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PART-I (B)

**Tender for Supply, installation and commissioning of
Oil Injected Screw Air Compressor System for Test
Facility at IPR, India**

Technical Specifications

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1 Introduction

A fully packaged single stage, rotary screw air compressor system is required at IPR for supply of compressed air for different instrumentation/valve applications. Here, this compressor system means, it should include all components that are needed to suck air from ambient up to the terminal point where compressed pure air (oil, moisture and dusts are removed as per specifications of this document) is delivered, which can be taken by pipe line to different applications. This compressor system should be designed for easy to install, simple to operate and should deliver rated compressor performance. The enclosure should be designed to manage the environment of the internal components and the cooling ventilation system, at the same time it should, significantly, reduce the sound level emitted from the machine into the installation environment. The complete package should be designed to be located on an adequate flat floor without any special foundations and fixtures on the ground. The fully packaged compressor unit should have sufficient leak proof components/elements to avoid air and oil leakage.

The compressor should have high reliability for uninterrupted operation for at least 2 months. It should have sufficient instruments & sensors for monitoring and fault diagnosis and appropriate controls with interlocks for safe operations.

This air compressor system will be used for instrumentation air purpose. For pneumatic control of valves, instrumentation air is required to have compressed air at 13 bar (gauge) pressure and ~320 K temperature with flow rate ~500 CFM(cubic feet per minute) as nominal requirement. At the outlet of the compressor system, delivered compressed air should be pure and lubricating oil content in this compressed air should be less than 0.01 PPM (parts per million) by volume.

Detailed requirements and specifications are given in this document.

2 Design Data of Compressor System

2.1 Main Design Data

Following Table-1 gives the main data required for supply of oil injected air screw compressor system. Only screw type compressor will be considered as this can provide high flow rate at the pressure required here.

Table-1: Main design data for air compressor system

| Sr.No. | DESCRIPTION OF PARAMETER | IPR requirement |
|--------|---|---|
| 1. | No. of compressor systems required | One |
| 2. | Compressor Type | Oil injected/oil flooded screw type |
| 3. | Cooling type for cooling of oil and air | Air cooled (Coolers must be sized for the load corresponding to higher torque load of motor shaft mentioned in Sl. No. 10 of this table (total for both coolers) which is also equal to the minimum required motor capacity) |
| 4. | Nominal discharge Pressure of air required at the end (or terminal point) of compressor system | 13 bar(g) or higher |
| 5. | Single Stage or Double Stage compression | Single stage |
| 6. | Lubricating oil content in air at the end (or terminal point) of compressor system. | ≤ 0.01 PPM By volume (Activated carbon bed may be used to achieve this. If this is used, a filter should be used at the down stream of it to filtrate 20 micron or bigger size carbon particles coming from this bed) |
| 7. | Moisture content in terms of PDP in terminal point (end of compressor system) discharge air | \leq PDP (pressure dew point) 5 °C. |
| 8. | Air volume flow control or Part Load Control method | VFD (variable frequency Drive) (it should be able to vary flow at least down to 30% and on higher side up to 100% of nominal flow rate. |
| 9. | Volume Flow rate in cfm (cubic feet per minute) at suction condition (atmospheric pressure and temperature) | between 450 to 500 And as per standard capacity of supplier |
| 10. | Motor shaft torque | 20 % more than standard requirement for the nominal compressed air delivery |

| | | |
|-----|---|--|
| | | mentioned in this document. This is required considering special application requirement. |
| 11. | Air Temperature at the Outlet of whole compressor unit at any time in the year | < (Ambient +10 ⁰ C) (Gandhinagar, Gujarat atmospheric temperature should be taken into account for designing the air coolers) |
| 12. | Type of delivery pipe end connection to the application at the outlet of whole unit | Bolted SS (stainless steel) flange type. Standard flanged end pipe with holes for bolting and counter blank flange should be provided by the supplier. |
| 13. | Suction filter housing | It should have separate housing with its pipe assembled to the suction port of the compressor with bolted flange. Compressor (or air end) with this filter housing should not be made as one casted component) |
| 14. | Air receiver tank | <p>A vertical tank with following specs should be included towards the end (or terminal point) of air discharge (or terminal point) of the compressor system.</p> <p>Design pressure-17 bar (g), working pressur-15 bar (g), Internal volume: 2 m³ maximum height-3.5 m tank construction material: carbon steel or mild steel with epoxy painting on both internal and external.</p> <p>pressure gauge and pressure relief valve with burst disc should be provided. leak tightness at any location: AS per design code/standard</p> |
| 15. | Design, fabrication and tests code/standard | ASME or equivalent international code/standard |
| 16. | Pressure test and leak test of air receiver tank | As per design code/standard |

