Government of India
Bhabha Atomic Research Centre
Chemistry Division

Ref. No. BARC/ChD/502/MF/RBA4013/2022/17 Date:16/11/2022

Subject: Fabrication of Hydrogen-Oxygen recombination flowing mode reactor.

Dear Sir/Madam,

1. Quotations are invited for the minor fabrication job, as per the enclosed specifications.
2. Bidder shall quote for fabrication of these components with material.
3. Taxes and excise duties shall be quoted separately.
4. The quotation must reach the Head, Chemistry Division by date 28/11/2022 and must be sent in a sealed, printed envelope superscripted with reference number and the due date.
5. The address on the envelope should read — Dr. A.K. Tyagi,

Head, Chemistry Division,
Bhabha Atomic Research Centre,
Trombay, Mumbai 400085.
Contact person: Suhas B Phapale, (022-25592282)

6. The bidder shall deliver the finished product within 6/8 weeks from the date of receipt of the order. The finished product shall be delivered by the bidder at Chemistry Division, BARC, Trombay, Mumbai-400085. Any delay which is attributable to the bidder is liable for penalty @ per week (max. 5 %) to be imposed on the bidder. Extension required, if any, is to be applied before validity of the Work Order is over, with proper justifications.
7. Bidder is liable to install the reactor and give training after completion of the installation.
8. Head, ChD, BARC Mumbai reserves the rights to accept /reject any or all quotations without assigning any reasons.
9. Delivery charges, if any, must be clearly mentioned with the offer.
10. Quotations must also indicate the validity of offer.
11. Quotations are to be in printed letterhead / quotation format only. Quotation received in computer generated forms will be considered as invalid and rejected.
12. Quotation should consist of GST registration number, PAN number of the firm.
13. Claim referred by the firms are also to be in printed INVOICE format consisting of the above registration numbers.
14. No Free issue material will be given.

16/11/2022

16/11/2022

16/11/2022

(Dr. A.K. Tyagi)
Head, Chemistry Division

डॉ. ए. के. त्यागी / Dr. A. K. Tyagi
अध्यक्ष, रसायनिकी प्रभाग
Head, Chemistry Division
बी.ए.आर.सी. / B.A.R.C.
ट्रॉम्बे, मुम्बई-४०००८५ / Trombay, Mumbai-400085

Annexure - 1

Specifications

Ref. No: BARC/ChD/502/MF/RBA4013/2022/17 Date:16/11/2022

Description of work: Fabrication of Hydrogen-Oxygen recombination flowing mode reactor.

Standard Supply: Hydrogen mass flow controller: up to 10ml per minute, Air/Nitrogen Mass flow controllers: up to 200ml per minute, mixing chamber, reaction chamber/Catalyst Bed, Thermocouple (K-type, 1 mm or less thickness), temperature recorder, all tubing and assembly, on/off valves (manual).

It may be noted that this tender is floated as a **Two-part tender.** The technical and commercial bids shall be submitted separately in two sealed envelopes, should super-scribed as **"Technical Bid"** and **"Commercial Bid"** duly furnishing all the required information. These bids should be placed in single muster envelope, which should be super-scribed as " Fabrication of Hydrogen-Oxygen recombination flowing mode reactor " and addressed to following person, should reach him on or before the date and time mentioned. The quotation should be sent only by speed post or registered post of Indian Postal Department. Tender number, due date and subject are to be clearly mentioned on all the three envelop. Otherwise, quotation will be ignored. Vendors are also instructed not to include any financial value or term in technical bid.

Terms and conditions for qualifying technical bid:

- Vendor should be familiar with automation and have PLC and HMI interface experience.
- Vendor must have at least five years of experience doing similar work in DAE. (A copy of the work order must be included with the technical bid.)
- Vendors must have a current PVC certificate.
- Preparation of conceptual design drawing in AutoCAD with appropriate line weights, pen thickness and formatting, based on previous same kind of work order.
- The bid can be considered technically suitable after final approval for the drawing in consultation with our staff.

Terms and conditions for submitting a qualifying financial bid

- It includes all financial terms and the total cost of the work as specified in the scope of work.
- All taxes must be clearly stated.
- The vendor must state unequivocally whether he accepts all of the financial terms and conditions outlined in the tender document.
- The offer's validity must be clearly stated.

Technical Specifications for Hydrogen -Oxygen recombination flowing mode reactor.

Fabrication and supply of flowing mode reactor Stainless steel (SS 304) with catalyst bed and plates that can support catalyst PCRD plates as well as bead or extrude type supported catalyst. Current hydrogen-oxygen recombination reactor operates in static mode to monitor catalytic activity, but a flowing mode reactor is required to have in-situ operation resemblance of PCRD catalyst plates over reactor. As gas mixture consisting of H_2 + Air + N_2 with varying compositions has to be evaluated, a flowing mode reactor with a mixing chamber and an integrated reaction chamber/catalyst bed that can measure temperature at multiple points within the bed must be built. Inside the chamber, plates can support catalyst PCRD plates as well as bead or extrude type supported catalyst holding assemblies. Continuous and flowing mode experiments, as well as similar experiments in the reactor's actual operating PCRD-based catalyst condition, necessitate fabrication as per the attached drawing.

