

**e-Tender Document for**

**Supply and Installation of *Machineries /***

***Equipment***

**at**

**CIPET:SARP- LARPM, Bhubaneswar**



**TENDER DOCUMENT NO. 03/2018-19**

**LAST DATE FOR SUBMISSION OF BID: 16.05.2019**

**SCHOOL FOR ADVANCED RESEARCH IN POLYMERS (SARP) - LARPM**  
**CENTRAL INSTITUTE OF PLASTICS ENGINEERING & TECHNOLOGY**  
**(Ministry of Chemicals & Fertilizer, Govt. of India)**  
**B-25, C.N.I. Complex, Patia, Bhubaneswar – 751 024 (Odisha)**  
**Tel: 0674-2740173, Fax : 0674-2740463,**  
**Web: [cipet.gov.in](http://cipet.gov.in), e-mail : [larpmcipet@larpm.in](mailto:larpmcipet@larpm.in)**

**e-TENDER NOTICE (03/2018-19)**

CIPET:SARP-LARPM, Bhubaneswar invites bids through e-Tender **UNDER SINGLE STAGE TWO BID SYSTEM IN e-TENDER PORTAL ([www.tenderwizard.com/CIPET](http://www.tenderwizard.com/CIPET))** from Reputed Suppliers/ Manufacturers / Authorized Dealer & Distributors having valid PAN, IT Return & GST Registration Certificate for supply & installation of the following equipment at CIPET:SARP-LARPM, Bhubaneswar. Bid offers should be of two parts viz., Technical Bid & Commercial Bid.

| Sl. No. | Name of the Equipments           | Tender No. |
|---------|----------------------------------|------------|
| 1.      | High Pressure PU Foaming Machine | 03/2018-19 |
| 2.      | Heat Flow Meter                  |            |
| 3.      | Pycnometer                       |            |
| 4.      | Viscometer                       |            |
| 5.      | Potentiometric Auto Tritator     |            |

Bidders are requested to visit the web-site [www.tenderwizard.com/CIPET](http://www.tenderwizard.com/CIPET) or [www.cipet.gov.in](http://www.cipet.gov.in) and submit their offers electronically. It may be noted that offers submitted on paper manually or the offers sent by post shall not be entertained. The last date for submission of the bid is as mentioned below:

**Last date for the online submission of the bid : 16.05.2019, 03.00 P.M.**

**Opening of Technical bid : 17.05.2019, 03.30 P.M.**

**Opening of Commercial bid : After Evaluation of Technical Bid**

**For further clarification, please contact no. 0674-2740173/9090968453/7894316788**

CIPET:SARP-LARPM reserves the absolute right to accept/reject any or all bids at any stage of the tender process without assigning any reason whatsoever.

**Administrative Officer, CIPET:SARP-LARPM**

## INSTRUCTIONS TO BIDDERS

### (A) Introduction

School for Advanced in Research (SARP) - LARPM is an exclusive R&D wing of CIPET functioning at Bhubaneswar. SARP-LARPM was set up with an objective of developing high-end polymeric materials for various engineering applications in the areas of packaging, automotives, aerospace, defence, biomedical, energy storage etc. The laboratory has high-end characterization facility and basic amenities under one roof, for Researchers and Intellectuals working in the areas of Polymer Science & Technology. The laboratory is also recognized by National Accreditation Board for Testing and Calibration Laboratories (NABL) as per ISO:IEC 17025:2005 and DST / DSIR, Govt. of India for undertaking Research Activities in applied areas of Polymer Science & Technology.

### (B) The Bidding Documents

- **Content of Bidding Documents**

The Bidding Documents include;

- (a) Instruction to Bidders;
- (b) Terms and Conditions of Contract;
- (c) Schedule of Requirements;
- (d) Technical Specifications & Compliance Sheets;
- (e) Manufacturer's Authorization Form;
- (f) Bid Form and Price Schedules;
- (g) Contract Form;
- (h) Performance Security Form;
- (i) Deviation Statement;

- The Bidder is expected to examine all instructions, forms, terms and specifications in the Bidding Documents. Failure to furnish all information required by the Bidding Documents or submission of a bid not substantially responsive to the Bidding Documents in every respect will be at the Bidder's risk and may result in rejection of the bid.

- **Amendment of Bidding Documents :**

- At any time prior to the deadline for submission of bids, the Purchaser may, for any reason, whether at their own initiative or in response to a clarification requested by a prospective bidder, modify the Bidding Documents by amendment.
- In order to afford prospective Bidders reasonable time in which to take the amendment into account in preparing their bid, the Purchaser may, at their discretion, extend the deadline for the submission of bids

### (C) Eligible Criteria for Bidders :

- Audited Balance sheet for the last 3 years
- Up-to-date IT return for the last 3 years, PAN Card, GST Registration Certificate.
- The Bidders must have satisfactorily supplied & completed installation of similar type of Instrument at-least 02 nos. in any Govt. Organisations/PSU/Corporate Sectors during the last 5 years. The Certificate in support of that from the user must be attached. The Customer Feed Back Certificate must be enclosed.

- Self declaration on **NO PENDING LITIGATION**.
- The vendor shall have local service and application office and infrastructure to attend visit within 48 hours.
- The vendor should furnish details of customers in India.
- The bidders shall give a list of his relatives working with the CIPET along with their designations and addresses.

**(D) Terms & Conditions :**

- **Taxes :** All taxes, duties, packing, forwarding & installation have been included in the quoted rate.
- **Performance Security :** 10% of the Purchase Order value shall be submitted by the party towards performance security within 7 days of receipt of Purchase Order in the form of Demand Draft. The Performance Security will be refunded after warranty period is over.
- **Warranty :** The Instrument should be covered under 1 year warranty from the date of installation and commissioning.
- **Delivery Period :** Supplier should be delivered the instrument within 08-10 weeks from the date of receipt of Purchase Order, failing which liquidated damage @ 0.5% per week shall be deducted from the final payment, for each week of delay beyond the delivery period upto maximum of 2%.
- **Payment :** 90% after supply of Instrument & balance 10% after successful installation, commissioning & Training as per our Technical Specifications & subject to fulfilment of other terms & conditions of the e-Tender documents.
- The Bidder shall provide the Bank accounts details along with Scanned copy of cancelled cheque for onward transaction.
- The vendor should have technical support in the area of application and service available within the country.
- In case of any up-gradation of software then the same should be provided free of cost by the supplier/manufacture.
- Power and receptacle/socket as per Indian Standards should be provided.
- Appropriate tool box/kit for routine maintenance should be provided with the equipment
- On-site (at SARP-LARPM, Bhubaneswar) installation, demonstration and training for system operation and maintenance as well as application support should be provided by the vendor at its own cost.
- Tenders should specify & provide all mandatory and other accessories required for installation, commissioning and running the machine.
- The repairing/rectification/replacement/configuration required, if any, of the items under warranty must be done at CIPET:SARP-LARPM, Bhubaneswar by the bidder.

