

**INDIAN INSTITUTE OF TECHNOLOGY  
CENTRE FOR ENVIRONMENTAL SCIENCE AND ENGINEERING**

**Enquiry letter for purchase of PTAG**

**Sub: Quotation for supply of Plasma Torch Aerosol Generator (PTAG)**

**Reference: IITK/CE/2016/1003**

**Dated: February 22, 2016**

Sir / Madam,

With reference to the subject mentioned above, you are invited to submit the quotation in a sealed cover. Configuration/Specifications are given below:

**Specifications for Plasma Torch Aerosol Generator:**

Plasma Torch is a device used to convert electrical arc energy to heat the gas. High enthalpy gas plasma is used for vaporizing metallic/ceramic powder to form aerosols. The plasma torch used in the aerosol generation is of non-transferred arc type, where anode does not form a work piece but gets water cooled. The produced arc should be stable around the centre line of the cathode, hence reducing the erosion of anode and increasing the working life of anode.

The system consists of following elements:

1. **Cathode:** It is electron source for plasma torch. The principle mechanism for Electron emission is thermionic emission. It is constructed from Tungsten rod embedded in copper rod, later machined to provide water circulation. The embedding of tungsten into copper is done hydraulically. It is capable to carry current of order of 100-800 Amps. It is cooled by Chilled water.
2. **Trigger electrode:** The plasma arc is initiated by applying high voltage and high current between cathode and trigger electrode. The trigger electrode is made from electrical grade copper. It also acts as nozzle for cathode part of current channelization.
3. **Anode:** It is made from water cooled copper. Electron current emitted from the cathode gets terminated on to anode as diffused arc. It is the place where most of the heat is concentrated in the plasma torch. The heat is extracted by passing cold nitrogen/Argon gas/water.

All the above components should be precisely machined and assembled on metallic flange. Water cooling circuit consists of a standard commercial chiller of ~5-7 ton capacity to provide cooling for torch as well as power supply. The chilled water is circulated using 1 HP self-priming pump. Water flow in each of the piping line is measured using acrylic body rotameter. Water flow into each

connection can be controlled by valves. The flow sensing is provided and used to interlock the flow protection. A water header made from SS304 at inlet and out let side is provided for distribution and returning water to cooler. Demineralized water is circulated in closed loop. DM water should be periodically changed in 3 – 4 months. Temperature of cooling water at inlet, out let of each flow circuit should be measured by RTDs, and displayed on the front panel

The plasma forming gas is either Nitrogen or Argon. Generally commercial grade Nitrogen and Argon is sufficient. If nitrogen gas is used then for the same power, voltage required is more and vice versa for Argon. A mixture of nitrogen and argon can also be used.

Arc is initiated by applying high voltage and high frequency between anode and cathode. The entire plasma torch assembly should be assembled and tested several times for safe and continuous operation at the factory and demonstrated the operation to the Engineer from the department.

### **Specification of Plasma Torch Power Supply:**

- 2 No of Plasma Torches
- Net DC power: 40KW
- Electrical Input: 3 phase, 415V, 3 phase 35 – 50 Amps with mains fuse and on/off Manual switch
- Output Voltage: 50 Volts DC at Full load
- Output current range: 100-800 Amps
- Maximum DC current: 800 Amps
- Open Circuit voltage: 200 V DC
- Power factor: >0.9
- System frequency: 20 KHz
- Cooling: Water cooling (inbuilt)
- Auto Ignition circuit: Consisting of 3MHz / 3 KV electronic ignition without spark gap
- Arc power supply should be IGBT based with control logics.
- All control elements are fuse for current and surge protectors for voltage protected
- Transformers, controllers etc should be housed inside the panel to minimize the space.
- Front panel should be provided with touch screen which displays Arc current and Voltage.

Following push buttons are required:

DC “ON” – Green

Torch “ON” – Green

Torch “OFF” - Red

Emergency “OFF” –Mushroom Head–Yellow

Potentiometer for increasing the arc current.

Temperature indicators, control operation, water flow indication, PF switch selection, SPP, transformer temperature, stack temperature, etc. should be integrated with main panel and their status is displayed on touch screen. Hooter should blow when there is malfunction in the operation. Interlocks should be provided for the safety and easier operation of the PTAG.

**List of Spares:**

- All fuses used the power supply – 2 sets
- Anodes: 5 Numbers
- Cathodes: 5 Numbers
- Trigger electrode [HV/HF]: 3 Numbers
- Insulators used in the torch: 3 Numbers
- O’rings and gaskets: 2 Sets

**The quotation should have the following details:**

1. Cost of the item and accessories and installation charges, if any
2. Technical specifications in detail
3. Warranty period
4. Educational discount considering end use for research and teaching
5. Payment terms
6. Proprietary Certificate, if applicable
7. Comprehensive AMC prices should be quoted separately
8. Any other relevant details
9. List of the institutes, where similar systems are supplied.

**Terms and condition:-**

1. Sealed Quotation must reach to us till March 20, 2016 extended up to April 20, 2016 and Re- extended up to October 20, 2016. **Again R-extend upto October 28, 2016.**
2. Prices should be in INR and CIF IIT Kanpur.
3. Our Institute is partially exempted from custom duty.
4. The final selection will be made based on weights given to technical merit and pricing as 70% and 30% each, respectively.
5. Vendor can contact Dr. S.N. Tripathi on Telephone no. 0512-2597845, if he desires, so to evaluate the job, scope and details of work.

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