**Indian Institute of Technology Bombay**
**Materials Management Division**

**PR No. 1000045654** **RFQ No. 3600002969**

**Hollow Fibre Spinning, Bundling and Testing Facility – 1 Set.**

**Technical Specification**

## I. Spinning System

| Sr. No | Description | Detailed Technical Specifications | Technical Compliance (Yes/No) | Additional Information (If any) |
|---|---|---|---|---|
| **1.** | **Dope Storage Tank** | i) Dope storage(service) tank: 2-2.5 L<br>ii) Temperature control: RT to 100±5℃ | | |
| **2.** | **Dope Supply Unit** | Gear pump/ High Pressure Syringe Pump (flow stability up to 345 bar) | | |
| **3.** | **Inner Coagulant Tank** | i) Inner coagulant storage(service) tank: 2-2.5 L<br>ii) Temperature control: RT to 100±5℃ | | |
| **4.** | **Inner Coagulant Supply Unit** | Gear pump | | |
| **5.** | **Outer Coagulant Tank** | i) Inner coagulant storage(service) tank: 2-2.5 L<br>ii) Temperature control: RT to 100±5℃ | | |
| **6.** | **Outer Coagulant Supply Unit** | Gear pump | | |
| **7.** | **Nozzle/Spinneret Plate** | **a) Single-Layer Spinneret:**<br>i) Inner ID/Outer OD: 0.8/1.4 mm<br>ii) Inner ID/Outer OD: 0.2/0.6 mm<br>iii) Inner ID/Outer OD: 0.3/0.6 mm<br><br>**b) Double-Layer Spinneret:**<br>i) Inner OD/Middle OD/Outer OD: 0.3/1.1/1.8 mm<br>ii) Temperature control: RT to ~75℃<br>iii) Vertical movement using a motor movable to 0~1m height from water surface | | |

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| **8.** | **Humidity Chamber** | Steam supply using a steam generator along with a Humidity and Temperature monitoring system should be provided | | |
| **9.** | **Coagulation Bath** | i) 1st guide roll: Motorized<br>ii) Temp. control: RT to ~ 60±3℃, without cooling system<br>iii) Water circulation should be done using a circulation pump | | |
| **10.** | **Godet roller (washing bath)** | i) Temperature control: RT to 60±3℃, without cooling system<br>ii) Circulation pump<br>Godet roll size: Φ100mm X 150mm<br>iii) Material: stainless steel 304, surface polishing<br>iv) Motor drive: Individual control for each roll<br>v) Speed control range: 5 to30m/min | | |
| **11.** | **Take-Up Winder** | i) Dimension: Φ 280 mm, Width: 60 mm (20 mm)<br>ii) One fixed wheel, one removable (manually removable)<br>iii) Speed control: 5 to 30 m/min<br>iv) Weight type (Dancer roll) tension control<br>v) Coherent winding for close-space winding in each layer and off-set subsequent layer in groves of previous layer | | |
| **12.** | **System Power and Control** | i) AC380 V (3 phase) x 50/60 Hz (Adjustable according to the electrical level at the customer's premises)<br>ii) Touch screen control | | |
| **13.** | **System Dimension** | 4500 mm L x 1000 mm W (maximum) | | |

**II. Membrane Flushing System**

| **Sr. No** | **Description** | **Detailed Technical Specifications** | **Technical Compliance (Yes/No)** | **Additional Information (If any)** |
|---|---|---|---|---|
| **1.** | **Membrane Flushing System** | i) Fibre wash Bath with Recirculation pump and flowmeter.<br>ii) On Tank online Refractometer | | |

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| | | and TDS and conductivity measurement.<br>iii) Two modes of operation: Automatic / Manual<br>iv) Material: aluminium frame and stainless steel 304 bath<br>v) Type: Bundled shower washer, 5-step automatic movement<br>vi) Circulation pump: 4 $m^3$/h<br>vii) Temperature control: RT to 70°C<br>viii) Online refractometer<br><br>Dimension: 800 mm L x 1,200 mm W x 2,200mmH<br>(750 x 600x 400mmH<br>(bath)) | | |
| **2.** | **Membrane drying system** | Hot air oven with temperature and flow rate control for control drying from moist to bone dry | | |

**III. Membrane Module Potting System**

| **Sr. No** | **Description** | **Detailed Technical Specifications** | **Technical Compliance (Yes/No)** | **Additional Information (If any)** |
|---|---|---|---|---|
| **1.** | **Module Dimension (OD)** | 0.5 to 6 inch (12.7 to 152.4 mm) | | |
| **2.** | **Module Dimension (Length)** | 150 mm to 1500 mm L | | |
| **3.** | **Turn Table** | 150 mm to 1200 mm | | |
| **4.** | **Capacity** | 1 ea/cycle | | |
| **5.** | **Module Type** | I type | | |
| **6.** | **Potting Adhesion** | PU or Epoxy | | |
| **7.** | **Motor Power** | 1Hp to 1.5 or suitable | | |
| **8.** | **Rotating Speed** | 0~450 rpm | | |
| **9.** | **Speed Control And** | Digital setting and indicating | | |
| **10.** | **Running Time Setting** | Hot air circulation type | | |

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| **11.** | **Temp. Control** | Range: RT to 50℃ | | |
| **12.** | **Safety** | Door locking system | | |
| **13.** | **Control System** | Safety mode setting | | |
| **14.** | **Electrical Power** | PLC and HMI control<br>380V 3 phase x 50/60 Hz | | |
| **15.** | **System Dimension** | 2000 mm L x 1500 mm W (maximum) | | |