- The Annual Maintenance Charges (AMC) 3 Years should be quoted separately (Optional), which should not be quoted in the Price Bid.
- The supplier should mention the model & make against the Instrument.
- **Spares:** The supplier must confirm in writing that the spares for the instrument will be available for a period of at least 05 (Five) years after the Instrument supplied.
- **Bid document:** The vendor should read the e-Tender documents carefully before quoting. It shall be deemed that the vendor has gone through the documents carefully and has understood its implication.
- **Technical bid:** The Technical Bid should accompany with full technical literature, leaflets of the technical features of the Instrument must be submitted for evaluation.
- **Declaration:** The bidder should attach a self-declaration statement that he is not debarred/ blacklisted or banned from any Central Government / PSU / State Govt / any Corporate Sector.
- **Manual:** Complete set of service manual for diagnostics, trouble shooting and maintenance along with electronic circuit diagram (in English) – hard and soft copy should be provided with the instrument
- The e-Tender, submitted by the Bidder who have already been declared as Black Listed or whose contract was terminated for dissatisfactory supply or who was unable to supply any Institute/Organization run by the State / Central Government / PSU / Corporate Sectors will not be considered even his being the lowest rate.
- The Bidder should provide relevant documents regarding the Partnership Firm/Public/Pvt. Ltd. Company/Cooperative society.

### Pre-Requisites

- Pre-installation requirements indicating details of power requirement, utility air, water, ventilation, safety device, if any, along with the foundation requirement needed for installation & commissioning should be provided prior to supply of Machine.
- Appropriate tool box/kit for routine maintenance should be provided with the equipment
- All documents (i.e. operating & service manuals, drawings etc.) and original softwares relevant to the instrument and its accessories must be supplied.
- Power and receptacle/socket as per Indian Standards should be provided.
- The vendor shall attend by visit within 48 hours of need.

### Training

- Training at vendor site and onsite for system operation and maintenance as well as application support should be provided by the vendor at its own cost.

- Prices quoted should be on Delivered Duty Paid (DDP) basis to CIPET:SARP-LARPM, Bhubaneswar.
- Any legal disputes subject to Bhubaneswar, India jurisdiction only
- **Delivery and Documents**

**(a) For Imported Goods**

- Original and three copies of Supplier's invoice showing Goods description, quantity, unit price, total amount.
- Original and three copies of the negotiable clean, on –board bill of lading marked freight prepaid and three copies of non-negotiable bill of lading.
- Five Copies of packing list identifying contents of each package.
- Insurance Certificate.
- Manufacturer's /Supplier's guaranty certificate.
- Traceable Calibration Certificate issued by Accredited Calibration agency and
- Certificate of Origin.

**(b) For Domestic Goods:**

Original and Three copies of:

- Copies of the Supplier invoice showing Goods description, quantity, unit price, total amount.
- Railway receipt /Acknowledgement of receipt of goods from the consignee(s);
- Manufacturer's /Supplier's guarantee Certificate;
- Traceable Calibration Certificate issued by Accredited Calibration agency,
- Certificate of origin and
- Document evidence for GST Registration /Octroi etc., wherever applicable, bearing seal of office of issue indicating payments made extra.

The above documents shall be received by the Purchaser before arrival of the goods (except where the goods have been delivered directly to the consignee with all documents) and if not received, the supplier will be responsible for any consequent expenses.

• **Warranty/Guarantee**

- The Supplier warrants that the Goods supplied under this Contract are new, unused, of the most recent or current models and incorporate all recent improvements in design and materials unless provided otherwise in the Contract. The Supplier further warrants that the Goods supplied under this Contract shall have no defect arising from design, materials or workmanship (except insofar as the design or material is required by the Purchaser's Specifications) or from any act or omission of the supplier, that may develop under normal use of the supplied Goods in conditions obtaining in the country of final destination.
- This warranty/guarantee shall remain valid for 12 months after the Goods or any portion thereof as the case may be, have been delivered and Commissioned at the final destination indicated in the Contract.
- The Purchaser shall promptly notify the Supplier, in writing, of any claims arising under this warranty.



- Upon receipt of such notice, the Supplier shall, with all reasonable speed, repair or replace the defective Goods or parts thereof, without cost to the Purchaser.
- If the Supplier, having been notified, fails to remedy the defect(s) within a reasonable period, the Purchaser may proceed to take such remedial action as may be necessary, at the Supplier's risk and expense and without prejudice to any other rights which the Purchaser may have against the Supplier under the Contract.
- The Supplier must provide the following warranties:
  - (a) The equipment proposed is Complete in every way
  - (b) The hardware/software specification, Capabilities and performance characteristics are as stated in the bidder's proposal and accompanying documentation.
  - (c) The supplier will offer to the Purchaser all technological updates, cost reductions and facilities, which are offered to other clients, in India, during the Contract tenure.

If the supplier is acting directly for the manufacturer of the Goods and Services, the Manufacture must honor these guarantee.

The MAINTENANCE SERVICE shall be as follows.

- (a) Free maintenance services shall be provided by the Supplier during the period of warranty.
- (b) The maximum response time for maintenance complaint from any of the destination specified in the Schedule of requirements (i.e. time required for supplier's maintenance engineer to report at the installation after a request call/email is made or letter is written) shall not exceed 24 hours.

- **Liquidated Damages:-**

If the Supplier fails to deliver any or all of the goods within the time period(s) specified in the Contract ,the Purchaser shall, without prejudice to its other remedies under the contract, deduct form the Contract Price, as liquidated damages, a sum equivalent @ 0.5% per week shall be deducted from the final payment, for each week of delay beyond the delivery period upto maximum of 2% of the delayed goods or services Contract price. Once the maximum is reached, the purchaser may consider termination of the contract

## **(E) Preparation of Bids**

### **1. Bid Form**

The Bidder shall complete the Bid Form and the appropriate Price Schedule furnished in the Bidding Documents, indicating for the goods to be supplied, a brief description of the Goods, their country of origin, quantity and prices

### **2. Agents and service facilities in India :**

If a foreign bidder has engaged an Indian agent, it will be required to give the following details in the offer:

- (i) The name and address of the local agent;
- (ii) What service the agent renders; and
- (iii) The amount of remuneration for the agent included in the offer

### 3. Documents establishing Bidder's Eligibility and Qualifications

- The Bidder shall furnish, as part of its bid, documents establishing the bidder's eligibility to bid and its qualifications to perform the Contract if its bid is accepted.
- The documentary evidence of the Bidder's qualifications to perform the Contract if its bid is accepted, shall establish to the Purchaser's satisfaction:
  - (a) In the case of a Bidder offering to supply goods under the contract which the Bidder did not manufacture or otherwise produce, the Bidder has been duly authorized by the goods manufacturer or producer to supply the goods in India.
  - (b) In the case of a Bidder not doing business within India, the Bidder is or will be (if successfully represented by an agent in India) equipped and able to carry out the Supplier's maintenance, repair and spare-parts stocking obligations prescribed by the Conditions of the Contract and / or Technical Specifications
  - (c) The Bidder has the financial, technical, and production capability necessary to perform the Contract and meets the criteria outlined in the qualification criteria specified as per the Tender norms.

### 4. Period of Validity of Bids

- Bids shall remain valid for 120 days after the date of bid opening prescribed by the Purchaser. A bid valid for a shorter period may be rejected by the Purchaser as non-responsive.