2.2 Other Specifications, supplier need to consider for Supply of Whole System

1. Installation Location: Outdoor (IPR Extension Lab, Bidhata Building, Gandhinagar, Gujarat).
2. Temperature and humidity variation: As per Gandhinagar weather.
3. Vibration and noise level: < 78 db at a distance of 1 meter from the unit. We prefer the noise level of the compressor should be as minimum as possible.
4. Filters for oil and suction air should be able to filtrate all particles of 20 micron or bigger size.
5. Necessary instrumentation and controls for all variable parameter should have local display with control cabinet.
6. Power available at IPR: a) 415 V \pm 10%, 50 Hz \pm 5% , 3 phase, 5 wire (without back up) for heavy loads and b) 230 V \pm 1%, 50 Hz \pm 1Hz , single phase, 3 wire
7. Air receiver tank should have necessary instruments and accessories useful for operations and tests (pressure tests and leak tests), besides whatever mentioned in this document.
8. Supplier should give a list of istrumentations and controls, if any, with make of it and main specifications included in the supply. This should be also uploaded with quotations/proposal for technical evaluations.
9. Necessary safety equipments and alarm provisions shall be provided. Its list should be uploaded by the supplier along with quotations/proposals for technical evaluation.
10. To support the buffer tank on the concrete floor it should have provision of fixing with anchor-fastner. It should not require special concrete flooring. Supplier must upload the weight and dimensions of components/systems along with proposal for technical evaluation.
11. Supplier should provide calibrated flow meter in addition with standard package to measure air volumetric or mass flow rate during acceptance test. This should be included as part of the supply.

3 Scope of work and Supply

3.1 Scope of Work

The offer must include the following works:

1. Fabrication and assembly of components of compressor unit with all accessories.
2. Appropriate quality assurance and quality control, inspection and tests.
3. Pre-dispatch inspection tests at factory site.
4. Installation, interconnection of piping if any, acceptance tests and commissioning at IPR.
5. Documentations related to quality controls and quality assurance and tests done at vendor's site and tests and commissioning done at IPR site.
6. Documentations related to design, drawing, codes and standards used for different components, instrumentations, control units.
7. Documentations and drawings required for trouble shooting during operation, maintenance and repair.

3.2 Scope of Supply

The offer must include the following components/elements to supply

1. One Compressor unit with electrical motor and VFD.
2. An air receiver tank with all accessories.
3. Oil removal system which includes bulk oil separator, oil cooler, filters and coalescers.
4. Enclosure with support frame for compressor system's main components to reduce noise level outside of it and to safeguard from atmospheric dust and other harmful elements.
5. Electric Control cabinet.
6. Instrumentation and Control System which should include sufficient valves, instruments and safety equipments.
7. Documentations related to quality controls and quality assurance and tests done at vendor's site and tests and commissioning done at IPR site.
8. Documentations related to design, drawing, codes and standards used for different components, instrumentations and control units.
9. Documentations and drawings required for trouble-shooting during operation, maintenance and repair.

4 Documents for Approval Before Manufacturing

Following documents must be provided by the supplier for approval by IPR before manufacturing of compressor system including air receiver tank.

1. GA (General Arrangement) drawing, PID (Process instrumentation drawing) and ES(Electric schematic) drawing for compressor system except air receiver tank.
2. GA and volume calculations for air receiver tank.
3. QA (quality assurance) and QP (quality plan) documents

5 Tests, Commissioning, Acceptance and spare parts

5.1 Factory Acceptance Tests (FAT)

FAT should include following tests and inspections at Vendor's factory before dispatch to IPR under the witness of IPR and/or IPR representatives. These will be considered as pre-dispatch inspection.

1. A final pressure test shall be carried out at the factory site for air receiver tank as per design code.
2. Leak test of air receiver tank as per design code.
3. Operation and checking of health of all parts.
4. Measurement of pressure, temperature and volume flow rate of compressed air near final delivery point (or terminal point) of the whole system.
5. Measurement of oil content in compressed air near final delivery (or terminal point) of whole system. If supplier can't do, it should get it done by a third party under the witness of IPR representative. Or, supplier should give relevant design data to IPR for verification and approval before manufacturing.
6. Measurement of vibration/noise level at full load.
7. Measurement of power consumption at different part load operations(30%, 60% and 100% of full load)
8. Checking of all design, drawing and fabrication documentations.
9. Checking of all inspection and test reports
10. All results should conform to that specified by the supplier within +/- 10 % deviation.
11. Vendor should intimate IPR at least 15 days in advance about the dates of above mentioned FAT.

5.2 Installation, Commissioning and site acceptance tests (SAT) at IPR

Installation and interconnecting piping work, if any will be done by the supplier at IPR, Gandhinagar. All required tools and equipments for this purpose is in the scope of supplier. All performance tests and commissioning runs for acceptance must be carried out by the personnel and under the responsibility of the supplier. The detailed test procedure will be defined jointly by the customer and the supplier.

During commissioning, following tasks will be performed:

1. Test of all the sequential procedures for starting the compressor unit, nominal operations for at least 1 day continuously and shut down of the compressor unit.
2. Measurement of pressure, temperature and volume flow rate of compressed air near final delivery point (or terminal point) of the whole system
3. Power consumption at full load and part load.
4. Local oil leaks will be checked visually. There should not be any visible oil leakage.
5. All results should conform to that specified by the supplier within +/- 10 % deviation.
6. On successful completion of site performance tests and reception of all specified documents, the purchaser will issue a **certificate of acceptance**.

5.3 Spare parts

Vendor should upload the list of spares including consumables (lubricating oils, gaskets, etc) required for at least 2 years operation and the prices for the same at the price bid (under optional item/spares)