



INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
MATERIALS MANAGEMENT DIVISION

**Direct : (+91-22) 2576 8800 (DR) / 8803 (Local) / 8804 (Import) /
8805 (Enquiry & Bill tracking), 8802(Progress) Email :
drmm@iitb.ac.in**

Supply of Advanced Ultra Super Critical Test Facility

Scope of Work:

- Preparation of detailed design & manufacturing drawings using AutoCAD, as per purchase orders specifications and getting it approved by the client's representative.
- Preparation of detailed QA & manufacturing plan and getting it approved by the client's representative.
- Incorporation of safety features for the 24x7 unattended operation of the autoclave system (and taking its approval from IIT BOMBAY)
- Manufacturing of the components as per approved drawings & QAP for purchaser approval.
- Shop assembly of the equipment and internal performance tests of sub-systems and overall equipment.
- Shop testing of the system as per purchase order specifications in the presence of client's representatives.
- Disassembly, painting/finishing, packing of the equipment and shipment to client's site after.
- Commissioning, demonstration and training at IIT Bombay
- Provision of the following documents after commissioning:
Operation & maintenance manual-3sets
As-built drawings-3 sets
Comply with ASME code for design, fabrication, commissioning and fabrication of the system to meet the operating parameters, safety and inspection issues.



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Generalized Specifications of the System:

SR.NO.	ITEM	Specifications	MOC/MAKE	QTY.
1.	Autoclave	<p>Working A self-sealing pressure vessel, capacity: 1litres inner Diameter: 60 mm, Operating Pressure & temperature a) 710°C & 32 MPa b) 760°C & 23 MPa</p> <p>Specimen holder zone must be maintained at the required (set temperature) The working height 320 mm. Corrosion allowance: 5 mm</p>	Inconel 617 Forgings and no welding	1No.
2.	Storage tank	Capacity: 500Literss.	SS316	1 No.
3.	Diaphragm type feed pump (Sandwich type Metal Diaphragm Dosing Pump upto 500 kg/cm ²) pressure controlled at the outlet with a back pressure regulator (TESCOM 54-2100 Series backpressure regulator or equivalent, suitable for 15,000 psig / 1034 bar liquid applications, Cv = 0.08).	-		1



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4.	Dissolved Oxygen Analyzer	0 to 1000° ppb Sensitivity 11 ppb	STD	1 No.
5.	Conductivity Meter	0 to 100 μ S/cm or better Sensitivity: 0.1 μ S/cm	STD	1 No.
6.	pH meter	Measurement range: 0-12 Sensitivity: 0.1 pH	STD	1 No.
11.	Pre-heater Assembly		As required	1 No.
12.	PID programmable controller	Accuracy: ± 3 °C	STD	1 No.
13	Deaerator for feed water tank			
14	Sparging with Nitrogen and/or argon gas with a sparger to remove air from the loop	Able to control oxygen content of water /ppb to 8 ppm		
15	Water flow rate controlled by adjustment given on the dosing pump and by speed control of the pump motor.	1-20 ml/min		
15	Supply unit for feed water of the desired quality	Able to integrate the same with the main unit or the party should integrate the units supplied by us (so quote this unit as optional)		1



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17	High temperature and high pressure tubing upto 500 °C.		Inconel 600/625/617	
18	Low temperature (less than 300 deg C) pressure tubing, less than 11000 psig		Type 316 LSS or better	
18	Specimen holder rack, with hooks for hanging flat specimens.	Specimen holder zone must be maintained at the required (set temperature) Minimum 9 and maximum 12 specimens, of maximum dimensions 25×15×5 (mm), should be accommodated	Inconel 600/625/617	
19	Purging with inert gas	Provision must be made to purge the autoclave and the loop system where water is not present to purge with argon/nitrogen/helium gas		
20	PLC based control system with SCADA and HMI interface.	Control system with PLC and Pc with SCADA and HMI for 1) Active mimic 2) Fault annunciation 3) Data Logging.	STD	1 No.

Note: There will be no welded parts in High Pressure High Temperature Autoclave. Forgings are to be used for autoclaves. Accessories such as pH, conductivity and oxygen analysers and high pressure pump used in manufacturing of the unit need to from companies having proven track record.



