



PetroSA NITROGEN GENERATOR PACKAGE SUPPLIER SCOPE

DATE	08/02/2022
REF. NO.	PD/14/9/3/3/NITROGEN AND AIR SUPPLY
PROJECT NO:	P003.1172
PROJECT NAME:	PSA TO SUPPLY NITROGEN FOR PRESERVATION

Background

The current nitrogen supply of the plant is from Unit 03 Air Separation Units (ASU) which will no longer be used to supply nitrogen. Therefore, an alternative source of nitrogen for the plant will be required.

PSA Nitrogen Generator Specifications

A **PSA nitrogen generator** was identified as a suitable option for meeting our low purity nitrogen supply requirements. The nitrogen will be distributed through the low pressure distribution header to all nitrogen users.

The nitrogen generator will use compressed dry air supplied from a centrifugal air compressor. From the compressor the air goes through an air receiver where any free water is drained and then to a drier which removes moisture and produces dry air with a dew point of -16°C^1 . It then goes through a filter and is then distributed to the three users: (1) Instrument air, (2) Plant air and (3) Nitrogen generator.

The PSA nitrogen generator will be required to deliver Nitrogen with a purity of 98% Nitrogen at a minimum flow-rate of $2000\text{Nm}^3/\text{h}^2$ and a maximum air/nitrogen ratio of 2.6 at the compressed air inlet conditions of 8barg and 40°C . The compressed air supply to the nitrogen generator will vary, due to the fact that compressed air supplies not only the nitrogen generator but instrument and plant air users as well.

¹ -16°C is dew point at operating conditions of 8barg. The dew point at atmospheric conditions is -40°C

² Normal conditions is defined as 0°C and 0kPag

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Compressed air will be available at the following conditions (*see datasheet for full operating conditions*):

Compressed air conditions	
Operating Pressure	8 barg
Operating Temperature	40°C
Max dew point	-16°C
Design Pressure	10 barg
Design Temperature	60°C

The nitrogen supplied from the nitrogen generator must meet the following specification based on the compressed air conditions specified. (*See datasheet for full nitrogen specifications*)

Nitrogen Supply specifications	
Minimum Nitrogen Flow-rate (supplier to specify actual nitrogen production rate)	2000 nm ³ /h
Maximum Air/Nitrogen ratio (supplier to specify actual air/nitrogen ratio)	2.6
Nitrogen purity	98%
The remaining impurity should be Oxygen. (Supplier to specify other impurities present with residual oxygen)	2%

- Supplier to specify pressure drop through generator package and final outlet pressure of nitrogen generator.
- Nitrogen purity must be continuously monitored and controlled by the nitrogen generator. Nitrogen below desired purity should automatically be isolated and blown down to atmosphere.
- Nitrogen generator must have the flexibility of adjusting the nitrogen purity to a minimum of 95%. Vendor to specify air/nitrogen ratios, and nitrogen capacity for the desired purity range between a minimum purity of 95% and a maximum purity of 99.95%.
- Supplier to provide performance guarantee of nitrogen generator that it will meet capacity and purity specifications.
- Supplier to size and provide nitrogen receiver vessel as part of nitrogen generator package. Nitrogen generator package refers to nitrogen PSA unit and receiver.

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Control System and Instrument Scope

The Electrical and Control System Requirements as detailed below is pertaining to the option to procure.

- The control system shall comprise of all instruments, actuated control valves, integrated controller & logic solver with local Human Machine Interface (HMI).
- The control system, field instruments and actuated valves shall meet industrial standards and be suitable for continuous (24/7) operation.
- All actuated valves shall be pneumatic.
- All on-off valves utilised in sequence controls and switched regularly, shall be specified as high cyclic service valves. Tight shutoff requirements shall be considered.
- Design shall be fail safe.
- Solenoid valves shall not be pilot operated.
- Actuated valves shall be spring return to fail position.
- Valve position switches shall be provided as required by the control system / control scheme.
- Dry instrument air (min pressure 600kPa) will be provided for connection to the skid or can be derived internally from the air supply to the generator.
- The instrument air must be distributed internal to the skid with 3/8 inch stainless steel instrument tubing. All fittings and tubing shall be imperial standard. Isolation valves must be provided at each actuated valve.
- 24VDC Uninterrupted Power Supply will be provided for the control system.
- Analog signals shall be 4 to 20mA.
- Binary signals shall be 24VDC.
- Transmitters are preferred above switches for measuring process conditions.
- Local panel and junction boxes shall be in stainless steel.
- All process instruments that are connected to the process envelope shall be supplied with an instrument type isolation manifold/valve with vent valve in addition to the piping isolation valve.

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- Junction boxes shall be provided for the connection of power cables, instrument cables and communication cables. Sufficient terminations shall be provided to terminate all cores of the cables installed and all wires shall be marked.
- All instruments, junction boxes, local mounted controller and HMI shall have an ingress protection of minimum IP65.
- PetroSA shall issue each instrument and actuated valve with a unique tag number which is to be used throughout the system.
- Individual data sheets are to be supplied with each of the instruments. Data sheet format to be agreed.
- Design documents (connection and wiring schedules, equipment and panel layouts etc.) and shall be provided as part of the supply.
- Calibration certificates and leak test certificates must be supplied for each instrument and actuated valve.
- Engineering interface and application software, specialised and diagnostic tools must form part of the proposal.
- The Nitrogen Generator control system will be interfaced with ABB 800xA HMI or Melody Process stations that form part of the Refinery Distributed Control System (DCS). The DCS HMI is operating in a virtualised environment.
- The communication interface can be OPC, Modbus RTU or Modbus TCP/IP.
- The N2 Generator should (as a minimum) be able to be locally and remotely operate - put on stop/start/standby.
- Locally and remotely change nitrogen purity specification from local the HMI and DCS.
- Locally and remotely observe timer sequence steps on control system from local the HMI and DCS.
- Alarms and shutdowns to observable from the local HMI and DCS.
- Interface equipment required for the PetroSA part of the control systems are excluded from the scope of supply.
- All work to be performed on the existing DCS and ESD systems shall be performed by the PetroSA Control Systems technicians.

Electrical Requirements

- The supplier shall indicate any additional electrical requirements.

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- Provision shall be made for connection of the skid to the plant electrical earthing system.
- All electrical equipment shall be earthed in accordance with the manufacturers requirements.
- 220VAC/50Hz is available for lighting and small power requirements.

Installation and Commissioning

Supplier to install and commission nitrogen generator.

Maintenance

- Supplier to provide commissioning and running SPIR list.

Purchase

- Nitrogen (N2) generator cost to PetroSA (excluding costs associated transportation to PetroSA site).
- Nitrogen (N2) generator delivery / transportation cost to PetroSA site.
- Include the exchange rate and foreign currency on the date of the quote been delivered and indicate percentage of local and foreign currency contents.
- Supplier to specify their delivery schedule (duration) from the date of order.

General

- **Supplier to complete PetroSA Datasheet and all required information specified.**
- All drawings and documentation for equipment to be supplied.
- Design must comply with relevant codes and standards. Pressure vessels must comply with PetroSA - SPECIFICATION FOR CATEGORY 3 PRESSURE VESSELS.
- Operating manual for the nitrogen generator must be included. Training of personnel to operate and maintain equipment to be included.
- Any deviations from the scope of work, prescribed standards or specifications shall be highlighted by the supplier.

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