1. Mass flow controller: No of MFC – 3 Nos., MFCs will be calibrated for, N_2, H_2 and Air, Accuracy: ≤ ± 0.02% of Full Scale, Material: Stainless Steel (316L), Control Stability: ≤ ± 0.1% of Full Scale, Control Valve: Closed Solenoid, Mass flow controller maximum pressure 10 bar, Control Range: a) ranging from 0.5 SCCM full scale to 5 SCCM Full scale (For H_2), b) 10 SCCM full scale to 20 SLPM full scale for N_2 and Air.
2. Thermocouples: Service application- Gas Temperature measurement in ½" Pipe. Type of T/C Sensor: K-Type (1mm), No of Thermocouple: 4Nos., Sensor tip Grounded, Insulated with high Purity MgO. Sheet Material -SS 316, Sheath tube O.D, 6mm, Operating pressure – 2Kg/cm^2
3. Solenoid valves: Manufacturer model no – GSR: 4323/0801/.012, Service application- Hydrogen, Air & Nitrogen Gas., Body Stainless steel, End connection ½" BSP,
4. Pressure reducing valve for Air, H_2, Nitrogen: Make Tescom, PRV type two stage, PRV , Body Stainless steel, End connection ½" NPT(F), Outlet 1-10Kg/cm^2, Gas Temperature Range 50 C,
5. PLC: Tag no PLC-01, Manu-Delta Electronic- model no DVP-28SV11T2, Power supply voltage 24V/DC, Number of digital input point 16. Number of digital Output point 12. Input voltage 24V/DC,5mA.
6. HMI: Manufacturer Delta Electronics Model No-DOP/B10E615
7. Thermocouple Expansion Card: As per requirement

8. Analog Expansion Card: As per application requirement

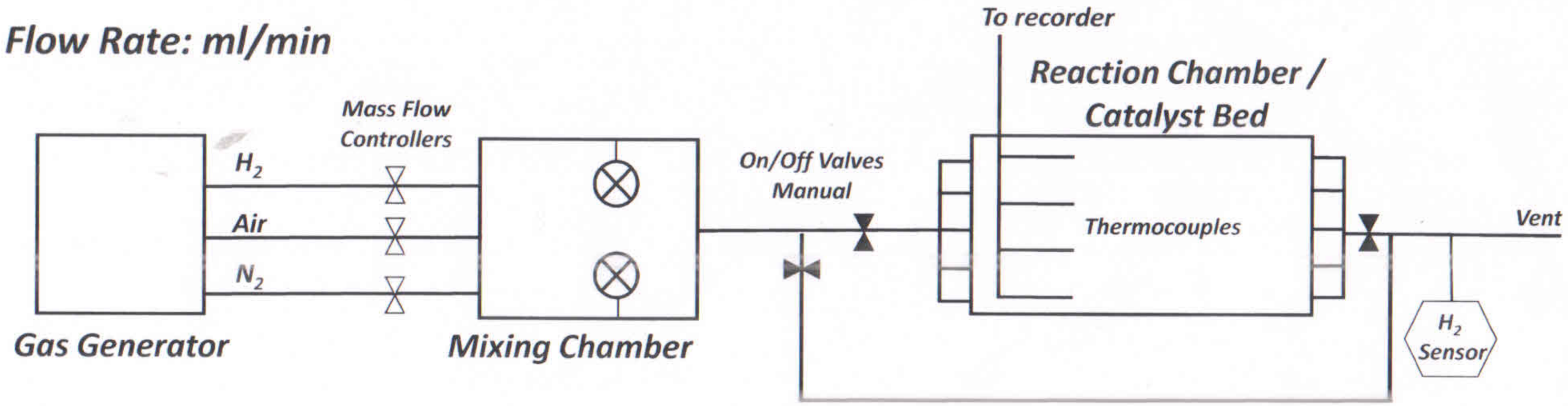
9. Safety valve: ½" BSP(f), Body Stainless steel

10. Control Panel: Control Panel Cabinet

11.Chamber size/Reactor Size: Reactor size for cavity plate of 6 Nos. Size:

Mixing Chamber: (450mm length and Diameter 300mm, Spiral gas mixing)

12.Reaction Chamber/Catalyst Bed: Width 500mm x depth 300mm x Height 200mm.



To be supplied by MKM Engineers:

1. Hydrogen mass flow controller: Upto 10 ml per minute
2. Air / Nitrogen Mass flow controllers: Upto 200 ml per minute
3. Mixing Chamber
4. Reaction Chamber / Catalyst Bed
5. Thermocouple (K-Type, 1mm or less thickness) 4 nos.
6. Temperature recorder
7. All tubing and assembly
8. On/Off Valves (Manual)

To be procured by BARC:

1. Gas generator
2. Hydrogen Sensor