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**Technical Specifications of GAS CHROMATOGRAPHY
(GC x GC)- MASS SPECTROMETER SYSTEM**

SCOPE & APPLICATION:

The GCxGC-MS system should be capable of analyzing both quantitatively and qualitatively, with high resolution. It should be able to analyse Hydrogen gas, hydrocarbon gases and permanent gases such as C1, C2, C3, CO, CO₂, N₂, O₂ etc using TCD detector. GCxGC-MS system with Flow Modulator should be used to identify components in Jet Fuel & Lube Oil. The GC should be of latest model/version from a reputed manufacturer. The GCs shall be installed at IIT Mumbai.

Technical Specifications

	General System Configurations:
a)	The GC system should meet the following minimum requirements but not limited to these. Bidder will quote the complete system with adequate flexibility to meet the stated scope of work.
b)	All quoted technical specifications are to be supported by company's original printed Technical Specification sheets.
c)	The GC should be equipped with electronic pressure and flow controller for inlets, detectors and auxiliary gases.
A.	Column Oven:
	<ol style="list-style-type: none">1. Operation temperature should be from ambient+4 to 450 C.2. Temperature set point resolution should 0.1 C3. Temperature cool down time from 400 C to 50 C should be less than 4 minutes.4. Maximum achievable temperature ramp rate: 120 °C/min5. The GC should support 20 oven ramps with 21 plateaus
B.	Split/Split less Capillary Inlet <ol style="list-style-type: none">1. It should have split ratio up to 7500:12. It should have optimized septum purge flow control to eliminate ghost peaks3. Maximum temperature 400 Deg C4. Total flow control/sensing up to 1000 ml/minute for hydrogen and helium.5. Total flow setting range 0 to 200 ml for Nitrogen and 0 to 1000 ml for Hydrogen.6. Split/split less inlets should have flow sensors for control of split ratio.7. Gas saver mode to reduce gas consumption without compromising performance.8. Electronic septum purge flow control to eliminate ghost peak
C.	Detectors: The instrument should have detector modules (One TCD &One MS) present with independent temperature and pneumatic control.

i.	<p>Thermal Conductivity Detector (TCD):</p> <ol style="list-style-type: none"> I. The TCD should have a minimum detectable level of 400 pg tridecane / ml with helium carrier gas. II. Linear dynamic range: 10⁵+5%, and above with N2 carrier. III. 400°C maximum operating temperature
ii.	<p>Mass Spectrometer Specifications (MS):</p> <ol style="list-style-type: none"> I. Latest single quad EI MS must have a capacity to show the instrument detection limit of 1.5 fg or less for 10 fg/ul OFN for ion 272. II. MS system must have the SCAN sensitivity of 300:1 or better for OFN standard of 0.1 pg/ul, scanning from the range of 50-300 with nominal ion of 272. III. MS must come with series II triple axis detector with high energy dianode with long life electron multiplier. IV. The Mass Filter and Detector should be placed on the same plate as Ion Source for better accessibility. V. The Mass Spectrometer shall have an electronic scan rate of 20,000 u/sec or better. VI. The mass spectrometer must use an ion source where the metallic parts are constructed from inert material and Ion Source temp controllable from 150 to 300 degrees C. VII. Stainless steel or coating the metallic parts with an inert material is not preferred. VIII. Mass Spectrometer should utilize a Quadrupole Mass Filter consisting of a monolithic quartz structure without a quadrupole consisting of separate rods. The Quadrupole is to be independently heated and its temperature is to be user selectable from 106 to 200 deg C. IX. Mass Range for the MS must be from 1.6 to 1050 amu or better. X. The mass spectrometer shall have the capability to create 100 SIM ion groups with up to 60 ions per group. XI. The high-vacuum region must utilize an air-cooled high vacuum turbo pump with a minimum pumping speed of 255 L/s (Helium) Turbo Pump with 2.5 m³/hr mechanical pump or better. XII. System should come with sleep/wake mode to conserve carrier gas and electricity. XIII. When Vent Cycle is started, GC recognizes and optimizes the column flow to cool down the MSD faster.
D.	<p>Columns:</p>
	<p>The unit shall have the required number of suitable columns to carry out application mentioned in scope. The following columns or equivalent should be supplied along with system. Two capillary columns: 30m x 0.25mm non-polar, 5m x 0.25mm polar Three packed column for permanent gas separation</p>
E.	<p>Electronic Pneumatic Control (EPC)</p> <ol style="list-style-type: none"> 1. The equipment should have full electronic pressure control for all inlet and detectors. 2. The EPC should have Atmospheric pressure compensation sensor to compensate for altitude and ambient temperature variation. 3. Pressure adjustment in increments of 0.001 psi 4. Pressure sensors accuracy: <±2% full scale, Repeatability: <±0.05 psi and temperature coefficient <±0.01psi.

	<p>5. Retention time repeatability should be less than 0.0008 minutes.</p> <p>6. It should have facility for pre programmed leak test.</p> <p>7. Carrier and make up gas setting selectable for H2, He, N2, Ar</p>
F.	<p>Communication system for external control of GC parameters: The instrument should start its operation with a single switch. The operating switch should purge, stabilize, inject and start the programme both in gas chromatograph and in the data processor/integrator simultaneously.</p>
G.	<p>Data Acquisition, Processing and Interpretation: The GCxGC MS software provided for equipment operation, control and data acquisition should be compatible with data processor. The vendor should install the latest version of original software with license certificate along with copy from the original manufacturer.</p>
H.	<p>GCxGC System GCxGC system must be capable of performing comprehensive GCxGC on the entire sample.</p> <p>i. Modulator system The GCxGC modulation must be Capillary Flow Technology based in order to achieve modulation starting from C1.</p> <p>ii. Data Processing Software The GCxGC system should include a complete data processing software package capable of: Automated peak location based on expected peak width and a signal-to-noise threshold. Automated peak area calculations based on automated combination of modulated peak slices. Automated analyte quantification. The GCxGC system should include software capable of displaying: Contour plots; Surface plots; Wire mesh plots etc. The data processing package should have classification feature for grouping compounds of similar chemical functionality.</p>
I.	<p>Warranty – Instrument should be supplied with warranty for 3 years</p>