2g
- Test pressure : 10.01 Kg/cm2g

B. PSA Module

- Capacity : 20 NM3/Hour
- Working Pressure : 7 Kg/cm2g
- Dia of Towers : 500mm
- Height : 1,200mm
- Shell thickness : 8mm
- Dish thickness : 8mm
- MOC : SA-516 Gr.70
- Design Code : ASME Sec. VIII, Div. 1
- Design pressure : 7.7 Kg/cm2g
- Test Pressure : 10.01 kg/cm2g

C. Nitrogen Surge vessel

- Volume : 1 M3
- Orientation : Vertical
- Dia : 1,100mm
- Height : 1,800mm
- Shell thickness : 8 mm
- Dish thickness : 8 mm
- Type of dish : Semi ellipsoidal
- MOC of Shell : SA-516 Gr.70
- MOC of Dish : SA – 516 Gr.70
- Design Code : ASME Sec. VIII, Div. 1
- Working Pressure : 6 Kg/cm2g
- Design pressure : 6.6 Kg/cm2g
- Test pressure : 8.6 Kg/cm2g

D. Nitrogen Storage Tank

- Volume : 5 M3
- Orientation : Vertical
- Dia : 1,500mm
- Height : 3,900mm
- Shell thickness : 8 mm
- Dish thickness : 8 mm
- Type of dish : Semi ellipsoidal
- MOC of Shell : SA-516 Gr.70
- MOC of Dish : SA-516 Gr.70
- Design Code : ASME Sec. VIII, Div. 1
- Working Pressure : 5.5 Kg/cm2g
- Design pressure : 6.05 Kg/cm2g
- Test pressure : 7.86 Kg/cm2g

ANNEXURE – V

SCOPE OF SUPPLIES

PSA scope of supply shall be Design, Manufacturing, supply and installation of PSA Nitrogen Gas Generator – assembled on channel base frame, comprising of main component as under :-

- Package Air Compressor with 15 KW motor 1 No.
- Refrigerated Air Dryer 1 No.
- Air Receiver 1 No.
- Pre-Filter 1 No.
- 3-Stage Oil Removal Filter 1 No.
- Twin Adsorber Tower PSA Unit with changeover valves 1 set
  (Complete with an Integral Desiccant based Air Dryer)
- Carbon Molecular Sieves First Charge
- Activated Alumina First Charge
- Nitrogen Gas Surge Vessel 1 No.
- Pressure holding valve 1 No.
- 3 way vent valve 1 No.
- Silencer 1 No.
- Nitrogen gas Flowmeter with Totalizer 1 No.
- On-Line Oxygen Analyser with alarm facility 1 No.
- On-Line Dew Point Meter with alarm facility 1 No.
  (Being offered on optional basis)
- Complete instrumentation of gas plant
  As per enclosed P&I diagram 1 set
- Control Panel with PLC 1 No.
- Nitrogen Receiver Storage Tank 5 M3 1 No.
  (Being offered on optional basis)

ANNEXURE – VI

EXCLUSIONS

- All civil work, cable trenches etc.
- Piping from Air Compressor to PSA Skid and from Nitrogen Surge Vessel to Nitrogen Receiver Storage Tank and then to your system
- You shall provide all utilities free of cost during erection, testing and commissioning at site.
- Main earthling ring and earthling pit shall be provided by you. All earthing connection from this ring to our various equipment shall be done by you.
- Any instruments/ item which is not specifically mentioned herewith in writing, shall be considered as excluded from our scope of supply.
- Erection of equipment at your site. Necessary supervision of our engineer will however be provided by us.

ANNEXURE – VII

UTILITIES FOR 20 NM3/hr 99.99% PSA NITROGEN PLANT

Power @ 415V 3 Phase 50 Hz : 19 KWH

No cooling water is required.

ANNEXURE – VIII

MAKES OF COMPONENTS

• Air Compressor	:	Atlas Copco / Chicago Pneumatic Ingersoll Rand
• Pressure / temp. indicators	:	Baumer
• Flowmeter	:	Eureka / Flow Star
• Pressure Holding Valve	:	Nirmal / Ashu
• Solenoid valves	:	Rotex
• Carbon Molecular Sieves	:	**Kuraray (Japan)**
• Changeover valves & Actuators	:	Xomox / Rotex / Aira
• Activated alumina	:	CECA - France
• Oxygen Analyzer	:	PSA with sensor of Teledyne (USA)
• Dew Point Transmitter	:	GE(UK) / CSI (Germany)
• PLC	:	Siemens

N.B.

Kuraray (Japan) is by far the best quality CMS across the world.