### 5. Submission of Bids

- i) The detailed technical specification of the equipment is enclosed in Bid document, Offer should be of two parts Viz., "**TECHNICAL BID**" and "**COMMERCIAL BID**" The content of the both bids should be as under;

#### (a) TECHNICAL BID should include the following:-

- ✓ Detailed specification of the base equipment (Product Make & Model) along with the specification of accessories, which are included in the Base unit.
- ✓ Scope of supply
- ✓ Deviation Statement
- ✓ Product Literature/Brochure
- ✓ Proforma for Performance Statement
- ✓ Qualification Criteria
- ✓ List of spare parts included (without quoting the price) (the acceptance and rejection of spare parts will be at sole discretion of CIPET:SARP-LARPM)
- ✓ List of optional accessories with their technical specification. (without quoting the price)
- ✓ Manufacturer's Authorization Form
- ✓ Bid Form
- ✓ Any other information which the bidder would like to state about the technically of the equipment.

#### (b) COMMERCIAL BID should include the following:-

- ✓ Statement showing the price of the each items of spare parts which is mentioned in the Technical Bid
- ✓ Conditional bids will not be accepted. The condition laid down by CIPET:SARP-LARPM is final and binding on all bidders.
- ✓ The quote should be in Indian Currency (INR).
- ✓ CIPET:SARP-LARPM reserves the right to accept or reject any or all tenders either in part or in full without assigning any reasons thereof.



The bids, which are not containing the statements, mentioned in 5 (i) (a) & (b) are liable to be rejected.

- The proforma of Annexures in the Bidding document, wherever necessary, should be typed on the bidder's letter head and upload the same.
- Price Schedule should be submitted in the prescribed format given under price schedule of the Bidding Document.
- The Deviation Statement enclosed should be duly filled in and submitted along with Bidding Document. If the bidder is offering more than one options/models a separate Deviation statement for each of such quotes should be submitted along with the offer.
- Quotes received without price schedule and deviation statement as per our prescribed format, will summarily be rejected.
- Relaxation of Norms for Startup and Micro & Small Enterprises in Public Procurement on Prior Experience – Prior Turnover Criteria.

## **6. Deadline for Submission of Bids**

The Purchaser may, at its discretion, extend this deadline for submission of bids by amending the Bid Documents, in which case all rights and obligations of the Purchaser and Bidders previously subject to the deadline will thereafter be subject to the dead-line as extended.

## **7. Evaluation and Comparison of Bids**

- The Purchaser will evaluate and compare the bids previously determined to be substantially responsive.
- The availability in India of spare parts and after-sales services for the equipment offered (imported goods) – in the bid; (the inclusion of cost of spare parts for comparison as per requirement will be at sole discretion of CIPET:SARP-LARPM. Also, CIPET:SARP-LARPM reserves right to accept any bid and to reject any bid or all bids.

## **(F) Award of Contract**

### **• Post Qualification**

- The Purchaser will determine to its satisfaction whether the Bidder selected as having submitted the lowest evaluated responsive bid is qualified to satisfactorily perform the Contract.
- The determination will take into account the Bidder's financial, technical and production capabilities. It will be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder as well as such other information as the Purchaser deems necessary and appropriate.
- An Affirmative determination will be a prerequisite for award of the Contract to the Bidder. A negative determination will result in rejection of the Bidder's bid.

### **• Purchaser's right to vary Quantities at Time of Award**

- The Purchaser reserves the right at the time of award of Contract to increase or decrease of the quantity of goods and services specified in the Schedule of Requirements without any change in price or other terms and conditions.

### **• Purchaser's Right to Accept any Bid and to Reject Any or All Bids**

- The Purchaser reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids at any time prior to award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidders or Bidders of the grounds for the purchaser's action.

## MANUFACTURER'S AUTHORIZATION FORM

No.....

dated.....

To  
School for Advanced Research in Polymers – LARPM,  
CIPET, B-25,C.N.I Complex, P.O: KIIT, Patia,  
Bhubaneswar-751024, India.

Dear Sir  
Ref: Bid Reference

We ..... who are established and reputable  
manufacturers of .....having factories at  
.....and.....do hereby authorize  
M/s.....  
M/s.....  
M/s.....etc (Name and  
address of Agents) to bid and conclude the contract with you against the above Bid are authorized  
to bid and conclude the contract in regard to this business against this specific Bid.

We hereby extend our full guarantee and warranty as per the Terms and Conditions of Contract for  
the goods offered for supply against this invitation for bid by the above firms.

Yours Faithfully,

(Name)  
for and on behalf of M/s.....  
(Name of Manufactures)

**Note:** This letter of authority should be on the letterhead of the manufacturing concern and should  
be signed by a person competent and having the power of attorney to bind the manufacturer

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## PERFORMANCE SECURITY FORM

To:

School for Advanced Research in Polymers (SARP)-LARPM,  
CIPET, B-25,C.N.I Complex,P.O:KIIT,Patia,Bhubaneswar-751024, India.

**WHEREAS**..... (Name of  
Supplier)

Hereinafter called "the Supplier" has undertaken, in pursuance of Notification of Contract  
No..... dated, ..... 20..... to supply

..... (Description of Goods and Services) hereinafter called "the Contract".

**AND WHEREAS** it has stipulated by you with a Bank Guarantee by a recognized bank for the sum  
specified therein as security for compliance with the Supplier's performance obligations in  
accordance with the Contract. AND WHEREAS we have agreed to give the Supplier a Guarantee:

THEREFORE WE hereby affirm that we are Guarantors and responsible to you, on behalf of the  
Supplier, up to a total of (Amount of the Guarantee in Words and Figures) and we undertake to  
pay you, upon your first written demand declaring the Supplier to be in default under the Contract  
and without cavil or argument, any sum or sums within the limit of (Amount of Guarantee) as  
aforesaid, without your needing to prove or to show grounds or reasons for your demand or the  
sum specified therein.

This guarantee is valid until the .....day of.....20.....

Signature and Seal of Guarantors

.....  
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Date .....  
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Address :.....

## PROFORMA FOR PERFORMANCE STATEMENT

(for Simple Goods/equipment for a period of last three years)

Bid No.....Date of opening.....Time.....Hours

Name of the Firm.....

| Order placed<br>By .....       | Order No<br>and date | Description and quantity<br>of ordered equipment | Value of<br>order | Date of completion of delivery |        | Remarks indicating<br>reasons for late<br>delivery, if any | Has the<br>equipment been<br>satisfactorily<br>functioning? |
|--------------------------------|----------------------|--------------------------------------------------|-------------------|--------------------------------|--------|------------------------------------------------------------|-------------------------------------------------------------|
| (Full address of<br>Purchaser) |                      |                                                  |                   | As per Contract                | Actual |                                                            |                                                             |
| 1                              | 2                    | 3                                                | 4                 | 5                              | 6      | 7                                                          | 8                                                           |

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Signature and seal of the Bidder

**PROFORMA FOR DEVIATION STATEMENT**

Bid Ref No.

