High Pressure Fixed Bed Reactor

IIT Madras is looking to procure a *High Pressure Fixed-Bed Reactor* designed for catalytic reactions under pressures up to 50 bars and temperatures up to 350 °C. The reactor setup will consist of two gaseous inlets, a tubular reactor, a split-tube furnace and single outlet (gas-phase). The entire unit should be suitable for continuous operation for the above mentioned temperature and pressure range

Reactor and Furnace

- Split-tube Tubular Furnace for a ½" OD tube
- Heating length of 300 mm or higher
- Material of construction for the reactor tube should be compatible with CO2, H2, CH4 and methanol at design pressure and temperature
- Max. design pressure = 50 bars
- Max. design temperature at 50 bars = 400 °C
- A thermocouple to be placed in the catalyst bed inside thermowell for reaction temperature measurement
- Reactor and fittings to be designed for easy loading and unloading of catalyst without disturbing the thermocouple
- Temperature inside the reactor to be controllable to ± 2 °C (or lower) when no reaction is occurring.
- Two reactant gases must be metered using mass flow controllers (MFC) that are designed for flowrates up to 500 ml/min (0.5 SLPM). The MFCs must be of Bronkhorst, Brooks, Alicat or equivalent recognized manufacturer.
- Gases from cylinders (procured separately by IITM) are to be pressure controlled with regulators before entering MFCs. Bypass for MFCs to be provided for directing of gas from regulators using needle valves
- Transfer line for the gaseous products to GC (length ~ 5 meters)

Pressure Control

- Back pressure regulator (BPR) of low dead volume
- Provision for bypassing BPR during atmospheric pressure operation may be provided.

Control System and Data Acquisition

- Electronic control system should be PLC or PID based control panel integrated with data acquisition software package. All the process parameters should be controlled by analog and digital I/O and as well as ASCII Communication. Data should be accessible through control panel as well as data acquisition on PC.

General Specifications

- All fittings expected to be Swagelok. All valves to be of low dead volume and to be operated manually.
- Manual control of all systems (temperature, pressure, liquid and gas flows) with digital read outs
- Suitable safety features for pressure and temperature to be incorporated in the system, wherever possible.
- Spares for three years of continuous operation to be provided with on-site warranty of three years.
- The entire unit should be suitable for Indian power system.
- A detailed flow diagram (PID) of the entire unit with the specifications of the individual components (manufacturer, pressure and temperature rating) to be supplied along with the technical quotation.

Prior Experience

The vendor must have experience in supplying same model at least to five educational institutions such as IITs, IISc and other Technological Institutions/Universities.

The vendor must provide the details of organizations and contact person where such systems have been supplied.

On-site Installation & training should be included in quote.