ANNEXURE – IX

DESICCANTS QUANTITY DETAILS

S.No.	Item Description	Make	Quantity
1.	Carbon Molecular Sieves	**Kuraray - Japan**	400 Liters
2.	Activated Alumina	**CECA - France**	45 Liters

ANNEXURE –X

DRAWINGS & DOCUMENTS

Following drawings shall be submitted by us after the receipt of the order, within two weeks time for your approval:-

- Detailed Process and instrumentation drawing showing ranges of various instruments, pipe line size etc.
- Power and control circuit drawing for control panel.
- Civil foundation
- Equipment layout drawings

Following drawing and documents shall be submitted to you at the time of handing over of the equipment after commissioning at site :

- One set of Operation and maintenance manual for gas plant
- One final set of drawings.

ANNEXURE – XI

SPACE REQUIREMENT

To install PSA Nitrogen Gas Generator of 20 NM3/hour capacity, the space requirement including Air Compressor will be as given below:-

Length : 6.5 Meters

Width : 2.2 Meters

Height : 3.0 Meters

Installation : In Doors (at least under a shed)

It is advisable to leave a clear space of minimum 1 meter all around the Gas Generator for ease of maintenance. NITROGEN STORAGE TANK HAS BEEN ENVISAGED TO BE INSTALLED OUTSIDE THE BUILDING.

Detailed layout plan and civil foundation drawing shall be submitted after finalization of specifications.

ANNEXURE –XII

AUTOMATIC SAFETIES & INTERLOCKS

The Gas Generator is fully automatic and requires no continuous attention of the operator. All operations take place automatically and nitrogen purity remains consistent. In case of any abnormality, the Gas Generator would trip automatically with audio visual alarms for necessary action.

For monitoring the performance of the Gas Generator, it is advised that the plant operators should maintain log sheets and record all parameters of the Gas Generator every 2 hourly.

1. Audio Visual Alarms:

Following abnormalities will be indicated on the control panel :-

a) High Oxygen in Final Nitrogen Gas

b) Low air pressure in air receiver

c) High air temperature in Air Receiver

2. Electrical Interlocks

3 way Vent Valve would open to atmosphere in the event of :

- High Oxygen content in the final nitrogen gas

3. Safety Valves :

Location	Qty	Size
- Air Receiver	1 No.	25 NB
- Nitrogen Surge Vessel	1 No.	25 NB
- Nitrogen Storage Tank	1 No.	25 NB

ANNEXURE - XIII

INSPECTION

Inspection of the plant equipment, valves, fittings and all other assemblies may be carried out by you at our works. For the vital components like Air Compressor, Automatic Change-Over Valves and Carbon Molecular Sieves, Manufacturers' Test Certificates will be furnished. Performance test will be carried out at your site only.

PRICE

Our Price for design, manufacture and supply of 20 NM3/hour capacity PSA Nitrogen Gas Plant suitable to produce 99.99% purity nitrogen complete with Package Air Compressor, its 15 KW motor, all accessories, Refrigerated Dryer, Air Receiver, Pre-Filter, 3-Stage Oil Removal Filter, PSA Module, Surge Vessel, PLC based control panel, On-Line type Oxygen Analyzer, Nitrogen Flowmeter and all instrumentations as per the scope of supplies mentioned above shall be:

Rs. 29,79,000/-

Additional price for On-Line Dew Point Meter will be:

Rs. 1,17,000/-

Additional price for 5 M3 geometrical volume Nitrogen Storage Tank complete with its valves & instrumentation will be:

Rs. 3,69,000/-

PRICE BASIS

The above prices are based on equipment ex-our works, Faridabad.

GST @18% will be charged extra.

The Nitrogen Gas Generator falls under **HSN Code 84051090.**

PAYMENT SCHEDULE

20% advance along with the order.

75% (+ GST amount) against proforma invoice before dispatch.

5% after commissioning at site.

DELIVERY SCHEDULE

- We will dispatch the equipment within 4 months from the date of receipt of your confirmed purchase order along with requisite advance payment.
- The erection and commissioning at your site would take 10 days time.

SUPERVISION OF ERECTION AND COMMISSIONING

The PSA will assist in finalization of building plan, electrification plan etc. in line with the plants requirements. The PSA shall furnish all the civil drawings with loading details etc. for preparation of foundations.

The equipment will be erected on foundation by client's contractors. The erection will be carried out under the supervision of PSA's engineers. Charges for the same will be **Rs. 90,000/-** + GST @18%. This service falls under **SAC 998331.**

GUARANTEE

Equipment supplied by us will be guaranteed for material, workmanship and its required performance for a period of 12 months from the date of commissioning or 18 months from the date of dispatch - whichever is earlier. During the guarantee period, we will repair/replace the defective parts of material free of cost.

VALIDITY

Our offer validity will be for a period of 30 days from the date of this quotation.