Date of Opening

Time :

Name of the Firm

Name of the Equipement quoted

Model No.:

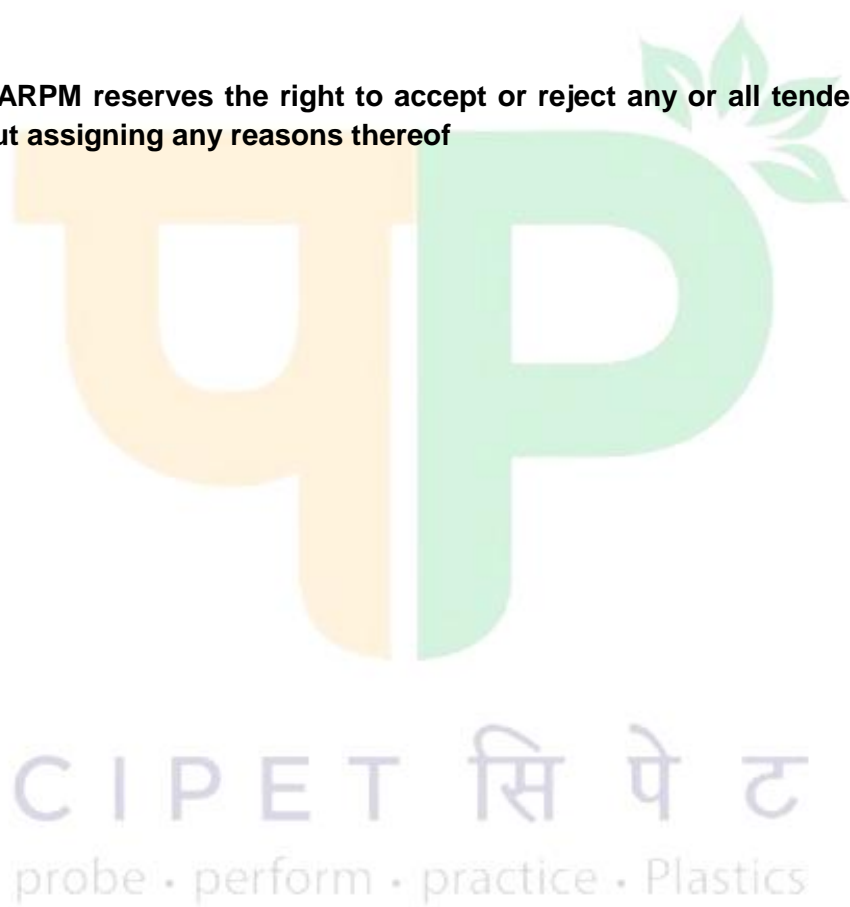
| Purchaser's Specification | Bidders Specification | Deviation, if any | Justification | Remarks |
|---------------------------|-----------------------|-------------------|---------------|---------|
|                           |                       |                   |               |         |

Note : Separate Deviation statements should be submitted along with the bid for all models / alternative quotes.

**Note :- Further if any e-Tender queries please contact the following officials of etenderwizard:**

| Sl. No. | Name of the Official | Contact Number | e-mail ID               |
|---------|----------------------|----------------|-------------------------|
| 01.     | Mr. S.K. Mohapatra   | 7377708585     | twhelpdesk404@gmail.com |
| 02.     | Mr. Swades Kumar Bal | 7008064095     | twhelpdesk404@gmail.com |

**CIPET:SARP-LARPM reserves the right to accept or reject any or all tenders either in part or in full without assigning any reasons thereof**





|                                       |   |                                                                                                                              |
|---------------------------------------|---|------------------------------------------------------------------------------------------------------------------------------|
| <b>NAME</b>                           | : | <b>1. High Pressure Rigid PU Foaming Machine</b>                                                                             |
| <b>QUANTITY</b>                       | : | 01no.                                                                                                                        |
| <b>TYPES OF TESTS TO BE PERFORMED</b> | : | For production of High Pressure Rigid PU Foam by using different blowing agents (Cyclopentane, Ecomate) with safety systems. |

### **TECHNICAL SPECIFICATION**

| <b>PARAMETERS</b>                | <b>:</b> | <b>DETAILS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ratio                            | :        | 1: 5 to 5: 1 (Changeable)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Output In ratio 1:1 and variable | :        | 130 to 300 gms/sec                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Machine Tank- (ISO+POLY)         | :        | <ul style="list-style-type: none"> <li>Insulated MS vertical cylindrical minimum tank of capacity 20 dm<sup>3</sup> each.</li> <li>Equipped with temperature controller and transducer.</li> <li>Heat exchanger with cooling system.</li> <li>Auto feed valve.</li> <li>Mixer inside the tank.</li> <li>Nitrogen pad with safety valves.</li> <li>Agitator unit with drive system for Iso and Polyol tanks.</li> <li>Flame proof motors for agitator on Polyol side.</li> <li>Air pressure controlled gauge for pressurization circuits.</li> <li>Leakage monitoring system in the mixing head area.</li> <li>Leakage monitoring system in the machine board.</li> <li>Level indicators</li> <li>Safety relief valves and pressure gauge.</li> </ul>                     |
| Metering pump                    | :        | 02 nos. of tank for ISOCYANATE & POLYOL metering line. <ul style="list-style-type: none"> <li>High pressure &amp; precise metering pump (06 cc rotary power make) for processing wide varieties of Isocyanates/polyols.</li> <li>Over pressure safety valve on the feed line.</li> <li>Chemical resistant/treatment for the hydromatic high pressure metering pump.</li> <li>Filters with manual ball valve at suction point.</li> <li>Maximum feeding pressure upto 10 bar.</li> <li>Maximum working pressure upto 200 bar.</li> <li>Deviation 5% max.</li> <li>Min. out put 100ml/min-1 ltr./min. at 500 RPM motor.</li> <li>Max. Out put 10-15 ltr./min. at 1500 RPM motor.</li> <li>Metering pump with Magnetic coupling and other pumps explosion proof.</li> </ul> |
| Hydraulic system                 | :        | With appropriate pressure, accumulator capacity, unit & tank capacity to meet the desired output of the foaming machine.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Hydraulic pressure upper limit   | :        | 180–200 bar                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Hydraulic lower limit            | :        | 120 bar.(min.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Mixing Head                      | :        | <ul style="list-style-type: none"> <li>L-shape with double piston with laminar outlet flow.</li> <li>Proximity sensor.</li> <li>Mixing head extension, with manual and automatic cleaning.</li> <li>Head is mounted on 1-3 mtr. Long pneumatic boom.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

