Subject: Fabrication, supply, installation and commissioning of ammonia cracker unit

Tender No: BARC/UED/ATM/20067 due on 20/11/2020

Dear Sir,

Quotations are invited in sealed envelope for and on behalf of The President of India acting through Head, UED for fabrication, supply, installation and commissioning of ammonia cracker unit as per the following terms and conditions. Please note that quotations shall be submitted on printed letterheads and must bear PAN NO/GST NO etc. Quotations not complying with them are liable to be rejected.

1. **Description of work:** Please refer technical specifications in Annexure I.

2. **Charges:** Price should clearly indicate the basic cost and applicable GST. Cost break-up should be given.

3. **Delivery:** Delivery shall be made within 120 days.

4. **Guarantee:** You shall give guarantee against any defect and trouble free performance for a period of one year from the date of commissioning of the unit.

5. **Income tax:** Income Tax @2% and surcharge on IT any other govt. applicable levies/taxes will be deducted from your bill.

6. **FIM:** No FIM involved.

7. **Penalty:** Please note that any delay, which is attributable to the contractor, is liable to penalty @0.5% per week (max.5%) to be imposed on the contractor.

8. **Validity:** The validity of offer must be mentioned in the quotation.

Quotations should reach by **speed post or registered post** on or before the stipulated date to Head, UED in sealed envelope mentioning clearly the tender no and due date.

Yours faithfully,

Archana T. M. (SO/E)
ANNEXURE I

1. **Scope of work:** The scope of work includes design, fabrication, testing, installation, commissioning and safe door delivery of ammonia cracker unit at Uranium Extraction Division, BARC, Trombay-400085.

2. **Process description:** Cracked gas containing a mixture of hydrogen and nitrogen is to be produced from ammonia.

3. **Capacity** : 25 Nm³/hour of cracked gas

4. **Inlet conditions** : Ammonia at 0.5 kg/cm², room temperature (Pressure regulating valve is not required)

5. **Outlet conditions (Acceptance criteria):**

   - **Composition**
     - N₂: 75%
     - H₂: 25%

   - **Maximum gas temperature at outlet** : 40°C
   - **Gas pressure at outlet** : 2000 mm wc
   - **Max permissible limit for uncracked NH₃** : 100 ppm

6. **Major equipment:**

   i) **Retort:** The retort shall be designed for an operating pressure of 0.3-0.5 kg/cm² (g) and an operating temperature of 850°C-875°C. Material of construction for retort should be HU grade stainless steel or higher. It should be filled with catalyst containing minimum 8% Nickel. 100% radiography should be done for all weld joints of the retort.

   ii) **Furnace:** The retort should be electrically heated by a furnace. This furnace shall have suitable thermal insulation to avoid heat losses and to maintain surface temperatures not exceeding above 55 °C. Nichrome (Nickel 80% and Chromium 20%) should be used as heating element. It shall be possible to open the chamber for periodic in-service inspection of retort tube and for replacement of heating elements. The chamber should have easy access to facilitate removal/reinstallation of catalyst; inspection of heating elements and insulation, etc.

   iii) **Cooler:** The cracked gas coming from furnace should be further cooled to ambient temperature using water/air heat exchanger.

   iv) **Moisture separator:** Moisture separator units are to be given for ammonia gas coming from cylinder and for cracked gas leaving the cooler. Suitable drain valves have to be provided.

   v) **Control Panel:** The panel should be designed as per IEC 61439 or equivalent. Degree of protection should be IP-54 or better. All the compartments shall be accessed from front openable doors and should be provided with 6 mm neoprene gasket for sealing.
vi) Switch mode power supply (SMPS): In case DC power is required to supply PLC, actuators; the output of SMPS should be rated at least 2 times higher than calculated load. The SMPS should be fan-less model from reputed make like Siemens/ Telemacanique etc. Output voltage should be adjustable with inbuilt potentiometer. Features to be included are overload protection with manual/automatic reset, Short-Circuit protection with manual/automatic reset and over-Heat protection with automatic reset.

vii) Pipelines, flanges and valves: All pipes, flanges and valves shall conform to following standards:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipes</td>
<td>ASTM A312</td>
</tr>
<tr>
<td>Flanges</td>
<td>ASTM A961, ASME B16.5</td>
</tr>
<tr>
<td>Valves</td>
<td>ASTM A961, ASME B16.34, B16.10</td>
</tr>
</tbody>
</table>

7. Instrumentation and control: The following instrumentation should be provided:

- Needle valve at the inlet of moisture separator for fine control.
- Pressure gauge at the inlet of moisture separator.
- Temperature controllers, safety controllers for furnace.
- Rotameter for flow measurement of cracked gas is to be provided at the outlet of the cracker unit.
- Valves and rotameter for flow control of water in cooler.

8. The following manufacturers are preferred for instrumentation:

- Temperature sensors and controllers: Radix or equivalent
- Pressure gauges: Radix or equivalent.
- MCBs and contactors: Schneider, Siemens etc. or equivalent.
- Cables: Polycab or equivalent.

9. Spares:

- Solenoid valves: 10% of each size (or 1 no whichever is higher)
- Pneumatic tubing: Minimum 5 m of every sizes
- Electro pneumatic solenoid valve: 10% of every sizes (or 1 no whichever is higher)
- Push-In tube fitting: 10% of every sizes (or 1 no whichever is higher)
- Temperature Indicator and controller: 10% of every type (or 1 no whichever is higher)
- Temperature Sensors: 10% of every type (or 1 no whichever is higher)
- Rotameter: 1 no
- SMPS: 1 no
10. **Quality assurance and testing:** The equipment and their components shall be of reputable make and comply with the relevant Indian standard specifications or internationally applicable standards. The fabricator should have a full-fledged quality assurance facility and qualified staff to perform all the inspection and testing. The fabricator shall maintain quality control/inspection records that shall indicate the particulars of the quality control operations carried out. The department shall have the right to witness any/all such operations. Moisture separator, heat exchanger shall be hydro tested as per ASME BPVC section VII division 1. Radiographic examination shall be carried out for retort in accordance with the requirements of ASME Sec. V/other applicable code. Welding rods, electrodes and filler metals used should be as per ASME section II Part C. Welding joints shall be tested by liquid penetration examination as per ASTM E165 and reports submitted.

11. All equipment must bear the manufacturer’s address, operating conditions for which the equipment is designed, year of manufacturing and testing.

12. **Documentation:** The following documents should be submitted:

- Chemical and mechanical test certificates of bought-out items and raw materials.
- DP test reports of all weld joints.
- Hydro-test and pneumatic test certificates of all components.
- Radiographic test report of retort.
- Fit-up reports of all components.
- Test and calibration reports of all instruments.
- P&ID of the system.
- Start up and shut down procedures.
- Maintenance procedures and recommended list of spares.
- Data sheets of all components, catalyst etc.
- As built engineering drawings of all components.

13. After order is placed party should submit P&ID, layout and QAP of the cracker unit for perusal before manufacturing.

14. Any utilities required for installation and operation of the cracker unit may be mentioned in the quotation.

15. **Warranty:** Warranty for a period of 12 months since the handing over of the plant should be given.

16. **Inspection:** The unit will be inspected at vendor’s site before dispatch.

17. **FIM:** No Free Issue Material (FIM) will be supplied by BARC.