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Manufacturing:

- All GA drawings prepared will be in 2D (AutoCAD).
- These drawings will have complete details pertaining to manufacturing, dimension tolerance, bill of materials etc.
- Softcopies of these drawings will be submitted to the concerned IIT BOMBAY representative for approval. All comments & suggestions will be marked on one set of drawings & returned to incorporate necessary corrections & changes.

Other documents to be submitted:

- Detailed Operation procedure
- Detailed Emergency procedure
- Listing of each safety feature incorporated and how it functions, including alarms, trip settings and back up power provisions
- Listing of Fire safety features
- Hazard analysis
- Seismic stability analysis
- Thorough inspection of all components carried out at various stages of manufacturing.

Inspection & Testing:

- **Inspection:**
 - The concerned IIT BOMBAY representatives need to be given complete access to the facility for inspection during the manufacturing of the system.
 - Certified test reports of all the materials used for manufacturing will be compiled & made readily available to IIT BOMBAY representative for verification.
 - A copy of all the test certificates will be incorporated into the manufacturing records for IIT Bombay perusal.

Testing:

- Hydro testing of the Autoclave as per appropriate ASME code or test at the design temperature and pressure (760 °C and 32 MPa).
- The entire system will be tested for proper functionality at their duty points, including rate temperature and pressure for a continuous period of at least 72 hours.

Documentation:

Three (3) numbers of bound copies of QA reports comprising of dimension inspection, performance test reports, manual, as built drawings, electrical circuit diagrams, calibration certificates etc. of all components to be submitted

Documents required along with the bid

- Write or description of the system including the conceptual design review.
- Schematic Diagram of the Autoclave.
- P & ID of the complete system.



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- Certificates demonstrating the technical capabilities of the bidder. Expertise in establishing similar systems and successful operation at the users place is a strong point of consideration for technical qualification of the bid
- Makes and specifications of the following components along with catalog:
 - High pressure dosing pump
 - Back pressure regulator
 - Dissolved Oxygen Analyzer, Conductivity Analyzer and pH Analyzer with analog/ digital feedback to the control system.
 - Specification of the control system with makes of PLC, SCADA and HMI.

Packing & Transportation:

After carrying out all the tests successfully at works as specified, the equipment covered in the contract will be carefully packed by appropriate means so as to protect from any damage.

Warranty:

The goods furnished should be in full accordance with the requirements of the tender technical specifications.

The company/supplier will provide warranty for the goods stating that the goods are free from defects in design, materials or workmanship as applicable and the warranty will cover a period of 30 months from the date of delivery or twenty four months (24) from the date of commissioning, whichever is earlier.

If within the expiry of the above stipulated warranty period, the subject goods or any part thereof are found defective because of workmanship or materials, the company/supplier will at its own expense repair or furnish and install replacement parts of proper workmanship and material as approved by IIT Bombay.

Delivery Sschedule:

Providing preliminary design review in one month from the date of placing purchase order

Providing detailed design review within two months from the date of placing purchase order

Provide details of civil and electrical engineering work needed for commissioning the system: three months from the date of placing purchase order.

Ssatisfactory completion of the work and obtaining shipping release, the system will be delivered to IIT BOMBAY stores: within seven months from the date of placing purchase order

Commissioning : within seven months from the date of placing purchase order



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 **Technical Competence**

The unit in question is high pressure and high temperature system. Hence, the committee will exercise due diligence in assessing and qualifying the bidder. Therefore, the bidders are requested to submit relevant documents such as given below for the committee to evaluate.

(a) Proven capabilities

The bidder shall provide details of previous orders executed of similar system

(b) The bidder shall provide the list clients and contact of such cases as in 9.a

(c) The bidder shall provide engineering capabilities to design and manufacture this unit

(d) The bidder shall provide details showing that company has manpower and technical capability within India to provide services post commissioning of the unit.

(e) The bidder needs to give conceptual design review for the committee to evaluate the capability of the bidder to manufacture the unit.

(f) Any advance payment of money, will be linked to providing preliminary design review and detailed design review.