|                        |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        |   | <ul style="list-style-type: none"> <li>• It provide vertical and angular movement to mixing head.</li> <li>• Micro PLC provided on head for processing applications</li> <li>• Flash diaphragm pressure with digital display of upstream and downstream of the pump</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                      |
| Electric control panel | : | <ul style="list-style-type: none"> <li>• Electric panel with nitrogen jacketing with safety controls.</li> <li>• SCHNEIDER /SIEMENS make.</li> <li>• Equipped with PID controllers with safety alarms</li> </ul> <p>At the end of each pouring it is possible to display :</p> <ul style="list-style-type: none"> <li>• Avg. Isocyanate &amp; polyol output and total output.</li> <li>• Pressure, temperature, shot time, flow rate weight etc.</li> </ul>                                                                                                                                                                                                         |
| Ancillaries equipment  | : | <ul style="list-style-type: none"> <li>• Suitable Chiller Unit as suitable.</li> <li>• Mixing head support boom.</li> <li>• Nozzle set with different dimension.</li> <li>• Pressure gauge for HP &amp; LP.</li> <li>• Hydrocarbon sensor.</li> <li>• Heating resistance.</li> <li>• Inline premix unit for cyclopentane system.</li> </ul>                                                                                                                                                                                                                                                                                                                         |
| Safety System          |   | <ul style="list-style-type: none"> <li>• Comprising of gas detectors (sensors)</li> <li>• Control panel for Cyclopentane monitory near PU machine.</li> <li>• Fan control unit.</li> <li>• All the sensors are connected to safety electric control panel with blinker light. All indicators shall me mounted on the control panel.</li> <li>• Alarm, Automatic electric cut-off, Safety cabling, Safety indicators etc.</li> <li>• Ducting, Railings, Pipings, platform with blower system and other related fixtures required for successful installation of machine according to plant layout &amp; equipment system shall be provided by the bidder.</li> </ul> |
| Moulds                 |   | <ul style="list-style-type: none"> <li>• Brett mould (200/20/5 cm and 70/40/10cm) with water heating system, top cover with pneumatic open and close system (optional and small control panel). The heating unit will be comprised with heater reservoir tank, required piping and fittings and shall be centrally located.</li> </ul>                                                                                                                                                                                                                                                                                                                              |
| Other Mandatory Items  | : | <p>While supplying the Machines, the supplier should also provide the following items apart from above:</p> <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual- 01 set .</li> <li>• Calibration &amp; warranty certificate with traceability for required parameters.</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; Operation.</li> <li>• Onsite Training to be provided for all officers at commissioning site.</li> <li>• Pre Installation requirements should be provided by Bidder.</li> </ul>                                          |

### TECHNICAL COMPLIANCE SHEET

| PARAMETERS                       | : | DETAILS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | COMPLIANCE<br>Y/N |
|----------------------------------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Ratio                            | : | 1: 5 to 5: 1 (Changeable)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                   |
| Output In ratio 1:1 and variable | : | 130 to 300 gms/sec                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |
| Machine Tank-<br>(ISO+POLY)      | : | <ul style="list-style-type: none"> <li>Insulated MS vertical cylindrical minimum tank of capacity 20 dm<sup>3</sup> each.</li> <li>Equipped with temperature controller and transducer.</li> <li>Heat exchanger with cooling system.</li> <li>Auto feed valve.</li> <li>Mixer inside the tank.</li> <li>Nitrogen pad with safety valves.</li> <li>Agitator unit with drive system for Iso and Polyol tanks.</li> <li>Flame proof motors for agitator on Polyol side.</li> <li>Air pressure controlled gauge for pressurization circuits.</li> <li>Leakage monitoring system in the mixing head area.</li> <li>Leakage monitoring system in the machine board.</li> <li>Level indicators</li> <li>Safety relief valves and pressure gauge.</li> </ul>                     |                   |
| Metering pump                    | : | 02 nos. of tank for ISOCYANATE & POLYOL metering line. <ul style="list-style-type: none"> <li>High pressure &amp; precise metering pump (06 cc rotary power make) for processing wide varieties of Isocyanates/polyols.</li> <li>Over pressure safety valve on the feed line.</li> <li>Chemical resistant/treatment for the hydromatic high pressure metering pump.</li> <li>Filters with manual ball valve at suction point.</li> <li>Maximum feeding pressure upto 10 bar.</li> <li>Maximum working pressure upto 200 bar.</li> <li>Deviation 5% max.</li> <li>Min. out put 100ml/min-1 ltr./min. at 500 RPM motor.</li> <li>Max. Out put 10-15 ltr./min. at 1500 RPM motor.</li> <li>Metering pump with Magnetic coupling and other pumps explosion proof.</li> </ul> |                   |
| Hydraulic system                 | : | With appropriate pressure, accumulator capacity, unit & tank capacity to meet the desired output of the foaming machine.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                   |
| Hydraulic pressure upper limit   | : | 180–200 bar                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                   |
| Hydraulic lower limit            | : | 120 bar.(min.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                   |
| Mixing Head                      | : | <ul style="list-style-type: none"> <li>L-shape with double piston with laminar outlet flow.</li> <li>Proximity sensor.</li> <li>Mixing head extension, with manual and automatic cleaning.</li> <li>Head is mounted on 1-3 mtr. Long pneumatic boom.</li> <li>It provide vertical and angular movement to mixing head.</li> <li>Micro PLC provided on head for processing applications</li> </ul>                                                                                                                                                                                                                                                                                                                                                                        |                   |

|                        |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |
|------------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|                        |   | <ul style="list-style-type: none"> <li>Flash diaphragm pressure with digital display of upstream and downstream of the pump</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |
| Electric control panel | : | <ul style="list-style-type: none"> <li>Electric panel with nitrogen jacketing with safety controls.</li> <li>SCHNEIDER /SIEMENS make.</li> <li>Equipped with PID controllers with safety alarms</li> </ul> <p>At the end of each pouring it is possible to display :</p> <ul style="list-style-type: none"> <li>Avg. Isocyanate &amp; polyol output and total output.</li> <li>Pressure, temperature, shot time, flow rate weight etc.</li> </ul>                                                                                                                                                                                                       |  |
| Ancillaries equipment  | : | <ul style="list-style-type: none"> <li>Suitable Chiller Unit as suitable.</li> <li>Mixing head support boom.</li> <li>Nozzle set with different dimension.</li> <li>Pressure gauge for HP &amp; LP.</li> <li>Hydrocarbon sensor.</li> <li>Heating resistance.</li> <li>Inline premix unit for cyclopentane system.</li> </ul>                                                                                                                                                                                                                                                                                                                           |  |
| Safety System          |   | <ul style="list-style-type: none"> <li>Comprising of gas detectors (sensors)</li> <li>Control panel for Cyclopentane monitory near PU machine.</li> <li>Fan control unit.</li> <li>All the sensors are connected to safety electric control panel with blinker light. All indicators shall be mounted on the control panel.</li> <li>Alarm, Automatic electric cut-off, Safety cabling, Safety indicators etc.</li> <li>Ducting, Railings, Pipings, platform with blower system and other related fixtures required for successful installation of machine according to plant layout &amp; equipment system shall be provided by the bidder.</li> </ul> |  |
| Moulds                 |   | <ul style="list-style-type: none"> <li>Brett mould (200/20/5 cm and 70/40/10cm) with water heating system, top cover with pneumatic open and close system (optional and small control panel). The heating unit will be comprised with heater reservoir tank, required piping and fittings and shall be centrally located.</li> </ul>                                                                                                                                                                                                                                                                                                                    |  |
| Other Mandatory Items  | : | <p>While supplying the Machines, the supplier should also provide the following items apart from above:</p> <ul style="list-style-type: none"> <li>Hard copies of Operational &amp; Service Manual- 01 set .</li> <li>Calibration &amp; warranty certificate with traceability for required parameters.</li> <li>Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; Operation.</li> <li>Onsite Training to be provided for all officers at commissioning site.</li> <li>Pre Installation requirements should be provided by Bidder.</li> </ul>                                        |  |

|                                       |   |                                                                                                                                                                           |
|---------------------------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NAME</b>                           | : | <b>2. Heat Flow Meter</b>                                                                                                                                                 |
| <b>QUANTITY</b>                       | : | 01 nos.                                                                                                                                                                   |
| <b>TYPES OF TESTS TO BE PERFORMED</b> | : | To determine the thermal conductivity properties of low thermal conductivity thermally insulation materials as well as all other materials with a high level of accuracy. |
| <b>REFERENCE STANDARDS</b>            | : | ASTM C518, ASTM C1784, ISO 8301, JIS A1412, DIN EN 12667, EN 12664, ASTM D-2326                                                                                           |