**IV. Membrane Module Cutting System**

| **Sr. No** | **Description** | **Detailed Technical Specifications** | **Technical Compliance (Yes/No)** | **Additional Information (If any)** |
|---|---|---|---|---|
| **1.** | **Module dimension (OD)** | 0.5- 6 inch | | |
| **2.** | **Module dimension (Length)** | 150 mm to 1500 mm L | | |
| **3.** | **Potting material** | Polyurethane | | |
| **4.** | **cutting type** | i) Guillotine type (knife slicing type)<br>ii) Loading and unloading: manual | | |
| **5.** | **capacity** | 1ea/cycle | | |
| **6.** | **module moving** | i) Moving unit: LM guide & ball screw<br>ii) Driving system: Servo motor<br>Module holder: clamp type | | |
| **7.** | **Cutting part** | i) Motor driven<br>ii) Knife material: SKD11 | | |
| **8.** | **Membrane Module Packing density** | 50-60 % | | |
| **9.** | **System dimension (mm)** | 2000L x 1000W (maximum) | | |
| **10.** | **Control system** | PLC control with touch screen | | |
| **11.** | **Electrical power** | 380V, 3phase, 60/50 Hz<br>(Adjustable according to the electrical level at the customer's premises) | | |

**V. Overall General Specification:**

| Sr. No | Description | Detailed Technical Specifications | Technical Compliance (Yes/No) | Additional Information (If any) |
|---|---|---|---|---|
| **1.** | **Fibre Dimension Specifications:** | i) Small fibres: Outer diameter (OD) of 200-250 µm with a 50 µm wall thickness.<br>ii) Larger fibres: OD of 2 mm with a wall thickness of 0.5 µm. | | |
| **2.** | **Orifice Setups:** | Should include double and triple orifice options for simultaneous spinning of fibres with varying inner and outer diameters. | | |
| **3.** | **Air Gap Submersion:** | An air gap of submerged to 1 m should be provided, allowing for controlled fibre formation and structure. | | |
| **4.** | **Temperature Control System:** | Adjustable temperature settings for the spinneret and air gap from 0 to 60 °C, allowing precision in fibre extrusion conditions. | | |
| **5.** | **Inert Gas and Humidity Control:** | Equipped with an inert gas blanket to manage humidity levels ranging from -40 °C dew point to 100% relative humidity (RH) for optimal fibre conditions. | | |
| **6.** | **Spinneret Flexibility:** | Easy attachment and detachment of the spinneret, with adjustable air gap distances for tailored spinning requirements. | | |
| **7.** | **Polymer Solution Pump:** | A pumping system designed for high-concentration polymer solutions, capable of handling up to 30 wt% polymer for triple-orifice applications. | | |

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| **8.** | **Additive-Compatible Pumping System:** | The pumping system should be compatible with solid additives (e.g., ZIF/MOF), as well as natural fibres like silk, jute, cellulose, and solvents such as NMP, DMF, and DMSO | | |
| **9.** | **Dope Preparation and Handling:** | i) Should include facilities for preparing dope volumes from 1 to 5 L, with degassing capabilities, storage tanks, batching, and weighing systems.<br><br>ii) Additional equipment should include a vacuum oven with a rotary basket, a probe/bath sonicator, and overhead stirring for uniform mixing. | | |
| **10.** | **Coagulation and Washing, Flushing along with drying:** | A coagulation bath and an alcohol wash bath should be provided for effective fibre solidification and removal of residual solvents. | | |
| **11.** | **Take-Up and Stretching Control:** | Take-up spool and controlled stretching during winding for proper fibre alignment and surface morphology adjustments. | | |
| **12.** | **Post-Treatment and Spool Facilities:** | Should include facilities for post-treatment, spool-to-spool transfer, and fibre bundling for up to 10,000 fibers in a hexagonal arrangement, with mat woven configurations using dacron monofilament yarn. | | |
| **13.** | **Bundle Potting and Curing:** | i) Potting system for simultaneous end-sealing using centrifugal coating, followed by a curing oven for durability.<br>ii) Resin mixing machine, rotary saw, titanium knife | | |

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| | | iii) Two centrifugal Potting machines for module lengths 1000 mm and 400 mm | | |
| **14.** | **Production rate** | 1 km/shift (8 hours) | | |
| **15.** | **Module Fabrication** | i) Module fabricated with ~8,000 fibers (≈200 µm OD) packed within a module shell of 29 mm inner diameter (density at 50–60%)<br>ii) Spacer yarns (monofilament threads interlaced among the fibers) were incorporated to maintain separation and ensure uniform alignment of the fiber bundle. | | |
| **16.** | **Leakage Testing System** | Integrated facility for leakage testing of hollow fiber modules and membranes | | |
| **17.** | **Casing (housing) tube for the modules:** | Tube size and fitting connector to be as per NIPRO dialyzer specifications:<br>a) 0.2 $m^2$: OD 19 mm, Length 257 mm<br>b) 0.6 $m^2$: OD 26 mm, Length 257 mm<br>c) 1.0 $m^2$: OD 35 mm, Length 300 mm | | |
| **18.** | **Warranty** | 3-year Comprehensive warranty | | |

Note: The maximum gate clearance available for instrument movement into the facility is ~**1 m (width)** and **2.4 m (height)**. Kindly ensure that the instrument and any associated packing /transport arrangement are compatible with these dimensions.

To be supplied along with the bid

1. Hollow Fiber samples with 250 micrometre OD with 50 micrometre wall thickness
2. Bundle of approximately 8000 fibers
3. Sample woven mat, 300 mm by 300 mm
4. Casing 0.6 $m^2$ dialyzer
5. Factory acceptance test (FAT) to validate above performance.