

Specifications for 15 liter Bioreactor with accessories

General specifications –

Autoclavable bioreactor vessel, 15 liter (2.5 to 12.0 liter working volume) total capacity, jacketed vessel, having provision of heating and cooling during cultivation, the lid of the vessel should have provision for pH, Temperature, Dissolved oxygen, foam, Should have the provision for sampling port and continuous culturing.

Autoclavable Fermentor vessel

Fermentor with borosilicate vessel with total volume of 15 liters and working volume from 2.5 Liter to 12 Liter FERMENTOR Vessel must be a Jacketed Vessel having with the head plate of SS316L. It should have the Temperature Control via circulation of Hot / Cold Water in the Jacket through an inbuilt Thermo circulator unit (working temperature range 8°C - 80°C above coolant temperature) The system must be complete to measure and control pH, DO, stirrer speed (10-1000rpm), foam control & temperature.

Agitator

Stirrer assembly - Top driven system magnetically coupled (based on permanent magnets) operable in the range 10 - 1000 RPM (with digital indicator) having an accuracy of $\pm 1\%$ of full scale. (Technical drawing of stirrer assembly to be submitted with the offer). Two numbers adjustable six blade flat disc turbine (Rushton) impellers to provide good mixing and oxygen transfer for high cell density cultivation.

Aeration System

Provision for mixing at least four gases (Air, Oxygen, Nitrogen and CO₂), necessary rotameters, valves, gas mix station to be included. Air filtration with membrane filter Supply capacity for fermenter: Air: upto 2 VVM, Oxygen \geq 0.5 VVM, Sparger – One number sparger.

Controller

Latest Generation Microprocessor based Touch Screen Controller with self Tuning P.I.D. Controls i.e. the controller must have the capability to adapt to P.I.D. loops automatically without user intervention. Color touch screen interface to guide the user through operation of the controller. System must display ONLINE virtual overview of all process parameters on the controller screen itself. The real time process parameters should be displayed simultaneously on the monitor and on the computer (through Data

Acquisition software). The system should also have the capability to have remote access of process parameters via. Internet

Controller must be GAMP/cGMP /guidelines compliant. This fact must be explicitly stated in the printed catalogue of the manufacturer, a copy of which should be enclosed with the tender

The advanced controller must have at least 15 or more in-built USERDEFINED control loops. All the 15 loops of the controller must be user assignable i.e. the function of these loops can be changed as and when desired by the user. The loops should be configurable for additional weight based feed addition control, on-line O₂ / CO₂ Analyzers, on-line viable cell biomass measurement or other similar functions by simple addition of components in future.

The Controller must have Dose Monitoring facility for pH (Via amount of alkali / acid added to the fermenter) and DO (Via amount of Air / O₂) being fed to the culture for every batch cultivation.

Monitoring and control

Agitation, temperature with provision for hot/ chilled water circulation, pH with acid alkali pumps and Dissolved oxygen sensor with RPM / oxygen supply control, Gas mix station for minimum two gases, gas flow meters for air/ Nitrogen to maintain the DO at the desired level. Foam sensor with peristaltic pump for antifoam addition.

Three nos of assignable (in built) fixed speed (20 rpm, 24 V) peristaltic pumps on console (with easy tube loading head) connected to the Microprocessor based control system for acid, alkali, antifoam Also, provide suitable Liquid Addition Bottles for pH control, acid (1 Liter bottle) and alkali (1 Liter bottle), for foam control, antifoam (1 Liter bottle) The bottles have to be complete with filters and on-line connectors for tubings for aseptic handling and transfer.

The pumps should have the provision of use in a standalone mode and also through remote controlled mode via computer coupled dedicated software. The software to drive the pumps at user defined feeding profiles and at different feed rates should be included. The pumps must be configurable using the control system.

Continuous Culturing / Medium addition accessories –

The system must be equipped with all the accessories for addition and withdrawal of medium / broth to & from the bioreactor vessel. System should be equipped with level control system It should also have two computer coupled variable speed peristaltic pump (0 – 100 rpm) (with easy tube loading head) for addition of nutrient & with drawl of broth during the cultivation. The system should also have the silicon tubing of different size - 100 meters for addition of acid medium etc in the vessel. Also, provide nutrients feedings bottles (1 x 5 Liter and 1 x 10 Liter bottle). The bottles have to be complete with filters and on-line connectors for tubings for aseptic handling and transfer.

The fermenter system should also have the spin filter for retention of cells in the bioreactor and perfusion pipe for removal of cell free fermentation broth during continuous cultivation at high dilution rates.

System should be complete with accessories required for microbial application inclusive of sampling system with (10 no.) sample bottles & Stainless steel Air outlet condenser.

Software (Price to be quoted separately)

Windows based data acquisition and supervisory control software for data acquisition and analysis. The software should be able to do remote monitoring and control. The software should be adaptable with both analog and digital outputs using AD/ DA cards. The software should be capable to program and execute the intermittent nutrient feeding during the fermentation.

Others

Silicon / Norprene food tubing 100 meters

Spare parts for trouble free and maintenance free operation to be included – O'rings, inoculation Septa, Spare autoclavable disposable air filters – 11 no's , DO membrane kit – 1 No., Additional pH Sensor – 1 No and electrolytes- 1 no.

Suitable Air compressor to be included as per below specifications:-

Type : Reciprocating

Stage: Single

Motor: Coaxial, 0.75 HP

Volt /PH: 230/1

RPM: 1420

Air Receiver: 25 Liter

Working Pressure: 116 psi/8 bar

Free air delivery: 65LPM

A suitable computer i7 processor (Branded: DEL/HP) with 19" TFT monitor, Intel processor, 2 GB RAM, 500 GB Hard disk, 2 no's of USB ports must be provided with the system.

Terms and Conditions –

1. Please submit the TECHNICAL and FINANCIAL bids in separate sealed envelopes. Mark the two envelopes clearly as "Technical Bid" and "Financial Bid". Both the sealed envelopes should be sent in a single sealed envelope, clearly marked as "**Quotations for Purchase of 15 liter Bioreactor due on 26-09-12**". The quote should reach the following address on or before 26-09-12, up to 5 PM.

Prof. A. K. Srivastava

Department of Biochemical Engineering and Biotechnology

Indian Institute of Technology Delhi

Hauz Khas, New Delhi-110016

2. Please quote F.O.B. & CIF New Delhi prices separately.

3. Technical bid should contain **compliance chart** based on specifications as per NIQ, but must not contain any commercial information
4. The quotations should be in the currency of the country of origin and should be valid for at least three months.
5. Please attach all the technical literature and a list of similar installations done in India.
6. The warranty on the equipment should be clearly specified.
7. Payment should be through irrevocable letter of credit.
8. If the quote is being submitted by the representative of the Principals/manufacturer themselves, a valid Agency ship/Dealership Certificate authorizing the agent to quote to IIT Delhi on behalf of the Principals should be enclosed.
9. Complete set of manuals for the operation of equipment should be given.
10. Clearly specify the installation requirements—such as space, power, frequency, environment (Temperature and humidity) etc.
11. The institute reserves the right to accept or reject any / all the quotations without assigning any reasons thereof.