### **TECHNICAL SPECIFICATION**

| <b>PARAMETERS</b>                   | : | <b>DETAILS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Plate Temperature Ranges            | : | -20( <sup>0</sup> C) to 90( <sup>0</sup> C) or equivalent                                                                                                                                                                                                                                                                                                                                                                                                       |
| Cooling System                      | : | Forced Air/External Chiller                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Plate Temperature Control           | : | Peltier System                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Air-tight system                    | : | Sample compartment with possibility to introduce inert gases                                                                                                                                                                                                                                                                                                                                                                                                    |
| Thermocouple Precision              | : | +/- 0.01( <sup>0</sup> c)                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Number of Programmable Temperatures | : | 1 to 10                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Specimen Size (L x W x H) mm        | : | 203 x 203 x 51/305 x 305 x 100/610 x 610 x 200                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Thermal Resistance Range            | : | 0.1 to 8.0 m <sup>2</sup> K/W                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Thermal Conductivity Range          | : | 0.001 to 2.0 W/(m·K)                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Repeatability                       | : | 0.25% or better                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Accuracy                            | : | ± 1 to 3%                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Dimensions (L x W x H) mm           | : | Max. 800 x 950 x 800                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Variable Load                       | : | Up to 21 kPa                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Other Mandatory Items               | : | <p>While supplying the Machine, the supplier should also provide the following items apart from above:</p> <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual- 01 set.</li> <li>• Calibration &amp; warranty certificate with traceability for required parameters.</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; Operation.</li> </ul> |

### TECHNICAL COMPLIANCE SHEET

| PARAMETERS                          | : | DETAILS                                                                                                                                                                                                                                                                                                                                                                                                                                                         | COMPLIANCE<br>Y/N |
|-------------------------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Plate Temperature Ranges            | : | -20( <sup>0</sup> C) to 90( <sup>0</sup> C) or equivalent                                                                                                                                                                                                                                                                                                                                                                                                       |                   |
| Cooling System                      | : | Forced Air/External Chiller                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |
| Plate Temperature Control           | : | Peltier System                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |
| Air-tight system                    |   | Sample compartment with possibility to introduce inert gases                                                                                                                                                                                                                                                                                                                                                                                                    |                   |
| Thermocouple Precision              | : | +/- 0.01( <sup>0</sup> c)                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |
| Number of Programmable Temperatures | : | 1 to 10                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |
| Specimen Size (L x W x H) mm        | : | 203 x 203 x 51/305 x 305 x 100/610 x 610 x 200                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |
| Thermal Resistance Range            | : | 0.1 to 8.0 m <sup>2</sup> K/W                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |
| Thermal Conductivity Range          | : | 0.001 to 2.0 W/(m·K)                                                                                                                                                                                                                                                                                                                                                                                                                                            |                   |
| Repeatability                       | : | 0.25% or better                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                   |
| Accuracy                            | : | ± 1 to 3%                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |
| Dimensions (L x W x H) mm           | : | Max. 800 x 950 x 800                                                                                                                                                                                                                                                                                                                                                                                                                                            |                   |
| Variable Load                       | : | Up to 21 kPa                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |
| Other Mandatory Items               | : | <p>While supplying the Machine, the supplier should also provide the following items apart from above:</p> <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual- 01 set.</li> <li>• Calibration &amp; warranty certificate with traceability for required parameters.</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; Operation.</li> </ul> |                   |



|                                       |   |                                                                    |
|---------------------------------------|---|--------------------------------------------------------------------|
| <b>NAME</b>                           | : | <b>3. Pycnometer</b>                                               |
| <b>QUANTITY</b>                       | : | 01 no.                                                             |
| <b>TYPES OF TESTS TO BE PERFORMED</b> | : | It is used for the measurement of true density of solids and foam. |

### **TECHNICAL SPECIFICATION**

| <b>PARAMETERS</b>     | <b>:</b> | <b>DETAILS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Large sample cells    | :        | <ul style="list-style-type: none"> <li>• 135 cm<sup>3</sup></li> <li>• Volume Accuracy - better than +/- 0.02%</li> <li>• Repeatability - better than +/-0.01%</li> </ul>                                                                                                                                                                                                                                                                                         |
| Medium sample cells   | :        | <ul style="list-style-type: none"> <li>• 50 cm<sup>3</sup></li> <li>• Volume Accuracy - better than +/- 0.02%</li> <li>• Repeatability - better than +/- -0.01%</li> </ul>                                                                                                                                                                                                                                                                                        |
| Small sample cells    | :        | <ul style="list-style-type: none"> <li>• 10 cm<sup>3</sup></li> <li>• Volume Accuracy - better than +/- 0.03%</li> <li>• Repeatability - better than +/- 0.015%</li> </ul>                                                                                                                                                                                                                                                                                        |
| Sample Volume         | :        | 0.1 - 135 cm <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Resolution            | :        | 0.0001 g/cm <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Analysis Time         | :        | within 1 minute                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Pressure Range        | :        | 1-20 psig                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Gas Requirements      | :        | Compressed gas regulated to 20 psig(High purity helium or nitrogen)                                                                                                                                                                                                                                                                                                                                                                                               |
| Operational mode      | :        | Fully automatic operation                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Purge Modes           | :        | Continuous flow with user selectable time                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Other Mandatory Items | :        | <p>While supplying the Machines, the supplier should also provide the following items apart from above:</p> <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual- 01 set .</li> <li>• Calibration &amp; warranty certificate with traceability for required parameters.</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; Operation.</li> </ul> |

### TECHNICAL COMPLIANCE SHEET

| PARAMETERS            | : | DETAILS                                                                                                                                                                                                                                                                                                                                                                                                                                                     | COMPLIANCE<br>Y/N |
|-----------------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Large sample cells    | : | <ul style="list-style-type: none"> <li>135 cm<sup>3</sup></li> <li>Volume Accuracy - better than +/- 0.02%</li> <li>Repeatability - better than +/-0.01%</li> </ul>                                                                                                                                                                                                                                                                                         |                   |
| Medium sample cells   | : | <ul style="list-style-type: none"> <li>50 cm<sup>3</sup></li> <li>Volume Accuracy - better than +/- 0.02%</li> <li>Repeatability - better than +/- 0.01%</li> </ul>                                                                                                                                                                                                                                                                                         |                   |
| Small sample cells    | : | <ul style="list-style-type: none"> <li>10 cm<sup>3</sup></li> <li>Volume Accuracy - better than +/- 0.03%</li> <li>Repeatability - better than +/- 0.015%</li> </ul>                                                                                                                                                                                                                                                                                        |                   |
| Sample Volume         | : | 0.1 - 135 cm <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |
| Resolution            | : | 0.0001 g/cm <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |
| Analysis Time         | : | within 1 minute                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |
| Pressure Range        | : | 1-20 psig                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |
| Gas Requirements      | : | Compressed gas regulated to 20 psig(High purity helium or nitrogen)                                                                                                                                                                                                                                                                                                                                                                                         |                   |
| Operational mode      | : | Fully automatic operation                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |
| Purge Modes           | : | Continuous flow with user selectable time                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |
| Other Mandatory Items | : | <p>While supplying the Machines, the supplier should also provide the following items apart from above:</p> <ul style="list-style-type: none"> <li>Hard copies of Operational &amp; Service Manual- 01 set .</li> <li>Calibration &amp; warranty certificate with traceability for required parameters.</li> <li>Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; Operation.</li> </ul> |                   |

|                              |   |                                                                                                                                                                                     |
|------------------------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NAME</b>                  | : | <b>4. Viscometer</b>                                                                                                                                                                |
| <b>Quantity</b>              | : | 01                                                                                                                                                                                  |
| <b>Purpose</b>               | : | To estimate the viscosity of the polyols, oil and other raw materials.                                                                                                              |
| <b>Principle/ Definition</b> | : | Based on the concept of measuring the viscosity from the relative motion of the fluid and surface when the flow condition has a small Reynolds number for there to be laminar flow. |
| <b>Reference Standard</b>    | : | ASTM D4889 – 15, ASTM D4878 - 15, ASTM D445 – 18, ISO 2884.                                                                                                                         |

#### **TECHNICAL SPECIFICATION**

| <b>PARAMETERS</b>   | : | <b>DETAILS</b>                                                                                     |
|---------------------|---|----------------------------------------------------------------------------------------------------|
| Range of viscosity  | : | 1-6 M                                                                                              |
| Sample Type         | : | Liquids                                                                                            |
| Temperature         | : | Built in RTD Temperature probe                                                                     |
| RPM                 | : | 0.1-200                                                                                            |
| No. of Increments   | : | Predefined speed as well as option for customizable speed shall be available                       |
| Instrument leveling | : | Manual                                                                                             |
| Spindle Selection   | : | Manual                                                                                             |
| Sample Volume       | : | Max. 750 ml                                                                                        |
| Accuracy            | : | ± 1% of the range                                                                                  |
| Repeatability       | : | ± 0.2% of the range                                                                                |
| Data Storage Option | : | Real Time Data Storage with Date and Time and capability of internal data storage of min of 100 MB |
| Math Models         | : | All suitable models for high and low viscous material                                              |
| Dialogue Language   | : | English                                                                                            |
| Spindle Coupling    | : | Screw/magnetic or with advanced technology.                                                        |
| Spindles            | : | 04no. or more                                                                                      |
| Spindle Material    | : | Chemical resistant material                                                                        |

|                                |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Display of Reading             | : | Direct display of reading in multiple units for viscosity, temperature, shear rate/stress, % Torque, Speed/Spindle and Step Program.                                                                                                                                                                                                                                                                                                                                                                                       |
| Communication                  | : | <ul style="list-style-type: none"> <li>• USB, RS232 and parallel port communication with an option to connect with a printer.</li> <li>• The instrument should be stand alone and also have the possibility for computer control.</li> </ul>                                                                                                                                                                                                                                                                               |
| Microcontroller Specifications | : | <ul style="list-style-type: none"> <li>• Color screen display</li> <li>• Real time trend indicator</li> <li>• Option for concurrent graphing in the measurement.</li> <li>• Looping functions for repetitive tests</li> </ul>                                                                                                                                                                                                                                                                                              |
| Other Mandatory Items          | : | <p>While supplying the Machines, the supplier should also provide the following items apart from above:</p> <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual- 01 Set.</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning&amp; Operation</li> <li>• Onsite Training to be provided for all officers at commissioning site.</li> <li>• Pre Installation requirements should be provided by Bidder.</li> </ul> |

### TECHNICAL COMPLIANCE SHEET

| PARAMETERS                     | : | DETAILS                                                                                                                                                                                                                                      | COMPLIANCE<br>Y/N |
|--------------------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Range of viscosity             | : | 1-6 M                                                                                                                                                                                                                                        |                   |
| Sample Type                    | : | Liquids                                                                                                                                                                                                                                      |                   |
| Temperature                    | : | Built in RTD Temperature probe                                                                                                                                                                                                               |                   |
| RPM                            | : | 0.1-200                                                                                                                                                                                                                                      |                   |
| No. of Increments              | : | Predefined speed as well as option for customizable speed shall be available                                                                                                                                                                 |                   |
| Instrument leveling            | : | Manual                                                                                                                                                                                                                                       |                   |
| Spindle Selection              | : | Manual                                                                                                                                                                                                                                       |                   |
| Sample Volume                  | : | Max. 750 ml                                                                                                                                                                                                                                  |                   |
| Accuracy                       | : | $\pm 1\%$ of the range                                                                                                                                                                                                                       |                   |
| Repeatability                  | : | $\pm 0.2\%$ of the range                                                                                                                                                                                                                     |                   |
| Data Storage Option            | : | Real Time Data Storage with Date and Time and capability of internal data storage of min of 100 MB                                                                                                                                           |                   |
| Math Models                    | : | All suitable models for high and low viscous material                                                                                                                                                                                        |                   |
| Dialogue Language              | : | English                                                                                                                                                                                                                                      |                   |
| Spindle Coupling               | : | Screw/magnetic or with advanced technology.                                                                                                                                                                                                  |                   |
| Spindles                       | : | 04no. or more                                                                                                                                                                                                                                |                   |
| Spindle Material               | : | Chemical resistant material                                                                                                                                                                                                                  |                   |
| Display of Reading             | : | Direct display of reading in multiple units for viscosity, temperature, shear rate/stress, % Torque, Speed/Spindle and Step Program.                                                                                                         |                   |
| Communication                  | : | <ul style="list-style-type: none"> <li>• USB, RS232 and parallel port communication with an option to connect with a printer.</li> <li>• The instrument should be stand alone and also have the possibility for computer control.</li> </ul> |                   |
| Microcontroller Specifications | : | <ul style="list-style-type: none"> <li>• Color screen display</li> <li>• Real time trend indicator</li> <li>• Option for concurrent graphing in the measurement.</li> <li>• Looping functions for repetitive tests</li> </ul>                |                   |

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Other Mandatory Items | <p>: While supplying the Machines, the supplier should also provide the following items apart from above:</p> <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual- 01 Set.</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning&amp; Operation</li> <li>• Onsite Training to be provided for all officers at commissioning site.</li> <li>• Pre Installation requirements should be provided by Bidder.</li> </ul> |  |
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|---------------------------------------|---|--------------------------------------------------------------------|
| <b>NAME</b>                           | : | <b>5. Potentiometric Auto Titrator</b>                             |
| <b>QUANTITY</b>                       | : | 01 nos.                                                            |
| <b>TYPES OF TESTS TO BE PERFORMED</b> | : | To determine the hydroxyl value and acid value of polyols and oils |
| <b>REFERENCE STANDARDS</b>            | : | ASTM E 1899-08, DIN 53240-2, ASTM D4662                            |

### TECHNICAL SPECIFICATION

| <b>PARAMETERS</b>                                       | : | <b>DETAILS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Stirrer                                                 | : | The instrument should be equipped with magnetic stirrer and propeller stirrer along with display for controlling the stirrer speed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Burette resolution and its parameters                   | : | <ul style="list-style-type: none"> <li>The titrator should have motor driven piston burette with titration curve display.</li> <li>It should also have high resolution burette with volume of 1/10,000-20,000 and flexibility of using more than one solvent.<br/>For 10 ml the burette resolution should be 0.5 <math>\mu</math>l</li> <li>The titrator should be equipped with intelligent burette having automatic burette recognition feature that can automatically store details regarding titrant data, titrant name, concentration, and date of preparation etc.</li> <li>Filling up of burette with new titrant and emptying the burette, with a single command should be possible. The volume of the Burettes should be of 2, 5, 10, 20, 50 and 100 ml.</li> <li>The instrument should have the feasibility of connecting at least three Titrating burettes for performing different types of titrations.</li> </ul> |
| pH                                                      | : | 0 to +14 with Resolution of 0.001 pH or better<br>The instrument should have pH measurement capability with at least 5 point pH calibration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Potential                                               | : | At least 1000 mV with Resolution of 0.1 mV or better                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Polarization sensor current                             | : | $\pm$ 100-120 $\mu$ A with Resolution of 0.1 $\mu$ A or better                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Temperature                                             | : | - 50 to +150 $^{\circ}$ C with Resolution of 0.1 $^{\circ}$ C or better                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Potentiometric Sensor Measurement range with resolution | : | 0 to 1200 mV or more with a resolution of 0.1 mV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Polarized Sensor Measurement range and resolution       | : | 0 to 1100 mV/ 0 to 200 $\mu$ A (or more) with a resolution of 0.1 mV / 0.1 $\mu$ A respectively.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Titration facility                                      | : | <ul style="list-style-type: none"> <li>The titrator should be capable of performing acid-base, non-aqueous, precipitation, argentometric, redox and complexometric titrations.</li> <li>The instrument should also have the facility to</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

|                       |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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|                       |   | <p>perform Volumetric KF titrations if required in future.</p> <ul style="list-style-type: none"> <li>The instrument should have automation facility for handling sample preparation and titrating at least 15 polyol samples</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Storage facility      | : | The instrument should have automatic facility for storing at least 100 ASTM Methods & 1500 results.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Other Mandatory Items | : | <p>Latest windows based software should be provided with the system, along with the following facilities:</p> <ul style="list-style-type: none"> <li>Suitable software with facility for parallel multi-tasking functions should be provided.</li> <li>Standard display any higher version would be preferred.</li> <li>Result monitoring, customized report and automatic data back-up should be available.</li> <li>Result trend analysis and the history about each determination should be available.</li> <li>Automatic inquiry of sample size and/or ID number after start of titration on request.</li> <li>Variable Start Delay for poorly soluble samples.</li> <li>It should have min 15 no. of method functions with at-least 1 loops per method.</li> <li>Export and import of data in different standard formats should be possible.</li> <li>Intelligent sensors with chip on board technology should be provided to capture all data related to calibration and performance of sensors.</li> <li>The instrument should have the provision for direct connection to balances, USB keyboard, printer and USB mouse for amicable handling of operations.</li> <li>Instrument should have suitable data management software.</li> <li>Accessories and sensors required to perform the applications should be quoted along with the instrument.</li> <li>The potentiometric titration system should be offered with all the necessary accessories and consumables.</li> <li>Calculation: Easy and clearly understandable, scientific calculation formulas and parameters, Same calculations for all the user and different methods ( no need to remember)</li> <li>Hard copies of Operational &amp; Service Manual- 01 Set.</li> <li>Machine should come with all other essential accessories &amp; spares required for installation, commissioning&amp; Operation</li> <li>Onsite Training to be provided for all officers at commissioning site.</li> </ul> |

### TECHNICAL COMPLIANCE SHEET

| PARAMETERS                                              | : | DETAILS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | COMPLIANCE<br>Y/N |
|---------------------------------------------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Stirrer                                                 | : | The instrument should be equipped with magnetic stirrer and propeller stirrer along with display for controlling the stirrer speed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |
| Burette resolution and its parameters                   | : | <ul style="list-style-type: none"> <li>The titrator should have motor driven piston burette with titration curve display.</li> <li>It should also have high resolution burette with volume of 1/10,000-20,000 and flexibility of using more than one solvent. For 10 ml the burette resolution should be 0.5 <math>\mu</math>l</li> <li>The titrator should be equipped with intelligent burette having automatic burette recognition feature that can automatically store details regarding titrant data, titrant name, concentration, and date of preparation etc.</li> <li>Filling up of burette with new titrant and emptying the burette, with a single command should be possible. The volume of the Burettes should be of 2, 5, 10, 20, 50 and 100 ml.</li> <li>The instrument should have the feasibility of connecting at least three Titrating burettes for performing different types of titrations.</li> </ul> |                   |
| pH                                                      | : | 0 to +14 with Resolution of 0.001 pH or better<br>The instrument should have pH measurement capability with at least 5 point pH calibration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |
| Potential                                               | : | At least 1000 mV with Resolution of 0.1 mV or better                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |
| Polarization sensor current                             | : | $\pm$ 100-120 $\mu$ A with Resolution of 0.1 $\mu$ A or better                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |
| Temperature                                             | : | - 50 to +150 $^{\circ}$ C with Resolution of 0.1 $^{\circ}$ C or better                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |
| Potentiometric Sensor Measurement range with resolution |   | 0 to 1200 mV or more with a resolution of 0.1 mV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                   |
| Polarized Sensor Measurement range and resolution       |   | 0 to 1100 mV/ 0 to 200 $\mu$ A (or more) with a resolution of 0.1 mV / 0.1 $\mu$ A respectively.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                   |
| Titration facility                                      | : | <ul style="list-style-type: none"> <li>The titrator should be capable of performing acid-base, non-aqueous, precipitation, argentometric, redox and complexometric titrations.</li> <li>The instrument should also have the facility to perform Volumetric KF titrations if required in future.</li> <li>The instrument should have automation facility for handling sample preparation and titrating at least 15 polyol samples</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                   |
| Storage facility                                        | : | The instrument should have automatic facility for storing at least 100 ASTM Methods & 1500 results.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |

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| Other Mandatory Items | <p>:</p> <p>Latest windows based software should be provided with the system, along with the following facilities:</p> <ul style="list-style-type: none"> <li>• Suitable software with facility for parallel multi-tasking functions should be provided.</li> <li>• Standard display any higher version would be preferred.</li> <li>• Result monitoring, customized report and automatic data back-up should be available.</li> <li>• Result trend analysis and the history about each determination should be available.</li> <li>• Automatic inquiry of sample size and/or ID number after start of titration on request.</li> <li>• Variable Start Delay for poorly soluble samples.</li> <li>• It should have min 15 no. of method functions with at-least 1 loops per method.</li> <li>• Export and import of data in different standard formats should be possible.</li> <li>• Intelligent sensors with chip on board technology should be provided to capture all data related to calibration and performance of sensors.</li> <li>• The instrument should have the provision for direct connection to balances, USB keyboard, printer and USB mouse for amicable handling of operations.</li> <li>• Instrument should have suitable data management software.</li> <li>• Accessories and sensors required to perform the applications should be quoted along with the instrument.</li> <li>• The potentiometric titration system should be offered with all the necessary accessories and consumables.</li> <li>• Calculation: Easy and clearly understandable, scientific calculation formulas and parameters, Same calculations for all the user and different methods ( no need to remember)</li> <li>• Hard copies of Operational &amp; Service Manual- 01 Set.</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning&amp; Operation</li> <li>• Onsite Training to be provided for all officers at commissioning site.</li> </ul> |  |
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